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TABLE OF CONTENTS

Management and Budget, Office of (September 92)	1
Attorney General (August 92)	75
Game and Fish Department (June 92)	79
Health and Consolidated Laboratories, Department of (June 92, September 92, October 92, November 92)	85
Insurance, Commissioner of (June 92, August 92)	1131
Board of Animal Health (November 92)	1157
Medical Examiners, Board of (July 92)	1161
Milk Stabilization Board (July 92)	1165
Nursing, Board of (June 92, November 92)	1177
Occupational Therapy Practice, Board of (November 92)	1189
Parks and Tourism Department (July 92)	1197
Pesticide Control Board (July 92)	1203
Pharmacy, Board of (June 92)	1213
Public Instruction, Superintendent of (November 92)	1229
Public Service Commission (September 92, November 92)	1233
Retirement Board (June 92, September 92)	1269
Seed Commission (June 92)	1283
Department of Human Services (August 92, November 92)	1305
Oilseed Council (June 92)	1447
Tax Commissioner (June 92, November 92)	1451
Water Commission (July 92)	1493
Workers Compensation Bureau (August 92)	1499
Seed Arbitration Board (July 92)	1503
Real Estate Appraiser Qualifications and Ethics Board (October 92)	1513

TITLE 4

Office of Management and Budget

SEPTEMBER 1992

STAFF COMMENT: Chapters 4-07-03 through 4-07-35 contain all new material but are not underscored so as to improve readability.

CHAPTER 4-07-03
CLASSIFICATION PLAN

Section	
4-07-03-01	Scope of Chapter
4-07-03-02	Definitions
4-07-03-03	Official Class Title
4-07-03-04	Interpretation of Class Specifications
4-07-03-05	Classification or Reclassification Request
4-07-03-06	Information and Forms Required
4-07-03-07	An Employee May Request a Review
4-07-03-08	An Appointing Authority Shall Consider an Employee's Request
4-07-03-09	A Request for a Classification Review Must be Submitted for all Positions Affected by a Reassignment
4-07-03-10	Central Personnel Division Shall Notify the Appointing Authority and Employee
4-07-03-11	Classification Appeal to the Director [Reserved]

4-07-03-01. Scope of chapter. This chapter applies to all state agencies, departments, institutions, and boards and commissions that employ classified employees, except those institutions in the university system. Additionally, this chapter applies to those agencies of local government that employ individuals whose positions are classified by the central personnel division.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12, 54-44.3-20
Law Implemented: NDCC 54-44.3-12(1)

4-07-03-02. Definitions. The terms used throughout this chapter have the same meaning as in North Dakota Century Code chapter 54-44.3, except "classification plan" means the listing of all the classes that have been established, the specifications for those classes, and the process and procedures developed to maintain the plan.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-03-03. Official class title. The official class title must be used to designate positions or employees when entering such information on payroll and personnel records, or in other communications related to personnel administration processes. However, any suitable or common title to designate persons or positions may be used when communicating externally, or when the purpose of the communication is not related to personnel administration.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-03-04. Interpretation of class specifications. Class specifications are generally descriptive of the duties and conditions typical of the class. Neither an appointing authority nor an employee may interpret class specifications as restrictive, except for the specified minimum qualification requirements. The inclusion of particular phrases in the specifications that list the duties performed may not be interpreted to exclude other duties of a similar kind and quality. An appointing authority may, at any time, require an employee to perform any of the duties that are in the class specifications or any other appropriate duties.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-03-05. Classification or reclassification request. A classification or reclassification request may be submitted for review by the appointing authority to the central personnel division, only if one of the following reasons apply:

1. A new position has been authorized.

2. New responsibilities are assigned to a new or existing position.
3. A significant amount of responsibilities are reassigned or changed for a position.
4. A position has not been reviewed for at least three years and different duties and responsibilities have been assigned to the position.
5. A position is classified in a class or class series that has been revised and the duties and responsibilities assigned to the position are no longer similar to the revised class or class series.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

4-07-03-06. Information and forms required. A classification or reclassification request must include all information specified by the central personnel division. The request must be submitted on the form specified by the division.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

4-07-03-07. An employee may request a review. An employee may request that an appointing authority submit the employee's position to the central personnel division for review if the employee demonstrates that one of the reasons in section 4-07-03-05 applies to the employee's position.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

4-07-03-08. An appointing authority shall consider an employee's request. An appointing authority shall consider an employee's request to submit the employee's position to the central personnel division for review. The appointing authority shall, within sixty calendar days, determine if any of the reasons in section 4-07-03-05 apply. If any of the reasons apply, the appointing authority shall submit the request to the central personnel division for review. If none of the reasons apply, the appointing authority may return the request to the employee.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

4-07-03-09. A request for a classification review must be submitted for all positions affected by a reassignment. When a reclassification request is due to a reassignment of responsibilities, a request for a classification review must be submitted for all positions affected.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-03-10. Central personnel division shall notify the appointing authority and employee. Within sixty calendar days of receiving a request to review a position, the central personnel division shall notify the agency appointing authority and the employee in writing of the division's decision and the right to appeal.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-03-11. Classification appeal to the director. [Reserved]

CHAPTER 4-07-04
COMPENSATION PLAN

Section	
4-07-04-01	Scope of Chapter
4-07-04-02	Definitions
4-07-04-03	Class Evaluation Process
4-07-04-04	A Request to Review a Pay Grade
4-07-04-05	Additional Information Required
4-07-04-06	Information and Forms Required
4-07-04-07	An Employee May Request a Review
4-07-04-08	An Appointing Authority Shall Consider an Employee's Request
4-07-04-09	Central Personnel Division Shall Notify the Appointing Authority and the Employee
4-07-04-10	Pay Grade Appeal to the Director [Reserved]

4-07-04-01. Scope of chapter. This chapter applies to all state agencies, departments, institutions, and boards and commissions that employ classified employees, except those institutions in the university system. Additionally, this chapter applies to those agencies of local government that employ individuals whose positions are classified by the central personnel division.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12

4-07-04-02. Definitions. The terms used throughout this chapter have the same meaning as in North Dakota Century Code chapter 54-44.3, except "compensation plan" means the listing of all the pay grades used in the classified service and the pay ranges assigned to each grade.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-04-03. Class evaluation process. The director, central personnel division, shall develop, implement, and maintain a class evaluation process to evaluate and assign an appropriate pay grade to all classes in the classification plan.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-04-04. A request to review a pay grade. A request to review a pay grade may be submitted to the central personnel division by the appointing authority only if one of the following reasons apply:

1. The duties and responsibilities of the class have changed.
2. The appointing authority is experiencing recruiting problems due to the assigned pay grade.
3. The appointing authority is experiencing retention problems due to the assigned pay grade.
4. The appointing authority can provide employment market data that shows an extreme variance between market pay and the classified salary.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

4-07-04-05. Additional information required. An appointing authority requesting a pay grade review shall furnish additional information to the central personnel division at the time the request is made. The additional information must include:

1. A statement of the problem.
2. Any available statistical data that relates to the problem encountered, i.e., turnover rate, recruiting costs, training costs, etc.
3. Details of efforts to resolve the problem through alternative methods.
4. Any available analysis of the current use of the salary range assigned to the existing pay grade.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

4-07-04-06. Information and forms required. A request to review a pay grade must contain all information specified by the central personnel division. A request must be submitted on the form specified by the division.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

4-07-04-07. An employee may request a review. An employee may request that an appointing authority submit the pay grade assigned to the employee's class to the central personnel division for review.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

4-07-04-08. An appointing authority shall consider an employee's request. An appointing authority shall consider an employee's request to submit the pay grade assigned to the employee's class to the central personnel division for review. The appointing authority shall, within sixty calendar days, determine if any of the reasons in section 4-07-04-04 apply and if the information required in section 4-07-04-05 is available. If any of the reasons apply and if the information is available, the appointing authority shall submit the request to the central personnel division for review. If none of the reasons apply, the appointing authority may return the request to the employee.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

4-07-04-09. Central personnel division shall notify the appointing authority and the employee. Within sixty calendar days of receiving a request to review a pay grade, the central personnel division shall notify the agency appointing authority and the employee in writing of the division's decision and the right to appeal.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

4-07-04-10. Pay grade appeal to the director. [Reserved]

CHAPTER 4-07-05
RECRUITMENT AND SELECTION

Section	
4-07-05-01	Scope of Chapter
4-07-05-02	Promotion Within an Agency
4-07-05-03	Minimum Qualifications
4-07-05-04	Notifying Central Personnel
4-07-05-05	Recruiting and Selection

4-07-05-01. Scope of chapter. This chapter applies to all state agencies, departments, institutions, and boards and commissions that employ classified employees, except those institutions in the university system. Additionally, this chapter applies to those agencies of local government that employ individuals whose positions are classified by the central personnel division.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12(1)

4-07-05-02. Promotion within an agency. An appointing authority may promote an employee from within an agency to fill any vacant classified position that the employee qualifies for in the respective agency. When promoting an employee from within the agency, the appointing authority may restrict the announcement of the position vacancy to the employees of that agency only.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03(4), 54-44.3-12(1)

4-07-05-03. Minimum qualifications. An appointing authority may not employ, promote, or reassign a person in or to a position in the classified service unless that person possesses qualifications that at least meet the minimum qualifications for that class as they are stated in the class specifications.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-05-04. Notifying central personnel. An appointing authority shall notify the central personnel division of each vacant classified, nontemporary position that the appointing authority intends to fill by employing a person who is not currently an employee of the agency. However, an appointing authority who is employed by an agency that is a party to a contract with job service North Dakota for employment

recruiting and referral services need not provide notification. The notification submitted may be in the form of a completed vacancy announcement or memo. Notification must be submitted to the division prior to beginning the recruiting effort.

History: Effective September 1, 1992.

General Authority: NDCC 54-42-03, 54-44.3-12

Law Implemented: NDCC 54-42-03(3), 54-44.3-12(1)

4-07-05-05. Recruiting and selection. When an appointing authority proceeds to fill a vacant classified, nontemporary position by recruiting an individual who is not a current employee of the agency, the appointing authority shall ensure that the public has the opportunity to know of and apply for the position. Additionally, the appointing authority shall select the applicant for appointment on the basis of the applicant's job-related qualifications for the position.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

CHAPTER 4-07-06
PROBATIONARY PERIOD

Section	
4-07-06-01	Scope of Chapter
4-07-06-02	Probationary Period
4-07-06-03	Purpose and Duration
4-07-06-04	Advising a New Employee
4-07-06-05	Separation During the Probationary Period
4-07-06-06	Evaluation and Notice of Completion
4-07-06-07	Extending a Probationary Period
4-07-06-08	Promotion During Initial Probationary Period
4-07-06-09	Promotion Following the Initial Probationary Period

4-07-06-01. Scope of chapter. This chapter applies to all state agencies, departments, institutions, and boards and commissions that employ classified employees, except those institutions in the university system. Additionally, this chapter applies to those agencies of local government that employ individuals whose positions are classified by the central personnel division.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

4-07-06-02. Probationary period. Each newly hired or rehired classified employee shall serve a probationary period.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1), 54-44.3-01

4-07-06-03. Purpose and duration. The purpose of the probationary period is to evaluate whether the employee can meet the performance requirements of the position to which the employee has been assigned. The duration of the initial probationary period must be for six months, which is determined by the completion of one thousand forty hours of work, exclusive of overtime. However, an agency may use a probationary period with a longer duration if it is needed to determine satisfactory performance, and if it does not exceed one year's duration.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-01, 54-44.3-12(1)

4-07-06-04. Advising a new employee. An appointing authority shall advise each newly hired or rehired employee of the applicable probationary period prior to the time the employee begins work.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-01, 54-44.3-12(1)

4-07-06-05. Separation during the probationary period. An employee may be separated from the employee's position for any lawful reason at any time during the probationary period. The employee may not grieve or appeal a lawful separation. The appointing authority shall notify the employee of the separation in writing.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-01, 54-44.3-12(1)

4-07-06-06. Evaluation and notice of completion. At the conclusion of an employee's initial probationary period, the appointing authority shall evaluate the employee's performance in writing. The appointing authority shall also notify the employee in writing that the employee has satisfactorily completed the probationary period. A copy of the evaluation and notice must be retained in the employee's official personnel file.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-01, 54-44.3-12(1)

4-07-06-07. Extending a probationary period. An appointing authority may extend an initial period of probation only if there is a documented work-related reason for doing so.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

4-07-06-08. Promotion during initial probationary period. An employee may be promoted during the employee's initial probationary period. The employee shall gain the right to appeal to the state personnel board following the successful completion of the probationary period imposed at the time of hire. Any additional period used to determine whether the employee can meet the requirements of the position

to which the employee has been promoted may not be used to affect the employee's rights to appeal to the state personnel board.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-06-09. Promotion following the initial probationary period. An employee may be promoted following the employee's initial probationary period. When an employee is so promoted, a subsequent period of probation may be imposed. The purpose of the subsequent period of probation is to determine whether the employee can meet the performance requirements of the new position. If an employee does not complete the subsequent period of probation successfully, the employee may be reassigned, returned to the employee's former position, if available, or dismissed. However in such instances, the employee has the right to appeal to the state personnel board.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

CHAPTER 4-07-07
WORKING HOURS AND HOLIDAYS

Section	
4-07-07-01	Scope of Chapter
4-07-07-02	Definitions
4-07-07-03	The Standard Workweek
4-07-07-04	Flexitime
4-07-07-05	Nonstandard Hours
4-07-07-06	Holidays

4-07-07-01. Scope of chapter. This chapter applies to all state agencies, departments, institutions, and boards and commissions that employ classified employees, except those institutions in the university system. Additionally, this chapter applies to those agencies of local government that employ individuals whose positions are classified by the central personnel division.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-07-02. Definitions. The terms used in this chapter have the same meaning as in North Dakota Century Code chapter 54-44.3, except:

1. "Core time" means the designated period of time within a standard workday and within a standard workweek, when all agency employees must either be on duty or on a leave status.
2. "Flexitime" means the approved starting and quitting times, outside the core time, that allow employees to vary their arrival and departure times.
3. "Standard workweek" means a fixed and regularly recurring forty-hour period within the calendar week.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-07-03. The standard workweek. The standard workweek, starting time, quitting time, and core times applicable to an agency's employees must be made known to those employees.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-07-04. Flexitime. An appointing authority may allow employees to use flexitime provided that regular service to the public is not interrupted.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

4-07-07-05. Nonstandard hours. An appointing authority may assign an employee to work hours other than the standard work hours. Additionally, an appointing authority may assign an employee to work hours in excess of the standard workweek.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

4-07-07-06. Holidays. The holidays for individuals who are employed by agencies subject to this chapter are those that are listed in North Dakota Century Code section 1-03-01.

History: Effective September 1, 1992.

General Authority: NDCC 54-42-03, 54-44.3-12

Law Implemented: NDCC 54-42-03, 54-44.3-12(1)

CHAPTER 4-07-08
WORKING AND INCLEMENT WEATHER CONDITIONS

Section	
4-07-08-01	Scope of Chapter
4-07-08-02	Reporting to Work
4-07-08-03	Reporting Late or Leaving Early
4-07-08-04	Key Positions
4-07-08-05	No Pay Reduced
4-07-08-06	Employee Not Scheduled to Work

4-07-08-01. Scope of chapter. This chapter applies to all state agencies, departments, institutions, and boards and commissions that employ classified employees, except those institutions in the university system. Additionally, this chapter applies to those agencies of local government that employ individuals whose positions are classified by the central personnel division.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-08-02. Reporting to work. During inclement weather conditions unless otherwise notified by an authorized official, each employee shall report to work as scheduled at the appointed time.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-08-03. Reporting late or leaving early. An employee who either reports to work late, or who leaves work early during inclement weather conditions while the employee's place of work remains open, must be charged appropriate leave for the time not worked.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-08-04. Key positions. An appointing authority may designate key positions. Individuals occupying those positions shall provide continuing services or essential services as required during emergency or inclement weather conditions when the agency is closed by an authorized official. An individual occupying a key position may be provided extra compensation, in addition to the regular pay rate, for performing required work during a period when agency facilities or normal operations have been closed or curtailed due to emergency or inclement weather conditions.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-08-05. No pay reduced. An appointing authority may not reduce the pay of an employee who is released from work due to an emergency or inclement weather conditions by an authorized official for those hours the employee was not required to work.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-08-06. Employee not scheduled to work. An employee not scheduled to report for work at an agency closed due to emergency or inclement weather conditions may not be provided additional compensation or time off due to the agency closing. However, an employee who had previously been granted leave for time off on a day when an agency is subsequently closed due to emergency or inclement weather conditions may not be charged leave for that day.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

CHAPTER 4-07-09
TRANSFERS, ANNUAL LEAVE AND SICK LEAVE HOURS

Section	
4-07-09-01	Scope of Chapter
4-07-09-02	Definitions
4-07-09-03	Assumption of Accrued Annual Leave and Sick Leave Hours

4-07-09-01. Scope of chapter. This chapter applies to all state agencies, departments, institutions, and boards and commissions that employ classified employees, except those institutions in the university system. Additionally, this chapter applies to those agencies of local government that employ individuals whose positions are classified by the central personnel division.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-09-02. Definitions. The terms used throughout this chapter have the same meaning as in North Dakota Century Code chapter 54-44.3, except "transfer" means an approved nontemporary change in employment for an employee from a position with one agency to another position with a different agency that does not result in a break in service.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-09-03. Assumption of accrued annual leave and sick leave hours. An appointing authority who elects to employ an individual by means of a transfer shall provide for the assumption of accrued annual leave and sick leave hours as follows:

1. An appointing authority in a state agency employing an individual from another state agency shall accept all sick leave hours, but may accept all or only a part of the employee's annual leave hours.

2. An appointing authority in an agency subject to the merit system who employs an individual from an agency subject to the merit system shall accept all sick leave hours, but may accept all or only a part of the employee's annual leave hours.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

CHAPTER 4-07-10
PERFORMANCE MANAGEMENT

Section

4-07-10-01	Scope of Chapter
4-07-10-02	Requirement for Performance Management Program
4-07-10-03	Requirement to Communicate Performance Expected
4-07-10-04	Criteria for Performance Management Programs

4-07-10-01. Scope of chapter. This chapter applies to all state agencies, departments, institutions, and boards and commissions that employ classified employees, except those institutions in the university system. Additionally, this chapter applies to those agencies of local government that employ individuals whose positions are classified by the central personnel division.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

4-07-10-02. Requirement for performance management program. Each agency, department, and institution shall adopt and use a program to provide for the development and management of the performance of each classified employee.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

4-07-10-03. Requirement to communicate performance expected. Each classified employee must be informed of the responsibilities assigned to the employee's position and of the level of performance needed to successfully perform the work.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

4-07-10-04. Criteria for performance management programs. Each agency, department, and institution shall use the criteria in one or the other of the following performance management program types:

1. Standard program.
 - a. Performance reviews are conducted annually.
 - b. Performance reviews are based on individual job-related requirements.

- c. A standard form or approach is used.
 - d. Performance standards, or goals and objectives are used.
 - e. The review includes a review of past performance.
 - f. The review includes a discussion of how performance may be improved or how an employee's skills may be developed.
2. Alternative program.
- a. Performance reviews are conducted as needed.
 - b. Performance reviews are based on how the employee functions as part of a team.
 - c. The emphasis of the program is on improving the quality of a service or product, constantly improving systems and processes, and on preventing problems and eliminating them.
 - d. The program provides guidance for the education, training, and self-improvement of the employee.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

CHAPTER 4-07-11

SEPARATIONS

[Reserved]

CHAPTER 4-07-12
ANNUAL LEAVE

Section	
4-07-12-01	Scope of Chapter
4-07-12-02	Definitions
4-07-12-03	Annual Leave Accrual
4-07-12-04	Annual Leave Accrual Schedule
4-07-12-05	Accrual for Employment for a Fraction of a Month
4-07-12-06	Annual Leave Taken in Fifteen-Minute Increments
4-07-12-07	Approval Required
4-07-12-08	Annual Leave Limit
4-07-12-09	Change of Cutoff Date
4-07-12-10	Pay During Employment
4-07-12-11	Credit for Temporary Service
4-07-12-12	Annual Leave and Reemployment

4-07-12-01. Scope of chapter. This chapter applies to all state agencies, departments, institutions, and boards and commissions that employ classified employees, except those institutions in the university system. Additionally, this chapter applies to those agencies of local government that employ individuals whose positions are classified by the central personnel division.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-12-02. Definitions. The terms used throughout this chapter have the same meaning as in North Dakota Century Code chapters 54-06, 54-44.3, and 54-52-01, except "annual leave" means an approved absence from work with pay, provided to a permanent employee, for vacation or other purposes including the adoption of a child.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-12-03. Annual leave accrual. Annual leave begins to accrue for each new permanent employee from the first day of the employee's probationary period.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-12-04. Annual leave accrual schedule. Agencies are advised that the following annual leave accrual schedule is recommended for use by each agency subject to this chapter:

<u>Years of Service</u>	<u>Hours Earned Per Month</u>
zero through three	eight
four through seven	ten
eight through twelve	twelve
thirteen through eighteen	fourteen
over eighteen	sixteen

An agency adopting or using a different accrual schedule shall promptly file a copy of that schedule with the central personnel division.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-06-14, 54-44.3-12(1)

4-07-12-05. Accrual for employment for a fraction of a month. An employee accrues leave for being employed for a fraction of a month. The number of annual leave hours earned by an employee for employment for a fraction of a month must be in proportion to the total number of straight time hours the employee actually worked compared to the total number of normal working hours in the month.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-12-06. Annual leave taken in fifteen-minute increments. Effective on January 1, 1993, annual leave must be taken in fifteen-minute increments. An appointing authority may not accept an employee's request for annual leave for an amount of time less than fifteen minutes in duration.

History: Effective January 1, 1993.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-12-07. Approval required. Generally, a request to use annual leave must be approved before the employee is authorized to take the leave. A leave request may be denied if the employee's absence would unduly disrupt the operations or services of the agency.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-12-08. Annual leave limit. The accrual of annual leave is limited in that no more than two hundred forty hours of accrued annual leave may be carried forward beyond December thirty-first of each year. If an agency uses a cutoff date other than December thirty-first, then the agency may continue to do so as long as the same cutoff date is used for all of the agency's employees, and the two hundred forty hour limit is observed.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-12-09. Change of cutoff date. An agency may not change the cutoff date it uses relating to the limit of annual leave accrual without first notifying the agency's employees.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-12-10. Pay during employment. An employee may not be paid for unused annual leave while the employee remains in the service of the agency. When an employee is transferring from one agency to another, the employee must be paid for the difference in hours between what the employee has accumulated and the number of hours the gaining agency will accept. When an employee is leaving the service of the agency, the employee must be paid for all accrued hours of annual leave.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-12-11. Credit for temporary service. A temporary employee who becomes permanent must be given credit for the employee's length of service as a temporary employee for the purpose of determining the annual leave accrual rate. An agency may not grant annual leave hours to a temporary employee.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-12-12. Annual leave and reemployment. An employee who leaves his or her employment and who is rehired within one year, must be credited with the employee's previous years of continuous service for the purpose of determining the employee's annual leave accrual rate. However, an employee affected by a reduction in force and rehired within

two years must be credited with the employee's previous service for the purpose of determining the employee's annual leave accrual rate.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

CHAPTER 4-07-13
SICK LEAVE

Section	
4-07-13-01	Scope of Chapter
4-07-13-02	Definitions
4-07-13-03	Sick Leave Accrual
4-07-13-04	Sick Leave Accrual Rate
4-07-13-05	Accrual for Fractional Months
4-07-13-06	No Limit on Sick Leave Carryover
4-07-13-07	Uses of Sick Leave
4-07-13-08	Sick Leave Taken in Increments
4-07-13-09	Sick Leave and Pregnancy
4-07-13-10	Temporary or Emergency Employment
4-07-13-11	Sick Leave and Reemployment

4-07-13-01. Scope of chapter. This chapter applies to all state agencies, departments, institutions, and boards and commissions that employ classified employees, except those institutions in the university system. Additionally, this chapter applies to those agencies of local government that employ individuals whose positions are classified by the central personnel division.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

4-07-13-02. Definitions. The terms used throughout this chapter have the same meaning as in North Dakota Century Code chapters 54-06, 54-44.3, and 54-52.4, except:

1. "Eligible family member" means the employee's spouse, parent (natural, adoptive, foster, and stepparent), child (natural, adoptive, foster, and stepchild), or any other family member who is financially or legally dependent upon the employee or who resides with the employee for the purpose of the employee providing care to the family member.
2. "Sick leave" means an approved absence from work, with pay, provided to a permanent employee for use when the employee requires diagnosis or treatment of a medically related condition, or when the employee is ill or injured and is

unable to work, or for use under certain circumstances when there is an illness or medical need in the employee's family.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-13-03. Sick leave accrual. Sick leave begins to accrue for each new permanent employee from the first day of the probationary period.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-13-04. Sick leave accrual rate. Agencies are advised that the following sick leave accrual schedule is recommended for use by each agency subject to this chapter:

<u>Years of Service</u>	<u>Hours Earned Per Month</u>
zero to all	eight

An agency adopting or using a different accrual schedule shall promptly file a copy of that schedule with the central personnel division.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-06-14, 54-44.3-12(1)

4-07-13-05. Accrual for fractional months. An employee accrues sick leave for employment for a fraction of a month. The number of sick leave hours earned by an employee for employment for a fraction of a month must be in proportion to the total number of straight time hours the employee actually worked compared to the total number of working hours in a month.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-13-06. No limit on sick leave carryover. An employee may not be limited in the number of unused earned sick leave hours that may be carried over from one calendar year to another.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-13-07. Uses of sick leave. Sick leave may be used by an employee when:

1. The employee is ill or injured and is unable to work.
2. The employee has an appointment for the diagnosis or treatment of a medically related condition.
3. The employee wishes to attend to the needs of the employee's eligible family members who are ill or to assist them in obtaining other services related to their health or well-being. Sick leave used for these purposes may not exceed forty hours per calendar year.
4. It is appropriate as a participant in an employee assistance program.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

4-07-13-08. Sick leave taken in increments. Effective January 1, 1993, sick leave must be taken in fifteen-minute increments. An appointing authority may not accept an employee's request for sick leave for an amount of time less than fifteen minutes in duration.

History: Effective January 1, 1993.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

4-07-13-09. Sick leave and pregnancy. A pregnant employee, who is temporarily medically disabled from performing the employee's assigned work, must be considered eligible for sick leave. Pregnancy must be treated in the same manner as any other medical disability with respect to sick leave benefits.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

4-07-13-10. Temporary or emergency employment. A temporary or emergency employee may not be credited with any accrued sick leave hours.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

4-07-13-11. Sick leave and reemployment. An employee who leaves his or her employment and who is rehired within one year must be credited with the amount of sick leave hours the employee had accumulated at the time of departure, less any amount for which the employee had subsequently been paid. An employee affected by a reduction in force and rehired within two years must be credited with the amount of sick leave hours the employee had accumulated at the time of departure, less any amount for which the employee had subsequently been paid.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

CHAPTER 4-07-14
FUNERAL LEAVE

Section	
4-07-14-01	Scope of Chapter
4-07-14-02	Definitions
4-07-14-03	Granting Leave
4-07-14-04	Not Considered Sick Leave or Annual Leave

4-07-14-01. Scope of chapter. This chapter applies to all state agencies, departments, institutions, and boards and commissions that employ classified employees, except those institutions in the university system. Additionally, this chapter applies to those agencies of local government that employ individuals whose positions are classified by the central personnel division.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-14-02. Definitions. The terms used throughout this chapter have the same meaning as in North Dakota Century Code chapter 54-44.3, except:

1. "Family" means husband, wife, son, daughter, father, mother, stepparents, brother, sister, grandparents, grandchildren, stepchildren, foster parents, foster children, daughter-in-law, and son-in-law.
2. "Funeral leave" means an approved absence from work, with pay, of up to twenty-four working hours, provided to an employee to attend or make arrangements for a funeral, as a result of a death in the employee's family, or in the family of an employee's spouse.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-14-03. Granting leave. An appointing authority may grant a request for a funeral leave even if the absence of the employee might interfere with the normal operations of the agency.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-14-04. Not considered sick leave or annual leave. An agency may not consider funeral leave as sick leave or annual leave.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

CHAPTER 4-07-15
LEAVE WITHOUT PAY

Section	
4-07-15-01	Scope of Chapter
4-07-15-02	Definitions
4-07-15-03	Leave Without Pay

4-07-15-01. Scope of chapter. This chapter applies to all state agencies, departments, institutions, and boards and commissions that employ classified employees, except those institutions in the university system. Additionally, this chapter applies to those agencies of local government that employ individuals whose positions are classified by the central personnel division.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-15-02. Definitions. The terms used throughout this chapter have the same meaning as in North Dakota Century Code chapter 54-44.3, except "leave without pay" means the approved absence from work without pay of an employee for up to no more than one year's duration.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-15-03. Leave without pay. An appointing authority may grant an employee's request for a leave of absence without pay provided that:

1. The absence of the employee will not unduly disrupt the agency's operations or services.
2. The appointing authority and the employee have agreed in writing about the terms and conditions of the employee's return to work.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

CHAPTER 4-07-16
JURY AND WITNESS LEAVE

Section	
4-07-16-01	Scope of Chapter
4-07-16-02	Jury Duty
4-07-16-03	Witness on Behalf of the Employer
4-07-16-04	Witness Fee
4-07-16-05	Witness Fee and Law Enforcement Personnel
4-07-16-06	Witness Duties

4-07-16-01. Scope of chapter. This chapter applies to all state agencies, departments, institutions, and boards and commissions that employ classified employees, except those institutions in the university system. Additionally, this chapter applies to those agencies of local government that employ individuals whose positions are classified by the central personnel division.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-16-02. Jury duty. An employee selected for jury duty must be granted an approved absence from work with pay, except that an amount of pay equal to the amount the employee received from the court for jury duty service must be deducted from the employee's regular pay. However, if an employee is on authorized annual leave while performing jury duty, the employee may retain the fee paid by the court and the employee's pay may not be reduced.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-16-03. Witness on behalf of the employer. When an employee is called or appears as a witness, or as an expert witness, on behalf of the employer, and the employee's department reimburses the employee for mileage, meals, and lodging, then the employee may not submit an additional claim for mileage, meals, and lodging. Also, the employee must be paid the employee's regular rate of compensation for time spent as a witness.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-16-04. Witness fee. An employee may retain a witness fee paid by a party only when each of the following apply:

1. The employee's agency did not reimburse the employee for mileage, meals, and lodging.
2. The employee is on authorized leave.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-16-05. Witness fee and law enforcement personnel. When a law enforcement officer performs duties as a witness during off-duty time, the officer may receive a witness fee and reimbursement for mileage, meals, and lodging, provided the officer is not otherwise reimbursed by the employer. When a law enforcement officer performs duties as a witness in an official capacity in a criminal case, the officer is regarded as performing normal duties, and consequently the officer may not retain a witness fee.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-16-06. Witness duties. An employee who performs witness duties unrelated to the employee's official capacity, or because the employee is personally interested in the proceedings, or because the employee volunteers to do so, must be placed on annual leave or leave without pay status. In these situations, the employee may retain any witness fee provided to the employee.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

CHAPTER 4-07-17
WORKERS' COMPENSATION AND LEAVE

Section	
4-07-17-01	Scope of Chapter
4-07-17-02	Employee Election to Use Leave
4-07-17-03	Leave Without Pay While Receiving Benefits
4-07-17-04	Pay Differential and Charging Leave Account

4-07-17-01. Scope of chapter. This chapter applies to all state agencies, departments, institutions, and boards and commissions that employ classified employees, except those institutions in the university system. Additionally, this chapter applies to those agencies of local government that employ individuals whose positions are classified by the central personnel division.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-17-02. Employee election to use leave. If an employee is receiving workers' compensation benefits, the employee may elect to use either the employee's accumulated sick leave, annual leave, or leave without pay during the period the employee is unable to work.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-17-03. Leave without pay while receiving benefits. An employee receiving workers' compensation benefits who has either utilized all leave benefits, or who has elected not to use accrued leave benefits, must be placed in a leave without pay status for the remainder of the period that the employee is unable to work. An employee may remain in a leave without pay status for a time period not to exceed two years.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-17-04. Pay differential and charging leave account. An employee who elects to use leave while receiving workers' compensation benefits must be paid by the employee's agency an amount equal to the difference between the employee's regular base salary and the amount the employee receives from workers' compensation while the employee is on leave. An employee's leave account must then be charged with the number of hours that corresponds to the percentage of salary the agency pays.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

CHAPTER 4-07-18
SERVICE AWARD PROGRAMS

Section	
4-07-18-01	Scope of Chapter
4-07-18-02	Requirement for Service Award Program
4-07-18-03	Retroactivity
4-07-18-04	Length of Service Required to Receive Award
4-07-18-05	Service Award Types
4-07-18-06	Retirement Awards
4-07-18-07	Cash

4-07-18-01. Scope of chapter. This chapter applies to all state agencies, departments, institutions, and board and commissions that employ classified employees, except those institutions in the university system.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-18-02. Requirement for service award program. Each agency, department, institution, board and commission shall recognize certain service anniversaries of classified employees by implementing and administering a service award program.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-18-03. Retroactivity. The required service award program may not be retroactive. However, all times worked in the employment of the state prior to January 1, 1986, must be counted toward any future service award.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-18-04. Length of service required to receive award. An employee must have completed the equivalent of five, ten, fifteen, twenty, twenty-five, thirty, thirty-five, or forty years of full-time employment with the state in order to receive a service award. An employee who leaves employment with the state and then returns, again begins to accumulate time. That time must be added to the employee's previous service and applied to any future service award.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-18-05. Service award types. The types of service awards that are given to employees must be provided as follows:

1. Following the completion of five years; certificate or plaque, and a gift not to exceed a value of twenty-five dollars.
2. Following the completion of ten years; certificate or plaque, and a gift not to exceed a value of fifty dollars.
3. Following the completion of fifteen years; certificate or plaque, and a gift not to exceed a value of seventy-five dollars.
4. Following the completion of twenty years; certificate or plaque, and a gift not to exceed a value of two hundred dollars.
5. Following the completion of twenty-five years; certificate or plaque, and a gift not to exceed a value of two hundred dollars.
6. Following the completion of thirty years; certificate or plaque, and a gift not to exceed a value of two hundred dollars.
7. Following the completion of thirty-five years; certificate or plaque, and a gift not to exceed a value of two hundred dollars.
8. Following the completion of forty years; certificate or plaque, and a gift not to exceed a value of two hundred dollars.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-18-06. Retirement awards. A retirement award must be provided to an employee who has a minimum of fifteen years of service, and who has not been previously recognized for a retirement by the state, as follows:

1. A plaque with bronzed certificate or bronzed letter signed by the governor.
2. A gift with a value not to exceed two hundred dollars.

3. A farewell coffee party, provided that the employee agrees to participate.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-18-07. Cash. An agency may not provide cash to an employee as part of a service award program. An agency may, however, provide a gift certificate.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

CHAPTER 4-07-19
DISCIPLINARY ACTIONS

Section	
4-07-19-01	Scope of Chapter
4-07-19-02	Definitions
4-07-19-03	Discipline Only for Cause
4-07-19-04	Use of Progressive Discipline

4-07-19-01. Scope of chapter. This chapter applies to all state agencies, departments, institutions, and board and commissions that employ classified employees, except those institutions in the university system. Additionally, this chapter applies to those agencies of local government that employ individuals whose positions are classified by the central personnel division.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

4-07-19-02. Definitions. The terms used throughout this chapter have the same meaning as in North Dakota Century Code chapter 54-44.3, except:

1. "Cause" means conduct related to the employee's job duties, job performance, or working relationships that is detrimental to the discipline and efficiency of the service in which the employee is or was engaged.
2. "Progressive discipline" includes the disciplinary actions imposed to correct an employee's behavior, beginning with the least severe appropriate action and progressing to the more severe, for repeated instances of poor job performance, or for repeated violations of the same or similar rules or standards.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

4-07-19-03. Discipline only for cause. An employee may be disciplined only for cause.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

4-07-19-04. Use of progressive discipline. Progressive discipline must be used to correct an employee's job performance problems or for a violation of rules or standards, except:

1. When an infraction or a violation of a serious nature is committed such as, but not limited to, insubordination, theft, falsification of pay records, assaulting a supervisor or coworker, patient or client, and for which the imposition of less severe disciplinary action would be inappropriate.
2. When an employee is in the initial probationary period.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

CHAPTER 4-07-20
GRIEVANCE PROCEDURES
[Reserved]

CHAPTER 4-07-21
ALTERNATIVE DISPUTE RESOLUTION

Section	
4-07-21-01	Scope of Chapter
4-07-21-02	Definitions
4-07-21-03	Alternative Dispute Resolution
4-07-21-04	Grievance Time Limits Suspended

4-07-21-01. Scope of chapter. This chapter applies to all state agencies, departments, institutions, and boards and commissions that employ classified employees, except those institutions in the university system. Additionally, this chapter applies to those agencies of local government that employ individuals whose positions are classified by the central personnel division.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-21-02. Definitions. The terms used throughout this chapter have the same meaning as in North Dakota Century Code chapter 54-44.3, except "alternative dispute resolution" means a method of resolving disputes, outside the grievance process, that involves a neutral person to assist in identifying issues, developing options, and arriving at a settlement that is agreeable to the participants through the use of one or more appropriate techniques.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-21-03. Alternative dispute resolution. Alternative dispute resolution may be used to settle disputes that occur within an agency. Both the agency appointing authority and the individual employee involved in the dispute must agree to the use of alternative dispute resolution prior to using the method. If either the appointing authority or the employee do not agree to use alternative dispute resolution, then the method may not be used.

History: Effective September 1, 1992.
General Authority: NDCC 54-44.3-12
Law Implemented: NDCC 54-44.3-12(1)

4-07-21-04. Grievance time limits suspended. During the time period when the agency appointing authority and the employee involved in a dispute are utilizing alternative dispute resolution, the time limits of the internal agency grievance procedure must be suspended. If a

settlement is not agreed to by the participants, then the time limits of the agency grievance procedure must be activated.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3-12

Law Implemented: NDCC 54-44.3-12(1)

CHAPTER 4-07-22
MERIT SYSTEM VACANCY ANNOUNCEMENTS

Section	
4-07-22-01	Scope of Chapter
4-07-22-02	Definitions
4-07-22-03	Requirements
4-07-22-04	Minimum Qualifications
4-07-22-05	Open Register Vacancy Announcements
4-07-22-06	Specific Vacancy Announcements
4-07-22-07	Closing Date

4-07-22-01. Scope of chapter. This chapter applies to all applicants who apply for positions in agencies covered by the North Dakota merit system and to all agencies, departments, institutions, boards, commissions, and political subdivisions required to comply with standards for a merit system of personnel administration as administered by the central personnel division.

History: Effective September 1, 1992.

General Authority: NDCC 54-42-03, 54-44.3-12

Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-22-02. Definitions. The terms used throughout this chapter have the same meaning as in North Dakota Century Code chapters 54-42 and 54-44.3, except:

1. "Closing date" means a date after which applications will no longer be accepted for a specific vacancy.
2. "Open register" means a list of applicants available for future employment vacancies maintained by the division so that applications may be accepted at any time, and the minimum qualifications used are taken directly from the class specifications, and the duration of the register is for one year.
3. "Specific vacancy register" means a list of applicants available for employment prepared for a specific position using minimum qualifications developed by the employing agency, and the register is maintained until the particular position is filled or the vacancy is canceled.
4. "Underfill" means to fill a classified position by employing an individual in a lower level class than originally announced.
5. "Vacancy announcement" means an announcement that a particular position is vacant and that the appointing authority intends to recruit to fill it.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-22-03. Requirements. Each vacancy announcement must include the following information:

1. Class title.
2. Position number.
3. Salary range.
4. Closing date.
5. Location of position.
6. Merit system application form requirement.
7. Summary of work.
8. Minimum qualifications and special requirements.
9. Type of recruitment.
 - a. Internal unit posting.
 - b. Internal agency posting.
 - c. External.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-22-04. Minimum qualifications.

1. An appointing authority shall contact the central personnel division prior to the distribution of a vacancy announcement to resolve any question about minimum qualifications statements.
2. If an appointing authority wishes to consider underfilling, the appointing authority shall include the following information in the minimum qualifications statements:
 - a. The intent to underfill.
 - b. The class title of the underfill.
 - c. The minimum qualifications of the underfill class.

3. Once a position has been advertised, an appointing authority may not change the minimum qualifications or the closing date without readvertising the position.

History: Effective September 1, 1992.

General Authority: NDCC 54-42-03, 54-44.3-12

Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-22-05. Open register vacancy announcements.

1. A vacancy announced for a class maintained on the open register must use the minimum qualifications as appear on the class specification.
2. An appointing authority may state a preference for additional education or experience, but the preference may not replace the minimum qualifications in subsection 1 of section 4-07-22-05.

History: Effective September 1, 1992.

General Authority: NDCC 54-42-03, 54-44.3-12

Law Implemented: NDCC 54-42-03, 54-44.3-12(1)

4-07-22-06. Specific vacancy announcements.

1. Minimum qualifications for a specific vacancy may not contain minimum qualifications that are less than the established minimum qualifications on the class specification, but they may contain more specific requirements.
2. When advertising for required education on a specific vacancy, an appointing authority may:
 - a. Narrow the range of appropriate degrees.
 - b. Specify the additional training or experience needed for working in an upper level of a class series.
3. An appointing authority may not use the terms "the equivalent of" or "equivalent to" in the minimum qualifications on a vacancy announcement.
4. An appointing authority shall define the type and length of experience that substitutes for a college degree, if a substitution statement is used in the minimum qualifications of the class specification.
5. An appointing authority shall define the terms "related field" or "related experience" if used in the minimum qualifications.

History: Effective September 1, 1992.

General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-22-07. Closing date. An applicant meets the applicable closing date on a vacancy announcement if:

1. The application received is postmarked on or before the closing date.
2. The application is delivered or electronically transmitted to the appropriate agency on or by five p.m. on the advertised closing date.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

CHAPTER 4-07-23
MERIT SYSTEM AGENCIES AND VETERANS' PREFERENCE

Section

4-07-23-01	Scope of Chapter
4-07-23-02	Documentation Required
4-07-23-03	Deadlines for Receipt of Documentation
4-07-23-04	Expiration of Documentation

4-07-23-01. Scope of chapter. This chapter applies to all applicants who apply for positions in agencies covered by the North Dakota merit system and to all agencies, departments, institutions, boards, commissions, and political subdivisions required to comply with standards for a merit system of personnel administration as administered by the central personnel division.

History: Effective September 1, 1992.

General Authority: NDCC 54-42-03, 54-44.3

Law Implemented: NDCC 54-42-03, 54-44.3-23

4-07-23-02. Documentation required. The documentation required to be submitted at the time of making application to substantiate a claim for veterans' preference is as follows:

1. An applicant claiming veterans' preference shall provide a copy of report of separation DD-214.
2. An applicant claiming disabled veterans' preference shall provide a copy of report of separation DD-214 and a letter less than one year old from the veterans' administration indicating the veteran's disability status.
3. An applicant claiming veterans' preference as an eligible spouse of a deceased veteran shall provide a copy of the marriage certificate, the veteran's report of separation DD-214, and the veteran's death certificate.
4. An applicant claiming disabled veterans' preference as an eligible spouse of a disabled veteran shall provide a copy of the marriage certificate, the veteran's report of separation DD-214, and a letter less than one year old from the veterans' administration indicating the veteran's disability status.

History: Effective September 1, 1992.

General Authority: NDCC 54-42-03, 54-44.3

Law Implemented: NDCC 54-42-03, 54-44.3-23

4-07-23-03. Deadlines for receipt of documentation.

1. Open registers.

- a. The central personnel division shall add veterans' preference points, if applicable, to an applicant's score effective on the date the veterans' documentation is received and processed.
- b. Veterans' preference points may not be added to a certificate of eligibles retroactively.

2. Specific vacancy registers.

- a. Veterans' preference documentation required in section 4-07-23-02 must be postmarked on or before the closing date on the vacancy announcement.
- b. Veterans' preference points may not be added to a certificate of eligibles retroactively.

History: Effective September 1, 1992.

General Authority: NDCC 54-42-03, 54-44.3

Law Implemented: NDCC 54-42-03, 54-44.3-23

4-07-23-04. Expiration of documentation.

1. Disabled veterans' preference documentation must be considered valid for a period of one year from the date of the disability letter from the veterans' administration.
2. Notice of the expiration date of the documentation must be provided to the disabled veteran when the disabled veteran's name is placed on the register.
3. Disabled veterans' preference points must be removed from each register if current documentation from the disabled veteran is not received by the expiration date in subsection 2 of section 4-07-23-04.

History: Effective September 1, 1992.

General Authority: NDCC 54-42-03, 54-44.3

Law Implemented: NDCC 54-42-03, 54-44.3-23

CHAPTER 4-07-24
MERIT SYSTEM APPLICATIONS

Section	
4-07-24-01	Scope of Chapter
4-07-24-02	Application or Application Supplement Required
4-07-24-03	Open Register Applications
4-07-24-04	Specific Vacancy Applications
4-07-24-05	Investigation of Application Information
4-07-24-06	Disapproval and Disqualification of Applications
4-07-24-07	Merit System Application Appeals to the Director [Reserved]

4-07-24-01. Scope of chapter. This chapter applies to all applicants who apply for positions in agencies covered by the North Dakota merit system and to all agencies, departments, institutions, boards, commissions, and political subdivisions required to comply with standards for a merit system of personnel administration as administered by the central personnel division.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-24-02. Application or application supplement required. Each application for a position in an agency covered by the North Dakota merit system must be made on an application or supplemental application form specified by the central personnel division.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3
Law Implemented: NDCC 54-42-03, 54-44.3

4-07-24-03. Open register applications.

1. The central personnel division shall accept an application for a class maintained on an open register at any time and shall consider only information contained in that application and in previous applications.
2. The central personnel division may not consider additional education and experience information received from an applicant after a rating has been established. However, that

information must be retained in the applicant's file for consideration for any future rating.

History: Effective September 1, 1992.

General Authority: NDCC 54-42-03, 54-44.3-12

Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-24-04. Specific vacancy applications.

1. The central personnel division shall accept an application for a class maintained on a specific vacancy register only when a specific vacancy has been announced. The division shall consider only information contained in that application and in previous applications.
2. The central personnel division may not accept an application for a class maintained on a specific vacancy register after the closing date.
3. The central personnel division may not consider additional education and experience information submitted by an applicant after the closing date. However, the division must retain the information and place it in the applicant's file for consideration for any future vacancy.

History: Effective September 1, 1992.

General Authority: NDCC 54-42-03, 54-44.3-12

Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-24-05. Investigation of application information. The central personnel division may investigate an applicant's training and experience in order to verify the application information provided. If the investigation produces evidence that the applicant falsified information affecting the applicant's rating, the division may rate or rerate the applicant's record accordingly, make any necessary adjustments to registers and notify the applicant of the action.

History: Effective September 1, 1992.

General Authority: NDCC 54-42-03, 54-44.3-12

Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-24-06. Disapproval and disqualification of applications. Applications may be disapproved or disqualified after rating for any of the following reasons:

1. If an applicant does not meet the minimum qualifications.
2. If an applicant has made a false statement of material fact on the application.

3. If an erroneous approval was made by the central personnel division.
4. If an applicant has used or attempted to use political pressure or bribery to secure an advantage in the examination or employment process.
5. If an applicant has directly or indirectly obtained information regarding the examination process to which the applicant was not entitled.
6. If there are other valid reasons to justify the disqualification.

History: Effective September 1, 1992.

General Authority: NDCC 54-42-03, 54-44.3-12

Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-24-07. Merit system application appeals to the director.
[Reserved]

CHAPTER 4-07-25
MERIT SYSTEM EXAMINATIONS

Section	
4-07-25-01	Scope of Chapter
4-07-25-02	Examinations Administered by the Division
4-07-25-03	Conduct of Examinations
4-07-25-04	Reexamination Schedule
4-07-25-05	Notice of Final Rating
4-07-25-06	Correcting an Error

4-07-25-01. Scope of chapter. This chapter applies to all applicants who apply for positions in agencies covered by the North Dakota merit system and to all agencies, departments, institutions, boards, commissions, and political subdivisions required to comply with standards for a merit system of personnel administration as administered by the central personnel division.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-25-02. Examinations administered by the division. Examinations administered by the division may include one or a combination of the following:

1. A rating of training and experience.
2. A written examination.
3. A keyboard performance examination.
4. A pass or fail review.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-25-03. Conduct of examinations. The central personnel division shall conduct all examinations in places convenient for applicants and practicable for administration. The division may make

arrangements for the use of various public buildings in order to conduct the examinations.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-25-04. Reexamination schedule.

1. An applicant who fails an examination may retake the examination in accordance with a reexamination schedule established by the central personnel division.
2. An applicant who has passed an examination may retake the examination once, according to reexamination procedures established by the central personnel division. The central personnel division shall use the higher of the two examination scores.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-25-05. Notice of final rating. The central personnel division shall notify an applicant who applies for a class maintained on an open or specific vacancy register of the applicant's final rating in writing.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-25-06. Correcting an error. The central personnel division shall promptly take action, upon notification, to correct an error made by the division in any part of the examination process. The division shall notify an applicant in writing of any corrective action taken.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

CHAPTER 4-07-26
MERIT SYSTEM REGISTERS

Section	
4-07-26-01	Scope of Chapter
4-07-26-02	Names on the Register
4-07-26-03	Open Registers
4-07-26-04	Specific Vacancy Registers
4-07-26-05	Duration of Open Registers
4-07-26-06	Duration of Specific Vacancy Registers
4-07-26-07	Removal From Registers

4-07-26-01. Scope of chapter. This chapter applies to all applicants who apply for positions in agencies covered by the North Dakota merit system and to all agencies, departments, institutions, boards, commissions, and political subdivisions required to comply with standards for a merit system of personnel administration as administered by the central personnel division.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-26-02. Names on the register. The central personnel division shall place the names of individuals onto each register maintained by the division in order of the individual's final rating, starting with the highest final rating.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-26-03. Open registers. The central personnel division shall establish and maintain open registers for which an applicant may apply at any time for those classes determined appropriate by the division and the merit system agency affected. The division shall provide notice of the classes that are maintained on open registers.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-26-04. Specific vacancy registers. The central personnel division shall establish and maintain specific vacancy registers. An applicant may apply for a class included on a specific vacancy register only when a specific vacancy is announced.

History: Effective September 1, 1992.

General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-26-05. Duration of open registers. The central personnel division shall consider an applicant's name to be valid on an open register only for a period of one year from the date the applicant's name was placed on the register.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-26-06. Duration of specific vacancy registers. A specific vacancy register is valid only for the period of time until the specific vacancy is filled or the vacancy is canceled.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-26-07. Removal from registers. An applicant's name may be removed from an open register or a specific vacancy register for any of the reasons specified in section 4-07-24-06. The central personnel division shall notify, in writing, an applicant whose name is removed from the register.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

CHAPTER 4-07-27
MERIT SYSTEM CERTIFICATES OF ELIGIBLES

Section	
4-07-27-01	Scope of Chapter
4-07-27-02	Definition
4-07-27-03	Veteran's Preference on Certificates
4-07-27-04	Certificate for a Position on an Open Register
4-07-27-05	Certificate for a Specific Vacancy
4-07-27-06	Revision to a Certificate of Eligibles
4-07-27-07	Certificate of Eligibles and Applicants

4-07-27-01. Scope of chapter. This chapter applies to all applicants who apply for positions in agencies covered by the North Dakota merit system and to all agencies, departments, institutions, boards, commissions, and political subdivisions required to comply with standards for a merit system of personnel administration as administered by the central personnel division.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-27-02. Definition. "Certificate of eligibles" means a list of available, qualified applicants that is referred to a merit system agency for the purpose of selecting an applicant to fill a vacant position, and on which names appear in order of final rating, starting with the highest.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-27-03. Veteran's preference on certificates. Veteran's preference points must be identified on a certificate of eligibles next to the applicant's final rating.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-27-04. Certificate for a position on an open register.

1. The central personnel division shall issue a certificate of eligibles upon receipt of a request from an agency.

2. The certificate of eligibles must consist of only those names appearing on the open register for the specific class requested at the time the agency made the request.
3. If the request designates one position to be filled, the certificate of eligibles must consist of the top seven scores or the seventeen highest names, whichever number of eligibles is greater.
4. If the request designates more than one position to be filled, one additional score or three additional names, whichever number of eligibles is greater, must be included on the certificate of eligibles.

History: Effective September 1, 1992.

General Authority: NDCC 54-42-03, 54-44.3-12

Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-27-05. Certificate for a specific vacancy.

1. The central personnel division, upon receipt of a request for personnel from an agency, shall issue a certificate of eligibles for a specific vacancy as soon after the closing date as possible.
2. The certificate of eligibles must consist of the names of all applicants who meet the minimum qualifications, regardless of the number of positions to be filled.

History: Effective September 1, 1992.

General Authority: NDCC 54-42-03, 54-44.3-12

Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-27-06. Revision to a certificate of eligibles.

1. A revision to an open register certificate of eligibles may be issued by the central personnel division upon request of an appointing authority, if the appointing authority has considered all applicants on the original certificate. A revision to a certificate is considered as a continuation of the original certificate.
2. A revision to a specific vacancy certificate of eligibles may be issued by the central personnel division only if the appointing authority has reannounced the specific vacancy and has used the same minimum qualifications in the announcement.

History: Effective September 1, 1992.

General Authority: NDCC 54-42-30, 54-44.3-12

Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-27-07. Certificate of eligibles and applicants.

1. An appointing authority shall consider in rank order each applicant whose name is included on a certificate of eligibles.
2. An appointing authority shall enter coded comments on a certificate indicating the action taken on each applicant whose name appears on the certificate.
3. An appointing authority who passes over an applicant by selecting for employment an applicant with a lower score, shall justify the selection, document it in writing, and ensure the documentation is maintained by the agency.
4. An appointing authority shall enter a code on a certificate if an applicant is unavailable. An applicant may be considered as unavailable for employment for any of the following reasons:
 - a. Failing to respond to an agency written inquiry within seven working days of mailing to the applicant's last known address.
 - b. Declining an offer of employment in a permanent position.
 - c. Declining to consider employment in geographic areas previously indicated by the applicant.
 - d. Providing a statement that the applicant no longer wishes to be considered for employment.
 - e. Accepting an offer of probationary employment.

History: Effective September 1, 1992.

General Authority: NDCC 54-42-03, 54-44.3-12

Law Implemented: NDCC 54-42-03, 54-44.3-12

CHAPTER 4-07-28
MERIT SYSTEM EMPLOYMENT STATUS

Section	
4-07-28-01	Scope of Chapter
4-07-28-02	Definition
4-07-28-03	Merit System Employment Status - Exceptions
4-07-28-04	Extension of Merit System Coverage

4-07-28-01. Scope of chapter. This chapter applies to all applicants who apply for positions in agencies covered by the North Dakota merit system and to all agencies, departments, institutions, boards, commissions, and political subdivisions required to comply with standards for a merit system of personnel administration as administered by the central personnel division.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-28-02. Definitions. The terms used throughout this chapter have the same meaning as in North Dakota Century Code chapters 54-42 and 54-44.3 except:

1. "Emergency status" means a category of employment that applies to an individual employed as a result of unusual or unexpected conditions without regard to the normal certification process and the duration of the employment does not exceed sixty working days.
2. "Merit system exempt status" means a category of employment that applies to an individual employed in a nonclassified position without regard to the normal certification process such as with seasonal or time-limited programs and for appointed officials.
3. "Permanent status" means a category of employment that applies to an individual employed in a classified position, who was certified to an agency by the central personnel division, and who has successfully completed the six-month probationary period.
4. "Probationary status" means a category of employment that applies to an individual employed in a classified position, who was certified to an agency by the central personnel division, and who has not yet completed the initial six-month probationary period.
5. "Temporary status" means a category of employment that applies to an individual who has certified to an agency by the central

personnel division and is employed in a position that is time-limited in duration.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3
Law Implemented: NDCC 54-42-03, 54-44.3

4-07-28-03. Merit system employment status - Exceptions. Each employee of a merit system agency shall have employment status under the merit system, except individuals in the categories of merit system exempt or emergency status.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3
Law Implemented: NDCC 54-42-03, 54-44.3

4-07-28-04. Extension of merit system coverage. If merit system coverage is extended to a program or agency, examination requirements, if applicable, are waived and each employee must be granted merit system employment status as follows:

1. An employee who meets the minimum qualifications for the class and who has successfully completed a probationary period must be granted permanent status.
2. An employee who meets the minimum qualifications for the class but who has not completed a probationary period must be granted probationary status. The employee may obtain permanent status upon successful completion of the probationary period.
3. An employee who does not meet the minimum qualifications for the class must be considered as not having status until the employee meets the minimum qualifications. The employee may obtain permanent status when the employee meets the minimum qualifications.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

CHAPTER 4-07-29
MERIT SYSTEM INTERNAL APPLICANT REVIEW

Section	
4-07-29-01	Scope of Chapter
4-07-29-02	Definition
4-07-29-03	Internal Applicant Review
4-07-29-04	Certificate for Internal Applicant

4-07-29-01. Scope of chapter. This chapter applies to all applicants who apply for positions in agencies covered by the North Dakota merit system and to all agencies, departments, institutions, boards, commissions, and political subdivisions required to comply with standards for a merit system of personnel administration as administered by the central personnel division.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-29-02. Definition. "Internal applicant" means an employee who has permanent, probationary, or temporary merit system employment status within an agency, or a previous employee who is eligible for reinstatement to an agency.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-29-03. Internal applicant review. The central personnel division shall review application from an internal applicant on a pass or fail basis, and notify the applicant and the appointing authority accordingly.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-29-04. Certificate for internal applicant. The central personnel division shall issue an appointing authority an internal applicant review form or forms in lieu of a certificate of eligibles.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

CHAPTER 4-07-30
MERIT SYSTEM PROMOTIONS

Section	
4-07-30-01	Scope of Chapter
4-07-30-02	Definitions
4-07-30-03	Requirements

4-07-30-01. Scope of chapter. This chapter applies to all applicants who apply for positions in agencies covered by the North Dakota merit system and to all agencies, departments, institutions, boards, commissions, and political subdivisions required to comply with standards for a merit system of personnel administration as administered by the central personnel division.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-30-02. Definitions. The terms used throughout this chapter have the same meaning as in North Dakota Century Code chapters 54-42 and 54-44.3, except "promotion" means a personnel action that results in the advancement of an employee to a position in a different class which has a higher pay grade than the employee's previous position.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-30-03. Requirements. An employee who has permanent, probationary, or temporary merit system employment status, is eligible for consideration by an appointing authority for a promotion within the agency, if each of the following requirements are met:

1. The employee meets the minimum qualifications announced for the position.
2. The employee successfully completes an examination requirement specified by the central personnel division, if applicable.
3. The employee's name is certified to the appointing authority by the central personnel division.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

CHAPTER 4-07-31
MERIT SYSTEM TRANSFERS

Section	
4-07-31-01	Scope of Chapter
4-07-31-02	Definitions
4-07-31-03	Requirements

4-07-31-01. Scope of chapter. This chapter applies to all applicants who apply for positions in agencies covered by the North Dakota merit system and to all agencies, departments, institutions, boards, commissions, and political subdivisions required to comply with standards for a merit system of personnel administration as administered by the central personnel division.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-31-02. Definitions. The terms used throughout this chapter have the same meaning as in North Dakota Century Code chapters 54-42 and 54-44.3, except "transfer" means a personnel action that results in the reassignment of an employee from one position to a different position that has the same or lower pay grade than the employee's previous position and that does not result in a break in service.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-31-03. Requirements. An employee who has permanent, probationary, or temporary merit system employment status, is eligible for consideration by an appointing authority for a transfer within the agency, if each of the following requirements are met:

1. The employee meets the minimum qualifications announced for the position.
2. The employee successfully completes an examination requirement specified by the central personnel division, if applicable.
3. The employee's name is certified to the appointing authority by the central personnel division.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

CHAPTER 4-07-32
MERIT SYSTEM RECLASSIFICATIONS

Section	
4-07-32-01	Scope of Chapter
4-07-32-02	Definitions
4-07-32-03	Requirements

4-07-32-01. Scope of chapter. This chapter applies to all applicants who apply for positions in agencies covered by the North Dakota merit system and to all agencies, departments, institutions, boards, commissions, and political subdivisions required to comply with standards for a merit system of personnel administration as administered by the central personnel division.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-32-02. Definitions. The terms used throughout this chapter have the same meaning as in North Dakota Century Code chapters 54-42 and 54-44.3, except "reclassification" means a personnel action that changes the classification assigned to an employee's position from one classification to a different classification by the central personnel division.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-32-03. Requirements. When an employee's position is reclassified, the following requirements apply:

1. The central personnel division shall waive any examination requirement.
2. If the employee does not meet the minimum qualifications of the new classification, either through education or experience, the employee must underfill in a lower classification until the employee meets the minimum qualifications.
3. If the reclassification involves a review of a class series, and the employee does not meet the minimum qualifications of the new series, the central personnel division director shall waive the minimum qualifications requirements for the employee's current position only.

4. If the employee meets the minimum qualifications, then the central personnel division shall certify the employee's name to the appointing authority.

History: Effective September 1, 1992.

General Authority: NDCC 54-42-03, 54-44.3-12

Law Implemented: NDCC 54-42-03, 54-44.3-12

CHAPTER 4-07-33
MERIT SYSTEM REINSTATEMENTS

Section	
4-07-33-01	Scope of Chapter
4-07-33-02	Definitions
4-07-33-03	Requirements
4-07-33-04	Employment Status Upon Reinstatement

4-07-33-01. Scope of chapter. This chapter applies to all applicants who apply for positions in agencies covered by the North Dakota merit system and to all agencies, departments, institutions, boards, commissions, and political subdivisions required to comply with standards for a merit system of personnel administration as administered by the central personnel division.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-33-02. Definitions. The terms used throughout this chapter have the same meaning as in North Dakota Century Code chapters 54-42 and 54-44.3, except "reinstatement" means a personnel action that involves the reemployment of a previous employee who resigned or was separated while in good standing in a position within three years from the date of the employee's prior separation.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-33-03. Requirements. A former employee who previously had permanent, probationary, or temporary status is eligible for consideration by an appointing authority for reinstatement within the agency, if each of the following requirements are met:

1. The employee meets the minimum qualifications announced for the position.
2. The employee successfully completes an examination requirement specified by the central personnel division, if applicable.

3. The employee's name is certified to the appointing authority by the central personnel division.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-33-04. Employment status upon reinstatement. A previous employee who is reinstated shall serve a probationary period.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

CHAPTER 4-07-34
MERIT SYSTEM PAYROLL REVIEW

Section
4-07-34-01 Scope of Chapter
4-07-34-02 Payroll Review

4-07-34-01. Scope of chapter. This chapter applies to all applicants who apply for positions in agencies covered by the North Dakota merit system and to all agencies, departments, institutions, boards, commissions, and political subdivisions required to comply with standards for a merit system of personnel administration as administered by the central personnel division.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

4-07-34-02. Payroll review. The central personnel division shall review the payrolls of agencies subject to this chapter to ensure compliance with the merit system of personnel administration. The central personnel division may delegate this responsibility to those agencies provided the agencies agree to perform the reviews.

History: Effective September 1, 1992.
General Authority: NDCC 54-42-03, 54-44.3-12
Law Implemented: NDCC 54-42-03, 54-44.3-12

CHAPTER 4-07-35
SEVERABILITY

Section
4-07-35-01 Severability

4-07-35-01. Severability. If any provision of article 4-07 or application thereof to any person or circumstances is held invalid, such invalidity may not affect other provisions or applications of article 4-07 which can be given effect without the invalid provision or application. The rules of article 4-07 are declared to be severable.

History: Effective September 1, 1992.

General Authority: NDCC 54-44.3

Law Implemented: NDCC 54-42-03, 54-44.3-12

TITLE 10
Attorney General

AUGUST 1992

ARTICLE 10-04.1

GAMES OF CHANCE

[Repealed effective April 1, 1992]

Determined repealed by the office of the Legislative Council pursuant to subsection 3 of North Dakota Century Code section 28-32-03 because the authority for adoption of the rules was transferred to another agency by S.L. 1991, ch. 28, § 29.

TITLE 30
Game and Fish Department

JUNE 1992

STAFF COMMENT: Chapters 30-02-04 and 30-02-05 contain all new material but are not underscored so as to improve readability.

CHAPTER 30-02-04
PLUGGING OR TAGGING NORTH AMERICAN WILD SHEEP HORNS
AND TROPHY HEADS

Section	
30-02-04-01	Requirements for Plugging or Tagging North American Wild Sheep Horns and Trophy Heads
30-02-04-02	Penalties

30-02-04-01. Requirements for plugging or tagging North American wild sheep horns and trophy heads. Any North American wild sheep horns or trophy heads, which have not been previously tagged or plugged, must be delivered to the North Dakota game and fish department's central office in Bismarck, North Dakota. The game and fish department will provide a department-approved plug and perform the installation.

Individuals who make a prior appointment shall have their wild sheep horns plugged and returned to them immediately. The game and fish department may hold the horns of any North American wild sheep for up to thirty days if prior appointment has not been made.

History: Effective June 1, 1992.
General Authority: NDCC 20.1-02-26
Law Implemented: NDCC 20.1-02-26

30-02-04-02. Penalties. No person may possess North American wild sheep horns or the trophy head from which the identifying tag or plug has been removed. Any person who violates this section is guilty of a noncriminal offense and shall pay a two hundred fifty dollar fee.

History: Effective June 1, 1992.
General Authority: NDCC 20.1-02-26
Law Implemented: NDCC 20.1-02-26, 20.1-01-30(3)

CHAPTER 30-02-05
ROCKY MOUNTAIN ELK FOUNDATION ELK LICENSE RAFFLE

Section	
30-02-05-01	Procedures and Conditions
30-02-05-02	Accounting Statement
30-02-05-03	Financial Report

30-02-05-01. Procedures and conditions. Prior to the printing or distribution of any raffle tickets, the rocky mountain elk foundation shall submit to the director of the North Dakota game and fish department an overall plan of raffle procedures and program conditions for the director's approval. A detailed copy of guidelines for volunteers who are assisting in the sales of raffle tickets must also be submitted. Upon the director's approval, the rocky mountain elk foundation must provide a copy of these guidelines to all volunteers prior to the volunteers being issued tickets for sale to the public. The raffle must be organized and conducted in accordance with chapter 10-04.1-07 and North Dakota Century Code chapter 53-06.1.

History: Effective June 1, 1992.
General Authority: NDCC 20.1-08-04.6
Law Implemented: NDCC 20.1-08-04.6

30-02-05-02. Accounting statement. The rocky mountain elk foundation will provide the game and fish director with a detailed accounting statement within thirty days after the completion of the raffle drawing. This statement will include information regarding raffle expenses, gross and net raffle income, number of tickets sold and unsold, as well as documented proof that no more than ten percent of the gross raffle proceeds were used to promote the raffle.

History: Effective June 1, 1992.
General Authority: NDCC 20.1-08-04.6
Law Implemented: NDCC 20.1-08-04.6

30-02-05-03. Financial report. The rocky mountain elk foundation will provide the director with an annual financial report for all projects funded with raffle proceeds and the balance of unspent funds.

History: Effective June 1, 1992.
General Authority: NDCC 20.1-08-04.6
Law Implemented: NDCC 20.1-08-04.6

CHAPTER 30-04-06

30-04-06-02. Fees. Each petition shall be accompanied by a two dollar application fee. In addition to the application fee, the following fees are required for each license that is to be replaced:

Type of License	Fee
Resident fishing licenses	\$ 1.00
Husband-wife resident fishing license	1.00
Resident senior citizen fishing license	1.00
Resident totally or permanently disabled fishing license	1.00
Nonresident fishing license	4.00
Nonresident husband-wife fishing license	8.00
Trout and salmon license	1.00
Resident small game and habitat license (age 19 and over)	1.00
Resident youth small game and habitat license (under age 19)	1.00
Nonresident small game - including general game	10.00
Nonresident small game/waterfowl - including general game	10.00
Resident deer bow license	8.00
Nonresident deer bow license	18.00
Resident fur-bearer license	1.00
Resident antelope bow license	8.00
Nonresident antelope bow license	18.00
Resident deer gun license	8.00
Nonresident deer gun license	18.00
Resident general game license	1.00
Nonresident general game license	1.00
Nonresident nongame license	2.00
Wild turkey license	2.00
Guide license	2.00
<u>Combination license</u>	<u>4.00</u>

History: Effective September 1, 1983; amended effective June 1, 1984; April 1, 1986; June 1, 1992.

General Authority: NDCC 20.1-02-05

Law Implemented: NDCC 20.1-02-05

TITLE 33

Health and Consolidated Laboratories, Department of

JUNE 1992

CHAPTER 33-10-01

33-10-01-04. Definitions. As used in this article, these terms have the definitions set forth below. Additional definitions used only in a certain section will be found in that section. Terms not defined in this article shall have the meaning given them in North Dakota Century Code chapter 23-20.1.

1. "A₁" means the maximum activity of special form radioactive material permitted in a Type A package. "A₂" means the maximum activity of radioactive material, other than special form radioactive material, permitted in a Type A package. These values are either listed in chapter 33-10-13, appendix A, table I, or may be derived in accordance with the procedure prescribed in chapter 33-10-13 appendix A.
2. "Accelerator produced material" means any material made radioactive by exposing it in a particle accelerator.
- ~~2.~~ 3. "Act" means North Dakota Century Code chapter 23-20.1.
- ~~3.~~ 4. "Agreement state" means any state with which the United States nuclear regulatory commission has entered into an effective agreement under section 274(b) of the Atomic Energy Act of 1954, as amended [73 Stat. 688; 42 U.S.C. 2021].
- ~~4.~~ 5. "Airborne radioactive material" means any radioactive material dispersed in the air in the form of dusts, fumes, mists, vapors, or gases.
- ~~5.~~ 6. "Airborne radioactivity area" means:

- a. Any room, enclosure, or operating area in which airborne radioactive material exists in concentrations in excess of the amounts specified in appendix A, table I, column 1, chapter 33-10-04; or
 - b. Any room, enclosure, or operating area in which airborne radioactive material exists in concentrations which, averaged over the number of hours in any week during which individuals are in the area, exceed twenty-five percent of the amounts specified in appendix A, table I, column 1, chapter 33-10-04.
- ~~6-~~ 7. "Byproduct material" means:
- a. Any radioactive material, except special nuclear material, yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material; and
 - b. The tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content.
- ~~7-~~ 8. "Calendar quarter" means not less than twelve consecutive weeks nor more than fourteen consecutive weeks. The first calendar quarter of each year shall begin in January and subsequent calendar quarters shall be so arranged such that no day is included in more than one calendar quarter and no day in any one year is omitted from inclusion within a calendar quarter. No licensee or registrant shall change the method observed by the licensee or registrant of determining calendar quarters for purposes of this article except at the beginning of a calendar year.
- ~~8-~~ 9. "Calibration" means the determination of:
- a. The response or reading of an instrument relative to a series of known radiation values over the range of the instrument; or
 - b. The strength of a source of radiation relative to a standard.
- ~~9-~~ 10. "CFR" means Code of Federal Regulations.
11. "Chelating agent" means amine polycarboxylic acids, hydroxycarboxylic acids, gluconic acid, and polycarboxylic acids.
- ~~10-~~ 12. "Curie" means a unit of measurement of radioactivity. One curie (Ci) is that quantity of radioactive material which decays at the rate of 3.7×10^{10} disintegrations per second (dps). Commonly used submultiples of the curie are the

millicurie and the microcurie. One millicurie (mCi) = 0.001 curie = 3.7×10^7 dps. One microcurie (μ Ci) = 0.000001 curie = 3.7×10^4 dps. (See section 33-10-01-14 for the SI equivalent "becquere1".)

- ~~11~~ 13. "Department" means the ~~North Dakota~~ state department of health and consolidated laboratories.
- ~~12~~ 14. "Depleted uranium" means the source material uranium in which the isotope uranium-235 is less than 0.711 weight percent of the total uranium present. Depleted uranium does not include special nuclear material.
- ~~13~~ 15. "Dose" means absorbed dose or dose equivalent as appropriate:
- "Absorbed dose" is the energy imparted to matter by ionizing radiation per unit mass of irradiated material at the place of interest. The special unit of absorbed dose is the rad. (See "rad".) (See section 33-10-01-14 for the SI equivalent "gray".)
 - "Dose equivalent" is a quantity that expresses on a common scale for all radiation a measure of the postulated effect on a given organ. It is defined as the absorbed dose in rads times certain modifying factors. The unit of dose equivalent is the rem. (See "rem".) (See section 33-10-01-14 for the SI equivalent "sievert".)
- ~~14~~ 16. "Dose commitment" means the total radiation dose to a part of the body that will result from retention in the body of radioactive material. For purposes of estimating the dose commitment, it is assumed that from the time of intake the period of exposure to retained material will not exceed fifty years.
17. "Explosive material" means any chemical compound, mixture, or device which produces a substantial instantaneous release of gas and heat spontaneously or by contact with sparks or flame.
- ~~15~~ 18. "Exposure" means the quotient of dQ by dm where "dQ" is the absolute value of the total charge of the ions of one sign produced in air when all the electrons (negatrons and positrons) liberated by photons in a volume element of air having mass "dm" are completely stopped in air. (The special unit of exposure is the roentgen (R).) (See section 33-10-01-14 for the SI equivalent "coulomb per kilogram".)
- ~~16~~ 19. "Exposure rate" means the exposure per unit of time, such as R/min, mR/h, etc.
20. "Former United States atomic energy commission or United States nuclear regulatory commission licensed facilities" means nuclear reactors, nuclear fuel reprocessing plants,

uranium enrichment plants, or critical mass experimental facilities where their atomic energy commission or nuclear regulatory commission licenses have been terminated.

- ~~21.~~ 21. "Hazardous waste" means those wastes designated as hazardous by United States environmental protection agency regulations in 40 CFR part 261 and article 33-24 of the North Dakota Administrative Code.
- ~~17.~~ 22. "Healing arts" means diagnostic or healing treatment of human and animal maladies including, but not limited to, the following which are duly licensed by the state of North Dakota for the lawful practice of: medicine and its associated specialties, dentistry, veterinary medicine, osteopathy, chiropractic, and podiatry.
- ~~18.~~ 23. "High radiation area" means any area, accessible to individuals, in which there exists radiation at such levels that a major portion of the body could receive in any one hour a dose in excess of one hundred millirems (one millisievert).
- ~~19.~~ 24. "Human use" means the internal or external administration of radiation or radioactive material to human beings.
- ~~20.~~ 25. "Individual" means any human being.
- ~~21.~~ 26. "Inspection" means an official examination or observation including, but not limited to, tests, surveys, and monitoring to determine compliance with rules, regulations, orders, requirements, and conditions of the department.
- ~~22.~~ 27. "Interlock" means a device arranged or connected such that the occurrence of an event or condition is required before a second event or condition can occur or continue to occur.
- ~~23.~~ 28. "License" means a general or specific license issued by the department in accordance with the regulations adopted by the department.
- ~~24.~~ 29. "Licensee" means any person who is licensed by the department in accordance with this article and North Dakota Century Code chapter 23-20.1.
- ~~25.~~ 30. "Licensing state" means any state with regulations equivalent to the Suggested State Regulations for Control of Radiation relating to, and an effective program for, the regulatory control of NARM and which has been granted final designation by the conference of radiation control program directors, incorporated.
- ~~26.~~ 31. "Major processor" means a user processing, handling, or manufacturing radioactive material exceeding Type A quantities as unsealed sources or material, or exceeding four times

Type B quantities as sealed sources, but does not include nuclear medicine programs, universities, industrial radiographers, or small industrial programs. The terms "Type A quantity" and "Type B quantity of radioactive material the aggregate radioactivity of which does not exceed that specified in the following table:" are defined in chapter 33-10-13.

Transport Groups (see Table A)	Type A Quantity (in curies)	Type B Quantity (in curies)
I	0.001	20
II	0.05	20
III	3	200
IV	20	200
V	20	5,000
VI and VIII	1,000	50,000
Special form	20*	5,000

*Except that for californium-252, the limit is 2 Ci.

- 27- 32. "NARM" means any naturally occurring or accelerator-produced radioactive material except source material. It does not include byproduct, source, or special nuclear material. (Note: For the purpose of meeting the definition of a licensing state by the conference of radiation control program directors, incorporated, naturally occurring or accelerator-produced radioactive material only refers to discrete sources of naturally occurring or accelerator-produced radioactive material. Diffuse sources of naturally occurring or accelerator-produced radioactive material are excluded from consideration by the conference of radiation control program directors, incorporated, for licensing state designation purposes.)
- 28- 33. "Natural radioactivity" means radioactivity of naturally occurring nuclides.
- 29- 34. "Occupational dose" means exposure of an individual to radiation (a) in a restricted area; or (b) in the course of employment in which the individual's duties involve exposure to radiation; provided, that occupational dose shall not be deemed to include any exposure of an individual to radiation for the purpose of diagnosis or therapy of such individual.
- 30- 35. "Ore refineries" means all processors of a radioactive material ore.
36. "Package" means the packaging together with its radioactive contents as presented for transport.
- 31- 37. "Particle accelerator" means any machine capable of accelerating electrons, protons, deuterons, or other charged

particles in a vacuum and of discharging the resultant particulate or other radiation into a medium at energies usually in excess of one megaelectronvolt.

- ~~32-~~ 38. "Person" means any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, agency, political subdivision of this state, any other state or political subdivision or agency thereof, and any legal successor, representative, agent, or agency of the foregoing, other than the commission, or any successor thereto and other than federal government agencies licensed by the commission or any successor thereto.
- ~~33-~~ 39. "Personnel monitoring equipment" means devices, e.g., film badges, pocket dosimeters, and thermoluminescent dosimeters, designed to be worn or carried by an individual for the purpose of estimating the dose received by the individual.
- ~~34-~~ 40. "Pharmacist" means an individual licensed by this state to compound and dispense drugs, prescriptions, and poisons.
- ~~35-~~ 41. "Physician" means an individual licensed by this state to dispense drugs in the practice of medicine.
42. "Pyrophoric liquid" means any liquid that ignites spontaneously in dry or moist air at or below one hundred thirty degrees Fahrenheit [54.4 degrees Celsius]. A "pyrophoric solid" is any solid material, other than one classed as an explosive, which under normal conditions is liable to cause fires through friction, retained heat from manufacturing or processing, or which can be ignited readily and, when ignited, burns so vigorously and persistently as to create a serious transportation, handling, or disposal hazard. Included are spontaneously combustible and water-reactive materials.
- ~~36-~~ 43. "Rad" means the special unit of absorbed dose. One rad equals one hundredth of a joule per kilogram of material; for example, if tissue is the material of interest, then one rad equals one hundred ergs per gram of tissue [10 milligrays]. (See section 33-10-01-14 for the SI equivalent "gray".)
- ~~37-~~ 44. "Radiation" means ionizing radiation, i.e., gamma rays and X-rays, alpha and beta particles, high speed electrons, neutrons, high speed protons, and other nuclear atomic particles.
- ~~38-~~ 45. "Radiation area" means any area, accessible to individuals, in which there exists radiation at such levels that a major portion of the body could receive in any one hour a dose in excess of five millirems [0.05 millisievert], or in any five consecutive days a dose in excess of one hundred millirems (1 millisievert).

- ~~39-~~ 46. "Radiation machine" means any device capable of producing radiation except those which produce radiation only from radioactive material.
- ~~40-~~ 47. "Radiation safety officer" means a person who has the knowledge and responsibility to apply appropriate radiation protection requirements.
- ~~41-~~ 48. "Radioactive material" means any material (solid, liquid, or gas) which emits radiation spontaneously.
- ~~42-~~ 49. "Radioactivity" means the disintegration of unstable atomic nuclei by the emission of radiation.
- ~~43-~~ 50. "Registrant" means any person who is registered with the department and is legally obligated to register with the department pursuant to this article and North Dakota Century Code chapter 23-20.1.
- ~~44-~~ 51. "Registration" means the notification of the department of possession of a source of radiation and the furnishing of information with respect thereto, in accordance with North Dakota Century Code chapter 23-20.
- ~~45-~~ 52. "Regulations of the United States department of transportation" means the regulations in 49 CFR, 100-189.
- ~~46-~~ 53. "Rem" means a measure of the dose of any radiation to body tissue in terms of its estimated biological effect relative to a dose received from an exposure to one roentgen (R) of X-rays. ~~one special unit of dose equivalent.~~ (See section 33-10-01-14 for the SI equivalent "sievert".) One millirem (mrem) = 0.001 rem. For the purpose of this article, any of the following is considered to be equivalent equal to a dose of one rem:
- a. An exposure of ~~+ R~~ one roentgen of x, or gamma radiation.
 - b. ~~A~~ An absorbed dose of ~~+ one~~ one rad due to x, gamma, or beta radiation.
 - c. ~~A~~ An absorbed dose of 0.05 rad due to particles heavier than protons and with sufficient energy to reach the lens of the eye.
 - d. ~~A~~ An absorbed dose of 0.1 rad due to neutrons or high energy protons. If it is more convenient to measure the neutron flux, or equivalent, than to determine the neutron absorbed dose in rads, one rem of neutron radiation may, for purposes of this article, be assumed to be equivalent to fourteen million neutrons per square centimeter incident upon the body; or, if there exists sufficient information to estimate with reasonable accuracy the

approximate distribution in energy of the neutrons, the incident number of neutrons per square centimeter equivalent to one rem may be estimated from the following table:

Neutron Flux Dose Equivalents

Neutron energy (MeV)	Number of neutrons per square centimeter for a dose equivalent of <u>± one rem or ten millisieverts</u> (neutrons/cm ²)	Average flux density to deliver one hundred millirems or <u>one millisievert</u> in forty hours (neutrons/cm ² per second)
Thermal	970 x 10 ⁶	670
0.0001	720 x 10 ⁶	500
0.005	820 x 10 ⁶	570
0.02	400 x 10 ⁶	280
0.1	120 x 10 ⁶	80
0.5	43 x 10 ⁶	30
1.0	26 x 10 ⁶	18
2.5	29 x 10 ⁶	20
5.0	26 x 10 ⁶	18
7.5	24 x 10 ⁶	17
10.0	24 x 10 ⁶	17
10 to 30	14 x 10 ⁶	10

~~47-~~ 54. "Research and development" means (a) theoretical analysis, exploration, or experimentation; or (b) the extension of investigative findings and theories of a scientific or technical nature into practical application for experimental and demonstration purposes, including the experimental production and testing of models, devices, equipment, materials, and processes. Research and development does not include the internal or external administration of radiation or radioactive material to human beings.

- ~~48-~~ 55. "Restricted area" (controlled area) means any area access to which is controlled by the licensee or registrant for purposes of protection of individuals from exposure to radiation and radioactive material. "Restricted area" does not include any areas used for residential quarters, although a separate room or rooms in a residential building may be set apart as a restricted area.
- ~~49-~~ 56. "Roentgen" (R) means the special unit of exposure. One roentgen equals 2.58×10^{-4} coulombs per kilogram of air. (See "exposure")
- ~~50-~~ 57. "Sealed source" means radioactive material that is permanently bonded or fixed in a capsule or matrix designed to prevent release and dispersal of the radioactive material under the most severe conditions which are likely to be encountered in normal use and handling.
- ~~51-~~ 58. "Source material" means: (a) uranium or thorium, or any combination thereof, in any physical or chemical form; or (b) ores which contain by weight one-twentieth of one percent (0.05 percent) or more of (1) uranium, (2) thorium, or (3) any combination thereof. Source material does not include special nuclear material.
- ~~52-~~ 59. "Source material milling" means any activity that results in the production of byproduct material as defined in subdivision b of subsection 6 7.
- ~~53-~~ 60. "Source of radiation" means any radioactive material, or any device or equipment emitting or capable of producing radiation.
61. "Special form radioactive material" means radioactive material which satisfies the following conditions:
- a. It is either a single solid piece or is contained in a sealed capsule that can be opened only by destroying the capsule.
 - b. The piece or capsule has at least one dimension not less than five millimeters [0.197 inch].
 - c. It satisfies the test requirements specified by the United States nuclear regulatory commission. A special form encapsulation designed in accordance with the United States nuclear regulatory commission requirements in effect on June 30, 1983, and constructed prior to July 1, 1985, may continue to be used. A special form encapsulation either designed or constructed after June 30, 1985, must meet requirements of this definition applicable at the time of its design or construction.

54. "Special form" means any of the following physical forms of licensed material of any transport group:

- a. The material is in solid form having no dimension less than five-tenths millimeter or at least one dimension greater than five millimeters; does not melt, sublime, or ignite in air at a temperature of one thousand degrees Fahrenheit {540.00 degrees Celsius}; will not shatter or crumble if subjected to the percussion test described in Appendix B to this chapter; and is not dissolved or converted into dispersible form to the extent of more than five-thousandths percent by weight by immersion for one week in water at sixty-eight degrees Fahrenheit {20 degrees Celsius} or in air at eighty-six degrees Fahrenheit {30 degrees Celsius}; or
- b. The material is securely contained in a capsule having no dimension less than five-tenths millimeter or at least one dimension greater than five millimeters; which will retain its contents if subjected to the tests prescribed in Appendix B to this chapter; and which is constructed of materials which do not melt, sublime, or ignite in air at one thousand four hundred seventy-five degrees Fahrenheit {807.22 degrees Celsius}; and do not dissolve or convert into dispersible form to the extent of more than five-thousandths percent by weight by immersion for one week in water at sixty-eight degrees Fahrenheit {20 degrees Celsius} or in air at eighty-six degrees Fahrenheit {30 degrees Celsius}.

55- 62. "Special nuclear material in quantities not sufficient to form a critical mass" means uranium enriched in the isotope U-235 in quantities not exceeding three hundred fifty grams of contained U-235, uranium-233 in quantities not exceeding two hundred grams; plutonium in quantities not exceeding two hundred grams; or any combination of them in accordance with the following formula: For each kind of special nuclear material, determine the ratio between the quantity of that special nuclear material and the quantity specified above for the same kind of special nuclear material. The sum of such ratios for all of the kinds of special nuclear material in combination shall not exceed "1", i.e., unity. For example, the following quantities in combination would not exceed the limitation and are within the formula:

$$\frac{175 \text{ (grams contained U-235)}}{350} + \frac{50 \text{ (grams U-233)}}{200} + \frac{50 \text{ (grams Pu)}}{200} = 1$$

56- 63. "Survey" means an evaluation of the production, use, release, disposal, or presence of sources of radiation under a specific set of conditions to determine actual or potential radiation hazards. When appropriate, such evaluation includes, but is not limited to tests, physical examination, and measurements

of levels of radiation or concentration of radioactive material present.

57. 64. "Test" means a method for determining the characteristics or condition of sources of radiation or components thereof. "Test" may also mean the process of verifying compliance with this article.
58. 65. "These rules" means all parts of this article and any subsequent changes or additions thereto.
59. "Transport group" means any one of seven groups into which radionuclides in normal form are classified, according to their toxicity and their relative potential hazard in transport, in Appendix A to this chapter.
- a. Any radionuclide not specifically listed in one of the groups in Appendix A shall be assigned to one of the groups in accordance with the following table:

Radionuclide	Radioactive Half-Life		
	0 to 1000 days	1000 days to 10^6 years	Over 10^6 years
Atomic number 1-81	Group III	Group II	Group III
Atomic number 82 and over	Group I	Group I	Group III

- b. For mixtures of radionuclides the following shall apply:
- (1) If the identity and respective activity of each radionuclide are known, the permissible activity of each radionuclide shall be such that the sum, for all groups present, of the ratio between the total activity for each group to the permissible activity for each group will not be greater than unity.
 - (2) If the groups of the radionuclides are known but the amount in each group cannot be reasonably determined, the mixture shall be assigned to the most restrictive group present.
 - (3) If the identity of all or some of the radionuclides cannot be reasonably determined, each of those unidentified radionuclides shall be considered as belonging to the most restrictive group which cannot be positively excluded.

~~(4)~~ Mixtures consisting of a single radioactive decay chain where the radionuclides are in the naturally occurring proportions shall be considered as consisting of a single radionuclide. The group and activity shall be that of the first member present in the chain, except that if a radionuclide "X" has a half-life longer than that of that first member and an activity greater than that of any other member, including the first, at any time during transportation, the transport group of the nuclide "X" and the activity of the mixture shall be the maximum activity of that nuclide "X" during transportation.

- ~~60-~~ 66. "United States department of energy" means the department of energy established by Public Law No. 95-91 [91 Stat. 565; 42 U.S.C. 7101 et seq.] to the extent that the department exercises functions formerly vested in the United States atomic energy commission, its chairman, members, officers, and components and transferred to the United States energy research and development administration and to the administrators thereof pursuant to sections 104(b), (c), and (d) of the Energy Reorganization Act of 1974 [Pub. L. 93-438; 88 Stat. 1237, effective January 19, 1975] and transferred to the secretary of energy pursuant to subsection 301(a) of the Department of Energy Organization Act [Pub. L. 95-91; 91 Stat. 577-578; 42 U.S.C. 7151, effective October 1, 1977].
- ~~61-~~ 67. "Unrefined and unprocessed ore" means ore in its natural form prior to any processing, such as grinding, roasting, beneficiating, or refining.
- ~~62-~~ 68. "Unrestricted area" (uncontrolled area) means any area access to which is not controlled by the licensee or registrant for purposes of protection of individuals from exposure to radiation and radioactive material, and any area used for residential quarters.
69. "Waste" means those low-level radioactive wastes that are acceptable for disposal in a land disposal facility. For the purposes of this definition, low-level waste has the same meaning as in the Low-Level Radioactive Waste Policy Act [Pub. L. 96-573; 94 Stat. 3347; 42 U.S.C. 2021b-2021j], as amended by Pub. L. 99-240 [99 Stat. 1842; 42 U.S.C. 2021b-2021j], effective January 15, 1986; that is, radioactive waste:
- a. Not classified as high-level radioactive waste, spent nuclear fuel, or byproduct material as defined in section 11e(2) of the Atomic Energy Act [Pub. L. 95-604; 92 Stat. 3033; 42 U.S.C. 2014(e)(2)] (uranium or thorium tailings and waste); and

b. Classified as low-level radioactive waste consistent with existing law and in accordance with subdivision a by the United States nuclear regulatory commission.

~~63-~~ 70. "Waste handling licensees" means persons licensed to receive and store radioactive wastes prior to disposal and/or persons licensed to dispose of radioactive waste.

~~64-~~ 71. "Worker" means an individual engaged in work under a license or registration issued by the department and controlled by a licensee or registrant, but does not include the licensee or registrant.

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

33-10-01-13. Communications. All communications and reports concerning this article and applications filed thereunder shall be addressed to the department ~~at its office located at~~ as follows:

North Dakota State Department of Health
and Consolidated Laboratories
Division of Environmental Engineering
1200 Missouri Avenue, Room 304
Box 5520,
Bismarck, North Dakota, 58502-5520,
Telephone (701) ~~224-2348~~ 221-5188
Facsimile (FAX) (701) 221-5200

~~or telegraph North Dakota State Department of Health, State Capitol,
Bismarck, North Dakota.~~

History: Amended effective June 1, 1986; June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

33-10-01-14. The international system of units (SI). The Metric Conversion Act of 1975 [Pub. L. 94-168; 89 Stat. 1007; 15 U.S.C. 205a-205k] urged the increasing awareness and use of the international system of units. The generally accepted regulatory values in the narrative portions of this document are followed by the international system of units equivalents in parentheses. Where appropriate, schedules and appendices are provided with notes concerning conversion factors. The inclusion of the international system of units equivalent is for informational purposes only.

1. Absorbed dose. The unit of absorbed dose is the gray (Gy), which is equal to one joule per kilogram. One rad is equal to 1×10^{-2} gray. Submultiples included in this document are the milligray (mGy) and the microgray (μ Gy).

2. Dose equivalent. The unit of dose equivalent is the sievert (Sv) which is equal to one joule per kilogram. One rem is equal to 1×10^{-2} sievert. Submultiples included in this document are the millisievert (mSv) and the microsievert (μ Sv).
3. Exposure. The unit of exposure is the coulomb per kilogram (C/kg). One roentgen is equal to 2.58×10^{-4} coulomb per kilogram. Submultiples of this unit are the millicoulomb per kilogram (mC/kg) and the microcoulomb per kilogram (μ C/kg).
4. Radioactivity. The unit of measurement of radioactivity is the becquerel (Bq) and is equal to one transformation per second. One curie is equal to 3.7×10^{10} becquerels. Multiples included in this document are kilobecquerel (kBq), megabecquerel (MBq), gigabecquerel (GBq), and petabecquerel (PBq).
5. SI numerical prefix conversions. See table below for a listing of numerical prefixes to convert SI units or English units by appropriate multiples:

SI Numerical Prefix Conversion Table

Multiplication Factors	Prefix	Symbol
<u>$1\ 000\ 000\ 000\ 000\ 000\ 000 = 10^{18}$</u>	<u>exa</u>	<u>E</u>
<u>$1\ 000\ 000\ 000\ 000\ 000 = 10^{15}$</u>	<u>peta</u>	<u>P</u>
<u>$1\ 000\ 000\ 000\ 000 = 10^{12}$</u>	<u>tera</u>	<u>T</u>
<u>$1\ 000\ 000\ 000 = 10^9$</u>	<u>giga</u>	<u>G</u>
<u>$1\ 000\ 000 = 10^6$</u>	<u>mega</u>	<u>M</u>
<u>$1\ 000 = 10^3$</u>	<u>kilo</u>	<u>k</u>
<u>$100 = 10^2$</u>	<u>hecto</u>	<u>h</u>
<u>$10 = 10^1$</u>	<u>deka</u>	<u>da</u>
<u>$0.1 = 10^{-1}$</u>	<u>deci</u>	<u>d</u>
<u>$0.01 = 10^{-2}$</u>	<u>centi</u>	<u>c</u>
<u>$0.001 = 10^{-3}$</u>	<u>milli</u>	<u>m</u>
<u>$0.000\ 001 = 10^{-6}$</u>	<u>micro</u>	<u>μ</u>
<u>$0.000\ 000\ 001 = 10^{-9}$</u>	<u>nano</u>	<u>n</u>
<u>$0.000\ 000\ 000\ 001 = 10^{-12}$</u>	<u>pico</u>	<u>p</u>
<u>$0.000\ 000\ 000\ 000\ 001 = 10^{-15}$</u>	<u>femto</u>	<u>f</u>
<u>$0.000\ 000\ 000\ 000\ 000\ 001 = 10^{-18}$</u>	<u>atto</u>	<u>a</u>

History: Effective June 1, 1992.
 General Authority: NDCC 28-32-02
 Law Implemented: NDCC 28-32-02

APPENDIX A
TRANSPORT GROUPING OF RADIONUCLIDES

Element *	Radionuclide **	Group
Actinium(89)	Ac-227	I
	Ac-228	I
Americium(95)	Am-241	I
	Am-243	I
Antimony(51)	Sb-122	IV
	Sb-124	III
	Sb-125	III
Argon(18)	Ar-37	VI
	Ar-41	II
	Ar-41(uncompressed) ***	V
Arsenic(33)	As-73	IV
	As-74	IV
	As-76	IV
	As-77	IV
Astatine(85)	At-211	III
Barium(56)	Ba-131	IV
	Ba-133	II
	Ba-140	III
Berkelium(97)	Bk-249	I
Beryllium(4)	Be-7	IV
Bismuth(83)	Bi-206	IV
	Bi-207	III
	Bi-210	II
	Bi-212	III
Bromine(35)	Br-82	IV
Cadmium(48)	Cd-109	IV
	Cd-115 M	III
	Cd-115	IV
Calcium(20)	Ca-45	IV
	Ca-47	IV
Californium(98)	Cf-249	I
	Cf-250	I
	Cf-252	I
Carbon(6)	C-14	IV
Cerium(58)	Ce-141	IV
	Ce-143	IV
	Ce-144	III
	Ce-144	III
Cesium(55)	Cs-131	IV
	Cs-134 M	III
	Cs-134	III
	Cs-135	IV
	Cs-136	IV
	Cs-137	III
Chlorine(17)	Cl-36	III
	Cl-38	IV
Chromium(24)	Cr-51	IV
Cobalt(27)	Co-56	III

	Co-57	IV
	Co-58 M	IV
	Co-58	IV
	Co-60	III
Copper(29)	Cu-64	IV
Curium(96)	Cm-242	I
	Cm-243	I
	Cm-244	I
	Cm-245	I
	Cm-246	I
Dysprosium(66)	Dy-154	III
	Dy-165	IV
	Dy-166	IV
Erbium(68)	Er-169	IV
	Er-171	IV
Europium(63)	Eu-150	III
	Eu-152 M	IV
	Eu-152	III
	Eu-154	II
	Eu-155	IV
Flourine(9)	F-18	IV
Gadolinium(64)	Gd-153	IV
	Gd-159	IV
Gallium(31)	Ga-67	III
	Ga-72	IV
Germanium(32)	Ge-71	IV
Gold(79)	Au-193	III
	Au-194	III
	Au-195	III
	Au-196	IV
	Au-198	IV
	Au-199	IV
Hafnium(72)	Hf-181	IV
Holmium(67)	Ho-166	IV
Hydrogen(1)	H-3(see tritium)	
Indium(49)	In-113 M	IV
	In-114 M	III
	In-115 M	IV
	In-115	IV
Iodine(53)	I-124	III
	I-125	III
	I-126	III
	I-129	III
	I-131	III
	I-132	IV
	I-133	III
	I-134	IV
	I-135	IV
Iridium(77)	Ir-190	IV
	Ir-192	III
	Ir-194	IV
Iron(26)	Fe-55	IV
	Fe-59	IV

Krypton(36)	Kr-85 M	III
	Kr-85 M (uncompressed) ***	V
	Kr-85	III
	Kr-85(uncompressed) ***	VI
	Kr-87	II
	Kr-87(uncompressed) ***	V
Lanthanum(57)	La-140	IV
Lead(82)	Pb-203	IV
	Pb-210	II
	Pb-212	II
Lutetium(71)	Lu-172	III
	Lu-177	IV
Magnesium(12)	Mg-28	III
Manganese(25)	Mn-52	IV
	Mn-54	IV
	Mn-56	IV
Mercury(80)	Hg-197 M	IV
	allg-197	IV
	Hg-203	IV
Mixed fission products (MFP)		II
Molybdenum(42)	Mo-99	IV
Neodymium(60)	Nd-147	IV
	Nd-149	IV
Neptunium(93)	Np-237	I
	Np-239	I
Nickel(28)	Ni-56	III
	Ni-59	IV
	Ni-63	IV
	Ni-65	IV
Niobium(41)	Nb-93 M	IV
	Nb-95	IV
	Nb-97	IV
Osmium(76)	Os-185	IV
	Os-191 M	IV
	Os-191	IV
	Os-193	IV
Palladium(46)	Pd-103	IV
	Pd-109	IV
Phosphorus(15)	P-32	IV
Platinum(78)	Pt-191	IV
	Pt-193	IV
	Pt-193 M	IV
	Pt-197	IV
	Pt-197 M	IV
Plutonium(94)	Pu-238 (F)	I
	Pu-239 (F)	I
	Pu-240	I
	Pu-241 (F)	I
	Pu-242	I
Polonium(84)	Po-210	I
Potassium(19)	K-42	IV
	K-43	III
Praseodymium(59)	Pr-142	IV

	Pr-143	IV
Promethium(61)	Pm-147	IV
	Pm-149	IV
Protactinium(91)	Pa-230	I
	Pa-231	I
	Pa-233	II
Radium(88)	Ra-223	II
	Ra-224	II
	Ra-226	I
	Ra-228	I
Radon(86)	Rn-220	IV
	Rn-222	II
Rhenium(75)	Re-183	IV
	Re-186	IV
	Re-187	IV
	Re-188	IV
	Re-Natural	IV
Rhodium(45)	Rh-103 M	IV
	Rh-105	IV
Rubidium(37)	Rb-86	IV
	Rb-87	IV
	Rb-Natural	IV
Ruthenium(44)	Ru-97	IV
	Ru-103	IV
	Ru-105	IV
	Ru-106	III
Samarium(62)	Sm-145	III
	Sm-147	III
	Sm-151	IV
	Sm-153	IV
Scandium(21)	Sc-46	III
	Sc-47	IV
	Sc-48	IV
Selenium(34)	Se-75	IV
Silicon(14)	Si-31	IV
Silver(47)	Ag-105	IV
	Ag-110 M	III
	Ag-111	IV
Sodium(11)	Na-22	III
	Na-24	IV
Strontium(38)	Sr-85 M	IV
	Sr-85	IV
	Sr-89	III
	Sr-90	II
	Sr-91	III
	Sr-92	IV
Sulfur(16)	S-35	IV
Tantalum(73)	Ta-182	III
Technetium(43)	Tc-96 M	IV
	aTc-96	IV
	Tc-97 M	IV
	Tc-97	IV
	Tc-99 M	IV

	Fe-99	IV
Tellurium(52)	Fe-125 M	IV
	Fe-127 M	IV
	Fe-127	IV
	Fe-129	III
	Fe-129 M	III
	Fe-129	IV
	Fe-131 M	III
	Fe-132	IV
Terbium(65)	Tb-160	III
Thallium(81)	Tl-200	IV
	Tl-201	IV
	Tl-202	IV
	Tl-204	III
Thorium(90)	Th-227	II
	Th-228	I
	Th-230	I
	Th-231	I
	Th-232	III
	Th-234	II
	Th-Natural	III
	Thulium(69)	Tm-168
	Tm-170	III
	Tm-171	IV
Tin(50)	Sn-113	IV
	Sn-117 M	III
	Sn-121	III
	Sn-125	IV
Tritium(1)	H-3	IV
	H-3 (as a gas, as luminous paint, or absorbed on solid material)	VII
Tungsten(74)	W-181	IV
	W-185	IV
	W-187	IV
	Uranium(92)	U-230
	U-232	I
	U-233 (F)	II
	U-234	II
	aU-235 (F)	III
	U-236	II
	U-238	III
	U-Natural	III
	U-Enriched (F)	III
	U-Depleted	III
Vanadium(23)	V-48	IV
	V-49	III
Xenon(54)	Xe-125	III
	Xe-131 M	III
	Xe-131 M (uncompressed) ***	V
	Xe-133	III
	Xe-133 (uncompressed) ***	VI
	Xe-135	II

	Xe-135 (uncompressed) ***	V
Ytterbium(70)	Yb-175	IV
Yttrium(39)	Y-88	III
	Y-90	IV
	Y-91m	III
	Y-91	III
	Y-92	IV
	Y-93	IV
Zinc(30)	Zn-65	IV
	Zn-69 M	IV
	Zn-69	IV
Zirconium(40)	Zr-93	IV
	Zr-95	III
	Zr-97	IV

* Atomic number shown in parentheses.

** Atomic mass number shown after the element symbol.

*** Uncompressed means at a pressure not exceeding one atmosphere.

M Metastable state.

(F) Fissile material.

History: Amended effective October 1, 1982.

APPENDIX B

TESTS FOR SPECIAL FORM LICENSED MATERIAL

1. FREE DROP - A free drop through a distance of thirty feet {9.14 meters} onto a flat essentially unyielding horizontal surface, striking the surface in such a position as to suffer maximum damage.
2. PERCUSSION - Impact of the flat circular end of a one-inch {2.54 centimeter} diameter steel rod weighing three pounds {1.36 kilograms}, dropped through a distance of forty inches {101.6 centimeters}. The capsule or material shall be placed on a sheet of lead, of hardness number three and five-tenths to four and five-tenths on the Vickers scale, and not more than one inch {2.54 centimeters} supported by a smooth essentially unyielding surface.
3. HEATING - Heating in air to a temperature of one thousand four hundred seventy-five degrees Fahrenheit {807.22 degrees Celsius} and remaining at that temperature for a period of ten minutes.
4. IMMERSION - Immersion for twenty-four hours in water at room temperature. The water shall be at pH six through pH eight, with a maximum conductivity of ten micromhos per centimeter.

CHAPTER 33-10-02

33-10-02-01. Purpose and scope.

1. This chapter provides for the registration of radiation machine facilities and for the registration of persons providing radiation machine installation, servicing, or services.
2. ~~For purposes of this chapter, "facility" means the location at which one or more devices or sources are installed or located within one building, vehicle, or under one roof and are under the same administrative control.~~
- 3- In addition to the requirements of this chapter, all registrants are subject to the applicable provisions of other parts chapters of this article.

History: Amended effective June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-02-01.1. Definitions. As used in this chapter, "facility" means the location at which one or more devices or sources are installed or located, or both, within one building, vehicle, or under one roof and are under the same administrative control.

History: Effective June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-02-02. Exemptions.

1. Electronic equipment that produces radiation incidental to its operation for other purposes is exempt from the registration and notification requirements of this chapter, providing that the dose equivalent rate averaged over an area of ten square centimeters does not exceed one-half millirem (5 microsievert) per hour at five centimeters from any accessible surface of such equipment. The production, testing, or factory servicing of such equipment shall not be exempt.
2. Radiation machines while in transit or storage incident thereto are exempt from the requirements of this chapter.
3. Domestic television receivers are exempt from the requirements of this chapter.

History: Amended effective June 1, 1992.

General Authority: NDCC 28-32-02
Law Implemented: NDCC 23-20.1-04

33-10-02-03. Application for registration of radiation machine facilities. Each person having a radiation machine facility shall:

1. Apply for registration of such facility with the department within thirty days following the effective date of this chapter or thereafter prior to the operation of a radiation machine facility. Application for registration shall be completed on forms furnished by the department and shall contain all the information required by the form and accompanying instructions.
2. Designate on the application form an individual to be responsible for radiation protection.
3. Each registrant shall prohibit any person from furnishing radiation machine servicing or services as described in subsection 4 of section 33-10-02-05, to the registrant's radiation machine facility until such person provides evidence that the service person has been registered with the department as a provider of services in accordance with section 33-10-02-05.

History: Amended effective June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

33-10-02-04. Application for registration of servicing and services.

1. Each person who is engaged in the business of installing or offering to install radiation machines or is engaged in the business of furnishing or offering to furnish radiation machine servicing or services in this state ~~to a department licensee or registrant~~ shall apply for registration of such services with the department within thirty days following the effective date of this chapter or thereafter prior to furnishing or offering to furnish any such services.
2. Application for registration shall be completed on forms furnished by the department and shall contain all information required by the department as indicated on the forms and accompanying instructions.
3. Each person applying for registration under this chapter shall specify:
 - a. That the person has read and understands the requirements of this ~~chapter~~ article.

- b. The services for which the person is applying for registration.
 - c. The training and experience that qualify the person to discharge the services for which the person is applying for registration.
 - d. The type of measurement instrument to be used, frequency of calibration, and source of calibration.
 - e. The type of personnel dosimeters supplied, frequency of reading, and replacement or exchange schedule.
4. For the purpose of this section, services may include, but shall not be limited to:
 - a. Installation or servicing, or both, of radiation machines and associated radiation machine components.
 - b. Calibration of radiation machines or radiation measurement instruments or devices.
 - c. Radiation protection or health physics consultations or surveys.
 - d. Personnel dosimetry services.
 5. No individual may perform services which are not specifically stated for that individual on the notice of registration issued by the department.

History: Amended effective June 1, 1986; June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-02-05. Issuance of notice of registration.

1. Upon a determination that an applicant meets the requirements of the article, the department shall issue a notice of registration.
2. The department may incorporate in the notice of registration at the time of issuance or thereafter by appropriate rule, or order, such additional requirements and conditions with respect to the registrant's receipt, possession, use, and transfer of radiation machines as it deems appropriate or necessary.

History: Amended effective June 1, 1986; June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-02-06. Expiration of notice of registration. Except as provided by subsection 2 of section 33-10-02-07, each notice of registration shall expire at the end of the specified day on the date in the month and year stated therein.

History: Amended effective June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-02-10. Assembler or transfer or obligation.

1. Any person who sells, leases, transfers, lends, disposes, assembles, or installs radiation machines in this state shall notify the department within fifteen days of:
 - a. The name and address of persons who have received these machines.
 - b. The manufacturer, model, and serial number of each radiation machine transferred.
 - c. The date of transfer of each radiation machine.
2. No person shall make, sell, lease, transfer, lend, assemble, or install radiation machines or the supplies used in connection with such machines unless such supplies and equipment, when properly placed in operation and used, shall meet the requirements of this article.

History: Amended effective June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-02-11. Out-of-state radiation machines.

1. ~~a.~~ Whenever any radiation machine is to be brought into the state, for any temporary use, the person proposing to bring such machine into the state shall give written notice to the department at least three days before such machine is to be used in the state. The notice shall include ~~the~~:
 - a. The type of radiation machine, ~~the~~.
 - b. The nature, duration, and scope of use, ~~the~~.
 - c. The exact ~~location~~ locations where the radiation machine is to be used, ~~the~~.
 - d. States in which this machine is registered.

- e. The names and addresses where the machine users can be reached while in the state, and the annual fee of forty dollars.
 - f. Payment of the annual reciprocity fee prescribed in chapter 33-10-11.
- b- 2. If, for a specific case, the three-day notification period would impose an undue hardship on the person, upon application to the department, permission to proceed sooner may be granted.
- 2- 3. ~~In addition, the out-of-state person shall do all of the following~~ The person referred to in subsection 1 shall:
- a. Comply with this article.
 - b. Supply the department with such other information as the department may request.
 - c. Reapply for reciprocity privileges or apply for registration by the department at the termination of the one-year reciprocity period. Not operate within the state on a temporary basis in excess of one hundred eighty calendar days per year.
 - d. Reapply for reciprocity privileges annually.

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

CHAPTER 33-10-03

33-10-03-01. Purpose and scope.

1. This chapter ~~provides~~ and chapters 33-10-07 and 33-10-13 provide for the licensing of radioactive material. No person shall receive, possess, use, transfer, own, or acquire radioactive material except as authorized ~~in a specific or general license issued~~ pursuant to this chapter or chapters 33-10-07 and 33-10-13, or as otherwise provided in ~~this chapter~~ these chapters.
2. In addition to the requirements of this chapter, all licensees are subject to the requirements of chapters 33-10-01, 33-10-04, and 33-10-10, and 33-10-13. ~~Licensees~~ Furthermore, licensees engaged in industrial radiographic operations are subject to the requirements of chapter 33-10-05, licensees using ~~sealed sources~~ radionuclides in the healing arts are subject to the requirements of chapter 33-10-07, and licensees engaged in ~~wire line~~ wireline and subsurface tracer studies are subject to the requirements of chapter 33-10-12.

History: Amended effective June 1, 1986; June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-03-02. Exemptions.

1. Source material.

- a. Any person is exempt from this chapter to the extent that such person receives, possesses, uses, owns, or transfers source material in any chemical mixture, compound, solution, or alloy in which the source material is by weight less than one-twentieth of one percent of the mixture, compound, solution, or alloy.
- b. Any person is exempt from this chapter to the extent that such person receives, possesses, uses, or transfers unrefined and unprocessed ore containing source material; provided, that except as authorized in a specific license, such person shall not refine or process such ore.
- c. Any person is exempt from this chapter to the extent that such person receives, possesses, uses, or transfers:
 - (1) Any quantities of thorium contained in:
 - (a) Incandescent gas mantles.

- (b) Vacuum tubes.
 - (c) Welding rods.
 - (d) Electric lamps for illuminating purposes provided that each lamp does not contain more than fifty milligrams of thorium.
 - (e) Germicidal lamps, sunlamps, and lamps for outdoor or industrial lighting provided that each lamp does not contain more than two grams of thorium.
 - (f) Rare earth metals and compounds, mixtures, and products containing not more than one-fourth of one percent by weight thorium, uranium, or any combination of these.
 - (g) Personnel neutron dosimeters, provided that each dosimeter does not contain more than fifty milligrams of thorium.
- (2) Source material contained in the following products:
- (a) Glazed ceramic tableware, provided that the glaze contains not more than twenty percent by weight source material.
 - (b) Glassware, ~~glass enamel, and glass enamel frit~~ containing not more than ten percent by weight source material, but not including commercially manufactured glass brick, pane glass, ceramic tile, or other glass enamel or ceramic used in construction.
 - (c) Glass enamel or glass enamel frit containing not more than ten percent by weight source material imported or ordered for importation into the United States, or initially distributed by manufacturers in the United States, before July 25, 1983.
 - (d) Piezoelectric ceramic containing not more than two percent by weight source material.
- (3) Photographic film, negatives, and prints containing uranium or thorium.
- (4) Any finished product or part fabricated of, or containing, tungsten-thorium or magnesium-thorium alloys, provided that the thorium content of the alloy does not exceed four percent by weight and that ~~the~~ this exemption ~~contained in this paragraph~~ shall

not be deemed to authorize the chemical, physical, or metallurgical treatment or processing of any such product or part.

- (5) Uranium contained in counterweights installed in aircraft, rockets, projectiles, and missiles, or stored or handled in connection with installation or removal of such counterweights, provided that all of the following are met:
 - (a) The counterweights are manufactured in accordance with a specific license issued by the United States nuclear regulatory commission authorizing distribution by the licensee pursuant to 10 CFR 40.
 - (b) Each counterweight has been impressed with the following legend clearly legible through any plating or other covering: "DEPLETED URANIUM". This requirement need not be met by counterweights manufactured prior to December 31, 1969; provided, that such counterweights are impressed with the legend, "CAUTION - RADIOACTIVE MATERIAL - URANIUM".
 - (c) Each counterweight is durably and legibly labeled or marked with the identification of the manufacturer and the statement: "UNAUTHORIZED ALTERATIONS PROHIBITED". This requirement need not be met by counterweights manufactured prior to December 31, 1969; provided, that such counterweights are impressed with the legend, "CAUTION - RADIOACTIVE MATERIAL - URANIUM".
 - (d) The exemption contained in this paragraph shall not be deemed to authorize the chemical, physical, or metallurgical treatment or processing of any such counterweights other than repair or restoration of any plating or other covering.
- (6) Uranium used as shielding constituting part of any shipping container which is conspicuously and legibly impressed with the legend "CAUTION - RADIOACTIVE SHIELDING - URANIUM" and which meets the specifications for containers for radioactive material prescribed in 49 CFR 173.394 or 173.395 of United States department of transportation regulations. Natural or depleted uranium metal used as shielding constituting part of any shipping container, provided that:

(a) The shipping container is conspicuously and legibly impressed with the legend "CAUTION - RADIOACTIVE SHIELDING - URANIUM".

(b) The uranium metal is encased in mild steel or equally fire-resistant metal of minimum wall thickness of one-eighth inch [3.2 millimeters].

(7) Thorium contained in finished optical lenses, provided that each lens does not contain more than thirty percent by weight of thorium, and that the exemption contained in this paragraph shall not be deemed to authorize either:

(a) The shaping, grinding, or polishing of such lens or manufacturing processes other than the assembly of such lens into optical systems and devices without any alteration of the lens; or

(b) The receipt, possession, use, or transfer of thorium contained in contact lenses, or in spectacles, or in eyepieces in binoculars or other optical instruments.

(8) Uranium contained in detector heads for use in fire detection units, provided that each detector head contains not more ~~the~~ than five-thousandths microcurie [185 becquerels] of uranium.

(9) Thorium contained in any finished aircraft engine part containing nickel-thoria alloy, provided that all of the following are met:

(a) The thorium is dispersed in the nickel-thoria alloy in the form of finely divided thoria (thorium dioxide).

(b) The thorium content in the nickel-thoria alloy does not exceed four percent by weight.

d. The exemptions in subdivision c do not authorize the manufacture of any of the products described.

2. Radioactive material other than source material.

a. Exempt concentrations.

(1) Except as provided in paragraph 2, any person is exempt from this chapter to the extent that such person receives, possesses, uses, transfers, owns, or acquires products containing radioactive material introduced in concentrations not in excess of those listed in Schedule A of this chapter.

- (2) No person may introduce radioactive material into a product or material knowing or having reason to believe that it will be transferred to persons exempt under paragraph 1 or equivalent regulations of the United States nuclear regulatory commission or any agreement state or licensing state, except in accordance with a specific license issued pursuant to subdivision a of subsection 5 of section 33-10-03-05 or the general license provided in ~~subsection 4~~ of section 33-10-03-06.

b. Exempt quantities.

- (1) Except as provided in paragraphs 2 and 3, any person is exempt from this chapter to the extent that such person receives, possesses, uses, transfers, owns, or acquires radioactive material in individual quantities each of which does not exceed the applicable quantity set forth in Schedule B of this chapter.
- (2) This subdivision does not authorize the production, packaging, or repackaging of radioactive material for purposes of commercial distribution, or the incorporation of radioactive material into products intended for commercial distribution.
- (3) No person may, for purposes of commercial distribution, transfer radioactive material in the individual quantities set forth in Schedule B, knowing or having reason to believe that such quantities of radioactive material will be transferred to persons exempt under this subdivision or equivalent regulations of the United States nuclear regulatory commission, any agreement state, or a licensing state, except in accordance with a specific license issued by the United States nuclear regulatory commission pursuant to 10 CFR 32.18 or by the department pursuant to subdivision b of subsection 5 of section 33-10-03-05 which license states that the radioactive material may be transferred by the licensee to persons exempt under this subdivision or the equivalent regulations of the United States nuclear regulatory commission, any agreement state, or a licensing state.

c. Exempt items.

- (1) Certain items containing radioactive material. Except for persons who apply radioactive material to, or persons who incorporate radioactive material into, the following products, any person is exempt from this chapter to the extent that the person receives,

possesses, uses, transfers, owns, or acquires the following products. (Authority to transfer possession or control by the manufacturer, processor, or producer of any equipment, device, commodity, or other product containing ~~source material~~ or byproduct material whose subsequent possession, use, transfer, and disposal by all other persons are exempted from regulatory requirements may be obtained only from the United States nuclear regulatory commission, Washington, D.C. 20555):

- (a) Timepieces or hands or dials containing not more than the following specified quantities of ~~byproduct~~ radioactive material and not exceeding the following specified radiation dose rates:
- [1] Twenty-five millicuries [925 megabecquerels] of tritium per timepiece.
 - [2] Five millicuries [185 megabecquerels] of tritium per hand.
 - [3] Fifteen millicuries [555 megabecquerels] of tritium per dial (bezels when used shall be considered as part of the dial).
 - [4] One hundred microcuries [3.7 megabecquerels] of promethium-147 per watch or two hundred microcuries [7.4 megabecquerels] of promethium-147 per any other timepiece.
 - [5] Twenty microcuries [0.74 megabecquerels] of promethium-147 per watch hand or forty microcuries [1.48 megabecquerels] of promethium-147 per other timepiece hand.
 - [6] Sixty microcuries [2.22 megabecquerels] of promethium-147 per watch dial or one hundred twenty microcuries [4.44 megabecquerels] of promethium-147 per other timepiece dial (bezels when used shall be considered as part of the dial).
 - [7] The ~~levels of~~ radiation dose rate from hands and dials containing promethium-147 will not exceed, when measured through fifty milligrams per square centimeter of absorber:
 - [a] For wristwatches, one-tenth millirad [1 microgray] per hour at ten centimeters from any surface.

[b] For pocket watches, one-tenth millirad [1 microgray] per hour at one centimeter from any surface.

[c] For any other timepiece, two-tenths millirad [2 micrograys] per hour at ten centimeters from any surface.

[8] One microcurie [37 kilobecquerels] of radium-226 per timepiece in timepieces acquired prior to ~~the effective date of this article~~ October 1, 1982.

(b) Lock illuminators containing not more than fifteen millicuries [555 megabecquerels] of tritium or not more than two millicuries [74 megabecquerels] of promethium-147 installed in automobile locks. The radiation dose rate from each lock illuminator containing promethium-147 will not exceed one millirad [10 micrograys] per hour at one centimeter from any surface when measured through fifty milligrams per square centimeter of absorber.

(c) Balances of precision containing not more than one millicurie [37 megabecquerels] of tritium per balance or not more than five-tenths millicurie [18.5 megabecquerels] of tritium per balance part.

(d) Automobile shift quadrants containing not more than twenty-five millicuries [925 megabecquerels] of tritium.

(e) Marine compasses containing not more than seven hundred fifty millicuries [27.75 gigabecquerels] of tritium gas and other marine navigational instruments containing not more than two hundred fifty millicuries [9.25 gigabecquerels] of tritium gas.

(f) Thermostat dials and pointers containing not more than twenty-five millicuries [925 megabecquerels] of tritium per thermostat.

(g) Electron tubes; provided, that each tube does not contain more than one of the following specified quantities of ~~byproduct~~ radioactive material:

[1] One hundred fifty millicuries [5.55 gigabecquerels] of tritium per microwave receiver protector tube or ten millicuries

[370 megabecquerels] of tritium per any other electron tube.

- [2] One microcurie [37 kilobecquerels] of cobalt-60.
- [3] Five microcuries [185 kilobecquerels] of nickel-63.
- [4] Thirty microcuries [1.11 megabecquerels] of krypton-85.
- [5] Five microcuries [185 kilobecquerels] of cesium-137.
- [6] Thirty microcuries [1.11 megabecquerels] of promethium-147.

And provided further, that the radiation dose rate from each electron tube containing ~~byproduct~~ radioactive material do not exceed one millirad [10 micrograys] per hour at one centimeter from any surface when measured through seven milligrams per square centimeter of absorber. For purposes of this subparagraph, "electron tubes" include spark gap tubes, power tubes, gas tubes including glow lamps, receiving tubes, microwave tubes, indicator tubes, pickup tubes, radiation detection tubes, and any other completely sealed tube that is designed to conduct or control electrical currents.

(h) Ionizing radiation measuring instruments containing, for purposes of internal calibration or standardization, one or more sources of ~~byproduct~~ radioactive material; provided, that:

- [1] Each source contains no more than one exempt quantity set forth in Schedule B of this chapter; and
- [2] Each instrument contains no more than ten exempt quantities. For purposes of this subparagraph an instrument's source may contain either one type or different types of radionuclides and an individual exempt quantity may be composed of fractional parts of one or more of the exempt quantities in Schedule B of this chapter, provided that the sum of such fractions shall not exceed unity.

[3] For americium-241, five-hundredths microcurie [1.85 kilobecquerels] is considered an exempt quantity under this subparagraph.

- (i) Spark gap irradiators containing not more than one microcurie [37 kilobecquerels] of cobalt-60 per spark gap irradiator for use in electrically ignited fuel oil burners having a firing rate of at least three gallons [11.4 liters] per hour.
- (2) Self-luminous products containing radioactive material.
 - (a) Tritium, krypton-85, or promethium-147. Except for persons who manufacture, process, or produce self-luminous products containing tritium, krypton-85, or promethium-147, any person is exempt from this chapter to the extent that such person receives, possesses, uses, transfers, owns, or acquires tritium, krypton-85 or promethium-147 in self-luminous products manufactured, processed, produced, imported, or transferred in accordance with a specific license issued by the United States nuclear regulatory commission pursuant to 10 CFR 32.22, which license authorizes the transfer of the product to persons who are exempt from regulatory requirements. The exemptions in this paragraph do not apply to tritium, krypton-85, or promethium-147 used in products primarily for frivolous purposes or in toys or adornments.
 - (b) Radium-226. Any person is exempt from this article to the extent that such person receives, possesses, uses, transfers, or owns articles containing less than one-tenth microcurie [3.7 kilobecquerels] of radium-226 which were acquired prior to ~~the effective date of this article~~ October 1, 1982.
- (3) Gas and aerosol detectors containing radioactive material.
 - (a) Except for persons who manufacture, process, or produce gas and aerosol detectors containing radioactive material, any person is exempt from this chapter to the extent that such person receives, possesses, uses, transfers, owns, or acquires radioactive material in gas and aerosol detectors designed to protect life or property from fires and airborne hazards provided that detectors containing radioactive material shall have been manufactured, imported, or transferred

in accordance with a specific license issued by the United States nuclear regulatory commission or a licensing state, pursuant to 10 CFR 32.26, or equivalent, which authorizes the transfer of the detectors to persons who are exempt from regulatory requirements. (Authority to transfer possession or control by the manufacturer, processor, or producer of any equipment, device, commodity, or other product containing ~~source material~~ or byproduct material whose subsequent possession, use, transfer, and disposal by all other persons are exempted from regulatory requirements may be obtained only from the United States nuclear regulatory commission, Washington, D.C. 20555.)

- (b) Gas and aerosol detectors previously manufactured and distributed to general licensees in accordance with a specific license issued by an agreement state shall be considered exempt under subparagraph a, provided that the device is labeled in accordance with the specific license authorizing distribution of the general licensed device, and provided further that they meet the requirements of subdivision c of subsection 5 of section 33-10-03-05.
 - (c) Gas and aerosol detectors containing NARM previously manufactured and distributed in accordance with a specific license issued by a licensing state shall be considered exempt under subparagraph a, provided that the device is labeled in accordance with the specific license authorizing distribution, and provided further that they meet the requirements of subdivision c of subsection 5 of section 33-10-03-05.
- (4) Resins containing scandium-46 and designed for sand consolidation in oil wells. Any person is exempt from this chapter to the extent that such person receives, possesses, uses, transfers, owns, or acquires synthetic plastic resins containing scandium-46 which are designed for sand consolidation in oil wells. Such resins shall have been manufactured or imported in accordance with a specific license issued by the United States nuclear regulatory commission, or shall have been manufactured in accordance with the specifications contained in a specific license issued by the department or any agreement state to the manufacturer of such resins pursuant to licensing requirements equivalent to those in 10 CFR 32.16 and 32.17 of the regulations of the United States nuclear regulatory

commission. This exemption does not authorize the manufacture of any resins containing scandium-46.

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-03-03. Licenses. Licenses for radioactive materials are of two types: general and specific.

1. General licenses provided in this chapter are effective without the filing of applications with the department or the issuance of licensing documents to the particular persons, although the filing of a certificate with the department may be required by the particular general license. The general licensee is subject to all other applicable portions of this chapter article and any limitations of the general license.
2. Specific licenses require the submission of an application to the department and the issuance of a licensing document by the department. The licensee is subject to all applicable portions of this chapter article as well as any limitations specified in the licensing document.

History: Amended effective June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 23-02.1-04

33-10-03-04. General licenses.

1. General licenses - source material.
 - a. A general license is hereby issued authorizing commercial and industrial firms, research, educational and medical institutions, state and local government agencies to use and transfer not more than fifteen pounds [~~6.80~~ 6.82 kilograms] of source material at any one time for research, development, educational, commercial, or operational purposes. A person authorized to use or transfer source material, pursuant to this general license, may not receive more than a total of one hundred fifty pounds [~~68.04~~ 68.2 kilograms] of source material in any one calendar year.
 - b. Persons who receive, possess, use, or transfer source material pursuant to the general license issued in subdivision a shall not receive more than a total of one hundred fifty pounds [~~68.04~~ kilograms] of source material in any one calendar year.

- Persons who receive, possess, use, or transfer source material pursuant to the general license issued in subdivision a are exempt from the provisions of chapters 33-10-04 and 33-10-10 to the extent that such receipt, possession, use, or transfer is within the terms of such general license; provided, however, that this exemption shall not be deemed to apply to any such person who is also in possession of source material under a specific license issued pursuant to this chapter.
- c. Persons who receive, possess, use, or transfer source material pursuant to the general license in subdivision a are prohibited from administering source material, or the radiation therefrom, either externally or internally, to human beings except as may be authorized by the department in a specific license.
- d. A general license is hereby issued authorizing the receipt of title to source material without regard to quantity. This general license does not authorize any person to receive, possess, use, or transfer source material.
- e. Depleted uranium in industrial products and devices.
- (1) A general license is hereby issued to receive, acquire, possess, use, or transfer, in accordance with paragraphs 2, 3, 4, and 5, of depleted uranium contained in industrial products or devices for the purpose of providing a concentrated mass in a small volume of a product or device.
- (2) The general license in paragraph 1 applies only to industrial products or devices which have been manufactured either in accordance with a specific license issued to the manufacturer of the products or devices pursuant to subdivision a of subsection 5 of section 33-10-03-05 or in accordance with a specific license issued to the manufacturer by the United States nuclear regulatory commission or an agreement state which authorizes manufacture of the products or devices for distribution to persons generally licensed by the United States nuclear regulatory commission or an agreement state.
- (3) (a) Persons who receive, acquire, possess, or use depleted uranium pursuant to the general license established by paragraph 1 shall file form RAD 811 "registration certificate - use of depleted uranium under general license" with the department. The form shall be submitted within thirty days after the first receipt or acquisition of such depleted uranium. The registrant shall furnish the following

information and such other information as may be required by that form:

- [1] Name and address of the registrant.
 - [2] A statement that the registrant has developed and will maintain procedures designed to establish physical control over the depleted uranium described in paragraph 1 and designed to prevent transfer of such depleted uranium in any form, including metal scrap, to persons not authorized to receive the depleted uranium.
 - [3] Name and title, address, and telephone number of the individual duly authorized to act for and on behalf of the registrant in supervising the procedures identified in paragraph 1 item 2 of subparagraph a.
- (b) The registrant possessing or using depleted uranium under the general license established by paragraph 1 shall report in writing to the department any changes in information furnished by the registrant in form RAD 811 "registration certificate - use of depleted uranium under general license". The report shall be submitted within thirty days after the effective date of such change.
- (4) A person who receives, acquires, possesses, or uses depleted uranium pursuant to the general license established by paragraph 1:
- (a) May not introduce such depleted uranium, in any form, into a chemical, physical, or metallurgical treatment or process, except a treatment or process for repair or restoration of any plating or other covering of the depleted uranium.
 - (b) May not abandon such depleted uranium.
 - (c) Shall transfer or dispose of such depleted uranium only by transfer in accordance with subsection ~~14~~ 12 of section 33-10-03-05. In the case where the transferee receives the depleted uranium pursuant to the general license established by paragraph 1, the transferor shall furnish the transferee a copy of this ~~section~~ article and a copy of form RAD 811. In the case where the transferee receives the depleted uranium pursuant to a general license contained

in the United States nuclear regulatory commission's or agreement state's regulation equivalent to paragraph 1, the transferor shall furnish the transferee a copy of this ~~section~~ article and a copy of form RAD 811 accompanied by a note explaining that use of the product or device is regulated by the United States nuclear regulatory commission or agreement state under requirements substantially the same as those in this article.

(d) Within thirty days of any transfer, shall report in writing to the department the name and address of the person receiving the depleted uranium pursuant to such transfer.

(e) May not export such depleted uranium except in accordance with a license issued by the United States nuclear regulatory commission pursuant to 10 CFR 110.

(5) Any person receiving, acquiring, possessing, using, or transferring depleted uranium pursuant to the general license established by paragraph 1 is exempt from the requirements of chapters 33-10-04 and 33-10-10 with respect to the depleted uranium covered by that general license.

2. General licenses - radioactive material other than source material.

a. Certain devices and equipment. A general license is hereby issued to transfer, receive, acquire, own, possess, and use radioactive material incorporated in the following devices or equipment which have been manufactured, tested and labeled by the manufacturer in accordance with a specific license issued to the manufacturer ~~pursuant to subdivision f of subsection 5 of section 33-10-03-05 or its equivalent by the department, by the United States nuclear regulatory commission, any agreement state, or a licensing state, and authorizing distribution under this general license or its equivalent for use pursuant to 10 CFR 31.3.~~ This general license is subject to the provisions of sections 33-10-01-06 through 33-10-01-11, paragraph 2 of subdivision a of subsection 2 of section 33-10-03-02, ~~subsection~~ subsections 7, 12, and 13 of section 33-10-03-05, section 33-10-03-07, and chapters 33-10-04 and, 33-10-10, and 33-10-13. (Attention is directed particularly to the provisions of chapter 33-10-04 which relate to the labeling of containers.)

(1) Static elimination device. Devices designed for use as static eliminators which contain, as a sealed

source or sources, radioactive material consisting of a total of not more than five hundred microcuries [18.5 megabecquerels] of polonium-210 per device.

- (2) Ion generating tube. Devices designed for ionization of air which contain, as a sealed source or sources, radioactive material consisting of a total of not more than five hundred microcuries [18.5 megabecquerels] of polonium-210 per device or a total of not more than fifty millicuries [1.85 gigabecquerels] of hydrogen-3 (tritium) per device.

b. Certain measuring, gauging, and controlling devices.

- (1) A general license is hereby issued to commercial and industrial firms and to research, educational, and medical institutions, individuals in the conduct of their business, and state or local government agencies to own, receive, acquire, possess, use, or transfer in accordance with the provisions of paragraphs ~~1~~, 2, ~~and 3~~, and 4, radioactive material, excluding special nuclear material, contained in devices designed and manufactured for the purpose of detecting, measuring, gauging, or controlling thickness, density, level, interface location, radiation, leakage, or qualitative or quantitative chemical composition, or for producing light or an ionized atmosphere.
- (2) The general license in paragraph 1 applies only to radioactive material contained in devices which have been manufactured and labeled in accordance with the specifications contained in a specific license issued by the department pursuant to subdivision d of subsection 5 of section 33-10-03-05 or in accordance with the specifications contained in a specific license issued by the United States nuclear regulatory commission, an agreement state, or a licensing state which authorizes distribution of devices to persons generally licensed by the nuclear regulatory commission, an agreement state, or a licensing state. (Regulations under the Federal Food, Drug, and Cosmetic Act authorizing the use of radioactive control devices in food production require certain additional labeling thereon which is found in 21 CFR 179.21.)
- (3) Any person who owns, receives, acquires, possesses, uses, or transfers radioactive material in a device pursuant to the general license in paragraph 1:
 - (a) Shall assure that all labels affixed to the device at the time of receipt, and bearing a

statement that removal of the label is prohibited, are maintained thereon and shall comply with all instructions and precautions provided by such labels.

- (b) Shall assure that the device is tested for leakage of radioactive material and proper operation of the on-off mechanism and indicator, if any, at no longer than six-month intervals or at such other intervals as are specified in the label; however:

[1] Devices containing only krypton need not be tested for leakage of radioactive material.

[2] Devices containing only tritium or not more than one hundred microcuries [3.7 megabecquerels] of other beta or gamma emitting material or ten microcuries [0.37 megabecquerels] of alpha emitting material and devices held in storage in the original shipping container prior to initial installation need not be tested for any purpose.

- (c) Shall assure that other testing, installation, servicing, and removal from installation involving the radioactive materials, its shielding or containment, are performed:

[1] In accordance with the instructions provided by the labels; or

[2] By a person holding a specific license from the department, the United States nuclear regulatory commission, an agreement state, or a licensing state to perform such activities.

- (d) Shall maintain records showing compliance with the requirements of subparagraphs b and c. The records shall show the results of tests. The records also shall show the dates of performance of, and the names of persons performing, testing, installation servicing and removal from installation concerning the radioactive material, its shielding or containment. Records of tests for leakage of radioactive material required by subparagraph b must be maintained for two years after the required leak test is performed. Records of tests of the on-off mechanism and indicator required by subparagraph b must be maintained for two years

after the required test of the on-off mechanism and indicator is performed. Records which are required by subparagraph c must be maintained for a period of two years from the date of the recorded event.

- (e) Upon the occurrence of a failure of or damage to, or any indication of a possible failure of or damage to, the shielding of the radioactive material or the on-off mechanism or indicator, or upon the detection of five-thousandths microcurie [185 becquerels] or more removable radioactive material, shall immediately suspend operation of the device until it has been repaired by the manufacturer or other person holding a specific license from the department, the United States nuclear regulatory commission, an agreement state, or a licensing state to repair such devices, or disposed of by transfer to a person authorized by a specific license to receive the radioactive material contained in the device and, within thirty days, furnish to the department a report containing a brief description of the event and the remedial action taken.
- (f) Shall not abandon the device containing radioactive material.
- (g) Except as provided in subparagraph h, shall transfer or dispose of the device containing radioactive material only by transfer to a specific licensee of the department, the United States nuclear regulatory commission, an agreement state, or a licensing state whose specific license authorizes the person to receive the device and within thirty days after transfer of a device to a specific licensee shall furnish to the department a report containing identification of the device by manufacturer's name and model number and the name and address of the person receiving the device. No report is required if the device is transferred to the specific licensee in order to obtain a replacement device.
- (h) Shall transfer the device to another general licensee only:

[1] Where the device remains in use at a particular location. In such case the transferor shall give the transferee a copy of this chapter and any safety documents

identified in the label on the device and within thirty days of the transfer, report to the department the manufacturer's name and model number of device transferred, the name and address of the transferee, and the name or position of an individual who may constitute a point of contact between the department and the transferee; or

[2] Where the device is held in storage in the original shipping container at its intended location of use prior to initial use by a general licensee.

- (i) Shall comply with the provisions of subsections 2 and 3 of section 33-10-04-05 for reporting radiation incidents, theft, or loss of licensed material, but shall be exempt from the other requirements of chapters 33-10-04 and 33-10-10.
 - (4) The general license in paragraph 1 does not authorize the manufacture of devices containing radioactive material.
 - (5) The general license provided in paragraph 1 is subject to the provisions of sections ~~33-10-01-01~~ 33-10-01-06 through 33-10-01-11, subsections 7, ~~14~~ 12, and ~~15~~ 13 of section 33-10-03-05, and ~~section 33-10-03-07~~ chapter 33-10-13.
- c. Luminous safety devices for aircraft.
- (1) A general license is hereby issued to own, receive, acquire, possess, and use tritium or promethium-147 contained in luminous safety devices for use in aircraft, provided all of the following are met:
 - (a) Each device contains not more than ten curies [370 gigabecquerels] of tritium or three hundred millicuries [11.1 gigabecquerels] of promethium-147.
 - (b) Each device has been manufactured, assembled, or imported in accordance with a specific license issued by the United States nuclear regulatory commission, or each device has been manufactured or assembled in accordance with the specifications contained in a specific license issued by the department or any agreement state to the manufacturer or assembler of such device pursuant to licensing requirements equivalent to those in 10 CFR 32.53 of the regulations of the United States nuclear regulatory commission.

- (2) Persons who own, receive, acquire, possess, or use luminous safety devices pursuant to paragraph 1 are exempt from the requirements of chapters 33-10-04 and 33-10-10 except that they shall comply with the provisions of subsections 2 and 3 of section 33-10-04-05.
 - (3) This general license does not authorize the manufacture, assembly, or repair of luminous safety devices containing tritium or promethium-147.
 - (4) This general license does not authorize the ownership, receipt, acquisition, possession, or use of promethium-147 contained in instrument dials.
 - (5) This general license is subject to the provisions of sections ~~33-10-01-01~~ 33-10-01-06 through 33-10-01-11, subsections 7, ~~14~~ 12, and ~~15~~ 13 of section 33-10-03-05, and ~~section 33-10-03-07~~ chapter 33-10-13.
- d. Ownership of radioactive material. A general license is hereby issued to own radioactive material without regard to quantity. Notwithstanding any other provisions of this chapter, this general license does not authorize the manufacture, production, transfer, receipt, possession, or use of radioactive material.
- e. Calibration and reference sources.
- (1) A general license is hereby issued to those persons listed below to own, receive, acquire, possess, use, and transfer, in accordance with the provisions of paragraphs ~~3~~ 4 and ~~4~~ 5, americium-241 in the form of calibration or reference sources:
 - (a) Any person who holds a specific license issued by the department which authorizes the person to receive, possess, use, and transfer radioactive material.
 - (b) Any person who holds a specific license issued by the United States nuclear regulatory commission which authorizes ~~him~~ the person to receive, possess, use, and transfer special nuclear material.
 - (2) A general license is hereby issued to own, receive, possess, use, and transfer plutonium in the form of calibration or reference sources in accordance with the provisions of paragraphs ~~3~~ 4 and ~~4~~ 5 to any person who holds a specific license issued by the

department which authorizes the person to receive, possess, use, and transfer radioactive material.

- (3) A general license is hereby issued to own, receive, possess, use, and transfer radium-226 in the form of calibration or reference sources in accordance with the provisions of paragraphs 4 and 5 to any person who holds a specific license issued by the department which authorizes the person to receive, possess, use, and transfer radioactive material.
- (4) The general licenses in paragraphs 1 ~~and~~, 2, and 3 apply only to calibration or reference sources which have been manufactured in accordance with the specifications contained in a specific license issued to the manufacturer or importer of the sources by the United States nuclear regulatory commission pursuant to 10 CFR 32.57 or 10 CFR 70.39 or which have been manufactured in accordance with the specifications contained in a specific license issued to the manufacturer by the department, any agreement state or licensing state pursuant to licensing requirements equivalent to those contained in 10 CFR 32.57 or 10 CFR 70.39 of the regulations of the United States nuclear regulatory commission.
- (5) The general licenses provided in paragraphs 1, 2, and 3 are subject to the provisions of sections 33-10-01-06 through 33-10-01-11, subsections 7, ~~11~~ 12, and ~~15~~ 13 of section 33-10-03-05, ~~section 33-10-03-07~~, and chapters 33-10-04 ~~and~~, 33-10-10, and 33-10-13. In addition, persons who own, receive, acquire, possess, use, or transfer one or more calibration or reference sources pursuant to these general licenses:
 - (a) Shall not possess at any one time, at any one location of storage or use, more than five microcuries [185 kilobecquerels] of americium-241, five microcuries [185 kilobecquerels] of plutonium, or five microcuries [185 kilobecquerels] of radium-226 in such sources.
 - (b) Shall not receive, possess, use, or transfer such source unless the source, or the storage container, bears a label which includes the following statement or a substantially similar statement which contains the information called for in the following statement:

[1] The receipt, possession, use, and transfer of this source, Model _____, Serial No. _____, are subject to a general license

radiopharmaceuticals which are under the general license in this subdivision to affix a certain identifying label to the container or in the leaflet or brochure which accompanies the radiopharmaceutical. The new drug provisions of the Federal Food, Drug, and Cosmetic Act also govern the availability and use of any specific diagnostic drugs in interstate commerce.)

(1) A general license is hereby issued to any physician to receive, possess, transfer, or use radioactive material set forth below for the stated diagnostic uses, provided, however, that the use is in accordance with the provision of paragraphs 2, 3, and 4, the radioactive material is in the form of capsules, disposable syringes, or other prepackaged individual doses, and the radioactive material has been manufactured in accordance with a specific license issued pursuant to subdivision g of subsection 5 of section 33-10-03-05 by the department, the United States nuclear regulatory commission, any agreement state, or licensing state authorizing distribution under the general license granted in this subdivision or its equivalent:

(a) Iodine-131 as sodium iodide (Na^{131}I) for measurement of thyroid uptake.

(b) Iodine-131 as iodinated human serum albumin (I-HSA) for determinations of blood and blood plasma volume.

(c) Iodine-125 as iodinated human serum albumin (I-HSA) for determinations of blood and blood plasma volume.

(d) Cobalt-57 for the measurement of intestinal absorption of cyanocobalamin.

(e) Cobalt-58 for the measurement of intestinal absorption of cyanocobalamin.

(f) Cobalt-60 for the measurement of intestinal absorption of cyanocobalamin.

(g) Chromium-51 as sodium radiochromate for determination of red blood cell volumes and studies of red blood cell survival time.

(2) No physician shall receive, possess, use, or transfer radioactive material pursuant to the general license established by paragraph 1 until the physician has filed Department Form RAD 684, "Certificate - Medical Use of Radioactive Material Under General License"

with the department and received from the department a validated copy of the Department Form RAD 684 with certification number as signed. The generally licensed physician shall furnish on Department Form RAD 684 the following information and such other information as may be required by that form:

- (a) Name and address of the generally licensed physician.
 - (b) A statement that the generally licensed physician is a duly licensed physician (authorized to dispense drugs) in the practice of medicine in this state.
 - (c) A statement that the generally licensed physician has appropriate radiation measuring instruments to carry out the diagnostic procedures for which the physician proposes to use radioactive material under the general license of this paragraph and that the physician is competent in the use of such instruments.
- (3) A physician who receives, possesses, or uses a pharmaceutical containing radioactive material pursuant to the general license established by paragraph † shall comply with the following:
- (a) The physician shall not possess at any one time, pursuant to the general license in paragraph † more than:
 - {1} Two hundred microcuries of iodine-131.
 - {2} Two hundred microcuries of iodine-125.
 - {3} Five microcuries of cobalt-57.
 - {4} Five microcuries of cobalt-58.
 - {5} Five microcuries of cobalt-60.
 - {6} Two hundred microcuries of chromium-51.
 - (b) The physician shall store the pharmaceutical until administered in the original shipping container, or a container providing equivalent radiation protection.
 - (c) The physician shall use the pharmaceutical only for the uses authorized by paragraph †.

(d) The physician shall not administer the pharmaceutical to a woman with confirmed pregnancy or to a person under eighteen years of age.

(e) The physician shall not transfer the radioactive material to a person who is not authorized to receive it pursuant to a license issued by the department, the United States nuclear regulatory commission, any agreement state or a licensing state, or in any manner other than in the unopened, labeled shipping container as received from the supplier, except by administering it to a patient.

(4) The generally licensed physician possessing or using radioactive material under the general license of paragraph 1 shall report in duplicate to the department, any changes in the information furnished by the physician in the "Certificate - Medical Use of Radioactive Material Under General License", Department Form RAD 684. The report shall be submitted within thirty days after the effective date of such change.

(5) Any person using radioactive material pursuant to the general license of paragraph 1 is exempt from the requirements of chapters 33-10-04 and 33-10-10 with respect to the radioactive material covered by the general license.

g. f. General license for use of radioactive material for certain in vitro clinical or laboratory testing. (The new drug provisions of the Federal Food, Drug, and Cosmetic Act also govern the availability and use of any specific diagnostic drugs in interstate commerce.)

(1) A general license is hereby issued to any physician, veterinarian in the practice of veterinary medicine, clinical laboratory, or hospital to receive, acquire, possess, transfer, or use, for any of the following stated tests, in accordance with the provisions of paragraphs 2, 3, 4, 5, and 6, the following radioactive materials in prepackaged units for use in in vitro clinical or laboratory tests not involving internal or external administration of radioactive material, or the radiation therefrom, to human beings or animals:

(a) Carbon-14, in units not exceeding ten microcuries [370 kilobecquerels] each for use in in vitro clinical or laboratory tests not involving internal or external administration of

radioactive material, or the radiation therefrom, to human beings or animals.

- (f) (b) Cobalt-57, in units not exceeding ten microcuries [370 kilobecquerels] each for use in in vitro clinical or laboratory tests not involving internal or external administration of radioactive material, or the radiation therefrom, to human beings or animals.
- (d) (c) Hydrogen-3 (tritium), in units not exceeding fifty microcuries [1.85 megabecquerels] each for use in in vitro clinical or laboratory tests not involving internal or external administration of radioactive material, or the radiation therefrom, to human beings or animals.
- (a) (d) Iodine-125, in units not exceeding ten microcuries [370 kilobecquerels] each for use in in vitro clinical or laboratory tests not involving internal or external administration of radioactive material, or the radiation therefrom, to human beings or animals.
- (h) (e) Mock iodine-125 reference or calibration sources, in units not exceeding five-hundredths microcurie [185 becquerels] of iodine-129 and five-thousandths microcurie [185 becquerels] of americium-241 each for use in in vitro clinical or laboratory tests not involving internal or external administration of radioactive material, or the radiation therefrom, to human beings or animals.
- (b) (f) Iodine-131, in units not exceeding ten microcuries [370 kilobecquerels] each for use in in vitro clinical or laboratory tests not involving internal or external administration of radioactive material, or the radiation therefrom, to human beings or animals.
- (e) (g) Iron-59, in units not exceeding twenty microcuries [740 kilobecquerels] each for use in in vitro clinical or laboratory tests not involving internal or external administration of radioactive material, or the radiation therefrom, to human beings or animals.
- (g) (h) Selenium-75, in units not to exceed exceeding ten microcuries [370 kilobecquerels] each for use in in vitro clinical or laboratory tests not involving internal or external administration of

radioactive material, or the radiation therefrom, to human beings or animals.

- (2) No person shall receive, acquire, possess, use, or transfer radioactive material pursuant to the general license established by paragraph 1 until the person has filed Department Form RAD 732, "Certificate - In Vitro Testing with Radioactive Material Under General License", with the department and received from the department a validated copy of Department Form RAD 732 with certification number as signed assigned. The physician, veterinarian, clinical laboratory, or hospital shall furnish on Department Form RAD 732 the following information and such other information as may be required by that form:
 - (a) Name and address of the physician, veterinarian, clinical laboratory, or hospital.
 - (b) The location of use.
 - (c) A statement that the physician, veterinarian, clinical laboratory, or hospital has appropriate radiation measuring instruments to carry out in vitro clinical or laboratory tests with radioactive material as authorized under the general license in paragraph 1 and that such tests will be performed only by personnel competent in the use of such instruments and in the handling of the radioactive material.
- (3) A person who receives, acquires, possesses, or uses radioactive material pursuant to the general license established by paragraph 1 shall comply with the following:
 - (a) The general licensee shall not possess at any one time, pursuant to the general license in paragraph 1, at any one location of storage or use, a total amount of iodine-125, iodine-131, selenium-75, iron-59 ~~and~~, or cobalt-57 in excess of two hundred microcuries [7.4 megabecquerels].
 - (b) The general licensee shall store the radioactive material, until used, in the original shipping container or in a container providing equivalent radiation protection.
 - (c) The general licensee shall use the radioactive material only for the uses authorized by paragraph 1.

- (d) The general licensee shall not transfer the radioactive material to a person who is not authorized to receive it pursuant to a license issued by the department, the United States nuclear regulatory commission, any agreement state, or a licensing state, nor transfer the radioactive material in any manner other than in the unopened, labeled shipping container as received from the supplier.
 - (e) The general licensee shall dispose of the mock iodine-125 reference or calibration sources described in subparagraph ~~h~~ e of paragraph 1 as required by subsection 1 of section 33-10-04-04.
- (4) The general licensee shall not receive, acquire, possess, or use radioactive material pursuant to paragraph 1-:
- (a) Except as prepackaged units which are labeled in accordance with the provisions of a specific license issued by the United States nuclear regulatory commission, any agreement state, or a licensing state which authorizes the manufacture and distribution of iodine-125, iodine-131, carbon-14, hydrogen-3 (tritium), iron-59, selenium-75, cobalt-57, or mock iodine-125 to persons generally licensed under this ~~paragraph~~ subdivision or its equivalent; and
 - (b) Unless one of the following ~~statement statements, as appropriate~~, or a substantially similar statement which contains the information called for in one of the following ~~statement statements~~, appears on a label affixed to each prepackaged unit or appears in a leaflet or brochure which accompanies the package:

[1] This radioactive material may be received, acquired, possessed, and used only by physicians, veterinarians, clinical laboratories, or hospitals and only for in vitro clinical or laboratory tests not involving internal or external administration of the material, or the radiation therefrom, to human beings or animals. Its receipt, acquisition, possession, use, and transfer are subject to this article and a general license of the United States nuclear regulatory commission or of a state with which the commission has entered into an agreement for the exercise of regulatory authority.

Name of manufacturer

[2] This radioactive material shall be received, acquired, possessed, and used only by physicians, veterinarians, clinical laboratories, or hospitals and only for in vitro clinical or laboratory tests not involving internal or external administration of the material, or the radiation therefrom, to human beings or animals. Its receipt, acquisition, possession, use, and transfer are subject to this article and a general license of a licensing state.

Name of manufacturer

- (5) The physician, veterinarian, clinical laboratory, or hospital possessing or using radioactive material under the general license of paragraph 1 shall report, in writing, to the department, any changes in the information furnished by the physician, veterinarian, clinical laboratory, or hospital in the "Certificate - In Vitro Testing with Radioactive Material Under General License", Department Form RAD 732. The report shall be furnished within thirty days after the effective date of such change.
- (6) Any person using radioactive material pursuant to the general license of paragraph 1 is exempt from the requirements of chapters 33-10-04 and 33-10-10 with respect to radioactive material covered by that general license. However, persons using mock iodine-125 reference or calibration sources described in subparagraph e of paragraph 1 shall comply with the provisions of subsection 1 of section 33-10-04-04 and subsections 2 and 3 of section 33-10-04-05.

~~h.~~ g. Ice detection devices.

- (1) A general license is hereby issued to own, receive, acquire, possess, use, and transfer strontium-90 contained in ice detection devices, provided each device contains not more than fifty microcuries [1.85 megabecquerels] of strontium-90 and each device has been manufactured or imported in accordance with a specific license issued by the United States nuclear regulatory commission or each device has been manufactured in accordance with the specifications contained in a specific license issued by the department or any agreement state to the manufacturer

of such device pursuant to licensing requirements equivalent to those in 10 CFR 32.61 of the regulations of the United States nuclear regulatory commission.

- (2) Persons who own, receive, acquire, possess, use, or transfer strontium-90 contained in ice detection devices pursuant to the general license in paragraph 1-:
 - (a) Shall, upon occurrence of visually observable damage, such as a bend or crack or discoloration from overheating to the device, discontinue use of the device until it has been inspected, tested for leakage and repaired by a person holding a specific license from the United States nuclear regulatory commission or an agreement state to manufacture or service such devices; or shall dispose of the device pursuant to the provisions of subsection 1 of section 33-10-04-04.
 - (b) Shall assure that all labels affixed to the device at the time of receipt, and which bear a statement which prohibits removal of the labels, are maintained thereon.
 - (c) Are exempt from the requirements of chapters 33-10-04 and 33-10-10 except that such persons shall comply with the provisions of subsection 1 of section 33-10-04-04, and subsections 2 and 3 of section 33-10-04-05.
- (3) This general license does not authorize the manufacture, assembly, disassembly, or repair of strontium-90 in ice detection devices.
- (4) This general license is subject to the provisions of sections 33-10-01-06 through 33-10-01-11, subsections 7, ~~14~~ 12, and ~~15~~ 13 of section 33-10-03-05, and ~~section 33-10-03-07~~ chapter 33-10-13.

~~i. General licensed quantities for radium-226.~~

- ~~(1) A general license is hereby issued to commercial and industrial firms, and to research, educational, medical, and governmental institutions to own, receive, acquire, possess, use, and transfer radium-226 in units not exceeding one-tenth microcurie each in accordance with the provisions of paragraphs 2, 3, and 4.~~

(2) No such person shall receive, acquire, possess, use, or transfer radium-226 pursuant to the general license established by paragraph † until the person has filed Department Form RAD 76† "Certificate - Radium-226 Under General License", with the department and has received from the department a validated copy of Department Form RAD 76† with certification number assigned. The person identified in paragraph † shall furnish in Department Form RAD 76† the following information and such other information as may be required by that form:

(a) Name and address of the person identified in paragraph †.

(b) The location of use.

(c) A statement that such person has appropriate radiation measuring instruments to carry out an adequate program of radiation protection and that the use of authorized material will be performed only by personnel competent in the use of such instruments and in the handling of the radioactive material.

(3) A person who receives, acquires, possesses, or uses radium-226 pursuant to the general license established by paragraph † shall comply with the following:

(a) The general licensee shall not possess at any one time, pursuant to the general license in paragraph † at any one location of storage or use, a total amount of radium-226 in excess of five microcuries.

(b) The general licensee shall store the radium-226, until used, in the original shipping container or in a container providing equivalent radiation protection.

(c) The general licensee shall not transfer the radioactive material to a person who is not authorized to receive it pursuant to a license issued by the department, or any agreement state, nor transfer the radioactive material in any manner other than in the unopened, labeled shipping container as received from the shipper.

(d) The person possessing or using the radioactive material under the general license of paragraph † shall report, in writing, to the department, any changes in the information furnished by the

person in the "Certificate - Radium-226 Under General License", Department Form RAD 761. The report shall be furnished within thirty days after the effective date of such change.

(e) Any person using radium-226 pursuant to the general license of paragraph † is exempt from the requirements of chapters ~~33-10-04~~ and ~~33-10-10~~ with respect to the radioactive material covered by the general license.

(4) This general license does not authorize the manufacture, commercial distribution, or human use of radium-226.

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992.

General Authority: NDCC ~~28-32-04~~ 28-32-02

Law Implemented: NDCC 23-20.1-04

33-10-03-05. Specific licenses.

1. Filing application for specific licenses.

- a. Applications for specific licenses shall be filed ~~in triplicate~~ on a form prescribed by the department.
- b. The department may at any time after the filing of the original application, and before the expiration of the license, require further statements in order to enable the department to determine whether the application should be granted or denied or whether a license should be modified or revoked.
- c. Each application shall be signed by the applicant or licensee or a person duly authorized to act for and on the applicant's behalf.
- d. An application for a license may include a request for a license authorizing one or more activities.
- e. In the application, the applicant may incorporate by reference information contained in previous applications, statements, or reports filed with the department provided such references are clear and specific.
- f. Applications and documents submitted to the department shall be made available for public inspection except that the department may withhold any document or part thereof which is protected from disclosure by state and federal law or rule, including protection of trade secrets and individual medical records, as afforded by North Dakota Century Code section 23-20.1-09.1 from public inspection

if disclosure of its content is not required in the public interest and would adversely affect the interest of a person concerned.

- g. Each application for a specific license shall be accompanied by the fee prescribed in chapter 33-10-11.
2. General requirements for the issuance of specific licenses. A license application will be ~~granted~~ approved if the department determines all of the following:
 - a. The applicant is qualified by reason of training and experience to use the material in question for the purpose requested in accordance with this ~~chapter~~ article in such a manner as to minimize danger to public health and safety or property.
 - b. The applicant has a permanent in-state office.
 - c. The applicant's proposed equipment, facilities, and procedures are adequate to minimize danger to public health and safety or property.
 - d. The issuance of the license will not be inimical to the health and safety of the public.
 - e. The applicant satisfies any applicable special requirements in subsections 3, 4, or 5, and in chapters 33-10-05, 33-10-07, and 33-10-12.
 - f. Environmental report, commencement of construction. In the case of an application for a license to receive and possess radioactive material for commercial waste disposal by land burial, source material milling, or for the conduct of any other activity which the department determines will significantly affect the quality of the environment, the department, before commencement of construction of the plant or facility in which the activity will be conducted, has concluded, after weighing the environmental, economic, technical, and other benefits against environmental costs and considering available alternatives, that the action called for is the issuance of the proposed license, with any appropriate conditions to protect environmental values. Commencement of construction prior to such conclusion shall be grounds for denial of a license to receive and possess radioactive material in such plant or facility. As used in this paragraph the term "commencement of construction" means any clearing of land, excavation, or other substantial action that would adversely affect the environment of a site. The term does not mean site exploration, necessary roads for site exploration, borings to determine foundation conditions, or other preconstruction monitoring

or testing to establish background information related to the suitability of the site or the protection of environmental values.

g. Financial surety arrangements for site reclamation.

(1) Pursuant to subsection 2 of North Dakota Century Code section 23-20.1-04 and ~~except~~ as otherwise provided, financial surety arrangements for site reclamation ~~and long term surveillance and control~~ which may consist of surety bonds, cash deposits, certificates of deposit, deposits of government securities, letters or lines of credit, or any combination of the above for the categories of licensees listed in paragraph 4 shall be established to ensure the protection of the public health and safety in the event of abandonment, default, or other inability of the licensee to meet the requirements of the North Dakota Century Code and this article.

(a) The amount of funds to be ensured by such surety arrangements shall be based on department-approved cost estimates.

(b) Self-insurance, or any arrangement which essentially constitutes self-insurance, ~~e.g., a contract with a state or federal agency,~~ will not satisfy the surety requirement since this provides no additional assurance other than that which already exists through license requirements.

(2) The arrangements required in paragraph 1 shall be established prior to ~~commencement of operations~~ issuance of the license to assure that sufficient funds will be available to carry out the decontamination and decommissioning of the facility.

(3) ~~Amendments to licenses in effect on October 1, 1982, may be issued providing that the required surety arrangements are established within ninety days after October 1, 1982.~~

~~(4)~~ The following specific licensees are required to make financial surety arrangements:

(a) Major processors.

(b) Waste handling licensees.

(c) Former United States atomic energy commission or United States nuclear regulatory commission licensed facilities.

(d) Source material milling operations.

(e) All others except persons exempt pursuant to paragraph 5.

↔ (4) For source material milling operations, the amount of funds to be ensured by such surety arrangements shall be based on department-approved cost estimates in an approved plan for (a) decontamination and decommissioning of mill buildings and the milling site to levels which would allow unrestricted use of these areas upon decommissioning, and (b) the reclamation of tailings or waste disposal areas in accordance with the technical criteria delineated in chapter 33-10-03. The licensee shall submit this plan in conjunction with an environmental report that addresses the expected environmental impacts of the milling operation, decommissioning and tailings reclamation, and evaluates alternatives for mitigating these impacts. In addition, the surety shall cover the payment of the charge for long-term surveillance and control required by the department. In establishing specific surety arrangements, the licensee's cost estimates shall take into account total costs that would be incurred if an independent contractor were hired to perform the decommissioning and reclamation work. In order to avoid unnecessary duplication and expense, the department may accept financial sureties that have been consolidated with financial or surety arrangements established to meet requirements of other federal or state agencies or local governing bodies for such decommissioning, decontamination, reclamation, and long-term site surveillance, provided such arrangements are considered adequate to satisfy these requirements and that portion of the surety which covers the decommission and reclamation of the mill, mill tailings site and associated areas, and the long-term funding charge are clearly identified. The licensee's surety mechanism will be reviewed annually by the department to assure that sufficient funds will be available for completion of the reclamation plan if the work had to be performed by an independent contractor. The amount of surety liability should be adjusted to recognize any increases or decreases resulting from inflation, changes in engineering plans, activities performed, and any other conditions affecting costs. Regardless of whether reclamation is phased through the life of the operation or takes place at the end of operations, an appropriate portion of surety liability shall be retained until final compliance with the reclamation plan is determined. This will

yield a surety that is at least sufficient at all times to cover the costs of decommissioning and reclamation of the areas that are expected to be disturbed before the next license renewal. The term of the surety mechanism must be open ended, unless it can be demonstrated that another arrangement would provide an equivalent level of assurance. This assurance could be provided with a surety instrument which is written for a specified period of time, e.g., five years, yet which must be automatically renewed unless the surety notifies the beneficiary (the department) and the principal (the licensee) some reasonable time, e.g., ninety days, prior to the renewal date of their intention not to renew. In such a situation the surety requirement still exists and the licensee would be required to submit an acceptable replacement surety within a brief period of time to allow at least sixty days for the department to collect.

~~(6)~~ (5) The following persons are exempt from the requirements of paragraph 1:

- (a) All state, local, or other government agencies, unless they are subject to subparagraph ~~a~~ or b of paragraph ~~4~~ 3.
- (b) Persons authorized to possess no more than one thousand times the quantity specified in Schedule B, Exempt Quantities, or combination of radioactive material listed therein as given in Schedule B.
- (c) Persons authorized to possess hydrogen-3 contained as hydrogen gas in a sealed source.
- (d) Persons authorized to possess radioactive noble gases in sealed sources with no radioactive daughter product with half-life greater than thirty days.

~~(7)~~ The requirements of paragraph ~~1~~ will not be applicable to uranium mill tailings licensees after September 30, 1983, or whenever this state obtains an amended agreement with the United States nuclear regulatory commission pursuant to the Uranium Mill Tailings Radiation Control Act of 1978, as amended [42 U.S.C. 7901 et seq.].

- h. Long-term care requirements. Pursuant to North Dakota Century Code section 23-20.1-04, and as otherwise provided, a long-term care trust fund shall be established by the following specific licensees prior to the issuance

of the license. (Long-term care funding may also be required for former United States atomic energy commission or United States nuclear regulatory commission licensed facilities.)

(1) Waste handling licensees.

(2) Source material milling licensees.

i. Continued surveillance requirements for source material mills.

(1) The final disposition of tailings or wastes at source material milling sites should be such that the need for ongoing active maintenance is not necessary to preserve isolation. As a minimum, annual site inspections shall be conducted by the department retaining ultimate custody of the site where tailings, or wastes are stored to confirm the integrity of the stabilized tailings, or waste systems and to determine the need, if any, for maintenance or monitoring. Results of the inspection shall be reported to the United States nuclear regulatory commission within sixty days following each inspection, if, on the basis of a site-specific evaluation, such a need appears necessary due to the features of a particular tailings or waste disposal system.

(2) A minimum charge of two hundred fifty thousand dollars (1978 dollars) to cover the costs of long-term surveillance shall be paid by each mill operator to the department prior to the termination of a uranium or thorium mill license. If site surveillance or control requirements at a particular site are determined, on the basis of a site-specific evaluation, to be significantly greater than those specified in paragraph 1, e.g., if fencing is determined to be necessary, variance in funding requirements may be specified by the department. The total charge to cover the costs of long-term surveillance shall be such that, with an assumed one percent annual real interest rate, the collected funds will yield interest in an amount sufficient to cover the annual costs of site surveillance. The charge will be adjusted annually prior to actual payments to recognize inflation. The inflation rate to be used is that indicated by the change in the consumer price index published by the United States department of labor, bureau of labor statistics.

3. Special requirements for issuance of certain specific licenses for radioactive material - Use of sealed sources in industrial

radiography. In addition to the requirements set forth in subsection 2, a specific license for use of sealed sources in industrial radiography will be issued if all of the following are met:

a. Human use of radioactive material in institutions. In addition to the requirements set forth in subsection 2, a specific license for human use of radioactive material in institutions will be issued if all of the following are met:

- (1) The applicant has appointed a medical isotopes committee of at least three members to evaluate all proposals for research, diagnostic, and therapeutic use of radioactive material within that institution. Membership of the committee shall include a physician recognized as a specialist in nuclear medicine, a person with a special competence in radiation safety, and a representative of the institution's management.
- (2) The applicant possesses adequate facilities for the clinical care of patients.
- (3) The physician designated on the application as the individual user has substantial experience in the handling and administration of radioactive material and, where applicable, the clinical management of radioactive patients.
- (4) If the application is for a license to use unspecified quantities or multiple types of radioactive material, the applicant's staff has substantial experience in the use of a variety of radioactive materials for a variety of human uses.

b. Licensing of individual physicians for human use of radioactive material.

- (1) An application by an individual physician or group of physicians for a specific license for human use of radioactive material will be approved if all of the following are met:
 - (a) The applicant satisfies the general requirements specified in subsection 2.
 - (b) The application is for use in the applicant's private practice.
 - (c) The applicant has access to a hospital possessing adequate facilities to hospitalize and monitor the applicant's radioactive patients whenever it is advisable.

(d) The applicant has extensive experience in the proposed use, the handling and administration of radioactive material, and where applicable, the clinical management of radioactive patients. (The physician shall furnish suitable evidence of such experience with the application. A statement from the medical isotopes committee in the institution where the physician acquired experience, indicating its amount and nature, may be submitted as evidence of such experience.)

(2) The department will not approve an application by an individual physician or group of physicians for a specific license to receive, possess, or use radioactive material on the premises of a hospital or clinic unless:

(a) The use of radioactive material is limited to:

{1} The administration of radiopharmaceuticals for diagnostic or therapeutic purposes.

{2} The performance of diagnostic studies on patients to whom a radiopharmaceutical has been administered.

{3} The performance of in vitro diagnostic studies.

{4} The calibration and quality control checks of radioactive assay instrumentation, radiation safety instrumentation, and diagnostic instrumentation.

(b) The physician brings the radioactive material with the patient and removes the radioactive material when the physician departs. (The institution cannot receive, possess, or store radioactive material other than the amount of material remaining in the patient.)

(c) The medical institution does not hold a radioactive material license under subdivision a.

c. Specific licenses for certain groups of medical uses of radioactive material.

(1) Subject to the provisions of paragraphs 2, 3, and 4, an application for a specific license pursuant to subdivision a or b for any medical use or uses of radioactive material specified in one or more of

Groups I through VI of Schedule G of this chapter will be approved for all of the uses within the group or groups which include the use or uses specified in the application if:

- (a) The applicant satisfies the requirements of subdivisions a, b, and d.
 - (b) The applicant, or the physician designated in the application as the individual user, has adequate clinical experience in the types of uses included in the group or groups.
 - (c) The applicant or the physicians and all other personnel who will be involved in the preparation and use of the radioactive material have adequate training and experience in the handling of radioactive material appropriate to their participation in the uses included in the group or groups.
 - (d) The applicant's radiation detection and measuring instrumentation is adequate for conducting the procedures involved in the uses included in the group or groups.
 - (e) The applicant's radiation safety operating procedures are adequate for handling and disposal of the radioactive material involved in the uses included in the group or groups.
- (2) Any licensee who is authorized to use radioactive material pursuant to one or more groups in paragraph 1 and Schedule G of this chapter is subject to the following conditions:
- (a) For Groups I, II, IV, and V, no licensee shall receive, possess, or use radioactive material except as a radiopharmaceutical manufactured in the form to be administered to the patient, labeled, packaged, and distributed in accordance with a specific license issued by the department pursuant to subdivision j of subsection 5, a specific license issued by the United States nuclear regulatory commission pursuant to 10 CFR 32.72, or a specific license issued by an agreement state or a licensing state pursuant to equivalent regulations.
 - (b) For Group III, no licensee shall receive, possess, or use generators or reagent kits containing radioactive material or shall use reagent kits that do not contain radioactive

material to prepare radiopharmaceuticals containing radioactive material, except:

- f1] Reagent kits not containing radioactive material that are approved by the department, the United States nuclear regulatory commission, an agreement state, or a licensing state for use by persons licensed pursuant to this subdivision and Schedule E of this chapter or equivalent regulations.
 - f2] Generators or reagent kits containing radioactive material that are manufactured, labeled, packaged, and distributed in accordance with a specific license issued by the department pursuant to subdivision k of this subsection, a specific license issued by the United States nuclear regulatory commission pursuant to 10 CFR 32.73, or a specific license issued by an agreement state or a licensing state pursuant to equivalent regulations.
- (c) For Group VI, no licensee shall receive, possess, or use radioactive material except as contained in a source or device that has been manufactured, labeled, packaged, and distributed in accordance with a specific license issued by the department pursuant to subdivision l of subsection 5, a specific license issued by the United States nuclear regulatory commission pursuant to 10 CFR 32.74, or a specific license issued to the manufacturer by an agreement state or a licensing state pursuant to equivalent regulations.
- (d) For Group III, any licensee using generators or reagent kits shall:
- f1] Elute the generator, or process radioactive material with the reagent kit, in accordance with instructions approved by the department, the United States nuclear regulatory commission, an agreement state, or a licensing state and furnished by the manufacturer on the label attached to or in the leaflet or brochure that accompanies the generator or reagent kit.
 - f2] Before administration to patients, cause each elution or extraction of technetium-99m generator to be tested to determine

either the total molybdenum-99 activities or the concentration of the molybdenum-99. This testing shall be conducted according to written procedures and by personnel who have been specifically trained to perform the test.

f3] Prohibit the administration to patients of technetium-99m containing more than one microcurie of molybdenum-99 per millicurie of technetium-99m, or more than five microcuries of molybdenum-99 per administered dose, at the time of administration.

f4] Maintain for department inspection records of the molybdenum-99 test conducted on each elution from the generator.

(e) For Group VI any licensee who possesses and uses sources or devices containing radioactive material shall:

f1] Gause each source or device containing more than one hundred microcuries of radioactive material with a half-life greater than thirty days, except iridium-192 seeds encased in nylon ribbon, to be tested for contamination or leakage at intervals not to exceed six months or at such other intervals as are approved by the department, the United States nuclear regulatory commission, an agreement state, or a licensing state and described by the manufacturer on the label attached to the source, device, or permanent container thereof, or in the leaflet or brochure which accompanies the source or device. Each source or device shall be so tested prior to its first use unless the supplier furnishes a certificate that the source or device has been so tested within six months prior to the transfer.

f2] Assure that the test required by item f of this subparagraph shall be capable of detecting the presence of five-thousandths microcurie of radioactive material on the test sample or in the case of radium, the escape of radon at the rate of one-thousandths microcurie per twenty-four hours. The test sample shall be taken from the source or from the surfaces of the

device in which the source is permanently or semipermanently mounted or stored on which one might expect contamination to accumulate. Records of leak test results shall be kept in units of microcuries and maintained for inspection by the department.

- [3] If the test required by item 1 of this subparagraph reveals the presence of five thousandths microcurie or more of removable contamination or in the case of radium, the escape of radon at the rate of one thousandths microcurie per twenty-four hours, immediately withdraw the source from use and cause it to be decontaminated and repaired or to be disposed of in accordance with this article. A report shall be filed within five days of the test with the department, describing the equipment involved, the test results, and the corrective action taken.
- [4] Follow the radiation safety and handling instructions approved by the department, the United States nuclear regulatory commission, an agreement state, or a licensing state and furnished by the manufacturer on the label attached to the source, device, or permanent container thereof, or in the leaflet or brochure which accompanies the source or device, and maintain such instruction in a legible and conveniently available form.
- [5] Conduct a quarterly physical inventory to account for all sources and devices received and possessed. Records of the inventories shall be maintained for inspection by the department and shall include the quantities and kinds of radioactive material, location of sources and devices, and the date of the inventory.
- [6] Assure that needles or standard medical applicator cells containing radium-226, or cobalt-60 as wire are not opened while in the licensee's possession unless specifically authorized by a license issued by the department.
- [7] Assure that patients treated with cobalt-60, cesium-137, iridium-192, or radium-226

implants remain hospitalized until a source count and a radiation survey of the patient confirms that all implants have been removed.

- (f) For groups I, II, and III, any licensee using radioactive material for clinical procedures other than those specified in the product labeling (package insert) shall comply with the product labeling regarding:
 - {1} Chemical and physical form.
 - {2} Route of administration.
 - {3} Dosage range.
- (3) Any licensee who is licensed pursuant to paragraph 4 for one or more of the medical use groups in Schedule C also is authorized to use radioactive material under the general license in subdivision g of subsection 2 of section 33-10-03-04 for the specified in vitro uses without filing Form RAD 732 as required by paragraph 2 of that subdivision; provided, that the licensee is subject to the other provisions of that subdivision.
- (4) Any licensee who is licensed pursuant to paragraph 4 for one or more of the medical use groups in Schedule C also is authorized subject to the provisions of this paragraph and paragraph 5, to receive, possess, and use for calibration and reference standards:
 - (a) Any radioactive material listed in Group I, Group II, or Group III of Schedule C to this chapter with a half-life not longer than one hundred days, in amounts not to exceed fifteen millicuries total.
 - (b) Any radioactive material listed in Group I, Group II, or Group III of Schedule C to this chapter with half-life greater than one hundred days in amounts not to exceed two hundred microcuries total.
 - (c) Technetium-99m in amounts not to exceed thirty millicuries.
 - (d) Any radioactive material, in amounts not to exceed three millicuries per source, contained in calibration or reference sources that have been manufactured, labeled, packaged, and distributed in accordance with a specific

license issued by the department pursuant to subdivision a of subsection 5, a specific license issued by the United States nuclear regulatory commission pursuant to 10 CFR 32.74, or a specific license issued to the manufacturer by an agreement state or a licensing state pursuant to equivalent regulations.

[1] A specific license issued by the department pursuant to subdivision a of subsection 5 or an application filed with the department pursuant to subdivision a of subsection 5 on or before July 1, 1977, for a license to manufacture and distribute a source that the applicant distributed commercially on or before July 1, 1977, on which application the department has not acted.

[2] A specific license issued by the United States nuclear regulatory commission pursuant to 10 CFR 32.74 or an application filed with the United States atomic energy commission pursuant to 10 CFR 32.74 on or before October 15, 1974, for a license to manufacture and distribute a source that the applicant distributed commercially on or before August 16, 1974, on which application the United States nuclear regulatory commission has not acted.

[3] A specific license issued by an agreement state pursuant to equivalent regulations or an application filed with an agreement state pursuant to equivalent regulations on or before July 1, 1977, for a license to manufacture and distribute a source that the applicant distributed commercially on or before July 1, 1977, on which application the agreement state has not acted.

(5) (a) Any licensee or registrant who possesses sealed sources as calibration or reference sources pursuant to paragraph 4 shall cause each sealed source containing radioactive material, other than hydrogen-3, with a half-life greater than thirty days in any form other than gas to be tested for leakage or contamination at intervals not to exceed six months. In the absence of a certificate from a transferor indicating that a test has been made within six months prior to the transfer, the sealed source should not be

used until tested; provided, however, that no leak tests are required when:

[1] The source contains one hundred microcuries or less of beta or gamma, or both, emitting material or ten microcuries or less of alpha emitting material; or

[2] The sealed source is stored and is not being used; such sources shall, however, be tested for leakage prior to any use or transfer unless they have been leak tested within six months prior to the date of use or transfer.

(b) The leak test shall be capable of detecting the presence of five-thousandths microcurie of radioactive material on the test sample. The test sample shall be taken from the sealed source or from the surfaces of the device in which the sealed source is mounted or stored on which contamination might be expected to accumulate. Records of leak test results shall be kept in units of microcuries and maintained for inspection by the department.

(c) If the leak test reveals the presence of five-thousandths microcurie or more of removable contamination, the licensee or registrant shall immediately withdraw the sealed source from use and shall cause it to be decontaminated and repaired or to be disposed of in accordance with this chapter and chapter 33-10-04. A report shall be filed within five days of the test with the department describing the equipment involved, the test results, and the corrective action taken.

(6) Any licensee or registrant who possesses and uses calibration and reference sources pursuant to subparagraph d of paragraph 4 shall:

(a) Follow the radiation safety and handling instructions approved by the department, the United States nuclear regulatory commission, an agreement state, or a licensing state and furnished by the manufacturer on the label attached to the source, or permanent container thereof, or in the leaflet or brochure that accompanies the source, and maintain such instruction in a legible and conveniently available form.

- (b) Conduct a quarterly physical inventory to account for all sources received and possessed. Records of the inventories shall be maintained for inspection by the department and shall include the quantities and kinds of radioactive material, location of sources, and the date of the inventory.
- d. Human use of sealed sources. In addition to the requirements set forth in subsection 2, a specific license for human use of sealed sources will be issued only if the applicant or, if the application is made by an institution, the individual user (1) has specialized training in the diagnostic or therapeutic use of the sealed source considered, or has experience equivalent to such training, and (2) is a physician.
- e. Use of sealed sources in industrial radiography. In addition to the requirements set forth in subsection 2, a specific license for use of sealed sources in industrial radiography will be issued if all of the following are met:
 - (1) The applicant will have an adequate program for training radiographers and radiographer's assistants and submits to the department a schedule or description of such program which specifies the:
 - (a) Initial training.
 - (b) Periodic training.
 - (c) On-the-job training.
 - (d) Means to be used by the licensee to determine the radiographer's knowledge and understanding of and ability to comply with this article and licensing requirements, and the operating and emergency procedures of the applicant.
 - (e) Means to be used by the licensee to determine the radiographer's assistant's knowledge and understanding of and ability to comply with the operating and emergency procedures of the applicant.
 - (2) The applicant has established and submits to the department satisfactory written operating and emergency procedures described in subsection 2.
 - (3) The applicant will have an internal inspection system adequate to ensure that this article, license

provisions, and the applicant's operating and emergency procedures are followed by radiographers and radiographer's assistants; the inspection system shall include the performance of internal inspections at intervals not to exceed three months and the retention of records of such inspections.

(4) The applicant submits to the department a description of the applicant's overall organizational structure pertaining to the industrial radiography program, including specified delegations of authority and responsibility for operation of the program.

(5) The applicant who desires to conduct the applicant's own leak tests has established adequate procedures to be followed in leak testing sealed sources for possible leakage and contamination and submits to the department a description of such procedures including:

(a) Instrumentation to be used.

(b) Method of performing tests, e.g., points on equipment to be smeared and method of taking smear.

(c) Pertinent experience of the person who will perform the test.

(6) The applicant will conduct a program for inspection and maintenance of radiographic exposure devices and storage containers to assure proper functioning of components important to safety.

a. The applicant will have an adequate program for training radiographic personnel and submits to the department a schedule or description of such program which specifies the:

(1) Initial training.

(2) Periodic training.

(3) On-the-job training.

(4) Means to be used by the licensee to determine the radiographic personnel's knowledge and understanding of and ability to comply with this article and licensing requirements, and the operating and emergency procedures of the applicant.

b. The applicant has established and submits to the department satisfactory written operating and emergency

procedures described in subsection 2 of section 33-10-05-06.

- c. The applicant will have an internal inspection system adequate to assure that this article, license provisions, and the applicant's operating and emergency procedures are followed by radiographic personnel; the inspection system must include the performance of internal inspections at intervals not to exceed three months and the retention of records of such inspections for two years.
 - d. The applicant submits to the department a description of the applicant's overall organizational structure pertaining to the industrial radiography program, including specified delegations of authority and responsibility for operation of the program.
 - e. The applicant who desires to conduct the applicant's own leak tests has established adequate procedures to be followed in testing sealed sources for possible leakage and contamination and submits to the department a description of such procedures including:
 - (1) Instrumentation to be used.
 - (2) Method of performing tests.
 - (3) Pertinent experience of the individual who will perform the test.
 - f. The licensee shall conduct a program for inspection and maintenance of radiographic exposure devices and storage containers to assure proper functioning of components important to safety.
4. Special requirements for specific licenses of broad scope. This subsection prescribes requirements for the issuance of specific licenses of broad scope for radioactive material (~~"broad licenses"~~) and certain rules governing holders of such licenses. (Authority to transfer possession or control by the manufacturer, processor, or producer of any equipment, device, commodity, or other product containing **source material or byproduct material** whose subsequent possession, use, transfer, and disposal by all other persons are exempted from regulatory requirements may be obtained only from the United States nuclear regulatory commission, Washington, D.C. 20555.)
- a. The different types of broad licenses are set forth below:
 - (1) A "Type A specific license of broad scope" is a specific license authorizing receipt, acquisition, ownership, possession, use, and transfer of any chemical or physical form of the radioactive material

specified in the license, but not exceeding quantities specified in the license, for any authorized purpose. The quantities specified are usually in the multicurie range.

- (2) A "Type B specific license of broad scope" is a specific license authorizing receipt, acquisition, ownership, possession, use, and transfer of any chemical or physical form of radioactive material specified in Schedule B C, for any authorized purpose. The possession limit for a Type B broad license of broad scope, if only one radionuclide is possessed thereunder, is the quantity specified for that radionuclide in Schedule B C, Column I. If two or more radionuclides are possessed thereunder, the possession limit for each is determined as follows: For each radionuclide, determine the ratio of the quantity possessed to the applicable quantity specified in Schedule B C, Column I, for that radionuclide. The sum of the ratios for all radionuclides possessed under the license shall not exceed unity.
 - (3) A "Type C specific license of broad scope" is a specific license authorizing receipt, acquisition, ownership, possession, use, and transfer of any chemical or physical form of radioactive material specified in Schedule B C, for any authorized purpose. The possession limit for a Type C broad license of broad scope, if only one radionuclide is possessed thereunder, is the quantity specified for that radionuclide in Schedule B C, Column II. If two or more radionuclides are possessed thereunder, the possession limit is determined for each as follows: For each radionuclide determine the ratio of the quantity possessed to the applicable quantity specified in Schedule B C, Column II, for that radionuclide. The sum of the ratios for all radionuclides possessed under the license shall not exceed unity.
- b. An application for a Type A specific license of broad scope will be approved if all of the following are met:
- (1) The applicant satisfies the general requirements specified in subsection 2.
 - (2) The applicant has engaged in a reasonable number of activities involving the use of radioactive material.
 - (3) The applicant has established administrative controls and provisions relating to organization and management, procedures, recordkeeping, material

control and accounting, and management review that are necessary to assure safe operations, including:

- (a) The establishment of a radiation safety committee composed of such persons as a radiation safety officer, a representative of management, and persons trained and experienced in the safe use of radioactive material.
 - (b) The appointment of a radiation safety officer who is qualified by training and experience in radiation protection, and who is available for advice and assistance on radiation safety matters.
 - (c) The establishment of appropriate administrative procedures to assure:
 - [1] Control of procurement and use of radioactive material.
 - [2] Completion of safety evaluations of proposed uses of radioactive material which take into consideration such matters as the adequacy of facilities and equipment, training and experience of the user, and the operating or handling procedures.
 - [3] Review, approval, and recording by the radiation safety committee of safety evaluation of proposed uses prepared in accordance with item 2 of this subparagraph prior to use of the radioactive material.
- c. An application for a Type B specific license of broad scope will be approved if all of the following are met:
- (1) The applicant satisfies the general requirements specified in subsection 2.
 - (2) The applicant has established administrative controls and provisions relating to organization and management, procedures, recordkeeping, material control and accounting, and management review that are necessary to assure safe operations, including:
 - (a) The appointment of a radiation safety officer who is qualified by training and experience in radiation protection, and who is available for advice and assistance on radiation safety matters.

- (b) The establishment of appropriate administrative procedures to assure:
 - [1] Control of procurement and use of radioactive material.
 - [2] Completion of safety evaluations of proposed uses of radioactive material which take into consideration such matters as the adequacy of facilities and equipment, training and experience of the user, and the operating or handling procedures.
 - [3] Review, approval, and recording by the radiation safety officer of safety evaluations of proposed uses prepared in accordance with item 2 of this subparagraph prior to use of the radioactive material.
- d. An application for a Type C specific license of broad scope will be approved if all of the following are met:
 - (1) The applicant satisfies the general requirements specified in subsection 2.
 - (2) The applicant submits a statement that radioactive material will be used only by, or under the direct supervision of, individuals who have received all of the following:
 - (a) A college degree at the bachelor level, or equivalent training and experience, in the physical or biological sciences or in engineering.
 - (b) At least forty hours of training and experience in the safe handling of radioactive material, and in the characteristics of ionizing radiation, units of radiation dose and quantities, radiation detection instrumentation, and biological hazards of exposure to radiation appropriate to the type and forms of radioactive material to be used.
 - (3) The applicant has established administrative controls and provisions relating to procurement of radioactive material, procedures, recordkeeping, material control and accounting, and management review necessary to assure safe operations.
- e. Specific licenses of broad scope are subject to the following conditions:

- (1) Persons Unless specifically authorized, persons licensed pursuant to this subsection shall not:
 - (a) Conduct tracer studies in the environment involving direct release of radioactive material.
 - (b) Receive, acquire, own, possess, use, or transfer devices containing one hundred thousand curies [3.7 petabecquerels] or more of radioactive material in sealed sources used for irradiation of materials.
 - (c) Conduct activities for which a specific license issued by the department under subsection 3 or 5, or chapter 33-10-07, is required.
 - (d) Add or cause the addition of radioactive material to any food, beverage, cosmetic, drug, or other product designed for ingestion or inhalation by, or application to, a human being.
 - (2) Each Type A specific license of broad scope issued under this subsection shall be subject to the condition that radioactive material possessed under the license may only be used by, or under the direct supervision of, individuals approved by the licensee's radiation safety committee.
 - (3) Each Type B specific license of broad scope issued under this subsection shall be subject to the condition that radioactive material possessed under the license may only be used by, or under the direct supervision of, individuals approved by the licensee's radiation safety officer.
 - (4) Each Type C specific license of broad scope issued under this subsection shall be subject to the condition that radioactive material possessed under the license may only be used by, or under the direct supervision of, individuals who satisfy the requirements of subdivision d.
5. Special requirements for specific license to manufacture, assemble, repair, or distribute commodities, products, or devices which contain radioactive material.
- a. Licensing the introduction of radioactive material into products in exempt concentrations.
 - (1) In addition to the requirements set forth in subsection 2, a specific license authorizing the introduction of radioactive material into a product

or material owned by or in the possession of the licensee or another to be transferred to persons exempt under paragraph 1 of subdivision a of subsection 2 of section 33-10-03-02 will be issued if:

↔↔ (a) The applicant submits a description of the product or material into which the radioactive material will be introduced, intended use of the radioactive material and the product or material into which it is introduced, method of introduction, initial concentration of the radioactive material in the product or material, control methods to assure that no more than the specified concentration is introduced into the product or material, estimated time interval between introduction and transfer of the product or material, and estimated concentration of the radioactive material in the product or material at the time of transfer.

↔↔ (b) The applicant provides reasonable assurance that the concentrations of radioactive material at the time of transfer will not exceed the concentrations in Schedule A, that reconcentration of the radioactive material in concentrations exceeding those in Schedule A is not likely, that use of lower concentrations is not feasible, and that the product or material is not likely to be incorporated in any food, beverage, cosmetic, drug or other commodity or product designed for ingestion or inhalation by, or application to, a human being.

↔↔ (2) Each person licensed under this subsection shall file an annual report with the department which shall identify the type and quantity of each product or material into which radioactive material has been introduced during the reporting period; name and address of the person who owned or possessed the product or material, into which radioactive material has been introduced, at the time of introduction; the type and quantity of radionuclide introduced into each such product or material; and the initial concentrations of the radionuclide in the product or material at time of transfer of the radioactive material by the licensee. If no transfers of the radioactive material have been made pursuant to this ~~division~~ subdivision during the reporting period, the report shall so indicate. The report shall cover the year ending June thirtieth, and shall be filed within thirty days thereafter.

- b. Licensing the distribution of radioactive material in exempt quantities. (Authority to transfer possession or control by the manufacturer, processor, or producer of any equipment, device, commodity, or other product containing ~~source material~~ or byproduct material whose subsequent possession, use, transfer, and disposal by all other persons are exempted from regulatory requirements may be obtained only from the United States nuclear regulatory commission, Washington, D.C. 20555.)
- (1) An application for a specific license to distribute NARM to persons exempted from this article pursuant to subdivision b of subsection 2 of section 33-10-03-02 will be approved if all of the following are met:
- (a) The radioactive material is not contained in any food, beverage, cosmetic, drug, or other commodity designed for ingestion or inhalation by, or application to, a human being.
 - (b) The radioactive material is in the form of processed chemical elements, compounds, or mixtures, tissue samples, bioassay samples, counting standards, plated or encapsulated sources, or similar substances, identified as radioactive and to be used for its radioactive properties, but is not incorporated into any manufactured or assembled commodity, product, or device intended for commercial distribution.
 - (c) The applicant submits copies of prototype labels and brochures and the department approves such labels and brochures.
- (2) The license issued under paragraph 1 is subject to the following conditions:
- (a) No more than ten exempt quantities shall be sold or transferred in any single transaction. However, an exempt quantity may be composed of fractional parts of one or more of the exempt quantity provided the sum of the fractions shall not exceed unity.
 - (b) Each exempt quantity shall be separately and individually packaged. No more than ten such packaged exempt quantities shall be contained in any outer package for transfer to persons exempt pursuant to subdivision b of subsection 2 of section 33-10-03-02. The outer package shall be such that the dose rate at the external surface

of the package does not exceed one-half millirem [5 microsieverts] per hour.

(c) The immediate container of each quantity or separately packaged fractional quantity of radioactive material shall bear a durable, legible label which (1) identifies the radionuclide and the quantity of radioactivity, and (2) bears the words "radioactive material".

(d) In addition to the labeling information required by subparagraph c, the label affixed to the immediate container, or an accompanying brochure, shall (1) state that the contents are exempt from ~~United States nuclear regulatory commission or agreement state requirements or a licensing state requirements~~; (2) bear the words "radioactive material - not for human use - introduction into foods, beverages, cosmetics, drugs, or medicinals, or into products manufactured for commercial distribution is prohibited - exempt quantities should not be combined"; and (3) set forth appropriate additional radiation safety precautions and instructions relating to the handling, use, storage, and disposal of the radioactive material.

(3) Each person licensed under this subdivision shall maintain records identifying, by name and address, each person to whom radioactive material is transferred for use under subdivision b of subsection 2 of section 33-10-03-02 or the equivalent regulations of ~~an agreement state or a licensing state~~, and stating the kinds and quantities of radioactive material transferred. An annual summary report stating the total quantity of each radionuclide transferred under the specific license shall be filed with the department. Each report shall cover the year ending June thirtieth, and shall be filed within thirty days thereafter. If no transfers of radioactive material have been made pursuant to this subdivision during the reporting period, the report shall so indicate.

c. Licensing the incorporation of ~~NARM~~ naturally occurring and accelerator-produced radioactive material into gas and aerosol detectors. An application for a specific license authorizing the incorporation of ~~radioactive material other than source or byproduct material~~ NARM into gas and aerosol detectors to be distributed to persons exempt under paragraph 3 of subdivision c of subsection 2 of section 33-10-03-02 will be approved if the application

satisfies requirements equivalent to those contained in 10 CFR 32.26 ~~of the regulations of the United States nuclear regulatory commission~~. The maximum quantity of radium-226 in each device may not exceed one-tenth microcurie [3.7 kilobecquerels].

d. Licensing the manufacture and distribution of devices to persons generally licensed under subdivision ~~a~~ b of subsection 2 of section 33-10-03-04.

(1) An application for a specific license to manufacture or distribute devices containing radioactive material, excluding special nuclear material, to persons generally licensed under subdivision b of subsection 2 of section 33-10-03-04 or equivalent regulations of the United States nuclear regulatory commission, an agreement state, or a licensing state will be approved if:

(a) The applicant satisfies the general requirements of subsection 2 of this section.

(b) The applicant submits sufficient information relating to the design, manufacture, prototype testing, quality control, labels, proposed uses, installation, servicing, leak testing, operating and safety instructions, and potential hazards of the device to provide reasonable assurance that:

[1] The device can be safely operated by persons not having training in radiological protection.

[2] Under ordinary conditions of handling, storage, and use of the device, the radioactive material contained in the device will not be released or inadvertently removed from the device, and it is unlikely that any person will receive in any period of one calendar quarter a dose in excess of ten percent of the limits specified in the table of subdivision a of subsection 1 of section 33-10-04-02.

[3] Under accident conditions (such as fire and explosion) associated with handling, storage, and use of the device, it is unlikely that any person would receive an external radiation dose or dose commitment in excess of the following organ doses:

(The model, serial number, and name of manufacturer or distributor may be omitted from this label provided ~~they are~~ the information is elsewhere specified in labeling affixed to the device.) This label shall be maintained on the device in a legible condition. Removal of this label is prohibited.

CAUTION-RADIOACTIVE MATERIAL

(name of manufacturer or distributor)

[b] The receipt, possession, use, and transfer of ~~the~~ this device Model _____, Serial No. _____, are subject to a general license or ~~its~~ the equivalent and the regulations of a licensing state. (The model, serial number, and name of manufacturer or distributor may be omitted from this label provided ~~they are~~ the information is elsewhere specified in labeling affixed to the device.) This label shall be maintained on the device in a legible condition. Removal of this label is prohibited.

CAUTION-RADIOACTIVE MATERIAL

(name of manufacturer or distributor)

(2) In the event the applicant desires that the device be required to be tested at intervals longer than six months, either for proper operation of the on-off mechanism and indicator, if any, or for leakage of radioactive material or for both, the applicant shall include in the application sufficient information to demonstrate that such longer interval is justified by performance characteristics of the device or similar devices and by design features which have a significant bearing on the probability or consequences of leakage of radioactive material from the device or failure of the on-off mechanism and indicator. In determining the acceptable interval for the test for leakage of radioactive material, the department will consider information which includes, but is not limited to:

(a) Primary containment ~~(source capsule)~~.

- (b) Protection of primary containment.
 - (c) Method of sealing containment.
 - (d) Containment construction materials.
 - (e) Form of contained radioactive material.
 - (f) Maximum temperature withstood during prototype test.
 - (g) Maximum pressure withstood during prototype tests.
 - (h) Maximum quantity of contained radioactive material.
 - (i) Radiotoxicity of contained radioactive material.
 - (j) Operating experience with identical devices or similarly designed and constructed devices.
- (3) In the event the applicant desires that the general licensee under subdivision b of subsection 2 of section 33-10-03-04, or under equivalent regulations of the United States nuclear regulatory commission, an agreement state, or a licensing state, be authorized to install the device, collect the sample to be analyzed by a specific licensee for leakage of radioactive material, service the device, test the on-off mechanism and indicator, or remove the device from installation, the applicant shall include in the application written instructions to be followed by the general licensee, estimated calendar quarter doses associated with such activity or activities, and basis for such estimates. The submitted information shall demonstrate that performance of such activity or activities by an individual untrained in radiological protection, in addition to other handling, storage, and use of devices under the general license, is unlikely to cause that individual to receive a calendar quarter dose in excess of ten percent of the limits specified in the table in subdivision a of subsection 1 of section 33-10-04-02.
- (4) Each person licensed under subdivision d to distribute devices to generally licensed persons shall:
- (a) Furnish a copy of the general license contained in subdivision b of subsection 2 of section ~~33-10-04-02~~ 33-10-03-04 to each person to whom the person directly or through an intermediate

person transfers radioactive material in a device for use pursuant to the general license contained in subdivision b of subsection 2 of section 33-10-03-04.

- (b) Furnish a copy of the general license contained in the United States nuclear regulatory ~~commission~~ commission's, agreement state's, or licensing state's regulation equivalent to subdivision b of subsection 2 of section 33-10-03-04, or alternatively, furnish a copy of the general license contained in subdivision b of subsection 2 of section 33-10-03-04 to each person to whom the person directly or through an intermediate person transfers radioactive material in a device for use pursuant to the general license of the United States nuclear regulatory commission, the agreement state, or the licensing state. If a copy of the general license in subdivision b of subsection 2 of section 33-10-03-04 is furnished to such a person, it shall be accompanied by a note explaining that the use of the device is regulated by the United States nuclear regulatory commission, agreement state, or a licensing state under requirements substantially the same as those in subdivision b of subsection 2 of section 33-10-03-04.
- (c) Report to the department all transfers of such devices to persons for use under the general license in subdivision b of subsection 2 of section 33-10-03-04. Such report shall identify each general licensee by name and address, an individual by name or position who may constitute a point of contact between the department and the general licensee, the type and model number of device transferred, and the quantity and type of radioactive material contained in the device. If one or more intermediate persons will temporarily possess the device at the intended place of use prior to its possession by the user, the report shall include identification of each intermediate person by name, address, contact, and relationship to the intended user. If no transfers have been made to persons generally licensed under subdivision b of subsection 2 of section 33-10-03-04 during the reporting period, the report shall so indicate. The report shall cover each calendar quarter and shall be filed within thirty days thereafter.

(d) Furnish reports to other agencies.

- [1] Report to the United States nuclear regulatory commission all transfers of such devices to persons for use under the United States nuclear regulatory commission general license in 10 CFR 31.5.
- [2] Report to the responsible state agency all transfers of ~~such devices to persons~~ manufactured and distributed pursuant to subdivision d for use under a general license in an agreement that state's regulations equivalent to subdivision b of subsection 2 of section 33-10-03-04.
- [3] Such reports shall identify each general licensee by name and address, an individual by name or position who may constitute a point of contact between the department and the general licensee, the type and model of the device transferred, and the quantity and type of radioactive material contained in the device. If one or more intermediate persons will temporarily possess the device at the intended place of use prior to its possession by the user, the report shall include identification of each intermediate person by name, address, contact, and relationship to the intended user. The report shall be submitted within thirty days after the end of each calendar quarter in which such a device is transferred to the generally licensed person.
- [4] If no transfers have been made to United States nuclear regulatory commission licensees during the reporting period, this information shall be reported to the United States nuclear regulatory commission.
- [5] If no transfers have been made to general licensees within a particular state during the reporting period, this information shall be reported to the responsible state agency upon request of the ~~department~~ agency.

- (e) Keep records showing the name, address, and the point of contact for each general licensee to whom the licensee directly or through an intermediate person transfers radioactive material in devices for use pursuant to the

general license provided in subdivision b of subsection 2 of section 33-10-03-04, or equivalent regulations of the United States nuclear regulatory commission or an agreement state or a licensing state. The records should show the date of each transfer, the isotope radionuclide and the quantity of radioactivity in each device transferred, the identity of any intermediate person, and compliance with the report requirements of this section paragraph.

e. Special requirements for the manufacture, assembly, or repair of luminous safety devices for use in aircraft. An application for a specific license to manufacture, assemble, or repair luminous safety devices containing tritium or promethium-147 for use in aircraft, for distribution to persons generally licensed under subdivision c of subsection 2 of section 33-10-03-04 will be approved subject to the following conditions if:

- (1) The applicant satisfies the general requirements specified in subsection 2 of this section.
- (2) The applicant satisfies the general requirements of 10 CFR 32.53, 32.54, 32.55, 32.56, and 32.101 or their equivalent.

f. Special requirements for license to manufacture calibration sources containing americium-241, plutonium, or radium-226 for distribution to persons generally licensed under subdivision e of subsection 2 of section 33-10-03-04. An application for a specific license to manufacture calibration and reference sources containing americium-241, plutonium, or radium-226 to persons generally licensed under subdivision e of subsection 2 of section 33-10-03-04 will be approved subject to the following conditions if:

- (1) The applicant satisfies the general requirement of subsection 2 of this section.
- (2) The applicant satisfies the requirements of 10 CFR 32.57, 32.58, 32.59, and 32.102 and 10 CFR 70.39 or their equivalent.

~~g. Manufacture and distribution of radioactive material for medical use under general license. In addition to requirements set forth in subsection 2, a specific license authorizing the distribution of radioactive material for use by physicians under the general license in subdivision f of subsection 2 of section 33-10-03-04 will be issued if all of the following are met:~~

(1) The applicant submits evidence that the radioactive material is to be manufactured, labeled, and packaged in accordance with a new drug application which the commissioner of food and drugs, food and drug administration, has approved, or in accordance with a license for a biologic product issued by the secretary, United States department of health, education, and welfare.

(2) One of the following statements, as appropriate, or a substantially similar statement which contains the information called for in the following statement, appears on the label affixed to the container or appears in the leaflet or brochure which accompanies the package:

(a) This radioactive drug may be received, possessed, and used only by physicians licensed to dispense drugs in the practice of medicine. Its receipt, possession, use, and transfer are subject to this article and a general license or its equivalent of the United States nuclear regulatory commission or of a state with which the commission has entered into an agreement for the exercise of regulatory authority.

Name of manufacturer

(b) This radioactive drug may be received, possessed, and used only by physicians licensed [to dispense drugs] in the practice of medicine. Its receipt, possession, use, and transfer are subject to this article and a general license or its equivalent of a licensing state.

Name of manufacturer

h. g. Manufacture and distribution of radioactive material for certain in vitro clinical or laboratory testing under general license. An application for a specific license to manufacture or distribute radioactive material for use under the general license of subdivision g f of subsection 2 of section 33-10-03-04 will be approved if:

- (1) The applicant satisfies the general requirements specified in subsection 2 of this section.
- (2) The radioactive material is to be prepared for distribution in prepackaged units of:

- ~~(c)~~ (a) Carbon-14 in units not exceeding ten microcuries [370 kilobecquerels] each.
- ~~(f)~~ (b) Cobalt-57 in units not exceeding ten microcuries [370 kilobecquerels] each.
- ~~(d)~~ (c) Hydrogen-3 (tritium) in units not exceeding fifty microcuries [1.85 megabecquerels] each.
- ~~(a)~~ (d) Iodine-125 in units not exceeding ten microcuries [370 kilobecquerels] each.
- ~~(h)~~ (e) Mock iodine-125 in units not exceeding five-hundredths microcurie [1.85 kilobecquerels] of iodine-129 and five-thousandths microcurie [185 becquerels] of americium-241 each.
- ~~(b)~~ (f) Iodine-131 in units not exceeding ten microcuries [370 kilobecquerels] each.
- ~~(e)~~ (g) Iron-59 in units not exceeding twenty microcuries [740 kilobecquerels] each.
- ~~(g)~~ (h) Selenium-75 in units not exceeding ten microcuries [370 kilobecquerels] each.

(3) Each prepackaged unit bears a durable, clearly visible label:

- (a) Identifying the radioactive contents as to chemical form and radionuclide, and indicating that the amount of radioactivity does not exceed ten microcuries [370 kilobecquerels] of iodine-125, iodine-131, carbon-14, cobalt-57, or selenium-75; fifty microcuries [1.85 megabecquerels] of hydrogen-3 (tritium); ~~or~~ twenty microcuries [740 kilobecquerels] of iron-59; or mock iodine-125 in units not exceeding five-hundredths microcurie [1.85 kilobecquerels] of iodine-129 and five-thousandths microcurie [185 becquerels] of americium-241 each.
- (b) Displaying the radiation caution symbol described in paragraph 1 of subdivision a of subsection 3 of section 33-10-04-03 and the words, "CAUTION, RADIOACTIVE MATERIAL", and "Not for Internal or External Use in Humans or Animals".

(4) One of the following statements, as appropriate, or a substantially similar statement which contains the information called for in the following statements, appears on a label affixed to each prepackaged unit

or appears in a leaflet or brochure which accompanies the package:

- (a) This radioactive material may be received, acquired, possessed, and used only by physicians, veterinarians, clinical laboratories, or hospitals and only for in vitro clinical or laboratory tests not involving internal or external administration of the material, or the radiation therefrom, to human beings or animals. Its receipt, acquisition, possession, use, and transfer are subject to this article and a general license of the United States nuclear regulatory commission or of a state with which the commission has entered into an agreement for the exercise of regulatory authority.

Name of manufacturer

- (b) This radioactive material may be received, acquired, possessed, and used only by physicians, veterinarians, clinical laboratories, or hospitals and only for in vitro clinical or laboratory tests not involving internal or external administration of the material, or the radiation therefrom, to human beings or animals. Its receipt, acquisition, possession, use, and transfer are subject to this article and a general license of a licensing state.

Name of manufacturer

- (5) The label affixed to the unit, or the leaflet or brochure which accompanies the package, contains adequate information as to the precautions to be observed in handling and storing such radioactive material. In the case of the mock iodine-125 reference or calibration source, the information accompanying the source must also contain directions to the licensee regarding the waste disposal requirements set out in subsection 1 of section 33-10-04-04.

~~h.~~ h. Licensing the manufacture and distribution of ice detection devices. An application for a specific license to manufacture and distribute ice detection devices to persons generally licensed under subdivision ~~h~~ g of subsection 2 of section 33-10-03-04 will be approved ~~subject to the following conditions~~ if: (1) the applicant

satisfies the general requirements of subsection 2 of this section and, (2) the criteria of 10 CFR 32.61, 32.62, and 32.103 are met.

~~j.~~ i. Manufacture and distribution of radiopharmaceuticals containing radioactive material for medical use under group licenses.

(1) An application for a specific license to manufacture and distribute radiopharmaceuticals containing radioactive material for use by persons licensed pursuant to subdivision c of subsection 3 this chapter for the uses listed in Group I, Group II, Group IV, or Group V of Schedule E to this chapter subsection 1 of section 33-10-07-06, subsection 1 of section 33-10-07-07, or subsection 1 of section 33-10-07-08 will be approved if:

(a) The applicant satisfies the general requirements specified in subsection 2.

(b) The applicant submits evidence that:

[1] The radiopharmaceutical containing radioactive material will be manufactured, labeled, and packed in accordance with the Federal Food, Drug, and Cosmetic Act or the Public Health Service Act, such as a new drug application approved by the United States food and drug administration or a "Notice of Claimed Investigational Exemption for a New Drug" that has been accepted by the United States food and drug administration; or

[2] The manufacture and distribution of the radiopharmaceutical containing radioactive material is not subject to the Federal Food, Drug, and Cosmetic Act and the Public Health Service Act.

(c) The applicant submits information on the radionuclide, chemical and physical form, packaging including maximum activity per package, and shielding provided by the packaging of the radioactive material which is appropriate for safe handling and storage of radiopharmaceuticals by group licensees.

(d) [1] The label affixed to each package of the radiopharmaceutical contains information on the radionuclide, quantity, and date of assay and the label affixed to each

package, or the leaflet or brochure which accompanies each package, contains a statement that the radiopharmaceutical is licensed by the department for distribution to persons licensed pursuant to ~~subdivision c of subsection 3 Schedule 6 Group I, Group II, Group IV, and Group V of chapter 33-10-03, as appropriate~~ this chapter for the uses listed in subsection 1 of section 33-10-07-06, subsection 1 of section 33-10-07-07, and subsection 1 of section 33-10-07-08, or under equivalent licenses of the United States nuclear regulatory commission, an agreement state, or a licensing state.

[2] The labels, leaflets, or brochures required by this ~~subdivision~~ subparagraph are in addition to the labeling required by the United States food and drug administration and they may be separate from or, with the approval of the United States food and drug administration, may be combined with the labeling required by the United States food and drug administration.

~~k.~~ j. Manufacture and distribution of generators or reagent kits for preparation of radiopharmaceuticals containing radioactive material.

~~(1)~~ An application for a specific license to manufacture and distribute generators or reagent kits containing radioactive material for preparation of radiopharmaceuticals by persons licensed pursuant to ~~subdivision c of subsection 3~~ this chapter for the uses listed in Group III of Schedule 6 of this chapter subsection 1 of section 33-10-07-07 will be approved if:

~~(a)~~ (1) The applicant satisfies the general requirements specified in subsection 2.

~~(b)~~ (2) The applicant submits evidence that:

~~(1)~~ (a) The generator or reagent kit is to be manufactured, labeled, and packaged in accordance with the Federal Food, Drug, and Cosmetic Act or the Public Health Service Act, such as a new drug application approved by the United States food and drug administration, ~~a biologic product license issued by the United States food and drug administration,~~ or a "Notice of Claimed Investigational Exemption for

a New Drug" that has been accepted by the United States food and drug administration; or

- ~~f2f~~ (b) The manufacture and distribution of the generator or reagent kit are not subject to the Federal Food, Drug, and Cosmetic Act and the Public Health Service Act.
- ~~f2f~~ (3) The applicant submits information on the radionuclide, chemical and physical form, packaging including maximum activity per package, and shielding provided by the packaging of the radioactive material contained in the generator or reagent kit.
- ~~f2f~~ (4) The label affixed to the generator or reagent kit contains information on the radionuclide, quantity, and date of assay.
- ~~f2f~~ (5) The label affixed to the generator or reagent kit, or the leaflet or brochure which accompanies the generator or reagent kit, contains:
 - ~~f2f~~ (a) Adequate information, from a radiation safety standpoint, on the procedures to be followed and the equipment and shielding to be used in eluting the generator or processing radioactive material with the reagent kit.
 - ~~f2f~~ (b) A statement that this generator or reagent kit (as appropriate) is approved for use by persons licensed by the department pursuant to ~~subdivision c of subsection 3 of section 33-10-03-05 and Schedule G Group III of chapter 33-10-03~~ subsection 1 of section 33-10-07-07 or under equivalent licenses of the United States nuclear regulatory commission, an agreement state, or a licensing state. The labels, leaflets, or brochures required by this subdivision are in addition to the labeling required by the United States food and drug administration and they may be separate from or, with the approval of the United States food and drug administration, may be combined with the labeling required by the United States food and drug administration.

Note: Although the department does not regulate the manufacture and distribution of reagent kits that do not contain radioactive material, it does regulate the use of such reagent kits for the preparation of radiopharmaceuticals containing radioactive material as part of its licensing and regulation of the users of radioactive material. Any manufacturer of reagent kits

that do not contain radioactive material who desires to have the reagent kits approved by the department for use by persons licensed pursuant to subdivision c of subsection 3 of section 33-10-03-05 and Group III of Schedule E subsection 1 of section 33-10-07-07 may submit the pertinent information specified in this subdivision ~~to this chapter.~~

~~1.~~ k. Manufacture and distribution of sources or devices containing radioactive material for medical use.

~~1.~~ An application for a specific license to manufacture and distribute sources and devices containing radioactive material to persons licensed pursuant to subdivision c of subsection 3 chapter 33-10-07 for use as a calibration or reference source or for the uses listed in Group VI of Schedule E to this chapter subsection 1 of section 33-10-07-09 and subsection 1 of section 33-10-07-10 will be approved if:

~~1.~~ (1) The applicant satisfies the general requirements in subsection 2.

~~1.~~ (2) The applicant submits sufficient information regarding each type of source or device pertinent to an evaluation of its radiation safety, including:

~~1.~~ (a) The radioactive material contained, its chemical and physical form, and amount.

~~1.~~ (b) Details of design and construction of the source or device.

~~1.~~ (c) Procedures for, and results of, prototype tests to demonstrate that the source or device will maintain its integrity under stresses likely to be encountered in normal use and accident accidents.

~~1.~~ (d) For devices containing radioactive material, the radiation profile of a prototype device.

~~1.~~ (e) Details of quality control procedures to assure that production sources and devices meet the standards of the design and prototype tests.

~~1.~~ (f) Procedures and standards for calibrating sources and devices.

~~1.~~ (g) Legend and methods for labeling sources and devices as to their radioactive content.

~~f8~~ (h) ~~Instruction~~ Instructions for handling and storing the source or device from the radiation safety standpoint; these instructions are to be included on a durable label attached to the source or device or attached to a permanent storage container for the source or device; provided, that instructions which are too lengthy for such label may be summarized on the label and printed in detail ~~in~~ on a brochure which is referenced on the label.

~~f2~~ ~~f3~~ (3) The label affixed to the source or device, or to the permanent storage container for the source or device, contains information on the radionuclide, quantity, and date of assay, and a statement that the ~~name of~~ source or device is licensed by the department for distribution to persons licensed pursuant to ~~subdivision c of subsection 3 and Schedule G Group VI to this~~ chapter 33-10-07, subsection 1 of section 33-10-07-09, and subsection 1 of section 33-10-07-10, or under equivalent licenses of the United States nuclear regulatory commission, an agreement state, or a licensing state; provided, that such labeling for sources which do not require long-term storage, ~~e.g., gold-198 seeds,~~ may be on a leaflet or brochure which accompanies the source.

~~f2~~ ~~f3~~ (4) If the applicant desires that the source or device be required to be tested for leakage of radioactive material at intervals longer than six months, the applicant shall include in the application sufficient information to demonstrate that such longer interval is justified by performance characteristics of the source or device or similar sources or devices and by design features that have a significant bearing on the probability or consequences of leakage of radioactive material from the source.

~~f3~~ (5) In determining the acceptable interval for test of leakage of radioactive material, the department will consider information that includes, but is not limited to:

~~f1~~ (a) Primary containment ~~or source capsule~~.

~~f2~~ (b) Protection of primary containment.

~~f3~~ (c) Method of sealing containment.

~~f4~~ (d) Containment construction materials.

~~f5~~ (e) Form of contained radioactive material.

- ~~f6~~ (f) Maximum temperature withstood during prototype tests.
- ~~f7~~ (g) Maximum pressure withstood during prototype tests.
- ~~f8~~ (h) Maximum quantity of contained radioactive material.
- ~~f9~~ (i) Radiotoxicity of contained radioactive material.
- ~~f10~~ (j) Operating experience with identical sources or devices or similarly designed and constructed sources or devices.

~~m~~ 1. Requirements for license to manufacture and distribute industrial products containing depleted uranium for mass-volume applications.

- (1) An application for a specific license to manufacture industrial products and devices containing depleted uranium for use pursuant to subdivision e of subsection 1 of section 33-10-03-04 or equivalent regulations of the United States nuclear regulatory commission or an agreement state will be approved if:
 - (a) The applicant satisfies the general requirements specified in subsection 2 of this section.
 - (b) The applicant submits sufficient information relating to the design, manufacture, prototype testing, quality control procedures, labeling or marking, proposed uses, and potential hazards of the industrial product or device to provide reasonable assurance that possession, use, or transfer of the depleted uranium in the product or device is not likely to cause any individual to receive in any period of one calendar quarter a radiation dose in excess of ten percent of the limits specified in the table in subdivision a of subsection 1 of section 33-10-04-02.
 - (c) The applicant submits sufficient information regarding the industrial product or device and the presence of depleted uranium for a mass-volume application in the product or device to provide reasonable assurance that unique benefits will accrue to the public because of the usefulness of the product or device.
- (2) In the case of an industrial product or device whose unique benefits are questionable, the department will approve an application for a specific license under

this subdivision only if the product or device is found to combine a high degree of utility and low probability of uncontrolled disposal and dispersal of significant quantities of depleted uranium into the environment.

- (3) The department may deny any application for a specific license under this subdivision if the end uses of the industrial product or device cannot be reasonably foreseen.
- (4) Each person licensed pursuant to paragraph 1 shall:
 - (a) Maintain the level of quality control required by the license in the manufacture of the industrial product or device, and in the installation of the depleted uranium into the product or device.
 - (b) Label or mark each unit to:
 - [1] Identify the manufacturer of the product or device and the number of the license under which the product or device was manufactured, the fact that the product or device contains depleted uranium, and the quantity of depleted uranium in each product or device; and
 - [2] State that the receipt, possession, use, and transfer of the product or device are subject to a general license or the equivalent and the regulations of the United States nuclear regulatory commission or of an agreement state.
 - (c) Assure that the depleted uranium before being installed in each product or device has been impressed with the following legend clearly legible through any plating or other covering: "Depleted Uranium".
 - (d) [1] Furnish a copy of the general license contained in subdivision e of subsection 1 of section 33-10-03-04 and a copy of department Form RAD 811 to each person to whom the licensee transfers depleted uranium in a product or device for use pursuant to the general license contained in subdivision e of subsection 1 of section 33-10-03-04; or

[2] Furnish a copy of the general license contained in the United States nuclear regulatory commission's or agreement state's regulation equivalent to subdivision e of subsection 1 of section 33-10-03-04 and a copy of the United States nuclear regulatory commission's or agreement state's certificate, or alternatively, furnish a copy of the general license contained in subdivision e of subsection 1 of section 33-10-03-04 and a copy of the general license department Form RAD 811 to each person to whom the licensee transfers depleted uranium in a product or device for use pursuant to the general license of the United States nuclear regulatory commission or an agreement state, with a note explaining that use of the product or device is regulated by the United States nuclear regulatory commission or an agreement state under requirements substantially the same as those in subdivision e of subsection 1 of section 33-10-03-04.

(e) Report to the department all transfers of industrial products or devices to persons for use under the general licensee in subdivision e of subsection 1 of section 33-10-03-04. Such report must identify each general licensee by name and address, an individual by name and position who may constitute a point of contact between the department and the general licensee, the type and model number of device transferred, and the quantity of depleted uranium contained in the product or device. The report shall be submitted within thirty days after the end of each calendar quarter in which such a product or device is transferred to the generally licensed person. If no transfers have been made to persons generally licensed under subdivision e of subsection 1 of section 33-10-03-04 during the reporting period, the report shall so indicate.

(f) [1] Report to the United States nuclear regulatory commission all transfers of industrial products or devices to persons for use under the United States nuclear regulatory commission general license in 10 CFR 40.25.

[2] Report to the responsible state agency all transfers of devices manufactured and distributed pursuant to this subdivision for use under a general license in that state's regulations equivalent to subdivision e of subsection 1 of section 33-10-03-04.

[3] Such report shall identify each general licensee by name and address, an individual by name and position who may constitute a point of contact between the department and the general licensee, the type and model number of the device transferred, and the quantity of depleted uranium contained in the product or device. The report shall be submitted within thirty days after the end of each calendar quarter in which such product or device is transferred to the generally licensed person.

[4] If no transfers have been made to United States nuclear regulatory commission licensees during the reporting period, this information shall be reported to the United States nuclear regulatory commission.

[5] If no transfers have been made to general licensees within a particular agreement state during the reporting period, this information shall be reported to the responsible agreement state agency upon the request of that agency.

(g) Keep records showing the name, address, and point of contact for each general licensee to whom the licensee transfers depleted uranium in industrial products or devices for use pursuant to the general license provided in subdivision e of subsection 1 of section 33-10-03-04 or equivalent regulations of the United States nuclear regulatory commission or of an agreement state. The records shall be maintained for a period of two years and shall show the date of each transfer, the quantity of depleted uranium in each product or device transferred, and compliance with the report requirements of this ~~section~~ subsection.

~~m.~~ m. Special requirements for issuance of specific licenses for source material milling. In addition to the requirements set forth in subsection 2, a specific license for source material milling will be issued if the applicant submits

to the department a satisfactory application as described herein and meets the other conditions specified below:

- (1) An application for a license to receive title to, receive, possess, and use source material for milling or byproduct material as defined in subdivision b of subsection 6 shall address the following:
 - (a) Description of the proposed project or action.
 - (b) Area/site characteristics including geology, topography, hydrology, and meteorology.
 - (c) Radiological and nonradiological impacts of the proposed project or action, including waterway and ground water impacts.
 - (d) Environmental effects of accidents.
 - (e) Long-term impacts including decommissioning, decontamination, and reclamation.
 - (f) Site and project alternatives.

(Note: In this paragraph, "byproduct material" means the tailings or waste produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content.)

- (2) Pursuant to subdivision e f of subsection 2, the applicant may not commence construction of the project until the department has weighed the environmental, economic, technical, and other benefits against the environmental costs and has concluded that the issuance of the license is appropriate.
- (3) At least one full year prior to any major site construction, a preoperational monitoring program shall be conducted to provide complete baseline data on a milling site and its environs. Throughout the construction and operating phases of the mill, an operational monitoring program shall be conducted to measure or evaluate performance of control systems and procedures; to evaluate environmental impacts of operation; and to detect potential long-term effects.
- (4) Prior to issuance of the license, the mill operator shall establish financial surety arrangements consistent with the requirements of subdivision f g of subsection 2.

- (a) The amount of funds to be ensured by financial surety arrangements shall be based on department-approved cost estimates in an approved plan for decontamination and decommissioning of mill buildings and the milling site to levels which would allow unrestricted use of these areas upon decommissioning, and the reclamation of tailings and/or waste disposal areas. The licensee shall submit this plan in conjunction with an environmental report that addresses the expected environmental impacts of the milling operation, decommissioning and tailings reclamation, and that evaluates alternatives for mitigating these impacts. In establishing specific surety arrangements, the licensee's cost estimates shall take into account total costs that would be incurred if an independent contractor were hired to perform the decommissioning and reclamation work. In order to avoid unnecessary duplication and expense, the department may accept financial sureties that have been consolidated with financial surety arrangements established to meet requirements of other federal or state agencies and/or local governing bodies for such decommissioning, decontamination, reclamation, and long-term site surveillance, provided such arrangements are considered adequate to satisfy these requirements and that portion of the surety which covers the decommissioning and reclamation of the mill, mill tailings site and associated areas, and the long-term funding charge are clearly identified. The licensee's surety mechanism will be reviewed annually by the department to assure that sufficient funds will be available for completion of the reclamation plan if the work had to be performed by an independent contractor. The amount of surety liability should be adjusted to recognize any increases or decreases resulting from inflation, changes in engineering plans, activities performed, and any other conditions affecting costs. Regardless of whether reclamation is phased through the life of the operation or takes place at the end of operations, an appropriate portion of surety liability shall be retained until final compliance with the reclamation plan is determined. This will yield a surety that is at least sufficient at all times to cover the costs of decommissioning, decontamination, and reclamation of the areas that are expected to be disturbed before the

next license renewal. The term of the surety mechanism must be open ended, unless it can be demonstrated that another arrangement would provide an equivalent level of assurance. This assurance could be provided with a surety instrument which is written for a specified period of time, e.g., five years, which must be automatically renewed unless the surety agent notifies the beneficiary (the state regulatory agency) and the principal (the licensee, ⁷) some reasonable time., e.g., ninety days, prior to the renewal date of their intention not to renew. In such a situation, the surety requirement still exists and the licensee would be required to submit an acceptable replacement surety within a brief period of time to allow at least sixty days for the regulatory agency to collect.

(b) The total amount of funds for reclamation or long-term surveillance and control shall be transferred to the United States if title and custody of such material and its disposal site is transferred to the United States upon termination of a license. Such funds include, but are not limited to, sums collected for long-term surveillance and control. Such funds do not, however, include moneys held as surety where no default has occurred, and the reclamation or other bonded activity has been performed.

(5) The applicant shall provide procedures describing the means employed to meet the following requirements during the operational phase of any project.

(a) Milling operations shall be conducted so that all effluent releases are reduced to as low as is reasonably achievable below the limits of chapter 33-10-04.

(b) The mill operator shall conduct daily inspection of any tailings or waste retention systems. Records of such inspections shall be maintained for review by the department.

(c) The mill operator shall immediately notify the department of the following:

[1] Any failure in a tailings or waste retention system which results in a release of tailings or waste into unrestricted areas.

[2] Any unusual conditions (conditions not contemplated in the design of the retention system) which if not corrected could lead to failure of the system and result in a release of tailings or waste into unrestricted areas.

(6) Continued surveillance requirements for source material mills having reclaimed residues.

(a) The final disposition of tailings or wastes at source material milling sites should be such that the need for ongoing active maintenance is not necessary to preserve isolation. As a minimum, annual site inspections shall be conducted by the government agency retaining ultimate custody of the site where tailings or wastes are stored to confirm the integrity of the stabilized tailings or waste systems and to determine the need, if any, for maintenance and/or monitoring. Results of the inspection shall be reported to the United States nuclear regulatory commission within sixty days following each inspection. The United States nuclear regulatory commission may require more frequent site inspections, if, on the basis of a site-specific evaluation, such a need appears necessary due to the features of a particular tailings or waste disposal system.

(b) A minimum charge of two hundred fifty thousand dollars in 1978 dollars to cover the costs of long-term surveillance shall be paid by each mill operator to the department prior to the termination of a uranium or thorium mill license. If site surveillance or control requirements at a particular site are determined, on the basis of a site-specific evaluation, to be significantly greater than those specified in subparagraph a, additional funding requirements may be specified by the department. The total charge to cover the costs of long-term surveillance shall be such that, with an assumed one percent annual real interest rate, the collected funds will yield interest in an amount sufficient to cover the annual costs of site surveillance. The charge will be reviewed annually to recognize or adjust for inflation.

(7) An application for a license to own, receive, possess, and use byproduct material as defined in ~~subsection 6 of~~ section 33-10-01-04 shall contain

proposed specifications relating to the emissions control and disposition of the byproduct material to achieve the requirements and objectives set forth in the criteria listed in Schedule ~~E~~ D of chapter 33-10-03.

6. Issuance of specific licenses.

- a. Upon a determination that an application meets the requirements of North Dakota Century Code chapter 23-20.1 and this ~~chapter~~ article, the department will issue a specific license authorizing the proposed activity in such form and containing such conditions and limitations as it deems appropriate or necessary.
- b. The department may incorporate in any license at the time of issuance, or thereafter by appropriate rule or order, such additional requirements and conditions with respect to the licensee's receipt, possession, use, and transfer of radioactive material subject to this ~~part~~ chapter as it deems appropriate or necessary in order to:
 - (1) Minimize danger to public health and safety or property.
 - (2) Require such reports and the keeping of such records, and to provide for such inspections of activities under the license as may be appropriate or necessary.
 - (3) Prevent loss or theft of material subject to this chapter.

7. Specific terms and conditions of licenses.

- a. Each license issued pursuant to this chapter shall be subject to all the provisions of North Dakota Century Code chapter 23-20.1, now or hereafter in effect, and to all applicable rules and orders of the department.
- b. No license issued or granted under this chapter and no right to possess or utilize radioactive material granted by any license issued pursuant to this chapter shall be transferred, assigned, or in any manner disposed of, either voluntarily or involuntarily, directly or indirectly, through transfer of control of any license to any person unless the department shall, after securing full information find that the transfer is in accordance with the provisions of North Dakota Century Code chapter 23-20.1, now or hereafter in effect, and to all valid rules and orders of the department, and shall give its consent in writing.

- c. Each person licensed by the department pursuant to this chapter shall confine ~~the person's~~ use and possession of the material licensed to the locations and purposes authorized in the license.
- d. Each licensee shall notify the department in writing when the licensee decides to permanently discontinue all activities involving materials authorized under the license.
- e. Each licensee shall notify the department in writing immediately following the filing of a voluntary or involuntary petition for bankruptcy under any chapter of title 11 (bankruptcy) of the United States Code by or against:
 - (1) The licensee;
 - (2) An entity (as that term is defined in 11 U.S.C. 101(14) [Pub. L. 95-598; 92 Stat. 2549]) controlling the licensee or listing the license or licensee as property of the estate; or
 - (3) An affiliate (as that term is defined in 11 U.S.C. 101(2) [Pub.L. 95-598; 92 Stat. 2549]) of the licensee.

This notification must indicate the bankruptcy court in which the petition for bankruptcy was filed and the date of the filing of the petition.

8. Expiration and termination of licenses.

- a. Except as provided in subdivision b of subsection 9, each specific license shall expire at the end of the specified day, in the month and year stated therein.
- b. Each licensee shall notify the department immediately, in writing, and request termination of the license when the licensee decides to terminate all activities involving radioactive material authorized under the license. This notification and request for termination of the license must include the required statement and radiation survey report specified in paragraph 1 of subdivision d.
- c. No less than thirty days before the expiration date specified in the license, the licensee shall either:
 - (1) Submit an application for license renewal under subsection 9; or
 - (2) Notify the department, in writing, if the licensee decides not to renew the license.

d. (1) If a licensee does not submit an application for license renewal under subsection 9, the licensee shall, on or before the expiration date specified in the license:

(a) Terminate use of radioactive material;

(b) Remove radioactive contamination to the extent practicable;

(c) Properly dispose of radioactive material;

(d) Submit a statement certifying proper disposition of radioactive material using RCP Form 1; and

(e) Submit a radiation survey report to confirm the absence of radioactive material or to establish the levels of residual radioactive contamination, unless the licensee demonstrates the absence of residual radioactive contamination in some other manner. The licensee shall, as appropriate:

[1] Report levels of radiation in units of microrads per hour of beta and gamma radiation at one centimeter and gamma radiation at one meter from surfaces and report levels of radioactivity, including alpha, in units of transformations per minute (or microcuries) for one hundred square centimeters removable and fixed on surfaces, microcuries per milliliter in water, and picocuries per gram in contaminated solids such as soils or concrete; and

[2] Specify the instrumentation used and certify that each instrument was properly calibrated and tested.

(2) If no residual radioactive contamination attributable to activities conducted under the license is detected, the licensee shall submit a certification that no detectable radioactive contamination was found. The department will notify the licensee, in writing, of the termination of the license.

(3) (a) If detectable levels of residual radioactive contamination attributable to activities conducted under the license are found, the license continues in effect beyond the expiration date, if necessary, with respect to possession of residual radioactive material

present as contamination until the department notifies the licensee in writing that the license is terminated. During this time the licensee is subject to the provisions of subdivision e.

(b) In addition to the required statement and radiation survey report submitted under subdivision d, the licensee shall submit a plan for decontamination, if required, as regards residual radioactive contamination remaining at the time the license expires.

e. Each licensee who possesses residual radioactive material under paragraph 3 of subdivision d, following the expiration date specified in the license shall:

(1) Limit actions involving radioactive material to those related to decontamination and other activities related to preparation for release for unrestricted use; and

(2) Continue to control entry to restricted areas until they are suitable for release for unrestricted use and the department notifies the licensee in writing that the license is terminated.

9. Renewal of licenses.

a. Applications for renewal of specific licenses shall be filed in accordance with subsection 1.

b. In any case in which a licensee, not less than thirty days prior to expiration of the licensee's existing license, has filed an application in proper form for renewal or for a new license authorizing the same activities, such existing license shall not expire until ~~the application has been finally determined~~ final action by the department.

10. Amendment of licenses at request of licensee. Applications for amendment of a license shall be filed in accordance with subsection 1 and shall specify the respects in which the licensee desires the license to be amended and the grounds for such amendment.

11. Department action on applications to renew or amend. In considering an application by a licensee to renew or amend the license, the department will apply the criteria set forth in subsection 2, 3, 4, or 5, and chapters 33-10-05, 33-10-07, or 33-10-12, as applicable.

12. Persons possessing a license for source, byproduct, or special nuclear material in quantities not sufficient to form a critical mass. Any person who, on June 1, 1986, possesses a general or specific license for source, byproduct, or special nuclear material in quantities not sufficient to form a critical mass, issued by the United States nuclear regulatory commission, shall be deemed to possess a like license issued under this article, such license to expire either ninety days after receipt from the department of a notice of expiration of such license, or on the date of expiration specified in the United States nuclear regulatory commission license, whichever is earlier.
13. Persons possessing naturally occurring and accelerator-produced radioactive material. Any person who, on June 1, 1986, possesses NARM for which a specific license is required by the article shall be deemed to possess such a license issued under the article. Such license shall expire ninety days after the effective date of these rules, provided, however, that if within the ninety days the person possessing such material files an application in proper form for a license, such existing license shall not expire until the application has been finally determined by the department.
14. Transfer of material.
 - a. No licensee shall transfer radioactive material except as authorized pursuant to this subsection.
 - b. Except as otherwise provided in one's license and subject to the provisions of subdivisions c and d, any licensee may transfer radioactive material:
 - (1) To the department. (A licensee may transfer material to the department only after receiving prior approval from the department.)
 - (2) To the United States department of energy.
 - (3) To any person exempt from this ~~chapter~~ article to the extent permitted under such exemption.
 - (4) To any person authorized to receive such material under terms of a general license or its equivalent, or a specific license or equivalent licensing document, issued by the department, the United States nuclear regulatory commission, any agreement state, or any licensing state, or to any person otherwise authorized to receive such material by the federal government or any agency thereof, the department, ~~any~~ an agreement state, or a licensing state.
 - (5) As otherwise authorized by the department in writing.

- c. Before transferring radioactive material to a specific licensee of the department, the United States nuclear regulatory commission, an agreement state, or a licensing state, or to a general licensee who is required to register with the department, the United States nuclear regulatory commission, an agreement state, or a licensing state prior to receipt of the radioactive material, the licensee transferring the material shall verify that the transferee's license authorizes the receipt of the type, form, and quantity of radioactive material to be transferred.
- d. ~~The~~ Any of the following methods for the verification required by subdivision c ~~are~~ is acceptable:
- (1) The transferor may ~~have in the transferor's possession,~~ possess and read, a current copy of the transferee's specific license or registration certificate.
 - (2) The transferor may ~~have in the transferor's possession~~ possess a written certification by the transferee that the transferee is authorized by license or registration certificate to receive the type, form, and quantity of radioactive material to be transferred, specifying the license or registration certificate number, issuing agency, and expiration date.
 - (3) For emergency shipments, the transferor may accept oral certification by the transferee that the transferee is authorized by license or registration certificate to receive the type, form, and quantity of radioactive material to be transferred, specifying the license or registration certificate number, issuing agency, and expiration date; provided, that the oral certification is confirmed, in writing, within ten days.
 - (4) The transferor may obtain other ~~sources of~~ information compiled by a reporting service from official records of the department, the United States nuclear regulatory commission, ~~or the licensing agency of~~ an agreement state, or a licensing state ~~as to~~ regarding the identity of licensees and the scope and expiration dates of licenses and registration.
 - (5) When none of the methods of verification described in paragraphs 1 ~~and~~ through 4 are readily available or when a transferor desires to verify that information received by one of such methods is correct or up-to-date, the transferor may obtain and record confirmation from the department, the United States

nuclear regulatory commission, or the licensing agency of an agreement state, or a licensing state that the transferee is licensed to receive the radioactive material.

- e. ~~Preparation for shipment~~ Shipment and transport of radioactive material shall be in accordance with the provisions of ~~section 33-10-03-07~~ chapter 33-10-13.

~~15.~~ 13. Modification, and revocation, and termination of licenses.

- a. The terms and conditions of all licenses shall be subject to amendment, revision, or modification or the license may be suspended or revoked by reason of amendments to North Dakota Century Code chapter 23-20.1, or by reason of this article, and orders issued by the department.
- b. Any license may be revoked, suspended, or modified, in whole or in part, for any material false statement in the application or any statement of fact required under provisions of North Dakota Century Code chapter 23-20.1, or because of conditions revealed by such application or statement of fact or any report, record, or inspection or other means which would warrant the department to refuse to grant a license on an original application, or for violation of, or failure to observe any of the terms and conditions of North Dakota Century Code chapter 23-20.1, or of the license, or of this article, or any order of the department.
- c. Except in cases of willfulness or those in which the public health, interest or safety requires otherwise, no license shall be modified, suspended, or revoked unless, prior to the institution of proceedings therefor, facts or conduct which may warrant such action shall have been called to the attention of the licensee, in writing, and the licensee shall have been accorded an opportunity to demonstrate or achieve compliance with all lawful requirements.
- ~~d. The department may terminate a specific license upon request submitted by the licensee to the department in writing.~~

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 23-20.1-04

33-10-03-06. Reciprocity Reciprocal recognition of licenses.

- 1. Licenses of byproduct, source, and special nuclear material in quantities not sufficient to form a critical mass.

a. Subject to this ~~chapter~~ article, any person who holds a specific license from the United States nuclear regulatory commission or ~~any an agreement state or any licensing state~~, and issued by the agency having jurisdiction where the licensee maintains an office for directing the licensed activity and at which radiation safety records are normally maintained, is hereby granted a general license to conduct the activities authorized in such licensing document within this state for a period of one year beginning with the date of notification not in excess of one hundred eighty days in any calendar year provided that:

a- (1) The licensing document does not limit the activity authorized by such document to specified installations or locations.

b- (2) The out-of-state licensee notifies the department, in writing, at least three days prior to engaging in such activity. Such notification shall indicate the location, period, and type of proposed possession and use within the state, and shall be accompanied by a copy of the pertinent licensing document and a copy of the licensee's operating and procedures manual. If, for a specific case, the three-day period would impose an undue hardship on the out-of-state licensee, the licensee may, upon application to the department, obtain permission to proceed sooner. The department may waive the requirement for filing additional written notifications during the remainder of the calendar year following the receipt of the initial notification from a person engaging in activities under the general license provided in this subsection.

c- (3) The out-of-state licensee complies with this article and with all the terms and conditions of the ~~licensee's~~ licensing document, except any such terms and conditions which may be inconsistent with this article.

d- (4) The out-of-state licensee supplies such other information as the department may request.

e- (5) The out-of-state licensee shall not transfer or dispose of radioactive material possessed or used under the general license provided in this subsection subdivision except by transfer to a person:

(+) (a) Specifically licensed by the department or the United States nuclear regulatory commission, ~~another licensing state, or an agreement state~~ to receive such material; or

- ~~2~~ (b) Exempt from the requirements for a license for such material under subdivision a of subsection 2 of section 33-10-03-02, ~~or subsection 2 of this section.~~
- f. (6) The out-of-state licensee shall submit an annual reciprocity fee of three hundred dollars, as prescribed in chapter 33-10-11, at the time of written notification.
2. b. Notwithstanding the provisions of ~~subsection 1~~ ~~subdivision a~~, any person who holds a specific license issued by the United States nuclear regulatory commission, ~~or an agreement state, or a licensing state~~ authorizing the holder to manufacture, transfer, install, or service a device described in paragraph 1 of subdivision ~~a~~ ~~b~~ of subsection 2 of section 33-10-03-04 within areas subject to the jurisdiction of the licensing body is hereby granted a general license to install, transfer, demonstrate, or service such a device in this state provided that:
- a. (1) The person shall file a report with the department within thirty days after the end of each calendar quarter in which any device is transferred to or installed in this state. Each report shall identify each general licensee to whom the device is transferred by name and address, the type of device transferred, and the quantity and type of radioactive material contained in the device.
- b. (2) The device has been manufactured, labeled, installed, and serviced in accordance with applicable provisions of the specific license issued to the person by the United States nuclear regulatory commission, or an agreement state, ~~or a licensing state.~~
- c. (3) The person shall ensure that any labels required to be affixed to the device under ~~requirements~~ rules of the authority which licensed manufacture of the device bear a statement that "Removal of this label is prohibited".
- d. (4) The holder of the specific license shall furnish to each general licensee to whom the holder transfers such device or on whose premises the holder installs such device a copy of the general license contained in subdivision ~~a~~ ~~b~~ of subsection 2 of section 33-10-03-04.
- (5) The out-of-state licensee shall submit an annual reciprocity fee, as prescribed in chapter 33-10-11, at the time of written notification.

~~3-~~ c. The department may withdraw, limit, or qualify its acceptance of any specific license or equivalent licensing document issued by the United States nuclear regulatory commission, or an agreement state, or licensing state or of any product distributed pursuant to such licensing document, upon determining that such action is necessary in order to prevent undue hazard to public health and safety or property.

2. Licenses of naturally occurring and accelerator-produced radioactive material.

a. Subject to this article, any person who holds a specific license from a licensing state, and issued by the department having jurisdiction where the licensee maintains an office for directing the licensed activity and at which radiation safety records are normally maintained, is hereby granted a general license to conduct the activities authorized in such licensing document within this state for a period not in excess of one hundred eighty days in any calendar year provided that all of the following requirements are met:

(1) The licensing document does not limit the activity authorized by such document to specified installations or locations.

(2) The out-of-state licensee notifies the department, in writing, at least three days prior to engaging in such activity. Such notification must indicate the location, period, and type of proposed possession and use within the state, and must be accompanied by a copy of the pertinent licensing document and a copy of the licensee's operating and procedures manual. If, for a specific case, the three-day period would impose an undue hardship on the out-of-state licensee, the licensee may, upon application to the department, obtain permission to proceed sooner. The department may waive the requirement for filing additional written notifications during the remainder of the calendar year following the receipt of the initial notification from a person engaging in activities under the general license provided in subdivision a.

(3) The out-of-state licensee complies with this article and with all the terms and conditions of the licensing document, except any such terms and conditions which may be inconsistent with this article.

(4) The out-of-state licensee supplies such other information as the department may request.

(5) The out-of-state licensee may not transfer or dispose of radioactive material possessed or used under the general license provided in subdivision a except by transfer to a person:

(a) Specifically licensed by the department or by another licensing state to receive such material; or

(b) Exempt from the requirements for a license for such material under subsection 2 of section 33-10-03-02.

(6) The out-of-state licensee shall submit an annual reciprocity fee, as described in chapter 33-10-11, at the time of written notification.

b. Notwithstanding the provisions of subdivision a, any person who holds a specific license issued by a licensing state authorizing the holder to manufacture, transfer, install, or service a device described in paragraph 1 of subdivision b of subsection 2 of section 33-10-03-04 within areas subject to the jurisdiction of the licensing body is hereby granted a general license to install, transfer, demonstrate, or service such a device in this state provided that:

(1) Such person shall file a report with the department within thirty days after the end of each calendar quarter in which any device is transferred to or installed in this state. Each such report must identify each general licensee to whom such device is transferred by name and address, the type of device transferred, and the quantity and type of radioactive material contained in the device;

(2) The device has been manufactured, labeled, installed, and serviced in accordance with applicable provisions of the specific license issued to such person by a licensing state;

(3) Such person shall assure that any labels required to be affixed to the device under rules of the authority which licensed manufacture of the device bear a statement that "Removal of this label is prohibited";

(4) The holder of the specific license shall furnish to each general licensee to whom the holder transfers such device or on whose premises the holder installs such device a copy of the general license contained in subdivision b of subsection 2 of section 33-10-03-04 or in equivalent regulations of another

licensing state having jurisdiction over the manufacture and distribution of the device; and

(5) The out-of-state licensee shall submit an annual reciprocity fee, as prescribed in chapter 33-10-11, at the time of written notification.

c. The department may withdraw, limit, or qualify its acceptance of any specific license or equivalent licensing document issued by a licensing state, or any product distributed pursuant to such licensing document, upon determining that such action is necessary in order to prevent undue hazard to public health and safety or property.

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-03-07. Transportation. Repealed effective June 1, 1992.

- †. No person may deliver radioactive material to a carrier for transport or transport radioactive material except as authorized in a general or specific license issued by the department or as exempted in the following:
- a. Common and contract carriers, freight forwarders, and warehousemen who are subject to the rules and regulations of the United States department of transportation in 49 CFR 170 through 189 or the United States postal service in the postal service manual (domestic mail manual), section 124.3 incorporated by reference, 39 CFR 111.11 (1974) are exempt from this article to the extent that they transport or store radioactive material in the regular course of their carriage for another or storage incident thereto. Common and contract carriers who are not subject to the rules and regulations of the United States department of transportation or United States postal service are subject to this section and other applicable sections of this article.
 - b. Physicians, as defined in section 33-10-01-04, are exempt from the requirements of subsection † to the extent that they transport radioactive material for use in the practice of medicine.
 - c. Any licensee is exempt from subsection † to the extent that the licensee delivers to a carrier for transport packages each of which contains no radioactive material having a specific activity in excess of two thousandths microcurie per gram.

d. Any licensee who delivers radioactive material to a carrier for transport, where such transport is subject to the regulations of the United States postal service, is exempt from the provisions of subsection 1.

2. Intrastate transport.

a. A general license is hereby issued to any common or contract carrier to receive, possess, transport, and store radioactive material in the regular course of carriage for another or storage incident thereto, provided the transportation and storage is in accordance with the applicable requirements of the regulations, appropriate to the mode of transport, of the United States department of transportation insofar as such regulations relate to the loading and storage of packages, placarding of the transporting vehicle, and incident reporting. (Any notification of incidents referred to in these requirements shall be filed with, or made to, the department.)

b. A general license is hereby issued to any private carrier to transport radioactive material, provided the transportation is in accordance with the applicable requirements of the regulations, appropriate to the mode of transport, of the United States department of transportation insofar as such regulations relate to the loading and storage of packages, placarding of the transporting vehicle, and incident reporting. (Any notification of incidents referred to in these requirements shall be filed with, or made to, the department.)

c. Persons who transport radioactive material pursuant to the general licenses in subdivision a or b are exempt from the requirements of chapters 33-10-04 and 33-10-10 to the extent that they transport radioactive material.

3. Preparation of radioactive material for transport. A general license is hereby issued to deliver radioactive material to a carrier for transport provided that:

a. The licensee complies with the applicable requirements of the regulations, appropriate to the mode of transport, of the United States department of transportation insofar as such regulations relate to the packaging of radioactive material, and to the monitoring, marking, and labeling of those packages.

b. The licensee has established procedures for opening and closing packages, in which radioactive material is transported to provide safety and to assure that, prior to

the delivery to a carrier for transport, each package is closed for transport.

- c. Prior to delivery of a package to a carrier for transport, the licensee shall assure that any special instructions needed to safely open the package are sent to or have been made available to the consignee. (For the purpose of this section, a licensee who transports one's own licensed material as a private carrier is considered to have delivered such material to a carrier for transport.)
4. Advance notification of transport of nuclear waste. For the purpose of this section "nuclear waste" means any large quantity of source, byproduct, or special nuclear material required to be in Type B packaging while transported to, through or across state boundaries to a disposal site, or to a collection point for transport to a disposal site.
- a. Prior to the transport of any nuclear waste outside of the confines of the licensee's facility or other place of use or storage, or prior to the delivery of any nuclear waste to a carrier for transport, each licensee shall provide advance notification of such transport to the governor (or governor's designee) of each state through which the waste will be transported.
 - b. Each advance notification required by subdivision a must contain the following information:
 - (1) The name, address, and telephone number of the shipper, carrier, and receiver of the shipment.
 - (2) A description of the nuclear waste contained in the shipment as required by the regulations of the United States department of transportation in 49 CFR 172.202 and 172.203(d).
 - (3) The point of origin of the shipment and the seven-day period during which departure of the shipment is estimated to occur.
 - (4) The seven-day period during which arrival of the shipment at state boundaries is estimated to occur.
 - (5) The destination of the shipment, and the seven-day period during which arrival of the shipment is estimated to occur.
 - (6) A point of contact with a telephone number for current shipment information.
 - c. The notification required by subdivision a shall be made in writing to the office of each appropriate governor (or

governor's designee) and to the department. A notification delivered by mail must be postmarked at least seven days before the beginning of the seven-day period during which departure of the shipment is estimated to occur. A notification delivered by messenger must reach the office of the governor (or governor's designee) at least four days before the beginning of the seven-day period during which departure of the shipment is estimated to occur. A copy of the notification shall be retained by the licensee for one year.

- d. The licensee shall notify each appropriate governor (or governor's designee) and the department of any changes to schedule information provided pursuant to subdivision a. Such notification shall be by telephone to a responsible individual in the office of the governor (or governor's designee) of the appropriate state or states. The licensee shall maintain for one year a record of the name of the individual contacted.
- e. Each licensee who cancels a nuclear waste shipment for which advance notification has been sent shall send a cancellation notice to the governor (or governor's designee) of each appropriate state and to the department. A copy of the notice shall be retained by the licensee for one year.

History: Amended effective October 1, 1982; June 1, 1986.
General Authority: NDGG 28-32-02
Law Implemented: NDGG 28-32-02

SCHEDULE A
EXEMPT CONCENTRATIONS

Element (Atomic Number)	<u>Radionuclide</u> <u>Isotope</u>	Column I Gas Con- centration $\mu\text{Ci/ml}^{1/}$	Column II Liquid and Solid Concen- tration $\mu\text{Ci/ml}^{2/}$
Antimony (51)	Sb-122		3×10^{-4}
	Sb-124		2×10^{-4}
	Sb-125		1×10^{-3}
Argon (18)	Ar-37	1×10^{-3}	
	Ar-41	4×10^{-7}	
Arsenic (33)	As-73		5×10^{-3}
	As-74		5×10^{-4}
	As-76		2×10^{-4}
	As-77		8×10^{-4}
Barium (56)	Ba-131		2×10^{-3}
	Ba-140		3×10^{-4}
Beryllium (4)	Be-7		2×10^{-2}
Bismuth (83)	Bi-206		4×10^{-4}
Bromine (35)	Br-82	4×10^{-7}	3×10^{-3}
Cadmium (48)	Cd-109		2×10^{-3}
	Cd-155m <u>Cd-115m</u>		3×10^{-4}
	Cd-115		3×10^{-4}
Calcium (20)	Ca-45		9×10^{-5}
	Ca-47		5×10^{-4}
Carbon (6)	C-14	1×10^{-6}	8×10^{-3}
Cerium (58)	Ce-141		9×10^{-4}
	Ce-143		4×10^{-4}
	Ce-144		1×10^{-4}
Cesium (55)	Cs-131		2×10^{-2}
	Cs-134m		6×10^{-2}
	Cs-134		9×10^{-5}
Chlorine (17)	Cl-38	9×10^{-7}	4×10^{-3}
Chromium (24)	Cr-51		2×10^{-2}
Cobalt (27)	Co-57		5×10^{-3}
	Co-58		1×10^{-3}
	Co-60		5×10^{-4}
Copper (29)	Cu-64		3×10^{-3}
Dysprosium (66)	Dy-165		4×10^{-3}
	Dy-166		4×10^{-4}
Erbium (68)	Er-169		9×10^{-4}
	Er-171		1×10^{-3}

^{1/} Values are given in Column I only for those materials normally used as gases.

^{2/} $\mu\text{Ci/gm}$ for solids.

Element (Atomic Number)	Radionuclide Isotope	Column I Gas Concentration $\mu\text{Ci}/\text{ml}^{1/}$	Column II Liquid and Solid Concentration $\mu\text{Ci}/\text{ml}^{2/}$
Europium (63)	Eu-152 ($T_r=9.2$ h)		6×10^{-4}
	Eu-155		2×10^{-3}
Fluorine (9)	F-18	2×10^{-6}	8×10^{-3}
Gadolinium (64)	Gd-153		2×10^{-3}
	Gd-159		8×10^{-4}
Gallium (31)	Ga-72		4×10^{-4}
Germanium (32)	Ge-71		2×10^{-2}
Gold (79)	Au-196		2×10^{-3}
	Au-198		5×10^{-4}
	Au-199		2×10^{-3}
Hafnium (72)	Hf-181		7×10^{-4}
Hydrogen (1)	H-3	5×10^{-6}	3×10^{-2}
Indium (49)	In-113m In-113m		1×10^{-2}
	In-114m		2×10^{-4}
Iodine (53)	I-126	3×10^{-9}	2×10^{-5}
	I-131	3×10^{-9}	2×10^{-5}
	I-132	8×10^{-8}	6×10^{-4}
	I-133	1×10^{-8}	7×10^{-5}
	I-134	2×10^{-7}	1×10^{-3}
Iridium (77)	Ir-190		2×10^{-3}
	Ir-192		4×10^{-4}
	Ir-194		3×10^{-4}
Iron (26)	Fe-55		8×10^{-3}
	Fe-59		6×10^{-4}
Krypton (36)	Kr-85m	1×10^{-6}	
	Kr-85	3×10^{-6}	
Lanthanum (57)	La-140		2×10^{-4}
Lead (82)	Pb-203		4×10^{-3}
Lutetium (71)	Lu-177		1×10^{-3}
Manganese (25)	Mn-52		3×10^{-4}
	Mn-54		1×10^{-3}
	Mn-56		1×10^{-3}
Mercury (80)	Hg-197m		2×10^{-3}
	Hg-197		3×10^{-3}
	Hg-203		2×10^{-4}
Molybdenum (42)	Mo-99		2×10^{-3}
Neodymium (60)	Nd-147		6×10^{-4}
	Nd-149		3×10^{-3}

^{1/} Values are given in Column I only for those materials normally used as gases.

^{2/} $\mu\text{Ci}/\text{gm}$ for solids.

Element (Atomic Number)	Radionuclide Isotope	Column I Gas Concentration $\mu\text{Ci/ml}^{1/}$	Column II Liquid and Solid Concentration $\mu\text{Ci/ml}^{2/}$
Nickel (28)	Ni-65		1×10^{-3}
Niobium (Columbium) (41)	Nb-95		1×10^{-3}
	Nb-97		9×10^{-3}
Osmium (76)	Os-185		7×10^{-4}
	Os-191m		3×10^{-2}
	Os-191		2×10^{-3}
	Os-193		6×10^{-4}
Palladium (46)	Pd-103		3×10^{-3}
	Pd-109		9×10^{-4}
Phosphorus (15)	P-32		2×10^{-4}
Platinum (78)	Pt-191		1×10^{-3}
	Pt-193m		1×10^{-2}
	Pt-197m		1×10^{-2}
	Pt-197		1×10^{-3}
Polonium (84)	Po-210		7×10^{-6}
Potassium (19)	K-42		3×10^{-3}
Praseodymium (59)	Pr-142		3×10^{-4}
	Pr-143		5×10^{-4}
Promethium (61)	Pm-147		2×10^{-3}
	Pm-149		4×10^{-4}
Radium (88)	Ra-226		1×10^{-7}
	Ra-228		3×10^{-7}
Rhenium (75)	Re-183		6×10^{-3}
	Re-186		9×10^{-4}
	Re-188		6×10^{-4}
Rhodium (45)	Rh-103m		1×10^{-1}
	Rh-105		1×10^{-3}
Rubidium (37)	Rb-86		7×10^{-4}
Ruthenium (44)	Ru-97		4×10^{-3}
	Ru-103		8×10^{-4}
	Ru-105		1×10^{-3}
	Ru-106		1×10^{-4}
Samarium (62)	Sm-153		8×10^{-4}
Scandium (21)	Sc-46		4×10^{-4}
	Sc-47		9×10^{-4}
	Sc-48		3×10^{-4}
Selenium (34)	Se-75		3×10^{-3}
Silicon (14)	Si-31		9×10^{-3}
Silver (47)	Ag-105		1×10^{-3}
	Ag-110m		3×10^{-4}
	Ag-111		4×10^{-4}

^{1/} Values are given in Column I only for those materials normally used as gases.

^{2/} $\mu\text{Ci/gm}$ for solids.

Element (Atomic Number)	Radionuclide Isotope	Column I Gas Concentration $\mu\text{Ci/ml}^{1/}$	Column II Liquid and Solid Concentration $\mu\text{Ci/ml}^{2/}$
Sodium (11)	Na-24		2×10^{-3}
Strontium (38)	Sr-85		1×10^{-3}
	Sr-89		1×10^{-4}
	Sr-91		7×10^{-4}
	Sr-92		7×10^{-4}
Sulfur (16)	S-35	9×10^{-8}	6×10^{-4}
Tantalum (73)	Ta-182		4×10^{-4}
Technetium (43)	Tc-96m		1×10^{-1}
	Tc-96		1×10^{-3}
Tellurium (52)	Te-125m		2×10^{-3}
	Te-127m		6×10^{-4}
	Te-127		3×10^{-3}
	Te-129m		3×10^{-4}
	Te-131m		6×10^{-4}
	Te-132		3×10^{-4}
Terbium (65)	Tb-160		4×10^{-4}
Thallium (81)	Tl-200		4×10^{-3}
	Tl-201		3×10^{-3}
	Tl-202		1×10^{-3}
	Tl-204		1×10^{-3}
Thulium (69)	Tm-170		5×10^{-4}
	Tm-171		5×10^{-3}
Tin (50)	Sn-113		9×10^{-4}
	Sn-125		2×10^{-4}
Tungsten (Wolfram) (74)	W-181		4×10^{-3}
	W-187		7×10^{-4}
Vanadium (23)	V-48		3×10^{-4}
Xenon (54)	Xe-131m	4×10^{-6}	
	Xe-133	3×10^{-6}	
	Xe-135	1×10^{-6}	
Ytterbium (70)	Yb-175		1×10^{-3}
Yttrium (39)	Y-90		2×10^{-4}
	Y-91m		3×10^{-2}
	Y-91		3×10^{-4}
	Y-92		6×10^{-4}
	Y-93		3×10^{-4}
	Zinc (30)	Zn-65	
Zirconium (40)	Zn-69m		7×10^{-4}
	Zn-69		2×10^{-2}
	Zr-95		6×10^{-4}
	Zr-97		2×10^{-4}

^{1/} Values are given in Column I only for those materials normally used as gases.

^{2/} $\mu\text{Ci/gm}$ for solids.

Element (Atomic Number)	Radionuclide Isotope	Column I Gas Concentration $\mu\text{Ci}/\text{ml}^{1/}$	Column II Liquid and Solid Concentration $\mu\text{Ci}/\text{ml}^{2/}$
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Beta and/or gamma emitting radioactive material not listed above with half-life less than 3 years.

1×10^{-10}

1×10^{-6}

NOTE 1: Many ~~radioisotopes disintegrate~~ radionuclides transform into ~~isotopes which are also radioactive~~ other radionuclides. In expressing the concentrations in Schedule A, the activity stated is that of the parent isotope radionuclide and takes into account the ~~daughters~~ radioactive decay products.

NOTE 2: For purposes of subsection 2 of section 33-10-03-02-2, where there is involved a combination of isotopes radionuclides, the limit for the combination should be derived as follows: Determine for each isotope radionuclide in the product the ratio between the radioactivity concentration present in the product and the exempt radioactivity concentration established in Schedule A for the specific isotope radionuclide when not in combination. The sum of such ratios may not exceed "1" (~~i.e.,~~ unity).

EXAMPLE:

$$\frac{\text{Concentration of Isotope Radionuclide A in Product}}{\text{Exempt concentration of Isotope Radionuclide A}} +$$

$$\frac{\text{Concentration of Isotope Radionuclide B in Product}}{\text{Exempt concentration of Isotope Radionuclide A B}} \leq 1$$

NOTE 3: To convert $\mu\text{Ci}/\text{ml}$ to SI units of megabecquerels per liter, multiply the above values by 37.

EXAMPLE: Zirconium (40) Zr-97 ($2 \times 10^{-4} \mu\text{Ci}/\text{ml}$ multiplied by 37 is equivalent to 74×10^{-4} megabecquerels per liter).

^{1/} Values are given in Column I only for those materials normally used as gases.

^{2/} $\mu\text{Ci}/\text{gm}$ for solids.

SCHEDULE B
EXEMPT QUANTITIES

Radioactive Material	Microcuries
Americium-241 (Am 241)	0.05
Antimony-122 (Sb 122)	100
Antimony-124 (Sb 124)	10
Antimony-125 (Sb 125)	10
Arsenic-73 (As 73)	100
Arsenic-74 (As 74)	10
Arsenic-76 (As 76)	10
Arsenic-77 (As 77)	100
Barium-131 (Ba 131)	10
Barium-133 (Ba 133)	10
Barium-140 (Ba 140)	10
Bismuth-210 (Bi 210)	1
Bromine-82 (Br 82)	10
Cadmium-109 (Cd 109)	10
Cadmium-115m (Cd 115m)	10
Cadmium-115 (Cd 115)	100
Calcium-45 (Ca 45)	10
Calcium-47 (Ca 47)	10
Carbon-14 (C 14)	100
Cerium-141 (Ce 141)	100
Cerium-143 (Ce 143)	100
Cerium-144 (Ce 144)	1
Cesium-129 (Cs 129)	100
Cesium-131 (Cs 131)	1,000
Cesium-134m (Cs 134m)	100
Cesium-134 (Cs 134)	1
Cesium-135 (Cs 135)	10
Cesium-136 (Cs 136)	10
Cesium-137 (Cs 137)	10
Chlorine-36 (Cl 36)	10
Chlorine-38 (Cl 38)	10
Chromium-51 (Cr 51)	1,000
Cobalt-57 (Co 57)	100
Cobalt-58m (Co 58m)	10
Cobalt-58 (Co 58)	10
Cobalt-60 (Co 60)	1
Copper-64 (Cu 64)	100
Dysprosium-165 (Dy 165)	10
Dysprosium-166 (Dy 166)	100
Erbium-169 (Er 169)	100
Erbium-171 (Er 171)	100
Europium-152 (Eu 152)9.2h	100

Radioactive Material

Microcuries

Europium-152 (Eu 152)13 yr	1
Europium-154 (Eu 154)	1
Europium-155 (Eu 155)	10
Fluorine-18 (F 18)	1,000
Gadolinium-153 (Gd 153)	10
Gadolinium-159 (Gd 159)	100
Gallium-67 (Ga 67)	100
Gallium-72 (Ga 72)	10
Germanium-68 (Ge 68)	10
Germanium-71 (Ge 71)	100
Gold-195 (Au 195)	10
Gold-198 (Au 198)	100
Gold-199 (Au 199)	100
Hafnium-181 (Hf 181)	10
Holmium-166 (Ho 166)	100
Hydrogen-3 (H 3)	1,000
Indium-111 (In 111)	100
Indium-113m (In 113m)	100
Indium-114m (In 114m)	10
Indium-115m (In 115m)	100
Indium-115 (In 115)	10
Iodine-123 (I 123)	100
Iodine-125 (I 125)	1
Iodine-126 (I 126)	1
Iodine-129 (I 129)	0.1
Iodine-131 (I 131)	1
Iodine-132 (I 132)	10
Iodine-133 (I 133)	1
Iodine-134 (I 134)	10
Iodine-135 (I 135)	10
Iridium-192 (Ir 192)	10
Iridium-194 (Ir 194)	100
Iron-52 (Fe 52)	10
Iron-55 (Fe 55)	100
Iron-59 (Fe 59)	10
Krypton-85 (Kr 85)	100
Krypton-87 (Kr 87)	10
Lanthanum-140 (La 140)	10
Lutetium-177 (Lu 177)	100
Manganese-52 (Mn 52)	10
Manganese-54 (Mn 54)	10
Manganese-56 (Mn 56)	10
Mercury-197m (Hg 197m)	100
Mercury-197 (Hg 197)	100
Mercury-203 (Hg 203)	10
Molybdenum-99 (Mo 99)	100
Neodymium-147 (Nd 147)	100

Radioactive Material

Microcuries

Neodymium-149 (Nd 149)	100
Nickel-59 (Ni 59)	100
Nickel-63 (Ni 63)	10
Nickel-65 (Ni 65)	100
Niobium-93m (Nb 93m)	10
Niobium-95 (Nb 95)	10
Niobium-97 (Nb 97)	10
Osmium-185 (Os 185)	10
Osmium-191m (Os 191m)	100
Osmium-191 (Os 191)	100
Osmium-193 (Os 193)	100
Palladium-103 (Pd 103)	100
Palladium-109 (Pd 109)	100
Phosphorus-32 (P 32)	10
Platinum-191 (Pt 191)	100
Platinum-193m (Pt 193m)	100
Platinum-193 (Pt 193)	100
Platinum-197m (Pt 197m)	100
Platinum-197 (Pt 197)	100
Polonium-210 (Po 210)	0.1
Potassium-42 (K 42)	10
Potassium-43 (K 43)	10
Praseodymium-142 (Pr 142)	100
Praseodymium-143 (Pr 143)	100
Promethium-147 (Pm 147)	10
Promethium-149 (Pm 149)	10
Rhenium-186 (Re 186)	100
Rhenium-188 (Re 188)	100
Rhodium-103m (Rh 103m)	100
Rhodium-105 (Rh 105)	100
Rubidium-81 (Rb 81)	10
Rubidium-86 (Rb 86)	10
Rubidium-87 (Rb 87)	10
Ruthenium-97 (Ru 97)	100
Ruthenium-103 (Ru 103)	10
Ruthenium-105 (Ru 105)	10
Ruthenium-106 (Ru 106)	1
Samarium-151 (Sm 151)	10
Samarium-153 (Sm 153)	100
Scandium-46 (Sc 46)	10
Scandium-47 (Sc 47)	100
Scandium-48 (Sc 48)	10
Selenium-75 (Se 75)	10
Silicon-31 (Si 31)	100
Silver-105 (Ag 105)	10
Silver-110m (Ag 110m)	1
Silver-111 (Ag 111)	100

Radioactive Material

Microcuries

Sodium-22 (Na 22)	10
Sodium-24 (Na 24)	10
Strontium-85 (Sr 85)	10
Strontium-89 (Sr 89)	1
Strontium-90 (Sr 90)	0.1
Strontium-91 (Sr 91)	10
Strontium-92 (Sr 92)	10
Sulphur-35 (S 35)	100
Tantalum-182 (Ta 182)	10
Technetium-96 (Tc 96)	10
Technetium-97m (Tc 97m)	100
Technetium-97 (Tc 97)	100
Technetium-99m (Tc 99m)	100
Technetium-99 (Tc 99)	10
Tellurium-125m (Te 125m)	10
Tellurium-127m (Te 127m)	10
Tellurium-127 (Te 127)	100
Tellurium-129m (Te 129m)	10
Tellurium-129 (Te 129)	100
Tellurium-131m (Te 131m)	10
Tellurium-132 (Te 132)	10
Terbium-160 (Tb 160)	10
Thallium-200 (Tl 200)	100
Thallium-201 (Tl 201)	100
Thallium-202 (Tl 202)	100
Thallium-204 (Tl 204)	10
Thulium-170 (Tm 170)	10
Thulium-171 (Tm 171)	10
Tin-113 (Sn 113)	10
Tin-125 (Sn 125)	10
Tungsten-181 (W 181)	10
Tungsten-185 (W 185)	10
Tungsten-187 (W 187)	100
Vanadium-48 (V 48)	10
Xenon-131m (Xe 131m)	1,000
Xenon-133 (Xe 133)	100
Xenon-135 (Xe 135)	100
Ytterbium-175 (Yb 175)	100
Yttrium-87 (Y 87)	10
Yttrium-88 (Y 88)	10
Yttrium-90 (Y 90)	10
Yttrium-91 (Y 91)	10
Yttrium-92 (Y 92)	100
Yttrium-93 (Y-93)	100
Zinc-65 (Zn 65)	10
Zinc-69m (Zn 69m)	100
Zinc-69 (Zn 69)	1,000

Radioactive Material Microcuries

Zirconium-93 (Zr 93)	10
Zirconium-95 (Zr 95)	10
Zirconium-97 (Zr 97)	10

Any radioactive material not listed above other than alpha emitting radioactive material 0.1

Note: For purposes of subparagraph b of paragraph 6 5 of subdivision f g of subsection 2 of section 33-10-03-05 where there is involved a combination of isotopes radionuclides, the limit for the combination should be derived as follows:

Determine the amount of each isotope radionuclide possessed and 1,000 times the amount in Schedule B for each of those isotopes radionuclides when not in combination. The sum of the ratios of those quantities may not exceed one (i.e., unity).

Example:

$$\frac{\text{Amt. of } \underline{\text{isotope Radionuclide A possessed}}}{1000 \times \text{Schedule B quantity for } \underline{\text{isotope Radionuclide A}}} + \frac{\text{Amt. of } \underline{\text{isotope Radionuclide B possessed}}}{1000 \times \text{Schedule B quantity for } \underline{\text{isotope Radionuclide B}}} \leq 1$$

Note 2: To convert microcuries to SI units of kilobecquerels, multiply the above values by 37.

Example: Zirconium-97 (10 microcuries multiplied by 37 is equivalent to 370 kilobecquerels).

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992.

SCHEDULE C
GROUPS OF MEDICAL USES OF RADIOACTIVE MATERIAL

GROUP I: Use of prepared radiopharmaceuticals for certain diagnostic studies involving measurements of uptake, dilution, and excretion. This group does not include uses involving imaging and tumor localizations.

- (1) Chromium-51 as sodium chromate or labeled human serum albumin.
- (2) Cobalt-57 as labeled cyanocobalamin.
- (3) Cobalt-58 as labeled cyanocobalamin.
- (4) Cobalt-60 as labeled cyanocobalamin.
- (5) Iodine-123 as sodium iodide.
- (6) Iodine-125 as sodium iodide, iodinated human serum albumin, oleic acid, or sodium iothalamate.
- (7) Iodine-131 as sodium iodide, iodinated human serum albumin, labeled rose bengal, triolein, or sodium iodohippurate.
- (8) Iron-59 as citrate.
- (9) Potassium-42 as chloride.
- (10) Sodium-24 as chloride.
- (11) Technetium-99m as pertechnetate.
- (12) Any radioactive material in a radiopharmaceutical and for a diagnostic use involving measurements of uptake, dilution, or excretion for which a "notice of claimed investigational exemption for a new drug" (IND) or a "new drug application" (NDA) has been accepted by the food and drug administration (FDA).

GROUP II: Use of prepared radiopharmaceuticals for diagnostic studies involving imaging and tumor localizations.

- (1) Chromium-51 as human serum albumin.
- (2) Fluorine-18 in solution.
- (3) Gallium-67 as citrate.

- ~~(4) Gold-198 in colloidal form.~~
- ~~(5) Indium-113m as chloride.~~
- ~~(6) Iodine-123 as sodium iodide.~~
- ~~(7) Iodine-125 as sodium iodide or fibrinogen.~~
- ~~(8) Iodine-131 as sodium iodide, iodinated human serum albumin, macroaggregated iodinated human serum albumin, colloidal (microaggregated) iodinated human serum albumin, rose bengal, or sodium iodohippurate.~~
- ~~(9) Mercury-197 as chlormerodrin.~~
- ~~(10) Mercury-203 as chlormerodrin.~~
- ~~(11) Selenium-75 as selenomethionine.~~
- ~~(12) Strontium-85 as nitrate.~~
- ~~(13) Strontium-87m as chloride.~~
- ~~(14) Technetium-99m as pertechnetate, sulfur colloid, or macroaggregated human serum albumin.~~
- ~~(15) Thallium-201 as chloride.~~
- ~~(16) Ytterbium-169 as pentatate sodium.~~
- ~~(17) Any radioactive material in a radiopharmaceutical prepared from a reagent kit listed in (3) of Group III.~~
- ~~(18) Any radioactive material in a radiopharmaceutical and for a diagnostic use involving imaging except those in gaseous forms for which a "notice of claimed investigational exemption for a new drug" (IND) or a "new drug application" (NDA) has been accepted by the food and drug administration (FDA).~~

GROUP III. Use of generators and reagent kits for the preparation and use of radiopharmaceuticals containing radioactive material for certain diagnostic uses.

- ~~(1) Molybdenum-99/technetium-99m generators for the elution of technetium-99m pertechnetate.~~
- ~~(2) Technetium-99m as pertechnetate for use with reagent kits for preparation and use of radiopharmaceuticals containing technetium-99m as provided in (3) and (6) of this group.~~
- ~~(3) Reagent kits for preparation of technetium-99m labeled:

 - ~~(i) sulfur colloid;~~~~

- (ii) pentatate sodium;
 - (iii) human serum albumin microspheres;
 - (iv) polyphosphates;
 - (v) macroaggregated human serum albumin;
 - (vi) etidronate sodium;
 - (vii) stannous pyrophosphate;
 - (viii) human serum albumin;
 - (ix) medronate sodium;
 - (x) gluceptate sodium;
 - (xi) oxidronate sodium;
 - (xii) disofenin;
 - (xiii) succimer; and
 - (xiv) albumin colloid.
- (4) ~~Tin-113/indium-113m~~ generators for the elution of indium-113m as chloride.
- (5) ~~Yttrium-87/strontium-87m~~ generators for the elution of strontium-87m.
- (6) Any generator or reagent kit for preparation and diagnostic use of a radiopharmaceutical containing radioactive material for which generator or reagent kit a "notice of claimed investigational exemption for a new drug" (IND) has been accepted by the food and drug administration (FDA).

GROUP IV: Use of prepared radiopharmaceuticals for certain therapeutic uses that do not normally require hospitalization for purposes of radiation safety.

- (1) ~~Iodine-131~~ as iodide for treatment of hyperthyroidism and cardiac dysfunction;
- (2) ~~Phosphorus-32~~ as soluble phosphate for treatment of polycythemia vera, leukemia, and bone metastases;
- (3) ~~Phosphorus-32~~ as colloidal chromic phosphate for intracavitary treatment of malignant effusions;

- ~~(4) Any radioactive material in a radiopharmaceutical and for a therapeutic use not normally requiring hospitalization for purposes of radiation safety for which a "notice of claimed investigational exemption for a new drug" (IND) has been accepted by the food and drug administration (FDA).~~

~~GROUP V. Use of prepared radiopharmaceuticals for certain therapeutic uses that normally require hospitalization for purposes of radiation safety.~~

- ~~(1) Gold-198 as colloid for intracavitary treatment of malignant effusions;~~
- ~~(2) Iodine-131 as iodide for treatment of thyroid carcinoma;~~
- ~~(3) Any radioactive material in a radiopharmaceutical and for a therapeutic use normally requiring hospitalization for radiation safety reasons for which a "notice of claimed investigational exemption for a new drug" (IND) has been accepted by the food and drug administration (FDA).~~

~~GROUP VI. Use of sources and devices containing radioactive material for certain medical uses.~~

- ~~(1) Americium-241 as a sealed source in a device for bone mineral analysis;~~
- ~~(2) Cesium-137 encased in needles and applicator cells for topical, interstitial, and intracavitary treatment of cancer;~~
- ~~(3) Cobalt-60 encased in needles and applicator cells for topical, interstitial, and intracavitary treatment of cancer;~~
- ~~(4) Gold-198 as seeds for interstitial treatment of cancer;~~
- ~~(5) Iodine-125 as a sealed source in a device for bone mineral analysis;~~
- ~~(6) Iridium-192 as seeds encased in nylon ribbon for interstitial treatment of cancer;~~
- ~~(7) Strontium-90 sealed in an applicator for treatment of superficial eye conditions;~~
- ~~(8) Radon-222 as seeds for topical, interstitial, and intracavitary treatment of cancer;~~
- ~~(9) Radium-226 as a sealed source for topical, interstitial, and intracavitary treatment of cancer;~~
- ~~(10) Iodine-125 as seeds for interstitial treatment of cancer; and~~
- ~~(11) Iodine-125 as a sealed source in a portable device for bone imaging and foreign body detection.~~

History: Amended effective October 1, 1982; June 1, 1986.

SCHEDULE D C
LIMITS FOR BROAD LICENSES (SUBSECTION 4 OF SECTION 33-10-03-05)

Radioactive Material	Col. I curies	Col. II curies
Antimony-122	1	0.01
Antimony-124	1	0.01
Antimony-125	1	0.01
Arsenic-73	10	0.1
Arsenic-74	1	0.01
Arsenic-76	1	0.01
Arsenic-77	10	0.1
Barium-131	10	0.1
Barium-140	1	0.01
Beryllium-7	10	0.1
Bismuth-210	0.1	0.001
Bromine-82	10	0.1
Cadmium-109	1	0.01
Cadmium-115m	1	0.01
Cadmium-115	10	0.1
Calcium-45	1	0.01
Calcium-47	10	0.1
Carbon-14	100	1
Cerium-141	10	0.1
Cerium-143	10	0.1
Cerium-144	0.1	0.001
Cesium-131	100	1
Cesium-134m	100	1
Cesium-134	0.1	0.001
Cesium-135	1	0.01
Cesium-136	10	0.1
Cesium-137	0.1	0.001
Chlorine-36	1	0.01
Chlorine-38	100	1
Chromium-51	100	1
Cobalt-57	10	0.1
Cobalt-58m	100	1
Cobalt-58	1	0.01
Cobalt-60	0.1	0.001
Copper-64	10	0.1
Dysprosium-165	100	1
Dysprosium-166	10	0.1
Erbium-169	10	0.1
Erbium-171	10	0.1
Europium-152 (9.2 h)	10	0.1
Europium-152 (13 y)	0.1	0.001

Radioactive Material	Col. I	Col. II
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	curies	curies
Europium-154	0.1	0.001
Europium-155	1	0.01
Fluorine-18	100	1
Gadolinium-153	1	0.01
Gadolinium-159	10	0.1
Gallium-72	10	0.1
Germanium-71	100	1
Gold-198	10	0.1
Gold-199	10	0.1
Hafnium-181	1	0.01
Holmium-166	10	0.1
Hydrogen-3	100	1
Indium-113m	100	1
Indium-114m	1	0.01
Indium-115m	100	1
Indium-115	1	0.01
Iodine-125	0.1	0.001
Iodine-126	0.1	0.001
Iodine-129	0.1	0.001
Iodine-131	0.1	0.001
Iodine-132	10	0.1
Iodine-133	1	0.01
Iodine-134	10	0.1
Iodine-135	1	0.01
Iridium-192	1	0.01
Iridium-194	10	0.1
Iron-55	10	0.1
Iron-59	1	0.01
Krypton-85	100	1
Krypton-87	10	0.1
Lanthanum-140	1	0.01
Lutetium-177	10	0.1
Manganese-52	1	0.01
Manganese-54	1	0.01
Manganese-56	10	0.1
Mercury-197m	10	0.1
Mercury-197	10	0.1
Mercury-203	1	0.01
Molybdenum-99	10	0.1
Neodymium-147	10	0.1
Neodymium-149	10	0.1
Nickel-59	10	0.1
Nickel-63	1	0.01
Nickel-65	10	0.1
Niobium-93m	1	0.01
Niobium-95	1	0.01
Niobium-97	100	1

Radioactive Material

Col. I

Col. II

	curies	curies
Osmium-185	1	0.01
Osmium-191m	100	1
Osmium-191	10	0.1
Osmium-193	10	0.1
Palladium-103	10	0.1
Palladium-109	10	0.1
Phosphorus-32	1	0.01
Platinum-191	10	0.1
Platinum-193m	100	1
Platinum-193	10	0.1
Platinum-197m	100	1
Platinum-197	10	0.1
Polonium-210	0.01	0.0001
Potassium-42	1	0.01
Praseodymium-142	10	0.1
Praseodymium-143	10	0.1
Promethium-147	1	0.01
Promethium-149	10	0.1
Radium-226	0.01	0.0001
Rhenium-186	10	0.1
Rhenium-188	10	0.1
Rhodium-103m	1,000	10
Rhodium-105	10	0.1
Rubidium-86	1	0.01
Rubidium-87	1	0.01
Ruthenium-97	100	1
Ruthenium-103	1	0.01
Ruthenium-105	10	0.1
Ruthenium-106	0.1	0.001
Samarium-151	1	0.01
Samarium-153	10	0.1
Scandium-46	1	0.01
Scandium-47	10	0.1
Scandium-48	1	0.01
Selenium-75	1	0.01
Silicon-31	10	0.1
Silver-105	1	0.01
Silver-110m	0.1	0.001
Silver-111	10	0.1
Sodium-22	0.1	0.001
Sodium-24	1	0.01
Strontium-85m	1,000	10
Strontium-85	1	0.01
Strontium-89	1	0.01
Strontium-90	0.01	0.0001
Strontium-91	10	0.1
Strontium-92	10	0.1

Radioactive Material

Col. I

Col. II

	curies	curies
Sulphur-35	10	0.1
Tantalum-182	1	0.01
Technetium-96	10	0.1
Technetium-97m	10	0.1
Technetium-97	10	0.1
Technetium-99m	100	1
Technetium-99	1	0.01
Tellurium-125m	1	0.01
Tellurium-127m	1	0.01
Tellurium-127	10	0.1
Tellurium-129m	1	0.01
Tellurium-129	100	1
Tellurium-131m	10	0.1
Tellurium-132	1	0.01
Terbium-160	1	0.01
Thallium-200	10	0.1
Thallium-201	10	0.1
Thallium-202	10	0.1
Thallium-204	1	0.01
Thulium-170	1	0.01
Thulium-171	1	0.01
Tin-113	1	0.01
Tin-125	1	0.01
Tungsten-181	1	0.01
Tungsten-185	1	0.01
Tungsten-187	10	0.1
Vanadium-48	1	0.01
Xenon-131m	1,000	10
Xenon-133	100	1
Xenon-135	100	1
Ytterbium-175	10	0.1
Yttrium-90	1	0.01
Yttrium-91	1	0.01
Yttrium-92	10	0.1
Yttrium-93	1	0.01
Zinc-65	1	0.01
Zinc-69m	10	0.1
Zinc-69	100	1
Zirconium-93	1	0.01
Zirconium-95	1	0.01
Zirconium-97	1	0.01
Any radioactive material other than source material, special nuclear material, or alpha emitting radioactive material not listed above.	0.1	0.001

Any radioactive material other than source material, special nuclear material, or alpha emitting radioactive material not listed above.

0.1

0.001

Note: To convert curies to the SI units gigabecquerels, multiply the above values by 37.

Example: Zirconium-97 (Col. II) (0.01 curies multiplied by 37 is equivalent to 0.37 gigabecquerels).

History: Amended effective June 1, 1992.

SCHEDULE E D
CRITERIA RELATED TO THE DISPOSITION OF
URANIUM MILL TAILINGS OR WASTES

INTRODUCTION - As required by ~~paragraph 6 of~~ subdivision ~~n m~~ of subsection 5 of section 33-10-03-05, each applicant for a license to possess and use source material in conjunction with uranium or thorium milling, or byproduct material at sites formerly associated with such milling, is required to include in a license application proposed specifications relating to milling operations and the disposition of tailings or waste resulting from such milling activities. This schedule establishes technical, financial, ownership, and long-term site surveillance criteria relating to the siting, operation, decontamination, decommissioning, and reclamation of mills and tailings or waste systems and sites at which such mills and systems are located. As used in this schedule the term "as low as is reasonably achievable" has the same meaning as in subsection 2 of section 33-10-04-01.

In many cases, flexibility is provided in the criteria to allow achieving an optimum tailings disposal program on a site-specific basis. However, in such cases the objectives, technical alternatives, and concerns which must be taken into account in developing a tailings program are identified. Applications for licenses must clearly demonstrate how the criteria have been addressed.

The specifications shall be developed considering the expected full capacity of tailings or waste systems and the lifetime of mill operations. Where later expansions of systems or operations may be likely (for example, where large quantities of ore now marginally uneconomical may be stockpiled), the amendability of the disposal system to accommodate increased capacities without degradation in long-term stability and other performance factors shall be evaluated.

Detailed programs meeting the technical and financial criteria in this schedule including appropriate supporting data, analyses, and alternatives, shall be developed by existing uranium milling licensees and filed, in connection with license renewal applications or within nine months from the effective date of this schedule whichever occurs first.

CRITERION 1 - In selecting among alternative tailings disposal sites or judging the adequacy of existing tailings sites, the following site features, which will determine the extent to which a program meets the broad objective of isolating the tailings and associated contaminants from man and the environment during operations and for thousands of

years thereafter without ongoing active maintenance, shall be considered:

- . remoteness from populated areas;
- . hydrologic and other natural conditions as they contribute to continued immobilization and isolation of contaminants from usable ground water sources; and
- . potential of minimizing erosion, disturbance, and dispersion by natural forces over the long term.

The site selection process shall be an optimization to the maximum extent reasonably achievable in terms of these features.

In the selection of disposal sites, primary emphasis shall be given to isolation of tailings or wastes, a matter having long-term impacts, as opposed to consideration only of short-term convenience or benefits, such as minimization of transportation or land acquisition costs. While isolation of tailings will be a function of both site characteristics and engineering design, overriding consideration shall be given to siting features given the long-term nature of the tailings hazards.

Tailings shall be disposed of in a manner such that no active maintenance is required to preserve the condition of the site.

CRITERION 2 - To avoid proliferation of small waste disposal sites, byproduct material from insite extraction operations, such as residues from solution evaporation or contaminated control processes, and wastes from small remote aboveground extraction operations shall preferably be disposed of at existing large mill tailings disposal sites; unless, considering the nature of the wastes, such as their volume and specific activity and the costs and environmental impacts of transporting the wastes to a large disposal site, such offsite disposal is demonstrated to be impracticable or the advantages of onsite burial clearly outweigh the benefits of reducing the perpetual surveillance obligations.

CRITERION 3 - The "prime option" for disposal of tailings is placement below grade, either in mines or specially excavated pits (that is, when the need for any specially constructed retention structure is eliminated). The evaluation of alternative sites and disposal methods performed by mill operators in support of their proposed tailings disposal program (provided in applicants' environmental reports) shall reflect serious consideration of this disposal mode. In some instances, below-grade disposal may not be the most environmentally sound approach, such as might be the case if a high quality ground water formation is relatively close to the surface or not very well isolated by overlying soils and rock. Also, geologic topographic conditions might make full, below-grade burial impracticable; for example, bedrock may be sufficiently near the surface that blasting would be required to excavate a disposal pit at excessive cost, and more suitable alternate sites are not available. Where full below-grade burial is not practicable, the size of retention structures, and size and steepness of

slopes of associated exposed embankments, shall be minimized by excavation to the maximum extent reasonably achievable or appropriate given the geologic and hydrogeologic conditions at a site. In these cases, it must be demonstrated that an above-grade disposal program will provide reasonably equivalent isolation of the tailings from natural erosional forces.

CRITERION 4 - The following site and design criteria shall be adhered to whether tailings or wastes are disposed of above or below grade:

- (a) Upstream rainfall catchment areas must be minimized to decrease erosion potential and the size of the maximum possible flood which could erode or wash out sections of the tailings disposal area.
- (b) Topographic features shall provide good wind protection.
- (c) Embankment and cover slopes shall be relatively flat after final stabilization to minimize erosion potential and to provide conservative factors of safety assuring long-term stability. The broad objective should be to contour final slopes to grades which are as close as possible to those which would be provided if tailings were disposed of below grade; this could, for example, lead to slopes of about ten horizontal to one vertical (10h:1v) or less steep. In general, slopes should not be steeper than about 5h:1v. Where steeper slopes are proposed, reasons why a slope less steep than 5h:1v would be impracticable should be provided, and compensating factors and conditions which make such slopes acceptable should be identified.
- (d) A full self-sustaining vegetative cover shall be established or rock cover employed to reduce wind and water erosion to negligible levels.

Where a full vegetative cover is not likely to be self-sustaining due to climatic conditions, such as in semiarid and arid regions, rock cover shall be employed on slopes of the impoundment system. The staff will consider relaxing this requirement for extremely gentle slopes such as those which may exist on the top of the pile.

The following factors shall be considered in establishing the final rock cover design to avoid displacement of rock particles by human and animal traffic or by natural processes, and to preclude undercutting and piping:

- shape, size, composition, gradation of rock particles (excepting bedding material, average particle size shall be at least cobble size or greater);
- rock cover thickness and zoning of particle by size; and

steepness of underlying slopes.

Individual rock fragments shall be dense, sound, and resistant to abrasion, and shall be free from cracks, seams, and other defects that would tend to unduly increase their destruction by water and frost actions. Weak, friable, or laminated aggregate shall not be used. Shale, rock, laminated with shale, and cherts shall not be used.

Rock covering of slopes may not be required where top covers are very thick (on the order of eighteen meters or greater); impoundment slopes are very gentle (on the order of 10h:1v or less); bulk cover materials have inherently favorable erosion resistance characteristics; and there is negligible drainage catchment area upstream of the pile, and there is good wind protection as described in points (a) and (b) of this criterion.

Furthermore, all impoundment surfaces shall be contoured to avoid areas of concentrated surface runoff or abrupt or sharp changes in slope gradient. In addition to rock cover on slopes, areas toward which surface runoff might be directed shall be well protected with substantial rock cover (riprap). In addition to providing for stability of the impoundment systems itself, overall stability, erosion potential, and geomorphology of surrounding terrain shall be evaluated to assure that there are no ongoing or potential processes, such as gully erosion, which would lead to impoundment instability.

- (e) The impoundment shall not be located near a capable fault that could cause a maximum credible earthquake larger than that which the impoundment could reasonably be expected to withstand. As used in this criterion, the term "capable fault" has the same meaning as defined in Section III (g) of Appendix A of 10 CFR 100. The term "maximum credible earthquake" means that earthquake which would cause the maximum vibratory ground motion based upon an evaluation of earthquake potential considering the regional and local geology and seismology and specific characteristics of local subsurface material.
- (f) The impoundment, where feasible, should be designed to incorporate features which will promote deposition. For example, design features which promote deposition of sediment suspended in any runoff which flows into the impoundment area might be utilized; the object of such a design feature would be to enhance the thickness of cover over time.

CRITERION 5 - Steps shall be taken to reduce seepage of toxic materials into ground water to the maximum extent reasonably achievable. Any seepage which does occur shall not result in deterioration of existing ground water supplies from their current or potential use. The following shall be considered to accomplish this:

- . installation of low permeability bottom liners (where synthetic liners are used, a leakage detection system shall be installed immediately below the liner to ensure major failures are detected if they occur. This is in addition to the ground water monitoring program conducted as provided in Criterion 7. Where clay liners are proposed or relatively thin insite clay soils are to be relied upon for seepage control, tests shall be conducted with representative tailings solutions and clay materials to confirm that no significant deterioration of permeability or stability properties will occur with continuous exposure of clay to tailings solutions. Tests shall be run for a sufficient period of time to reveal any effects if they are going to occur (in some cases, deterioration has been observed to occur rather rapidly after about nine months of exposure).
- . mill process design which provides the maximum practicable recycle of solutions and conservation of water to reduce the net input of liquid to the tailings impoundment.
- . dewatering of tailings by process devices or in-situ drainage system. At new sites, tailings shall be dewatered by a drainage system installed at the bottom of the impoundment to lower the phreatic surface and reduce the driving head for seepage, unless tests show tailings are not amenable to such a system. Where in-situ dewatering is to be conducted, the impoundment bottom shall be graded to assure that the drains are at a low point. The drains shall be protected by suitable filter materials to assure that drains remain free running. The drainage system shall also be adequately sized to assure good drainage.
- . neutralization to promote immobilization of toxic substances.

Where ground water impacts are occurring at an existing site due to seepage, action shall be taken to alleviate conditions that lead to excessive seepage impacts and restore ground water quality to its potential use before milling operations began to the maximum extent practicable. The specific seepage control and ground water protection method, or combination of methods, to be used must be worked out on a site-specific basis. Technical specifications shall be prepared to control installation of seepage control systems. A quality assurance, testing and inspection program, which includes supervision by a qualified engineer or geologist, shall be established to assure that specification is met.

While the primary method of protecting ground water shall be isolation of tailings and tailings solutions, disposal involving contact with ground water will be considered provided supporting tests and analysis are presented demonstrating that the proposed disposal and treatment methods will not degrade ground water from current or potential uses.

Furthermore, steps shall be taken during stockpiling of ore to minimize penetration of radionuclides into underlying soils; suitable methods include lining or compaction of ore storage areas.

In support of a tailings disposal system proposal, the applicant/operator shall supply information concerning the following:

- . The chemical and radioactive characteristics of the waste solutions.
- . The characteristics of the underlying soil and geologic formations particularly the extent to which they will control transport of contaminants and solutions. This shall include detailed information concerning extent, thickness, uniformity, shape, and orientation of underlying strata. Hydraulic gradients and conductivities of the various formations shall be determined.

This information shall be gathered by borings and field survey methods taken within the proposed impoundment area and in surrounding areas where contaminants might migrate to usable ground water. The information gathered on boreholes shall include both geologic and geophysical logs in sufficient number and degree of sophistication to allow determining significant discontinuities, fractures, and channeled deposits which are of high hydraulic conductivity. If field survey methods are used, they should be in addition to and calibrated with borehole logging. Hydrologic parameters such as permeability shall not be determined on the basis of laboratory analysis of samples alone; a sufficient amount of field testing (e.g., pump tests) shall be conducted to assure actual field properties are adequately understood. Testing shall be conducted to allow estimating chemi-sorption attenuation properties of underlying soil and rock.

- . Location, extent, quality, and capacity of any ground water at and near the site.

CRITERION 6 - Sufficient earth cover, but not less than three meters, shall be placed over tailings or wastes at the end of milling operations to result in a calculated reduction in surface exhalation of radon emanating from the tailings or wastes to less than two picocuries per square meter per second. In computing required tailings cover thickness, moisture in soils in excess of amounts found normally in similar soils in similar circumstances shall not be considered. Direct gamma exposure from the tailings or wastes should be reduced to background levels. The effects of any thin synthetic layer shall not be taken into account in determining the calculated radon exhalation level. If nonsoil materials are proposed to reduce tailings covers to less than three meters, it must be demonstrated that such materials will not crack or degrade by differential settlement, weathering, or other mechanism over long-term time intervals. Near surface materials, i.e., within the top three meters, shall not include mine waste or rock that contains

elevated levels of radium; soils used for near surface cover must be essentially the same, as far as radioactivity is concerned, as that of surrounding soils.

CRITERION 7 - Milling operations shall be conducted so that all airborne effluent releases are reduced to as low as is reasonably achievable. The primary means of accomplishing this shall be by means of emission controls. Institutional controls, such as extending the site boundary and exclusion area, may be employed to ensure that offsite exposure limits are met, but only after all practicable measures have been taken to control emissions at the source. Notwithstanding the existence of individual dose standards, strict control of emissions is necessary to assure that population exposures are reduced to the maximum extent reasonably achievable and to avoid site contamination. The greatest potential sources of offsite radiation exposure (aside from radon exposure) are dusting from dry surfaces of the tailings disposal area not covered by tailings solution and emissions from yellowcake drying and packaging operations. Checks shall be made and logged hourly of all parameters, e.g., differential pressure and scrubber water flow rate, which determine the efficiency of yellowcake stack emission control equipment operation. It shall be determined whether or not conditions are within a range prescribed to ensure that the equipment is operating consistently near peak efficiency; corrective action shall be taken when performance is outside of prescribed ranges. Effluent control devices shall be operative at all times during drying and packaging operations and whenever air is exhausting from the yellowcake stack.

Drying and packaging operations shall terminate when controls are inoperative. When checks indicate the equipment is not operating within the range prescribed for peak efficiency, actions shall be taken to restore parameters to the prescribed range. When this cannot be done without shutdown and repairs, drying and packaging operations shall cease as soon as practicable.

Operations may not be restarted after cessation due to off-normal performance until needed corrective actions have been identified and implemented. All such cessations, corrective actions, and restarts shall be reported to the department in writing, within ten days of the subsequent restart.

To control dusting from tailings, that portion not covered by standing liquids shall be wetted or chemically stabilized to prevent or minimize blowing and dusting to the maximum extent reasonably achievable. This requirement may be relaxed if tailings are effectively sheltered from wind, such as may be the case where they are disposed of below grade and the tailings surface is not exposed to wind. Consideration shall be given in planning tailings disposal programs to methods which would allow phased covering and reclamation of tailings impoundments since this will help in controlling particulate and radon emissions during operation. To control dusting from diffuse sources, such as tailings and ore pads where automatic controls do not apply, operators shall develop written operating procedures specifying the methods of control which will be utilized.

CRITERION 8 - These criteria relating to ownership of tailings and their disposal sites become effective on November 8, 1981, and apply to all licenses terminated, issued, or renewed after that date.

Any uranium or thorium milling license or tailings license shall contain such terms and conditions as the United States nuclear regulatory commission determines necessary to assure that prior to termination of the license, the licensee will comply with ownership requirements of this criterion for sites used for tailings disposal.

Title to the byproduct material license pursuant to subdivision m of subsection 5 of section 33-10-03-05 and land, including any interests therein (other than land owned by the United States or by a state) which is used for the disposal of any such byproduct material, or is essential to ensure the long-term stability of such disposal site, shall be transferred to the United States or the state in which such land is located, at the option of such state. In view of the fact that physical isolation must be the primary means of long-term control, and government land ownership is a desirable supplementary measure, ownership of certain severable subsurface interests, e.g., mineral rights, may be determined to be unnecessary to protect the public health and safety and the environment. In any case, however, the applicant/operator must demonstrate a serious effort to obtain such subsurface rights, and must, in the event that certain rights cannot be obtained, provide notification in local public land records of the fact that the land is being used for the disposal of radioactive material and is subject to either a United States nuclear regulatory commission general or specific license prohibiting the disruption and disturbance of the tailings. In some rare cases, such as may occur with deep burial where no ongoing site surveillance will be required, surface land ownership transfer requirements may be waived. For licenses issued before November 8, 1981, the department may take into account the status of the ownership of such land, and interests therein, and the ability of a licensee to transfer title and custody thereof to the United States or the state.

If the United States nuclear regulatory commission subsequent to title transfer determines that use of the surface or subsurface estates, or both, of the land transferred to the United States or to the state will not endanger the public health, safety, welfare, or environment, the United States nuclear regulatory commission may permit the use of the surface or subsurface estates, or both, of such land in a manner consistent with the provisions provided in these criteria. If the United States nuclear regulatory commission permits such use of such land, it will provide the person who transferred such land with the right of first refusal with respect to such use of such land.

Material and land transferred to the United States or the state in accordance with this criterion shall be transferred without cost to the United States or the state other than administrative and legal costs incurred in carrying out such transfer.

The provisions of chapter 33-10-03 respecting transfer of title and custody to land and tailings and waste shall not apply in the case of

lands held in trust by the United States for any Indian tribe or lands owned by such Indian tribe subject to a restriction against alienation imposed by the United States. In the case of such lands which are used for disposal of byproduct material, as defined in ~~subsection 6 of~~ section 33-10-01-04, the licensee shall enter into arrangements with the United States nuclear regulatory commission as may be appropriate to assure the long-term surveillance of such lands by the United States.

History: Effective October 1, 1982; amended effective June 1, 1986; June 1, 1992.

CHAPTER 33-10-04

33-10-04-02. Permissible doses, levels, and concentrations.

1. Radiation dose standards to individuals in restricted areas.
(For determining the doses specified in subdivision a of this subsection a dose from x or gamma rays up to ten MeV may be assumed to be equivalent to the exposure measured by a properly calibrated appropriate instrument in air at or near the body surface in the region of the highest dose rate.)

a. In accordance with subdivision a of subsection 2 and except as provided in subdivision b, no licensee or registrant shall possess, use, receive, or transfer sources of radiation in such a manner as to cause any individual in a restricted area to receive in any period of one calendar quarter from all sources of radiation a total occupational dose in excess of the standards specified in the following table:

Rems [Sieverts] per Calendar Quarter

Whole body; head and trunk; active blood-forming organs; lens of eyes; or gonads	1 1/4 rems [12.5 millisieverts]
Hands and forearms; feet and ankles	18 3/4 rems [187.5 millisieverts]
Skin of whole body	7 1/2 rems [75 millisieverts]

b. A licensee or registrant may permit an individual in a restricted area to receive a total occupational dose to the whole body greater than that permitted under subdivision a, provided all of the following conditions are met:

- (1) During any calendar quarter, the total occupational dose to the whole body shall not exceed three rems-[30 millisieverts];
- (2) The dose to the whole body, when added to the accumulated occupational dose to the whole body, shall not exceed 5 (N-18) rems [50 (N-18) millisieverts] where "N" equals the individual's age in years at the individual's last birthday; and

- (3) The licensee or registrant has determined the individual's accumulated occupational dose to the whole body on Department Form RAD 682 or on a clear and legible record containing all the information required in that form and has otherwise complied with the requirements of subsection 2. As used in ~~this~~ subdivision b of subsection 1, "dose to the whole body" includes any dose to the whole body, gonads, active blood-forming organs, head and trunk, or lens of eye.

2. Determination of accumulated dose.

- a. (1) Each licensee or registrant shall require any individual, prior to first entry of the individual into the licensee's or registrant's restricted area during each employment or work assignment under such circumstances that the individual will receive or is likely to receive in any period of one calendar quarter an occupational dose in excess of twenty-five percent of the applicable standards specified in ~~this~~ subdivision a of subsection 1 and subdivision a of subsection 4, to disclose in a written, signed statement, either of the following:

~~(1)~~ (a) ~~that~~ That the individual had no prior occupational dose during the current calendar quarter, or

~~(2)~~ (b) ~~the~~ The nature and amount of any occupational dose which the individual may have received during the specifically identified current calendar quarter from sources of radiation possessed or controlled by other persons.

- (2) Each licensee or registrant shall maintain records of such statements until the department authorizes their disposition.

- b. Before permitting, pursuant to subdivision b of subsection 1 ~~of this section~~, any individual in a restricted area to receive an occupational radiation dose in excess of the standards specified in subdivision a of subsection 1, each licensee or registrant shall:

- (1) Obtain a certificate on Department Form RAD 682 or on a clear and legible record containing all the information required in that form, signed by the individual, showing each period of time after the individual attained the age of eighteen in which the individual received an occupational dose of radiation; and

- (2) Calculate on Department Form RAD 682 in accordance with the instructions appearing therein, or on a clear and legible record containing all the information required in that form, the previously accumulated occupational dose received by the individual and the additional dose allowed for that individual under subdivision b of subsection 1.
- c. (1) In the preparation of Department Form RAD 682, or a clear and legible record containing all the information required in that form, the licensee or registrant shall make a reasonable effort to obtain reports of the individual's previously accumulated occupational dose. For each period for which the licensee or registrant obtains such reports, the licensee or registrant shall use the dose shown in the report in preparing the form. In any case where a licensee or registrant is unable to obtain reports of the individual's occupational dose for a previous complete calendar quarter, it shall be assumed that the individual has received the occupational dose specified in whichever of the following columns apply:

Part of Body	Column 1	Column 2
	Assumed Dose in Rems [<u>millisieverts</u>] for Calendar Quarters Prior to January 1, 1961	Assumed Dose in Rems [<u>millisieverts</u>] for Calendar Quarters Beginning After January 1, 1961
Whole body, gonads, active blood-forming organs, head and trunk, lens of eye	3 3/4 rems [<u>37.5 millisieverts</u>]	1 1/4 rems [<u>12.5 millisieverts</u>]

- (2) The licensee or registrant shall retain and preserve records used in preparing Department Form RAD 682 until the department authorizes their disposition. If calculation of the individual's accumulated occupational dose for all periods prior to January 1, 1961, yields a result higher than the applicable accumulated dose value for the individual as of that date, as specified in paragraph 2 of subdivision b of subsection 1, the excess may be disregarded.
3. Exposure of individuals to concentrations of radioactive material in restricted areas.
- a. (1) No licensee shall possess, use, or transfer radioactive material in such a manner as to permit any individual in a restricted area to inhale a

quantity of radioactive material in any period of one calendar quarter greater than the quantity which would result from inhalation for forty hours per week for thirteen weeks at uniform concentrations of radioactive material in air specified in appendix A, table I, column 1 of this chapter. If the radioactive material is of such form that intake by absorption through the skin is likely, individual exposures to radioactive material shall be controlled so that the uptake of radioactive material by any organ from either inhalation or absorption or both routes of intake in any calendar quarter does not exceed that which would result from inhaling such radioactive material for forty hours per week or thirteen weeks at uniform concentrations specified in Appendix A.

Since the concentration specified for tritium oxide vapor assumes equal intakes by skin absorption and inhalation, the total intake permitted is twice that which would result from inhalation alone at the concentration specified for tritium (H-3) (S) in appendix A, table I, column 1 of this chapter for forty hours per week for thirteen weeks.

For radon-222, the limiting quantity is that inhaled in a period of one calendar year. For radioactive material designated "Sub" in the "Isotope" column of the table, the concentration value specified is based upon exposure to the material as an external radiation source. Individual exposures to these materials may be accounted for as part of the limitation on individual dose in chapter 33-10-04 subsection 1. These nuclides shall be subject to the precautionary procedures required by this chapter paragraph 1 of subdivision b.

Multiply the concentration values specified in appendix A, table I, column 1 of this chapter by 6.3×10^8 ml milliliters to obtain the quarterly quantity limit. Multiply the concentration value specified in appendix A, table I, column 1 of this chapter by 2.5×10^9 ml milliliters to obtain the annual quantity limit for Rn-222.

If the radioactive material is of such form that intake by absorption through the skin is likely, individual exposures to radioactive material shall be controlled so that the uptake of radioactive material by any organ from either inhalation or absorption or both routes of intake in any calendar quarter does not exceed that which would result from inhaling such radioactive material for forty hours per week for

thirteen weeks at uniform concentrations specified in appendix A, table I, column 1 of this chapter.

Significant intake by ingestion or injection is presumed to occur only as a result of circumstances such as accident, inadvertence, poor procedure, or similar special conditions. Such intakes must be evaluated and accounted for by techniques and procedures as may be appropriate to the circumstances of the occurrence. Exposures so evaluated must be included in determining whether the limitation on individual exposures in paragraph 1 of subdivision a has been exceeded.

Regulatory guidance on assessment of individual intakes of radioactive material is given in United States nuclear regulatory commission regulatory guide 8.9, "Acceptable Concepts, Models, Equations and Assumptions for a Bioassay Program". Single copies of regulatory guide 8.9 are available from the department, upon written request.

b. To determine compliance with subdivision a-

- (1) The concentration for soluble hydrogen 3 in Table I, Column 1, of this chapter may be multiplied by 2.
- (2) For radon-222, a limiting quantity is that inhaled in a period of one calendar year.
- (3) For radioactive material designated "Sub" in the "Isotope" column of Table I of this chapter, the specified concentrations are based upon exposure to the radioactive material as an external source; hence, individual exposures to these radioactive materials may be accounted for as part of the limitation on individual dose in one point of this section.
- (4) It shall be assumed that a person working forty hours per week inhales 6.3×10^8 ml of air during thirteen such weeks and 2.5×10^9 ml of air during one year.

c. Notwithstanding subdivision a, if radioactive material is of such form that intake by absorption through the skin is likely, individual exposures to radioactive material shall be controlled so that the uptake of radioactive material by any organ from either inhalation or absorption or both routes of intake in any calendar quarter does not exceed that which would result from inhaling such radioactive material for forty hours per week for thirteen weeks at uniform concentrations specified in appendix A, table I, column 1, of this chapter.

~~d.~~ (2) No licensee shall possess, use, or transfer mixtures of U-234, U-235, and U-238 in soluble form in such a manner as to permit any individual in a restricted area to inhale a quantity of such material in excess of the intake limits specified in appendix A, table I, column 1, of this chapter. If such soluble uranium is of a form such that absorption through the skin is likely, individual exposures to such material shall be controlled so that the uptake of such material by any organ from either inhalation or absorption or both routes of intake does not exceed that which would result from inhaling such material at the limit specified in appendix A, table I, column 1, of this chapter. (Significant intake by ingestion or injection is presumed to occur only as a result of circumstances such as accident, inadvertence, poor procedure, or similar special conditions. Such intakes must be evaluated and accounted for by techniques and procedures as may be appropriate to the circumstances of the occurrence. Exposures so evaluated shall be included in determining whether the limitation on individual exposures in subdivision a of subsection 1 has been exceeded.)

~~e.~~ (3) For the purpose of determining compliance with the requirements of this ~~section~~ subsection, the licensee shall use suitable measurements of concentrations of radioactive materials in air for detecting and evaluating airborne radioactivity in restricted areas and in addition, as appropriate, shall use measurements of radioactivity in the body, measurements of radioactivity excreted from the body, or any combination of such measurements as may be necessary for timely detection and assessment of individual intakes of radioactivity by exposed individuals. It is assumed that an individual inhales radioactive material at the airborne concentration in which an individual is present unless the individual uses respiratory protective equipment pursuant to ~~this subsection~~ subdivision c. When assessment of a particular individual's intake of radioactive material is necessary, intakes less than those which would result from inhalation for two hours in any one day or for ten hours in any one week at uniform concentrations specified in appendix A, table I, column 1, of this chapter need not be included in such assessment, provided that for any assessment in excess of these amounts the entire amount is included.

~~f.~~ b. (1) The licensee shall, as a precautionary procedure, use process or other engineering controls, to the extent practicable, to limit concentrations of radioactive

materials in air to levels below those which delimit an airborne radioactivity area as defined in ~~subdivision d of subsection 3 of section 33-10-04-03~~ 33-10-01-04.

- (2) When it is impracticable to apply process or other engineering controls to limit concentrations of radioactive material in air below those defined in ~~subdivision d of subsection 3 of section 33-10-04-03~~ 33-10-01-04, other precautionary procedures, such as increased surveillance, limitation of working times, or provision of respiratory protective equipment, shall be used to maintain intake of radioactive material by any individual within any period of seven consecutive days as far below that intake of radioactive material which would result from inhalation of such material for forty hours at the uniform concentrations specified in appendix A, table I, column 1, of this chapter as is reasonably achievable. Whenever the intake of radioactive material by any individual exceeds this forty hour control measure, the licensee shall make such evaluations and take such actions as are necessary to assure against reoccurrence. The licensee shall maintain records of such occurrences, evaluations, and actions taken in a clear and readily identifiable form suitable for summary review and evaluation.

~~g.~~ c. When respiratory protective equipment is used to limit the inhalation of airborne radioactive material pursuant to paragraph 2 of subdivision f b, ~~a~~ the licensee may make allowance for such use in estimating exposures of individuals to such materials provided that such equipment is used as stipulated in regulatory guide 8.15, "Acceptable Programs for Respiratory Protection", of the United States nuclear regulatory commission. (Single copies of the United States nuclear regulator commission regulatory guide 8.15 are available from the department, upon written request.)

~~h.~~ d. Notwithstanding the provisions of subdivisions ~~f b~~ and ~~g~~ c, the department may impose further restrictions:

- (1) On the extent to which a licensee may make allowance for use of respirators in lieu of provision of process, containment, ventilation, or other engineering controls, if application of such controls is found to be practicable; and
- (2) As might be necessary to assure that the respiratory protective program of the licensee is adequate in limiting exposures of personnel to airborne radioactive ~~materials~~ material.

- ~~i~~ e. The licensee shall notify, in writing, the department at least thirty days before the date that respiratory equipment is first used under the provisions of this subsection.
 - ~~j~~ f. A licensee who was authorized to make allowance for use of respiratory protective equipment prior to October 1, 1982, shall bring the licensee's respiratory protective program into conformance with the requirements of subdivision g c within one year of that date, and is exempt from the requirements of subdivision e.
4. Exposure of minors. (For determining the doses specified in this subsection, a dose from x or gamma rays up to ten MeV may be assumed to be equivalent to the exposure measured by a properly calibrated appropriate instrument in air at or near the body surface in the region of the highest dose rate.)
- a. No licensee or registrant shall possess, use, or transfer sources of radiation in such a manner as to cause any individual within a restricted area, who is under eighteen years of age, to receive in any period of one calendar quarter from all sources of radiation in such licensee's or registrant's possession a dose in excess of ten percent of the limits specified in the table in subdivision a of subsection 1.
 - b. No licensee shall possess, use, or transfer radioactive material in such a manner as to cause any individual within a restricted area, who is under eighteen years of age, to be exposed to airborne radioactive material in an average concentration in excess of the limits specified in appendix A, table II, of this chapter. For purposes of this subdivision, concentrations may be averaged over periods not greater than a week.
 - c. The provisions of paragraph 2 of subdivision b and subdivision c of subsection 3 shall apply to exposures subject to subdivision b of subsection 4 except that the references in paragraph 2 of subdivision b and subdivision c of subsection 3 to appendix A, table I, column 1 of this chapter must be deemed to be references to appendix A, table II, column 1 of this chapter.
5. Permissible levels of radiation from external sources in unrestricted areas. (It is the intent of this subsection to limit radiation levels so that it is unlikely that individuals in unrestricted areas would receive a dose to the whole body in excess of one-half rem [5.0 millisieverts] in any one year. If in specific instances, it is determined by the department that this intent is not met, the department may, pursuant to section 33-10-01-09, impose such additional requirements on

the licensee or registrant as may be necessary to meet the intent.)

a. Except as authorized by the department pursuant to subdivision b, no licensee or registrant shall possess, use, or transfer sources of radiation in such a manner as to create in any unrestricted area from such sources of radiation in the licensee's or registrant's possession:

(1) Radiation levels which, if an individual were continuously present in the area, could result in the individual receiving a dose in excess of two millirems [0.02 millisievert] in any one hour; or

(2) Radiation levels which, if an individual were continuously present in the area, could result in the individuals receiving a dose in excess of one hundred millirems [1.0 millisievert] in any seven consecutive days.

b. Any person may apply to the department for proposed limits upon levels of radiation in unrestricted areas in excess of those specified in subdivision a resulting from the applicant's possession or use of sources of radiation. Such applications should include information as to anticipated average radiation levels and anticipated occupancy times for each unrestricted area involved. The department will approve the proposed limits if the applicant demonstrates to the satisfaction of the department that the proposed limits are not likely to cause any individual to receive a dose to the whole body in any period of one calendar year in excess of one-half rem [5.0 millisieverts].

6. Concentration of radioactivity in effluents to unrestricted areas.

a. A licensee shall not possess, use, or transfer licensed material so as to release to an unrestricted area radioactive material in concentrations which exceed the limits specified in appendix A, table II, of this chapter, except as authorized pursuant to subsection 2 of section 33-10-04-04 or subdivision b of this subsection. For purposes of this subsection concentrations may be averaged over a period not greater than one year.

b. An application for a license or amendment may include proposed limits higher than those specified in subdivision a. The department will approve the proposed limits if the applicant demonstrates all of the following:

- (1) That the applicant has made a reasonable effort to minimize the radioactivity contained in effluents to unrestricted areas.
 - (2) That it is not likely that radioactive material discharged in the effluent would result in the exposure of an individual to concentrations of radioactive material in air or water exceeding the limits specified in appendix A, table II, of this chapter.
- c. An application for higher limits pursuant to subdivision b shall include information demonstrating that the applicant has made a reasonable effort to minimize the radioactivity discharged in effluents to unrestricted areas, and shall include, as pertinent:
- (1) Information as to flow rates, total volume of effluent, peak concentration of each radionuclide in the effluent, and concentration of each radionuclide in the effluent averaged over a period of one year at the point where the effluent leaves a stack, tube, pipe, or similar conduit.
 - (2) A description of the properties of the effluents, including:
 - (a) Chemical composition.
 - (b) Physical characteristics, including suspended solids content in liquid effluents, and nature of gas or aerosol for air effluents.
 - (c) The hydrogen ion concentrations (pH) of liquid effluents.
 - (d) The size range of particulates in effluents released into air.
 - (3) A description of the anticipated human occupancy in the unrestricted area where the highest concentration of radioactive material from the effluent is expected, and, in the case of a river or stream, a description of water uses downstream from the point of release of the effluent.
 - (4) Information as to the highest concentration of each radionuclide in an unrestricted area, including anticipated concentrations averaged over a period of one year:
 - (a) In air at any point of human occupancy; or

- (b) In water at points of use downstream from the point of release of the effluent.
 - (5) The background concentration of radionuclides in the receiving river or stream prior to the release of liquid effluent.
 - (6) A description of the environmental monitoring equipment, including sensitivity of the system, and procedures and calculations to determine concentrations of radionuclides in the unrestricted area and possible reconcentrations of radionuclides.
 - (7) A description of the waste treatment facilities and procedures used to reduce the concentration of radionuclides in effluents prior to their release.
- d. For the purposes of this subsection, the concentration limits in appendix A, table II, of this chapter shall apply at the boundary of the restricted area. The concentration of radioactive material discharged through a stack, pipe, or similar conduit may be determined with respect to the point where the material leaves the conduit. If the conduit discharges within the restricted area, the concentration at the boundary may be determined by applying appropriate factors for dilution, dispersion, or decay between the point of discharge and the boundary.
- e. In addition to limiting concentrations in effluent streams, the department may limit quantities of radioactive material released in air or water during a specified period of time if it appears that the daily intake of radioactive material from air, water, or food by a suitable sample of an exposed population group, averaged over a period not exceeding one year, would otherwise exceed the daily intake resulting from continuous exposure to air or water containing one-third the concentration of radioactive material specified in appendix A, table II, of this chapter.
- f. The provisions of this subsection do not apply to disposal of radioactive material into sanitary sewerage systems, which is governed by subsection 3 of section 33-10-04-04.
- g. In addition to the other requirements of this chapter, licensees engaged in uranium fuel cycle operations shall comply with the provisions of 40 CFR part 190, "Environmental Radiation Protection Standards for Nuclear Power Operations".
7. Orders requiring furnishing of bioassay services. Where necessary or desirable in order to aid in determining the extent of an individual's exposure to concentrations of

radioactive material, the department may incorporate license provisions or issue an order requiring a licensee or registrant to make available to the individual appropriate bioassay services and to furnish a copy of the reports of such services to the department.

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 23-01-03

33-10-04-03. Precautionary procedures.

1. Surveys. Each licensee or registrant shall make or cause to be made such surveys as may be necessary for the applicant licensee or registrant to establish compliance with this chapter article and are reasonable under the circumstances to evaluate the extent of radiation hazards that may be present.
2. Personnel monitoring.
 - a. Each licensee or registrant shall supply appropriate personnel monitoring equipment to, and shall require the use of such equipment by:
 - a. (1) Each individual who enters a restricted area under such circumstances that the individual receives, or is likely to receive, a dose in any calendar quarter in excess of twenty-five percent of the applicable value specified in subdivision a of subsection 1 of section 33-10-04-02.
 - b. (2) Each individual under eighteen years of age who enters a restricted area under such circumstances that the individual receives, or is likely to receive, a dose in any calendar quarter in excess of five percent of the applicable value specified in subdivision a of subsection 1 of section 33-10-04-02.
 - c. (3) Each individual who enters a high radiation area.
 - b. Except as noted in subdivision c, all personnel dosimeters that require processing to determine the radiation dose and are utilized by licensees or registrants to comply with subdivision a, with other applicable chapters of this article, or with conditions specified in a license or a certificate of registration must be processed and evaluated by a dosimetry processor currently accredited by the national voluntary laboratory accreditation program of the national institute of standards and technology and approved in this accreditation process for the type of radiation or radiations that most closely approximate the

type of radiation or radiations for which the individual wearing the dosimeter is monitored.

c. The requirements of subdivision b do not apply to personnel dosimeters used to measure the dose to hand and forearms and feet and ankles.

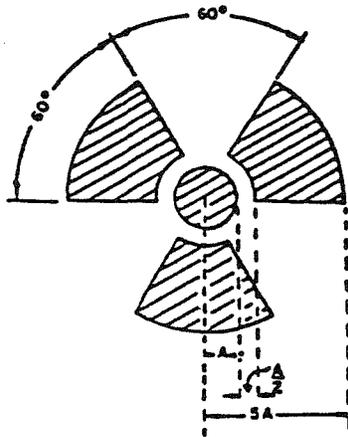
3. Caution signs, labels, and signals.

a. General.

- (1) Except as otherwise authorized by the department, symbols prescribed by this subsection shall use the conventional radiation caution colors (magenta or purple on yellow background). The symbol prescribed by this subsection is the conventional three blade design:

RADIATION SYMBOL

- (a) Crosshatch area is to be magenta or purple.
(b) Background is to be yellow.



- (2) In addition to the contents of signs and labels prescribed in this subsection, a licensee or registrant may provide on or near such signs and labels any additional information which may be appropriate in aiding individuals to minimize exposure to radiation.

- b. Radiation areas. Each radiation area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

CAUTION*

RADIATION AREA

*or "DANGER"

- c. High radiation areas.

- (1) Each high radiation area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

CAUTION*

HIGH RADIATION AREA

*or "DANGER"

- (2) Each entrance or access point to a high radiation area shall be:
- (a) Equipped with a control device which shall cause the level of radiation to be reduced below that at which an individual might receive a dose of one hundred millirems [1.0 millisievert] in one hour upon entry into the area;
 - (b) Equipped with a control device which shall energize a conspicuous visible or audible alarm signal in such a manner that the individual entering the high radiation area and the licensee or a supervisor of the activity are made aware of the entry; or
 - (c) Maintained locked except during periods when access to the area is required, with positive control over each individual entry.
- (3) The controls required by paragraph 2 shall be established in such a way that no individual will be prevented from leaving a high radiation area.
- (4) In the case of a high radiation area established for a period of thirty days or less, direct surveillance to prevent unauthorized entry may be substituted for the controls required by paragraph 2.
- (5) Any licensee or registrant may apply to the department for approval of methods not included in

paragraphs 2 and 4 for controlling access to high radiation areas. The department will approve the proposed alternatives if the licensee or registrant demonstrates that the alternative methods of control will prevent unauthorized entry into a high radiation area, and that the requirement of paragraph 3 is met.

(6) Each area in which there may exist radiation levels in excess of five hundred rems [5.0 sieverts] in one hour at one meter from a sealed radioactive source that is used to irradiate materials shall have entry control devices and alarms meeting the criteria specified in 10 CFR 20.203(c)(6).

(7) The requirements of paragraph 6 of this subdivision shall not apply to radioactive sources that are used in teletherapy, industrial radiography, or in completely self-contained irradiators. In the case of open field irradiators in which certain of the criteria specified in paragraph 6 are impracticable, equivalent protection shall be provided by license conditions. At least one of the alternative measures must include an entry-preventing interlock control based on a physical measurement of radiation that assures the absence of high radiation levels before an individual can gain access to an area where such sources are used.

d. Airborne radioactivity areas. Each airborne radioactivity area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

CAUTION*

AIRBORNE RADIOACTIVITY AREA

*or "DANGER"

e. Additional requirements.

(1) Each area or room in which any radioactive material, other than natural uranium or thorium, is used or stored in an amount exceeding ten times the quantity of radioactive material specified in appendix B of this chapter shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

CAUTION*

RADIOACTIVE MATERIAL

*or "DANGER"

- (2) Each area or room in which natural uranium or thorium is used or stored in an amount exceeding one hundred times the quantity specified in appendix B of this chapter shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words:

CAUTION*

RADIOACTIVE MATERIAL

*or "DANGER"

f. Containers.

- (1) Except as provided in paragraph 3, each container of radioactive material shall bear a durable, clearly visible label identifying the radioactive contents.
- (2) A label required pursuant to paragraph 1 shall bear the radiation caution symbol and the words:

CAUTION*

RADIOACTIVE MATERIAL

*or "DANGER"

It shall also provide sufficient information to permit individuals handling or using the containers, or working in the vicinity thereof, to take precautions to avoid or minimize exposures. (As appropriate, the information will include radiation levels, kinds of material, estimate of activity, date for which activity is estimated, etc.)

- (3) Notwithstanding the provisions of paragraph 1, labeling is not required:
 - (a) For containers that do not contain radioactive material in quantities greater than the applicable quantities listed in appendix B of this chapter.
 - (b) For containers containing only natural uranium or thorium in quantities no greater than ten

times the applicable quantities listed in appendix B of this chapter.

- (c) For containers that do not contain radioactive material in concentrations greater than the applicable concentrations listed in ~~Column 2, Table I,~~ appendix A, table I, column 2 of this chapter.
 - (d) For containers attended by an individual who takes the precautions necessary to prevent the exposure of any individual to radiation or radioactive material in excess of the limits established by this chapter.
 - (e) For containers in transport and packaged and labeled in accordance with regulations published by the United States department of transportation.
 - (f) For containers accessible only to individuals authorized to handle or use them or to work in the vicinity thereof, provided that the contents are identified to such individuals by a readily available written record. (For example, containers in locations such as water-filled canals, storage vaults, or hot cells.)
 - (g) For manufacturing and process equipment such as piping and tanks.
- (4) Each license shall, prior to disposal of an empty uncontaminated container to unrestricted areas, remove or deface the radioactive material label or otherwise clearly indicate that the container no longer contains radioactive materials.
- g. All radiation machines shall be labeled in a manner which cautions individuals that radiation is produced when the machine is being operated.
4. Exceptions from posting and labeling requirements. Notwithstanding the provisions of ~~subdivision c of~~ subsection 3:
- a. A room or area is not required to be posted with a caution sign because of the presence of a sealed source, provided the radiation level twelve inches [30.5 centimeters], from the surface of the source container or housing does not exceed five millirem [0.05.millisievert] per hour.
 - b. Rooms or other areas in hospitals are not required to be posted with caution signs, and control of entrance or

access thereto pursuant to subdivision c of subsection 3 is not required, because of the presence of patients containing radioactive material provided that there are personnel in attendance who will take the precautions necessary to prevent the exposure of any individual to radiation or radioactive material in excess of the limits established in this chapter.

- c. Caution signs are not required to be posted in areas or rooms containing radioactive material for periods of less than eight hours provided that:
 - (1) ~~the~~ The material is constantly attended during such periods by an individual who shall take the precautions necessary to prevent the exposure of any individual to radiation or radioactive material in excess of the limits established in this ~~part~~ chapter; and
 - (2) ~~such~~ Such area or room is subject to the licensee's or registrant's control.
 - d. A room or other area is not required to be posted with a caution sign, and control is not required for each entrance or access point to a room or other area which is a high radiation area solely because of the presence of radioactive material prepared for transport and packaged and labeled in accordance with regulations of the United States department of transportation.
5. Instruction of personnel. Instructions required for individuals working in or frequenting any portion of a restricted area are specified in subsection 2 of section ~~33-10-10-01~~ 33-10-10-02.
 6. Storage and control of sources of radiation.
 - a. Sources of radiation shall be secured from unauthorized removal from the place of storage.
 - b. Sources of radiation in an unrestricted area and not in storage shall be tended under the constant surveillance and immediate control of the licensee or registrant.
 7. Procedures for picking up, receiving, and opening packages.
 - (1) Each licensee or registrant who expects to receive a package containing quantities of radioactive material in excess of the ~~Type A~~ A₁ or A₂ quantities specified in ~~subdivision b~~ appendix A of chapter 33-10-13 shall:

- (a) If the package is to be delivered to the licensee's or registrant's facility by the carrier, make arrangements to receive the package when it is offered for delivery by the carrier; or
 - (b) If the package is to be picked up by the licensee or registrant at the carrier's terminal, make prior arrangements to receive notification from the carrier of the arrival of the package, at the time of arrival.
- (2) Each licensee or registrant who picks up a package of radioactive material from a carrier's terminal shall pick up the package expeditiously upon receipt of notification from the carrier of its arrival.
- b. (1) Each licensee or registrant, upon receipt of a package of radioactive material, shall monitor the external surfaces of the package for radioactive contamination caused by leakage of the radioactive contents, ~~except~~. The monitoring must be performed as soon as practicable after receipt, but no later than three hours after the package is received at the licensee's or registrant's facility if received during the licensee's or registrant's normal working hours or eighteen hours if received after normal working hours. Such monitoring need not be performed on:
- (a) Packages containing no more than the exempt quantity specified in the table in this subdivision ten microcuries [370 kilobecquerels] of alpha-emitting radioactive material or no more than one millicurie [37 megabecquerels] of other radioactive material.
 - (b) Packages containing no more than ten millicuries [370 megabecquerels] of radioactive material consisting solely of tritium, carbon-14, sulfur-35, or iodine-125.
 - (c) Packages containing only special form radioactive material as or gases or in special form.
 - (d) Packages containing only radioactive material in other than liquid form ~~←, including Mo-99/Tc-99m generators→~~, and not exceeding the Type A quantity limit specified in the table in this subdivision no more than the A₂ quantity specified in appendix A of chapter 33-10-13.

- (e) Packages containing only radionuclides with half-lives of less than thirty days and a total quantity of no more than one hundred millicuries [3.7 gigabecquerels].

The monitoring shall be performed as soon as practicable after receipt, but no later than three hours after the package is received at the licensee's facility if received during the licensee's normal working hours, or eighteen hours if received after normal working hours.

- (2) If removable radioactive contamination in excess of one-hundredth microcurie (~~twenty-two thousand two hundred disintegrations per minute~~) [370 becquerels] per one hundred square centimeters of package surface is found on the external surfaces of the package, the licensee or registrant shall immediately notify by telephone and telegraph in writing (or facsimile), the final delivering carrier and the department.

Table of Exempt and Type A Quantities

Transport group *	Exempt Quantity Limit (in millicuries)	Type A Quantity Limit (in curies)
I	0.01	0.001
II	0.1	0.050
III	1	3
IV	1	20
V	1	20
VI	1	1,000
VII	25,000	1,000
Special form *	1	20

* The definitions of "transport group" and "special form" are specified in section 33-10-01-04.

- c. (1) Each licensee or registrant, upon receipt of a package containing quantities of radioactive material in excess of the Type A₁ or A₂ quantities specified in subdivision b appendix A of chapter 33-10-13, other than those transported by exclusive use vehicle, shall monitor the radiation levels external to the package. The package shall be monitored as soon as practicable after receipt, but no later than three hours after the package is received at the licensee's or registrant's facility if received during the licensee's or registrant's normal working

hours, or eighteen hours if received after normal working hours.

- (2) If radiation levels are found on the external surface of the package in excess of two hundred millirem [2.0 millisievert] per hour, or in excess of ten millirem [0.1 millisievert] per hour at three feet [~~91.44 centimeters~~ 0.9 meter], from the external surface of the package in excess of ten millirem per hours, the licensee or registrant shall immediately notify, by telephone and ~~telegraph~~ in writing (or facsimile), the final delivering carrier and the department.

- d. Each licensee shall establish and maintain procedures for safely opening packages in which radioactive material is received, and shall assure that such procedures are followed and that due consideration is given to special instructions for the type of package being opened.

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 23-01-03

33-10-04-04. Waste disposal.

1. General requirement. No licensee shall dispose of any radioactive material except:
 - a. By transfer to an authorized recipient as provided in ~~chapter 33-10-03~~ subsection 12 of section 33-10-03-05; or
 - b. As authorized pursuant to subsection 6 of section 33-10-04-02 or subsection 2, 3, or 4 ~~of this section~~.
2. Method of obtaining approval of proposed disposal procedures.
 - a. Any person may apply to the department for approval of proposed procedures to dispose of radioactive material in a manner not otherwise authorized in this chapter. Each application shall include a description of the radioactive material, including the quantities and kinds of radioactive material and levels of radioactivity involved, and the proposed manner and conditions of disposal. The application, where appropriate, should also include an analysis and evaluation of pertinent information as to the nature of the environment, including topographical, geological, meteorological, and hydrological characteristics; usage of ground and surface ~~water~~ waters in the general area; the nature and location of other potentially affected facilities; and procedures to be observed to minimize the risk of unexpected or hazardous exposures.

b. The department will not approve any application for a license to receive radioactive material from other persons for disposal on land not owned by a state or the federal government.

3. Disposal by release into sanitary sewage systems.

a. No licensee or registrant shall discharge radioactive material into a sanitary sewage system unless all of the following are met:

~~a.~~ (1) It is readily soluble or dispersible in water.

~~b.~~ (2) The quantity of any radioactive material released into the system by the licensee or registrant in any one day does not exceed the larger of ~~paragraph 1 or 2~~:

~~(a)~~ (a) The quantity which, if diluted by the average daily quantity of sewage released into the sewer by the licensee or registrant, will result in an average concentration not greater than the limits specified in appendix A, table I, column 2, of this chapter.

~~(b)~~ (b) Ten times the quantity of such material specified in appendix B of this chapter.

~~c.~~ (3) The quantity of any radioactive material released in any one month, if diluted by the average monthly quantity of water released by the licensee or registrant, will not result in an average concentration exceeding the limits specified in appendix A, table I, column 2, of this chapter.

~~d.~~ (4) The gross quantity of ~~licensed and other~~ radioactive material, excluding hydrogen-3 and carbon-14, released into the sanitary sewage system by the licensee or registrant does not exceed one curie [37 gigabecquerels] per year. The quantities of hydrogen-3 and carbon-14 released into the sanitary sewage system may not exceed five curies [185 gigabecquerels] per year ~~or for~~ for hydrogen-3 and one curie [37 gigabecquerels] per year for carbon-14.

c. Excreta from individuals undergoing medical diagnosis or therapy with radioactive material shall be exempt from any limitations contained in this subsection.

d. No licensee or registrant may discharge radioactive material into an individual sewage disposal system used for the treatment of wastewater serving only a single dwelling, office building, industrial plant, or

institution except as specifically approved by the department pursuant to subsection 6 of section 33-10-04-02 and subsection 2 of this section.

- ~~4.~~ No licensee shall discharge radioactive material into an individual sewage disposal system used for the treatment of wastewater serving only a single dwelling, office building, industrial plant, or institution except as specifically approved by the department pursuant to subsection 6 of section ~~33-15-01-01~~ and subsection 2 of section ~~33-10-04-04~~.
- ~~5.~~ Excreta from individuals undergoing medical diagnosis or therapy with radioactive material shall be exempt from any limitations contained in this subsection.
- ~~6.~~ 4. Disposal by burial in soil. No licensee shall dispose of radioactive material by burial in soil except as specifically approved by the department pursuant to subsection 2 of this section.
- ~~7.~~ 5. Disposal by incineration. No licensee shall incinerate radioactive material for the purpose of disposal or preparation for disposal except as specifically approved by the department pursuant to subsection 6 of section 33-10-04-02 and subsection 2 of this section.
- ~~8.~~ 6. Disposal of specific wastes.
 - a. Any licensee may dispose of the following licensed material without regard to its radioactivity:
 - ~~a.~~ (1) Five-hundredths microcurie [1.850 kilobecquerels] or less of hydrogen-3 ~~or, carbon-14, or iodine-125,~~ per gram of medium, used for liquid scintillation counting, ~~or in vitro clinical or in vitro laboratory testing; and~~
 - ~~b.~~ (2) Five-hundredths microcurie [1.850 kilobecquerels] or less of hydrogen-3 ~~or, carbon-14, or iodine-125,~~ per gram of animal tissue averaged over the weight of the entire animal; provided, however, tissue may not be disposed of under this section in a manner that would permit its use either as food for humans or as animal feed.
 - ~~c.~~ b. Nothing in ~~this section~~ subsection a, however, relieves the licensee of maintaining records showing the receipt, transfer, and disposal of such radioactive material as specified in section 33-10-01-06.
 - ~~d.~~ c. Nothing in ~~this section~~ subsection a relieves the licensee from complying with other applicable federal, state, and

local regulations governing any other toxic or hazardous property of these materials.

~~9-~~ 7. Classification of radioactive waste for near-surface disposal.

- a. Considerations. Determination of the classification of waste involves two considerations. First, consideration must be given to the concentration of long-lived radionuclides (and their shorter-lived precursors) whose potential hazard will persist long after such precautions as institutional controls, improved waste form, and deeper disposal have ceased to be effective. These precautions delay the time when long-lived radionuclides could cause exposures. In addition, the magnitude of the potential dose is limited by the concentration and availability of the radionuclide at the time of exposure. Second, consideration must be given to the concentration of shorter-lived radionuclides for which requirements on institutional controls, waste form, and disposal methods are effective.
- b. Classes of waste.
 - (1) Class A waste is waste that is usually segregated from other waste classes at the disposal site. The physical form and characteristics of class A waste must meet the minimum requirements set forth in subdivision a of subsection ~~10 of this section~~ 8. If class A waste also meets the stability requirements set forth in subdivision b of subsection ~~10 of this section~~ 8, it is not necessary to segregate the waste for disposal.
 - (2) Class B waste is waste that must meet more rigorous requirements on waste form to ensure stability after disposal. The physical form and characteristics of class B waste must meet both the minimum and stability requirements set forth in subsection ~~10 of this section~~ 8.
 - (3) Class C waste is waste that not only must meet more rigorous requirements on waste to ensure stability but also requires additional measures at the disposal facility to protect against inadvertent intrusion. The physical form and characteristics of Class C waste must meet both the minimum and stability requirements set forth in subsection ~~10 of this section~~ 8.
- c. Classification determined by long-lived radionuclides. If the waste contains only radionuclides listed in table 1, classification shall be determined as follows:

- (1) If the concentration does not exceed one-tenth the value in table 1, the waste is class A.
- (2) If the concentration exceeds one-tenth the value in table 1 but does not exceed the value in table 1, the waste is class C.
- (3) If the concentration exceeds the value in table 1, the waste is not generally acceptable for near-surface disposal.
- (4) For wastes containing mixtures of radionuclides listed in table 1, the total concentration shall be determined by the sum of fractions rule described in subdivision g of this subsection.

Table 1

Radionuclide	Concentration (curies/cubic meter)*
C-14	8
C-14 in activated metal	80
Ni-59 in activated metal	220
Nb-94 in activated metal	0.2
Tc-99	3
I-129	0.08
Alpha emitting transuranic radionuclides with half-life greater than five years	100 [†] <u>nanocuries/gram</u>
Pu-241	3,500 [†] <u>nanocuries/gram</u>
Cm-242	20,000 [†] <u>nanocuries/gram</u>
Ra-226	100 [†] <u>nanocuries/gram</u>

[†] Units are nanocuries per gram

*To convert nanocuries to becquerels (Bq), multiply by 37.
To convert curies to gigabecquerels (GBq), multiply by 37.

- d. Classification determined by short-lived radionuclides. If the waste does not contain any of the radionuclides listed in table 1, classification shall be determined based on the concentrations shown in table 2. If a nuclide is not listed in table 2, it does not need to be considered in determining the waste class the waste does not contain any nuclides in either table 1 or 2, it is class A.

- (1) If the concentration does not exceed the value in column 1, the waste is class A.

- (2) If the concentration exceeds the value in column 1, but does not exceed the value in column 2, the waste is class B.
- (3) If the concentration exceeds the value in column 2, but does not exceed the value in column 3, the waste is class C.
- (4) If the concentration exceeds the value in column 3, the waste is not generally acceptable for near-surface disposal.
- (5) For wastes containing mixtures of the radionuclides listed in table 2, the total concentration shall be determined by the sum of fractions rule described in subdivision g of this subsection.

Table 2

Radionuclides	Concentration (curies/cubic meter)*		
	Column 1	Column 2	Column 3
Total of all radionuclides with less than five-year half-life	700	**	**
H-3	40	**	**
Co-60	700	**	**
Ni-63	3.5	70	700
Ni-63 in activated metal	35	700	7,000
Sr-90	0.04	150	7,000
Cs-137	1	44	4,600

*To convert nanocuries to becquerels (Bq), multiply by 37.

To convert curies to gigabecquerels (GBq), multiply by 37.

** There are no limits established for these radionuclides in Class B or C wastes. Practical considerations such as the effects of external radiation and internal heat generation on transportation, handling, and disposal will limit the concentrations for these wastes. These wastes shall be class B unless the concentrations of other radionuclides in table 2 determine the waste to be class C independent of these radionuclides.

- e. Classification determined by both long-lived and short-lived radionuclides. If the waste contains a mixture of radionuclides, some of which are listed in table 1, and some of which are listed in table 2, classification shall be determined as follows:

- (1) If the concentration of a radionuclide listed in table 1 is less than does not exceed one-tenth the value listed in table 1, the class shall be that determined by the concentration of radionuclides listed in table 2.
 - (2) If the concentration of a radionuclide listed in table 1 exceeds one-tenth the value listed in table 1, but does not exceed the value in table 1, the waste shall be class C, provided the concentration of radionuclides listed in table 2 does not exceed the value shown in column 3 of table 2.
- f. Classification of wastes with radionuclides other than those listed in tables 1 and 2. If the waste does not contain any radionuclides listed in either table 1 or 2, it is class A.
- g. The sum of the fractions rule for mixtures of radionuclides. For determining classification for waste that contains a mixture of radionuclides, it is necessary to determine the sum of fractions by dividing each radionuclide's concentration by the appropriate limit and adding the resulting values. The appropriate limits must all be taken from the same column of the same table. The sum of the fractions for the column must be less than, or equal to, 1.0 if the waste class is to be determined by that column.

Example: A waste contains Sr-90 in a concentration of 50 Ci/m³ [1.85 terabecquerels/m³] and Cs-137 in a concentration of ~~22~~Ci/m³ [814 gigabecquerels/m³]. Since the concentrations both exceed the values in table 2, column 1, ~~Table 2~~, they must be compared to column 2 values. For Sr-90 fraction, 50/150 = 0.33; for Cs-137 fraction, 22/44 = 0.5; the sum of the fractions = 0.83. Since the sum is less than 1.0, the waste is class B.

- h. Determination of concentrations in wastes. The concentration of a radionuclide may be determined by indirect methods such as use of scaling factors which relate the inferred concentration of one radionuclide to another that is measured, or radionuclide material accountability, if there is reasonable assurance that the indirect methods can be correlated with actual measurements. The concentration of a radionuclide may be averaged over the volume of the waste, or weight of the waste if the units are expressed as nanocuries per gram.

~~10~~ 8. Radioactive waste characteristics.

- a. The following are minimum requirements for all classes of waste and are intended to facilitate handling and provide

protection of health and safety of personnel at the disposal site.

- (1) Wastes shall be packaged in conformance with the conditions of the license issued to the site operator to which the waste will be shipped. Where the conditions of the site license are more restrictive than the provisions of ~~these rules~~ this article, the site license conditions shall govern.
 - (2) Wastes shall not be packaged for disposal in cardboard or fiberboard boxes.
 - (3) Liquid waste shall be packaged in sufficient absorbent material to absorb twice the volume of the liquid.
 - (4) Solid wastes containing liquid shall contain as little freestanding and noncorrosive liquid as is reasonably achievable, but in no case shall the liquid exceed one percent of the volume.
 - (5) Waste shall not be readily capable of detonation or of explosive decomposition or reaction at normal pressures and temperatures, or of explosive reaction with water.
 - (6) Waste shall not contain, or be capable of generating, quantities of toxic gases, vapors, or fumes harmful to persons transporting, handling, or disposing of the waste. This does not apply to radioactive gaseous waste packaged in accordance with paragraph 8 of this subdivision.
 - (7) Waste may not be pyrophoric. Pyrophoric materials contained in wastes shall be treated, prepared, and packaged to be nonflammable.
 - (8) Wastes in a gaseous form shall be packaged at ~~an~~ absolute a gauge pressure that does not exceed one and one-half atmospheres at twenty degrees Celsius. Total activity shall not exceed one hundred curies [3.7 terabecquerels] per container.
 - (9) Wastes containing hazardous, biological, pathogenic, or infectious material shall be treated to reduce to the maximum extent practicable the potential hazard from the nonradiological materials.
- b. The following are minimum requirements ~~are~~ intended to provide stability of the waste. Stability is intended to ensure that the waste does not degrade and affect overall stability of the site through slumping, collapse, or other

failure of the disposal unit and thereby lead to water infiltration. Stability is also a factor in limiting exposure to an inadvertent intruder, since it provides a recognizable and nondispersible waste.

- (1) Waste shall have structural stability. A structurally stable waste form will generally maintain its physical dimensions and its form, under the expected disposal conditions such as weight of overburden and compaction equipment, the presence of moisture, ~~and~~ microbial activity, and internal factors such as radiation effects and chemical changes. Structural stability can be provided by the waste form itself, processing the waste to a stable form, or placing the waste in a disposal container or structure that provides stability after disposal.
- (2) Notwithstanding the provisions in paragraphs 3 and 4 of subdivision a of this subsection, liquid wastes, or wastes containing liquid, shall be converted into a form that contains as little freestanding and noncorrosive liquid as is reasonably achievable, but in no case shall the liquid exceed one percent of the volume of the waste when the waste is in a disposal container designed to ensure stability, or five-tenths percent of the volume of the waste for waste processed to a stable form.
- (3) Void spaces within the waste and between the waste and its package shall be reduced to the extent practicable.

~~++~~ 9. Labeling. Each package of waste shall be clearly labeled to identify whether it is class A, class B, or class C waste, in accordance with subsection 7 ~~of this section~~.

~~+2~~ 10. Reserved.

~~+3~~ 11. Transfer for disposal and manifests.

- a. Each shipment of waste to a licensed land disposal facility shall be accompanied by a shipment manifest that contains the name, address, and telephone number of the person generating the waste. The manifest shall also include the name, address, and telephone number of the person transporting the waste to the land disposal facility. The manifest shall also indicate as completely as practicable: a physical description of the waste; the waste volume; radionuclide identity and quantity; the total radioactivity; and the principal chemical form. The solidification agent shall be specified. Wastes containing more than one-tenth percent chelating agents by weight shall be identified and the weight percentage of

the chelating agent estimated. Wastes classified as class A, class B, or class C in subsection 7 ~~of this section~~ shall be clearly identified as such in the manifest except when transferring to a licensed waste processor who treats or repackages waste. The total quantity of the radionuclides H-3, C-14, Tc-99, and I-129 shall be shown.

- b. The manifest required in subdivision a of this subsection may be shipping papers used to meet United States department of transportation or United States environmental protection agency regulations or requirements of the receiver, provided all the required information is included.
- c. Each manifest shall include a certification by the waste generator that the transported materials are properly classified, described, packaged, marked, and labeled and are in proper condition for transportation according to the applicable regulations of the United States department of transportation and the department. An authorized representative of the waste generator shall sign and date the manifest.
- d. Any generating licensee who transfers waste to a land disposal facility or a licensed waste collector shall comply with the following requirements. Any generating licensee who transfers waste to a licensed waste processor who treats or repackages waste shall comply with the requirements of paragraphs 4 through 8 of this subdivision. A licensee shall:
 - (1) Prepare all wastes so that the waste is classified according to subsection 9 ~~of this section~~ 7 and meets the waste characteristics requirements in subsection ~~10 of this section~~ 8.
 - (2) Label each package of waste to identify whether it is class A ~~waste~~, class B ~~waste~~, or class C waste, in accordance with subsection 9 ~~of this section~~ 7.
 - (3) Conduct a quality control program to assure compliance with subsections 9 7 and ~~10 of this section~~ 8; the program must include management evaluation of audits.
 - (4) Prepare shipping manifests to meet the requirements of subdivisions a and ~~b of this subsection~~ c.
 - (5) Forward a copy of the manifest to the intended recipient, at the time of shipment; or, deliver to a collector at the time the waste is collected,

obtaining acknowledgment of receipt in the form of a signed copy of the manifest from the collector.

- (6) Include one copy of the manifest with the shipment.
 - ~~(7)~~ (7) Forward a copy of the manifest to the department.
 - ~~(8)~~ (8) Retain a copy of the manifest with documentation of acknowledgment of receipt as the record of transfer of licensed material as required by ~~these rules~~ this article.
 - (9) For any shipments or any part of a shipment for which acknowledgment of receipt has not been received within the times set forth in this subsection, conduct an investigation in accordance with subdivision h ~~of this subsection~~.
- e. Any waste collector licensee who handles only prepackaged waste shall:
- (1) Acknowledge receipt of the waste from the generator within one week of receipt by returning a signed copy of the manifest.
 - (2) Prepare a new manifest to reflect consolidated shipments; the new manifest shall serve as a listing or index for the detailed generator manifests. Copies of the generator manifests shall be a part of the new manifest. The waste collector may prepare a new manifest without attaching the generator manifests, provided the new manifest contains for each package the information specified in subdivision ~~b~~ of this subsection a. The collector licensee shall certify that nothing has been done to the waste which would invalidate the generator's certification.
 - (3) Forward a copy of the new manifest to the land disposal facility operator at the time of shipment.
 - (4) Include the new manifest with the shipment to the disposal site.
 - (5) Retain a copy of the manifest with documentation of acknowledgment of receipt as the record of transfer of licensed material as required by this article, and retain information from generator manifests until disposition is authorized by the department.
 - (6) For any shipments or any part of a shipment for which acknowledgment of receipt is not received within the times set forth in this subdivision, conduct an

investigation in accordance with subdivision h of this subsection.

f. Any licensed waste processor who treats or repackages wastes shall:

- (1) Acknowledge receipt of the waste from the generator within one week of receipt by returning a signed copy of the manifest.
- (2) Prepare a new manifest that meets the requirements of subdivisions a, b, and c of this subsection. Preparation of the new manifest reflects that the processor is responsible for the waste.
- (3) Prepare all wastes so that the waste is classified according to subsection 9 of this section 7 and meets the waste characteristics requirement in subsection 10 of this section 8.
- (4) Label each package of waste to identify whether it is class A waste, class B waste, or class C waste, in accordance with subsections 9 7 and 11 of this section of this article 9.
- (5) A quality control program shall be conducted to assure compliance with subsections 9 7 and 10 9 of this section. The program must include management evaluation of audits.
- (6) Forward a copy of the new manifest to the disposal site operator or waste collector at the time of shipment, or deliver to a collector at the time the waste is collected, obtaining acknowledgment of receipt in the form of a signed copy of the manifest by the collector.
- (7) Include the new manifest with the shipment.
- (8) Retain copies of original manifests and new manifests with documentation of acknowledgment of receipt as the record of transfer of licensed material required by this article.
- (9) For any shipment or part of a shipment for which acknowledgment is not received within the times set forth in this section, conduct an investigation in accordance with subdivision h of this subsection.

g. The land disposal facility operator shall:

- (1) Acknowledge receipt of the waste within one week of receipt by returning a signed copy of the manifest to

the shipper. The shipper to be notified is the licensee who last possessed the waste and transferred the waste to the operator. The returned copy of the manifest shall indicate any discrepancies between materials listed on the manifest and materials received.

- (2) Maintain copies of all completed manifests until the department authorizes their disposition.
 - (3) Notify the shipper and the department when any shipment or part of a shipment has not arrived within sixty days after the advance manifest was received.
- h. Any shipment or part of a shipment for which acknowledgment is not received within the times set forth in this section must:
- (1) Be investigated by the shipper if the shipper has not received notification of receipt within twenty days after transfer.
 - (2) Be traced and reported. The investigation shall include tracing the shipment and filing a report with the department. Each licensee who conducts a trace investigation shall file a written report with the department within two weeks of completion of the investigation.

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC ~~23-01-03~~ 28-32-02

33-10-04-05. Records, reports, and notification.

1. Records of surveys, radiation monitoring, and disposal.

- a. Each licensee or registrant shall maintain records showing the radiation exposures of all individuals for whom personnel monitoring is required under subsection 2 of section 33-10-04-03. Such records shall be kept on Department Form RAD 683, in accordance with the instructions contained in that form, or on clear and legible records containing all the information required by Department Form RAD 683. The doses entered on the forms or records shall be for periods of time not exceeding one calendar quarter.
- b. Each licensee or registrant shall maintain records in the same units used in this chapter, showing the results of surveys required by subsection 1 of section 33-10-04-03, monitoring required by subdivisions b and c of subsection

7 of section 33-10-04-03, and disposals made under subsections 2, 3, ~~and~~ 4, 5, and 6 of section 33-10-04-04.

- c. (1) Records of individual exposure to radiation and to radioactive material which must be maintained pursuant to the provisions of subdivision a and records of bioassays, including results of whole body counting examinations, made pursuant to subsection 7 of section 33-10-04-02 shall be preserved until the department authorizes disposition.
- ~~d.~~ (2) Records of the results of surveys and monitoring which must be maintained pursuant to subdivision b shall be preserved for two years after completion of the survey except that the following records shall be maintained until the department authorizes their disposition:
 - ~~(1)~~ (a) Records of the results of surveys to determine compliance with subdivision a of subsection 3 of section 33-10-04-02.
 - ~~(2)~~ (b) In the absence of personnel monitoring data, records of the results of surveys to determine external radiation dose.
 - ~~(3)~~ (c) Records of the results of surveys used to evaluate the release of radioactive effluents to the environment.
- ~~e.~~ (3) Records of disposal of licensed radioactive material made pursuant to subsection 2, 3, ~~or~~ 4, 5, and 6 of section 33-10-04-04 shall be maintained until the department authorizes their disposition.
- ~~f.~~ (4) Records which must be maintained pursuant to this chapter may be the original or a reproduced copy or microfilm if such reproduced copy or microfilm is duly authenticated by authorized personnel and the microfilm is capable of producing a clear and legible copy after storage for the period specified by this chapter.
- ~~g.~~ (5) If there is a conflict between this chapter, license condition, or other written department approval or authorization pertaining to the retention period for the same type of record, the retention period specified in this chapter for such records shall apply unless the department, pursuant to subsection 1 of section 33-10-01-05, has granted a specific exemption from the record retention requirements specified in this chapter.

- ~~h.~~ (6) The discontinuance of, or curtailment of, activities does not relieve the licensee or registrant of responsibility for retaining all records required by this subsection. A licensee or registrant may, however, request the department to accept such records. The acceptance of the records by the department relieves the licensee or registrant of subsequent responsibility only in respect to their preservation as required by this subsection.
2. Reports of theft or loss of sources of radiation. Each licensee or registrant shall report by telephone and ~~telegraph~~ in writing (or by facsimile) to the department the theft or loss of any source of radiation immediately after such occurrence becomes known.
3. Notification of incidents.
- a. Immediate notification. Each licensee or registrant shall immediately ~~notify the department by telephone and telegraph of any incident~~ report any events to the department by telephone and in writing (or by facsimile) involving any source of radiation possessed by the licensee or registrant and which may have caused or threatens to cause any of the following:
- (1) A dose to the whole body of any individual of twenty-five rems [250 millisieverts] or more of radiation; a dose to the skin of the whole body of any individual of one hundred fifty rems [1.50 sievert] or more of radiation; or a dose to the feet, ankles, hands, or forearms of any individual of three hundred seventy-five rems [3.75 sieverts] or more of radiation.
 - (2) The release of radioactive material in concentrations which, if averaged over a period of twenty-four hours, would exceed five thousand times the limits specified for such materials in appendix A, table II of this chapter.
 - (3) A loss of one working week or more of the operation of any facilities affected.
 - (4) Damage to property in excess of two hundred thousand dollars.
- b. Twenty-four-hour notification. Each licensee or registrant shall within twenty-four hours notify the department by telephone and ~~telegraph~~ in writing (or by facsimile) of any incident involving any source of radiation possessed by the licensee or registrant and which may have caused or threatens to cause any of the following:

- (1) A dose to the whole body of any individual of five rems [50 millisieverts] or more of radiation; a dose to the skin of the whole body of any individual of thirty rems [300 millisieverts] or more of radiation; or a dose to the feet, ankles, hands, or forearms of seventy-five rems [750 millisieverts] or more of radiation.
 - (2) The release of radioactive material in concentrations which, if averaged over a period of twenty-four hours, would exceed five hundred times the limits specified for such materials in appendix A, table II of this chapter.
 - (3) A loss of one day or more of the operation of any facilities affected.
 - (4) Damage to property in excess of two thousand dollars.
- c. Any report filed with the department pursuant to this subsection shall be prepared in such a manner that names of individuals who have received excessive doses will be stated in a separate part of the report.

4. Reserved.

5. Reports of overexposures and excessive levels and concentrations.

- a. In addition to any notification required by subsection 3, each licensee or registrant shall make a report, in writing, within thirty days to the department of:

- (1) ~~each~~ Each exposure of an individual to radiation or concentrations of radioactive material in excess of any applicable limit ~~as set forth in this article or as otherwise approved by the department as required in section 33-10-04-02, subdivision a of subsection 4 of section 33-10-04-02, or the conditions of the license;~~

- (2) Each exposure of an individual to radioactive material in excess of the applicable limits in paragraphs 1 and 2 of subdivision a of subsection 3 and subdivision b of subsection 4 of section 33-10-04-02, or the conditions of the license;

- (3) Levels of radiation or concentrations of radioactive material in a restricted area in excess of any other applicable limit in the conditions of the license;

- ~~(2)~~ (4) ~~any~~ Any incident for which notification is required by subsection 3; and

~~(3)~~ (5) ~~levels~~ Levels of radiation or concentrations of radioactive material ~~(not involving excessive exposure of any individual)~~, whether or not involving excessive exposure of any individual, in an unrestricted area in excess of ten times any applicable limit ~~as~~ set forth in this chapter or as otherwise ~~approved~~ required by the ~~department~~ conditions of the license.

b. Each report required under this subdivision shall describe the extent of exposure of individuals to radiation or to radioactive material, including estimates of each individual's dose as required by subdivision c; levels of radiation and concentrations of radioactive material of this subsection involved; the cause of exposure, levels, or concentrations; and corrective steps taken or planned to assure against a recurrence.

~~b-~~ c. Any report filed with the department pursuant to this subsection shall include for each individual exposed the name, social security number, and date of birth, and an estimate of the individual's dose. The report shall be prepared so that this information is stated in a separate part of the report.

6. Reserved.

~~5-~~ 7. Vacating premises and equipment.

a. Premises. Each licensee before vacating any premise, or transferring the premise shall permanently decontaminate such premise below or equal to the standards specified in appendix C of this chapter. A survey shall be made after such decontamination and the department and the landlord or subsequent tenant or transferee shall be provided with a copy of such survey no less than thirty days before vacating or relinquishing possession or control of premise. No such premise may be vacated, sold, or transferred until the decontamination survey has been verified and accepted by the department.

b. Equipment. No machinery, instruments, laboratory equipment, or any other property used in contact with, or close proximity to radioactive material at a licensed premise may be assigned, sold, leased, or transferred to an unlicensed person unless such property has been permanently decontaminated below or equal to the standards specified in appendix C of this chapter. A survey shall be made after such decontamination and the department and subsequent transferee or owner shall be provided with a copy of such survey. No such equipment may be assigned, sold, leased, or transferred until such documentation survey has been verified and accepted by the department.

~~6-~~ 8. Notifications and reports to individuals.

- a. Requirements for notification and reports to individuals of exposure to radiation or radioactive material are specified in subsection 3 of section ~~33-10-10-01~~ 33-10-10-02.
- b. When a licensee or registrant is required pursuant to subsection ~~4~~ 5 to report to the department any exposure of an individual to radiation or radioactive material, the licensee or registrant shall also notify the individual. Such notice shall be transmitted at a time not later than the transmittal to the department, and shall comply with the provisions of subdivision a of subsection 3 of section ~~33-10-10-01~~ 33-10-10-02.

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

APPENDIX A
CONCENTRATIONS IN AIR AND WATER ABOVE NATURAL BACKGROUND

Element (atomic number)	isotope <u>Radio-</u> <u>nuclide</u> ^{1/}	Table I		Table II		
		Column 1 Air ($\mu\text{Ci/ml}$)	Column 2 Water ($\mu\text{Ci/ml}$)	Column 1 Air ($\mu\text{Ci/ml}$)	Column 2 Water ($\mu\text{Ci/ml}$)	
Actinium (89)	Ac-227	S	2×10^{-12}	6×10^{-5}	8×10^{-14}	2×10^{-6}
		I	3×10^{-11}	9×10^{-3}	9×10^{-13}	3×10^{-4}
	Ac-228	S	8×10^{-8}	3×10^{-3}	3×10^{-9}	9×10^{-5}
		I	2×10^{-8}	3×10^{-3}	6×10^{-10}	9×10^{-5}
Americium (95)	Am-241	S	6×10^{-12}	1×10^{-4}	2×10^{-13}	4×10^{-6}
		I	1×10^{-10}	8×10^{-4}	4×10^{-12}	3×10^{-5}
	Am-242m	S	6×10^{-12}	1×10^{-4}	2×10^{-13}	4×10^{-6}
		I	3×10^{-10}	3×10^{-3}	9×10^{-12}	9×10^{-5}
	Am-242	S	4×10^{-8}	4×10^{-3}	1×10^{-9}	1×10^{-4}
		I	5×10^{-8}	4×10^{-3}	2×10^{-9}	1×10^{-4}
	Am-243	S	6×10^{-12}	1×10^{-4}	2×10^{-13}	4×10^{-6}
		I	1×10^{-10}	8×10^{-4}	4×10^{-12}	3×10^{-5}
	Am-244	S	4×10^{-6}	1×10^{-1}	1×10^{-7}	5×10^{-3}
		I	2×10^{-5}	1×10^{-1}	8×10^{-7}	5×10^{-3}
Antimony (51)	Sb-122	S	2×10^{-7}	8×10^{-4}	6×10^{-9}	3×10^{-5}
		I	1×10^{-7}	8×10^{-4}	5×10^{-9}	3×10^{-5}
	Sb-124	S	2×10^{-7}	7×10^{-4}	5×10^{-9}	2×10^{-5}
		I	2×10^{-8}	7×10^{-4}	7×10^{-10}	2×10^{-5}
	Sb-125	S	5×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
		I	3×10^{-8}	3×10^{-3}	9×10^{-10}	1×10^{-4}
Argon (18)	Ar-37 Sub ^{2/}	6×10^{-3}	-----	1×10^{-4}	-----	
	Ar-41 Sub	2×10^{-6}	-----	4×10^{-8}	-----	
Arsenic (33)	As-73	S	2×10^{-6}	1×10^{-2}	7×10^{-8}	5×10^{-4}
		I	4×10^{-7}	1×10^{-2}	1×10^{-8}	5×10^{-4}
	As-74	S	3×10^{-7}	2×10^{-3}	1×10^{-8}	5×10^{-5}
		I	1×10^{-7}	2×10^{-3}	4×10^{-9}	5×10^{-5}
	As-76	S	1×10^{-7}	6×10^{-4}	4×10^{-9}	2×10^{-5}
		I	1×10^{-7}	6×10^{-4}	3×10^{-9}	2×10^{-5}
	As-77	S	5×10^{-7}	2×10^{-3}	2×10^{-8}	8×10^{-5}
		I	4×10^{-7}	2×10^{-3}	1×10^{-8}	8×10^{-5}
Astatine (85)	At-211	S	7×10^{-9}	5×10^{-5}	2×10^{-10}	2×10^{-6}
		I	3×10^{-8}	2×10^{-3}	1×10^{-9}	7×10^{-5}

Element (atomic number)	isotope Radio- nuclide ^{1/}	Table I		Table II		
		Column 1 Air ($\mu\text{Ci/ml}$)	Column 2 Water ($\mu\text{Ci/ml}$)	Column 1 Air ($\mu\text{Ci/ml}$)	Column 2 Water ($\mu\text{Ci/ml}$)	
Barium (56)	Ba-131	S	1×10^{-6}	5×10^{-3}	4×10^{-8}	2×10^{-4}
		I	4×10^{-7}	5×10^{-3}	1×10^{-8}	2×10^{-4}
	Ba-140	S	1×10^{-7}	8×10^{-4}	4×10^{-9}	3×10^{-5}
		I	4×10^{-8}	7×10^{-4}	1×10^{-9}	2×10^{-5}
Berkelium (97)	Bk-249	S	9×10^{-10}	2×10^{-2}	3×10^{-11}	6×10^{-4}
		I	1×10^{-7}	2×10^{-2}	4×10^{-9}	6×10^{-4}
	Bk-250	S	1×10^{-7}	6×10^{-3}	5×10^{-9}	2×10^{-4}
		I	1×10^{-6}	6×10^{-3}	4×10^{-8}	2×10^{-4}
Beryllium (4)	Be-7	S	6×10^{-6}	5×10^{-2}	2×10^{-7}	2×10^{-3}
		I	1×10^{-6}	5×10^{-2}	4×10^{-8}	2×10^{-3}
Bismuth (83)	Bi-206	S	2×10^{-7}	1×10^{-3}	6×10^{-9}	4×10^{-5}
		I	1×10^{-7}	1×10^{-3}	5×10^{-9}	4×10^{-5}
	Bi-207	S	2×10^{-7}	2×10^{-3}	6×10^{-9}	6×10^{-5}
		I	1×10^{-8}	2×10^{-3}	5×10^{-10}	6×10^{-5}
	Bi-210	S	6×10^{-9}	1×10^{-3}	2×10^{-10}	4×10^{-5}
		I	6×10^{-9}	1×10^{-3}	2×10^{-10}	4×10^{-5}
	Bi-212	S	1×10^{-7}	1×10^{-2}	3×10^{-9}	4×10^{-4}
		I	2×10^{-7}	1×10^{-2}	7×10^{-9}	4×10^{-4}
Bromine (35)	Br-82	S	1×10^{-6}	8×10^{-3}	4×10^{-8}	3×10^{-4}
		I	2×10^{-7}	1×10^{-3}	6×10^{-9}	4×10^{-5}
Cadmium (48)	Cd-109	S	5×10^{-8}	5×10^{-3}	2×10^{-9}	2×10^{-4}
		I	7×10^{-8}	5×10^{-3}	3×10^{-9}	2×10^{-4}
	Cd-115m	S	4×10^{-8}	7×10^{-4}	1×10^{-9}	3×10^{-5}
		I	4×10^{-8}	7×10^{-4}	1×10^{-9}	3×10^{-5}
	Cd-115	S	2×10^{-7}	1×10^{-3}	8×10^{-9}	3×10^{-5}
		I	2×10^{-7}	1×10^{-3}	6×10^{-9}	4×10^{-5}
Calcium (20)	Ca-45	S	3×10^{-8}	3×10^{-4}	1×10^{-9}	9×10^{-6}
		I	1×10^{-7}	5×10^{-3}	4×10^{-9}	2×10^{-4}
	Ca-47	S	2×10^{-7}	1×10^{-3}	6×10^{-9}	5×10^{-5}
		I	2×10^{-7}	1×10^{-3}	6×10^{-9}	3×10^{-5}
Californium (98)	Cf-49	S	2×10^{-12}	1×10^{-4}	5×10^{-14}	4×10^{-6}
		I	1×10^{-10}	7×10^{-4}	3×10^{-12}	2×10^{-5}
	Cf-250	S	5×10^{-12}	4×10^{-4}	2×10^{-13}	1×10^{-5}
		I	1×10^{-10}	7×10^{-4}	3×10^{-12}	3×10^{-5}
	Cf-251	S	2×10^{-12}	1×10^{-4}	6×10^{-14}	4×10^{-6}
		I	1×10^{-10}	8×10^{-4}	3×10^{-12}	3×10^{-5}
	Cf-252	S	6×10^{-12}	2×10^{-4}	2×10^{-13}	7×10^{-6}

Element (atomic number)	isotope Radio- nuclide ^{1/}	Table I		Table II		
		Column 1 Air ($\mu\text{Ci/ml}$)	Column 2 Water ($\mu\text{Ci/ml}$)	Column 1 Air ($\mu\text{Ci/ml}$)	Column 2 Water ($\mu\text{Ci/ml}$)	
	Cf-253	I	3×10^{-11}	2×10^{-4}	1×10^{-12}	7×10^{-6}
		S	8×10^{-10}	4×10^{-3}	3×10^{-11}	1×10^{-4}
	Cf-254	I	8×10^{-10}	4×10^{-3}	3×10^{-11}	1×10^{-4}
		S	5×10^{-12}	4×10^{-6}	2×10^{-13}	1×10^{-7}
		I	5×10^{-12}	4×10^{-6}	2×10^{-13}	1×10^{-7}
Carbon (6)	C-11*	Sub ^{2/}	4×10^{-6}	-----	-----	-----
	C-14	S	4×10^{-6}	2×10^{-2}	1×10^{-7}	8×10^{-4}
	(CO ₂)	Sub ^{2/}	5×10^{-5}	-----	1×10^{-6}	-----
Cerium (58)	Ce-141	S	4×10^{-7}	3×10^{-3}	2×10^{-8}	9×10^{-5}
		I	2×10^{-7}	3×10^{-3}	5×10^{-9}	9×10^{-5}
	Ce-143	S	3×10^{-7}	1×10^{-3}	9×10^{-9}	4×10^{-5}
		I	2×10^{-7}	1×10^{-3}	7×10^{-9}	4×10^{-5}
	Ce-144	S	1×10^{-8}	3×10^{-4}	3×10^{-10}	1×10^{-5}
		I	6×10^{-9}	3×10^{-4}	2×10^{-10}	1×10^{-5}
Cesium (55)	Cs-131	S	1×10^{-5}	7×10^{-2}	4×10^{-7}	2×10^{-3}
		I	3×10^{-6}	3×10^{-2}	1×10^{-7}	9×10^{-4}
	Cs-134m	S	4×10^{-5}	2×10^{-1}	1×10^{-6}	6×10^{-3}
		I	6×10^{-6}	3×10^{-2}	2×10^{-7}	1×10^{-3}
	Cs-134	S	4×10^{-8}	3×10^{-4}	1×10^{-9}	9×10^{-6}
		I	1×10^{-8}	1×10^{-3}	4×10^{-10}	4×10^{-5}
	Cs-135	S	5×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
		I	9×10^{-8}	7×10^{-3}	3×10^{-9}	2×10^{-4}
	Cs-136	S	4×10^{-7}	2×10^{-3}	1×10^{-8}	9×10^{-5}
		I	2×10^{-7}	2×10^{-3}	6×10^{-9}	6×10^{-5}
	Cs-137	S	6×10^{-8}	4×10^{-4}	2×10^{-9}	2×10^{-5}
		I	1×10^{-8}	1×10^{-3}	5×10^{-10}	4×10^{-5}
Chlorine (17)	Cl-36	S	4×10^{-7}	2×10^{-3}	1×10^{-8}	8×10^{-5}
		I	2×10^{-8}	2×10^{-3}	8×10^{-10}	6×10^{-5}
	Cl-38	S	3×10^{-6}	1×10^{-2}	9×10^{-8}	4×10^{-4}
		I	2×10^{-6}	1×10^{-2}	7×10^{-8}	4×10^{-4}
Chromium (24)	Cr-51	S	1×10^{-5}	5×10^{-2}	4×10^{-7}	2×10^{-3}
		I	2×10^{-6}	5×10^{-2}	8×10^{-8}	2×10^{-3}
Cobalt (27)	Co-57	S	3×10^{-6}	2×10^{-2}	1×10^{-7}	5×10^{-4}
		I	2×10^{-7}	1×10^{-2}	6×10^{-9}	4×10^{-4}
	Co-58m	S	2×10^{-5}	8×10^{-2}	6×10^{-7}	3×10^{-3}
		I	9×10^{-6}	6×10^{-2}	3×10^{-7}	2×10^{-3}
	Co-58	S	8×10^{-7}	4×10^{-3}	3×10^{-8}	1×10^{-4}
		I	5×10^{-8}	3×10^{-3}	2×10^{-9}	9×10^{-5}
	Co-60	S	3×10^{-7}	1×10^{-3}	1×10^{-8}	5×10^{-5}

Element (atomic number)	<u>isotope</u> <u>Radio-</u> <u>nuclide</u> ^{1/}	Table I		Table II		
		Column 1 Air ($\mu\text{Ci/ml}$)	Column 2 Water ($\mu\text{Ci/ml}$)	Column 1 Air ($\mu\text{Ci/ml}$)	Column 2 Water ($\mu\text{Ci/ml}$)	
		I	9×10^{-9}	1×10^{-3}	3×10^{-10}	3×10^{-5}
Copper (29)	Cu-64	S	2×10^{-6}	1×10^{-2}	7×10^{-8}	3×10^{-4}
		I	1×10^{-6}	6×10^{-3}	4×10^{-8}	2×10^{-4}
Curium (96)	Cm-242	S	1×10^{-10}	7×10^{-4}	4×10^{-12}	2×10^{-5}
		I	2×10^{-10}	7×10^{-4}	6×10^{-12}	2×10^{-5}
	Cm-243	S	6×10^{-12}	1×10^{-4}	2×10^{-13}	5×10^{-6}
		I	1×10^{-10}	7×10^{-4}	3×10^{-12}	2×10^{-5}
	Cm-244	S	9×10^{-12}	2×10^{-4}	3×10^{-13}	7×10^{-6}
		I	1×10^{-10}	8×10^{-4}	3×10^{-12}	3×10^{-5}
	Cm-245	S	5×10^{-12}	1×10^{-4}	2×10^{-13}	4×10^{-6}
		I	1×10^{-10}	8×10^{-4}	4×10^{-12}	3×10^{-5}
	Cm-246	S	5×10^{-12}	1×10^{-4}	2×10^{-13}	4×10^{-6}
		I	1×10^{-10}	8×10^{-4}	4×10^{-12}	3×10^{-5}
	Cm-247	S	5×10^{-12}	1×10^{-4}	2×10^{-13}	4×10^{-6}
		I	1×10^{-10}	6×10^{-4}	4×10^{-12}	2×10^{-5}
	Cm-248	S	6×10^{-13}	1×10^{-5}	2×10^{-14}	4×10^{-7}
		I	1×10^{-11}	4×10^{-5}	4×10^{-13}	1×10^{-6}
	Cm-249	S	1×10^{-5}	6×10^{-2}	4×10^{-7}	2×10^{-3}
I		1×10^{-5}	6×10^{-2}	4×10^{-7}	2×10^{-3}	
Dysprosium (66)	Dy-165	S	3×10^{-6}	1×10^{-2}	9×10^{-8}	4×10^{-4}
		I	2×10^{-6}	1×10^{-2}	7×10^{-8}	4×10^{-4}
	Dy-166	S	2×10^{-7}	1×10^{-3}	8×10^{-9}	4×10^{-5}
		I	2×10^{-7}	1×10^{-3}	7×10^{-9}	4×10^{-5}
Einsteinium (99)	Es-253	S	8×10^{-10}	7×10^{-4}	3×10^{-11}	2×10^{-5}
		I	6×10^{-10}	7×10^{-4}	2×10^{-11}	2×10^{-5}
	Es-254m	S	5×10^{-9}	5×10^{-4}	2×10^{-10}	2×10^{-5}
		I	6×10^{-9}	5×10^{-4}	2×10^{-10}	2×10^{-5}
	Es-254	S	2×10^{-11}	4×10^{-4}	6×10^{-13}	1×10^{-5}
		I	1×10^{-10}	4×10^{-4}	4×10^{-12}	1×10^{-5}
	Es-255	S	5×10^{-10}	8×10^{-4}	2×10^{-11}	3×10^{-5}
		I	4×10^{-10}	8×10^{-4}	1×10^{-11}	3×10^{-5}
Erbium (68)	Er-169	S	6×10^{-7}	3×10^{-3}	2×10^{-8}	9×10^{-5}
		I	4×10^{-7}	3×10^{-3}	1×10^{-8}	9×10^{-5}
	Er-171	S	7×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
		I	6×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}

Element (atomic number)	isotope Radio- nuclide ^{1/}		Table I		Table II	
			Column 1 Air ($\mu\text{Ci/ml}$)	Column 2 Water ($\mu\text{Ci/ml}$)	Column 1 Air ($\mu\text{Ci/ml}$)	Column 2 Water ($\mu\text{Ci/ml}$)
Europium (63)	Eu-152 Tr=9.2 hrs)	S	4×10^{-7}	2×10^{-3}	1×10^{-8}	6×10^{-5}
		I	3×10^{-7}	2×10^{-3}	1×10^{-8}	6×10^{-5}
	Eu-152 (Tr=13 yrs)	S	1×10^{-8}	2×10^{-3}	4×10^{-10}	8×10^{-5}
		I	2×10^{-8}	2×10^{-3}	6×10^{-10}	8×10^{-5}
	Eu-154	S	4×10^{-9}	6×10^{-4}	1×10^{-10}	2×10^{-5}
		I	7×10^{-9}	6×10^{-4}	2×10^{-10}	2×10^{-5}
	Eu-155	S	9×10^{-8}	6×10^{-3}	3×10^{-9}	2×10^{-4}
I		7×10^{-8}	6×10^{-3}	3×10^{-9}	2×10^{-4}	
Fermium (100)	Fm-254	S	6×10^{-8}	4×10^{-3}	2×10^{-9}	1×10^{-4}
		I	7×10^{-8}	4×10^{-3}	2×10^{-9}	1×10^{-4}
	Fm-255	S	2×10^{-8}	1×10^{-3}	6×10^{-10}	3×10^{-5}
		I	1×10^{-8}	1×10^{-3}	4×10^{-10}	3×10^{-5}
	Fm-256	S	3×10^{-9}	3×10^{-5}	1×10^{-10}	9×10^{-7}
		I	2×10^{-9}	3×10^{-5}	6×10^{-11}	9×10^{-7}
Fluorine (9)	F-18	S	5×10^{-6}	2×10^{-2}	2×10^{-7}	8×10^{-4}
		I	3×10^{-6}	1×10^{-2}	9×10^{-8}	5×10^{-4}
Gadolinium (64)	Gd-153	S	2×10^{-7}	6×10^{-3}	8×10^{-9}	2×10^{-4}
		I	9×10^{-8}	6×10^{-3}	3×10^{-9}	2×10^{-4}
	Gd-159	S	5×10^{-7}	2×10^{-3}	2×10^{-8}	8×10^{-5}
		I	4×10^{-7}	2×10^{-3}	1×10^{-8}	8×10^{-5}
Gallium (31)	Ga-67*	S	9×10^{-6}	3×10^{-2}	3×10^{-7}	1×10^{-3}
		I	6×10^{-6}	6×10^{-2}	2×10^{-7}	2×10^{-3}
	Ga-72	S	2×10^{-7}	1×10^{-3}	8×10^{-9}	4×10^{-5}
		I	2×10^{-7}	1×10^{-3}	6×10^{-9}	4×10^{-5}
Germanium (32)	Ge-68*	S	4×10^{-6}	2×10^{-2}	1×10^{-7}	8×10^{-4}
		I	1×10^{-6}	5×10^{-10}	5×10^{-10}	
	Ge-71	S	1×10^{-5}	5×10^{-2}	4×10^{-7}	2×10^{-3}
		I	6×10^{-6}	5×10^{-2}	2×10^{-7}	2×10^{-3}
Gold (79)	Au195*	S	8×10^{-6}	4×10^{-2}	3×10^{-7}	1×10^{-3}
		I	6×10^{-6}	6×10^{-3}	2×10^{-9}	2×10^{-4}
	Au-196	S	1×10^{-6}	5×10^{-3}	4×10^{-8}	2×10^{-4}
		I	6×10^{-7}	4×10^{-3}	2×10^{-8}	1×10^{-4}
	Au-198	S	3×10^{-7}	2×10^{-3}	1×10^{-8}	5×10^{-5}
		I	2×10^{-7}	1×10^{-3}	8×10^{-9}	5×10^{-5}
	Au-199	S	1×10^{-6}	5×10^{-3}	4×10^{-8}	2×10^{-4}
		I	8×10^{-7}	4×10^{-3}	3×10^{-8}	2×10^{-4}
Hafnium (72)	Hf-181	S	4×10^{-8}	2×10^{-3}	1×10^{-9}	7×10^{-5}
		I	7×10^{-8}	2×10^{-3}	3×10^{-9}	7×10^{-5}

Element (atomic number)	isotope Radio- nuclide ^{1/}		Table I		Table II	
			Column 1 Air ($\mu\text{Ci/ml}$)	Column 2 Water ($\mu\text{Ci/ml}$)	Column 1 Air ($\mu\text{Ci/ml}$)	Column 2 Water ($\mu\text{Ci/ml}$)
Holmium (67)	Ho-166	S	2×10^{-7}	9×10^{-4}	7×10^{-9}	3×10^{-5}
		I	2×10^{-7}	9×10^{-4}	6×10^{-9}	3×10^{-5}
Hydrogen (1)	H-3	S	5×10^{-6}	1×10^{-1}	2×10^{-7}	3×10^{-3}
		I	5×10^{-6}	1×10^{-1}	2×10^{-7}	3×10^{-3}
		Sub ^{2/}	2×10^{-3}	-----	4×10^{-5}	-----
Indium (49)	In-111*	S	5×10^{-6}	5×10^{-2}	1×10^{-7}	1×10^{-3}
		I	8×10^{-6}	3×10^{-2}	3×10^{-7}	1×10^{-3}
	In-113m	S	8×10^{-6}	4×10^{-2}	3×10^{-7}	1×10^{-3}
		I	7×10^{-6}	4×10^{-2}	2×10^{-7}	1×10^{-3}
	In-114m	S	1×10^{-7}	5×10^{-4}	4×10^{-9}	2×10^{-5}
		I	2×10^{-8}	5×10^{-4}	7×10^{-10}	2×10^{-5}
	In-115m	S	2×10^{-6}	1×10^{-2}	8×10^{-8}	4×10^{-4}
		I	2×10^{-6}	1×10^{-2}	6×10^{-8}	4×10^{-4}
	In-115	S	2×10^{-7}	3×10^{-3}	9×10^{-9}	9×10^{-5}
		I	3×10^{-8}	3×10^{-3}	1×10^{-9}	9×10^{-5}
Iodine (53)	I-123*	S	2×10^{-5}	3×10^{-3}	8×10^{-7}	1×10^{-4}
		I	5×10^{-9}	4×10^{-5}	8×10^{-11}	2×10^{-7}
	I-125	S	2×10^{-7}	6×10^{-3}	6×10^{-9}	2×10^{-4}
		I	8×10^{-9}	5×10^{-5}	9×10^{-11}	3×10^{-7}
	I-126	S	3×10^{-7}	3×10^{-3}	1×10^{-8}	9×10^{-5}
		I	2×10^{-9}	1×10^{-5}	2×10^{-11}	6×10^{-8}
	I-129	S	7×10^{-8}	6×10^{-3}	2×10^{-9}	2×10^{-4}
		I	9×10^{-9}	6×10^{-5}	1×10^{-10}	3×10^{-7}
	I-131	S	3×10^{-7}	2×10^{-3}	1×10^{-8}	6×10^{-5}
		I	2×10^{-7}	2×10^{-3}	3×10^{-9}	8×10^{-6}
	I-132	S	9×10^{-7}	5×10^{-3}	3×10^{-8}	2×10^{-4}
		I	3×10^{-8}	2×10^{-4}	4×10^{-10}	1×10^{-6}
	I-133	S	2×10^{-7}	1×10^{-3}	7×10^{-9}	4×10^{-5}
		I	5×10^{-7}	4×10^{-3}	6×10^{-9}	2×10^{-5}
	I-134	S	3×10^{-6}	2×10^{-2}	1×10^{-7}	6×10^{-4}
		I	1×10^{-7}	7×10^{-4}	1×10^{-9}	4×10^{-6}
I-135	S	4×10^{-7}	2×10^{-3}	1×10^{-8}	7×10^{-5}	
	I					
Iridium (77)	Ir-190	S	1×10^{-6}	6×10^{-3}	4×10^{-8}	2×10^{-4}
		I	4×10^{-7}	5×10^{-3}	1×10^{-8}	2×10^{-4}
	Ir-192	S	1×10^{-7}	1×10^{-3}	4×10^{-9}	4×10^{-5}
		I	3×10^{-8}	1×10^{-3}	9×10^{-10}	4×10^{-5}
	Ir-194	S	2×10^{-7}	1×10^{-3}	8×10^{-9}	3×10^{-5}
		I	2×10^{-7}	9×10^{-4}	5×10^{-9}	3×10^{-5}

Element (atomic number)	isotope Radio- nuclide ^{1/}	Table I		Table II		
		Column 1 Air ($\mu\text{Ci/ml}$)	Column 2 Water ($\mu\text{Ci/ml}$)	Column 1 Air ($\mu\text{Ci/ml}$)	Column 2 Water ($\mu\text{Ci/ml}$)	
Iron (26)	Fe-52*	S	4×10^{-6}	8×10^{-3}	1×10^{-7}	2×10^{-4}
		I	2×10^{-6}	1×10^{-2}	9×10^{-8}	4×10^{-4}
	Fe-55	S	9×10^{-7}	2×10^{-2}	3×10^{-8}	8×10^{-4}
		I	1×10^{-6}	7×10^{-2}	3×10^{-8}	2×10^{-3}
	Fe-59	S	1×10^{-7}	2×10^{-3}	5×10^{-9}	6×10^{-5}
		I	5×10^{-8}	2×10^{-3}	2×10^{-9}	5×10^{-5}
Krypton (36)	Kr-85m	Sub ^{2/}	6×10^{-6}	-----	1×10^{-7}	-----
	Kr-85	Sub	1×10^{-5}	-----	3×10^{-7}	-----
	Kr-87	Sub	1×10^{-6}	-----	2×10^{-8}	-----
	Kr-88	Sub	1×10^{-6}	-----	2×10^{-8}	-----
Lanthanum (57)	La-140	S	2×10^{-7}	7×10^{-4}	5×10^{-9}	2×10^{-5}
		I	1×10^{-7}	7×10^{-4}	4×10^{-9}	2×10^{-5}
Lead (82)	Pb-204 ₃	S	3×10^{-6}	1×10^{-2}	9×10^{-8}	4×10^{-4}
		I	2×10^{-6}	1×10^{-2}	6×10^{-8}	4×10^{-4}
	Pb-210	S	1×10^{-10}	4×10^{-6}	4×10^{-12}	1×10^{-7}
		I	2×10^{-10}	5×10^{-3}	8×10^{-12}	2×10^{-4}
	Pb-212	S	2×10^{-8}	6×10^{-4}	6×10^{-10}	2×10^{-5}
		I	2×10^{-8}	5×10^{-4}	7×10^{-10}	2×10^{-5}
Lutetium (71)	Lu-177	S	6×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
		I	5×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
Manganese (25)	Mn-52	S	2×10^{-7}	1×10^{-3}	7×10^{-9}	3×10^{-5}
		I	1×10^{-7}	9×10^{-4}	5×10^{-9}	3×10^{-5}
	Mn-54	S	4×10^{-7}	4×10^{-3}	1×10^{-8}	1×10^{-4}
		I	4×10^{-8}	3×10^{-3}	1×10^{-9}	1×10^{-4}
	Mn-56	S	8×10^{-7}	4×10^{-3}	3×10^{-8}	1×10^{-4}
		I	5×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
Mercury (80)	Hg-197m	S	7×10^{-7}	6×10^{-3}	3×10^{-8}	2×10^{-4}
		I	8×10^{-7}	5×10^{-3}	3×10^{-8}	2×10^{-4}
	Hg-197	S	1×10^{-6}	9×10^{-3}	4×10^{-8}	3×10^{-4}
		I	3×10^{-6}	1×10^{-2}	9×10^{-8}	5×10^{-4}
	Hg-203	S	7×10^{-8}	5×10^{-4}	2×10^{-9}	2×10^{-5}
		I	1×10^{-7}	3×10^{-3}	4×10^{-9}	1×10^{-4}
Molybdenum (42)	Mo-99	S	7×10^{-7}	5×10^{-3}	3×10^{-8}	2×10^{-4}
		I	2×10^{-7}	1×10^{-3}	7×10^{-9}	4×10^{-5}
Neodymium (60)	Nd-144	S	8×10^{-11}	2×10^{-3}	3×10^{-12}	7×10^{-5}
		I	3×10^{-10}	2×10^{-3}	1×10^{-11}	8×10^{-5}
	Nd-147	S	4×10^{-7}	2×10^{-3}	1×10^{-8}	6×10^{-5}

Element (atomic number)	isotope Radio- nuclide ^{1/}	Table I		Table II		
		Column 1 Air ($\mu\text{Ci/ml}$)	Column 2 Water ($\mu\text{Ci/ml}$)	Column 1 Air ($\mu\text{Ci/ml}$)	Column 2 Water ($\mu\text{Ci/ml}$)	
	Nd-149	I	2×10^{-7}	2×10^{-3}	8×10^{-9}	6×10^{-5}
		S	2×10^{-6}	8×10^{-3}	6×10^{-8}	3×10^{-4}
		I	1×10^{-6}	8×10^{-3}	5×10^{-8}	3×10^{-4}
Neptunium (93)	Np-237	S	4×10^{-12}	9×10^{-5}	1×10^{-13}	3×10^{-6}
		I	1×10^{-10}	9×10^{-4}	4×10^{-12}	3×10^{-5}
	Np-239	S	8×10^{-7}	4×10^{-3}	3×10^{-8}	1×10^{-4}
		I	7×10^{-7}	4×10^{-3}	2×10^{-8}	1×10^{-4}
Nickel (28)	Ni-59	S	5×10^{-7}	6×10^{-3}	2×10^{-8}	2×10^{-4}
		I	8×10^{-7}	6×10^{-2}	3×10^{-8}	2×10^{-3}
	Ni-63	S	6×10^{-8}	8×10^{-4}	2×10^{-9}	3×10^{-5}
		I	3×10^{-7}	2×10^{-2}	1×10^{-8}	7×10^{-4}
	Ni-65	S	9×10^{-7}	4×10^{-3}	3×10^{-8}	1×10^{-4}
		I	5×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
Niobium (41)	Nb-93m	S	1×10^{-7}	1×10^{-2}	4×10^{-9}	4×10^{-4}
		I	2×10^{-7}	1×10^{-2}	5×10^{-9}	4×10^{-4}
	Nb-95	S	5×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
		I	1×10^{-7}	3×10^{-3}	3×10^{-9}	1×10^{-4}
	Nb-97	S	6×10^{-6}	3×10^{-2}	2×10^{-7}	9×10^{-4}
		I	5×10^{-6}	3×10^{-2}	2×10^{-7}	9×10^{-4}
<u>Nitrogen (7)</u>	<u>N-13* Sub^{2/}</u>	<u>4×10^{-6}</u>				
Osmium (76)	Os-185	S	5×10^{-7}	2×10^{-3}	2×10^{-8}	7×10^{-5}
		I	5×10^{-8}	2×10^{-3}	2×10^{-9}	7×10^{-5}
	Os-191m	S	2×10^{-5}	7×10^{-2}	6×10^{-7}	3×10^{-3}
		I	9×10^{-6}	7×10^{-2}	3×10^{-7}	2×10^{-3}
	Os-191	S	1×10^{-6}	5×10^{-3}	4×10^{-8}	2×10^{-4}
		I	4×10^{-7}	5×10^{-3}	1×10^{-8}	2×10^{-4}
	Os-193	S	4×10^{-7}	2×10^{-3}	1×10^{-8}	6×10^{-5}
		I	3×10^{-7}	2×10^{-3}	9×10^{-9}	5×10^{-5}
<u>Oxygen (8)</u>	<u>O-15* Sub^{2/}</u>	<u>4×10^{-6}</u>				
Palladium (46)	Pd-103	S	1×10^{-6}	1×10^{-2}	5×10^{-8}	3×10^{-4}
		I	7×10^{-7}	8×10^{-3}	3×10^{-8}	3×10^{-4}
	Pd-109	S	6×10^{-7}	3×10^{-3}	2×10^{-8}	9×10^{-5}
		I	4×10^{-7}	2×10^{-3}	1×10^{-8}	7×10^{-5}
Phosphorus (15)	P-32	S	7×10^{-8}	5×10^{-4}	2×10^{-9}	2×10^{-5}
		I	8×10^{-8}	7×10^{-4}	3×10^{-9}	2×10^{-5}

Element (atomic number)	isotope Radio- nuclide ^{1/}	Table I		Table II		
		Column 1 Air ($\mu\text{Ci/ml}$)	Column 2 Water ($\mu\text{Ci/ml}$)	Column 1 Air ($\mu\text{Ci/ml}$)	Column 2 Water ($\mu\text{Ci/ml}$)	
Platinum (78)	Pt-191	S	8×10^{-7}	4×10^{-3}	3×10^{-8}	1×10^{-4}
		I	6×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
	Pt-193m	S	7×10^{-6}	3×10^{-2}	2×10^{-7}	1×10^{-3}
		I	5×10^{-6}	3×10^{-2}	2×10^{-7}	1×10^{-3}
	Pt-193	S	1×10^{-6}	3×10^{-2}	4×10^{-8}	9×10^{-4}
		I	3×10^{-7}	5×10^{-2}	1×10^{-8}	2×10^{-3}
	Pt-197m	S	6×10^{-6}	3×10^{-2}	2×10^{-7}	1×10^{-3}
		I	5×10^{-6}	3×10^{-2}	2×10^{-7}	9×10^{-4}
Pt-197	S	8×10^{-7}	4×10^{-3}	3×10^{-8}	1×10^{-4}	
	I	6×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}	
Plutonium (94)	Pu-238	S	2×10^{-12}	1×10^{-4}	7×10^{-14}	5×10^{-6}
		I	3×10^{-11}	8×10^{-4}	1×10^{-12}	3×10^{-5}
	Pu-239	S	2×10^{-12}	1×10^{-4}	6×10^{-14}	5×10^{-6}
		I	4×10^{-11}	8×10^{-4}	1×10^{-12}	3×10^{-5}
	Pu-240	S	2×10^{-12}	1×10^{-4}	6×10^{-14}	5×10^{-6}
		I	4×10^{-11}	8×10^{-4}	1×10^{-12}	3×10^{-5}
	Pu-241	S	9×10^{-11}	7×10^{-3}	3×10^{-12}	2×10^{-4}
		I	4×10^{-8}	4×10^{-2}	1×10^{-9}	1×10^{-3}
	Pu-242	S	2×10^{-12}	1×10^{-4}	6×10^{-14}	5×10^{-6}
		I	4×10^{-11}	9×10^{-4}	1×10^{-12}	3×10^{-5}
	Pu-243	S	2×10^{-6}	1×10^{-2}	6×10^{-8}	3×10^{-4}
		I	2×10^{-6}	1×10^{-2}	8×10^{-8}	3×10^{-4}
	Pu-244	S	2×10^{-12}	1×10^{-4}	6×10^{-14}	4×10^{-6}
		I	3×10^{-11}	3×10^{-4}	1×10^{-12}	1×10^{-5}
Polonium (84)	Po-210	S	5×10^{-10}	2×10^{-5}	2×10^{-11}	7×10^{-7}
		I	2×10^{-10}	8×10^{-4}	7×10^{-12}	3×10^{-5}
Potassium (19)	K-42	S	2×10^{-6}	9×10^{-3}	7×10^{-8}	3×10^{-4}
		I	1×10^{-7}	6×10^{-4}	4×10^{-9}	2×10^{-5}
	K-43*	S	5×10^{-6}	3×10^{-2}	2×10^{-7}	1×10^{-3}
		I	9×10^{-6}	1×10^{-3}	3×10^{-7}	6×10^{-5}
Praseodymium (59)	Pr-142	S	2×10^{-7}	9×10^{-4}	7×10^{-9}	3×10^{-5}
		I	2×10^{-7}	9×10^{-4}	5×10^{-9}	3×10^{-5}
	Pr-143	S	3×10^{-7}	1×10^{-3}	1×10^{-8}	5×10^{-5}
		I	2×10^{-7}	1×10^{-3}	6×10^{-9}	5×10^{-5}
Promethium (61)	Pm-147	S	6×10^{-8}	6×10^{-3}	2×10^{-9}	2×10^{-4}
		I	1×10^{-7}	6×10^{-3}	3×10^{-9}	2×10^{-4}
	Pm-149	S	3×10^{-7}	1×10^{-3}	1×10^{-8}	4×10^{-5}
		I	2×10^{-7}	1×10^{-3}	8×10^{-9}	4×10^{-5}

Element (atomic number)	isotope Radio- nuclide ^{1/}	Table I		Table II		
		Column 1 Air ($\mu\text{Ci/ml}$)	Column 2 Water ($\mu\text{Ci/ml}$)	Column 1 Air ($\mu\text{Ci/ml}$)	Column 2 Water ($\mu\text{Ci/ml}$)	
Protactinium (91)	Pa-230	S	2×10^{-9}	7×10^{-3}	6×10^{-11}	2×10^{-4}
		I	8×10^{-10}	7×10^{-3}	3×10^{-11}	2×10^{-4}
	Pa-231	S	1×10^{-12}	3×10^{-5}	4×10^{-14}	9×10^{-7}
		I	1×10^{-10}	8×10^{-4}	4×10^{-12}	2×10^{-5}
	Pa-233	S	6×10^{-7}	4×10^{-3}	2×10^{-8}	1×10^{-4}
		I	2×10^{-7}	3×10^{-3}	6×10^{-9}	1×10^{-4}
Radium (88)	Ra-223	S	2×10^{-9}	2×10^{-5}	6×10^{-11}	7×10^{-7}
		I	2×10^{-10}	1×10^{-4}	8×10^{-12}	4×10^{-6}
	Ra-224	S	5×10^{-9}	7×10^{-5}	2×10^{-10}	2×10^{-6}
		I	7×10^{-10}	2×10^{-4}	2×10^{-11}	5×10^{-6}
	Ra-226	S	3×10^{-11}	4×10^{-7}	3×10^{-12}	3×10^{-8}
		I	5×10^{-11}	9×10^{-4}	2×10^{-12}	3×10^{-5}
	Ra-228	S	7×10^{-11}	8×10^{-7}	2×10^{-12}	3×10^{-8}
		I	4×10^{-11}	7×10^{-4}	1×10^{-12}	3×10^{-5}
Radon (86)	Rn-220	S	3×10^{-7}	-----	1×10^{-8}	-----
		I	-----	-----	-----	-----
	Rn-222 ^{2/}		3×10^{-8}	-----	3×10^{-9}	-----
Rhenium (75)	Re-183	S	3×10^{-6}	2×10^{-2}	9×10^{-8}	6×10^{-4}
		I	2×10^{-7}	8×10^{-3}	5×10^{-9}	3×10^{-4}
	Re-186	S	6×10^{-7}	3×10^{-3}	2×10^{-8}	9×10^{-5}
		I	2×10^{-7}	1×10^{-3}	8×10^{-9}	5×10^{-5}
	Re-187	S	9×10^{-6}	7×10^{-2}	3×10^{-7}	3×10^{-3}
		I	5×10^{-7}	4×10^{-2}	2×10^{-8}	2×10^{-3}
	Re-188	S	4×10^{-7}	2×10^{-3}	1×10^{-8}	6×10^{-5}
		I	2×10^{-7}	9×10^{-4}	6×10^{-9}	3×10^{-5}
Rhodium (45)	Rh-103m	S	8×10^{-5}	4×10^{-1}	3×10^{-6}	1×10^{-2}
		I	6×10^{-5}	3×10^{-1}	2×10^{-6}	1×10^{-2}
	Rh-105	S	8×10^{-7}	4×10^{-3}	3×10^{-8}	1×10^{-4}
		I	5×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
Rubidium (37)	Rb-86	S	3×10^{-7}	2×10^{-3}	1×10^{-8}	7×10^{-5}
		I	7×10^{-8}	7×10^{-4}	2×10^{-9}	2×10^{-5}
	Rb-87	S	5×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
		I	7×10^{-8}	5×10^{-3}	2×10^{-9}	2×10^{-4}
Ruthenium (44)	Ru-97	S	2×10^{-6}	1×10^{-2}	8×10^{-8}	4×10^{-4}
		I	2×10^{-6}	1×10^{-2}	6×10^{-8}	3×10^{-4}
	Ru-103	S	5×10^{-7}	2×10^{-3}	2×10^{-8}	8×10^{-5}
		I	8×10^{-8}	2×10^{-3}	3×10^{-9}	8×10^{-5}
	Ru-105	S	7×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
		I	5×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}

Element (atomic number)	isotope Radio- nuclide ^{1/}	Table I		Table II		
		Column 1 Air ($\mu\text{Ci/ml}$)	Column 2 Water ($\mu\text{Ci/ml}$)	Column 1 Air ($\mu\text{Ci/ml}$)	Column 2 Water ($\mu\text{Ci/ml}$)	
	Ru-106	S	8×10^{-8}	4×10^{-4}	3×10^{-9}	1×10^{-5}
		I	6×10^{-9}	3×10^{-4}	2×10^{-10}	1×10^{-5}
Samarium (62)	Sm-147	S	7×10^{-11}	2×10^{-3}	2×10^{-12}	6×10^{-5}
		I	3×10^{-10}	2×10^{-3}	9×10^{-12}	7×10^{-5}
	Sm-151	S	6×10^{-8}	1×10^{-2}	2×10^{-9}	4×10^{-4}
		I	1×10^{-7}	1×10^{-2}	5×10^{-9}	4×10^{-4}
Sm-153	S	5×10^{-7}	2×10^{-3}	2×10^{-8}	8×10^{-5}	
	I	4×10^{-7}	2×10^{-3}	1×10^{-8}	8×10^{-5}	
Scandium (21)	Sc-46	S	2×10^{-7}	1×10^{-3}	8×10^{-9}	4×10^{-5}
		I	2×10^{-8}	1×10^{-3}	8×10^{-10}	4×10^{-5}
	Sc-47	S	6×10^{-7}	3×10^{-3}	2×10^{-8}	9×10^{-5}
		I	5×10^{-7}	3×10^{-3}	2×10^{-8}	9×10^{-5}
	Sc-48	S	2×10^{-7}	8×10^{-4}	6×10^{-9}	3×10^{-5}
		I	1×10^{-7}	8×10^{-4}	5×10^{-9}	3×10^{-5}
Selenium (34)	Se-75	S	1×10^{-6}	9×10^{-3}	4×10^{-8}	3×10^{-4}
		I	1×10^{-7}	8×10^{-3}	4×10^{-9}	3×10^{-4}
Silicon (14)	Si-31	S	6×10^{-6}	3×10^{-2}	2×10^{-7}	9×10^{-4}
		I	1×10^{-6}	6×10^{-3}	3×10^{-8}	2×10^{-4}
Silver (47)	Ag-105	S	6×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
		I	8×10^{-8}	3×10^{-3}	3×10^{-9}	1×10^{-4}
	Ag-110m	S	2×10^{-7}	9×10^{-4}	7×10^{-9}	3×10^{-5}
		I	1×10^{-8}	9×10^{-4}	3×10^{-10}	3×10^{-5}
	Ag-111	S	3×10^{-7}	1×10^{-3}	1×10^{-8}	4×10^{-5}
		I	2×10^{-7}	1×10^{-3}	8×10^{-9}	4×10^{-5}
Sodium (11)	Na-22	S	2×10^{-7}	1×10^{-3}	6×10^{-9}	4×10^{-5}
		I	9×10^{-9}	9×10^{-4}	3×10^{-10}	3×10^{-5}
	Na-24	S	1×10^{-6}	6×10^{-3}	4×10^{-8}	2×10^{-4}
		I	1×10^{-7}	8×10^{-4}	5×10^{-9}	3×10^{-5}
Strontium (38)	Sr-85m	S	4×10^{-5}	2×10^{-1}	1×10^{-6}	7×10^{-3}
		I	3×10^{-5}	2×10^{-1}	1×10^{-6}	7×10^{-3}
	Sr-85	S	2×10^{-7}	3×10^{-3}	8×10^{-9}	1×10^{-4}
		I	1×10^{-7}	5×10^{-3}	4×10^{-9}	2×10^{-4}
	Sr-89	S	3×10^{-8}	3×10^{-4}	3×10^{-10}	3×10^{-6}
		I	4×10^{-8}	8×10^{-4}	1×10^{-9}	3×10^{-5}
	Sr-90	S	1×10^{-9}	1×10^{-5}	3×10^{-11}	3×10^{-7}
		I	5×10^{-9}	1×10^{-3}	2×10^{-10}	4×10^{-5}
	Sr-91	S	4×10^{-7}	2×10^{-3}	2×10^{-8}	7×10^{-5}
		I	3×10^{-7}	1×10^{-3}	9×10^{-9}	5×10^{-5}

Element (atomic number)	isotope Radio- nuclide ^{1/}	Table I		Table II		
		Column 1	Column 2	Column 1	Column 2	
		Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	Air ($\mu\text{Ci/ml}$)	Water ($\mu\text{Ci/ml}$)	
	Sr-92	S	4×10^{-7}	2×10^{-3}	2×10^{-8}	7×10^{-5}
		I	3×10^{-7}	2×10^{-3}	1×10^{-8}	6×10^{-5}
Sulfur (16)	S-35	S	3×10^{-7}	2×10^{-3}	9×10^{-9}	6×10^{-5}
		I	3×10^{-7}	8×10^{-3}	9×10^{-9}	3×10^{-4}
Tantalum (73)	Ta-182	S	4×10^{-8}	1×10^{-3}	1×10^{-9}	4×10^{-5}
		I	2×10^{-8}	1×10^{-3}	7×10^{-10}	4×10^{-5}
Technetium (43)	Tc-96m	S	8×10^{-5}	4×10^{-1}	3×10^{-6}	1×10^{-2}
		I	3×10^{-5}	3×10^{-1}	1×10^{-6}	1×10^{-2}
	Tc-96	S	6×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
		I	2×10^{-7}	1×10^{-3}	8×10^{-9}	5×10^{-5}
	Tc-97m	S	2×10^{-6}	1×10^{-2}	8×10^{-8}	4×10^{-4}
		I	2×10^{-7}	5×10^{-3}	5×10^{-9}	2×10^{-4}
	Tc-97	S	1×10^{-5}	5×10^{-2}	4×10^{-7}	2×10^{-3}
		I	3×10^{-7}	2×10^{-2}	1×10^{-8}	8×10^{-4}
	Tc-99m	S	4×10^{-5}	2×10^{-1}	1×10^{-6}	6×10^{-3}
		I	1×10^{-5}	8×10^{-2}	5×10^{-7}	3×10^{-3}
	Tc-99	S	2×10^{-6}	1×10^{-2}	7×10^{-8}	3×10^{-4}
		I	6×10^{-8}	5×10^{-3}	2×10^{-9}	2×10^{-4}
Tellurium (52)	Te-125m	S	4×10^{-7}	5×10^{-3}	1×10^{-8}	2×10^{-4}
		I	1×10^{-7}	3×10^{-3}	4×10^{-9}	1×10^{-4}
	Te-127m	S	1×10^{-7}	2×10^{-3}	5×10^{-9}	6×10^{-5}
		I	4×10^{-8}	2×10^{-3}	1×10^{-9}	5×10^{-5}
	Te-127	S	2×10^{-6}	8×10^{-3}	6×10^{-8}	3×10^{-4}
		I	9×10^{-7}	5×10^{-3}	3×10^{-8}	2×10^{-4}
	Te-129m	S	8×10^{-8}	1×10^{-3}	3×10^{-9}	3×10^{-5}
		I	3×10^{-8}	6×10^{-4}	1×10^{-9}	2×10^{-5}
	Te-129	S	5×10^{-6}	2×10^{-2}	2×10^{-7}	8×10^{-4}
		I	4×10^{-6}	2×10^{-2}	1×10^{-7}	8×10^{-4}
	Te-131m	S	4×10^{-7}	2×10^{-3}	1×10^{-8}	6×10^{-5}
		I	2×10^{-7}	1×10^{-3}	6×10^{-9}	4×10^{-5}
Te-132	S	2×10^{-7}	9×10^{-4}	7×10^{-9}	3×10^{-5}	
	I	1×10^{-7}	6×10^{-4}	4×10^{-9}	2×10^{-5}	
Terbium (65)	Tb-160	S	1×10^{-7}	1×10^{-3}	3×10^{-9}	4×10^{-5}
		I	3×10^{-8}	1×10^{-3}	1×10^{-9}	4×10^{-5}
Thallium (81)	Tl-200	S	3×10^{-6}	1×10^{-2}	9×10^{-8}	4×10^{-4}
		I	1×10^{-6}	7×10^{-3}	4×10^{-8}	2×10^{-4}
	Tl-201	S	2×10^{-6}	9×10^{-3}	7×10^{-8}	3×10^{-4}
		I	9×10^{-7}	5×10^{-3}	3×10^{-8}	2×10^{-4}

Element (atomic number)	isotope Radio- nuclide ^{1/}	Table I		Table II		
		Column 1 Air ($\mu\text{Ci/ml}$)	Column 2 Water ($\mu\text{Ci/ml}$)	Column 1 Air ($\mu\text{Ci/ml}$)	Column 2 Water ($\mu\text{Ci/ml}$)	
	Tl-202	S	8×10^{-7}	4×10^{-3}	3×10^{-8}	1×10^{-4}
		I	2×10^{-7}	2×10^{-3}	8×10^{-9}	7×10^{-5}
	Tl-204	S	6×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
		I	3×10^{-8}	2×10^{-3}	9×10^{-10}	6×10^{-5}
Thorium (90)	Th-227	S	3×10^{-10}	5×10^{-4}	1×10^{-11}	2×10^{-5}
		I	2×10^{-10}	5×10^{-4}	6×10^{-12}	2×10^{-5}
	Th-228	S	9×10^{-12}	2×10^{-4}	3×10^{-13}	7×10^{-6}
		I	6×10^{-12}	4×10^{-4}	2×10^{-13}	1×10^{-5}
	Th-230	S	2×10^{-12}	5×10^{-5}	8×10^{-14}	2×10^{-6}
		I	1×10^{-11}	9×10^{-4}	3×10^{-13}	3×10^{-5}
	Th-231	S	1×10^{-6}	7×10^{-3}	5×10^{-8}	2×10^{-4}
		I	1×10^{-6}	7×10^{-3}	4×10^{-8}	2×10^{-4}
	Th-232	S	3×10^{-11}	5×10^{-5}	1×10^{-12}	2×10^{-6}
		I	3×10^{-11}	1×10^{-3}	1×10^{-12}	4×10^{-5}
	Th-					
	natural	S	6×10^{-11}	6×10^{-5}	2×10^{-12}	2×10^{-6}
	I	6×10^{-11}	6×10^{-4}	2×10^{-12}	2×10^{-5}	
Th-234	S	6×10^{-8}	5×10^{-4}	2×10^{-9}	2×10^{-5}	
	I	3×10^{-8}	5×10^{-4}	1×10^{-9}	2×10^{-5}	
Thulium (69)	Tm-170	S	4×10^{-8}	1×10^{-3}	1×10^{-9}	5×10^{-5}
		I	3×10^{-8}	1×10^{-3}	1×10^{-9}	5×10^{-5}
	Tm-171	S	1×10^{-7}	1×10^{-2}	4×10^{-9}	5×10^{-4}
		I	2×10^{-7}	1×10^{-2}	8×10^{-9}	5×10^{-4}
Tin (50)	Sn-113	S	4×10^{-7}	2×10^{-3}	1×10^{-8}	9×10^{-5}
		I	5×10^{-8}	2×10^{-3}	2×10^{-9}	8×10^{-5}
	Sn-125	S	1×10^{-7}	5×10^{-4}	4×10^{-9}	2×10^{-5}
		I	8×10^{-8}	5×10^{-4}	3×10^{-9}	2×10^{-5}
Tungsten (74)	W-181	S	2×10^{-6}	1×10^{-2}	8×10^{-8}	4×10^{-4}
		I	1×10^{-7}	1×10^{-2}	4×10^{-9}	3×10^{-4}
	W-185	S	8×10^{-7}	4×10^{-3}	3×10^{-8}	1×10^{-4}
		I	1×10^{-7}	3×10^{-3}	4×10^{-9}	1×10^{-4}
	W-187	S	4×10^{-7}	2×10^{-3}	2×10^{-8}	7×10^{-5}
		I	3×10^{-7}	2×10^{-3}	1×10^{-8}	6×10^{-5}
Uranium (92)	U-230	S	3×10^{-10}	1×10^{-4}	1×10^{-11}	5×10^{-6}
		I	1×10^{-10}	1×10^{-4}	4×10^{-12}	5×10^{-6}
	U-232	S	1×10^{-10}	8×10^{-4}	3×10^{-12}	3×10^{-5}
		I	3×10^{-11}	8×10^{-4}	8×10^{-13}	3×10^{-5}
	U-233	S	5×10^{-10}	9×10^{-4}	2×10^{-11}	3×10^{-5}
		I	1×10^{-10}	9×10^{-4}	4×10^{-12}	3×10^{-5}

Element (atomic number)	isotope Radio- nuclide ^{1/}	Table I		Table II		
		Column 1 Air ($\mu\text{Ci/ml}$)	Column 2 Water ($\mu\text{Ci/ml}$)	Column 1 Air ($\mu\text{Ci/ml}$)	Column 2 Water ($\mu\text{Ci/ml}$)	
	U-234	S ^{4/}	6×10^{-10}	9×10^{-4}	2×10^{-11}	3×10^{-5}
		I	1×10^{-10}	9×10^{-4}	4×10^{-12}	3×10^{-5}
	U-235	S ^{4/}	5×10^{-10}	8×10^{-4}	2×10^{-11}	3×10^{-5}
		I	1×10^{-10}	8×10^{-4}	4×10^{-12}	3×10^{-5}
	U-236	S	6×10^{-10}	1×10^{-3}	2×10^{-11}	3×10^{-5}
		I	1×10^{-10}	1×10^{-3}	4×10^{-12}	3×10^{-5}
	U-238	S ^{4/}	7×10^{-11}	1×10^{-3}	3×10^{-12}	4×10^{-5}
		I	1×10^{-10}	1×10^{-3}	5×10^{-12}	4×10^{-5}
	U-240	S	2×10^{-7}	1×10^{-3}	8×10^{-9}	3×10^{-5}
		I	2×10^{-7}	1×10^{-3}	6×10^{-9}	3×10^{-5}
	U- natural	S ^{4/}	1×10^{-10}	1×10^{-3}	5×10^{-12}	3×10^{-5}
		I	1×10^{-10}	1×10^{-3}	5×10^{-12}	3×10^{-5}
Vanadium (23)	V-48	S	2×10^{-7}	9×10^{-4}	6×10^{-9}	3×10^{-5}
		I	6×10^{-8}	8×10^{-4}	2×10^{-9}	3×10^{-5}
Xenon (54)	Xe-131m	Sub ^{2/}	2×10^{-5}	-----	4×10^{-7}	-----
	Xe-133m	Sub	1×10^{-5}	-----	3×10^{-7}	-----
	Xe-133	Sub	1×10^{-5}	-----	3×10^{-7}	-----
	Xe-135	Sub	4×10^{-6}	-----	1×10^{-7}	-----
Ytterbium (70)	Yb-175	S	7×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
		I	6×10^{-7}	3×10^{-3}	2×10^{-8}	1×10^{-4}
Yttrium (39)	Y-87*	S	4×10^{-6}	7×10^{-3}	1×10^{-7}	2×10^{-4}
		I	1×10^{-6}	3×10^{-2}	4×10^{-8}	7×10^{-4}
	Y-88*	S	3×10^{-7}	2×10^{-3}	6×10^{-9}	7×10^{-5}
		I	5×10^{-8}	3×10^{-3}	2×10^{-9}	9×10^{-5}
	Y-90	S	1×10^{-7}	6×10^{-4}	4×10^{-9}	2×10^{-5}
		I	1×10^{-7}	6×10^{-4}	3×10^{-9}	2×10^{-5}
	Y-91m	S	2×10^{-5}	1×10^{-1}	8×10^{-7}	3×10^{-3}
		I	2×10^{-5}	1×10^{-1}	6×10^{-7}	3×10^{-3}
	Y-91	S	4×10^{-8}	8×10^{-4}	1×10^{-9}	3×10^{-5}
		I	3×10^{-8}	8×10^{-4}	1×10^{-9}	3×10^{-5}
	Y-92	S	4×10^{-7}	2×10^{-3}	1×10^{-8}	6×10^{-5}
		I	3×10^{-7}	2×10^{-3}	1×10^{-8}	6×10^{-5}
	Y-93	S	2×10^{-7}	8×10^{-4}	6×10^{-9}	3×10^{-5}
		I	1×10^{-7}	8×10^{-4}	5×10^{-9}	3×10^{-5}
Zinc (30)	Zn-65	S	1×10^{-7}	3×10^{-3}	4×10^{-9}	1×10^{-4}
		I	6×10^{-8}	5×10^{-3}	2×10^{-9}	2×10^{-4}
	Zn-69m	S	4×10^{-7}	2×10^{-3}	1×10^{-8}	7×10^{-5}
		I	3×10^{-7}	2×10^{-3}	1×10^{-8}	6×10^{-5}

Element (atomic number)	isotope <u>Radio-</u> <u>nuclide</u> ^{1/}	Table I		Table II		
		Column 1 Air ($\mu\text{Ci/ml}$)	Column 2 Water ($\mu\text{Ci/ml}$)	Column 1 Air ($\mu\text{Ci/ml}$)	Column 2 Water ($\mu\text{Ci/ml}$)	
	Zn-69	S	7×10^{-6}	5×10^{-2}	2×10^{-7}	2×10^{-3}
		I	9×10^{-6}	5×10^{-2}	3×10^{-7}	2×10^{-3}
Zirconium (40)	Zr-93	S	1×10^{-7}	2×10^{-2}	4×10^{-9}	8×10^{-4}
		I	3×10^{-7}	2×10^{-2}	1×10^{-8}	8×10^{-4}
	Zr-95	S	1×10^{-7}	2×10^{-3}	4×10^{-9}	6×10^{-5}
		I	3×10^{-8}	2×10^{-3}	1×10^{-9}	6×10^{-5}
	Zr-97	S	1×10^{-7}	5×10^{-4}	4×10^{-9}	2×10^{-5}
		I	9×10^{-8}	5×10^{-4}	3×10^{-9}	2×10^{-5}
Any single radio- nuclide not listed above with decay mode other than alpha emission or spontaneous fission and with radioactive half-life less than 2 hours.	Sub ^{2/}		1×10^{-6}	-----	3×10^{-8}	-----
Any single radio- nuclide not listed above with decay mode other than alpha emission or spontaneous fission and with radioactive half-life greater than 2 hours.			3×10^{-9}	9×10^{-5}	1×10^{-10}	3×10^{-6}
Any single radio- nuclide not listed above, which decays by alpha emission or spontaneous fission.			6×10^{-13}	4×10^{-7}	2×10^{-14}	3×10^{-8}

ICRP = International Council
on Radiation Protection

*The values for C-11, Ga-67, Ge-68, Au-195, In-111, I-123, Fe-52, N-13, O-15, K-43, Y-87 and Y-88 have been calculated using the committed dose equivalent values of ICRP Publication 30 for the controlling organ.

^{1/} Soluble (S); Insoluble (I).

- 2/ "Sub" means that values given are for submersion in a semi-spherical infinite cloud of airborne material.
- 3/ These radon concentrations are appropriate for protection from radon-222 combined with its short-lived radioactive decay products (daughters). Alternatively, the value in Table I may be replaced by one-third (1/3) "working level." (A "working level" is defined as any combination of short-lived radon-222 ~~daughters~~ radioactive decay products, polonium-218, lead-214, bismuth-214, and polonium-214, in one liter of air, without regard to the degree of equilibrium, that will result in the ultimate emission of 1.3×10^5 MeV of alpha particle energy.) The Table II value may be replaced by one-thirtieth (1/30) of a "working level." The limit on radon-222 concentrations in restricted areas may be based on an annual average.
- 4/ For soluble mixtures of U-238, U-234, and U-235 in air chemical toxicity may be the limiting factor. If the percent by weight (enrichment) of U-235 is less than 5, the concentration value for a 40-hour workweek, Table I, is 0.2 milligrams uranium per cubic meter of air average. For any enrichment, the product of the average concentration and time of exposure during a 40-hour workweek shall not exceed 8×10^{-3} SA, $\mu\text{Ci-hr/ml}$, where SA is the specific activity of the uranium inhaled. The concentration value for Table II is 0.007 milligrams uranium per cubic meter of air. The specific activity for natural uranium is 6.77×10^{-7} curies per gram U uranium. The specific activity for other mixtures of U-238, U-235, and U-234, if not known, shall be:

$$\begin{array}{ll} \text{SA} = 3.6 \times 10^{-7} \text{ curies/gram U} & \text{U-depleted} \\ \text{SA} = (0.4 + 0.38 E + 0.0034 E^2) 10^{-6} & E \geq 0.72 \end{array}$$

where E is the percentage by weight of U-235, expressed as percent.

Note: In any case where there is a mixture in air or water of more than one radionuclide, the limiting values for purposes of this Appendix should be determined as follows:

1. If the identity and concentration of each radionuclide in the mixture are known, the limiting values should be derived as follows: Determine, for each radionuclide in the mixture, the ratio between the quantity present in the mixture and the limit otherwise established in Appendix "A" of the specific radionuclide when not in a mixture. The sum of such ratios for all the radionuclides in the mixture may not exceed "1" (i.e., "unity").

Example: If radionuclides a, b, and c are present in concentrations C_a , C_b , and C_c , and if the applicable maximum permissible concentrations (MPC's) are MPC_a , MPC_b , and MPC_c , respectively, then the concentrations shall be limited so that the following relationship exists:

$$\frac{C_a}{\text{MPC}_a} + \frac{C_b}{\text{MPC}_b} + \frac{C_c}{\text{MPC}_c} \leq 1$$

2. If either the identity or the concentration of any radionuclide in the

mixture is not known, the limiting values for purposes of Appendix "A" shall be:

- a. For purposes of Table I, Col. 1 6×10^{-13}
- b. For purposes of Table I, Col. 2 4×10^{-7}
- c. For purposes of Table II, Col. 1 2×10^{-14}
- d. For purposes of Table II, Col. 2 3×10^{-8}

3. If any of the conditions specified below are met, the corresponding values specified below may be used in lieu of those specified in paragraph 2 above.
- a. If the identity of each radionuclide in the mixture is known but the concentration of one or more of the radionuclides in the mixture is not known, the concentration limit for the mixture is the limit specified in Appendix "A" for the radionuclide in the mixture having the lowest concentration limit; or
 - b. If the identity of each radionuclide in the mixture is not known, but it is known that certain radionuclides specified in Appendix "A" are not present in the mixture, the concentration limit for the mixture is the lowest concentration limit specified in Appendix "A" for any radionuclide which is not known to be absent from the mixture; or

c. Radionuclide	Table I		Table II	
	Column 1 Air ($\mu\text{Ci/ml}$)	Column 2 Water ($\mu\text{Ci/ml}$)	Column 1 Air ($\mu\text{Ci/ml}$)	Column 2 Water ($\mu\text{Ci/ml}$)

If it is known that Sr-90, I-125, I-126, I-129, I-131, (I-133, Table II only), Pb-210, Po-210, At-211, Ra-223, Ra-224, Ra-226, Ac-227, Ra-228, Th-230, Pa-231, Th-232, Th-nat, Cm-248, Cf-254, and Fm-256 are not present--	-----	9×10^{-5}	-----	3×10^{-6}
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If it is known that Sr-90, I-125, I-126, I-129, (I-131, I-133, Table II only), Pb-210, Po-210, Ra-223, Ra-226, Ra-228, Pa-231, Th-nat, Cm-248, Cf-254, and Fm-256 are not present-----	-----	6×10^{-5}	-----	2×10^{-6}
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If it is known that Sr-90,

I-129, (I-125, I-126, I-131, Table II only), Pb-210, Ra-226, Ra-228, Cm-248, and Cf-254 are not present-----	2x10 ⁻⁵	-----	6x10 ⁻⁷
If it is known that (I-129, Table II only), Ra-226, and Ra-228 are not present-----	3x10 ⁻⁶	-----	1x10 ⁻⁷
If it is known that alpha- emitters and Sr-90, I-129, Pb-210, Ac-227, Ra-228, Pa-230, Pu-241, and Bk-249 are not present-----	3x10 ⁻⁹	-----	1x10 ⁻¹⁰
If it is known that alpha- emitters and Pb-210, Ac-227, Ra-228, and Pu-241 are not present-----	3x10 ⁻¹⁰	-----	1x10 ⁻¹¹
If it is known that alpha- emitters and Ac-227 are not present-----	3x10 ⁻¹¹	-----	1x10 ⁻¹²
If it is known that Ac-227, Th-230, Pa-231, Pu-238, Pu-239, Pu-240, Pu-242, Pu-244, Cm-248, Cf-249 and Cf-251 are not present-----	3x10 ⁻¹²	-----	1x10 ⁻¹³

4. If the mixture of radionuclides consists of uranium and its daughter products in ore dust prior to chemical ~~processing~~ separation of the uranium from the ore, the values specified below may be used ~~in lieu for uranium and its daughter products through radium-226, instead of those determined in accordance with paragraph 1, 2 or 3 above, or those specified in paragraphs 2 and 3 above.~~
 - a. For purposes of Table I, Column 1, 1×10^{-10} $\mu\text{Ci/ml}$ gross alpha activity; or 5×10^{-11} $\mu\text{Ci/ml}$ natural uranium; or 75 micrograms per cubic meter of air natural uranium.
 - b. For purposes of Table II, Column 1, 3×10^{-12} $\mu\text{Ci/ml}$ gross alpha activity; 2×10^{-12} $\mu\text{Ci/ml}$ natural uranium; or 3 micrograms per cubic meter of air natural uranium.
5. For purposes of this note, a radionuclide may be considered as not present in a mixture if (a) the ratio of the concentration of that radionuclide in the mixture (C_a) to the concentration limit for that radionuclide specified in Table II of Appendix "A" (MPC_a) does not exceed 1/10, (i.e., $C_a/\text{MPC}_a \leq 1/10$ and (b) the sum of such ratios for

all radionuclides considered as not present in the mixture does not exceed 1/4, (i.e., $C_a/MPC_a + C_b/MPC_b + \dots \leq 1/4$).

Note: To convert $\mu\text{Ci/ml}$ to SI units of megabecquerels per liter, multiply the above values by 37.

Example: Zirconium (40) Zr-97 S (Table I, Column 1-Air) ($1 \times 10^{-7} \mu\text{Ci/ml}$ multiplied by 37 is equivalent to $37 \times 10^{-7} \text{MBq/l}$).

History: Amended effective June 1, 1986; June 1, 1992.

APPENDIX B

(For Quantities for use in subsection 3 of section 33-10-04-03
and
subsection 3 of section 33-10-04-04)

Radioactive Material	Microcuries
Americium-241	0.01
Antimony-122	100
Antimony-124	10
Antimony-125	10
Arsenic-73	100
Arsenic-74	10
Arsenic-76	10
Arsenic-77	100
Barium-131	10
Barium-133	10
Barium-140	10
Bismuth-210	1
Bromine-82	10
Cadmium-109	10
Cadmium-115m	10
Cadmium-115	100
Calcium-45	10
Calcium-47	10
Carbon-14	100
Cerium-141	100
Cerium-143	100
Cerium-144	1
Cesium-131	1,000
Cesium-134m	100
Cesium-134	1
Cesium-135	10
Cesium-136	10
Cesium-137	10
Chlorine-36	10
Chlorine-38	10
Chromium-51	1,000
Cobalt-58m	10
Cobalt-58	10
Cobalt-60	1
Copper-64	100
Dysprosium-165	10
Dysprosium-166	100
Erbium-169	100
Erbium-171	100
Europium-152 (9.2 h)	100
Europium-152 (13 yr)	1
Europium-154	1
Europium-155	10

Fluorine-18	1,000
Gadolinium-153	10
Gadolinium-159	100
Gallium-72	10
Germanium-71	100
Gold-198	100
Gold-199	100
Hafnium-181	10
Holmium-166	100
Hydrogen-3	1,000
Indium-113m	100
Indium-114m	10
Indium-115m	100
Indium-115	10
Iodine-125	1
Iodine-126	1
Iodine-129	0.1
Iodine-131	1
Iodine-132	10
Iodine-133	1
Iodine-134	10
Iodine-135	10
Iridium-192	10
Iridium-194	100
Iron-55	100
Iron-59	10
Krypton-85	100
Krypton-87	10
Lanthanum-140	10
Lutetium-177	100
Manganese-52	10
Manganese-54	10
Manganese-56	10
Mercury-197m	100
Mercury-197	100
Mercury-203	10
Molybdenum-99	100
Neodymium-147	100
Neodymium-149	100
Nickel-59	100
Nickel-63	10
Nickel-65	100
Niobium-93m	10
Niobium-95	10
Niobium-97	10
Osmium-185	10
Osmium-191m	100
Osmium-191	100
Osmium-193	100
Palladium-103	100
Palladium-109	100
Phosphorus-32	10
Platinum-191	100

Platinum-193m	100
Platinum-193	100
Platinum-197m	100
Platinum-197	100
Plutonium-239	0.01
Polonium-210	0.1
Potassium-42	10
Praseodymium-142	100
Praseodymium-143	100
Promethium-147	10
Promethium-149	10
Radium-226	0.01
Rhenium-186	100
Rhenium-188	100
Rhodium-103m	100
Rhodium-105	100
Rubidium-86	10
Rubidium-87	10
Ruthenium-97	100
Ruthenium-103	10
Ruthenium-105	10
Ruthenium-106	1
Samarium-151	10
Samarium-153	100
Scandium-46	10
Scandium-47	100
Scandium-48	10
Selenium-75	10
Silicon-31	100
Silver-105	10
Silver-110m	1
Silver-111	100
Sodium-22	10
Sodium-24	10 1.
Strontium-85	10
Strontium-89	1
Strontium-90	0.1
Strontium-91	10
Strontium-92	10
Sulphur-35	100
Tantalum-182	10
Technetium-96	10
Technetium-97m	100
Technetium-97	100
Technetium-99m	100
Technetium-99	10
Tellurium-125m	10
Tellurium-127m	10
Tellurium-127	100
Tellurium-129m	10
Tellurium-129	100
Tellurium-131m	10
Tellurium-132	10

Terbium-160	10
Thallium-200	100
Thallium-201	100
Thallium-202	100
Thallium-204	10
Thorium (natural) <u>1/</u>	100
Thulium-170	10
Thulium-171	10
Tin-113	10
Tin-125	10
Tungsten-181	10
Tungsten-185	10
Tungsten-187	100
Uranium (natural) <u>2/</u>	100
Uranium-233	0.01
Uranium-234/235	<u>0.01</u>
Uranium-235	0.01
Vanadium-48	10
Xenon-131m	1,000
Xenon-133	100
Xenon-135	100
Ytterbium-175	100
Yttrium-90	10
Yttrium-91	10
Yttrium-92	100
Yttrium-93	100
Zinc-65	10
Zinc-69m	100
Zinc-69	1,000
Zirconium-93	10
Zirconium-95	10
Zirconium-97	10

Any alpha emitting radionuclide not listed above or mixtures of alpha emitters of unknown composition 0.01

Any radionuclide other than alpha emitting radionuclides, not listed above or mixtures of beta emitters of unknown composition 0.1

Note: For purposes of subsection 3 of section 33-10-04-03, and subsection 3 of section 33-10-04-04 where there is involved a combination of isotopes in known amounts, the limit for the combination should be derived as follows: Determine, for each isotope in the combination, the ratio between the quantity present in the combination and the limit otherwise established for the specific isotope when not in combination. The sum of such ratios for all the isotopes in the combination may not exceed "1" (i.e., "unity").

1/ Based on alpha disintegration rate of Th-232, Th-230 and their radioactive decay (daughter) products.

2/ Based on alpha disintegration rate of U-238, U-234, and U-235.

Note: To convert microcuries (uCi) to SI units of kilobecquerels (kBq), multiply the above values by 37.

Example: Zirconium-97 (10 uCi) (37) - 370 kBq
(10 μ Ci multiplied by 37 is equivalent to 370 kBq)

History: Amended effective June 1, 1986; June 1, 1992.

APPENDIX C
STANDARDS FOR UNRESTRICTED AREAS

(a) Surface contamination limits.

(1) Alpha emitters.

(i) Removable:	15	$\frac{\text{pCi}}{100 \text{ cm}^2}$	=	$\frac{33 \text{ dpm}}{100 \text{ cm}^2}$	average over any one surface
	45	$\frac{\text{pCi}}{100 \text{ cm}^2}$	=	$\frac{100 \text{ dpm}}{100 \text{ cm}^2}$	maximum
<hr/>					
(ii) Total (fixed)	450	$\frac{\text{pCi}}{100 \text{ cm}^2}$	=	$\frac{1000 \text{ dpm}}{100 \text{ cm}^2}$	average over any one surface
	2250	$\frac{\text{pCi}}{100 \text{ cm}^2}$	=	$\frac{5000 \text{ dpm}}{100 \text{ cm}^2}$	maximum
<hr/>					
		$0.25 \frac{\text{mrem}}{\text{hr}}$ at 1 cm			

(2) BetaGamma emitters.

(i) Removable: (all betagamma emitters except Hydrogen 3)	100 500	$\frac{\text{pCi}}{100 \text{ cm}^2}$ $\frac{\text{pCi}}{100 \text{ cm}^2}$			average over any one surface maximum
<hr/>					
Removable: (Hydrogen 3)	1000	$\frac{\text{pCi}}{100 \text{ cm}^2}$			average over any one surface
	5000	$\frac{\text{pCi}}{100 \text{ cm}^2}$			
<hr/>					
(ii) Total (fixed):		$0.25 \frac{\text{mrem}}{\text{hr}}$ at 1 cm from surface			

(b) Concentration in air and water: Appendix A, Table II of ~~Part-D~~ chapter 33-10-04.

(c) Concentrations in soil and other materials except water:

- (1) Radioactive material except source materials: Schedule A, Column II of ~~Part-G~~ chapter 33-10-03.
- (2) Source material: 0.05 per cent by weight.

History: Effective June 1, 1986; amended effective June 1, 1992.

CHAPTER 33-10-05

33-10-05-01. Purpose. This chapter establishes radiation safety requirements for persons utilizing sources of radiation for industrial radiography. The requirements of this chapter are in addition to, and not in substitution for, the other applicable requirements of this article.

History: Amended effective June 1, 1986; June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-05-02. Scope. This chapter applies to all licensees or registrants who use sources of radiation for industrial radiography ~~provided, however, that nothing in this chapter shall apply to the use of sources of radiation in the healing arts.~~ Except for those requirements of this chapter clearly applicable only to sealed radioactive sources, both radiation machines and sealed radioactive sources are covered by this chapter.

History: Amended effective June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-05-03. Definitions. As used in this chapter, the following definitions apply:

1. "Enclosed radiography" means industrial radiography conducted in an enclosed cabinet or room and includes cabinet radiography and shielded room radiography.
- a. "Cabinet radiography" means industrial radiography conducted in an enclosure or cabinet ~~so~~ shielded so that radiation levels at every location on the exterior meets the conditions specified in subsection 5 of section 33-10-04-02.
- ↔ 2. "Cabinet X-ray system" means an X-ray system with the X-ray tube installed in an enclosure ~~hereinafter termed "cabinet"~~ which, independently independent of existing architectural structures except the floor on which it may be placed. The cabinet X-ray system is intended to contain at least that portion of a material being irradiated, provide radiation attenuation, and exclude personnel from its interior during generation of ~~x~~ ionizing radiation. Included are all X-ray systems designed primarily for the inspection of carry-on baggage at airline, railroad, and bus terminals, and in similar facilities. An X-ray tube used within a shielded part of a building, or X-ray equipment which may temporarily or

occasionally incorporate portable shielding, is not considered a cabinet X-ray system.

- ~~2~~ 3. "Certified cabinet X-ray system" means an X-ray system which has been certified in accordance with 21 CFR 1010.2 as being manufactured and assembled pursuant to the provisions of 21 CFR 1020.40.
4. "Collimator" means a device used to limit the size, shape, and direction of the primary radiation beam.
- ~~2~~ 5. "Industrial radiography" means the examination of the macroscopic structure of materials by nondestructive methods utilizing using sources of ionizing radiation to produce radiographic images.
6. "Lixiscope" means a portable light-intensified imaging device using a sealed source.
- ~~3~~ 7. "Permanent radiographic installation" means a shielded installation or structure designed or intended for radiography and in which radiography is regularly performed.
- ~~4~~ 8. "Personal supervision" means ~~supervision such that the supervisor~~ guidance and instruction provided to a radiographer trainee by a radiographer instructor who is physically present at the site where, in visual contact with the trainee while the trainee is using sources of radiation and associated equipment are being used, watching the performance of the radiographer's assistant, and in such proximity that immediate assistance can be given as if required.
- ~~5~~ 9. "Radiographer" means any individual who performs, or ~~provides personal supervision of,~~ personally supervises industrial radiographic operations and who is responsible to the licensee or registrant for assuring compliance with the requirements of this article and all license (or certificate of registration) conditions.
10. "Radiographer instructor" means any radiographer who has been authorized by the department to provide on-the-job training to radiographer trainees in accordance with paragraph 2 of subdivision b of subsection 1 of section 33-10-05-05.
- ~~6~~ 11. ~~"Radiographer's assistant~~ Radiographer trainee" means any individual who, under the personal supervision of a radiographer instructor, uses sources of radiation, related handling tools, or radiation survey instruments in industrial radiography during the course of their instruction.
- ~~7~~ 12. "Radiographic exposure device" means any instrument containing a sealed source fastened or contained therein, in which the sealed source or shielding thereof may be moved, or otherwise

changed, from a shielded to unshielded position for purposes of making a radiographic exposure.

13. "Radiographic personnel" means any radiographer, radiographer instructor, or radiographer trainee.
14. "Residential location" means any area where structures in which people lodge or live are located, and the grounds on which such structures are located including, but not limited to, houses, apartments, condominiums, and garages.
- ~~8-~~ 15. "Shielded position" means the location within the radiographic exposure device or storage container which, by manufacturer's design, is the proper location for storage of the sealed source.
- ~~h-~~ 16. "Shielded-room radiography" means industrial radiography conducted in a room so shielded that every location on the exterior meets the conditions specified in subsection 5 of section 33-10-04-02.
- ~~9-~~ 17. "Source changer" means a device designed and used for replacement of sealed sources in radiographic exposure devices, including those source changers also used for transporting and storage of sealed sources.
18. "Storage area" means any location, facility, or vehicle which is used to store, transport, or secure a radiographic exposure device, a storage container, or a sealed source when it is not in use and which is locked or has a physical barrier to prevent accidental exposure, tampering with, or unauthorized removal of the device, container, or source.
- ~~+0-~~ 19. "Storage container" means a shielded device in which sealed sources are ~~transported or~~ secured and stored.
- ~~++-~~ 20. "Temporary jobsite" means any location where industrial radiography is performed other than the locations listed in a specific license or certificate of registration.
21. "Transport container" means a package that is designed to provide radiation safety and security when sealed sources are transported and which meets all applicable requirements of the United States department of transportation.

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

33-10-05-04. Equipment control.

1. Limits on levels of radiation for radiographic exposure devices and storage containers. Radiographic exposure devices measuring less than four inches [10 centimeters] from the sealed source storage position to any exterior surface of the device shall have no radiation level in excess of fifty milliroentgens [1.29×10^{-5} coulombs per kilogram] per hour at six inches [15 centimeters] from any exterior surface of the device. Radiographic exposure devices measuring a minimum of four inches [10 centimeters] from the sealed source storage position to any exterior surface of the device, and all storage containers for sealed sources or outer containers for radiographic exposure devices, shall have no radiation level in excess of two hundred milliroentgens [5.16×10^{-5} coulombs per kilogram] per hour at any exterior surface, and ten milliroentgens [2.58×10^{-6} coulombs per kilogram] per hour at ~~one meter~~ thirty-nine and four-tenths inches [1 meter] from any exterior surface. The radiation levels specified are with the sealed source in the shielded (i.e., "off") position.
2. Locking of sources of radiation.
 - a. Each source of radiation shall be provided with a lock or ~~outer locked~~ lockable outer container designed to prevent unauthorized or accidental production of radiation or removal or exposure of a sealed source and shall be kept locked at all times except when under the direct surveillance of a radiographer or ~~radiographer's assistant~~ radiographer trainee, or as may be otherwise authorized pursuant to subsection 1 of section 33-10-05-06. Each storage container and source changer likewise shall be provided with a lock and must be kept locked when containing sealed sources except when the container is under the direct surveillance of a radiographer or ~~radiographer's assistant~~ radiographer trainee.
 - b. Radiographic exposure devices, source changers, and storage containers, prior to being moved from one location to another and also prior to being secured to a given location, shall be locked and surveyed to assure that the sealed source is in the shielded position.
 - c. The sealed source must be secured in its shielded position by locking the exposure device or securing the remote control each time the sealed source is returned to its shielded position. Then a survey must be performed to determine that the sealed source is in the shielded position pursuant to subdivision b of subsection 3 of section 33-10-05-06.
3. Storage precautions.
 - a. Locked radiographic exposure devices, source changers, ~~source containers,~~ and storage containers, and radiation

machines shall be physically secured to prevent tampering or removal by unauthorized personnel.

b. Radiographic exposure devices, source changers, or transport containers that contain radioactive material may not be stored in residential locations. This requirement does not apply to storage of radioactive material in a vehicle in transit for use at temporary jobsites, if the licensee complies with subdivision c and if the vehicle does not constitute a permanent storage location as described in subdivision d of subsection 3.

c. If a vehicle is to be used for storage of radioactive material, a vehicle survey must be performed after securing radioactive material in the vehicle and before transport to ensure that radiation levels do not exceed the limits specified in subdivision a of subsection 5 of section 33-10-04-05 at the exterior surface of the vehicle.

d. A storage or use location is permanent if radioactive material is stored at the location for more than ninety days and any one or more of the following applies to the location:

(1) Telephone service is established by the licensee.

(2) Industrial radiographic services are advertised for or from the location.

(3) Industrial radiographic operations are conducted at other sites due to arrangements made from the location.

4. Radiation survey instruments.

a. The licensee or registrant shall maintain sufficient calibrated and operable radiation survey instruments to make physical radiation surveys as required by this chapter and chapter 33-10-04. Instrumentation required by this subsection must have a range such that two milliroentgens [5.16×10^{-7} coulombs per kilogram] per hour through one roentgen [2.58×10^{-4} coulombs per kilogram] per hour can be measured.

b. Each radiation survey instrument shall be calibrated ~~at~~:

(1) At energies appropriate for use, and at intervals not to exceed three months and after each instrument servicing, ~~such~~.

(2) Such that accuracy within plus or minus twenty percent can be demonstrated ~~at~~.

(3) At two or more widely separated points, other than zero, on each scale. A record shall be maintained of the latest date of calibration. Instrumentation required by this subsection shall have a range such that two milliroentgens per hour through one roentgen per hour can be measured points located approximately one-third and two-thirds of full-scale on each scale for linear scale instruments; at midrange of each decade, and at two points of at least one decade for logarithmic scale instruments; and at appropriate points for digital instruments.

- c. Records of these calibrations must be maintained for two years after the calibration date for inspection by the department.
 - d. Each radiation survey instrument must be checked with a radiation source at the beginning of each day of use and at the beginning of each workshift to ensure it is operating properly.
5. Leak testing, repair, tagging, opening, modification, and replacement of sealed sources.
- a. The replacement of any sealed source fastened to or contained in a radiographic exposure device and leak testing, repair, tagging, opening, or any other modification of any sealed source shall be performed only by persons specifically authorized to do so by the department, the United States nuclear regulatory commission, or any agreement state.
 - b. Each sealed source shall be tested for leakage at intervals not to exceed six months. In the absence of a certificate from a transferor that a test has been made within the six-month period prior to the transfer, the sealed source shall not be put into use until tested.
 - c. The leak test shall be capable of detecting the presence of five-thousandths microcurie [185 becquerels] of removable contamination on the sealed source. An acceptable leak test for sealed sources in the possession of a radiography licensee would be to test at the nearest accessible point to the sealed source storage position, or other appropriate measuring point, by a procedure to be approved pursuant to paragraph 5 of subdivision e of subsection 3 of section 33-10-03-05. Records of leak test results shall be kept in units of microcuries [becquerels] and maintained for inspection by the department for six months two years after the next required leak test is performed or until the sealed source is transferred or disposed.

- d. Any test conducted pursuant to subdivisions b and c which reveals the presence of five-thousandths microcurie [185 becquerels] or more of removable radioactive material shall be considered evidence that the sealed source is leaking. The licensee shall immediately withdraw the equipment involved from use and shall cause it to be decontaminated and repaired or to be disposed of, in accordance with this article. Within five days after obtaining results of the test, the licensee shall file a report with the department describing the equipment involved, the test results, and the corrective action taken.
- e. A sealed source which is not fastened to or contained in a radiographic exposure device shall Each radiographic exposure device must have permanently attached to it a durable tag at least one inch [2.54 centimeters] square bearing the prescribed radiation caution symbol in conventional colors, magenta or purple on a yellow background, and at least which has, as a minimum, the instructions instruction: "Danger - Radioactive Material - Do Not Handle - Notify Civil Authorities if Found".
6. Quarterly inventory. Each licensee shall conduct a quarterly physical inventory to account for all sealed sources and radiography exposure devices received or possessed by the licensee. The records of the inventories shall be maintained for two years from the date of the inventory for inspection by the department and shall include the quantities and kinds of radioactive material, the location of sealed sources, and the date of the inventory, the name of the individual conducting the inventory, the manufacturer, the model number, and the serial number.
7. Utilization logs. Each licensee or registrant shall maintain current logs, which shall be kept available for inspection by the department for two years from the date of the recorded event, showing for each source of radiation the following information:
- a. A description (or make and model number) unique identification, such as serial number, of each source of radiation or storage container radiation machine, each radiographic exposure device in which the a sealed source is located, and each sealed source.
- b. The identity of the radiographer to whom assigned.
- c. Locations where used and dates of use.
- d. The dates each source of radiation is removed from storage and returned to storage.

8. Inspection and maintenance.

- a. ~~The~~ Each licensee or registrant shall check ensure that checks for obvious defects in radiation machines, radiographic exposure devices, storage containers, and source changers are performed prior to use each day or shift the equipment is used.
- b. ~~The~~ Each licensee or registrant shall conduct a program for of at least quarterly inspection and maintenance of radiation machines, radiographic exposure devices, storage containers, and source changers at intervals not to exceed three months or prior to the first use thereafter to assure proper functioning of components important to safety. All appropriate parts shall be maintained in accordance with the manufacturer's specifications. Records of inspection and maintenance shall be maintained for inspection by the department until it authorizes their disposal for two years from the date the inspection and maintenance is performed.
- c. If any inspection conducted pursuant to subdivision a or b reveals damage to components critical to radiation safety, the device shall be removed from service and labeled as defective until repairs have been made.

9. Permanent radiographic installations. Permanent radiographic installations having high radiation area entrance controls of the ~~types~~ type described in subparagraphs b and c of paragraph 2 of subdivision c of subsection 3 of section 33-10-05-05 33-10-04-03 shall also meet the following requirements:

- a. Each entrance that is used for personnel access to the high radiation area shall have both visible and audible warning signals to warn of the presence of radiation. The visible signal shall be activated by radiation whenever the source is exposed. The audible signal shall be ~~actuuated~~ activated when an attempt is made to enter the installation while the source is exposed.
- b. ~~A~~ The control device or alarm system shall be tested for proper operation at the beginning of each period of use day of equipment use. If a control device or alarm system is operating improperly, it must be immediately labeled as defective and repaired before industrial radiographic operations are resumed. Records of such these tests shall be maintained for inspection by the department until it authorizes their disposal for two years from the date the tests were conducted.

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992.
General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-05-04.1. Exemptions.

1. Except for the requirements of subdivision b and c of subsection 6 of section 33-10-05-06, certified cabinet X-ray systems designed to exclude individuals from the interior of the cabinet are exempt from the requirements of this chapter.
2. Industrial users of lixiscopes are exempt from the requirements of this chapter.

History: Effective June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-05-05. Personal radiation safety requirements for radiographers and radiographers' assistants radiographic personnel.

1. Training and testing.

- a. The licensee or registrant shall not permit any individual to act as a radiographer trainee until such individual has received copies of, instructions in, and has demonstrated an understanding of:
 - (1) Has been instructed in the The subjects outlined in appendix A of this chapter;
 - (2) Has received copies of and instruction in department requirements The rules contained in this chapter and in the applicable sections of chapters 33-10-04 and, 33-10-10, department license under which the radiographer will perform radiography, and the licensee's operating and emergency procedures and 33-10-13;
 - (3) Has demonstrated competence to use the licensee's radiographic exposure devices, sealed sources, related handling tools, and survey instruments; and The appropriate department license or certificate of registration; and
 - (4) Has demonstrated understanding of the instructions in this paragraph by successful completion of a written test and a field examination on the subjects covered. The licensee's or registrant's operating and emergency procedures.

b. The licensee or registrant shall not permit any individual to act as a radiographer's assistant radiographer, as defined in this chapter, until such individual:

(1) Has received copies of and instruction in the licensee's operating and emergency procedures met the requirements of subdivision a of subsection 1;

(2) Has demonstrated competence to use, under the personal supervision of the radiographer, the radiographic exposure devices, sealed sources, related handling tools, and radiation survey instruments that the assistant will use; and provided the department with documentation showing completion of at least thirty days of on-the-job training by a radiographer instructor as a radiographer trainee following completion of the requirements of subdivision a of subsection 1;

Note: This requirement does not apply to individuals designated as radiographers prior to March 1, 1992.

(3) Has demonstrated competence in the use of sources of radiation, radiographic exposure devices, related handling tools, and radiation survey instruments which may be employed in industrial radiographic assignments;

~~(3)~~ (4) Has demonstrated an understanding of the instructions in this paragraph subdivision a of subsection 1 by successfully completing successful completion of a written or oral test and a field examination on the subjects covered-; and

(5) Has successfully completed an examination administered by the department or a third party designated by the department after March 1, 1993.

c. Records of the above training, including copies of written tests and dates of oral tests and field examinations, shall be maintained by the licensee or registrant for inspection by the department for three years following termination of employment.

d. Each licensee or registrant shall conduct an internal audit program to ensure that the department's radioactive material license conditions and the licensee's or registrant's operating and emergency procedures are followed by each radiographer and radiographer's assistant. These internal audits shall be performed at least quarterly, and each radiographer shall be audited at least annually quarterly. Records of internal audits

shall be maintained for inspection by the department for two years from the date of the audit.

2. Operating and emergency procedures. The licensee's or registrant's operating and emergency procedures shall include instructions in at least the following:
 - a. The handling and use of sources of radiation to be employed such that no individual is likely to be exposed to radiation doses in excess of the limits established in chapter 33-10-04.
 - b. Methods and occasions for conducting radiation surveys.
 - c. Methods for controlling access to radiographic areas.
 - d. Methods and occasions for locking and securing sources of radiation.
 - e. Personnel monitoring and the use of personnel monitoring equipment, including steps that must be taken immediately by radiography personnel in the event a pocket dosimeter is found to be ~~off scale~~ off-scale.
 - f. Transportation to field locations, including packing of sources of radiation in the vehicles, posting of vehicles, and control of sources of radiation during transportation.
 - g. Minimizing exposure of individuals in the event of an accident.
 - h. The procedure for notifying proper personnel in the event of an accident.
 - i. Maintenance of records.
 - j. The inspection and maintenance of radiographic exposure devices, source changers, storage containers, and radiation machines.
3. Personnel monitoring control.
 - a. ~~No~~ The licensee or registrant shall not permit any individual to act as a radiographer or as a ~~radiographer's assistant~~ radiographer trainee unless, at all times during radiographic operations, each such individual shall wear wears a direct-reading pocket dosimeter and either a film badge or a thermoluminescent dosimeter badge. Pocket dosimeters shall have a range from zero to at least two hundred milliroentgens [5.6×10^{-5} coulombs per kilogram] and shall be recharged daily or at the start of each shift. Each badge ~~and~~ or thermoluminescent dosimeter shall be assigned to and worn by only one individual.

- b. Pocket dosimeters shall be read and exposures recorded at least once daily.
 - c. Pocket dosimeters shall be checked for correct response to radiation at periods not to exceed one year for correct response to radiation. Acceptable dosimeters shall read within plus or minus thirty percent of the true radiation exposure. Records of this check must be maintained for inspection by the department for two years from the date of the annual check for correct response.
 - d. An If an individual's film badge or thermoluminescent dosimeter shall be immediately processed if pocket dosimeter is discharged beyond its range, industrial radiographic operations by that individual shall cease and the individual's film badge or thermoluminescent dosimeter must be processed immediately. The individual may not return to work with sources of radiation until a determination of the radiation exposure has been made.
 - e. Reports received from the film badge or thermoluminescent dosimeter processor and records of daily pocket dosimeter readings shall be maintained kept for inspection by the department until the department authorizes disposition.
 - f. If a film badge or thermoluminescent dosimeter is lost or damaged, the worker shall cease work immediately until a replacement film badge or thermoluminescent dosimeter is provided and the exposure is calculated for the time period from issuance to loss or damage of the film badge or thermoluminescent dosimeter.
4. Supervision of radiographers' assistants radiographer trainee. Whenever a radiographer's assistant radiographer trainee uses radiographic exposure devices, uses sealed sources or related source handling tools, or conducts radiation surveys required by subdivisions b and c of subsection 3 of section 33-10-05-06 to determine that the sealed source has returned to the shielded position after an exposure, the assistant radiographer trainee shall be under the personal supervision of a radiographer instructor. The personal supervision shall include-
- a. The radiographer's personal presence at the site where the sealed sources are being used-
 - b. The ability of the radiographer to give immediate assistance if required-
 - c. The radiographer's watching the assistant's performance of the operations referred to in this section-

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992.

General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

33-10-05-06. Precautionary procedures in radiographic operations.

1. Security. During each radiographic operation, the radiographer or ~~radiographer's assistant~~ radiographer trainee shall maintain a direct surveillance of the operation to protect against unauthorized entry into a high radiation area, as defined in chapter 33-10-01, except ~~(a)~~ where:
 - a. Where the high radiation area is equipped with a control device or alarm system as described in paragraph 2 of subdivision c of subsection 3 of section 33-10-04-03, ~~or~~ ~~(b)~~ where.
 - b. Where the high radiation area is locked to protect against unauthorized or accidental entry.
2. Posting. Notwithstanding any provisions in subdivision c of subsection 4 of section 33-10-04-03, areas in which radiography is being performed shall be conspicuously posted as required by paragraph 1 of subdivision c of subsection 3 of section 33-10-04-03 and subdivision b of subsection 3 of section 33-10-04-03.
3. Radiation surveys and survey records.
 - a. No radiographic operation shall be conducted unless calibrated and operable radiation survey instrumentation, as described in subsection 4 of section 33-10-05-04 is available and used at each site where radiographic exposures are made.
 - b. A survey with a radiation survey instrument shall be made after each radiographic exposure to determine that the sealed source has been returned to its shielded position. The entire circumference of the radiographic exposure device shall be surveyed. If the radiographic exposure device has a source guide tube, the survey shall include the entire length of the guide tube.
 - c. A survey must be made of the storage area as defined in section 33-10-05-03 whenever a radiographic exposure device is being placed in storage.
 - d. A physical radiation survey, as specified in subsection 2 of section 33-10-05-04, shall be made to determine that each sealed source is in its shielded position prior to securing the radiographic exposure device or, storage container, as specified in subsection 2 of section

~~33-10-05-04~~ or source changer in a storage area as defined in section 33-10-05-03.

- ~~d.~~ e. A physical radiation survey shall be made after each radiographic exposure using radiation machines to determine that the machine is "off".
- ~~e.~~ f. Records shall be kept of the surveys required by subdivisions c and d of subsection 3. Such records shall be maintained for inspection by the department for two years after completion of the survey. If the survey was used to determine an individual's exposure, however, the records of the survey must be maintained until the department authorizes their disposition.

4. ~~Records~~ Documents and records required at temporary jobsites. Each licensee or registrant conducting industrial radiography at a temporary ~~site~~ jobsite shall have the following records available at that site for inspection by the department:

- a. Appropriate license or certificate of registration or equivalent document.
- b. Operating and emergency procedures.
- c. Applicable rules.
- d. Survey records required pursuant to subsection 3 for the period of operation at the site.
- e. Daily pocket dosimeter records for the period of operation at the site.
- f. The latest instrument calibration and leak test record for specific devices in use at the site. Acceptable records include tags or labels which are affixed to the device or survey meter.

5. ~~Special~~ Specific requirements and exemptions for enclosed radiographic personnel performing industrial radiography.

- a. At a jobsite, the following must be supplied by the licensee or registrant:
 - (1) At least one operable, calibrated survey instrument;
 - (2) A current whole body personnel monitor (thermoluminescent dosimeter or film badge) for each individual;
 - (3) An operable, calibrated pocket dosimeter with a range of zero to two hundred milliroentgens [5.16×10^{-5} coulombs per kilogram] for each worker; and

(4) The appropriate barrier ropes and signs.

b. Industrial radiographic operations may not be performed if any of the items specified in subdivision a of subsection 5 are not available at the jobsite or are inoperable.

c. Each licensee or registrant shall provide as a minimum two radiographic personnel when sources of radiation are used at temporary jobsites. If one of the personnel is a radiographer trainee, the other must be a radiographer instructor.

d. No individual other than a radiographer or a radiographer trainee who is under the personal supervision of a radiographer instructor may manipulate controls or operate equipment used in industrial radiographic operations.

e. No individual may act as a radiographer instructor unless such individual:

(1) Has met the requirements of subdivision b of subsection 1 of section 33-10-05-05;

(2) Has one year of documented experience as a radiographer; and

(3) Has been named as a radiographer instructor on the license or registration certificate issued by the department.

f. During an inspection by the department, the department inspector may terminate an operation if any of the items required in subdivision a of subsection 5 are not available and operable or if the required number of radiographic personnel are not present. Operations may not be resumed until such conditions are met.

6. Special requirements and exemptions for cabinet radiography.

a. Systems for ~~enclosed~~ cabinet radiography designed to allow admittance of individuals shall:

(1) Comply with all applicable requirements of this ~~part~~ chapter and subsection 5 of section 33-10-04-02. If such a system is a certified cabinet X-ray system, it shall comply with all applicable requirements of this chapter and 21 CFR 1020.40.

(2) Be evaluated at intervals not to exceed one year to assure compliance with the applicable requirements as specified in paragraph 1. Records of these evaluations shall be maintained for inspection by the

department for a period of two years after the evaluation.

b. ~~Cabinet~~ Certified cabinet X-ray systems designed to exclude individuals from the interior of the cabinet are exempt from the requirements of this chapter except that:

- (1) Operating personnel must be provided with either a film badge or a thermoluminescent dosimeter and reports of the results must be maintained for inspection by the department.
- (2) No registrant shall permit any individual to operate a cabinet X-ray system until such individual has received a copy of and instruction in the operating procedures for the unit and has demonstrated competence in its use. Records which demonstrate compliance with this paragraph shall be maintained for inspection by the department until disposition is authorized by the department.
- (3) Tests for proper operation of high radiation area control devices or alarm systems, where applicable, ~~must~~ shall be conducted and recorded in accordance with subsection 9 of section 33-10-05-04.
- (4) The registrant shall perform an evaluation at intervals not to exceed one year, to determine conformance with subsection 5 of section ~~33-10-05-04~~ 33-10-04-02. If such a system is a certified cabinet X-ray system, it shall be evaluated at intervals not to exceed one year to determine conformance with 21 CFR 1020.40. Records of these evaluations shall be maintained for inspection by the department for a period of two years after the evaluation.

c. Certified cabinet X-ray systems shall be maintained in compliance with 21 CFR 1020.40 unless prior approval has been granted by the department pursuant to subsection 1 of section 33-10-01-05.

7. Prohibitions. Industrial radiography performed with a sealed source which is not fastened to or contained in radiographic exposure devices, known as fishpole radiography, is prohibited unless specifically authorized by the department.

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

APPENDIX A

~~THE INSTRUCTION OF RADIOGRAPHERS~~ SUBJECTS TO BE COVERED DURING SUBJECTS FOR INSTRUCTION OF RADIOGRAPHER TRAINEES

Training provided to qualify individuals as radiographer trainees in compliance with subdivision a of subsection 1 of section 33-10-05-05 shall be presented on a formal basis. The training must include the following subjects:

1. Fundamentals of radiation safety
 - a. Characteristics of radiation
 - b. Units of radiation dose (mrem or sievert) and quantity of radioactivity (curie or becquerel)
 - c. Significance of radiation dose
 - (1) Radiation protection standards
 - (2) Biological effects of radiation ~~dose~~
 - (3) Case histories of radiography accidents
 - d. Levels of radiation from sources of radiation
 - e. Methods of controlling radiation dose
 - (1) Working time
 - (2) Working distances
 - (3) Shielding
2. Radiation detection instrumentation to be used
 - a. Use of radiation survey instruments
 - (1) Operation
 - (2) Calibration
 - (3) Limitations
 - b. Survey techniques
 - c. Use of personnel monitoring equipment
 - (1) Film badges
 - (2) Thermoluminescent dosimeters (TLD's)

(3) Pocket dosimeters

3. The requirements of pertinent federal and state rules and regulations
4. The licensee's or registrant's written operating and emergency procedures
5. Radiographic equipment to be used
 - a. Remote handling equipment
 - b. Radiographic Operation and control of radiographic exposure devices and sealed sources, including pictures or models of source assemblies (pigtailes)
 - c. Storage and transport containers, source chargers
 - d. Operation and control of X-ray equipment
 - e. Collimators
4. ~~The requirements of pertinent federal regulations and this article~~
5. ~~The licensee's or registrant's written operating and emergency procedures~~
6. ~~Case histories of radiography accidents~~

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992.

CHAPTER 33-10-06

33-10-06-01. Scope. This chapter establishes requirements, for which a registrant is responsible, for use of X-ray equipment by or under the supervision of an individual authorized by and licensed in accordance with state statutes to engage in the healing arts or veterinary medicine. The requirements of this chapter are in addition to, and not in substitution for, other applicable requirements of this article.

History: Amended effective June 1, 1986; June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-06-02. Definitions. As used in this chapter, the following definitions apply:

1. "Accessible surface" means the external surface of the enclosure or housing provided by the manufacturer.
2. "Added filtration" means any filtration which is in addition to the inherent filtration.
3. "Aluminum equivalent" means the thickness of type 1100 aluminum alloy affording the same attenuation, under specified conditions, as the material in question. (The nominal chemical composition of type 1100 aluminum alloy is ninety-nine percent minimum aluminum, twelve-hundredths percent copper.)
4. "Assembler" means any person engaged in the business of assembling, replacing, or installing one or more components into an X-ray system or subsystem. The term includes the owner of an X-ray system or the employee or agent who assembles components into an X-ray system that is subsequently used to provide professional or commercial services.
5. "Attenuation block" means a block or stack, having dimensions twenty centimeters by twenty centimeters by three and eight-tenths centimeters, of type 1100 aluminum alloy or other materials having equivalent attenuation.
6. "Automatic exposure control" means a device which automatically controls one or more technique factors in order to obtain at a preselected location or locations a required quantity of radiation (See also "phototimer").
7. "Barrier" (see "protective barrier").

8. "Beam axis" means a line from the source through the centers of the X-ray fields.
9. "Beam-limiting device" means a device which provides a means to restrict the dimensions of the X-ray field.
10. "Beam monitoring system" means a system designed to detect and measure the radiation present in the useful beam.
11. "Cephalometric device" means a device intended for the radiographic visualization and measurement of the dimensions of the human head.
12. "Certified components" means components of X-ray systems which are subject to regulations promulgated under the Radiation Control for Health and Safety Act of 1968 [Pub. L. 90-602].
13. "Certified system" means any X-ray system which has one or more certified component or components.
14. "Changeable filters" means any filter, exclusive of inherent filtration, which can be removed from the useful beam through any electronic, mechanical, or physical process.
15. "Coefficient of variation" or "C" means the ratio of the standard deviation to the mean value of a population of observations. It is estimated using the following equation:

$$C = \frac{s}{\bar{X}} = \frac{1}{\bar{X}} \left[\sum_{i=1}^n \frac{(X_i - \bar{X})^2}{n-1} \right]^{1/2}$$

where:

s = Estimated standard deviation of the population.

X = Mean value of observations in sample.

X_i = ith observation in sample.

n = Number of observations in sample.

16. "Computed tomography" means the production of a tomogram by the acquisition and computer processing of X-ray transmission data.
17. "Contact therapy system" means an X-ray system used for therapy with the X-ray tube port placed in contact with or within five centimeters of the surface being treated.
- ~~17.~~ 18. "Control panel" means that part of the X-ray control upon which are mounted the switches, knobs, pushbuttons, and other hardware necessary for manually setting the technique factors.

- ~~18-~~ 19. "Cooling curve" means the graphical relationship between heat units stored and cooling time.
20. "CT" (see "computed tomography").
- ~~19-~~ 21. "Dead-man switch" means a switch so constructed that a circuit closing contact can be maintained only by continuous pressure on the switch by the operator.
- ~~20-~~ 22. "Detector" means (see "radiation detector").
- ~~21-~~ 23. "Diagnostic source assembly" means the tube housing assembly with a beam-limiting device attached.
- ~~22-~~ 24. "Diagnostic X-ray system" means an X-ray system designed for irradiation of any part of the human body for the purpose of diagnosis or visualization.
- ~~23-~~ 25. "Direct scattered radiation" means that scattered radiation which has been deviated in direction only by materials irradiated by the useful beam (see "scattered radiation").
- ~~24-~~ 26. "Entrance exposure rate" means the exposure per unit time at the point where the center of the useful beam enters the patient.
- ~~25-~~ 27. "Equipment" means (see "X-ray equipment").
- ~~26-~~ 28. "Field emission equipment" means equipment which uses an X-ray tube in which electron emission from the cathode is due solely to the action of an electric field.
- ~~27-~~ 29. "Filter" means material placed in the useful beam to absorb preferentially selected radiations.
- ~~28-~~ 30. "Fluoroscopic imaging assembly" means a subsystem in which X-ray photons produce a fluoroscopic image. It includes the image receptor or receptors such as the image intensifier and spot-film device, electrical interlocks, if any, and structural material providing linkage between the image receptor and diagnostic source assembly.
- ~~29-~~ 31. "Focal spot" means the area projected on the anode of the X-ray tube by the electrons accelerated from the cathode and from which the useful beam originates.
- ~~30-~~ 32. "General purpose radiographic X-ray system" means any radiographic X-ray system which, by design, is not limited to radiographic examination of specific anatomical regions.
- ~~31-~~ 33. "Gonad shield" means a protective barrier for the testes or ovaries.

- ~~32.~~ 34. "Half-value layer" means the thickness of specified material which attenuates the beam of radiation to an extent such that the exposure rate is reduced to one-half of its original value. In this definition the contribution of all scattered radiation, other than any which might be present initially in the beam concerned, is deemed to be excluded.
- ~~33.~~ 35. "Healing arts screening" means the testing of human beings using X-ray machines for the detection or evaluation of health indications when such tests are not specifically and individually ordered by a licensed practitioner of the healing arts legally authorized to prescribe such X-ray tests for the purpose of diagnosis or treatment.
- ~~34.~~ 36. "Heat unit" means a unit of energy equal to the product of the peak kilovoltage, milliamperes, and seconds, i.e., kVp x mA x seconds.
- ~~35.~~ 37. "HVL" means (see "half-value layer").
- ~~36.~~ 38. "Image intensifier" means a device, installed in its housing, which instantaneously converts an X-ray pattern into a corresponding light image of higher energy density.
- ~~37.~~ 39. "Image receptor" means any device, such as a fluorescent screen or radiographic film, which transforms incident X-ray photons either into a visible image or into another form which can be made into a visible image by further transformations.
- ~~38.~~ 40. "Image receptor support" means, for mammographic systems, that part of the system designed to support the image receptor in a horizontal plane during a mammographic examination.
- ~~39.~~ 41. "Inherent filtration" means the filtration of the useful beam provided by the permanently installed components of the tube housing assembly.
- ~~40.~~ "Interlock" means a device arranged or connected such that the occurrence of an event or condition is required before a second event or condition can occur or continue to occur.
- ~~41.~~ 42. "Irradiation" means the exposure of matter to ionizing radiation.
- ~~42.~~ 43. "Kilovolts peak" means (see "peak tube potential").
- ~~43.~~ 44. "kV" means kilovolts.
- ~~44.~~ 45. "kVp" means (see "peak tube potential").
- ~~45.~~ 46. "kWs" means kilowatt second. It is equivalent to 10^3 kV·mA's, i.e.,

$$(A) \text{ kWs} = (X) \text{ kV} \times (Y) \text{ mA} \times (Z) \text{ s} \times \frac{\text{kWs}}{10^3 \text{ kV} \times \text{mA} \times \text{s}} = \frac{XYZ \text{ kWs}}{10^3}$$

- ~~46.~~ 47. "Lead equivalent" means the thickness of lead affording the same attenuation, under specified conditions, as the material in question.
- ~~47.~~ 48. "Leakage radiation" means radiation emanating from the diagnostic or therapeutic source assembly except for:
- The useful beam.
 - Radiation produced when the exposure switch or timer is not activated.
- ~~48.~~ 49. "Leakage technique factors" means the technique factors associated with the diagnostic or therapeutic assembly which are used in measuring leakage radiation. They are defined as follows:
- For diagnostic source assemblies intended for capacitor energy storage equipment, the maximum-rated peak tube potential and the maximum-rated number of exposures in an hour for operation at the maximum-rated peak tube potential with the quantity of charge per exposure being ten millicoulombs, i.e., ten milliamperere seconds, or the minimum obtainable from the unit, whichever is larger.
 - For diagnostic source assemblies intended for field emission equipment rated for pulsed operation, the maximum-rated peak tube potential and the maximum-rated number of X-ray pulses in an hour for operation at the maximum-rated peak tube potential.
 - For all other diagnostic or therapeutic source assemblies, the maximum-rated peak tube potential and the maximum-rated continuous tube current for the maximum-rated peak tube potential.
- ~~49.~~ 50. "Light field" means that area of the intersection of the light beam from the beam-limiting device and one of the set of planes parallel to and including the plane of the image receptor, whose perimeter is the locus of points at which the illumination is one-fourth of the maximum in the intersection.
51. "Linear attenuation coefficient" or " μ " means the quotient of dN/N divided by dI when dN/N is the fraction of uncharged ionizing radiation that experience interactions in traversing a distance dI in a specified material.

~~50-~~ 52. "Line-voltage regulation" means the difference between the no-load and the loadline potentials expressed as a percent of the loadline potential. It is calculated using the following equation:

$$\text{Percent line-voltage regulation} = 100 (V_n - V_1)/V_1$$

where:

V_n = No-load line potential and

V_1 = Load line potential

~~51-~~ 53. "mA" means milliampere.

~~52-~~ 54. "mAs" means milliampere second.

~~53-~~ 55. "Maximum line current" means the root-mean-square current in the supply line of an X-ray machine operating at its maximum rating.

~~54-~~ 56. "Mobile X-ray equipment" (See "X-ray equipment").

57. "Patient" means an individual subjected to healing arts examination, diagnosis, or treatment.

~~55-~~ 58. "Peak tube potential" means the maximum value of the potential difference across the X-ray tube during an exposure.

59. "Phantom" means a volume of material behaving in a manner similar to tissue with respect to the attenuation and scattering of radiation.

~~56-~~ 60. "Phototimer" means a method for controlling radiation exposures to image receptors by the amount of radiation which reaches a radiation monitoring device. The radiation monitoring device is part of an electronic circuit which controls the duration of time the tube is activated (See "automatic exposure control").

~~57-~~ 61. "PID" means (see "position indicating device").

~~58-~~ 62. "Portable X-ray equipment" (see "X-ray equipment").

~~59-~~ 63. "Position indicating device" means a device on dental X-ray equipment used to indicate the beam position and to establish a definite source-surface (skin) distance. It may or may not incorporate or serve as a beam-limiting device.

~~60-~~ 64. "Primary dose monitoring system" means a system which will monitor the useful beam during irradiation and which will terminate irradiation when a preselected number of dose monitor units have been acquired.

~~61-~~ 65. "Primary protective barrier" means (see "protective barrier").

- ~~62-~~ 66. "Protective apron" means an apron made of radiation absorbing materials used to reduce radiation exposure.
- ~~63-~~ 67. "Protective barrier" means a barrier of radiation absorbing material or materials used to reduce radiation exposure. The types of protective barriers are as follows:
- a. "Primary protective barrier" means the material, excluding filters, placed in the useful beam, for protection purposes, to reduce the radiation exposure.
 - b. "Secondary protective barrier" means a barrier sufficient to attenuate the stray radiation to the required degree.
- ~~64-~~ 68. "Protective glove" means a glove made of radiation absorbing materials used to reduce radiation exposure.
- ~~65-~~ 69. "Qualified expert" means an individual who has demonstrated to the satisfaction of the department that such individual possesses the knowledge and training to measure ionizing radiation, to evaluate safety techniques, and to advise regarding radiation protection needs.
- ~~66-~~ 70. "Radiation detector" means a device which in the presence of radiation provides a signal or other indication suitable for use in measuring one or more quantities of incident radiation.
- ~~67-~~ 71. "Radiation therapy simulation system" means a radiographic or fluoroscopic X-ray system intended for localizing the volume to be exposed during radiation therapy and confirming the position and size of the therapeutic irradiation field.
- ~~68-~~ 72. "Radiograph" means an image receptor on which the image is created directly or indirectly by an X-ray pattern and results in a permanent record.
- ~~69-~~ 73. "Radiographic imaging system" means any system whereby a permanent or semipermanent image is recorded on an image receptor by the action of ionizing radiation.
- ~~70-~~ 74. "Radiological physicist" means an individual who:
- a. Is certified by the American board of radiology in therapeutic radiological physics, radiological physics, or X-ray and gamma-ray physics; or
 - b. Has a bachelor's degree in one of the physical sciences or engineering and three year's full-time experience working in therapeutic radiological physics under the direction of a physicist certified by the American board of radiology. The work duties must include duties involving the calibration and spot checks of a medical accelerator or a sealed source teletherapy unit; or

c. Has a master's or a doctor's degree in physics, biophysics, radiological physics, health physics, or engineering; has had one year's full-time training in therapeutic radiological physics; and has had one year's full-time work experience in a radiotherapy facility where the individual's duties involve calibration and spot checks of a medical accelerator or a sealed source teletherapy unit.

- ~~71.~~ 75. "Rating" means the operating limits as specified by the component manufacturer.
- ~~72.~~ 76. "Recording" means producing a permanent form of an image resulting from X-ray photons.
- ~~73.~~ 77. "Response time" means the time required for an instrument system to reach ninety percent of its final reading when the radiation-sensitive volume of the instrument system is exposed to a step change in radiation flux from zero sufficient to provide a steady-state midscale reading.
- ~~74.~~ 78. "Scattered radiation" means radiation that, during passage through matter, has been deviated in direction (See "direct scattered radiation").
- ~~75.~~ 79. "Secondary dose monitoring system" means a system which will terminate irradiation in the event of failure of the primary system.
- ~~76.~~ 80. "Secondary protective barrier" means (see "protective barrier").
- ~~77.~~ 81. "Shutter" means a device attached to the tube housing assembly which can totally intercept the useful beam and which has a lead equivalency not less than that of the tube housing assembly.
- ~~78.~~ 82. "SID" means (see "source-image receptor distance").
- ~~79.~~ 83. "Source" means the focal spot of the X-ray tube.
- ~~80.~~ 84. "Source-image receptor distance" means the distance from the source to the center of the input surface of the image receptor.
- ~~81.~~ 85. "Spot check" means a procedure which is performed to assure that a previous calibration continues to be valid.
- ~~82.~~ 86. "Spot film" means a radiograph which is made during a fluoroscopic examination to permanently record conditions which exist during that fluoroscopic procedure.

- ~~83-~~ 87. "Spot-film device" means a device intended to transport or position a radiographic image receptor between the X-ray source and fluoroscopic image receptor. It includes a device intended to hold a cassette over the input end of an image intensifier for the purpose of making a radiograph.
- ~~84-~~ 88. "SSD" means the distance between the source and the skin of the patient.
- ~~85-~~ 89. "Stationary X-ray equipment" ~~means~~ (see "X-ray equipment").
- ~~86-~~ 90. "Stray radiation" means the sum of leakage and scattered radiation.
- ~~87-~~ 91. "Technique factors" means the conditions of operation. They are specified as follows:
- a. For capacitor energy storage equipment, peak tube potential in kilovolts and quantity of charge in milliamperere second.
 - b. For field emission equipment rated for pulsed operation, peak tube potential in kV and number of X-ray pulses.
 - c. For CT X-ray systems designed for pulsed operation, peak tube potential in kilovolts, scan time in seconds, and either tube current in milliamperere, X-ray pulse width in seconds, and the number of X-ray pulses per scan, or the product of tube current, X-ray pulse width, and the number of X-ray pulses in milliamperere second.
 - d. For CT X-ray systems not designed for pulsed operation, peak tube potential in kilovolts, and either tube current in milliamperere scan time in seconds, or the product of tube current and exposure time in milliamperere second and the scan time when the scan time and exposure time are equivalent.
 - e. For all other equipment, peak tube potential in kilovolts and either tube current in milliamperere and exposure time in seconds, or the product of tube current and exposure time in milliamperere second.
- ~~88-~~ 92. "Termination of ~~radiation~~ irradiation" means the stopping of irradiation in a fashion which will not permit continuance of irradiation without the resetting of operating conditions at the control panel.
93. "Tomogram" means the depiction of X-ray attenuation properties of a section through the body.
- ~~89-~~ 94. "Traceable to a national standard" means that a quantity or a measurement has been compared to a national standard directly

or indirectly through one or more intermediate steps and that all comparisons have been documented.

- ~~90-~~ 95. "Tube" means an X-ray tube, unless otherwise specified.
- ~~91-~~ 96. "Tube housing assembly" means the tube housing with tube installed. It includes high-voltage and/or filament transformers and other appropriate elements when such are contained within the tube housing.
- ~~92-~~ 97. "Tube rating chart" means the set of curves which specify the rated limits of operation of the tube in terms of the technique factors.
- ~~93-~~ 98. "Useful beam" means the radiation emanating from the tube housing port or the radiation head and passing through the aperture of the beam-limiting device when the exposure controls are in a mode to cause the system to produce radiation.
- ~~94-~~ 99. "Variable-aperture beam-limiting device" means a beam-limiting device which has capacity for stepless adjustment of the X-ray field size at a given source-image receptor distance.
- ~~95-~~ 100. "Visible area" means that portion of the input surface of the image receptor over which incident X-ray photons are producing a visible image.
- ~~96-~~ 101. "Wedge filter" means an added filter effecting continuous progressive attenuation on all or part of the useful beam.
- ~~97-~~ 102. "X-ray control" means a device which controls input power to the X-ray high-voltage generator or the X-ray tube. It includes equipment such as timers, phototimers, automatic brightness stabilizers, and similar devices, which control the technique factors of an X-ray exposure.
- ~~98-~~ 103. "X-ray equipment" means an X-ray system, subsystem, or component thereof. Types of X-ray equipment are as follows:
- a. "Mobile X-ray equipment" means X-ray equipment mounted on a permanent base with wheels or casters for moving while completely assembled.
 - b. "Portable X-ray equipment" means X-ray equipment designed to be hand-carried.
 - c. "Stationary X-ray equipment" means X-ray equipment which is installed in a fixed location.
- ~~99-~~ 104. "X-ray field" means that area of the intersection of the useful beam and any one of the set of planes parallel to and including the plane of the image receptor, whose perimeter is

the locus of points at which the exposure rate is one-fourth of the maximum in the intersection.

~~+00-~~105. "X-ray high-voltage generator" means a device which transforms electrical energy from the potential supplied by the X-ray control to the tube operating potential. The device may also include means for transforming alternating current to direct current, filament transformers for the X-ray tube, high-voltage switches, electrical protective devices, and other appropriate elements.

~~+01-~~106. "X-ray system" means an assemblage of components for the controlled production of X-rays. It includes minimally an X-ray high-voltage generator, and X-ray control, a tube housing assembly, a beam-limiting device, and the necessary supporting structures. Additional components which function with the system are considered integral parts of the system.

~~+02-~~ "~~X-ray subsystem~~" means any combination of two or more components of an X-ray system.

~~+03-~~107. "X-ray tube" means any electron tube which is designed to be used primarily for the production of X-rays.

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-06-03. General requirements.

1. Administrative controls.

a. Registrant. The registrant shall be responsible for directing the operation of the X-ray systems which have been registered with the department. The registrant or the registrant's agent shall assure that the following provisions requirements are met in the operation of the X-ray system.

(1) An X-ray system which does not meet the provisions requirements of this ~~chapter~~ article shall not be operated for diagnostic or therapeutic purposes, if so directed by the department:

(2) Individuals who will be operating the X-ray systems shall be adequately instructed in the safe operating procedures and be competent in the safe use of the equipment. As a minimum, such instruction should consist of subjects outlined in appendix F of this chapter.

- (3) A chart shall be provided in the vicinity of the diagnostic X-ray system's control panel, which specifies for all examinations performed with that system the following information:
 - (a) Patient's anatomical size versus technique factors to be utilized.
 - (b) Type and size of the film or film-screen combination to be used.
 - (c) Type and focal distance of the grid to be used, if any.
 - (d) ~~Source to image~~ Source-image receptor distance to be used.
 - (e) Type and location of placement of gonad shielding to be used.
- (4) Written safety procedures and rules shall be provided to each individual operating X-ray equipment, including any restrictions of the operating technique required for the safe operation of the particular X-ray system. The operator shall be able to demonstrate familiarity with this article.
- (5) Except for patients who cannot be moved out of the room, only the staff and ancillary personnel required for the medical procedure or training shall be in the room during the radiographic exposure. Other than the patient being examined:
 - (a) All individuals shall be positioned such that no part of the body will be struck by the useful beam unless protected by five-tenths millimeter lead equivalent.
 - (b) Staff and ancillary personnel shall be protected from the direct scatter radiation by protective aprons or whole body protective barriers of not less than twenty-five hundredths millimeter lead equivalent.
 - (c) Patients who cannot be removed from the room shall be protected from the direct scatter radiation by whole body protective barriers of twenty-five hundredths millimeter lead equivalent or shall be so positioned that the nearest portion of the body is at least two meters from both the tube head and the nearest edge of the image receptor.

- (6) Gonad shielding of not less than twenty-five hundredths millimeter lead equivalent shall be used for patients who have not passed the reproductive age during radiographic procedures in which the gonads are in the useful beam, except for cases in which this would interfere with the diagnostic procedure.
- (7) Individuals shall not be exposed to the useful beam except for healing arts purposes and such exposure has been authorized by a licensed practitioner of the healing arts. This provision specifically prohibits deliberate exposure for the following ~~purpose~~ purposes:
 - (a) Exposure of an individual for training, demonstration or other non-healing-arts purposes ~~and~~.
 - (b) Exposure of an individual for the purpose of healing arts screening except as authorized by paragraph 11.
- (8) When a patient or film must be provided with auxiliary support during a radiation exposure:
 - (a) Mechanical holding devices shall be used when the technique permits. The safety rules, required by this section shall list individual projections where holding devices cannot be utilized.
 - (b) Written safety procedures, as required by paragraph 4, shall indicate the requirements for selecting a holder and the procedure the holder shall follow.
 - (c) The human holder shall be protected as required by paragraph 5.
 - (d) No individual shall be used routinely to hold film or patients.
 - (e) In those cases where the patient must hold the film, except during intraoral examinations, any portion of the body other than the area of clinical interest struck by the useful beam shall be protected by not less than five-tenths millimeter lead equivalent material.
 - (f) A record shall be made of the examination and shall include the name of the human holder, date of the examination, number of exposures, and technique factors utilized for the exposure.

- (9) Procedures and auxiliary equipment designed to minimize patient and personnel exposure commensurate with the needed diagnostic information shall be utilized. This is interpreted to include but not limited to:
- (a) The speed of film or screen and film combinations shall be the fastest speed consistent with the diagnostic objective of the examinations.
 - (b) The radiation exposure to the patient shall be the minimum exposure required to produce images of good diagnostic quality.
 - (c) Proper film processing procedures:
 - [1] Time temperature film processing must be as recommended by the film manufacturer or as noted in appendix D for manual processing.
 - [2] Automatic processors temperature and "replenishment rates" must be maintained as specified by the processor manufacturer or as noted in subsection 3 of appendix D.
 - [3] The darkroom integrity must be maintained as noted in subsection 4 of appendix D.
 - (d) Portable or mobile equipment shall be used only for examinations where it is impractical to transfer the patients to a stationary X-ray installation.
 - ~~(d)~~ (e) X-ray systems subject to section 33-10-06-06 shall not be utilized in procedures where the source to patient distance is less than thirty centimeters.
- (10) All individuals who are associated with the operation of an X-ray system are subject to the requirements of subsections 1 and 2 of section 33-10-04-02. In addition:
- (a) When protective clothing or devices are worn on portions of the body and a monitoring device is required, at least one such monitoring device shall be utilized as follows:
 - [1] When an apron is worn, the monitoring device shall be worn at the collar outside of the apron.

[2] The dose to the whole body based on the maximum dose attributed to the most critical organ shall be recorded in the reports required by subsection 1 of section 33-10-04-05. If more than one device is used and a record is made of the data, each dose shall be identified with the area where the device was worn on the body.

(b) Exposure of a personnel monitoring device to deceptively indicate a dose delivered to an individual is prohibited.

(11) Healing arts screening. Any person proposing to conduct a healing arts screening program shall not initiate such a program without prior approval of the department. When requesting such approval, that person shall submit the information outlined in appendix E of this chapter. If any information submitted to the department becomes invalid or outdated, the department shall be immediately notified.

b. Information and maintenance record and associated information. The registrant shall maintain the following information for each X-ray system for inspection by the department:

(1) Maximum rating of technique factors.

(2) Model and serial numbers of all certifiable components.

(3) Aluminum equivalent filtration of the useful beam, including any routine variation.

(4) Tube rating charts and cooling curves.

(5) Records of surveys, calibrations, maintenance, and modifications performed on the X-ray system after the effective date of section 33-10-06-03 with the names of persons who performed such services.

(6) A scale drawing of the room in which a stationary X-ray system is located with such drawing indicating the use of areas adjacent to the room and an estimation of the extent of occupancy by an individual in such areas. In addition, the drawing shall include:

(a) The results of a survey for radiation levels present at the operator's position and at

pertinent points outside the room at specified test conditions; or

(b) The type and thickness of materials, or lead equivalency, or each protective barrier.

(7) A copy of all correspondence with this department regarding that X-ray system.

c. X-ray log. Each facility shall maintain an X-ray log containing the patient's name, the type of examinations, and the dates those examinations were performed. When the patient or film must be provided with human auxiliary support, the name of the human holder shall be recorded.

2. Plan review.

a. Prior to construction, the floor plans and equipment arrangement or all new installations, or modifications of existing installations, utilizing X-rays for diagnostic or therapeutic purposes shall be submitted to the department for review and approval. The required information is denoted in appendices A ~~and~~, B, and C of this chapter.

b. The department may require the applicant to utilize the services of a qualified expert to determine the shielding requirements prior to the plan review and approval.

c. The approval of such plans shall not preclude the requirement of additional modifications should a subsequent analysis of operating conditions indicate the possibility of an individual receiving a dose in excess of the limits prescribed in subsections 1, 4, and 5 of section 33-10-04-02.

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-06-04. General requirements for all diagnostic X-ray systems. In addition to other requirements of this chapter, all diagnostic X-ray systems shall meet the following requirements:

1. Warning label. The control panel containing the main power switch shall bear the warning statement, legible and accessible to view: "WARNING: This X-ray unit may be dangerous to patient and operator unless safe exposure factors and operating instructions are observed."
2. Battery charge indicator. On battery-powered X-ray generators, visual means shall be provided on the control

panel to indicate whether the battery is in a state of charge adequate for proper operation.

3. Leakage radiation from the diagnostic source assembly. The leakage radiation from the diagnostic source assembly measured at a distance of one meter in any direction from the source shall not exceed one hundred milliroentgens in one hour when the X-ray tube is operated at its leakage technique factors. Compliance shall be determined by measurements averaged over an area of one hundred square centimeters with no linear dimension greater than twenty centimeters.
4. Radiation from components other than the diagnostic source assembly. The radiation emitted by a component other than the diagnostic source assembly shall not exceed two milliroentgens in one hour at five centimeters from any accessible surface of the component when it is operated in an assembled X-ray system under any conditions for which it was designed. Compliance shall be determined by measurements averaged over an area of one hundred square centimeters with no linear dimension greater than twenty centimeters.
5. Beam quality.
 - a. Half-value layer.
 - (1) The half-value layer (HVL) of the useful beam for a given X-ray tube potential shall not be less than the values shown in table I. If it is necessary to determine such half-value layer at an X-ray tube potential which is not listed in table I, linear interpolation or extrapolation may be made.

TABLE I

Design Operating Range (Kilovolts Peak)	Measured Potential (Kilovolts peak)	Half-value Layer (Millimeters of aluminum)
Below 50	30	0.3
	40	0.4
	49	0.5
50 to 70	50	1.2
	60	1.3
	70	1.5
Above 70	71	2.1
	80	2.3
	90	2.5
	100	2.7
	110	3.0
	120	3.2
	130	3.5
	140	3.8
	150	4.1

(2) The above half-value layer (HVL) criteria will be considered to have been met if it can be demonstrated that the aluminum equivalent of the total filtration in the primary beam is not less than that shown in table II.

TABLE II

<u>Filtration Required vs. Operating Voltage</u>	
Operating Voltage (kVp)	Total Filtration (inherent plus added) (millimeters aluminum equivalent)
Below 50	0.5 millimeters
50 - 70	1.5 millimeters
Above 70	2.5 millimeters

(3) In addition to the requirements of paragraph 1, all intraoral dental radiographic systems manufactured on and after December 1, 1980, shall have a minimum half-value layer not less than one and one-half

millimeters aluminum equivalent filtration permanently installed in the useful beam.

- (4) Beryllium window tubes shall have a minimum of five-tenths millimeter aluminum equivalent filtration permanently installed in the useful beam.
 - (5) For capacitor energy storage equipment, compliance with the requirements of this subsection shall be determined with the maximum quantity of charge per exposure.
 - (6) The required minimal aluminum equivalent filtration shall include the filtration contributed by all materials which are always present between the source and the patient.
- b. Filtration controls. For X-ray systems which have variable kilovolts peak and variable filtration for the useful beam, a device shall link the kilovolts peak selector with the filters and shall prevent an exposure unless the minimum amount of filtration required by paragraphs 1 or 2 of subdivision a is in the useful beam for the given kilovolts peak which has been selected.
6. Multiple tubes. Where two or more radiographic tubes are controlled by one exposure switch, the tube or tubes which have been selected shall be clearly indicated prior to initiation of the exposure. This indication shall be both on the X-ray control panel and at or near the tube housing assembly which has been selected.
 7. Mechanical support of tube head. The tube housing assembly supports shall be adjusted such that the tube housing assembly will remain stable during an exposure unless tube housing movement is a designed function of the X-ray system.
 8. Technique indicators.
 - a. The technique factors to be used during an exposure shall be indicated before the exposure begins, except when automatic exposure controls are used, in which case the technique factors which are set prior to the exposure shall be indicated.
 - b. The requirements of subdivision a may be met by permanent markings on equipment having fixed technique factors. Indication of technique factors shall be visible from the operators position except in the case of spot films made by the fluoroscopist.
 9. ~~Focal spot indication.~~ {Reserved}

~~†0-~~ Structural shielding requirements (see appendix C).

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-06-05. Fluoroscopic X-ray systems except for computed tomography X-ray systems. All fluoroscopic X-ray systems shall meet the following requirements:

1. Limitation of useful beam.

a. Primary barrier.

- (1) The fluoroscopic imaging assembly shall be provided with a primary protective barrier which intercepts the entire cross section of the useful beam at any source-image receptor distance (SID).
- (2) The X-ray tube used for fluoroscopy shall not produce X-rays unless the barrier is in position to intercept the entire useful beam.

b. X-ray field.

- (1) The X-ray field produced by non-image-intensified fluoroscopic equipment shall not extend beyond the entire visible area of the image receptor. This requirement applies to field size for both fluoroscopic procedures and spot filming procedures. In addition:
 - (a) Means shall be provided for stepless adjustment of the field size~~†.~~
 - (b) The minimum field size at the greatest source-image receptor distance shall be equal to or less than five centimeters by five centimeters~~†.~~
 - (c) For equipment manufactured after February 25, 1978, when the angle between the image receptor and the beam axis of the X-ray beam is variable, means shall be provided to indicate when the axis of the X-ray beam is perpendicular to the plane of the image receptor~~† and.~~
 - (d) Compliance with this paragraph shall be determined with the beam axis indicated to be perpendicular to the plane of the image receptor.

- (2) For image-intensified fluoroscopic equipment, neither the length nor the width of the X-ray field in the plane of the image receptor shall exceed that of the visible area of the image receptor by more than three percent of the source-image receptor distance. The sum of the excess length and the excess width shall be no greater than four percent of the source-image receptor distance. In addition:
- (a) Means shall be provided to permit further limitation of the field. Beam-limiting devices manufactured after May 22, 1979, and incorporated in equipment with a variable source-image receptor distance and/or a visible area of greater than three hundred square centimeters shall be provided with means for stepless adjustment of the X-ray field.
 - (b) All equipment with a fixed source-image receptor distance and a visible area of three hundred square centimeters or less shall be provided with either stepless adjustment of the X-ray field or with means to further limit the X-ray field size at the plane of the image receptor to one hundred twenty-five square centimeters or less. Stepless adjustment shall, at the greatest source-image receptor distance, provide continuous field sizes from the maximum obtainable to a field size of five by five centimeters or less.
 - (c) For equipment manufactured after February 25, 1978, when the angle between the image receptor and beam axis is variable, means shall be provided to indicate when the axis of the X-ray beam is perpendicular to the plane of the image receptor.
 - (d) Compliance shall be determined with the beam axis indicated to be perpendicular to the plane of the image receptor. For rectangular X-ray fields used with circular image reception, the error in alignment shall be determined along the length and width dimensions of the X-ray field which pass through the center of the visible area of the image receptor.
- (3) Spot-film devices which are certified components shall meet the following additional requirements:
- (a) Means shall be provided between the source and the patient for adjustment of the X-ray field size in the plane of the film to the size of

that portion of the film which has been selected on the spot-film selector. Such adjustment shall be automatically accomplished except when the X-ray field size in the plane of the film is smaller than that of the selected portion of the film. For spot-film devices manufactured after June 21, 1979, if the X-ray field size is less than the size of the selected portion of the film, the means for adjustment of the field size shall be only at the operator's option.

- (b) It shall be possible to adjust the X-ray field size in the plane of the film to a size smaller than the selected portion of the film. The minimum field size at the greatest source-image receptor distance shall be equal to, or less than, five centimeters by five centimeters.
- (c) The center of the X-ray field in the plane of the film shall be aligned with the center of the selected portion of the film to within two percent of the source-image receptor distance.
- (d) On spot-film devices manufactured after February 25, 1978, if the angle between the plane of the image receptor and beam axis is variable, means shall be provided to indicate when the axis of the X-ray beam is perpendicular to the plane of the image receptor, and compliance shall be determined with the beam axis indicated to be perpendicular to the plane of the image receptor.

(4) If a means exists to override any of the automatic X-ray field size adjustments required in subdivision b of subsection 1 that means:

- (a) Must be designed for use only in the event of system failure.
- (b) Must incorporate a signal visible at the fluoroscopist's position which will indicate whenever the automatic field size adjustment is overridden.
- (c) Must be clearly and durably labeled as follows:

FOR X-RAY FIELD
LIMITATION SYSTEM FAILURE

- 2. Activation of the fluoroscopic tube. X-ray production in the fluoroscopic mode shall be controlled by a device which

requires continuous pressure by the fluoroscopist for the entire time of any exposure. When recording serial fluoroscopic images, the fluoroscopist shall be able to terminate the X-ray exposure or exposures at any time, but means may be provided to permit completion of any single exposure of the series in process.

3. Exposure rate limits.

a. Entrance exposure rate allowable limits.

- (1) The exposure measured at the point where the center of the useful beam enters the patient shall not exceed ten roentgens [2.58 millicoulomb per kilogram] per minute, except during recording of fluoroscopic images or when provided with optional high level control.
- (2) When provided with optional high level control, the equipment shall not be operable at any combination of tube potential and current which will result in an exposure rate in excess of five roentgens [1.29 millicoulomb per kilogram] per minute at the point where the center of the useful beam enters the patient unless the high level control is activated.
 - (a) Special means of activation of high level controls shall be required. The high level control shall only be operable when continuous manual activation is provided by the operator.
 - (b) A continuous signal audible to the fluoroscopist shall indicate that the high level control is being employed.
- (3) In addition to the other requirements of this section, certified equipment which does not incorporate an automatic exposure control shall not be operable at any combination of tube potential and current which will result in any exposure rate in excess of five roentgens [1.29 millicoulomb per kilogram] per minute at the point where the center of beam enters the patient except during recording of fluoroscopic images or when provided with an optional high level control.
- (4) Compliance with the requirements of subsection 3 of this section shall be determined as follows:
 - (a) Movable grids and compression devices shall be removed from the useful beam during the measurement.

- (b) If the source is below the table, the exposure rate shall be measured one centimeter above the tabletop or cradle.
 - (c) If the source is above the table, the exposure rate shall be measured at thirty centimeters above the tabletop with the end of the beam-limiting device or spacer positioned as closely as possible to the point of measurement.
 - (d) In a All C-arm type of fluoroscope fluoroscopes, both stationary and mobile, shall meet the entrance exposure rate limits specified in paragraphs 1, 2, and 3 of subdivision a of subsection 3, shall be measured thirty centimeters from the input surface of the fluoroscopic imaging assembly with the source positioned at any available source-image receptor distance provided that the end of the spacer assembly or beam-limiting device is not closer than thirty centimeters from the input surface of the fluoroscopic imaging assembly.
- (5) Periodic measurement of entrance exposure rate shall be performed as follows:
- (a) Such measurements shall be made annually or after any maintenance of the system which might affect the exposure rate.
 - (b) Results of these measurements shall be posted where any fluoroscopist may have ready access to such results while using the fluoroscope and in the record required in paragraph 5 of subdivision b of subsection 1 of section 33-10-06-03. Results of the measurements shall include the roentgen per minute, as well as the technique factors used to determine such results. The name of the person performing the measurements and the date the measurements were performed shall be included in the results.
 - (c) Personnel monitoring devices may be used to perform the measurements required by subparagraph a provided the measurements are made as described in subparagraph d.
 - (d) Conditions of periodic measurements of entrance exposure rate are as follows:
 - [1] The measurement shall be made under the conditions that satisfy the requirements of paragraph 4.

[2] The kilovolts peak shall be the kilovolts typical of clinical use of the X-ray system.

[3] The X-ray systems that incorporates automatic exposure control shall have sufficient material placed in the useful beam to produce a milliamperage typical of the use of the X-ray system.

[4] X-ray systems that do not incorporate an automatic exposure control shall utilize a milliamperage typical of clinical use of the X-ray system. Materials should be placed in the useful beam when conducting these periodic measurements to protect the imaging system.

4. Barrier transmitted radiation rate limits.

a. The exposure rate due to transmission through the primary protective barrier with the attenuation block in the useful beam, combined with radiation from the image intensifier, if provided, shall not exceed two milliroentgens [0.516 microcoulomb per kilogram] per hour at ten centimeters from any accessible surface of the fluoroscopic imaging assembly beyond the plane of the image receptor for each roentgen per minute of entrance exposure rate.

b. Measuring compliance of barrier transmission.

(1) The exposure rate due to transmission through the primary protective barrier combined with radiation from the image intensifier shall be determined by measurements averaged over an area of one hundred square centimeters with no linear dimension greater than twenty centimeters.

(2) If the source is below the tabletop, the measurement shall be made with the input surface of the fluoroscopic imaging assembly positioned thirty centimeters above the tabletop.

(3) If the source is above the tabletop and the source-image receptor distance is variable, the measurement shall be made with the end of the beam-limiting device or spacer as close to the tabletop as it can be placed, provided that it shall not be closer than thirty centimeters.

(4) Movable grids and compression devices shall be removed from the useful beam during the measurement.

- (5) The attenuation block shall be positioned in the useful beam ten centimeters from the point of measurement of entrance exposure rate and between this point and the input surface of the fluoroscopic imaging assembly.
5. Indication of potential and current. During fluoroscopy and cinefluorography, the kilovolt and the milliamperere shall be continuously indicated.
6. Source-skin distance. The source to skin distance shall not be less than:
 - a. Thirty-eight centimeters on stationary fluoroscopes installed after September 1, 1968.
 - b. Thirty-five centimeters on stationary fluoroscopes which ~~are~~ were in operation prior to October 1, 1982.
 - c. Thirty centimeters on all mobile fluoroscopes.
 - d. Twenty centimeters for image intensified fluoroscopes used for specific surgical application. The written safety procedures must provide precautionary measures to be adhered to during the use of this device.
7. Fluoroscopic timer.
 - a. Means shall be provided to preset the cumulative on-time of the fluoroscopic tube. The maximum cumulative time of the timing device shall not exceed five minutes without resetting.
 - b. A signal audible to the fluoroscopist shall indicate the completion of any preset cumulative on-time. Such signal shall continue to sound while X-rays are produced until the timing device is reset.
8. Mobile fluoroscopes. In addition to the other requirements of this section, mobile fluoroscopes shall provide intensified imaging.
9. Control of scattered radiation.
 - a. Fluoroscopic table designs when combined with procedures utilized shall be such that no unprotected part of any staff or ancillary individual's body shall be exposed to unattenuated scattered radiation which originates from under the table. The attenuation required shall be not less than twenty-five hundredths millimeter lead equivalent.

- b. Equipment configuration when combined with procedures shall be such that no portion of any staff or ancillary individual's body, except the extremities, shall be exposed to the unattenuated scattered radiation emanating from above the tabletop unless that individual:
 - (1) Is at least one hundred twenty centimeters from the center of the useful beam; or
 - (2) The radiation has passed through not less than twenty-five hundredths millimeter lead equivalent material, e.g., drapes, bucky-slot cover-sliding or folding panel, or self-supporting curtains, in addition to any lead equivalency provided by the protective apron referred to in paragraph 5 of subdivision a of subsection 1 of section 33-10-06-03.
- c. Exceptions The department may grant exceptions to subdivision b of this subsection ~~may be made~~ in some special procedures where a sterile field will not permit the use of the normal protective barriers. Where the use of prefitted sterilized covers for the barriers is practical, the department shall not permit such exception.

10. Radiation therapy simulation system. Radiation therapy simulation systems shall be exempt from all the requirements of subsections 1, 4, and 7 of section 33-10-06-05 provided that:

- a. Such systems are designed and used in such a manner that no individual other than the patient is in the X-ray room during periods of time when the system is producing X-rays; and
- b. Such systems as do not meet the requirements of subsection 7 of section 33-10-06-05 are provided with a means of indicating the cumulative time that an individual patient has been exposed to X-rays. Procedures shall require in such cases that the timer be reset between examinations.

11. Structural shielding requirements (see appendix E).

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992.
 General Authority: NDCC 28-32-02
 Law Implemented: NDCC 28-32-02

33-10-06-06: Radiographic systems other than fluoroscopic, dental intraoral, ~~or~~ veterinarian, or computed tomography X-ray systems.

- 1. Beam limitations. The useful beam shall be limited to the area of clinical interest.

- a. General purpose stationary and mobile X-ray systems.
- (1) There shall be provided a means for stepless adjustment of the size of the X-ray field.
 - (2) Means shall be provided for visually defining the perimeter of the X-ray field. The total misalignment of the edges of the visually defined field with the respective edges of the X-ray field along either the length or width of the visually defined field shall not exceed two percent of the distance from the source to the center of the visually defined field when the surface upon which it appears is perpendicular to the axis of the X-ray beam.
 - (3) The department may grant an exemption ~~on noncertified X-ray systems~~ to paragraphs 1 and 2 of this subdivision on noncertified X-ray systems, provided the registrant makes a written application for such exemption and demonstrates in the application:
 - (a) ~~It~~ That it is impractical to comply with paragraphs 1 and 2 of this subdivision; and
 - (b) The purpose of paragraphs 1 and 2 of this subdivision will be met by other means.
- b. Additional requirements for stationary general purpose X-ray systems. In addition to the requirements of subdivision a of this subsection, all stationary X-ray systems shall meet the following requirements:
- (1) Means shall be provided to indicate when the axis of the X-ray beam is perpendicular to the plane of the image receptor, to align the center of the X-ray field with respect to the center of the image receptor to within two percent of the source-image receptor distance, and to indicate the source-image receptor distance to within two percent.
 - (2) The beam-limiting device shall numerically indicate the field size in the plane of the image receptor to which it is adjusted.
 - (3) Indication of field size dimensions and source-image receptor distance's shall be specified in inches or centimeters, and shall be such that aperture adjustments result in X-ray field dimensions in the plane of the image receptor which correspond to those indicated by the beam-limiting device to within two percent of the source-image receptor distance when the beam axis is indicated to be perpendicular to the plane of the image receptor.

- c. X-ray systems designed for one image receptor size. Radiographic equipment designed for only one image receptor size at the fixed source-image receptor distance shall be provided with means to limit the field at the plane of the image receptor to dimensions no greater than those of the image receptor, and to align the center of the X-ray field with the center of the image receptor to within two percent of the source-image receptor distance, or shall be provided with means to both size and align the X-ray field such that the X-ray field at the plane of the image receptor does not extend beyond any edge of the image receptor.
- d. Systems designed for or provided with special attachments for mammography. Radiographic systems designed only for mammography and general purpose radiographic systems, when special attachments for mammography are in service, shall be provided with means to limit the useful beam such that the X-ray field at the plane of the image receptor does not extend the edge of the image receptor designed to be adjacent to the chest wall where the X-ray field may not extend beyond this edge by more than two percent of the source-image receptor distance. This requirement can be met with a system which performs as prescribed in paragraph 3 of subdivision e of this subsection. When the beam-limiting device and image receptor support device are designed to be used to immobilize the breast during a mammographic procedure and the source-image receptor distance may vary, the source-image receptor distance indication specified in subparagraphs a and b of paragraph 3 of subdivision e of this subsection shall be the maximum source-image receptor distance for which beam-limiting device or aperture is designed. In addition, each image receptor support intended for installation on a system designed only for mammography shall have clear and permanent markings to indicate the maximum image receptor size for which it is designed.
- e. Special purpose X-ray systems.
 - (1) Means shall be provided to limit the X-ray field in the plane of the image receptor so that such field does not exceed each dimension of the image receptor by more than two percent of the source-image receptor distance when the axis of the X-ray beam is perpendicular to the plane of the image receptor.
 - (2) Means shall be provided to align the center of the X-ray field with the center of the image receptor to within two percent of the source-image receptor distance, or means shall be provided to both size and align the X-ray field such that the X-ray field at

the plane of the image receptor does not extend beyond any edge of the image receptor.

- (3) Paragraphs 1 and 2 of this subdivision may be met with a system that meets the requirements for a general purpose X-ray system as specified in subsection 1 of this section, or, when alignment means are also provided, may be met with either:
 - (a) An assortment of removable, fixed-aperture, beam-limiting devices sufficient to meet the requirement for each combination of image receptor size and source-image receptor distance for which the unit is designed with each such device having clear and permanent markings to indicate the image receptor size and source-image receptor distance for which it is designed; or
 - (b) A beam-limiting device having multiple fixed apertures sufficient to meet the requirement for each combination of image receptor size and source-image receptor distance for which the unit is designed. Permanent, clearly legible markings shall indicate the image receptor size and source-image receptor distance for which each aperture is designed and shall indicate which aperture is in position for use.

2. Radiation exposure control devices.

- a. Timers. Means shall be provided to terminate the exposure at the preset time interval, preset product of current and time, a preset number of pulses, or a preset radiation exposure to the image receptor. In addition, it shall not be possible to make an exposure when the timer is set to a "zero" or "off" position if either position is provided.
- b. X-ray control (exposure switch).
 - (1) A control which shall be the equivalent of a dead-man switch shall be incorporated into each X-ray system such that an exposure can be terminated at any time except for:
 - (a) Exposure of one-half second or less; or
 - (b) During serial radiography when means shall be provided to permit completion of any single exposure of the series in process.
 - (2) Each X-ray control shall be located in such a way as to meet the following requirements:

- (a) Stationary X-ray systems shall be required to have the X-ray control permanently mounted in a protected area so that the operator is required to remain in that protected area during the entire exposure (See appendix B).
 - (b) Mobile and portable X-ray systems which are:
 - [1] Used for greater than one week in one location (one room or suite) shall meet the requirements of subparagraph a of this paragraph.
 - [2] Used for greater than one hour and less than one week at one location, (one room or suite) shall meet the requirement of item 1 of this subparagraph or be provided with a six and one-half ~~foot~~ feet [1.98 ~~meter~~ meters] high protective barrier which is placed at least six feet [1.83 meters] from the tube housing assembly and at least six feet [1.83 meters] from the patient.
 - [3] Used to make an exposure of only one patient at the use location shall meet the requirement of item 1 or 2 of this subparagraph or be provided with a method of X-ray control which will permit the operator to be at least twelve feet [3.66 meters] from the tube housing assembly during an exposure.
 - (c) The X-ray control shall provide visual indication observable at or from the operator's protected position whenever X-rays are produced. In addition, a signal audible to the operator shall indicate that the exposure has terminated.
- c. Automatic exposure controls. When an automatic exposure control is provided:
- (1) Indication shall be made on the control panel when this mode of operation is selected;
 - (2) If the X-ray tube potential is equal to or greater than fifty kilovolts peak, the minimum exposure time for field emission equipment rated for pulsed operation shall be equal to or less than a time interval equivalent to two pulses;
 - (3) The minimum exposure time for all equipment other than that specified in paragraph 2 shall be equal to or less than one-sixtieth second or a time interval

required to deliver five milliamperere seconds, whichever is greater;

- (4) Either the product of the peak X-ray tube potential, current, and exposure time shall be limited to not more than sixty kilowatt seconds per exposure or the product of X-ray tube current and exposure time shall be limited to not more than six hundred milliamperere seconds per exposure except when the X-ray tube potential is less than fifty kilovolts peak in which case the product of X-ray tube current and exposure time shall be limited to not more than two hundred milliamperere seconds per exposure; and
- (5) A visible signal shall indicate when an exposure has been terminated at the limits required by paragraph 4 of this subdivision, and manual resetting shall be required before further automatically timed exposures can be made.

- d. Reproducibility. With a timer setting of five-tenths seconds or less, the average exposure period (\bar{T}) shall be greater than or equal to five times the maximum exposure period (T_{\max}) minus the minimum exposure period (T_{\min}) when four tests are performed.

$$\text{every } \bar{T} \geq 5(T_{\max} - T_{\min})$$

3. Source-to-skin distance. All mobile or portable radiographic systems shall be provided with means to limit the source-to-skin distance to not less than thirty centimeters.
4. Exposure reproducibility. ~~The exposure reproducibility shall meet the following requirements:~~ The coefficient of variation of exposure shall not exceed ten-hundredths when all technique factors are held constant. This requirement shall be deemed to have been met if, when four exposures are made at identical technique factors, that the value of the average exposure (\bar{E}) is greater than or equal to five times the maximum exposure (E_{\max}) minus the minimum exposure (E_{\min}),

$$\text{every } \bar{E} \geq 5(E_{\max} - E_{\min})$$

5. Radiation from capacitor energy storage equipment in standby status. Radiation emitted from the X-ray tube when the exposure switch or timer is not activated shall not exceed a rate of two milliroentgens per hour at five centimeters from any accessible surface of the diagnostic source assembly, with the beam-limiting device fully open.

6. Additional requirements applicable to certified systems only. Diagnostic X-ray systems incorporating one or more certified components shall be required to comply with the following additional requirements which relate to that certified components.

a. Reproducibility. When the equipment is operated on an adequate power supply as specified by the manufacturer in accordance with the requirements of applicable federal standards, the estimated coefficient of variation of radiation exposures shall be no greater than five-hundredths for any specific combination of selected technique factors.

b. Linearity. When the equipment allows a choice of X-ray tube current settings and is operated on power supply as specified by the manufacturer in accordance with the requirements of applicable federal standards, for any fixed X-ray tube potential within the range of forty percent to one hundred percent of the maximum rating, the average ratios of exposure to the indicated milliamperere-seconds product, ~~i.e.,~~ (milliroentgen per milliamperere second) obtained at any two consecutive tube current settings shall not differ by more than ten-hundredths times their sum,

$$\del{i.e.,} \quad | \bar{X}_1 - \bar{X}_2 | \leq 0.10 (\bar{X}_1 + \bar{X}_2)$$

where \bar{X}_1 and \bar{X}_2 are the average milliroentgen per milliamperere second values obtained at each of two consecutive tube current settings.

c. Accuracy. Deviation of technique factors from indicated values shall not exceed the limits specified for that system by its manufacturer.

d. Beam limitation for stationary and mobile general purpose X-ray systems.

(1) There shall be provided a means of stepless adjustment of the size of the X-ray field. The minimum field size at a source-image receptor distance of one hundred centimeters shall be equal to or less than five centimeters by five centimeters.

(2) When a light localizer is used to define the X-ray field, it shall provide an average illumination of not less than one hundred sixty lux or fifteen foot-candles at one hundred centimeters or at the

maximum source-image receptor distance, whichever is less. The average illumination shall be based upon measurements made in the approximate center of each quadrant of the light field.

- (3) The edge of the light field at one hundred centimeters or at the maximum source-image receptor distance, whichever is less, shall have a contrast ratio, corrected for ambient lighting, of not less than four in the case of beam-limiting devices designed for use on stationary equipment, and a contrast ratio of not less than three in the case of beam-limiting devices designed for use on mobile equipment. The contrast ratio is defined as I_1/I_2 where I_1 is the illumination three millimeters from the edge of the light field toward the center of the field; and I_2 is the illumination three millimeters from the edge of the light field away from the center of the field. Compliance shall be determined with a measuring instrument aperture of one millimeter in diameter.
- e. Beam limitation for portable X-ray systems. Beam limitation for portable X-ray systems shall meet the beam limitation requirements of subdivision a of subsection 1 and subdivision d of subsection 6 of section 33-10-06-06.
- f. Field limitation and alignment on stationary general purpose X-ray systems. ~~The requirements of this subdivision shall apply to~~ For stationary, general purpose X-ray systems which contain a tube housing assembly, an X-ray control, and, for those systems so equipped, a table, all certified in accordance with 21 CFR 1020.30(c).

~~(1) Means shall be provided for positive beam limitation which will, at the source-image receptor distance for which the device is designed, either cause automatic adjustment of the X-ray field in the plane of the image receptor to the image receptor size within five seconds after insertion of the image receptor or, if adjustment is accomplished automatically in a time interval greater than five seconds or is manual, will prevent production of X-rays until such adjustment is completed. For the source-image receptor distance at which the device is not intended to operate, the device shall prevent the production of X-rays.~~

~~(2) The X-ray field size in the plane of the image receptor, whether automatically or manually adjusted, shall be such that neither the length nor the width of the X-ray field differs from that of the image receptor by greater than three percent of the source-image receptor distance and that the sum of~~

the length and width differences without regard to sign be no greater than four percent of the source-image receptor distance when the equipment indicated that the beam axis is perpendicular to the plane of the image receptor.

(3) The radiographic system shall be capable of operation, at the discretion of the operator, such that the field size at the image receptor can be adjusted to a size smaller than the image receptor. The minimum field size at a distance of one hundred centimeters shall be equal to or less than five centimeters by five centimeters. Return to positive beam limitation as specified in paragraphs 1 and 2 shall occur upon a change in image receptor.

(4) Positive beam limitation may be bypassed when radiography is conducted which does not use the cassette tray or permanently mounted vertical cassette holder, or when either the beam axis or table angulation is not either ten degrees of the horizontal or vertical during any part of the exposure, or during stereoscopic radiography. If the bypass mode is provided, return to positive beam limitation shall be automatic.

(5) A capability may be provided for overriding positive beam limitation in the event of system failure or to perform special procedures which cannot be performed in the positive mode. If so provided, a key shall be required to override the positive mode. It shall be impossible to remove the key while the positive mode is overridden.

(1) Positive beam limitation (PBL) shall be provided whenever all the following conditions are met:

(a) The image receptor is inserted into a permanently mounted cassette holder.

(b) The image receptor length and width are each less than fifty centimeters.

(c) The X-ray beam axis is within plus or minus three degrees of vertical and the source-image receptor distance is ninety centimeters to one hundred thirty centimeters inclusive; or the X-ray beam axis is within plus or minus three degrees of horizontal and the source-image receptor distance is ninety centimeters to two hundred five centimeters inclusive.

- (d) The X-ray beam axis is perpendicular to the plane of the image receptor to within plus or minus three degrees.
 - (e) Neither tomographic nor stereoscopic radiography is being performed.
 - (f) The positive beam limitation system has not been intentionally overridden. The override provision is subject to paragraph 3.
- (2) Positive beam limitation (PBL) shall prevent the production of X-rays when:
- (a) Either the length or width of the X-ray field in the plane of the image receptor differs, except as permitted by paragraph 5, from the corresponding image receptor dimensions by more than three percent of the source-image receptor distance.
 - (b) The sum of the length and width differences as stated in subparagraph a, without regard to sign, exceeds four percent of the source-image receptor distance.
- (3) If a means of overriding the positive beam limitation (PBL) system exists, that means:
- (a) Must be designed for use only in the event of positive beam limitation system failure or if the system is being serviced.
 - (b) If in a position that the operator would consider it part of the operational controls or if it is referenced in the operator's manual or in other materials intended for the operator.
 - [1] Must require that a key be utilized to defeat the positive beam limitation;
 - [2] Must require that the key remain in place during the entire time the positive beam limitation system is overridden; and
 - [3] Must require that the key or key switch be clearly and durably labeled as follows:

FOR X-RAY FIELD LIMITATION
SYSTEM FAILURE

- (4) Compliance with paragraph 2 must be determined when the equipment indicates that the beam axis is

perpendicular to the plane of the image receptor and the requirements of paragraph 1 are met. Compliance must be determined no sooner than five seconds after insertion of the image receptor.

(5) The positive beam limitation system must be capable of operation, at the discretion of the operator, such that the size of the field may be made smaller than the size of the image receptor through stepless adjustment of the field size. The minimum field size at the source-image receptor distance of one hundred centimeters must be equal to or less than five centimeters by five centimeters.

(6) The positive beam limitation system must be designed such that if a change in image receptor does not cause an automatic return to positive beam limitation function as described in paragraph 2, then any change of image receptor size or source-image receptor distance must cause the automatic return.

g. Timers. Except for dental panoramic systems, termination of exposure shall cause automatic resetting of the timer to its initial setting or to "zero".

h. Transmission limit for image receptor supporting devices used for mammography. For X-ray systems manufactured after September 5, 1978, which are designed only for mammography, the transmission of the primary beams through the image receptor support provided with the system will be limited such that the exposure five centimeters from any accessible surface beyond the plane of the image receptor supporting device does not exceed one-tenth milliroentgen [25.8 microcoulomb per kilogram] for each activation of the tube. Exposure shall be measured with the system operated at the minimum source-image receptor distance for which it is designed. Compliance shall be determined at the maximum rated peak tube potential for the system and at the maximum rated product of tube current and exposure time (milliamperere second) for that peak tube potential. Compliance shall be determined by measurements averaged over an area of one hundred square centimeters with no linear dimension greater than twenty centimeters.

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-06-07. Intraoral dental radiographic systems. In addition to the provisions requirements of sections 33-10-06-03 and 33-10-06-04, the requirements of this section apply to X-ray equipment and associated

facilities used for dental radiography. Criteria for extraoral dental radiographic systems are covered in section 33-10-06-06.

1. Source-to-skin distance. X-ray systems designed for use with an intraoral image receptor shall be provided with means to limit source-to-skin distance to not less than:
 - a. Eighteen centimeters if operable above fifty kilovolts peak.
 - b. Ten centimeters if not operable above fifty kilovolts peak.
2. Field limitation.
 - ~~a.~~ Radiographic systems designed for use with an intraoral image receptor shall be provided with means to limit ~~the X-ray beam such that~~ source-to-skin distance, to not less than:
 - ~~↔~~ a. If the minimum source-to-skin distance (SSD) is eighteen centimeters or more, the X-ray field, at the minimum source-to-skin distance, shall be containable in a circle having a diameter of no more than seven centimeters.
 - ~~↔~~ b. If the minimum source-to-skin distance is less than eighteen centimeters, the X-ray field, at the minimum source-to-skin distance, shall be containable in a circle having a diameter of no more than six centimeters.
 - ~~b.~~ c. An open-ended shielded position indicating device shall be used. The shielding shall be equivalent to the requirements of subsection 4 of section 33-10-06-04.
3. Timers. Means shall be provided to terminate the exposure at a preset time interval, preset product of current and time, a preset number of pulses, or a preset radiation exposure to the image receptor. In addition:
 - ~~a.~~ ~~Termination of exposure shall cause automatic resetting of the timer to its initial setting or to zero.~~
 - ~~b.~~ It shall not be possible to make an exposure when the timer is set to a zero or off position if either position is provided.
 - ~~c.~~ ~~Accuracy: All timers shall be accurate to within ± ten percent of the selected value.~~
 - ~~d.~~ b. Reproducibility. When four timer tests taken at identical timer settings are performed the average time period (\bar{T}) shall be greater than five times the maximum period (T_{max}) less the minimum period (T_{min}). \bar{T} shall be less than or

~~equal to five seconds.~~ With a timer setting of five-tenths seconds or less, the average exposure period (T) must be greater than or equal to five times the maximum exposure period (T_{max}) minus the minimum exposure period (T_{min}) when four timer tests are performed:

$$\bar{T} \geq 5(T_{\max} - T_{\min})$$

~~T is greater than 5 (T_{max} - T_{min})~~

4. X-ray control (exposure switch).

- a. ~~A~~ An X-ray control which shall be the equivalent of a dead man switch shall be incorporated into each X-ray system such that an exposure can be terminated by the operator at any time, except for exposures of one-half second or less.
- b. Each X-ray control shall be located in such a way as to meet the following criteria:
 - (1) Stationary X-ray systems shall ~~have the control switch permanently mounted in a protected area, e.g., corridor outside the room~~ be required to have the X-ray control permanently mounted in a protected area, so that the operator is required to remain in that protected area during the entire exposure.
 - (2) Mobile and portable X-ray systems which are:
 - (a) Used for greater than one week in one location (one room or suite) shall meet the requirements of paragraph 1 of this subdivision.
 - (b) Used for ~~more~~ greater than one hour and less than one week at one location (one room or suite) shall meet the requirements of subparagraph a of this paragraph or be provided with a six and one-half-foot [1.98-meter] high protective barrier which is placed at least six feet [1.83 meters] from the tube housing assembly and at least six feet [1.83 meters] from the patient.
 - (c) Used to make ~~an exposure~~ exposures of only one a patient at the use location shall meet the requirements of subparagraph a or b of this paragraph or be provided with a method of X-ray control which will permit the operator to be at least twelve feet [3.66 meters] from the tube head assembly during an exposure.

c. The X-ray control shall provide visual indication observable at or from the operator's protected position whenever X-rays are produced. In addition, a signal audible to the operator shall indicate that the exposure has terminated.

5. Exposure reproducibility. ~~The exposure reproducibility shall meet the following requirements.~~

The coefficient of variation shall not exceed ten-hundredths when all technique factors are held constant. This requirement shall be deemed to have been met if, when four exposures are made at identical technique factors, ~~that~~ the value of the average exposure (\bar{E}) is greater than or equal to five times the maximum exposure (E_{\max}) minus the minimum exposure (E_{\min}),

$$\text{~~there~~ } \bar{E} \geq 5(E_{\max} - E_{\min})$$

6. Administrative controls.

- a. Patient and film holding devices shall be used when the techniques permit.
- b. ~~Neither the~~ The tube housing ~~nor and~~ the position indicating device shall not be handheld during an exposure.
- c. The X-ray system shall be operated in such a manner that the useful beam at the patient's skin does not exceed the requirements of subdivision a of subsection 2 of this section.
- d. Dental fluoroscopy without image intensification shall not be used.

7. Additional requirements applicable to certified systems only. Only diagnostic X-ray systems incorporating one or more certified components shall be required to comply with the following additional requirements which relate to that certified component.

- a. Reproducibility. When the equipment is operated on an adequate power supply as specified by the manufacturer, the estimated coefficient of variation of radiation exposures shall be no greater than five-hundredths for any specific combination of selected technique factors.
- b. Linearity. When the equipment allows a choice of X-ray tube current settings and is operated on a power supply as specified by the manufacturer in accordance with the

requirements of applicable federal standards, for any fixed X-ray tube potential within the range of forty percent to one hundred percent of the maximum rating, the average ratios of exposure to the indicated milliampereseconds product, ~~i.e.,~~ (milliroentgen per milliamperesecond), obtained at any two consecutive tube current settings shall not differ by more than ten-hundredths times their sum,

$$\text{~~i.e.,~~ } |\bar{X}_1 - \bar{X}_2| \leq 0.10 (\bar{X}_1 + \bar{X}_2),$$

where \bar{X}_1 and \bar{X}_2 are the average millirem per milliampereseconds values obtained at each of two consecutive tube current settings.

- c. Accuracy. Deviation of technique factors from indicated values shall not exceed the limits specified for that system by its manufacturer.
- d. Timers. Termination of exposure shall cause automatic resetting of the timer to its initial setting or to "zero".
- e. Beam quality. All certified dental X-ray systems manufactured on and after December 1, 1980, shall have a minimum half-value layer not less than one and one-half millimeters aluminum equivalent. Systems operating above seventy kilovolts peak are subject to the filtration requirements of subdivision a of subsection 5 of section 33-10-06-04.

8. Structural shielding requirements (see appendix E).

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-06-08. Therapeutic X-ray systems of less than one megaelectron volt (MeV).

1. Equipment requirements.

- a. Leakage radiation. When the tube is operated at its leakage technique factors, the leakage radiation shall not exceed the value specified at the distance specified for the classification of that X-ray system.

- (1) Contact therapy systems. Leakage radiation shall not exceed one hundred milliroentgens [25.8 microcoulomb per kilogram] per hour at five centimeters from the surface of the tube housing assembly.
 - (2) ~~0-150~~ Zero - one hundred fifty kilovolts peak systems. Systems which are manufactured or installed prior to October 1, 1982, shall have a leakage radiation which does not exceed one roentgen [0.258 millicoulomb per kilogram] in one hour at one meter from the source.
 - (3) ~~0-150~~ Zero - one hundred fifty kilovolts peak systems. Systems which are manufactured on or after October 1, 1982, shall have a leakage radiation which does not exceed one hundred milliroentgens [25.8 microcoulomb per kilogram] in one hour at one meter from the source.
 - (4) ~~151-999~~ One hundred fifty-one - nine hundred ninety-nine kilovolts peak systems. The leakage radiation shall not exceed one roentgen [0.258 millicoulomb per kilogram] in one hour at one meter from source except systems that operate in excess of five hundred kilovolts peak may have a leakage radiation at one meter from the source equivalent to the exposure within one hour of the useful beam at one meter from the source multiplied by a factor of one-thousandths not to exceed one-tenth percent of the useful beam one meter from the source.
- b. Permanent beam-limiting devices. Permanent fixed diaphragms or cones used for limiting the useful beam shall provide the same or higher degree of protection as required by the tube housing assembly.
- c. Removable and adjustable beam-limiting devices.
- (1) Removable beam-limiting devices shall, for the portion of the useful beam to be blocked by the useful devices, transmit not more than one percent of the beam at the maximum kilovoltage and maximum treatment filter. This requirement does not apply to auxiliary blocks or materials placed in the useful beam to shape the useful beam to the individual patient.
 - (2) Adjustable beam-limiting devices installed after October 1, 1982, shall meet the requirements of paragraph 1 of this subdivision.
 - (3) Adjustable beam-limiting devices installed before October 1, 1982, shall, for the portion of the X-ray

beam to be blocked by these devices, transmit not more than five percent of the original X-ray beam at the maximum kilovoltage and maximum treatment filter.

d. Filter system. The filter system shall be so designed that:

~~(1) Filters cannot be accidentally displaced from the useful beam at any possible tube orientation.~~

~~(2) Each filter is marked as to its material of construction and its thickness. For wedge filters, the wedge angle shall appear on the wedge or wedge tray.~~

~~(3) The radiation at five centimeters from the filter insertion slot opening does not exceed thirty roentgens per hour under any operating conditions.~~

(1) The filters cannot be accidentally displaced at any possible tube orientation;

(2) The radiation at five centimeters from the filter insertion slot opening does not exceed thirty roentgens [7.74 millicoulomb per kilogram] per hour under any operating conditions; and

(3) Each filter is marked as to its material of construction and its thickness. For wedge filters, the wedge angle must appear on the wedge or wedge tray.

e. Tube immobilization. The tube housing assembly shall be capable of being immobilized during stationary treatments.

f. Focal spot marking. The tube housing assembly shall be so marked that it is possible to determine the location of the focal spot to within five millimeters, and such marking shall be readily accessible for use during calibration procedures.

g. Beam block. Contact therapy tube housing assemblies shall have a removable shield of at least five-tenths millimeter lead equivalency at one hundred kilovolts peak that can be positioned over the entire useful beam exit port during periods when the beam is not in use.

h. Beam monitor system. Systems of greater than one hundred fifty kilovolts peak manufactured after October 1, 1982, shall be provided with a beam monitor system which:

- (1) Shall have the detector of the monitor system interlocked to prevent incorrect positioning in the useful beam;
- (2) Shall not allow irradiation until a preselected value of exposure of roentgens has been made at the treatment control panel;
- (3) Shall independently terminate irradiation when the preselection number of roentgens has been reached;
- (4) Shall be so designed that, in the event of a system malfunction or electrical power failure, the dose administered to a patient prior to the system malfunction or power failure can be accurately determined;
- (5) Shall have a display at the control panel from which the dose at a reference point in the treatment volume can be calculated;
- (6) Shall have a control panel display which maintains the reading until intentionally reset to zero; and
- (7) Shall have a control panel display which does not have scale multiplying factors and utilizes a design such that increasing dose is displayed by increasing numbers.

i. Timer.

- (1) A timer shall be provided which has a display at the treatment control panel. The timer shall be graduated in minutes and fractions of minutes. The timer shall have a preset time selector and an elapsed time indicator.
- (2) The timer shall be a cumulative timer which activates with the production of radiation and retains its reading after irradiation is interrupted or terminated. After irradiation is terminated and before irradiation can be reinitiated, it shall be necessary to cycle the preset time selector through zero time reset the elapsed time indicator to zero.
- (3) The timer shall terminate irradiation when a preselected time has elapsed if any dose monitoring system present has not previously terminated irradiation.
- (4) The timer shall permit accurate presetting and determination of exposure times as short as one second.

- (5) The timer shall not permit an exposure if set at zero.
 - (6) ~~The timer shall comply with the provisions of subdivision m of this subsection where applicable.~~
 - ~~(7)~~ The timer shall not activate until the shutter is opened when patient irradiation is controlled by a shutter mechanism.
- j. Control panel functions. The control panel, in addition to the displays required in other ~~provisions~~ requirements of this section shall have:
- (1) An indication of whether electrical power is available at the control panel and if activation of the X-ray tube is possible;
 - (2) An indication of whether X-rays are being produced;
 - (3) Means for indicating kilovolts and X-ray tube current;
 - (4) The means for terminating an exposure at any time;
 - (5) A locking device which will prevent unauthorized use of the X-ray system; and
 - (6) For X-ray equipment manufactured after October 1, 1982, a positive display of specific filters in the beam.
- k. Multiple tubes. When a control panel may energize more than one X-ray tube:
- (1) It shall be possible to activate only one X-ray tube ~~during any time interval~~;
 - (2) There shall be an indication at the control panel identifying which X-ray tube is energized; and
 - (3) There shall be an indication at the tube housing assembly when that tube is energized.
- l. Source-to-skin distance. There shall be means of determining the source-to-skin distance to within one centimeter.
- m. Shutters. Unless it is possible to bring the X-ray output to the prescribed exposure parameters within five seconds, the ~~entire useful~~ beam shall be automatically attenuated by a shutter having a lead equivalency not less than that of the tube housing assembly. In addition,

- (1) After the unit is at operating parameters, the shutter shall be controlled electrically by the operator from the control panel; and
 - (2) An indication of shutter position shall appear at the control panel.
- n. Low filtration X-ray tubes. Each X-ray system equipped with a beryllium or other low-filtration window shall be clearly labeled as such upon the tube housing assembly and at the control panel.
2. Facility design requirements for systems capable of operating above fifty kilovolts peak. ~~In addition to shielding adequate to meet requirements of chapters 33-10-04 and 33-10-06, the treatment room shall meet the following design requirements:~~
- a. ~~Voice~~ Aural communication. Provision shall be made for two-way aural communication between the patient and the operator at the control panel; ~~however.~~ However, where excessive noise levels or treatment requirements make aural communication impractical, other methods of communication shall be used.
 - b. Viewing systems.
 - (1) Windows, mirrors, or closed-circuit television, or an equivalent system shall be provided to permit continuous observation of the patient during irradiation and shall be so located that the operator can observe the patient from the control panel.
 - (2) When the primary viewing system is by electronic means, e.g., television, an alternate viewing system, which may be electronic, shall be available for use in the event of electronic failure of the primary viewing system.
 - c. Additional requirements for X-ray systems capable of operation above one hundred fifty kilovolts peak. Treatment rooms which contain an X-ray system capable of operating above one hundred fifty kilovolts peak shall meet the following additional requirements:
 - (1) All necessary shielding, except for any beam interceptor, shall be provided by fixed barriers. All protective barriers must be fixed except for entrance doors or beam interceptors.
 - (2) The control panel shall be outside the treatment room.

- (3) Entrance interlocks shall be provided such that all entrance doors must be closed before treatment can be initiated or continued. If the radiation beam is interrupted by any door opening, it shall not be possible to restore the machine to operation without closing the door and reinitiating irradiation by manual action at the control panel.
- (4) When any door referred to in paragraph 3 of this subdivision is opened while the X-ray tube is activated, the exposure at a distance of one meter from the source must be reduced to less than one hundred milliroentgens [25.8 microcoulomb per kilogram] per hour.

~~(a) X-ray production shall terminate within one second; or~~

~~(b) The radiation at a distance of one meter from the source shall be reduced to less than one hundred milliroentgens per hour within one second.~~

3. Surveys, calibrations, spot checks, and operating procedures.

a. Surveys.

- (1) All new facilities, and existing facilities not previously surveyed, shall have a survey made by, or under the direction of, a qualified expert. Such In addition, such surveys shall also be done after any change in the facility or equipment which might cause a significant increase in radiation hazard.
- (2) The expert registrant shall report one's findings in writing to the person in charge of the facility obtain a written report of the survey from the qualified expert, and a copy of the report shall be maintained transmitted by the registrant for inspection by the department to the department within thirty days of receipt of the report.
- (3) The survey and report shall indicate all instances where the installation, in the opinion of the qualified expert, is in violation of this article and cite all items of noncompliance.

b. Calibration.

- (1) The calibration of an X-ray system shall be performed at intervals not to exceed one year and after any change or replacement of components which could cause a change in the radiation output.

- (2) The calibration of the radiation output of the X-ray system shall be performed by or under the direction of a qualified expert who is physically present at the facility during such calibration.
 - (3) Calibration of the radiation output of an X-ray system shall be performed with a calibrated dosimetry system. The calibration of such system shall be traceable to a national standard. The instrument shall have been calibrated within the preceding two years.
 - (4) The calibrations made pursuant to this subdivision shall be such that the dose at the reference point in soft tissue can be calculated to within \pm must be such that the dose at a reference point in soft tissue can be calculated to within an uncertainty of five percent.
 - (5) The calibration of the X-ray system shall include, but not be limited to, the following determinations:
 - (a) Verification that the X-ray system is operating in compliance with the design specifications.
 - (b) The exposure rates for each combination of field size, technique factors, filter, and treatment distance used.
 - (c) The degree of congruence between the radiation field and the field indicated by the localizing device if such device is present.
 - (d) An evaluation of the uniformity of the largest radiation field used.
 - (6) Records of calibration shall be maintained by the registrant for ~~two~~ five years after completion of the calibration.
 - (7) A copy of the most recent X-ray system calibration shall be available at or in the area of the control panel.
- c. Spot checks. Spot checks shall be performed on X-ray systems capable of operation at greater than one hundred fifty kilovolts peak. Such spot checks shall meet the following requirements:
- (1) The spot check procedures shall be in writing and shall have been developed by a qualified expert. A copy of the procedures shall be submitted to the department prior to its implementation.

- (2) If a qualified expert does not perform the spot check measurement, the results of the spot check measurements shall be reviewed by a qualified expert within fifteen days.
- (3) The spot check procedures shall specify the frequency at which tests or measurements are to be performed. The spot check procedures shall specify that the spot check shall be performed during the calibration specified in subdivision b of subsection 3 of section 33-10-06-08. The acceptable tolerance for each parameter measured in the spot check when compared to the value for that parameter determined in the calibration specified in subdivision b of subsection 3 of section 33-10-06-08 shall be stated.
- (4) The cause for a parameter exceeding a tolerance set by the qualified expert shall be investigated and corrected before the system is used for patient irradiation.
- (5) Whenever a spot check indicates a significant change in the operating characteristics of a system, as specified in the qualified expert's spot check procedures, the system shall be recalibrated as required in subdivision b of subsection 3 of section 33-10-06-08.
- (6) Records of spot check measurements shall be maintained by the registrant for two years after completion of the spot check measurements and any necessary corrective actions.
- (7) Where a spot check involves a radiation measurement, such measurement shall be obtained using a system satisfying the requirements of subdivision b of subsection 3 of section 33-10-06-08 or which has been intercompared with a system meeting those requirements within the previous year.

d. Operating procedures.

- (1) X-ray systems shall not be left unattended unless the system is secured against unauthorized use.
- (2) When a patient must be held in position for radiation therapy, mechanical supporting or restraining devices shall be used.
- (3) The tube housing assembly shall not be held by hand during operation unless the system is designed to require such holding and the peak tube potential of the system does not exceed fifty kilovolts peak. In

such cases, the holder shall wear protective gloves and apron of not less than five-tenths millimeter lead equivalency at one hundred kilovolts peak.

- (4) No individual other than the patient shall be in the treatment room unless such individual is protected by a barrier sufficient to meet the requirements of subsection 1 of section 33-10-04-02. No individual other than the patient shall be in the treatment room during exposures when the kilovolts peak exceeds one hundred fifty.
- (5) The X-ray system shall not be used in the administration of radiation therapy unless the requirements of subdivision b of this subsection and paragraph 4 of subdivision c have been met.

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-06-09. X-ray and electron therapy systems with energies of one megaelectron volt (MeV) and above. Chapter 33-10-09 except subdivisions c and d of subsection 7 of section 33-10-09-03 shall apply to medical facilities using therapy systems with energies one megaelectron volt and above.

1. Definitions. In addition to the definitions provided in section 33-10-06-02, the following definitions are applicable to this section.
 - a. "Applicator" means a structure which determines the extent of the treatment field at a given distance from the virtual source and which may or may not incorporate the beam-limiting device.
 - b. "Beam scattering filter" means a filter used in order to scatter a beam of electrons.
 - c. "Central axis of the beam" means a line passing through the virtual source and the center of the plane figure formed by the edge of the first beam-limiting device.
 - d. "Dose monitoring system" means a system of devices for the detection, measurement, and display of quantities of radiation.
 - e. "Dose monitor unit" means a unit response from the dose monitoring system from which the absorbed dose can be calculated.

- f. "Existing equipment" means therapy systems subject to this section which were manufactured on or before January 1, 1985.
- g. "Field flattening filter" means a filter used to provide dose uniformity over the area of a useful beam of X-rays at a specified depth.
- h. "Field size" means the dimensions along the major axes of an area in a plane perpendicular to the specified direction of the beam of incident radiation at the normal treatment distance and defined by the intersection of the major axes and the fifty percent isodose line. Material shall be placed in the beam such that dose maximum is produced at the normal treatment distance when field size is being determined.
- i. "Gantry" means that part of the system supporting and allowing possible movements of the radiation head.
- j. "Interruption of irradiation" means the stopping of irradiation with the possibility of continuing irradiation without resetting of operating conditions at the control panel.
- k. "Isocenter" means a fixed point in space located at the center of the smallest sphere through which the central axis of the beams passes in all conditions.
- l. "Moving beam therapy" means radiation therapy with relative displacement of the useful beam and the patient during irradiation. It includes arc therapy, skip therapy, and rotational therapy.
- m. "New equipment" means systems subject to this section which were manufactured after January 1, 1985.
- n. "Normal treatment distance" means:
 - (1) For electron irradiation, the virtual source to surface distance along the central axis of the useful beam as specified by the manufacturer for the applicator.
 - (2) For X-ray irradiation, the virtual source to isocenter distance along the central axis of the useful beam. For nonisocentric equipment, this distance shall be that specified by the manufacturer.
- ~~o. "Patient" means an individual subjected to examination and treatment.~~

- p. "Phantom" means a volume of material behaving in a manner similar to tissue with respect to the attenuation and scattering of radiation.
- q. "Primary dose monitoring system" means a system which will monitor the quantity of radiation produced during irradiation and which will terminate irradiation when a preselected number of dose monitor units have been acquired.
- r. o. "Radiation head" means the structure from which the useful beam emerges.
- s. "Redundant dose monitoring combination" means a combination of two dose monitoring systems in which both systems are arranged to terminate irradiation in accordance with a preselected number of dose monitor units.
- t. "Secondary dose monitoring system" means a system which will terminate irradiation in the event of failure of the primary system.
- u. p. "Shadow tray" means a device attached to the radiation head to support auxiliary beam-limiting material.
- v. q. "Stationary beam therapy" means radiation therapy without relative displacement of the useful beam and patient during radiation.
- w. r. "Target" means that part of a radiation source which intercepts a beam of accelerated particles with subsequent emission of other radiation.
- x. "Termination of irradiation" means the stopping of irradiation in a fashion which will not permit continuance of irradiation without the resetting of operating conditions at the control panel.
- y. "Treatment field" means the area of the patient's skin which is to be irradiated.
- z. s. "Virtual source" means a point from which radiation appears to originate.

2. Requirements for equipment.

- a. Leakage radiation to the patient area.

(1) New equipment shall meet the following requirements:

- (a) For all operating conditions producing maximum leakage, the absorbed dose in rads [grays] due

to leakage radiation, including X-rays, electrons, and neutrons, at any point in a circular plane of two meters radius centered on and perpendicular to the central axis of the beam at the isocenter or the normal treatment distance and outside the maximum useful beam, shall not exceed one-tenth percent of the maximum absorbed dose in rads [grays] of the unattenuated useful beam measured at the point of intersection of the central axis of the beam and the plane surface. Measurements excluding those for neutrons shall be averaged over an area up to but not exceeding two hundred square centimeters at the positions specified. Measurements of the portion of the leakage radiation dose contributed by neutrons shall be averaged over an area up to but not exceeding two hundred square centimeters.

(b) For each system the registrant shall determine, or obtain from the manufacturer, the leakage radiation existing at the positions specified in subparagraph a for specified operation conditions. Records on leakage radiation shall be maintained at the installation for inspection by the department.

(2) Existing equipment shall meet the following requirements:

(a) For operating conditions producing maximum leakage radiation, the absorbed dose in rads [grays] due to leakage radiation excluding neutrons at any point in a circular plane of two meters radius centered on a perpendicular to the central axis of the beam one meter from the virtual source, and outside the maximum size useful beam, may not exceed one-tenth percent of the maximum absorbed dose in rads [grays] of the unattenuated useful beam measured at the point of intersection of the central axis of the beam and the surface of the circular plane. Measurements shall be averaged over an area up to but not exceeding one hundred square centimeters at the positions specified.

(b) For each system, the registrant shall determine, or obtain from the manufacturer, the leakage radiation existing at the positions specified in subparagraph a of this paragraph for specified operating conditions. Records on radiation leakage shall be maintained at the installation for inspection by the department.

b. Leakage radiation outside the patient area for new equipment.

(1) The absorbed dose in rads [grays] due to leakage radiation, except in the area specified in subparagraph a of paragraph 1 of subdivision a, when measured at any point one meter from the path of charged particle, before the charged particle strikes the target or window, may not exceed one-tenth percent for X-ray leakage nor five-hundredths percent for neutron leakage of the maximum absorbed dose in rads [grays] of the unattenuated useful beam measured at the point of intersection of the central axis of the beam and the circular plane specified in subparagraph a of paragraph 1 of subdivision a of this subsection.

(2) The registrant shall determine, or obtain from the manufacturer, the actual leakage radiation existing at the positions specified in paragraph 1 of this subdivision for specified operating conditions. ~~Measurements~~ Radiation measurements excluding neutrons shall be averaged over an area up to but not exceeding one hundred square centimeters at the positions specified. Neutron measurements shall be averaged over an area up to but not exceeding two hundred square centimeters.

c. Beam-limiting devices. Adjustable or interchangeable beam-limiting devices shall be provided and such devices shall transmit no more than two percent of the useful beam at the normal treatment distance for the portion of the useful beam which is to be attenuated by the beam-limiting device. The neutron component of the useful beam shall not be included in this requirement. ~~Measurements shall be averaged over an area up to, but not exceeding, one hundred square centimeters at the normal treatment distance.~~

d. Filters.

(1) Each filter which is removable from the system shall be clearly marked with an identification number. Documentation available at the control panel shall contain a description of the filter. For wedge filters, the wedge angle shall appear on the wedge or wedge tray.

(2) If the absorbed dose rate data required by subdivision p of subsection 2 of section 33-10-06-04 relates exclusively to operation with a field flattening or beam scattering filter in place, such filter shall be removable only by the use of tools.

(3) For new equipment which utilizes a system of wedge filters, interchangeable field flattening filters, or interchangeable beam scattering filters:

- (a) Irradiation shall not be possible until a selection of a filter has been made at the treatment control panel;
- (b) An interlock system shall be provided to prevent irradiation if the filter selected is not in the correct position;
- (c) A display shall be provided at the treatment control panel showing the filters in use; and
- (d) An interlock shall be provided to prevent irradiation if any filter selection operation carried out in the treatment room does not agree with the filter selection operation carried out at the treatment control panel.

e. Beam quality. The registrant shall determine, or obtain from the manufacturer, data sufficient to assure that the following beam quality requirements are met:

(1) The absorbed dose resulting from X-rays in a useful electron beam at a point on the central axis of the beam ten centimeters greater than the practical range of the electrons shall not exceed the value stated in table III. Linear interpolation shall be used for values not stated.

TABLE III

Maximum Energy of Electron Beam in MeV	X-ray Absorbed Dose as a Fraction of Maximum Absorbed Dose
1	0.03
15	0.05
35	0.10
50	0.20

(2) Compliance with paragraph 1 of this subdivision shall be determined using:

- (a) A measurement within a phantom with the incident surface of the phantom at the normal treatment distance and normal to the central axis of the beam;

- (b) The largest field size available which does not exceed fifteen centimeters by fifteen centimeters; and
 - (c) A phantom whose cross-sectional dimensions exceed the measurement radiation field by at least five centimeters and whose depth is sufficient to perform the required measurement.
- (3) The absorbed dose at a surface located at the normal treatment distance, at the point of intersection of that surface with the central axis of the useful beam during X-ray irradiation, shall not exceed the limits stated in table IV. Linear interpolation shall be used for values not stated.

Table IV	
Maximum Photon Energy in MeV	Absorbed Dose at the Surface as a Fraction of the Maximum Absorbed Dose
1	0.80
2	0.70
5	0.60
15	0.50
35	0.40
50	0.20

- (4) Compliance with paragraph 3 of this subdivision shall be determined by measurements made:
- (a) ~~Measurements made within~~ Within a phantom using an instrument which will allow extrapolation to the surface absorbed dose;
 - (b) ~~Use of~~ Using a phantom whose size and placement meet the requirements of paragraph 2 of this subdivision;
 - (c) ~~Removal~~ After removal of all beam modifying devices which can be removed without the use of tools, except for beam scattering or beam flattening filters; and
 - (d) The largest field size available which does not exceed fifteen centimeters by fifteen centimeters.
- (5) The registrant shall determine, or obtain from the manufacturer, the maximum percentage absorbed dose in

the useful beam due to stray neutrons in the useful beam, excluding stray neutron radiation, for specified operating conditions.

- f. Beam monitors. All therapy systems shall be provided with radiation detectors in the radiation head.
- (1) New equipment shall be provided with at least two radiation detectors. The detectors shall be incorporated into two separate dose monitoring systems.
 - (2) Existing equipment shall be provided with at least one radiation detector. This detector shall be incorporated into a primary dose monitoring system.
 - (3) The detectors and system into which the detector is incorporated shall meet the following requirements:
 - (a) Each detector shall be removable only with tools and shall be interlocked to prevent incorrect positioning.
 - (b) Each detector shall form part of a dose monitoring system from whose readings in dose monitor units the absorbed dose at a reference point in the treatment volume can be calculated.
 - (c) Each dose monitoring system shall be capable of independently monitoring, interrupting, and terminating irradiation.
 - (d) For new equipment, the design of the dose monitoring systems shall assure that:
 - [1] The malfunctioning of one system does not affect the correct functioning of the second system; and
 - [2] The failure of any element common to both systems which could affect the correct function of both systems shall terminate irradiation.
 - (e) Each dose monitoring system shall have a legible display at the treatment control panel. For new equipment, each display shall:
 - [1] Maintain a reading until intentionally reset to zero;
 - [2] Have only one scale and no scale multiplying factors;

[3] Utilize a design such that increasing dose is displayed by increasing numbers and shall be so designed that, in the event of an overdosage of radiation, the absorbed dose may be accurately determined; and

[4] In the event of power failure, the dose monitoring information required in this subparagraph displayed at the control panel at the time of failure shall be retrievable in at least one system for a twenty-minute period of time.

~~(f) In the event of power failure, the dose monitoring information required in subparagraph e displayed at the control panel at the time of failure shall be retrievable in at least one system.~~

g. Beam symmetry. In new equipment inherently capable of producing useful beams with asymmetry exceeding five percent, the asymmetry of the radiation beam in two orthogonal directions must be monitored before the beam passes through the beam-limiting device. Facilities must be provided so that, if the difference in dose rate between one region and another region symmetrically displaced from the central axis of the beam exceeds five percent of the central axis dose rate, indication of this condition is made at the control panel; and if this difference exceeds ten percent, the irradiation is terminated.

~~(1) For new equipment, each therapy machine shall have the capability of comparing the dose rates in each of the four quadrants of the central eighty percent of the useful beam. Beam symmetry information shall be displayed at the treatment control panel, and such display shall be capable of indicating a differential of more than five percent between any two of the quadrant dose rates. Beam asymmetry in excess of twenty percent shall automatically terminate the useful beam.~~

~~(2) Beam symmetry requirements of paragraph 1 of this subdivision shall be met if the user can demonstrate to the satisfaction of the department that adequate fail-safe protection against the beam asymmetry is incorporated into the inherent design of the accelerator.~~

~~(3) On existing equipment where the department has determined that beam symmetry is inadequate the use~~

~~of an automatic beam asymmetry warning system may be required.~~

- h. Selection and display of dose monitor units.
- (1) Irradiation shall not be possible until a selection of a number of dose monitor units has been made at the treatment control panel.
 - (2) After useful beam termination, it shall be necessary to reset the dosimeter display to zero before treatment can be reinitiated.
 - (3) The preselected number of dose monitor units shall be displayed at the treatment control panel until reset manually for the next irradiation.
 - (4) For new equipment after termination of irradiation, it shall be necessary to manually reset the preselected dose monitor units before irradiation can be initiated.
- i. Termination of irradiation by the dose monitoring system or systems during stationary beam therapy.
- (1) ~~Each of the required monitoring systems shall be capable of independently terminating irradiation. Provisions shall be made to test the correct operation of each system.~~
 - ~~(2) Each primary system shall terminate irradiation when the preselected number of dose monitor units has been detected by the system.~~
 - ~~(3) Each secondary system shall terminate irradiation when one hundred two percent of the preselected number of dose monitor units has been detected by the system.~~
 - ~~(4) For new equipment, indicators on the control panel shall show which monitoring system has terminated the beam.~~
 - (2) If original design of the equipment included a second dose monitoring system, that system must be capable of terminating irradiation when not more than fifteen percent or forty dose monitor units above the preselected number of dose monitor units set at the control panel has been detected by the second dose monitoring.
 - (3) For new equipment, a second dose monitoring system must be present. That system must be capable of

terminating irradiation when not more than ten percent or twenty-five dose monitoring units above the preselected number of dose monitor units set at the control panel has been detected by the second dose monitoring system.

- (4) For new equipment, an indicator on the control panel must show which dose monitoring system has terminated irradiation.
- j. Interruption switches. It shall be possible to interrupt irradiation and equipment movements at any time from the operator's position at the treatment control panel. Following an interruption, it shall be possible to restart irradiation by operator action without any reselection of operating conditions. If any change is made of a preselected value during an interruption, irradiation and equipment movements shall be automatically terminated.
- k. Termination switches. It shall be possible to terminate irradiation and equipment movements, or go from an interruption condition to termination conditions, at any time from the operator's position at the treatment control panel.
- l. Timer.
- (1) A timer shall be provided which has a display at the treatment control panel. The timer shall be graduated in minutes and decimals of minutes. The timer shall have a preset time selector and an elapsed time indicator.
- (2) The timer shall be a cumulative timer which ~~switches on and off with the~~ activates with the production of radiation and retains its reading after irradiation is interrupted or terminated. It shall be necessary to zero and subsequently reset the elapsed time indicator and the preset time selector after irradiation is terminated before irradiation shall again be possible. After irradiation is terminated and before irradiation can be reinitiated, it shall be necessary to reset the elapsed time indicator to zero.
- (3) For new equipment after termination of irradiation and before irradiation can be reinitiated, it shall be necessary to manually reset the preset time selector.
- (4) The timer shall terminate irradiation when a preselected time has elapsed if the dose monitor systems ~~fail to do so.~~ For new equipment after

termination of irradiation and before irradiation can be reinitiated, it shall be necessary to manually reset the preset time selector have not previously terminated irradiation.

m. Selection of radiation type. Equipment capable of both X-ray therapy and electron therapy shall meet the following requirements:

- (1) Irradiation shall not be possible until a selection of radiation type has been made at the treatment control panel.
- (2) An interlock system shall be provided to ensure that the equipment can emit only the radiation type which has been selected.
- (3) An interlock system shall be provided to prevent irradiation if any selected operations carried out in the treatment room do not agree with the selected operations carried out at the treatment control panel.
- (4) An interlock system shall be provided to prevent irradiation with X-rays except to obtain a port film when electron applicators are fitted ~~and irradiation with electrons when accessories specific for X-ray therapy are fitted.~~
- (5) An interlock system shall be provided to prevent irradiation with electrons when accessories specific for X-ray therapy are fitted.
- (6) The radiation type selected shall be displayed at the treatment control panel before and during irradiation.

n. Selection of energy. Equipment capable of generating radiation beams of different energies shall meet the following requirements:

- (1) Irradiation shall not be possible until a selection of energy has been made at the treatment control panel.
- (2) An interlock system shall be provided to ~~ensure that the equipment can emit only the energy of radiation which has been selected~~ prevent irradiation if any selected operations carried out in the treatment room do not agree with the selected operations carried out at the treatment control panel.

- (3) The nominal energy value selected shall be displayed at the treatment control panel before and during irradiation.
 - (4) For new equipment, an interlock system shall be provided to terminate irradiation if the energy of the electrons striking the X-ray target or electron window deviates by more than twenty percent or three megaelectron volts, whichever is smaller, from the selected nominal energy.
- o. Selection of stationary beam therapy or moving beam therapy. Equipment capable of both stationary beam therapy and moving beam therapy shall meet the following requirements:
- (1) Irradiation shall not be possible until a selection of stationary beam therapy or moving beam therapy has been made at the treatment control panel.
 - (2) An interlock system shall be provided to ensure that the equipment can operate only in the mode which has been selected.
 - (3) An interlock system shall be provided to prevent irradiation if any selected operations carried out in the treatment room do not agree with the selected operations carried out at the treatment control panel.
 - (4) The mode of operation shall be displayed at the treatment control panel.
 - (5) For new equipment, an interlock system shall be provided to terminate irradiation if:
 - (a) Movement of the gantry occurs during stationary beam therapy; or
 - (b) Movement of the gantry stops during moving beam therapy unless such stoppage is a preplanned function.
 - (6) Moving beam therapy shall be controlled to obtain the selected relationships between incremental dose monitor units and incremental angle of movement.
 - (a) For new equipment, an interlock system shall be provided to terminate irradiation if the number of dose monitor units delivered in any ten degrees of arc differs by more than twenty percent from the selected value.

- (b) For new equipment, where gantry angle terminates the irradiation in arc therapy, the dose monitor units shall differ by less than five percent from the value calculated from the absorbed dose per unit angle relationship.
- (7) Where the dose monitor system terminates the irradiation in arc therapy, the termination of irradiation shall be as required by subsection 1 of this section.
- p. Absorbed dose rate. For new equipment, a system shall be provided from whose readings the absorbed dose rate at a reference point in the treatment volume can be calculated (the radiation detectors specified in subdivision f of subsection 2 of section 33-10-06-09 may form part of this system). In addition:
- (1) The dose monitor unit rate shall be displayed at the treatment control panel.
 - (2) If the equipment can deliver under any conditions an absorbed dose rate at the normal treatment distance more than twice the maximum value specified by the manufacturer's anticipated dose rate for any machine parameters utilized, a device shall be provided which terminates irradiation when the absorbed dose rate exceeds a value twice the specified maximum. The value at which the irradiation will be terminated shall be a record maintained by the registrant.
- q. Location of virtual source and beam orientation. The registrant shall determine, or obtain from the manufacturer, the location with reference to an accessible point on the radiation head of:
- (1) The X-ray target or the virtual source of X-rays.
 - (2) The electron window or the virtual source of electrons if the system has electron beam ~~characteristics~~ capabilities.
- ~~(3) All possible orientations of the useful beam.~~
- r. System checking facilities. Capabilities shall be provided so that all radiation safety interlocks can be checked for correct operation. When preselection of any of the operating conditions requires action in the treatment room and at the treatment control panel, selection at one location shall not give a display at the other location until the requisite selected operations in both locations have been completed.

3. Facility and shielding requirements. In addition to chapter 33-10-04, the following design requirements shall apply:
- a. ~~Except for entrance doors or beam interceptors, all the required barriers shall be fixed barriers.~~ Protective barriers. All protective barriers must be fixed except for entrance doors or beam interceptors.
 - b. ~~The treatment control panel shall be located outside the treatment room.~~ Control panel. The control panel must be located outside the treatment room.
 - c. Viewing systems.
 - (1) Windows, mirrors, closed-circuit television, or ~~other~~ an equivalent viewing systems system shall be provided to permit continuous observation of the patient during irradiation and shall be so located that the operator may observe the patient from the treatment control panel.
 - (2) When the viewing system is by electronic means, ~~e.g., television,~~ an alternate viewing system, which may be electronic, shall be provided available for use in the event of failure of the primary system.
 - d. Aural communications. Provision shall be made for two-way aural communication between the patient and the operator at the ~~treatment~~ control panel. However, where excessive noise levels ~~makes~~ or treatment requirements make aural communication impractical, other methods of communication shall be used.
 - e. Room entrances. Treatment room entrances shall be provided with warning lights, ~~which will indicate when the useful beam is "on" in a readily observable position near the outside of all access doors in readily observable positions near the outside of all access doors to indicate when the useful beam is "on".~~
 - f. Entrance interlocks. Interlocks shall be provided such that all entrance doors ~~shall~~ must be closed before treatment can be initiated or continued. If the radiation beam is interrupted by any door opening, it shall not be possible to restore the machine to operation only by without closing the door and reinitiating exposure by manual action at the control panel.
4. Surveys, calibrations, spot checks, and operating procedures.
- a. Surveys.

- (1) All new facilities, and existing facilities not previously surveyed, shall have a survey made by, or under the direction of, a qualified expert. Such In addition, such surveys shall also be done after any change in the facility or equipment which might cause a significant increase in radiation hazard.
- (2) The registrant shall obtain a written report of the survey from the qualified expert and a copy of the report shall be transmitted by the registrant to the department within thirty days of receipt of the report.
- (3) The survey and report shall indicate all instances where the installation, in the opinion of the qualified expert, is in violation of this article ~~and shall cite the section violated.~~

b. Calibrations.

- (1) The calibration of systems subject to section 33-10-06-09 shall be performed in accordance with an established calibration protocol acceptable to the department (the calibration protocol published by the American association of physicists in medicine is accepted as an established protocol. For other protocols, the user shall submit that protocol to the department for concurrence that the protocol is acceptable) before the system is first used for irradiation of patient and thereafter at time intervals which do not exceed twelve months and after any change which might significantly alter the calibration, spatial distribution, or other characteristics of the therapy beam.
- (2) The calibration shall be performed under the direct supervision of a radiological physicist who is physically present at the facility during the calibration.
- (3) ~~Calibration of the dose equivalent of the therapy beam shall be performed with a measurement instrument the calibration of which is directly traceable to national standards of exposure or absorbed dose and which shall have been calibrated within the preceding two years.~~ Calibration radiation measurements required by paragraph 1 of section 33-10-06-09 must be performed using a dosimetry system:
 - (a) Having a calibration factor for cobalt-60 gamma rays traceable to a national standard.

- (b) Which has been calibrated within the previous two years and after any servicing that may have affected its calibration.
 - (c) Which has been calibrated in such a fashion that an uncertainty can be stated for the radiation quantities monitored by the system.
 - (d) Which has had constancy checks performed on the system as specified by a radiological physicist.
- (4) Calibrations made pursuant to subdivision b of this subsection shall be such that the dose at a reference point in soft tissue can be calibrated within + five percent. Calibrations must be in sufficient detail that the dose at a reference point in soft tissue may be calculated to within an uncertainty of five percent.
- (5) The calibration of the therapy beam shall include but be not limited to the following determinations:
- (a) Verification that the equipment is operating in compliance with the design specifications concerning the light localizer, the sidelight and back-pointer alignment with the isocenter, when applicable, variation in the axis of rotation for the table, gantry and jaw system, and beam flatness and symmetry at specified depths.
 - (b) The exposure rate absorbed dose rate at various depths of water for the range of field sizes used, for each effective energy, and for each treatment distance used for radiation therapy that will verify the accuracy of the dosimetry of all therapy procedures utilized with that therapy beam.
 - (c) The congruence between uniformity of the radiation field and the field indicated by the localizing device any dependency upon the direction of the useful beam.
 - (d) The uniformity of the radiation field and its dependency upon the direction of the useful beam.
 - (e) Verification that existing depth-dose data and isodose charts applicable to the specific machine continue to be valid or are updated to existing machine conditions.

- ~~(f)~~ (e) Verification of transmission and electron buildup factors for all accessories such as wedges, shadow trays, and compensators.
 - (6) Records of the calibration performed pursuant to paragraph 1 of this subdivision shall be maintained by the registrant for ~~two~~ five years after completion of the full calibration.
 - (7) A copy of the latest calibration performed pursuant to paragraph 1 of this subdivision shall be available for use by the operator at the treatment in the area of the control panel.
- c. Spot checks. Spot checks shall be performed on systems subject to this section during calibrations and thereafter at intervals not to exceed one month. Such spot checks shall meet the following requirements:
- (1) The spot check procedures shall be in writing and shall have been developed by a radiological physicist. A copy of the procedure shall be submitted to the department prior to its implementation.
 - (2) If a radiological physicist does not perform the spot check measurements, the results of the spot check measurements shall be reviewed by a radiological physicist within fifteen days.
 - (3) The spot check procedures shall specify the frequency at which tests or measurements are to be performed and the acceptable tolerance for each parameter measured in the spot check when compared to the value for that parameter determined in the calibration.
 - (4) At intervals not to exceed one week, spot checks shall be made of absorbed dose measurements at a minimum of two depths in a phantom.
 - (5) Where a system has built-in devices which provide a measurement of any parameter during irradiation, such measurement may not be utilized as a spot check measurement.
 - (6) The cause for a parameter exceeding a tolerance set by the radiological physicist shall be investigated and corrected before the system is used for patient irradiation.
 - (7) Whenever a spot check indicates a significant change in operating characteristics of a system, as specified in the radiological physicist's spot check

procedures, the system shall be recalibrated as required in subdivision b of subsection 4 of this section.

- (8) Records of spot check measurements shall be maintained by the registrant for a period of two years after completion of the spot check measurements and any necessary corrective actions.
- (9) Where a spot check involves a radiation measurement, such measurement shall be obtained using a system satisfying the requirements of subdivision b of subsection 4 of this section or which has been intercompared with a system meeting those requirements within the previous year.

d. Operating procedures.

- (1) No individual other than the patient shall be in the treatment room during treatment of a patient.
- (2) If a patient must be held in position during treatment, mechanical supporting or restraining devices shall be used.
- (3) The system shall not be used in the administration of radiation therapy unless the requirements of subdivisions a, b, and c of this subsection have been met.

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-06-10. Veterinary medicine radiographic installations. In addition to the requirements of sections 33-10-06-03 and 33-10-06-04, the following regulations shall apply to all veterinary medicine radiographic installations:

1. Equipment.

- a. The protective tube housing shall be of diagnostic type equivalent to the requirements of subsection 3 of section 33-10-06-04.
- b. Diaphragms or cones shall be provided for collimating the useful beam to the area of clinical interest and shall provide the same degree of protection as is required of the housing.
- c. The total filtration permanently in the useful beam shall not be less than five-tenths millimeters aluminum

equivalent for machines operating up to fifty ~~kVp~~ kilovolts peak, one and one-half millimeters aluminum equivalent for machines operating between fifty and seventy ~~kVp~~ kilovolts peak, and two and one-half millimeters aluminum equivalent for machines operating above seventy ~~kVp~~ kilovolts peak.

- d. A device shall be provided to terminate the exposure after a preset time or exposure.
 - e. A dead-man type of exposure switch shall be provided, together with an electrical cord of sufficient length, so that the operator can stand out of the useful beam and at least six feet [1.83 meters] from the animal during all X-ray exposures.
2. Structural shielding. All wall, ceiling, and floor areas shall be equivalent to or provided with applicable protective barriers as required in appendix Ⓔ of this chapter to assure compliance with sections 2, 4, and 5 of chapter 33-10-04.
 3. Operating procedures.
 - a. The operator shall stand well away from the useful beam and the animal during radiographic exposures.
 - b. No individual other than the operator shall be in the X-ray room while exposures are being made unless such individual's assistance is required.
 - c. When an animal must be held in position during radiography, mechanical supporting or restraining devices should be used. If the animal must be held by an individual, that individual shall be protected with appropriate shielding devices, such as protective gloves and apron, and the individual shall be so positioned that no part of the individual's body will be struck by the useful beam. The exposure of any individual used for this purpose shall be monitored.

History: Amended effective June 1, 1986; June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-06-11. Computed tomography X-ray systems.

1. Definitions. In addition to the definitions provided in sections 33-10-01-04 and 33-10-06-02, the following definitions are applicable to this section:

- a. "Computed tomography dose index" means the integral from -7T to +7T of the dose profile along a line perpendicular

to the tomographic plane divided by the product of the nominal tomographic section thickness and the number of tomograms produced in a single scan, that is:

$$CTDI = \frac{1}{nT} \int_{-T}^{+T} D(z) dz$$

where:

z = Position along a line perpendicular to the tomographic plane.

D(z) = Dose at position z.

T = Nominal tomographic section thickness.

n = Number of tomograms produced in a single scan.

This definition assumes that the dose profile is centered around z=0 and that, for a multiple tomogram system, the scan increment between adjacent scans is nT.

b. "Contrast scale" means the change in the linear attenuation coefficient per computed tomography number relative to water, that is:

$$CS = \frac{\mu_x - \mu_w}{(CTN)_x - (CTN)_w}$$

where:

μ_x = Linear attenuation coefficient of the material of interest.

μ_w = Linear attenuation coefficient of water.

$(CTN)_x$ = CTN of the material of interest.

$(CTN)_w$ = CTN of water.

c. "CS" (See "Contrast scale").

d. "CT" means a radiologic imaging technique that produces images of "slices" through a patient's body.

e. "CT conditions of operation" means all selectable parameters governing the operation of a CT X-ray system including, but not limited to, nominal tomographic section thickness, filtration, and the technique factors as defined in section 33-10-06-02.

f. "CTDI" (See "Computed tomography dose index").

g. "CT gantry" means the tube housing assemblies, beam-limiting devices, detectors, and the supporting structures and frames which hold these components.

h. "CTN" (See "CT number").

i. "CT number" means the number used to represent the X-ray attenuation associated with each elemental area of the CT image.

$$\text{CTN} = k \frac{(\mu_x - \mu_w)}{\mu_w}$$

where:

k = A constant (The constant has a normal value of one thousand when the Hounsfield scale of CTN is used.)

μ_x = Linear attenuation coefficient of the material of interest.

μ_w = Linear attenuation coefficient of water.

j. "Dose profile" means the dose as a function of position along a line.

k. "Elemental area" means the smallest area within a tomogram for which the X-ray attenuation properties of a body are depicted. (See also "Picture element").

l. "Multiple tomogram system" means a computed tomography X-ray system which obtains X-ray transmission data simultaneously during a single scan to produce more than one tomogram.

m. "Noise" means the standard deviation of the fluctuations in computed tomography number expressed as a percentage of the attenuation coefficient of water. Its estimate (S_n) is calculated using the following expression:

$$S_n = 100 \times \frac{CS \times s}{\mu_w}$$

where:

CS = Contrast scale.

μ_w = Linear attenuation coefficient of water.

s = Estimated standard deviation of the CTN of picture elements in a specified area of the CT image.

n. "Nominal tomographic section thickness" means the full width at half-maximum of the sensitivity profile taken at the center of the cross-sectional volume over which X-ray transmission data are collected.

o. "Picture element" means an elemental area of a tomogram.

- p. "Reference plane" means a plane which is displaced from and parallel to the tomographic plane.
- g. "Scan" means the complete process of collecting X-ray transmission data for the production of a tomogram. Data can be collected simultaneously during a single scan for the production of one or more tomograms.
- r. "Scan increment" means the amount of relative displacement of the patient with respect to the CT X-ray system between successive scans measured along the direction of such displacement.
- s. "Scan sequence" means a preselected set of two or more scans performed consecutively under preselected CT conditions of operation.
- t. "Scan time" means the period of time between the beginning and end of X-ray transmission data accumulation for a single scan.
- u. "Single tomogram system" means a CT X-ray system which obtains X-ray transmission data during a scan to produce a single tomogram.
- v. "Tomographic plane" means that geometric plane which is identified as corresponding to the output tomogram.
- w. "Tomographic section" means the volume of an object whose X-ray attenuation properties are imaged in a tomogram.

2. Requirements for equipment.

a. Termination of exposure.

- (1) Means must be provided to terminate the X-ray exposure automatically by either deenergizing the X-ray source or shuttering the X-ray beam in the event of equipment failure affecting data collection. Such termination must occur within an interval that limits the total scan time to no more than one hundred ten percent of its preset value through the use of either a backup timer or devices which monitor equipment function.
- (2) A visible signal must indicate when the X-ray exposure has been terminated through the means required by paragraph 1.
- (3) The operator must be able to terminate the X-ray exposure at any time during a scan, or series of scans under computed tomography X-ray system control, of greater than one-half second duration.

b. Tomographic plane indication and alignment.

- (1) For any single tomogram system, means must be provided to permit visual determination of the tomographic plane or a reference plane offset from the tomographic plane.
- (2) For any multiple tomogram system, means must be provided to permit visual determination of the location of a reference plane. This reference plane can be offset from the location of the tomographic planes.
- (3) If a device using a light source is used to satisfy paragraph 1 or 2, the light source must provide illumination levels sufficient to permit visual determination of the location of the tomographic plane or reference plane under ambient light conditions of up to five hundred lux.

c. Beam-on and shutter status indicators and control switches.

- (1) The computed tomography X-ray control and gantry must provide visual indication whenever X-rays are produced and, if applicable, whether the shutter is open or closed.
- (2) Each emergency button or switch must be clearly labeled as to its function.

d. Indication of computed tomography conditions of operation. The computed tomography X-ray system must be designed such that the computed tomography conditions of operation to be used during a scan or a scan sequence must be indicated prior to the initiation of a scan or a scan sequence. On equipment having all or some of these conditions of operation at fixed values, this requirement may be met by permanent markings. Indication of computed tomography conditions of operation must be visible from any position from which scan initiation is possible.

e. Extraneous radiation. When data are not being collected for image production, the radiation adjacent to the tube port may not exceed that permitted by subsection 3 of section 33-10-06-04.

f. Maximum surface computed tomography dose index identification. The angular position where the maximum surface computed tomography dose index occurs must be identified to allow for reproducible positioning of a computed tomography dosimetry phantom.

g. Additional requirements applicable to computed tomography X-ray systems containing a gantry manufactured after September 3, 1985.

- (1) The total error in the indicated location of the tomographic plane or reference plane may not exceed five millimeters.
- (2) If the X-ray production period is less than one-half second, the indication of X-ray production must be actuated for at least one-half second. Indicators at or near the gantry must be discernible from any point external to the patient opening where insertion of any part of the human body into the primary beam is possible.
- (3) The deviation of indicated scan increment versus actual increment may not exceed plus or minus one millimeter with any mass from zero to one hundred kilograms resting on the support device. The patient support device must be incremented from a typical starting position to the maximum incremented distance or thirty centimeters, whichever is less, and then returned to the starting position. Measurement of actual versus indicated scan increment may be taken anywhere along this travel.
- (4) Premature termination of the X-ray exposure by the operator shall necessitate resetting of the computed tomography conditions of operation prior to the initiation of another scan.

h. Facility design requirements.

- (1) Aural communication. Provision must be made for two-way aural communication between the patient and the operator at the control panel.
- (2) Viewing systems.
 - (a) Windows, mirrors, closed-circuit television, or an equivalent must be provided to permit continuous observation of the patient during irradiation and must be so located that the operator can observe the patient from the control panel.
 - (b) When the primary viewing system is by electronic means, an alternate viewing system (which may be electronic) must be available for use in the event of failure of the primary viewing system.

i. Surveys, calibrations, spot checks, and operating procedures.

(1) Surveys.

(a) All computed tomography X-ray systems installed after March 1, 1992, and those systems not previously surveyed shall have a survey made by, or under the direction of, a qualified expert. In addition, such surveys must be done after any change in the facility or equipment which might cause a significant increase in radiation hazard.

(b) The registrant shall obtain a written report of the survey from the qualified expert, and a copy of the report must be made available to the department upon request.

(2) Radiation calibrations.

(a) The calibration of the radiation output of the computed tomography X-ray system must be performed by, or under the direction of, a qualified expert who is physically present at the facility during such calibration.

(b) The calibration of a computed tomography X-ray system must be performed at intervals specified by a qualified expert and after any change or replacement of components which, in the opinion of the qualified expert, could cause a change in the radiation output.

(c) The calibration of the radiation output of a computed tomography X-ray system must be performed with a calibrated dosimetry system. The calibration of such system must be traceable to a national standard. The dosimetry system must have been calibrated within the preceding two years.

(d) Computed tomography dosimetry phantoms must be used in determining the radiation output of a computed tomography X-ray system. Such phantoms must meet the following specifications and conditions of use:

[1] Computed tomography dosimetry phantoms must be right circular cylinders of polymethyl methacrylate of density one point nineteen plus or minus point zero one grams per cubic centimeter. The phantoms must be at

least fourteen centimeters in length and must have diameters of thirty-two centimeters for testing computed tomography X-ray systems designed to image any section of the body and sixteen centimeters for systems designed to image the head or for whole body scanners operated in the head scanning mode.

[2] Computed tomography dosimetry phantoms must provide means for the placement of a dosimeter along the axis of rotation and along a line parallel to the axis of rotation and one centimeter from the outer surface and within the phantom. Means for the placement of dosimeters or alignment devices at other locations may be provided.

[3] Any effects on the doses measured due to the removal of phantom material to accommodate dosimeters must be accounted for through appropriate corrections to the reported data or included in the statement of maximum deviation for the values obtained using the phantom.

[4] All dose measurements must be performed with the computed tomography dosimetry phantom placed on the patient couch or support device without additional attenuation materials present.

(e) The calibration shall be required for each type of head, body, or whole-body scan performed at the facility.

(f) Calibration must meet the following requirements:

[1] The dose profile along the center axis of the computed tomography dosimetry phantom for the minimum, maximum, and midrange values of the nominal tomographic section thickness used by the registrant shall be measurable. Where less than three nominal tomographic thicknesses can be selected, the dose profile determination must be performed for each available nominal tomographic section thickness.

[2] The computed tomography dose index (For the purpose of determining the computed tomography dose index, the manufacturer's

statement as to the nominal tomographic section thickness for that particular system may be utilized.) along the two axes specified in item 2 of subparagraph d must be measured. The computed tomography dosimetry phantom must be oriented so that the measurement point one centimeter from the outer surface and within the phantom is in the same angular position within the gantry as the point of maximum surface computed tomography dose index identified. The computed tomography conditions of operation must correspond to typical values used by the registrant.

[3] The spot checks specified in paragraph 3 of subdivision i must be made.

(g) Calibration procedures must be in writing. Records of calibrations performed must be maintained for inspection by the department.

(3) Spot checks.

(a) The spot check procedures must be in writing and must have been developed by the qualified expert.

(d) The spot check procedures must incorporate the use of a computed tomography dosimetry phantom which has a capability of providing an indication of contrast scale, noise, nominal tomographic section thickness, the resolution capability of the system for low and high contrast objects, and measuring the mean computed tomography number for water or other reference material.

(c) All spot checks must be included in the calibration required by paragraph 2 and at time intervals and under system conditions specified by a qualified expert.

(d) Spot checks must include acquisition of images obtained with the computed tomography dosimetry phantoms using the same processing mode and computed tomography conditions of operation as are used to perform calibrations required by paragraph 2 of subdivision i. The images must be retained, until a new calibration is performed, in two forms as follows:

- [1] Photographic copies of the images obtained from the image display device; and
 - [2] Images stored in digital form on a storage medium compatible with the computed tomography X-ray system.
- (e) Written records of the spot checks performed shall be maintained for inspection by the department.
- (4) Operating procedures.
- (a) The computed tomography X-ray system may not be operated except by an individual who has been specifically trained in its operation.
 - (b) Information must be available at the control panel regarding the operation and calibration of the system. Such information must include the following:
 - [1] Dates of the latest calibration and spot checks and the location within the facility where the results of those tests may be obtained;
 - [2] Instructions on the use of the computed tomography dosimetry phantoms including a schedule of spot checks appropriate for the system, allowable variations for the indicated parameters, and the results of at least the most recent spot checks conducted on the system;
 - [3] The distance in millimeters between the tomographic plane and the reference plane if a reference plane is utilized; and
 - [4] A current technique chart available at the control panel which specifies for each routine examination the computed tomography conditions of operation and the number of scans per examination.
 - (c) If the calibration or spot check of the computed tomography X-ray system identifies that a system operating parameter has exceeded a tolerance established by the qualified expert, use of the computed tomography X-ray system on patients must be limited to those uses permitted by established written instructions of the qualified expert.

History: Effective June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

APPENDIX A
INFORMATION ON RADIATION SHIELDING REQUIRED
FOR PLAN REVIEWS

In order for the department to provide an evaluation, technical advice, and official approval on shielding requirements for a radiation installation, the following information is needed shall be submitted:

1. The plans should show, as a minimum, the following:
 - a. The normal location of the radiation producing equipment's X-ray system's radiation port; the port's travel and traverse limits; general direction or directions of the radiation useful beam; locations of any windows and doors; the location of the operator's booth; and the location of the equipment's X-ray control console panel.
 - b. Structural composition and thickness or lead equivalent of all walls, doors, partitions, floor, and ceiling of the room or rooms concerned.
 - c. ~~Height, floor to floor,~~ The dimensions of the room or rooms concerned.
 - d. The type of occupancy of all adjacent areas inclusive of space above and below the room or rooms concerned. If there is an exterior wall, show distance to the closest existing occupied area or areas where it is likely that individuals may be present.
 - e. The make and model of the radiation producing X-ray equipment including and the maximum energy output (for X-ray machines this is the kilovolt peak potential) technique factors.
 - f. The type of examinations or treatments which will be performed with the equipment, e.g., dental, orthodontal, chest, gastrointestinal, fluoroscopic, podiatry, fixed therapy, rotational therapy, etc.
2. Information on the anticipated workload used in shielding calculations will be provided by the facility of the X-ray systems.
3. If the services of a qualified radiation expert have been utilized, a copy of the expert's report shall be submitted with the plans. This report must show all basic assumptions (i.e., workload, occupancy and use factors, distance, etc.) used to determine the shielding requirements to determine the shielding requirements, a report, including all basic assumptions used, must be submitted with the plans.

History: Amended effective June 1, 1992.

APPENDIX B
MINIMUM DESIGN REQUIREMENTS FOR AN X-RAY MACHINE
OPERATOR'S BOOTH

1. Space requirements.

- a. The operator shall be allotted not less than seven and five-tenths square feet [~~0.70~~ 0.697 square meters] of unobstructed floor space in the booth.
- ~~(1)~~ b. The minimum space as indicated above operator's booth may be any geometric configuration with no dimension of less than two feet [0.61 meters].
- ~~(2)~~ c. The space shall be allotted excluding any encumbrance by the console, such as overhang ~~or~~ cables, or other similar encroachments.
- ~~(3)~~ d. An extension of a straight line drawn between any point on the edge of the booth shielding and (a) a point one foot [~~0.30~~ meters] horizontally beyond the nearest vertical edge of the chest cassette holder or (b) any corner of the examination table shall not impinge on the unobstructed space. The booth must be located or constructed such that unattenuated direct scatter radiation originating on the examination table or at the wall cassette not reach the operator's station in the booth.

2. Structural requirements.

- ~~(4)~~ a. The booth walls shall be permanently fixed barriers of at least seven feet [2.13 meters] high and shall be permanently fixed to the floor or other structure as may be necessary.
- ~~(5)~~ b. When a door or movable panel is used as an integral part of the booth structure, it must have a permissive device an interlock which will prevent an exposure when the door or panel is not closed ~~(this type of booth structure is not recommended).~~
- c. Shielding must be provided to meet the requirements of chapter 33-10-04 of these rules.

~~2.~~ 3. X-ray control placement.

- a. The X-ray control for the system shall be fixed within the booth and ~~shall~~:
 - (1) ~~Be~~ Shall be at least forty inches [~~101.6 centimeters~~ 1.02 meters] from any open edge of the booth wall which is ~~proximal~~ nearest to the examining table.

- (2) ~~Allow~~ Shall allow the operator to use the majority of the available viewing windows.

3- 4. Viewing system requirements.

- a. Each booth shall have at least one viewing device which will:

- (1) Be so placed that the operator can view the patient during any exposure-, and
- (2) ~~Be~~ The device shall be so placed that the operator can have full view of any occupant of the room and should be so placed that the operator can view any entry into the room. If any door, which allows access to the room, cannot be seen from the booth, then that door must have a permissive device an interlock controlling the exposure which will prevent the exposure if the door is not closed.

- b. When the viewing system is a window, the following requirements also apply:

- (1) It shall have a visible area of at least one square foot [929.03 square centimeters] the base of which is at least five feet [1.52 meters] above the floor. The viewing area must be at least one square foot [0.0929 square meters].
- (2) The distance between the proximal edge of the window and the open edge of the booth shall not be less than eighteen inches [45.72 centimeters]. The design of the booth must be such that the operator's expected position when viewing the patient and operating the X-ray system is at least eighteen inches [0.457 meter] from the edge of the booth.
- (3) The glass shall have the same lead equivalence as that required in the booth's wall in which it is to be mounted material constituting the window must have the same lead equivalence as that required in the booth's wall in which it is mounted.

- c. When the viewing system is by mirrors-, the mirrors must be so located as to accomplish the general requirements of subdivision a of subsection 4 of appendix B.

~~(1)~~ The mirror or mirrors shall be so located as to accomplish the general requirements as in subdivision a-

- d. When the viewing system is by electronic means:

- (1) The camera shall be so located as to accomplish the general requirements in ~~subdivision a.~~ subdivision a of subsection 4 of appendix B; and
- (2) There shall be an alternate viewing system as a backup for ~~electronic failure~~ the primary system.

History: Amended effective June 1, 1986; June 1, 1992.

APPENDIX E
INFORMATION TO BE SUBMITTED BY PERSONS PROPOSING
TO CONDUCT HEALING ARTS SCREENING

Persons requesting that the department approve a healing arts screening program shall submit the following information and evaluation:

1. Name and address of the applicant and, where applicable, the names and addresses of agents within this state.
2. Diseases or conditions for which the X-ray examinations are to be used in diagnoses.
3. ~~Description in detail~~ A detailed description of the X-ray examinations proposed in the screening program.
4. Description of the population to be examined in the screening program, i.e., age, sex, physical condition, and other appropriate information.
5. Any evaluation of any known alternate methods not involving ionizing radiation which could achieve the goals of the screening program and why these methods are not used ~~in preference to~~ instead of the X-ray examinations.
6. An evaluation by a qualified expert on the X-ray systems to be used in the screening program. The evaluation by the qualified expert shall show that such systems do satisfy all requirements of this article.
7. A description of the diagnostic film quality control program.
8. A copy of the technique chart for the X-ray examination ~~procedure~~ procedures to be used.
9. The qualifications of each individual who will be operating the X-ray systems.
10. The qualifications of the individual who will be supervising the operators of the X-ray systems. The extent of supervision and the method of work performance evaluation shall be specified.
11. The name and address of the individual who will interpret the radiographs.
12. A description of the procedures to be used in advising the individuals screened and their private practitioners of the healing arts of the results of the screening procedure and any further medical needs indicated.

13. A description of the procedures for the retention or disposition of the radiographs and other records pertaining to the X-ray examinations.

History: Effective October 1, 1982; amended effective June 1, 1986;
June 1, 1992.

APPENDIX F

INSTRUCTION OF USERS OF X-RAY EQUIPMENT IN THE HEALING ARTS

- I- 1. Fundamentals of radiation safety.
 - A- a. Characteristics of X-radiation.
 - B- b. Units of radiation dose (mrem).
 - C- c. Hazards of excessive exposure to radiation.
 - D- d. Levels of radiation from sources of radiation.
 - E- e. Methods of controlling radiation dose.
 - 1- (1) Working time.
 - 2- (2) Working distances.
 - 3- (3) Shielding.
- II- 2. Radiation detection instrumentation to be used.
 - A- a. Radiation survey instruments.
 - 1- (1) Operation.
 - 2- (2) Calibration.
 - 3- (3) Limitations.
 - B- b. Survey, monitoring, and spot check techniques.
 - C- c. Personnel monitoring devices.
 - 1- (1) Film badges.
 - 2- (2) Pocket dosimeters.
 - 3- (3) Thermoluminescent dosimeters.
 - D- d. Interpretation of personnel monitoring reports.
- III- 3. Operation and control of X-ray equipment.
 - A- a. Collimation and filtration.
 - B- b. Exposure techniques for the equipment used.

~~6-~~ c. Film processing techniques.

~~8-~~ d. Anatomy and positioning.

~~1-~~ (1) Relevant human anatomy.

~~2-~~ (2) Relevant human physiology.

~~3-~~ (3) Radiographic positioning.

~~IV-~~ 4. The requirements of pertinent federal ~~regulations and this~~
~~article~~ and state rules.

~~V-~~ 5. The licensee's or registrant's written operating and emergency
procedures.

History: Effective June 1, 1986; amended effective June 1, 1992.

CHAPTER 33-10-07

33-10-07-01. Purpose and scope. The requirements of this chapter apply to all licensees who use sealed sources in the healing arts and are in addition to other applicable requirements of this article. This chapter establishes requirements and provisions for the use of radionuclides in the healing arts and for issuance of licenses authorizing the medical use of this material. These requirements and provisions provide for the protection of the public health and safety. The requirements and provisions of this chapter are in addition to, and not in substitution for, others in this article. The requirements and provisions of this article apply to applicants and licensees subject to this chapter unless specifically exempted.

History: Amended effective June 1, 1986; June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-07-01.1. Definitions. As used in this chapter, the following definitions apply:

1. "Brachytherapy" means a method of radiation therapy in which an encapsulated source or group of sources is utilized to deliver a beta or gamma radiation at a distance of up to a few centimeters [inches], by surface, intracavitary, or interstitial application. "Area of use" means a portion of a physical structure that has been set aside for the purpose of receiving, using, or storing radioactive material.
2. "Teletherapy" means therapeutic irradiation in which the source of radiation is at a distance from the body. "As low as reasonably achievable" (ALARA) means making every reasonable effort to maintain exposures to radiation as far below the dose limits as is practical:
 - a. Consistent with the purpose for which the licensed activity is undertaken;
 - b. Taking into account the state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations; and
 - c. In relation to utilization of nuclear energy in the public interest.
3. "Authorized user" means a practitioner of the healing arts who is identified as an authorized user on a department [agreement state, licensing state or United States nuclear regulatory

- commission] license that authorizes the medical use of radioactive material.
4. "Brachytherapy" means a method of radiation therapy in which sealed sources are utilized to deliver a radiation dose at a distance of up to a few centimeters, by surface, intracavitary, or interstitial application.
 5. "Dedicated check source" means a radioactive source that is used to assure the constant operation of a radiation detection or measurement device over several months or years. This source may also be used for other purposes.
 6. "Management" means the chief executive officer or that individual's designee.
 7. "Medical institution" means an organization in which several medical disciplines are practiced.
 8. "Medical use" means the intentional internal or external administration of radioactive material, or the radiation therefrom, to humans in the practice of the healing arts.
 9. "Misadministration" means the administration of:
 - a. A radiopharmaceutical or radiation from a sealed source other than the one intended;
 - b. A radiopharmaceutical or radiation to the wrong patient;
 - c. A radiopharmaceutical or radiation by a route of administration other than that intended by the prescribing physician;
 - d. A diagnostic dosage of a radiopharmaceutical differing from the prescribed dosage by more than fifty percent;
 - e. A therapeutic dosage of a radiopharmaceutical differing from the prescribed dosage by more than ten percent; or
 - f. A therapeutic radiation dose from a sealed source such that errors in the source calibration, time of exposure, and treatment geometry result in a calculated total treatment dose differing from the final prescribed total treatment dose by more than ten percent.
 10. "Mobile nuclear medicine service" means the transportation and medical use of radioactive material.
 11. "Output" means the exposure rate, dose rate, or a quantity related in a known manner to these rates from a teletherapy unit for a specified set of exposure conditions.

12. "Teletherapy physicist" means an individual identified as the qualified teletherapy physicist on a department license.
13. "Teletherapy, means therapeutic irradiation in which the source of radiation is at a distance from the body.
14. "Visiting authorized user" means an authorized user who is not identified on the license of the licensee being visited.

History: Effective June 1, 1986; amended effective June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-07-02. Interstitial, intracavitary, and superficial applications. Repealed effective June 1, 1992.

~~1. Accountability, storage and transit.~~

- ~~a. Except as otherwise specifically authorized by the department each licensee shall provide accountability of sealed sources and shall keep a record of the issue and return of all sealed sources. A physical inventory shall be made at least every three months and a written record of the inventory maintained.~~
- ~~b. When not in use, sealed sources and applicators containing sealed sources shall be kept in a protective enclosure of such material and wall thickness as may be necessary to assure compliance with the provisions of subsections 1, 4, and 5 of section 33-10-04-02.~~
- ~~c. Each licensee shall follow the radiation safety and handling instructions approved by the department, the United States nuclear regulatory commission, an agreement state, or a licensing state and furnished by the manufacturer on the label attached to the source, device, or permanent container thereof, or in the leaflet or brochure which accompanies the source or device, and maintain such instruction in a legible and conveniently available form.~~
- ~~d. Each licensee shall assure that needles or standard medical applicator cells containing cobalt-60 as wire, radium-226, or cesium-137 are not opened while in the licensee's possession unless specifically authorized by a license issued by the department.~~

~~2. Testing sealed sources for leakage and contamination.~~

- ~~a. All sealed sources, containing more than one hundred microcuries of radioactive material with a half life greater than thirty days, or ten microcuries of~~

radium-226, shall be tested for leakage and/or contamination at intervals not to exceed six months or at such other intervals as are approved by the department, the United States nuclear regulatory commission, an agreement state, or a licensing state and described by the manufacturer on the label attached to the source, device, or permanent container thereof, or in the leaflet or brochure which accompanies the source or device shall be so tested prior to its first use unless the supplier furnishes a certificate that the source or device has been so tested within six months prior to the transfer.

- b. Leak tests shall be capable of detecting the presence of five-thousandths microcurie of radioactive material on the test sample or, in the case of radium, the escape of radon at the rate of one-thousandths microcurie per twenty-four hours. The test sample shall be taken from the source or from the surfaces of the device in which the source is permanently or semipermanently mounted or stored on which one might expect contamination to accumulate. Records of leak test results shall be kept in units of microcuries and maintained for inspection by the department.
- c. Any leak test conducted pursuant to subdivision a of this subsection which reveals the presence of five-thousandths microcurie or more of removable contamination or, in the case of radium, the escape of radon at the rate of one-thousandth microcurie per twenty-four hours, shall be considered evidence that the sealed source is leaking. The licensee shall immediately withdraw the source from use and cause it to be decontaminated and repaired or to be disposed of in accordance with department rules. A report shall be filed within five days of the test with the department describing the equipment involved, the tests results, and the corrective action taken.

3. Radiation surveys.

- a. The maximum radiation level at a distance of one meter from the patient in whom brachytherapy sources have been inserted shall be determined by measurement or calculation. This radiation level shall be entered on the patient's chart and signs as required under subsection 4 of this section.
- b. The radiation levels in the patient's room and the surrounding area shall be determined, recorded, and maintained for inspection by the department.
- c. The licensee shall assure that patients treated with cobalt-60, cesium-137, iridium-192, or radium-226 implants remain hospitalized until a source count and

radiation survey of the patient confirm that all implants have been removed.

4. Signs and records.

- a. In addition to the requirements of subsection 3 of section 33-10-04-03, the bed, cubicle, or room of the hospital brachytherapy patient shall be marked with a sign indicating the presence of brachytherapy sources. This sign shall incorporate the radiation symbol and specify the radionuclide, the activity, date, and the individual or individuals to contact for radiation safety instructions. The sign is not required provided the exception in subdivision b of subsection 4 of section 33-10-04-03 is met.
- b. The following information shall be included in the patient's chart:
 - (1) The radionuclide administered, number of sources, activity in millicuries and time and date of administration.
 - (2) The exposure rate at one meter, the time the determination was made, and by whom.
 - (3) The radiation symbol.
 - (4) The precautionary instructions necessary to assure that the exposure of individuals does not exceed that permitted under subsection 4 of section 33-10-04-02.

History: Amended effective June 1, 1986.

General Authority: NDCE 28-32-02

Law Implemented: NDCE 28-32-02d

33-10-07-03. Teletherapy. Repealed effective June 1, 1992.

4. Equipment.

- a. The housing shall be so constructed that, at one meter from the source, the maximum exposure rate does not exceed ten milliroentgens per hour when the beam control mechanism is in the "off" position. The average exposure rate measured at a representative number of points about the housing, each one meter from the source, shall not exceed two milliroentgens per hour.
- b. For teletherapy equipment installed after April 4, 1977, the leakage radiation measured at one meter from the source when the beam control mechanism is in the "on"

- position shall not exceed one-tenth of one percent of the useful beam exposure rate.
- c- Adjustable or removable beam-defining diaphragms shall allow transmission of not more than five percent of the useful beam exposure rate.
- d- The beam control mechanism shall be of a positive design capable of acting in any orientation of the housing for which it is designed to be used. In addition to an automatic closing device, the mechanism shall be designed so that it can be manually returned to the "off" position with a minimum risk of exposure.
- e- The closing device shall be so designed as to return automatically to the "off" position in the event of any breakdown or interruption of the activating force and shall stay in the "off" position until activated from the control panel.
- f- When any door to the treatment room is opened, the beam control mechanism shall automatically and rapidly restore the unit to the "off" position and cause it to remain there until the unit is reactivated from the control panel.
- g- There shall be at the housing and at the control panel a warning device that plainly indicates whether the beam is on or off.
- h- The equipment shall be provided with a locking device to prevent unauthorized use.
- i- The control panel shall be provided with a timer that automatically terminates the exposure after a preset time.
- j- Provision shall be made to permit continuous observation of patients during irradiation.
- k- Each teletherapy room shall be equipped with a radiation monitoring device which continuously monitors the teletherapy beam condition. The monitoring device shall be equipped with a backup battery power supply for emergencies due to electrical power failures.
- 2- Operation: No individual shall be in the treatment room during irradiation unless that individual is the patient. Mechanical restraining or supporting devices shall be used for positioning the patient, if necessary.
- 3- Testing for leakage and contamination: Teletherapy sources shall be tested for leakage and contamination in accordance with the procedures described in subsection 2 of section

~~33-10-07-02.~~ Tests of leakage may be made by wiping accessible surfaces of the housing port or collimator while the source is in the "off" position and measuring these wipes for transferred contamination.

4. Calibration and physical decay determinations.

a. Full calibration measurements shall be performed by licensees on each teletherapy unit:

(1) Prior to the first use of the unit for treating humans.

(2) Prior to treating humans:

(a) Whenever spot check measurements indicate that the output value differs by more than five percent from the value obtained at the last full calibration corrected mathematically for physical decay;

(b) Following replacement of the radiation source or following reinstallation of the teletherapy unit in a new location;

(c) Following any repair of the teletherapy unit that includes removal of the source or major repair of the components associated with the source exposure assembly; and

(3) At intervals not exceeding one year.

b. Full calibration measurements shall include determination of:

(1) The exposure rate or dose rate to an accuracy within + three percent for the range of field sizes and for the range of distances (or for the axis distance) used in radiation therapy;

(2) The congruence between the radiation field and the field indicated by the light beam localizing device;

(3) The uniformity of the radiation field and its dependence upon the orientation of the useful beam;

(4) Timer accuracy; and

(5) The accuracy of all distance measuring devices used for treating humans.

c. Full calibration measurements shall be made in accordance with the procedures recommended by the scientific

committee on radiation dosimetry of the American association of physicists in medicine (Physics in Medicine and Biology, Vol. 16, No. 3, 1971, pp. 379-396).

- d. The exposure rate or dose rate values shall be corrected mathematically for physical decay for intervals not exceeding one month.
 - e. Full calibration measurements and physical decay corrections shall be performed by an expert qualified by training and experience in accordance with subdivision a of subsection 7.
5. Spot check measurements.
- a. Spot check measurements shall be performed on each teletherapy unit at intervals not exceeding one month.
 - b. Spot check measurements shall include determination of:
 - (1) Timer accuracy;
 - (2) The congruence between the radiation field and the field indicated by the light beam localizing device;
 - (3) The accuracy of all distance measuring devices used for treating humans;
 - (4) The exposure rate, dose rate, or a quantity related in a known manner to these rates for one typical set of operating conditions; and
 - (5) The difference between the measurement made in and the anticipated output, expressed as a percentage of the anticipated output, i.e., the value obtained at last full calibration corrected mathematically for physical decay.
 - c. Spot check measurements shall be performed in accordance with procedures established by an expert qualified by training and experience in accordance with subdivision a of subsection 7. (A qualified expert need not actually perform the spot check measurements.) If a qualified expert does not perform the spot check measurements, the results of the spot check measurements shall be reviewed by a qualified expert within fifteen days.
6. Dosimetry system calibration.
- a. Full calibration measurements shall be performed using a dosimetry system that has been calibrated by the national bureau of standards or by a regional calibration laboratory accredited by the American association of

physicists in medicine. The dosimetry system shall have been calibrated within the previous two years and after any servicing that may have affected system calibration.

- b. Spot check measurements shall be performed using a dosimetry system that has been calibrated in accordance with subdivision a of this subsection. Alternatively, a dosimetry system used solely for spot check measurements may be calibrated by direct intercomparison with a system that has been calibrated in accordance with subdivision a of this subsection. This alternative calibration method shall have been performed within the previous one year and after each servicing that may have affected system calibration. Dosimetry systems calibrated by this alternative method shall not be used for full calibration measurements.

7. Qualified expert.

- a. The licensee shall determine if a person is an expert qualified by training and experience to calibrate a teletherapy unit and establish procedures for (and review the results of) spot check measurements. The licensee shall determine that the qualified expert:

- (1) Is certified by the American board of radiology in therapeutic radiological physics, radiological physics, roentgen-ray and gamma-ray physics, or X-ray and radium physics; or

- (2) Has the following minimum training and experience:

- (a) A master's or doctor's degree in physics, biophysics, radiological physics or health physics;

- (b) One year of full-time training in therapeutic radiological physics;

- (c) One year of full-time experience in a radiotherapy facility including personal calibration and spot check of at least one teletherapy unit; and

- (3) Licensees that have their teletherapy units calibrated by persons who do not meet criteria for minimum training and experience may request a license amendment excepting them from this subsection. The request should include the name of the proposed qualified expert, a description of the proposed expert's training and experience including information similar to that specified in this subdivision, reports of at least one calibration and

spot check program based on measurements personally made by the proposed expert within the last ten years, and written endorsement of the technical qualifications of the proposed expert from personal knowledge by a physicist certified by the American board of radiology in one of the specialties listed in subdivision a.

8. The licensee shall maintain, for inspection by the department, records of the measurements, tests, corrective actions, and instrument calibration made under subsections 4 and 5 and records of the licensee's evaluation of the qualified expert's training and experience made under subsection 7.
 - a. Records of full calibration measurements and calibration of the instruments used to make these measurements shall be preserved for five years after completion of the full calibration.
 - b. Records of spot check measurements and corrective actions and calibration of instruments used to make spot check measurements shall be preserved for two years after completion of the spot check measurements and corrective actions.
 - c. Records of the licensee's evaluation of the qualified expert's training and experience shall be preserved for five years after the qualified expert's last performance of a full calibration of the licensee's teletherapy unit.

History: Amended effective October 1, 1982; June 1, 1986.
General Authority: ~~NDEC 28-32-02~~
Law Implemented: ~~NDEC 28-32-02~~

33-10-07-03.1. General regulatory requirements.

1. License required.

- a. No person may manufacture, produce, acquire, receive, possess, use, or transfer radioactive material for medical use except in accordance with a specific license issued pursuant to this article.
- b. Unless prohibited by license condition, an individual may receive, possess, use, or transfer radioactive material in accordance with this chapter under the supervision of an authorized user as provided in subsection 5 of section 33-10-07-04.

2. License amendments. A licensee shall apply for and receive a license amendment:

- a. Before using radioactive material for a method or type of medical use not permitted by the license issued under this chapter;
 - b. Before permitting anyone, except a visiting authorized user described in subsection 6 of section 33-10-07-04, to work as an authorized user under the license;
 - c. Before changing a radiation safety officer or teletherapy physicist;
 - d. Before receiving radioactive material in excess of the amount authorized on the license;
 - e. Before adding to or changing the areas of use or address or addresses of use identified in the application or on the license; and
 - f. Before changing statements, representations, and procedures which are incorporated into the license.
3. Notifications. A licensee shall notify the department in writing within thirty days when an authorized user, radiation safety officer, or teletherapy physicist, permanently discontinues performance of duties under the license.

History: Effective June 1, 1992.
 General Authority: NDCC 28-32-02
 Law Implemented: NDCC 28-32-02

33-10-07-04. Additional requirements.

- 1. As low as reasonably achievable program.
 - a. Each licensee shall develop and implement a written program to maintain radiation doses and releases of radioactive material in effluents to unrestricted areas as low as reasonably achievable in accordance with subsection 2 of section 33-10-04-01.
 - b. To satisfy the requirement of subdivision a:
 - (1) The management, radiation safety officer, and all authorized users shall participate in the establishment, implementation, and operation of the program as required by this article or the radiation safety committee; or
 - (2) For licensees that are not medical institutions, management and all authorized users shall participate in the program as required by the radiation safety officer.

c. The as low as reasonably achievable program must include an annual review by the radiation safety committee for licensees that are medical institutions, or management and the radiation safety officer for licensees that are not medical institutions, of summaries of the types and amounts of radioactive material used, occupational dose reports, and continuing education and training for all personnel who work with or in the vicinity of radioactive material. The purpose of the review is to ensure that individuals make every reasonable effort to maintain occupational doses, doses to the general public, and releases of radioactive material as low as reasonably achievable, taking into account the state of technology, and the cost of improvements in relation to benefits.

d. The licensee shall retain a current written description of the as low as reasonably achievable program for the duration of the license. The written description must include:

(1) A commitment by management to keep occupational doses as low as reasonably achievable;

(2) A requirement that the radiation safety officer brief management once each year on the radiation safety program;

(3) Personnel exposure investigational levels as established in accordance with the requirements of paragraph 8 of subdivision b of subsection 3 that, when exceeded, will initiate an investigation by the radiation safety officer of the cause of the exposure; and

(4) Personnel exposure investigational levels as established in accordance with the requirements of paragraph 8 of subdivision b of subsection 3 that, when exceeded, will initiate a prompt investigation by the radiation safety officer of the cause of the exposure and consideration of actions that might be taken to reduce the probability of recurrence.

2. Radiation safety officer.

a. A licensee shall appoint a radiation safety officer responsible for implementing the radiation safety program. The licensee, through the radiation safety officer, shall ensure that radiation safety activities are being performed in accordance with approved procedures and regulatory requirements in the daily operation of the licensee's radioactive material program.

b. The radiation safety officer shall:

- (1) Investigate overexposures, accidents, spills, losses, thefts, unauthorized receipts, uses, transfers, and disposals, and other deviations from approved radiation safety practice and implement corrective actions as necessary;
- (2) Implement written policy and procedures for:
 - (a) Authorizing the purchase of radioactive material;
 - (b) Receiving and opening packages of radioactive material;
 - (c) Storing radioactive material;
 - (d) Keeping an inventory record of radioactive material;
 - (e) Using radioactive material safely;
 - (f) Taking emergency action if control of radioactive material is lost;
 - (g) Performing periodic radiation surveys;
 - (h) Performing checks and calibrations of survey instruments and other safety equipment;
 - (i) Disposing of radioactive material;
 - (j) Training personnel who work in or frequent areas where radioactive material is used or stored; and
 - (k) Keeping a copy of all records and reports required by this article, a copy of this article, a copy of each licensing request and license and amendments, and the written policy and procedures required by this article; and
- (3) For medical use not sited at a medical institution, approve or disapprove radiation safety program changes with the advice and consent of management prior to submittal to the department for licensing action; or
- (4) For medical use sited at a medical institution, assist the radiation safety committee in the performance of its duties.

3. Radiation safety committee. Each medical institution licensee shall establish a radiation safety committee to oversee the use of radioactive material.

a. The committee shall meet the following administrative requirements:

(1) Membership must consist of at least three individuals and must include an authorized user of each type of use permitted by the license, the radiation safety officer, a representative of the nursing service, and a representative of management who is neither an authorized user nor a radiation safety officer. Other members may be included as the licensee deems appropriate.

(2) The committee shall meet at least once each calendar quarter.

(3) To establish a quorum and to conduct business, one-half of the committee's membership must be present, including the radiation safety officer and the management's representative.

(4) The minutes of each radiation safety committee meeting must include:

(a) The date of the meeting;

(b) Members present;

(c) Members absent;

(d) Summary of deliberations and discussions;

(e) Recommended actions and the numerical results of all ballots; and

(f) Document any reviews required in subdivision c of subsection 1 and subdivision b of this subsection.

(5) The committee shall provide each member with a copy of the meeting minutes, and retain one copy until the department authorizes its disposition.

b. To oversee the use of licensed material, the committee shall:

(1) Be responsible for monitoring the institutional program to maintain occupational doses as low as reasonably achievable;

- (2) Review, on the basis of safety and with regard to the training and experience standards of this part, and approve or disapprove any individual who is to be listed as an authorized user, the radiation safety officer, or teletherapy physicist before submitting a license application or request for amendment or renewal;
- (3) Review on the basis of safety and approve or disapprove each proposed method of use of radioactive material;
- (4) Review on the basis of safety, and approve with the advice and consent of the radiation safety officer and the management representative, or disapprove procedures and radiation safety program changes prior to submittal to the department for licensing action;
- (5) Review quarterly, with the assistance of the radiation safety officer, occupational radiation exposure records of all personnel working with radioactive material;
- (6) Review quarterly, with the assistance of the radiation safety officer, all incidents involving radioactive material with respect to cause and subsequent actions taken;
- (7) Review annually, with the assistance of the radiation safety officer, the radioactive material program; and
- (8) Establish a table of investigational levels for occupational dose that, when exceeded, will initiate investigations and considerations of action by the radiation safety officer.

4. Statement of authorities and responsibilities.

- a. A licensee shall provide sufficient authority and organizational freedom to the radiation safety officer and the radiation safety committee to:
 - (1) Identify radiation safety problems;
 - (2) Initiate, recommend, or provide solutions; and
 - (3) Verify implementation of corrective actions.
- b. A licensee shall establish, in writing, the authorities, duties, responsibilities, and radiation safety activities of the radiation safety officer and the radiation safety committee.

5. Supervision.

a. A licensee who permits the receipt, possession, use, or transfer of radioactive material by an individual under the supervision of an authorized user as allowed by section 33-10-07-03.1 shall:

- (1) Instruct the supervised individual in the principles of radiation safety appropriate to that individual's use of radioactive material;
- (2) Review the supervised individual's use of radioactive material, provide reinstruction as needed and review records kept to reflect this use;
- (3) Require the authorized user to be immediately available to communicate with the supervised individual;
- (4) Require the authorized user to be able to be physically present and available to the supervised individual on one hour's notice (the supervising authorized user need not be present for each use of radioactive material); and
- (5) Require that only those individuals specifically trained, and designated by the authorized user, shall be permitted to administer radionuclides or radiation to patients.

b. A licensee shall require the supervised individual receiving, possessing, using, or transferring radioactive material under section 33-10-07-03.1 to:

- (1) Follow the instructions of the supervising authorized user;
- (2) Follow the procedures established by the radiation safety officer; and
- (3) Comply with this article and the license conditions with respect to the use of radioactive material.

6. Visiting authorized user.

a. A licensee may permit any visiting authorized user to use licensed material for medical use under the terms of the licensee's license for sixty days each year if:

- (1) The visiting authorized user has the prior written permission of the licensee's management and, if the use occurs on behalf of an institution, the institution's radiation safety committee;

(2) The licensee has a copy of an agreement state, licensing state, or United States nuclear regulatory commission license that identifies the visiting authorized user by name as an authorized user for medical use; and

(3) Only those procedures for which the visiting authorized user is specifically authorized by an agreement state, licensing state, or United States nuclear regulatory commission license are performed by that individual.

b. A licensee need not apply for a license amendment in order to permit a visiting authorized user to use licensed material as described in subdivision a.

c. A licensee shall retain copies of the records specified in subdivision a for five years from the date of the last visit.

7. Mobile nuclear medicine service administrative requirements.

a. The department will only license mobile nuclear medicine services in accordance with this chapter and other applicable requirements of this article to serve clients who do not have a department license.

b. Mobile nuclear medicine service licensees shall retain for the duration of service a letter signed by the management of each location where services are rendered that authorizes use of radioactive material.

c. A mobile nuclear medicine service may not have radioactive material delivered directly from the manufacturer or the distributor to the client's address of use.

8. Records and reports of misadministrations.

a. When a misadministration involves any therapy procedure, the licensee shall notify the department. The licensee shall also notify the referring physician of the affected patient and the patient or a responsible relative or guardian, unless the referring physician agrees to inform the patient or believes, based on medical judgment, that telling the patient or the patient's responsible relative or guardian would be harmful to one or the other, respectively. These notifications must be made within twenty-four hours after the licensee discovers the misadministration. If the referring physician, patient, or the patient's responsible relative or guardian cannot be reached within twenty-four hours, the licensee shall notify them as soon as practicable. The licensee is not required to notify the patient or the patient's

responsible relative or guardian without first consulting the referring physician; however, the licensee may not delay medical care for the patient because of this.

- b. Within fifteen days after an initial therapy misadministration report to the department, the licensee shall report, in writing, to the department and to the referring physician, and furnish a copy of the report to the patient or the patient's responsible relative or guardian if either was previously notified by the licensee as required by subdivision a. The written report must include the licensee's name; the referring physician's name; a brief description of the event; the effect on the patient; the action taken to prevent recurrence; whether the licensee informed the patient or the patient's responsible relative or guardian, and if not, why not. The report may not include the patient's name or other information that could lead to identification of the patient.
- c. When a misadministration involves a diagnostic procedure, the radiation safety officer shall promptly investigate its cause, make a record for department review, and retain the record as directed in subdivision d. The licensee shall also notify the referring physician and the department in writing on NRC form 473 "Diagnostic Misadministration Report" within fifteen days if the misadministration involved the use of radioactive material not intended for medical use, administration of dosage five-fold different from the intended dosage, or administration of radioactive material such that the patient is likely to receive an organ dose greater than two rems [0.02 sieverts] or a whole body dose greater than five hundred millirems [5 millisieverts]. Licensees may use dosimetry tables in package inserts, corrected only for amount of radioactivity administered, to determine whether a report is required.
- d. Each licensee shall retain a record of each misadministration for ten years. The record must contain the names of all individuals involved in the event, including the physician, allied health personnel, the patient, and the patient's referring physician, the patient's social security number or identification number if one has been assigned, a brief description of the event, the effect on the patient, and the action taken, if any, to prevent recurrence.
- e. Aside from the notification requirement, nothing in subdivisions a through d shall affect any rights or duties or licensees, and physicians in relation to each other, patients, or responsible relative or guardians.

9. Suppliers. A licensee shall use for medical use only:

- a. Radioactive material manufactured, labeled, packaged, and distributed in accordance with a license issued pursuant to these rules or the equivalent rules of another agreement state, a licensing state, or the United States nuclear regulatory commission; and
- b. Reagent kits that have been manufactured, labeled, packaged, and distributed in accordance with an approval issued by the United States food and drug administration.
- c. Teletherapy sources manufactured and distributed in accordance with a license issued pursuant to this article, or the equivalent rules of another agreement state, a licensing state, or the United States nuclear regulatory commission.

History: Effective June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-07-05. Specific requirements.

1. Quality control of imaging equipment. Each licensee shall establish written quality control procedures for all equipment used to obtain images from radionuclide studies. As a minimum, the procedures must include quality control procedures recommended by equipment manufacturers or procedures which have been approved by the department. The licensee shall conduct quality control procedures in accordance with written procedures.
2. Possession, use, calibration, and check of dose calibrators.
 - a. A medical use licensee authorized to administer radiopharmaceuticals shall possess a dose calibrator and use it to measure the amount of activity administered to each patient.
 - b. A licensee shall:
 - (1) Check each dose calibrator for constancy with a dedicated check source at the beginning of each day of use. To satisfy the requirement of this section, the check shall be done on a frequently used setting with a sealed source of not less than ten microcuries [370 kilobecquerels] of radium-226 or fifty microcuries [1.85 megabecquerels] of any other photon-emitting radionuclide with a half-life greater than ninety days;

- (2) Test each dose calibrator for accuracy upon installation and at intervals not to exceed twelve months thereafter by assaying at least two sealed sources containing different radionuclides, the activity of which the manufacturer has determined within five percent of the stated activity, with minimum activity of ten microcuries [370 kilobecquerels] for radium 226 and fifty microcuries [1.85 megabecquerels] for any other photon-emitting radionuclide, and at least one of which has a principal photon energy between one hundred thousand electron volts and five hundred thousand electron volts;
 - (3) Test each dose calibrator for linearity upon installation and at intervals not to exceed three months thereafter over the range of use between ten microcuries [370 kilobecquerels] and the highest dosage that will be administered; and
 - (4) Test each dose calibrator for geometry dependence upon installation over the range of volumes and volume configurations for which it will be used. The licensee shall keep a record of this test for the duration of the use of the dose calibrator.
- c. A licensee shall mathematically correct dosage readings for any geometry or linearity error that exceeds ten percent if the dosage is greater than ten microcuries [370 kilobecquerels] and shall repair or replace the dose calibrator if the accuracy or constancy error exceeds ten percent.
- d. A licensee shall also perform checks and tests required by subdivision b following adjustment or repair of the dose calibrator.
- e. A licensee shall retain a record of each check and test required by this section for two years. The records required by subdivision b must include:
- (1) For paragraph 1 of subdivision b, the model and serial number of the dose calibrator, the identity and calibrated activity of the radionuclide contained in the check source, the date of the check, the activity measured, the instrument settings, and the initials of the individual who performed the check;
 - (2) For paragraph 2 of subdivision b, the model and serial number of the dose calibrator, the model and serial number of each source used and the identity of the radionuclide contained in the source and its activity, the date of the test, the results of the

test, the instrument settings, and the signature of the radiation safety officer;

(3) For paragraph 3 of subdivision b, the model and serial number of the dose calibrator, the calculated activities, the measured activities, the date of the test, and the signature of the radiation safety officer; and

(4) For paragraph 4 of subdivision b, the model and serial number of the dose calibrator, the configuration and calibrated activity of the source measured, the activity of the source, the activity measured and the instrument setting for each volume measured, the date of the test, and the signature of the radiation safety officer.

3. Calibration and check of survey instruments.

a. A licensee shall ensure that the survey instruments used to show compliance with this section have been calibrated before first use, annually, and following repair.

b. To satisfy the requirements of subdivision a the licensee shall:

(1) Calibrate all required scale readings up to one thousand millirems [10 millisieverts] per hour with a radiation source;

(2) For each scale that must be calibrated, calibrate two readings separated by at least fifty percent of scale rating; and

(3) Conspicuously note on the instrument the apparent dose rate from a dedicated check source as determined at the time of calibration, and the date of calibration.

c. To satisfy the requirements of subdivision b, the licensee shall consider a point as calibrated if the indicated exposure rate differs from the calculated exposure rate by not more than twenty percent, and shall conspicuously attach a correction chart or graph to the instrument.

d. A licensee shall check each survey instrument for proper operation with the dedicated check source before each use. The licensee is not required to keep records of these checks.

e. The licensee shall retain a record of each calibration required in subdivision a for two years. The record must include:

- (1) A description of the calibration procedure; and
- (2) A description of the source used and the certified dose rates from the source, and the rates indicated by the instrument being calibrated, the correction factors deduced from the calibration data, the signature of the individual who performed the calibration, and the date of calibration.

f. To meet the requirements of subdivisions a, b, and c the licensee may obtain the services of individuals licensed by the department, the United States nuclear regulatory commission, and agreement state, or a licensing state to perform calibrations of survey instruments. Records of calibrations which contain information required by subdivision e must be maintained by the licensee.

4. Assay of radiopharmaceutical dosages. A licensee shall:

a. Assay, within thirty minutes before medical use, the activity of each radiopharmaceutical dosage that contains more than ten microcuries [370 kilobecquerels] of a photon-emitting radionuclides;

b. Assay, before medical use, the activity of each radiopharmaceutical dosage with a desired activity of ten microcuries [370 kilobecquerels] or less of a photon-emitting radionuclide to verify that the dosage does not exceed ten microcuries [370 kilobecquerels]; and

c. Retain a record of the assays required by subdivisions a and b for two years. To satisfy this requirement, the record must contain the:

(1) Generic name, trade name, or abbreviation of the radiopharmaceutical, its lot number, and expiration dates and the radionuclide;

(2) Patient's name, and identification number if one has been assigned;

(3) Prescribed dosage and activity of the dosage at the time of assay, or a notation that the total activity is less than ten microcuries [370 kilobecquerels];

(4) Date and time of the assay and administration; and

(5) Initials of the individual who performed the assay.

5. Authorization for calibration and reference sources. Any person authorized by section 33-10-07-03.1 for medical use of radioactive material may receive, possess, and use the

following radioactive material for check, calibration, and reference use:

- a. Sealed sources manufactured and distributed by persons specifically licensed pursuant to chapter 33-10-03.1 or equivalent provisions of the United States nuclear regulatory commission, agreement state, or licensing state and that do not exceed fifteen millicuries [555 megabecquerels] each;
- b. Any radioactive material listed in sections 33-10-07-06 and 33-10-07-07 with a half-life of one hundred days or less in individual amounts not to exceed fifteen millicuries [555 megabecquerels];
- c. Any radioactive material listed in sections 33-10-07-06 and 33-10-07-07 with a half-life greater than one hundred days in individual amounts not to exceed two hundred microcuries [7.4 megabecquerels] each; and
- d. Technetium-99m in individual amounts not to exceed fifty millicuries [1.85 gigabecquerels].

6. Requirements for possession of sealed sources and brachytherapy sources.

- a. A licensee in possession of any sealed source or brachytherapy source shall follow the radiation safety and handling instructions supplied by the manufacturer or equivalent instructions approved by the department and shall maintain the instructions for the duration of source use in a legible form convenient to users.
- b. A licensee in possession of a sealed source shall assure that:
 - (1) The source is tested for leakage before its first use unless the licensee has a certificate from the supplier indicating that the source was tested within six months before transfer to the licensee; and
 - (2) The source is tested for leakage at intervals not to exceed six months or at intervals approved by the department, another agreement state, a licensing state, or the United States nuclear regulatory commission.
- c. To satisfy the leak test requirements of subdivision b, the licensee shall assure that:
 - (1) Leak tests are capable of detecting the presence of five thousandths microcurie [185 becquerels] of radioactive material on the test sample, or in the

case of radium, the escape of radon at the rate of one thousandth microcurie [37 becquerels] per twenty-four hours;

(2) Test samples are taken from the source or from the surfaces of the device in which the source is mounted or stored on which radioactive contamination might be expected to accumulate; and

(3) Test samples are taken when the source is in the "off" position.

d. A licensee shall retain leak test records for five years. The records must contain the model number, and serial number, if assigned, of each source tested, the identity of each source radionuclide and its estimated activity, the measured activity of each test sample expressed in microcuries [becquerels], a description of the method used to measure each test sample, the date of the test, and the signature of the radiation safety officer.

e. If the leak test reveals the presence of five thousandths microcurie [185 becquerels] or more of removable contamination, the licensee shall:

(1) Immediately withdraw the sealed source from use and store it in accordance with the requirements of these regulations; and

(2) File a report with the department within five days of receiving the leak test results describing the equipment involved, the test results, and the action taken.

f. A licensee need not perform a leak test on the following sources:

(1) Sources containing only radioactive material with a half-life of less than thirty days;

(2) Sources containing only radioactive material as a gas;

(3) Sources containing one hundred microcuries [3.7 megabecquerels] or less of beta or photon-emitting material or ten microcuries [370 kilobecquerels] or less of alpha-emitting material;

(4) Seeds of iridium-192 encased in nylon ribbon; and

(5) Sources stored and not being used. The licensee shall, however, test each such source for leakage before any use or transfer unless it has been tested

for leakage within six months before the date of use or transfer.

- g. A licensee in possession of a sealed source or brachytherapy source shall conduct a physical inventory of all such sources at intervals not to exceed three months. The licensee shall retain each inventory record for five years. The inventory records must contain the model number of each source, and serial number if one has been assigned, the identity of each source radionuclide and its estimated activity, the location of each source, date of the inventory, and the signature of the radiation safety officer.
- h. A licensee in possession of a sealed source or brachytherapy source shall survey with a radiation survey instrument at intervals not to exceed three months all areas where such sources are stored. This does not apply to teletherapy sources in teletherapy units or sealed sources in diagnostic devices.
- i. A licensee shall retain a record of each survey required in subdivision h for two years. The record must include the date of the survey, a sketch of each area that was surveyed, the measured dose rate at several points in each area expressed in millirems [microsieverts] per hour, the model number and serial number of the survey instrument used to make the survey, and the signature of the radiation safety officer.

7. Syringe shields.

- a. A licensee shall keep syringes that contain radioactive material to be administered in a radiation shield.
- b. A licensee shall require each individual who prepares or administers radiopharmaceuticals to use a syringe radiation shield unless the use of the shield is contraindicated for that patient.

8. Syringe labels. Unless utilized immediately, a licensee shall conspicuously label each syringe, or syringe radiation shield that contains a syringe with a radiopharmaceutical, with the radiopharmaceutical name or its abbreviation, the type of diagnostic study or therapy procedure to be performed, or the patient's name.

9. Vial shields. A licensee shall require each individual preparing or handling a vial that contains a radiopharmaceutical to keep the vial in a vial radiation shield.

10. Vial shield labels. A licensee shall conspicuously label each vial radiation shield that contains a vial of a radiopharmaceutical with the radiopharmaceutical name or its abbreviation.
11. Surveys for contamination and ambient radiation dose rate.
- a. A licensee shall survey with a radiation detection survey instrument at the end of each day of use all areas where radiopharmaceuticals are routinely prepared for use or administered.
 - b. A licensee shall survey with a radiation detection survey instrument at least once each week all areas where radiopharmaceuticals or radioactive wastes are stored.
 - c. A licensee shall conduct the surveys required by subdivisions a and b so as to be able to measure dose rates as low as one-tenth millirem [1 microsievert] per hour.
 - d. A licensee shall establish dose rate action levels for the surveys required by subdivisions a and b and shall require that the individual performing the survey immediately notify the radiation safety officer if a dose rate exceeds an action level.
 - e. A licensee shall survey for removable contamination each day of use all areas where radiopharmaceuticals are routinely prepared for use or administered and each week where radioactive materials are stored.
 - f. A licensee shall conduct the surveys required by subdivision e so as to be able to detect contamination on each wipe sample of two thousand disintegrations per minute [33.3 becquerels].
 - g. A licensee shall establish removable contamination action levels for the surveys required by subdivision e and shall require that the individual performing the survey immediately notify the radiation safety officer if contamination exceeds action levels.
 - h. A licensee shall retain a record of each survey required by subdivisions a, b, and e for two years. The record must include the date of the survey, a sketch of each area surveyed, action levels established for each area, the measured dose rate at several points in each area expressed in millirems [microsieverts] per hour or the removable contamination in each area expressed in disintegrations per minute [becquerels] per one hundred square centimeters, the serial number and the model number of the instrument used to make the survey or analyze the

samples, and the initials of the individual who performed the survey.

12. Release of patients containing radiopharmaceuticals or permanent implants.

a. A licensee may not authorize release from confinement for medical care any patient administered a radiopharmaceutical until either:

(1) The dose rate from the patient is less than five millirems [50 microsieverts] per hour at a distance of one meter; or

(2) The activity in the patient is less than thirty millicuries [1.11 gigabecquerels].

b. A licensee shall not authorize release from confinement for medical care any patient administered a permanent implant until the dose rate from the patient is less than five millirems [50 microsieverts] per hour at a distance of one meter.

13. Mobile nuclear medicine service technical requirements. A licensee providing mobile nuclear medicine service shall:

a. Transport to each address of use only syringes or vials containing prepared radiopharmaceuticals or radiopharmaceuticals that are intended for reconstitution of radiopharmaceutical kits;

b. Bring into each location of use all radioactive material to be used and, before leaving, remove all unused radioactive material and associated radioactive waste;

c. Secure or keep under constant surveillance and immediate control all radioactive material when in transit or at a location of use;

d. Check survey instruments and dose calibrators as required in paragraph 1 of subdivision b of subsection 2, subdivisions d and e of subsection 2, subdivision d of subsection 3, and check all other transported equipment for proper function before medical use at each location of use;

e. Carry a calibrated survey meter in each vehicle that is being used to transport radioactive material, and, before leaving a client location of use, survey all areas of radiopharmaceutical use with a radiation detection survey instrument to ensure that all radiopharmaceuticals and all associated radioactive waste have been removed.

f. Retain a record of each survey required by subdivision e for two years. The record must include the date of the survey, a plan of each area that was surveyed, the measured dose rate at several points in each area of use expressed in millirems [microsieverts] per hour, the model and serial number of the instrument used to make the survey, and the initials of the individual who performed the survey.

14. Storage of volatiles and gases.

a. A licensee shall store volatile radiopharmaceuticals and radioactive gases in the shippers' radiation shield and container.

b. A licensee shall store and use a multidose container in a properly functioning fume hood.

15. Decay-in-storage.

a. A licensee shall hold radioactive material for decay-in-storage before disposal in ordinary trash and is exempt from the requirements of section 33-10-04-04 if the licensee:

(1) Holds radioactive material for decay a minimum of ten half-lives;

(2) Monitors radioactive material at the container surface before disposal as ordinary trash and determines that its radioactivity cannot be distinguished from the background radiation level with a radiation detection survey instrument set on its most sensitive scale and with no interposed shielding;

(3) Removes or obliterates all radiation labels; and

(4) Separates and monitors each generator column individually with all radiation shielding removed to ensure that its contents have decayed to background radiation level before disposal.

b. For radioactive material disposed in accordance with subdivision a, the licensee shall retain a record of each disposal for two years. The record must include the date of the disposal, the date on which the radioactive material was placed in storage, the radionuclides disposed, the model and serial number of the survey instrument used, the background dose rate, the radiation dose rate measured at the surface of each waste container, and the name of the individual who performed the disposal.

History: Effective June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

33-10-07-06. Specific requirements for the use of radiopharmaceuticals for uptake, dilution, or excretion studies.

1. Use of radiopharmaceuticals for uptake, dilution, or excretion studies.
 - a. A licensee may use the following prepared radiopharmaceuticals for diagnostic studies involving the measurement of uptake, dilution, or excretion:
 - (1) Iodine-131 as sodium iodide, iodinated human serum albumin (IHSA), labeled rose bengal, or sodium iodohippurate.
 - (2) Iodine-125 as sodium iodide or iodinated human serum albumin (IHSA).
 - (3) Cobalt-57 as labeled cyanocobalamin.
 - (4) Cobalt-58 as labeled cyanocobalamin.
 - (5) Cobalt-60 as labeled cyanocobalamin.
 - (6) Chromium-51 as sodium chromate or labeled human serum albumin.
 - (7) Iron-59 as citrate.
 - (8) Technetium-99m as pertechnetate.
 - (9) Any radioactive material in a radiopharmaceutical for a diagnostic use involving measurements of uptake, dilution, or excretion for which the food and drug administration has accepted a "notice of claimed investigational exemption for a new drug" (IND) or approved a "new drug application" (NDA).
 - b. A licensee using a radiopharmaceutical specified in this subsection for a clinical procedure other than one specified in the product label or package insert instructions shall comply with the product label or package insert instructions regarding physical form, route of administration and dosage range.
2. Possession of survey instrument. A licensee authorized to use radioactive material for uptake, dilution, and excretion studies shall possess a portable radiation detection survey instrument capable of detecting dose rates over the range

one-tenth millirem [1.0 microsievert] per hour to fifty millirems [500 microsieverts] per hour. The instrument shall be operable and calibrated in accordance with subsection 3 of section 33-10-07-05.

History: Effective June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

33-10-07-07. Specific requirements for the use of radiopharmaceuticals, generators, and reagent kits for imaging and localization studies.

1. Use of radiopharmaceuticals, generators, and reagent kits for imaging and localization studies.
 - a. A licensee may use the following radiopharmaceuticals, generators, and reagent kits for imaging and localization studies:
 - (1) Molybdenum-99/technetium-99m generators for the elution or extraction of technetium-99m as pertechnetate.
 - (2) Technetium-99m as pertechnetate.
 - (3) Prepared radiopharmaceuticals and reagent kits for the preparation of the following technetium-99m labeled radiopharmaceuticals:
 - (a) Sulfur colloid;
 - (b) Pentetate sodium;
 - (c) Human serum albumin microspheres;
 - (d) Polyphosphate;
 - (e) Macroaggregated human serum albumin;
 - (f) Etidronate sodium;
 - (g) Stannous pyrophosphate;
 - (h) Human serum albumin;
 - (i) Medronate sodium;
 - (j) Gluceptate sodium;
 - (k) Oxidronate sodium;

(l) Disofenin; and

(m) Succimer.

(4) Iodine-131 as sodium iodide, iodinated human serum albumin, macroaggregated iodinated human serum albumin, colloidal (macroaggregated) iodinated human serum albumin, rose bengal, or sodium iodohippurate.

(5) Iodine-125 as sodium iodide or fibrinogen.

(6) Chromium-51 as human serum albumin.

(7) Gold-198 in colloidal form.

(8) Mercury-197 as chlormerodrin.

(9) Selenium-75 as selenomethionine.

(10) Strontium-85 as nitrate.

(11) Ytterbium-169 as pentetate sodium.

(12) Gallium-67 as citrate.

(13) Indium-111 as chloride or DTPA.

(14) Tin-113/indium-113m generators for the elution of indium-113m as chloride.

(15) Yttrium-87/strontium-87m generators for the elution of strontium-87m.

(16) Thallium-201 as chloride.

(17) Iodine-123 as sodium iodide or iodohippurate.

(18) Any radioactive material in a diagnostic radiopharmaceutical, except aerosol or gaseous form, or any generator or reagent kit for preparation and diagnostic use of a radiopharmaceutical containing radioactive material for which the food and drug administration has accepted a "notice of claimed investigational exemption for a new drug" (IND) or approved a "new drug application" (NDA).

b. A licensee using radiopharmaceuticals specified in subdivision a for clinical procedures shall comply with the product label or package insert regarding physical form, route of administration, and dosage range.

- c. A licensee shall elute generators in compliance with subsection 2 and prepare radiopharmaceuticals from kits in accordance with the manufacturer's instructions.
- d. Technetium-99m pentetate as an aerosol for lung function studies is not subject to the restrictions in subdivision b.
- e. Provided the conditions of subsection 3 are met, a licensee shall use radioactive aerosols or gases only if specific application is made to and approved by the department.

2. Permissible molybdenum-99 concentration.

- a. A licensee may not administer a radiopharmaceutical containing more than fifteen hundredths microcurie of molybdenum-99 per millicurie of technetium-99m [0.15 kilobecquerel of molybdenum-99 per megabecquerel of technetium-99m].
- b. A licensee preparing technetium-99m radiopharmaceuticals from molybdenum-99/technetium-99m generators shall measure the molybdenum-99 concentration in each eluate or extract.
- c. A licensee who must measure molybdenum concentration shall retain a record of each measurement for two years. The record must include, for each elution or extraction of technetium-99m, the measured activity of the technetium expressed in millicuries [megabecquerels], the measured activity of molybdenum expressed in microcuries [kilobecquerels], the ratio of the measures expressed as microcuries of molybdenum per millicurie of technetium [kilobecquerels of molybdenum per megabecquerel of technetium], the date of the test, and the initials of the individual who performed the test.
- d. A licensee shall report immediately to the department each occurrence of molybdenum-99 concentration exceeding the limits specified in subdivision a.

3. Control of aerosols and gases.

- a. A licensee who administers radioactive aerosols or gases shall do so with a system that will keep airborne concentrations within the limits prescribed by subsections 3 and 6 of section 33-10-04-02.
- b. The system must either be directly vented to the atmosphere through an air exhaust or provide for collection and decay or disposal of the aerosol or gas in a shielded container.

- c. A licensee shall only administer radioactive gases in rooms that are at negative pressure compared to surrounding rooms.
 - d. Before receiving, using, or storing a radioactive gas, the licensee shall calculate the amount of time needed after a release to reduce the concentration in the area of use to the occupational limit listed in appendix A of chapter 33-10-04. The calculation must be based on the highest activity of gas handled in a single container and the measured available air exhaust rate.
 - e. A licensee shall post the time calculated in subdivision d at the area of use and require that, in case of a gas spill, individuals evacuate the room until the posted time has elapsed.
 - f. A licensee shall check the operation of collection systems monthly and measure the ventilation rates in areas of use at intervals not to exceed six months. Records of these checks and measurements must be maintained for two years.
 - g. A copy of the calculations required in subdivision d must be recorded and retained for the duration of the license.
4. Possession of survey instruments. A licensee authorized to use radioactive material for imaging and localization studies shall possess a portable radiation detection survey instrument capable of detecting dose rates over the range of one-tenth millirem [1 microsievert] per hour to fifty millirems [500 microsieverts] per hour, and a portable radiation measurement survey instrument capable of measuring dose rates over the range one millirem [10 microsieverts] per hour to one thousand millirems [10 millisieverts] per hour. The instruments must be operable and calibrated in accordance with subsection 3 of section 33-10-07-05.

History: Effective June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-07-08. Specific requirements for the use of radiopharmaceuticals for therapy.

- 1. Use of radiopharmaceuticals for therapy. A licensee may use the following prepared radiopharmaceuticals:
 - a. Iodine-131 as iodide for treatment of hyperthyroidism, cardiac dysfunction, and thyroid carcinoma.
 - b. Phosphorus-32 as soluble phosphate for treatment of polycythemia vera, leukemia, and bone metastases.

- c. Phosphorus-32 as colloidal chromic phosphate for intracavitary treatment of malignant effusions.
- d. Gold-198 as colloid for intracavitary treatment of malignant effusions.
- e. Any radioactive material in a radiopharmaceutical and for a therapeutic use for which the food and drug administration has accepted a "notice of claimed investigational exemption for a new drug" (IND), or approved a "new drug application" (NDA). The licensee shall comply with the package insert instructions regarding indications and method of administration.

2. Safety instruction.

- a. A licensee shall provide oral and written radiation safety instruction for all personnel caring for patients undergoing radiopharmaceutical therapy. Refresher training must be provided at intervals not to exceed one year.
- b. To satisfy subdivision a, the instruction must describe the licensee's procedures for:
 - (1) Patient control;
 - (2) Visitor control;
 - (3) Contamination control;
 - (4) Waste control;
 - (5) Notification of the radiation safety officer or authorized user in case of the patient's death or medical emergency; and
 - (6) Chapter 33-10-10 training requirements.
- c. A licensee shall keep a record of individuals receiving instruction required by subdivision a, a description of the instruction, the date of instruction, and the name of the individual who gave the instruction. Such record must be maintained for inspection by the department for two years.

3. Safety precautions.

- a. For each patient receiving radiopharmaceutical therapy and hospitalized for compliance with subsection 12 of section 33-10-07-05, a licensee shall:

- (1) Provide a private room with a private sanitary facility;
- (2) Post the patient's door with a "Caution: Radioactive Material" sign and note on the door or on the patient's chart where and how long visitors may stay in the patient's room;
- (3) Authorize visits by individuals under eighteen years of age only on a case-by-case basis with the approval of the authorized user after consultation with the radiation safety officer;
- (4) Promptly after administration of the dosage, measure the dose rates in contiguous restricted and unrestricted areas with a radiation measurement survey instrument to demonstrate compliance with the requirements of subsection 5 of section 33-10-04-02 and retain for two years a record of each survey that includes the time and date of the survey, a plan of the area or list of points surveyed, the measured dose rate at several points expressed in millirems per hour, the instrument used to make the survey, and the initials of the individual who made the survey;
- (5) Either monitor material and items removed from the patient's room to determine that any contamination cannot be distinguished from the natural background radiation level with a radiation detection survey instrument set on its most sensitive scale and with no interposed shielding, or handle these materials and items as radioactive waste;
- (6) Provide the patient with radiation safety guidance that will help to keep radiation doses to household members and the public as low as reasonably achievable before authorizing release of the patient;
- (7) Survey the patient's room and private sanitary facility for removable contamination with a radiation detection survey instrument before assigning another patient to the room. The room must not be reassigned until removable contamination is less than two hundred disintegrations per minute [3.33 becquerels] per one hundred square centimeters; and
- (8) Measure the thyroid burden of each individual who helped prepare or administer a dosage of iodine-131 within three days after administering the dosage, and retain for the period required by subdivision c of subsection 1 of section 33-10-04-05 a record of each thyroid burden measurement, date of measurement, the name of the individual whose thyroid burden was

measured, and the initials of the individual who made the measurements.

b. A licensee shall notify the radiation safety officer or the authorized user immediately if the patient dies or has a medical emergency.

4. Possession of survey instruments. A licensee authorized to use radioactive material for radiopharmaceutical therapy shall possess a portable radiation detection survey instrument capable of detecting dose rates over the range one-tenth millirem [1 microsievert] per hour to fifty millirems [500 microsieverts] per hour, and a portable radiation measurement survey instrument capable of measuring dose rates over the range one millirem [10 microsieverts] per hour to one thousand millirems [10 millisieverts] per hour. The instrument must be operable and calibrated in accordance with subsection 3 of section 33-10-07-05.

History: Effective June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

33-10-07-09. Specific requirements for the use of sealed sources for diagnosis.

1. Use of sealed sources for diagnosis. A licensee shall use the following sealed sources in accordance with the manufacturer's radiation safety and handling instructions:

a. Iodine-125 as a sealed source in a device for bone mineral analysis;

b. Americium-241 as a sealed source in a device for bone mineral analysis;

c. Gadolinium-153 as a sealed source in a device for bone mineral analysis; and

d. Iodine-125 as a sealed source in a portable device for imaging.

2. Availability of survey instrument. A licensee authorized to use radioactive material as a sealed source for diagnostic purposes shall have available for use a portable radiation detection survey instrument capable of detecting dose rates over the range one-tenth millirem [1 microsievert] per hour to fifty millirems [500 microsieverts] per hour or a portable radiation measurement survey instrument capable of measuring dose rates over the range one millirem [10 microsieverts] per hour to one thousand millirems [10 millisieverts] per hour.

The instrument must be operable and calibrated in accordance with subsection 3 of section 33-10-07-05.

History: Effective June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

33-10-07-10. Specific requirements for the use of sources for brachytherapy.

1. Use of sources for brachytherapy. A licensee shall use the following sources in accordance with the manufacturer's radiation safety and handling instructions:
 - a. Cesium-137 as a sealed source in needles and applicator cells for topical, interstitial, and intracavitary treatment of cancer;
 - b. Cobalt-60 as a sealed source in needles and applicator cells for topical, interstitial, and intracavitary treatment of cancer;
 - c. Gold-198 as a sealed source in seeds for interstitial treatment of cancer;
 - d. Iodine-125 as a sealed source in seeds for interstitial treatment of cancer;
 - e. Iridium-192 as seeds encased in nylon ribbon for interstitial treatment of cancer;
 - f. Radium-226 as a sealed source in needles or applicator cells for topical, interstitial, and intracavitary treatment of cancer;
 - g. Radon-222 as seeds for interstitial treatment of cancer;
 - h. Strontium-90 as a sealed source in an applicator for treatment of superficial eye conditions; and
 - i. Palladium-103 as a sealed source in seeds for the interstitial treatment of cancer.
2. Safety instruction.
 - a. The licensee shall provide oral and written radiation safety instruction to all personnel caring for a patient receiving implant therapy. Refresher training must be provided at intervals not to exceed one year.
 - b. To satisfy subdivision a, the instruction must describe:

- (1) Size and appearance of the brachytherapy sources;
 - (2) Safe handling and shielding instructions in case of a dislodged source;
 - (3) Procedures for patient control;
 - (4) Procedures for visitor control;
 - (5) Procedures for notification of the radiation safety officer or authorized user if the patient dies or has a medical emergency; and
 - (6) Chapter 33-10-10 training requirements.
- c. A licensee shall maintain a record of individuals receiving instruction required by subdivision a, a description of the instruction, the date of instruction, and the name of the individual who gave the instruction for two years.

3. Safety precautions.

- a. For each patient receiving implant therapy a licensee shall:
- (1) Not place the patient in the same room with a patient who is not receiving radiation therapy unless the licensee can demonstrate compliance with the requirement of subsection 5 of section 33-10-04-02 at a distance of one meter from the implant;
 - (2) Post the patient's door with a "Caution: Radioactive Materials" sign and note on the door or the patient's chart where and how long visitors may stay in the patient's room;
 - (3) Authorize visits by individuals under eighteen years of age only on a case-by-case basis with the approval of the authorized user after consultation with the radiation safety officer;
 - (4) Promptly after implanting the sources, survey the dose rates in contiguous restricted and unrestricted areas with a radiation measurement survey instrument to demonstrate compliance with subsection 5 of section 33-10-04-02 and retain for two years a record of each survey that includes the time and date of the survey, a sketch of the area or list of points surveyed, the measured dose rate at several points expressed in millirems [microsieverts] per hour, the instrument used to make the survey, and the initials of the individual who made the survey; and

(5) Provide the patient with radiation safety guidance that will help keep the radiation dose to household members and the public as low as reasonably achievable before releasing the patient if the patient was administered a permanent implant.

b. A licensee shall notify the radiation safety officer or authorized user immediately if the patient dies or has a medical emergency.

4. Brachytherapy sources inventory.

a. Each time brachytherapy sources are returned to an area of storage from an area of use, the licensee shall immediately count or otherwise verify the number returned to ensure that all sources taken from the storage area have been returned.

b. A licensee shall make a record of brachytherapy source utilization which includes:

(1) The names of the individuals permitted to handle the sources;

(2) The number and activity of sources removed from storage, the room number of use and patient's name, the time and date they were removed from storage, the number and activity of sources in storage after the removal, and the initials of the individual who removed the sources from storage; and

(3) The number and activity of sources returned to storage, the room number of use and patient's name, the time and date they were returned to storage, the number and activity of sources in storage after the return, and the initials of the individual who returned the sources to storage.

c. Immediately after implanting sources in a patient and immediately after removal of sources from a patient, the licensee shall make a radiation survey of the patient and the area of use to confirm that no sources have been misplaced. The licensee shall make a record of each survey.

d. A licensee shall maintain the records required in subdivisions b and c for two years.

5. Release of patients treated with temporary implants.

a. Immediately after removing the last temporary implant source from a patient, the licensee shall perform a radiation survey of the patient with a radiation detection

survey instrument to confirm that all sources have been removed. The licensee may not release from confinement for medical care a patient treated by temporary implant until all sources have been removed.

- b. A licensee shall maintain a record of patient surveys which demonstrate compliance with subdivision a for two years. Each record must include the date of the survey, the name of the patient, the dose rate from the patient expressed as millirems [microsieverts] per hour and measured within one meter from the patient, and the initials of the individual who made the survey.
6. Possession of survey instruments. A licensee authorized to use radioactive material for implant therapy shall possess a portable radiation detection survey instrument capable of detecting dose rates over the range one-tenth millirem [1 microsievert] per hour to fifty millirems [500 microsieverts] per hour, and a portable radiation measurement survey instrument capable of measuring dose rates over the range one millirem [10 microsieverts] per hour to one thousand millirems [10 millisieverts] per hour. The instruments must be operable and calibrated in accordance with subsection 3 of section 33-10-07-05.

History: Effective June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

33-10-07-11. Specific requirements for the use of a sealed source in teletherapy.

1. Use of a sealed source in a teletherapy unit. A licensee shall use cobalt-60 or cesium-137 as a sealed source in a teletherapy unit for medical use in accordance with the manufacturer's radiation safety and operating instructions.
2. Maintenance and repair restrictions. Only a person specifically licensed by the department, the United States nuclear regulatory commission, or an agreement state to perform teletherapy unit maintenance and repair shall install, relocate, or remove a teletherapy sealed source or a teletherapy unit that contains a sealed source or maintain, adjust, or repair the source drawer, the shutter or other mechanism of a teletherapy unit that could expose the source, reduce the shielding around the source, or result in increased radiation levels.
3. Amendments. In addition to the requirements specified in section 33-10-07-03, a licensee shall apply for and receive a license amendment before:

- a. Making any change in the treatment room shielding;
- b. Making any change in the location of the teletherapy unit within the treatment room;
- c. Using the teletherapy unit in a manner that could result in increased radiation levels in areas outside the teletherapy treatment room;
- d. Relocating the teletherapy unit; or
- e. Allowing an individual not listed on the licensee's license to perform the duties of the teletherapy physicist.

4. Safety instruction.

- a. A licensee shall conspicuously post written instructions at the teletherapy unit console. These instructions must inform the operator of:
 - (1) The procedure to be followed to ensure that only the patient is in the treatment room before turning the primary beam of radiation "on" to begin a treatment or after a door interlock interruption;
 - (2) The procedure to be followed if the operator is unable to turn the primary beam of radiation "off" with controls outside the treatment room or any other abnormal operation occurs; and
 - (3) The names and telephone numbers of the authorized users and radiation safety officer to be immediately contacted if the teletherapy unit or console operates abnormally.
- b. A licensee shall provide instruction in the topics identified in subdivision a to all individuals who operate a teletherapy unit and shall provide appropriate refresher training to individuals at intervals not to exceed one year.
- c. A licensee shall maintain a record of individuals receiving instruction required by subdivision b, a description of the instruction, the date of instruction, and the name of the individual who gave the instruction for two years.

5. Doors, interlocks, and warning systems.

- a. A licensee shall control access to the teletherapy room by a door at each entrance.

b. A licensee shall equip each entrance to the teletherapy room with an electrical interlock system that shall:

(1) Prevent the operator from turning the primary beam of radiation "on" unless each treatment room entrance door is closed;

(2) Turn the beam of radiation "off" immediately when an entrance door is opened; and

(3) Prevent the primary beam of radiation from being turned "on" following an interlock interruption until all treatment room entrance doors are closed and the beam on-off control is reset at the console.

c. A licensee shall equip each entrance to the teletherapy room with a conspicuously visible beam condition indicator light.

6. Possession of survey instrument. A licensee authorized to use radioactive material in a teletherapy unit shall possess either a portable radiation detection survey instrument capable of detecting dose rates over the range one-tenth millirem [1 microsievert] per hour to fifty millirems [500 microsieverts] per hour or a portable radiation measurement survey instrument capable of measuring dose rates over the range one millirem [10 microsieverts] per hour to one thousand millirems [10 millisieverts] per hour. The instruments must be operable and calibrated in accordance with subsection 3 of section 33-10-07-05.

7. Radiation monitoring device.

a. A licensee shall have in each teletherapy room a permanent radiation monitor capable of continuously monitoring beam status.

b. Each radiation monitor must be capable of providing visible notice of a teletherapy unit malfunction that results in an exposed or partially exposed source. The visible indicator of high radiation levels must be observable by an individual entering the teletherapy room.

c. Each radiation monitor must be equipped with a backup power supply separate from the power supply to the teletherapy unit. This backup power supply may be a battery system.

d. A radiation monitor must be checked with a dedicated check source for proper operation each day before the teletherapy unit is used for treatment of patients.

- e. A licensee shall maintain a record of the check required by subdivision d for two years. The record must include the date of the check, notation that the monitor indicates when the source is exposed, and the initials of the individual who performed the check.
 - f. If a radiation monitor is inoperable, the licensee shall require any individual entering the teletherapy room to use a survey instrument or audible alarm personal dosimeter to monitor for any malfunction of the source exposure mechanism. The instrument or dosimeter must be checked with a dedicated check source for proper operation at the beginning of each day of use. The licensee shall keep a record as described in subdivision e.
 - g. A licensee shall promptly repair or replace the radiation monitor if it is inoperable.
8. Viewing system. A licensee shall construct or equip each teletherapy room to permit continuous observation of the patient from the teletherapy unit console during irradiation.
9. Dosimetry equipment.
- a. A licensee shall have a calibrated dosimetry system available for use. To satisfy this requirement, one of the following two conditions must be met:
 - (1) The system must have been calibrated by the national institute of standards and technology or by a calibration laboratory accredited by the American association of physicists in medicine. The calibration must have been performed within the previous two years and after any servicing that may have affected system calibration; or
 - (2) The system must have been calibrated within the previous four years; eighteen to thirty months after that calibration, the system must have been intercompared at an intercomparison meeting with another dosimetry system that was calibrated within the past twenty-four months by the national institute of standards and technology or by a calibration laboratory accredited by the American association of physicists in medicine. The intercomparison meeting must be sanctioned by a calibration laboratory or radiologic physics center accredited by the American association of physicists in medicine. The results of the intercomparison meeting must have indicated that the calibration factor of the licensee's system had not changed by more than two percent. The licensee may not use the intercomparison result to change the calibration factor. When intercomparing

dosimetry systems to be used for calibrating cobalt-60 teletherapy units, the licensee shall use a teletherapy unit with a cobalt-60 source. When intercomparing dosimetry systems to be used for calibrating cesium-137 teletherapy units, the licensee shall use a teletherapy unit with a cesium-137 source.

- b. The licensee shall have available for use a dosimetry system for spot-check measurements. To meet this requirement, the system may be compared with a system that has been calibrated in accordance with subdivision a. This comparison must have been performed within the previous year and after each servicing that may have affected system calibration. The spot-check system must be the same system used to meet the requirement in subdivision a.
- c. The licensee shall maintain a record of each calibration, intercomparison, and comparison for the duration of the license. For each calibration, intercomparison, or comparison, the record must include the date, the model numbers and serial numbers of the instruments that were calibrated, intercompared, or compared as required by subdivisions a and b the correction factors that were determined, the names of the individuals who performed the calibration, intercomparison, or comparison, and evidence that the intercomparison meeting was sanctioned by a calibration laboratory or radiologic physics center accredited by the American association of physicists in medicine.

10. Full calibration measurements.

- a. A licensee authorized to use a teletherapy unit for medical use shall perform full calibration measurements on each teletherapy unit:
- (1) Before the first medical use of the unit;
 - (2) Before medical use under the following conditions:
 - (a) Whenever spot-check measurements indicate that the output differs by more than five percent from the output obtained at the last full calibration corrected mathematically for radioactive decay;
 - (b) Following replacement of the source or following reinstallation of the teletherapy unit in a new location; and

- (c) Following any repair of the teletherapy unit that includes removal of the source or major repair of the components associated with the source exposure assembly; and
- (3) At intervals not exceeding one year.
- b. To satisfy the requirement of subdivision a, full calibration measurements must include determination of:
- (1) The output within three percent for the range of field sizes and for the distance or range of distances used for medical use;
 - (2) The coincidence of the radiation field and the field indicated by the light beam localizing device;
 - (3) The uniformity of the radiation field and its dependence on the orientation of the useful beam;
 - (4) Timer accuracy, constancy, and linearity;
 - (5) "On-off" error; and
 - (6) The accuracy of all distance measuring and localization devices in medical use.
- c. A licensee shall use the dosimetry system described in subsection 9 to measure the output for one set of exposure conditions. The remaining radiation measurements required in paragraph 1 of subdivision b may then be made using a dosimetry system that indicates relative dose rates.
- d. A licensee shall make full calibration measurements required by subsection 1 in accordance with either the procedures recommended by the scientific committee on radiation dosimetry of the American association of physicists in medicine that are described in Physics in Medicine and Biology vol. 16, no. 3, 1971, pp. 379-396, or by task group 21 of the radiation therapy committee of the American association of physicists in medicine that are described in Medical Physics vol. 10, no. 6, 1983, pp. 741-771, and vol. 11, no. 2, 1984, p. 213.
- e. A licensee shall correct mathematically the outputs determined in paragraph 1 of subdivision b for physical decay for intervals not exceeding one month for cobalt-60 and intervals not exceeding six months for cesium-137.
- f. Full calibration measurements required by subdivision a and physical decay corrections required by subdivision e must be performed by a teletherapy physicist named on the licensee's license or authorized by a license issued by

the United States nuclear regulatory commission or an agreement state to perform such services.

g. A licensee shall maintain a record of each calibration for the duration of the license. The record must include the date of the calibration, the manufacturer's name, model number, and serial number for both the teletherapy unit and the source, the model numbers and serial numbers of the instruments used to calibrate the teletherapy unit, tables that describe the output of the unit over the range of field sizes and for the range of distances used in radiation therapy, a determination of the coincidence of the radiation field and the field indicated by the light beam localizing device, the measured timer accuracy for a typical treatment time, the calculated "on-off" error, the estimated accuracy of each distance measuring or localization device, and the signature of the teletherapy physicist.

11. Periodic spot checks.

a. A licensee authorized to use teletherapy units for medical use shall perform output spot checks on each teletherapy unit at intervals not to exceed one month.

b. To satisfy the requirement of subdivision a, spot checks must include determination of:

(1) Timer constancy and timer linearity over the range of use;

(2) "On-off" error;

(3) The coincidence of the radiation field and the field indicated by the light beam localizing device;

(4) The accuracy of all distance measuring and localization devices used for medical use;

(5) The output for one typical set of operating conditions; and

(6) The difference between the measurement made in paragraph 5 and the anticipated output, expressed as a percentage of the anticipated output (i.e., the value obtained at last full calibration corrected mathematically for physical decay).

c. A licensee shall use the dosimetry system described in subsection 9 to make the spot check required in paragraph 5 of subdivision e.

- d. A licensee shall perform spot checks required by subdivision a in accordance with procedures established by the teletherapy physicist. The teletherapy physicist does not need to actually perform the output spot-check measurements.
- e. A licensee shall have the teletherapy physicist review the results of each output spot check within fifteen days. The teletherapy physicist shall promptly notify the licensee in writing of the results of each output spot check. The licensee shall keep a copy of each written notification for two years.
- f. A licensee authorized to use a teletherapy unit for medical use shall perform safety spot checks of each teletherapy facility at intervals not to exceed one month.
- g. To satisfy the requirement of subdivision f, safety spot checks shall assure proper operation of:
- (1) Electrical interlocks at each teletherapy room entrance;
 - (2) Electrical or mechanical stops installed for the purpose of limiting use of the primary beam of radiation restriction of source housing angulation or elevation, carriage or stand travel, and operation of the beam "on-off" mechanism;
 - (3) Beam condition indicator lights on the teletherapy unit, on the control console, and in the facility;
 - (4) Viewing systems;
 - (5) Treatment room doors from inside and outside the treatment room; and
 - (6) Electrically assisted treatment room doors with the teletherapy unit electrical power turned "off".
- h. A licensee shall lock the control console in the "off" position if any door interlock malfunctions. No licensee may use the unit until the interlock system is repaired unless specifically authorized by the department.
- i. A licensee shall promptly repair any system identified in subdivision g that is not operating properly. The teletherapy unit may not be used until all repairs are completed.
- j. A licensee shall maintain a record of each spot check required by subdivisions a and f for two years. The record must include the date of the spot check, the

manufacturer's name, model number, and serial number for both the teletherapy unit, and source, the manufacturer's name, model number and serial number of the instrument used to measure the output of the teletherapy unit, the timer constancy and linearity, the calculated "on-off" error, a determination of the coincidence of the radiation field and the field indicated by the light beam localizing device, the timer constancy and linearity for a typical treatment time, the calculated "on-off" error, the estimated accuracy of each distance measuring or localization device, the difference between the anticipated output and the measured output, notations indicating the operability of each entrance door electrical interlock, each electrical or mechanical stop, each beam condition indicator light, the viewing system and doors, and the signature of the individual who performed the periodic spot check.

12. Radiation surveys for teletherapy facilities.

a. Before medical use, after each installation of a teletherapy source, and after making any change for which an amendment is required by subsection 3, the licensee shall perform radiation surveys with an operable radiation measurement survey instrument calibrated in accordance with subsection 3 of section 33-10-07-05 to verify that:

(1) The maximum and average radiation levels at one meter from the teletherapy source with the source in the "off" position and the collimators set for a normal treatment field do not exceed ten millirems [100 microsieverts] per hour and two millirems [20 microsieverts] per hour, respectively; and

(2) With the teletherapy source in the "on" position with the largest clinically available treatment field and with a scattering phantom in the primary beam of radiation, that:

(a) Radiation levels in restricted areas are not likely to cause personnel exposures in excess of the limits specified in subsection 1 of section 33-10-04-02; and

(b) Radiation levels in unrestricted areas do not exceed the limits specified in subdivision a of subsection 5 of section 33-10-04-02.

b. If the results of the surveys required in subdivision a indicate any radiation levels in excess of the respective limit specified in that paragraph, the licensee shall lock the control in the "off" position and not use the unit:

- (1) Except as may be necessary to repair, replace, or test the teletherapy unit, the teletherapy unit shielding, or the treatment room shielding; or
- (2) Until the licensee has received a specific exemption from the department.

c. A licensee shall maintain a record of the radiation measurements made following installation of a source for the duration of the license. The record must include the date of the measurements, the reason the survey is required, the manufacturer's name, model number and serial number of the teletherapy unit, the source, and the instrument used to measure radiation levels, each dose rate measured around the teletherapy source while in the "off" position and the average of all measurements, a plan of the areas surrounding the treatment room that were surveyed, the measured dose rate at several points in each area expressed in millirems [microsieverts] per hour, the calculated maximum level of radiation over a period of one week for each restricted and unrestricted area, and the signature of the radiation safety officer.

13. Safety spot checks for teletherapy facilities.

- a. A licensee shall promptly check all systems listed in subdivision g of subsection 11 for proper function after each installation of a teletherapy source and after making any change for which an amendment is required by subsection 3.
- b. If the results of the safety spot checks required in subdivision a indicate the malfunction of any system specified in subsection 11, the licensee shall lock the control console in the "off" position and not use the unit except as may be necessary to repair, replace, or check the malfunctioning system.
- c. A licensee shall maintain a record of the safety spot checks following installation of a source for two years. The record must include notations indicating the operability of each entrance door interlock, each electrical or mechanical stop, each beam condition indicator light, the viewing system, doors, and the signature of the radiation safety officer.

14. Modification of teletherapy unit or room before beginning a treatment program. If the survey required by subsection 12 indicates that an individual in an unrestricted area may be exposed to levels of radiation greater than those permitted by subdivision a of subsection 5 of section 33-10-04-02, before beginning the treatment program the licensee shall:

- a. Either equip the unit with stops or add additional radiation shielding to ensure compliance with subdivision a of subsection 5 of section 33-10-04-02;
 - b. Perform the survey required by subsection 12 again; and
 - c. Include in the report required by subsection 15 the results of the initial survey, a description of the modification made to comply with subdivision a, and the results of the second survey; or
 - d. Request and receive a license amendment under subdivision b of subsection 5 of section 33-10-04-02 that authorizes radiation levels in unrestricted areas greater than those permitted by subdivision a of subsection 5 of section 33-10-04-02.
15. Reports of teletherapy surveys, checks, tests, and measurements. A licensee shall furnish a copy of the records required in subsections 12, 13, and 14 and the output from the teletherapy source expressed as rems [sieverts] per hour at one meter from the source as determined during the full calibration required in subsection 10 to the department within thirty days following completion of the action that initiated the record requirement.
16. Five-year inspection.
- a. A licensee shall have each teletherapy unit fully inspected and serviced during teletherapy source replacement or at intervals not to exceed five years, whichever comes first, to assure proper functioning of the source exposure mechanism.
 - b. This inspection and servicing may only be performed by persons specifically licensed to do so by the department, an agreement state, or the United States nuclear regulatory commission.
 - c. A licensee shall maintain a record of the inspection and servicing for the duration of the license. The record must contain the inspector's name, the inspector's license number, the date of inspection, the manufacturer's name and model number and serial number for both the teletherapy unit and source, a list of components inspected, a list of components serviced and the type of service, a list of components replaced, and the signature of the inspector.

History: Effective June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

33-10-07-12. Specific requirements for training.

1. Radiation safety officer. Except as provided in subsection 2 an individual fulfilling the responsibilities of the radiation safety officer as provided in subsection 2 of section 33-10-07-04 shall:

a. Be certified by the:

- (1) American board of health physics in comprehensive health physics;
- (2) American board of radiology in radiological physics, therapeutic radiological physics, or medical nuclear physics;
- (3) American board of nuclear medicine;
- (4) American board of science in nuclear medicine; or
- (5) Board of pharmaceutical specialities in nuclear pharmacy or science; or

b. Have had two hundred hours of classroom and laboratory training as follows:

- (1) Radiation physics and instrumentation;
- (2) Radiation protection;
- (3) Mathematics pertaining to the use and measurement of radioactivity;
- (4) Radiation biology;
- (5) Radiopharmaceutical chemistry; and
- (6) One year of full-time experience in radiation safety at a medical institution under the supervision of the individual identified as the radiation safety officer by the department, an agreement state, licensing state, or United States nuclear regulatory commission license that authorizes the medical use of radioactive material;

c. Be an authorized user for those radioactive material uses that come within the radiation safety officer's responsibilities.

2. Training for experienced radiation safety officer. An individual identified as a radiation safety officer by the department, agreement state, licensing state, or United States nuclear regulatory commission license on October 1, 1986, who

oversees only the use of radioactive material for which the licensee was authorized on that date need not comply with the training requirements of subsection 1.

3. Training for uptake, dilution, or excretion studies. Except as provided in subsections 11 and 12, the licensee shall require the authorized user of a radiopharmaceutical listed in section 33-10-07-06 to be a physician who:

a. Is certified in:

(1) Nuclear medicine by the American board of nuclear medicine;

(2) Diagnostic radiology by the American board of radiology;

(3) Diagnostic radiology or radiology within the previous five years by the American osteopathic board of radiology; or

(4) Nuclear medicine by the American osteopathic board of nuclear medicine;

b. Has completed forty hours of instruction in basic radionuclide handling techniques applicable to the use of prepared radiopharmaceuticals, and twenty hours of supervised clinical experience.

(1) To satisfy the basic instruction requirement, forty hours of classroom and laboratory instruction must include:

(a) Radiation physics and instrumentation;

(b) Radiation protection;

(c) Mathematics pertaining to the use and measurement of radioactivity;

(d) Radiation biology; and

(e) Radiopharmaceutical chemistry.

(2) To satisfy the requirement for twenty hours of supervised clinical experience, training must be under the supervision of an authorized user at a medical institution and must include:

(a) Examining patients and reviewing the patients' case histories to determine the patients' suitability for radionuclide diagnosis, limitations, or contraindications;

- (b) Selecting the suitable radiopharmaceuticals and calculating and measuring the dosages;
 - (c) Administering dosages to patients and using syringe radiation shields;
 - (d) Collaborating with the authorized user in the interpretation of radionuclide test results; and
 - (e) Patient followup; or
 - c. Has successfully completed a six-month training program in nuclear medicine as part of a training program that has been approved by the accreditation council for graduate medical education and that included classroom and laboratory training, work experience, and supervised clinical experience in all the topics identified in subdivision b.
- 4. Training for imaging and localization studies. Except as provided in subsections 11 and 12, the licensee shall require the authorized user of a radiopharmaceutical, generator, or reagent kit specified in section 33-10-07-07 to be a physician who:
 - a. Is certified in:
 - (1) Nuclear medicine by the American board of nuclear medicine;
 - (2) Diagnostic radiology by the American board of radiology;
 - (3) Diagnostic radiology or radiology within the previous five years by the American osteopathic board of radiology; or
 - (4) Nuclear medicine by the American osteopathic board of nuclear medicine;
 - b. Has completed two hundred hours of instruction in basic radionuclide handling techniques applicable to the use of prepared radiopharmaceuticals, generators, and reagent kits, five hundred hours of supervised work experience, and five hundred hours of supervised clinical experience:
 - (1) To satisfy the basic instruction requirement, two hundred hours of classroom and laboratory training must include:
 - (a) Radiation physics and instrumentation;
 - (b) Radiation protection;

- (c) Mathematics pertaining to the use and measurement of radioactivity;
 - (d) Radiopharmaceutical chemistry; and
 - (e) Radiation biology.
- (2) To satisfy the requirement for five hundred hours of supervised work experience, training shall be under the supervision of an authorized user at a medical institution and must include:
- (a) Ordering, receiving, and unpacking radioactive materials safely and performing the related radiation surveys;
 - (b) Calibrating dose calibrators and diagnostic instruments and performing checks for proper operation of survey meters;
 - (c) Calculating and safely preparing patient dosages;
 - (d) Using administrative controls to prevent the misadministration of radioactive material;
 - (e) Using emergency procedures to contain spilled radioactive material safely and using proper decontamination procedures; and
 - (f) Eluting technetium-99m from generator systems, assaying and testing the eluate for molybdenum-99 and alumina contamination, and processing the eluate with reagent kits to prepare technetium-99m labeled radiopharmaceuticals.
- (3) To satisfy the requirement for five hundred hours of supervised clinical experience, training shall be under the supervision of an authorized user at a medical institution and must include:
- (a) Examining patients and reviewing the patients' case histories to determine the patients' suitability for radionuclide diagnosis, limitations, or contraindications;
 - (b) Selecting the suitable radiopharmaceuticals and calculating and measuring the dosages;
 - (c) Administering dosages to patients and using syringe radiation shields;

- (b) Use of soluble phosphorus-32 for the treatment of ascites, polycythemia vera, leukemia, or bone metastases in three individuals;
 - (c) Use of iodine-131 for treatment of thyroidcarcinoma in three individuals; and
 - (d) Use of colloidal chromic phosphorus-32 or of colloidal gold-198 for intracavitary treatment of malignant effusions in three individuals.
6. Training for therapeutic use of brachytherapy sources. Except as provided in subsection 11, the licensee shall require the authorized user using a brachytherapy source specified in section 33-10-07-10 for therapy to be a physician who:
- a. Is certified in:
 - (1) Radiology, therapeutic radiology, or radiation oncology by the American board of radiology;
 - (2) Radiation oncology by the American osteopathic board of radiology;
 - (3) Radiology, with a specialization in radiotherapy, as a British "fellow of the faculty of radiology" or "fellow of the royal college of radiology"; or
 - (4) Therapeutic radiology by the Canadian royal college of physicians and surgeons; or
 - b. Is in the active practice of therapeutic radiology, has completed two hundred hours of instruction in basic radionuclide handling techniques applicable to the therapeutic use of brachytherapy sources and five hundred hours of supervised work experience and a minimum of three years of supervised clinical experience.
 - (1) To satisfy the requirement for instruction, two hundred hours of classroom and laboratory training must include:
 - (a) Radiation physics and instrumentation;
 - (b) Radiation protection;
 - (c) Mathematics pertaining to the use and measurement of radioactivity; and
 - (d) Radiation biology.
 - (2) To satisfy the requirement for five hundred hours of supervised work experience, training must be under

the supervision of an authorized user at a medical institution and must include:

- (a) Ordering, receiving, and unpacking radioactive materials safely and performing the related radiation surveys;
 - (b) Checking survey meters for proper operation;
 - (c) Preparing, implanting, and removing sealed sources;
 - (d) Using administrative controls to prevent the misadministration of radioactive material; and
 - (e) Using emergency procedures to control radioactive material.
- (3) To satisfy the requirement for a period of supervised clinical experience, training must include one year in a formal training program approved by the residency review committee for radiology of the accreditation council for graduate medical education or the committee on postdoctoral training of the American osteopathic association, and an additional two years of clinical experience in therapeutic radiology under the supervision of an authorized user at a medical institution. The supervised clinical experience must include:
- (a) Examining individuals and reviewing their case histories to determine their suitability for brachytherapy treatment, and any limitations or contraindications;
 - (b) Selecting the proper brachytherapy sources, dose, and method of administration;
 - (c) Calculating the dose; and
 - (d) Postadministration followup and review of case histories in collaboration with the authorized user.

7. Training for ophthalmic use of strontium-90. Except as provided in subsection 11, the licensee shall require the authorized user using only strontium-90 for ophthalmic radiotherapy to be a physician who:

- a. Is certified in radiology, therapeutic radiology, or radiation oncology by the American board of radiology; or

b. Is in the active practice of therapeutic radiology or ophthalmology, and has completed twenty-four hours of instruction in basic radionuclide handling techniques applicable to the use of strontium-90 for ophthalmic radiotherapy, and a period of supervised clinical training in ophthalmic radiotherapy.

(1) To satisfy the requirement for instruction, the classroom and laboratory training must include:

(a) Radiation physics and instrumentation;

(b) Radiation protection;

(c) Mathematics pertaining to the use and measurement of radioactivity; and

(d) Radiation biology.

(2) To satisfy the requirement for a period of supervised clinical training in ophthalmic radiotherapy, training must be under the supervision of an authorized user at a medical institution and must include the use of strontium-90 for the ophthalmic treatment of five individuals that includes:

(a) Examination of each individual to be treated;

(b) Calculation of the dose to be administered;

(c) Administration of the dose; and

(d) Followup and review of each individual's case history.

8. Training for use of sealed sources for diagnosis. Except as provided in subsection 11, the licensee shall require the authorized user using a sealed source in a device specified in section 33-10-07-09 to be a physician, dentist, or podiatrist who:

a. Is certified in:

(1) Radiology, diagnostic radiology with special competence in nuclear radiology, therapeutic radiology, or radiation oncology by the American board of radiology;

(2) Nuclear medicine by the American board of nuclear medicine; or

(3) Diagnostic radiology or radiology by the American osteopathic board of radiology; or

b. Has completed eight hours of classroom and laboratory instruction in basic radionuclide handling techniques specifically applicable to the use of the device. To satisfy the requirement for instruction, the training must include:

- (1) Radiation physics, mathematics pertaining to the use and measurement of radioactivity, and instrumentation;
- (2) Radiation biology; and
- (3) Radiation protection and training in the use of the device for the purposes authorized by the license.

9. Training for teletherapy. Except as provided in subsection 11, the licensee shall require the authorized user of a sealed source specified in section 33-10-07-11 to be a physician who:

a. Is certified in:

- (1) Radiology, therapeutic radiology, or radiation oncology by the American board of radiology;
- (2) Radiation oncology by the American osteopathic board of radiology;
- (3) Radiology, with specialization in radiotherapy, as a British "fellow of the faculty of radiology" or "fellow of the royal college of radiology"; or
- (4) Therapeutic radiology by the Canadian royal college of physicians and surgeons; or

b. Is in the active practice of therapeutic radiology, and has completed two hundred hours of instruction in basic radionuclide techniques applicable to the use of a sealed source in a teletherapy unit, five hundred hours of supervised work experience, and a minimum of three years of supervised clinical experience.

(1) To satisfy the requirement for instruction, the classroom and laboratory training must include:

- (a) Radiation physics and instrumentation;
- (b) Radiation protection;
- (c) Mathematics pertaining to the use and measurement of radioactivity; and
- (d) Radiation biology.

- (2) To satisfy the requirement for supervised work experience, training must be under the supervision of an authorized user at an institution and shall include:
- (a) Review of the full calibration measurements and periodic spot checks;
 - (b) Preparing treatment plans and calculating treatment times;
 - (c) Using administrative controls to prevent misadministrations;
 - (d) Implementing emergency procedures to be followed in the event of the abnormal operation of a teletherapy unit or console; and
 - (e) Checking and using survey meters.
- (3) To satisfy the requirement for a period of supervised clinical experience, training must include one year in a formal training program approved by the residency review committee for radiology of the accreditation council for graduate medical education or the committee on postdoctoral training of the American osteopathic association and an additional two years of clinical experience in therapeutic radiology under the supervision of an authorized user at a medical institution. The supervised clinical experience must include:
- (a) Examining individuals and reviewing the individuals' case histories to determine the individuals' suitability for teletherapy treatment, and any limitations or contraindications;
 - (b) Selecting the proper dose and how it is to be administered;
 - (c) Calculating the teletherapy doses and collaborating with the authorized user in the review of patients' progress and consideration of the need to modify originally prescribed doses as warranted by patients' reaction to radiation; and
 - (d) Postadministration followup and review of case histories.

10. Training for teletherapy physicist. The licensee shall require the teletherapy physicist to:

- a. Be certified by the American board of radiology in:
- (1) Therapeutic radiological physics;
 - (2) Roentgen-ray and gamma-ray physics;
 - (3) X-ray and radium physics; or
 - (4) Radiological physics; or
- b. Hold a master's or doctor's degree in physics, biophysics, radiological physics, or health physics, and have completed one year of full-time training in therapeutic radiological physics and also one year of full-time work experience under the supervision of a teletherapy physicist at a medical institution. To meet this requirement, the individual shall have performed the tasks listed in subsection 6 of section 33-10-07-05 and subsections 10, 11, and 12 of section 33-10-07-11 under the supervision of a teletherapy physicist during the year of work experience.
11. Training for experienced authorized users. Practitioners of the healing arts identified as authorized users for the human use of radioactive material on a department, United States nuclear regulatory commission, agreement state, or licensing state license on April 1, 1987, who perform only those methods of use for which the practitioners were authorized on that date need not comply with the training requirements of this section.
12. Physician training in a three-month program. A physician who, before July 1, 1984, began a three-month nuclear medicine training program approved by the accreditation council for graduate medical education and has successfully completed the program, is exempted from the requirements of subsections 3 and 4.
13. Recentness of training. The training and experience specified in this section shall have been obtained within the five years preceding the date of application or the individual shall have had continuing applicable experience since the required training and experience was completed.

History: Effective June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

CHAPTER 33-10-08

33-10-08-01. Purpose and scope. This chapter provides special requirements for analytical X-ray equipment, ~~which~~. The requirements of this chapter are in addition to other, and not in substitution for, applicable requirements in other chapters of this article.

History: Amended effective June 1, 1986; June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-08-02. Definitions. As used in this chapter, the following definitions apply:

1. "Analytical X-ray equipment" means equipment used for X-ray diffraction or fluorescence analysis.
2. "Analytical X-ray system" means a group of ~~local and remote~~ components utilizing ~~X-rays~~ X-rays or gamma rays to determine the elemental composition or to examine the microstructure of materials. ~~Local components include those that are struck by X-rays such as radiation source housings, port and shutter assemblies, collimators, sample holders, cameras, goniometers, detectors and shielding. Remote components include power supplies, transformers, amplifiers, readout devices, and control panels.~~
3. "Fail-safe characteristics" means a design feature which causes beam port shutters to close, or otherwise prevents emergence of the primary beam, upon the failure of a safety or warning device.
4. "Local components" means part of an analytical X-ray system and includes areas that are struck by X-rays such as radiation source housings, port and shutter assemblies, collimators, sample holders, cameras, goniometers, detectors and shielding, but do not include power supplies, transformers, amplifiers, readout devices, and control panels.
5. "Normal operating procedures" means operating procedures for conditions suitable for analytical purposes with shielding and barriers in place step-by-step instructions necessary to accomplish the analysis. These do not procedures must include maintenance but do include routine alignment procedures. Routine and emergency radiation safety considerations are part of these procedures sample insertion and manipulation, equipment alignment, routine maintenance by the registrant, and data recording procedures, which are related to radiation safety.

6. "Open-beam configuration" means an analytical X-ray system in which an individual could accidentally place some part of the individual's body in the primary beam path during normal operation.
7. "Primary beam" means ionizing radiation which passes through an aperture of the source housing by a direct path from the X-ray tube or a radioactive source located in the radiation source housing.

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-08-03. Equipment requirements.

1. Safety device. A device which prevents the entry of any portion of an individual's body into the primary X-ray beam path or which causes the beam to be shut off upon entry into its path shall be provided on all open-beam configurations. A registrant may apply to the department for an exemption from the requirement of a safety device. Such application shall include:
 - a. A description of the various safety devices that have been evaluated.
 - b. The reason each of these devices cannot be used.
 - c. A description of the alternative methods that will be employed to minimize the possibility of an accidental exposure, including procedures to assure that operators and others in the area will be informed of the absence of safety devices.
2. Warning devices.
 - a. Open-beam configurations shall be provided with a readily discernible indication of:
 - (1) X-ray tube ~~status~~ (ON-OFF) status located near the radiation source housing, if the primary beam is controlled in this manner.
 - (2) Shutter status (OPEN-CLOSED) located near each port on the radiation source housing, if the primary beam is controlled in this manner.
 - b. An easily visible warning light labeled with the words "X-RAY ON", or words having a similar intent, must be located:

- (1) Near any switch that energizes an X-ray tube and shall be illuminated only when the tube is energized.
 - (2) In the case of a radioactive source, near any switch that opens a housing shutter and must be illuminated only when the shutter is open.
- c. Warning devices shall be labeled so that their purpose is easily identified. On equipment installed after August 1, 1979, warning devices shall have fail-safe characteristics.
3. Ports. Unused ports on radiation source housings shall be secured in the closed position in a manner which will prevent casual opening.
 4. Labeling. All analytical X-ray equipment shall be labeled with a readily discernible sign or signs bearing the radiation symbol and the words:
 - a. "CAUTION - HIGH INTENSITY X-RAY BEAM", or words having a similar intent, on the X-ray source housing-; and
 - b. "CAUTION RADIATION - THIS EQUIPMENT PRODUCES RADIATION WHEN ENERGIZED", or words having a similar intent, near any switch that energizes an X-ray tube if the radiation source is an X-ray tube-; or
 - c. "CAUTION - RADIOACTIVE MATERIAL", or words having a similar intent, on the source housing in accordance with section 33-10-04-03 if the radiation source is a radionuclide.
 5. Shutters. On open-beam configurations installed after August 1, 1979, each port on the radiation source housing shall be equipped with a shutter that cannot be opened unless a collimator or a coupling has been connected to the port.
 6. Warning lights.
 - a. An easily visible warning light labeled with the words "X-RAY ON", or words having a similar intent, shall be located:
 - (1) Near any switch that energizes an X-ray tube and shall be illuminated only when the tube is energized; or
 - (2) In the case of a radioactive source, near any switch that opens a housing shutter, and shall be illuminated only when the shutter is open.

- b. On equipment installed after August 1, 1979, warning lights shall have fail-safe characteristics.
7. Radiation source housing. Each radiation source housing is subject to the following requirements:
- a. Each X-ray tube housing shall be equipped with an interlock that shuts off the tube if it is removed from the radiation source housing or if the housing is disassembled.
 - b. Each radioactive source housing or port cover or each X-ray tube housing shall be so constructed that, with all shutters closed, the radiation measured at a distance of five centimeters from its surface is not capable of producing a dose in excess of two and one-half millirems [0.25 millisieverts] in one hour. For systems utilizing X-ray tubes, this limit shall be met at any specified tube rating.
8. Generator cabinet. Each X-ray generator shall be supplied with a protective cabinet which limits leakage radiation measured at a distance of five centimeters from its surface such that it is not capable of producing a dose in excess of one-quarter millirem [2.5 microsieverts] in one hour.

History: Amended effective June 1, 1986; June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-08-04. Area requirements.

- 1. Radiation levels. The local components of an analytical X-ray system shall be located and arranged and shall include sufficient shielding or access control such that no radiation levels exist in any area surrounding the local component group which could result in a dose to an individual present therein in excess of the dose limits given in subsection 5 of section 33-10-04-02. For systems utilizing X-ray tubes, these levels shall be met at any specified tube rating.
- 2. Surveys.
 - a. Radiation surveys, as required by subsection 1 of section 33-10-04-03, of all analytical X-ray systems sufficient to show compliance with subsection 1 of this section shall be performed:
 - (1) Upon installation of the equipment, and at least once every twelve months thereafter.

- (2) Following any change in the initial arrangement, number, or type of local components in the system.
 - (3) Following any maintenance requiring the disassembly or removal of a local component in the system.
 - (4) During the performance of maintenance and alignment procedures if the procedures require the presence of a primary X-ray beam when any local component in the system is disassembled or removed.
 - (5) Any time a visual inspection of the local components in the system reveals an abnormal condition.
 - (6) Whenever personnel monitoring devices show a significant increase over the previous monitoring period or the readings are approaching the radiation protection guides (radiation dose limits) limits specified in section 33-10-04-02.
- b. Radiation survey measurements shall not be required if a registrant can demonstrate compliance to the satisfaction of the department with subsection 1 in some other manner to the satisfaction of the department.
3. Posting. Each area or room containing analytical X-ray equipment shall be conspicuously posted with a sign or signs bearing the radiation symbol and the words "CAUTION - X-RAY EQUIPMENT", or words having a similar intent in accordance with section 33-10-04-03.

History: Amended effective June 1, 1986; June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-08-05. Operating requirements.

1. Procedures. Normal operating procedures shall be written and available to all analytical X-ray equipment workers. No person individual shall be permitted to operate analytical X-ray equipment in any manner other than that specified in the procedures unless such person individual has obtained written approval of the radiation safety officer.
2. Bypassing. No person individual shall bypass a safety device or interlock unless such person individual has obtained the approval of the radiation safety officer. Such approval shall be for a specified period of time. When a safety device or interlock has been bypassed, a readily discernible sign bearing the words "SAFETY DEVICE NOT WORKING", or words having a similar intent, shall be placed on the radiation source housing.

3. Repair or modification of X-ray tube systems. Except as specified in subsection 2 of this section, no operation involving removal of covers, shielding materials, or tube housings or modifications to shutters, collimators, or beam stops shall be performed without ascertaining that the tube is off and will remain off until safe conditions have been restored. The main switch, rather than interlocks, shall be used for routine shutdown in preparation for repairs.
4. Radioactive source replacement, testing, or repair. Radioactive source housings shall be opened for source replacement, leak testing, or other maintenance or repair procedures only by individuals authorized to specifically conduct such procedures under a license issued by the United States nuclear regulatory commission, an agreement state, or a licensing state.

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-08-06. Personnel requirements.

1. Instruction. No ~~person~~ individual shall be permitted to operate or maintain analytical X-ray equipment unless such ~~person~~ individual has received instruction in and demonstrated competence as to all of the following:
 - a. Identification of radiation hazards associated with the use of the equipment.
 - b. Significance of the various radiation warning ~~and~~ safety devices, and interlocks incorporated into the equipment, or the reasons they have not been installed on certain pieces of equipment and the extra precautions required in such cases.
 - c. Proper operating procedures for the equipment.
 - d. ~~Symptoms~~ Recognition of symptoms of an acute localized exposure.
 - e. Proper procedures for reporting an actual or suspected exposure.
2. Personnel monitoring.
 - a. Finger or wrist dosimetric devices shall be provided to and shall be used by:

- (1) Analytical X-ray equipment workers using systems having an open-beam configuration and not equipped with a safety device.
 - (2) Personnel maintaining analytical X-ray equipment if the maintenance procedures require the presence of a primary X-ray beam when any local component in the analytical X-ray system is disassembled or removed.
- b. Reported dose values shall not be used for the purpose of determining compliance with subsection 1 of section 33-10-04-02 unless evaluated by a qualified expert.

History: Amended effective June 1, 1986; June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

CHAPTER 33-10-09

33-10-09-02. Registration procedure.

1. Registration requirements. No person shall receive, possess, use, transfer, own, or acquire a particle accelerator except as authorized in a registration issued pursuant to ~~this article or as otherwise provided for in this article.~~ The general procedures for registration of particle accelerator facilities are included in chapter 33-10-02.
2. General requirements for the issuance of a registration for particle accelerators. (Refer to chapter 33-10-02.) In addition to the requirements of chapter 33-10-02, a registration application for use of a particle accelerator will be approved only if the department determines all of the following:
 - a. The applicant is qualified by reason of training and experience to use the accelerator in question for the purpose requested in accordance with this chapter and chapters 33-10-04 and 33-10-10 in such a manner as to minimize danger to public health and safety or property.
 - b. The applicant's proposed or existing equipment, facilities, operating and emergency procedures are adequate to protect health and minimize danger to public health and safety or property.
 - c. The issuance of the registration will not be inimical to the health and safety of the public, and the applicant satisfies any applicable special requirement in subsection 3.
 - d. The applicant has appointed a radiation safety officer.
 - e. The applicant or the applicant's staff has substantial experience in the use of particle accelerators and training sufficient for the application to its intended uses.
 - f. The applicant has established a radiation safety committee to approve, in advance, proposals for uses of particle accelerators, whenever deemed necessary by the department.
 - g. The applicant has an adequate training program for particle accelerator operators.
3. Human use of particle accelerators. In addition to the requirements set forth in chapter 33-10-02, a registration for

use of a particle accelerator in the healing arts will be issued only if all of the following are met:

- a. Whenever deemed necessary by the department, the applicant has appointed a medical committee of at least three members to evaluate all proposals for research, diagnostic, and therapeutic use of a particle accelerator. Membership of the committee should include physicians expert in internal medicine, hematology, therapeutic radiology, and a person experienced in depth dose calculations and protection against radiation.
- b. The individuals designated on the application as the users have substantial training and experience in deep therapy techniques or in the use of particle accelerators to treat humans.
- c. The individual designated on the application as the user must be a physician.

History: Amended effective June 1, 1986; June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-09-03. Radiation safety requirements for the use of particle accelerators.

1. General provisions requirements.

- a. This section establishes radiation safety requirements for the use of particle accelerators. The provisions requirements of this section are in addition to, and not in substitution for, other applicable provisions requirements of the chapter.
- b. The registrant shall be responsible for assuring that all requirements of this chapter are met.

2. Limitations.

- a. No registrant shall permit any person individual to act as an operator of a particle accelerator ~~operator~~ until such person shall have all of the following individual has:
 - (1) Been instructed in radiation safety and shall have demonstrated an understanding thereof.
 - (2) Received copies of and instruction in this chapter and the applicable requirements of chapters 33-10-04 and 33-10-10, pertinent registration conditions and the registrant's operating and emergency procedures, and shall have demonstrated understanding thereof.

- (3) Demonstrated competence to use the particle accelerator, related equipment, and survey instruments which will be employed ~~in the person's assignment~~.
- b. ~~Either the~~ The radiation safety committee or the radiation safety officer shall have the authority to terminate the operations at a particle accelerator facility if such action is deemed necessary to protect health and minimize danger to public health and safety or property.
3. Shielding and safety design requirements.
- a. A qualified expert, specifically ~~accepted~~ approved by the department, shall be consulted in the design of a particle accelerator installation and called upon to perform a radiation survey when the accelerator is first capable of producing radiation.
- b. Each particle accelerator installation shall be provided with such primary or secondary barriers ~~as are necessary~~ to assure compliance with subsections 1 and 5 of section 33-10-04-02.
4. Particle accelerator controls and interlock systems.
- a. Instrumentation, readouts, and controls on the particle accelerator control console shall be clearly identified and easily discernible.
- b. ~~All entrances~~ Each entrance into a target room or other high radiation area shall be provided with ~~interlocks~~ a safety interlock that ~~shut~~ shuts down the machine under conditions of barrier penetration.
- ~~d.~~ c. Each safety interlock shall be on a circuit which shall allow its operation independently of all other safety interlocks.
- ~~e.~~ d. All safety interlocks shall be ~~fail-safe, i.e.,~~ designed so that any defect or component failure in the interlock system prevents operation of the accelerator.
- ~~c.~~ e. When ~~an~~ a safety interlock system has been tripped, it shall only be possible to resume operation of the accelerator by manually resetting controls at the position where the interlock has been tripped, and lastly at the main control console.
- f. A scram button or other emergency power cutoff switch shall be located and easily identifiable in all high radiation areas. Such a cutoff switch shall include a manual reset so that the accelerator cannot be restarted

from the accelerator control console without resetting the cutoff switch.

5. Warning devices.

- a. All locations designated as high radiation areas, and entrances to such locations, shall be equipped with easily observable warning lights that operate when, and only when, radiation is being produced.
- b. Except in facilities designed for human exposure, each high radiation area shall have an audible warning device which shall be activated for fifteen seconds prior to the possible creation of such high radiation area. Such warning device shall be clearly discernible in all high radiation areas and all areas immediately adjacent to the high radiation areas.
- c. Barriers, temporary or otherwise, and pathways leading to high radiation areas shall be identified posted in accordance with subsection 3 of section 33-10-04-03.

6. Operating procedures.

- a. Particle accelerators, when not in operation, shall be secured to prevent unauthorized use.
- b. The safety interlock system shall not be used to turn off the accelerator beam except in an emergency.
- c. All safety and warning devices, including interlocks, shall be checked for proper operability at intervals not to exceed three months. Results of such tests shall be maintained for inspection at the accelerator facility for inspection by the department.
- d. Electrical circuit diagrams of the accelerator, and the associated interlock systems, shall be kept current and maintained for inspection by the department and shall be available to the operator at each accelerator facility.
- e. If, for any reason, it is necessary to intentionally bypass a safety interlock or interlocks, such action shall be **all of the following:**
 - (1) Authorized by the radiation safety committee or radiation safety officer.
 - (2) Recorded in a permanent log and a notice posted at the accelerator control console.
 - (3) Terminated as soon as possible.

- f. A copy of the current operating and the emergency procedures shall be maintained at the accelerator control panel.

7. Radiation monitoring requirements.

- a. There shall be available at each particle accelerator facility, appropriate portable monitoring equipment which is operable and has been appropriately calibrated for the ~~appropriate~~ radiations being produced at the facility. Such equipment shall be tested for proper operation daily and calibrated at intervals not to exceed one year, and after each servicing and repair.
- b. A radiation protection survey shall be performed and documented by a qualified expert, specifically approved by the department, when changes have been made in shielding, operation, equipment, or occupancy of adjacent areas.
- c. Radiation levels in all high radiation areas shall be continuously monitored. The monitoring devices shall be electrically independent of the accelerator control and safety interlock systems and capable of providing a readout at the control panel.
- d. All area monitors shall be calibrated annually at intervals not to exceed one year and after each servicing and repair.
- e. Whenever applicable, periodic surveys shall be made to determine the amount of airborne particulate radioactivity present.
- f. Whenever applicable, periodic ~~smear~~ wipe test surveys shall be made to determine the degree of contamination.
- g. All ~~area~~ surveys shall be made in accordance with the written procedures established by a qualified expert, specifically approved by the department, or the radiation safety officer of the particle accelerator facility.
- h. Records of all radiation protection surveys, calibration results, instrumentation tests, ~~and smear results shall be kept current and on file at each accelerator facility and~~ wipe test results must be maintained at the accelerator facility for inspection by the department.

8. Ventilation systems.

- a. Means shall be provided to ensure that personnel entering any area where airborne radioactivity may be produced will not be exposed to airborne radioactive material in excess

of ~~these~~ those limits specified in chapter 33-10-04, appendix A, table I.

- b. A registrant, as required by subsection 6 of section 33-10-04-02, shall not vent, release, or otherwise discharge airborne radioactive material to an unrestricted area which exceeds the limits specified in chapter 33-10-04, appendix A, table II, except as authorized pursuant to subsection 2 of section 33-10-04-04 or subdivision b of subsection 6 of section 33-10-04-02. For purposes of this subdivision, concentrations may be averaged over a period not greater than one year. Every reasonable effort should be made to maintain releases of radioactive material to unrestricted areas, as far below these limits as is reasonably achievable.

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

CHAPTER 33-10-10

33-10-10-01. Purpose and scope. This chapter establishes requirements for notices, instructions, and reports by licensees or registrants to individuals engaged in work activities under a license or registration and options available to such individuals in connection with department inspections of licensees or registrants to ascertain compliance with the provisions of North Dakota Century Code chapter 23-20.1, this article, orders, and licenses issued thereunder regarding radiological working conditions. This chapter applies to all persons who receive, possess, use, own, or transfer material sources of radiation licensed by or registered with the department pursuant to chapters 33-10-02 and 33-10-03.

~~1. Posting of notices to workers.~~

- a. Each licensee or registrant shall post current copies of the following documents:
 - ~~(1) This chapter and chapter 33-10-04.~~
 - ~~(2) The license, certificate of registration, conditions, or documents incorporated into the license by reference and amendments thereto.~~
 - ~~(3) The operating procedures applicable to work under the license or registration.~~
 - ~~(4) Any notice of violation involving radiological working conditions, proposed imposition of civil penalty, or order issued pursuant to chapter 33-10-01, and any response from the licensee or registrant.~~
- b. If posting of a document specified in paragraph 1, 2, or 3 of subdivision a is not practicable, the licensee or registrant may post a notice which describes the document and states where it may be examined.
- c. Department Form RAD 681 "Notice to Employees" shall be posted by each licensee or registrant as required by this article.
- d. Documents, notices, or forms posted pursuant to this subsection shall appear in a sufficient number of places to permit individuals engaged in work under the license or registration to observe them on the way to or from any particular work location to which the document applies, shall be conspicuous, and shall be replaced if defaced or altered.

- e. Department documents posted pursuant to paragraph 4 of subdivision a shall be posted within two working days after receipt of the documents from the department. The licensee's or registrant's response, if any, shall be posted within two working days after dispatch from the licensee or registrant. Such documents shall remain posted for a minimum of five working days or until action correcting the violation has been completed, whichever is later.
2. Instructions to workers. All individuals working in or frequenting any portion of a restricted area shall be kept informed of the storage, transfer, or use of radioactive material or of radiation in such portions of the restricted area; shall be instructed in the health protection problems associated with exposure to such radioactive material or radiation; in precautions or procedures to minimize exposure; and in the purposes and functions of protective devices employed; shall be instructed in, and instructed to observe, to the extent within the worker's control, the applicable provisions of this article and licenses for the protection of personnel from exposures to radiation or radioactive material occurring in such areas; shall be instructed of their responsibility to report promptly to the licensee or registrant any condition which may lead to or cause a violation of this article and licenses or unnecessary exposure to radiation or radioactive material; shall be instructed in the appropriate response to warnings made in the event of any unusual occurrence or malfunction that may involve exposure to radiation or radioactive material; and shall be advised as to the radiation exposure reports which workers may request pursuant to subsection 3. The extent of these instructions shall be commensurate with potential radiological health protection problems in the restricted area.
 3. Notifications and reports to individuals.
 - a. Radiation exposure data for an individual and the results of any measurements, analyses, and calculations of radioactive material deposited or retained in the body of an individual shall be reported to the individual as specified in this subsection. The information reported shall include data and results obtained pursuant to this article, orders, or license conditions, as shown in records maintained by the licensee or registrant pursuant to this article. Each notification and report shall: be in writing; include appropriate identifying data such as the name of the licensee or registrant, the name of the individual, and the individual's social security number; include the individual's exposure information; and contain the following statement:

This report is furnished to you under the provisions of North Dakota State Radiological Health Rules (North Dakota Administrative Code chapter 33-10-10). You should preserve this report for further reference.

- b. At the request of any worker, each licensee or registrant shall advise such worker annually of the worker's exposure to radiation or radioactive material as shown in records maintained by the licensee or registrant pursuant to subdivisions a and c of subsection 4 of section 33-10-04-05.
- c. At the request of a worker formerly engaged in work controlled by the licensee or the registrant, each licensee or registrant shall furnish to the worker a report of the worker's exposure to radiation or radioactive material. Such report shall be furnished within thirty days from the time the request is made, or within thirty days after the exposure of the individual has been determined by the licensee or registrant, whichever is later, shall cover, within the period of time specified in the request, each calendar quarter in which the worker's activities involved exposure to radiation from radioactive material licensed by, or radiation machines registered with the department, and shall include the dates and locations of work under the license or registration in which the worker participated during this period.
- d. When a licensee or registrant is required pursuant to subsection 5 of section 33-10-04-05 to report to the department any exposure of any individual to radiation or radioactive material, the licensee or the registrant shall also provide the individual a report on the individual's exposure data included therein. Such reports shall be transmitted at a time not later than the transmittal to the department.
- e. At the request of a worker who is terminating employment in a given calendar quarter with the licensee or registrant in work involving radiation dose, or of a worker who, while employed by another person, is terminating assignment to work involving radiation dose in the licensee's facility in that calendar quarter, each licensee or registrant shall provide to each such worker, or to the worker's designee, at termination a written report regarding the radiation dose received by the worker from operations of the licensee or registrant during that specifically identified calendar quarter or fraction thereof, or provide a written statement of that dose if the finally determined personnel monitoring results are

not available at that time. Estimated doses shall be clearly indicated as such.

4. Presence of representatives of licensees or registrants and workers during inspection.
 - a. Each licensee or registrant shall afford to the department at all reasonable times opportunity to inspect materials, machines, activities, facilities, premises, and records pursuant to this article.
 - b. During an inspection, department inspectors may consult privately with workers as specified in subsection 5. The licensee or registrant may accompany department inspectors during other phases of an inspection.
 - c. If, at the time of inspection, an individual has been authorized by the workers to represent them during department inspections, the licensee or registrant shall notify the inspectors of such authorization and shall give the workers' representative an opportunity to accompany the inspectors during the inspection of physical working conditions.
 - d. Each workers' representative shall be routinely engaged in work under control of the licensee or registrant and shall have received instructions as specified in subsection 2.
 - e. Different representatives of licensees or registrants and workers may accompany the inspectors during different phases of an inspection if there is no resulting interference with the conduct of the inspection. However, only one workers' representative at a time may accompany the inspectors.
 - f. With the approval of the licensee or registrant and the workers' representative, an individual who is not routinely engaged in work under control of the licensee or registrant, for example, a consultant to the licensee or registrant or to the workers' representative, shall be afforded the opportunity to accompany department inspectors during the inspection of physical working conditions.
 - g. Notwithstanding the other provisions of this subsection, department inspectors are authorized to refuse to permit accompaniment by any individual who deliberately interferes with a fair and orderly inspection. With regard to any area containing proprietary information, the workers' representative for that area shall be an individual previously authorized by the licensee or registrant to enter that area.

5. Consultation with workers during inspections.

- a. Department inspectors may consult privately with workers concerning matters of occupational radiation protection and other matters related to applicable provisions of this article and licenses to the extent the inspectors deem necessary for the conduct of an effective and thorough inspection.
- b. During the course of an inspection any worker may bring privately to the attention of the inspectors, either orally or in writing, any past or present condition which the worker has reason to believe may have contributed to or caused any violation of North Dakota Century Code chapter 23-20.1, this article, or license condition, or any unnecessary exposure of an individual to radiation from licensed radioactive material or a registered radiation machine under the licensee's or registrant's control. Any such notice, in writing, shall comply with the requirements of subdivision a of subsection 6.
- c. The provisions of subdivision b shall not be interpreted as authorization to disregard instructions pursuant to subsection 2.

6. Requests by workers for inspections.

- a. Any worker or representative of workers believing that violations of North Dakota Century Code chapter 23-20.1, this article, or license conditions exist or have occurred in work under a license or registration with regard to radiological working conditions in which the worker is engaged, may request an inspection by giving notice of the alleged violation to the department. Any such notice shall be in writing, shall set forth the specific grounds for the notice, and shall be signed by the worker or representative of the workers. A copy shall be provided to the licensee or registrant by the department no later than at the time of inspection except that, upon the request of the worker giving such notice, the worker's name and the name of individuals referred to therein shall not appear in such copy or on any record published, released, or made available by the department, except for good cause shown.
- b. If, upon receipt of such notice, the department determines that the complaint meets the requirements set forth in subdivision a, and that there are reasonable grounds to believe that the alleged violation exists or has occurred, an inspection shall be made as soon as practicable, to determine if such alleged violation exists or has occurred. Inspections pursuant to this subsection need not be limited to matters referred to in the complaint.

c. No license, registrant, or contractor or subcontractor of a licensee or registrant shall discharge or in any manner discriminate against any worker because such worker has filed any complaint or instituted or caused to be instituted any proceeding under this article or has testified or is about to testify in any such proceeding or because of the exercise by such worker on behalf of the worker or others of any option afforded by this chapter.

7. Inspections not warranted - informal review.

a. If the department determines, with respect to a complaint under subsection 6, that an inspection is not warranted because there are no reasonable grounds to believe that a violation exists or has occurred, the department shall notify the complainant in writing of such determination. The complainant may obtain review of such determination by submitting a written statement of position with the department which will provide the licensee or registrant with a copy of such statement by certified mail, excluding, at the request of the complainant, the name of the complainant. The licensee or registrant may submit an opposing written statement of position with the department which will provide the complainant with a copy of such statement by certified mail. Upon the request of the complainant, the department may hold an informal conference in which the complainant and the licensee or registrant may orally present their views. An informal conference may also be held at the request of the licensee or registrant, but disclosure of the identity of the complainant will be made only following receipt of written authorization from the complainant. The department shall render an informal opinion after the close of the conference. The complainant shall have the right of petition for a formal administrative hearing as provided for by North Dakota Century Code chapter 28-32 and North Dakota Administrative Code article 33-22, following the decision of such formal conference.

b. If the department determines that an inspection is not warranted because the requirements of subdivision a of subsection 6 have not been met, the department shall notify the complainant in writing of such determination. Such determination shall be without prejudice to the filing of a new complaint meeting the requirements of subdivision a of subsection 6.

History: Amended effective October 1, 1982; June 1, 1986; June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

33-10-10-02. General regulatory provisions and specific requirements.

1. Posting of notices to workers.

- a. Each licensee or registrant shall post current copies of the following documents:
 - (1) This chapter and chapter 33-10-04.
 - (2) The license, certificate of registration, conditions, or documents incorporated into the license by reference and amendments thereto.
 - (3) The operating procedures applicable to activities under the license or registration.
 - (4) Any notice of violation involving radiological working conditions, proposed imposition of civil penalty, or order issued pursuant to chapter 33-10-01, and any response from the licensee or registrant.
- b. If posting of a document specified in paragraph 1, 2, or 3 of subdivision a is not practicable, the licensee or registrant may post a notice which describes the document and states where it may be examined.
- c. Department Form RAD 681 "Notice to Employees" must be posted by each licensee or registrant as required by this article.
- d. Documents, notices, or forms posted pursuant to this subsection must appear in a sufficient number of places to permit individuals engaged in work under the license or registration to observe them on the way to or from any particular work location to which the document applies, must be conspicuous, and must be replaced if defaced or altered.
- e. Department documents posted pursuant to paragraph 4 of subdivision a must be posted within five working days after receipt of the documents from the department. The licensee's or registrant's response, if any, must be posted within five working days after dispatch from the licensee or registrant. Such documents must remain posted for a minimum of five working days or until action correcting the violation has been completed, whichever is later.

2. Instructions to workers.

a. All individuals working in or frequenting any portion of a restricted area:

- (1) Must be kept informed of the storage, transfer, or use of radioactive material or of sources of radiation in such portions of the restricted area.
- (2) Must be instructed in the health protection problems associated with exposure to such radiation or radioactive material, in precautions or procedures to minimize exposure, and in the purposes and functions of protective devices employed.
- (3) Must be instructed in, and instructed to observe, to the extent within the worker's control, the applicable provisions of this article and licenses for the protection of personnel from exposures to radiation or radioactive material occurring in such areas.
- (4) Must be instructed of their responsibility to report promptly to the licensee or registrant any condition which may constitute, lead to, or cause a violation of North Dakota Century Code chapter 23-20.1, this article, and licenses or unnecessary exposure to radiation or radioactive material.
- (5) Must be instructed in the appropriate response to warnings made in the event of any unusual occurrence or malfunction that may involve exposure to radiation or radioactive material.
- (6) Must be advised as to the radiation exposure reports which workers must be furnished pursuant to subsection 3.

b. The extent of these instructions must be commensurate with potential radiological health protection problems in the restricted area.

3. Notifications and reports to individuals.

a. Radiation exposure data for an individual and the results of any measurements, analyses, and calculations of radioactive material deposited or retained in the body of an individual must be reported to the individual as specified in this subsection. The information reported must include data and results obtained pursuant to this article, orders, or license conditions, as shown in records maintained by the licensee or registrant pursuant to subdivisions a and c of subsection 1 of section 33-10-04-05. Each notification and report must:

- (1) Be in writing.
- (2) Include appropriate identifying data such as the name of the licensee or registrant, the name of the individual, and the individual's social security number.
- (3) Include the individual's exposure information.
- (4) Contain the following statement:

This report is furnished to you under the provisions of North Dakota State Radiological Health Rules (North Dakota Administrative Code chapter 33-10-10). You should preserve this report for further reference.

- b. Each licensee or registrant shall advise each worker annually of the worker's exposure to radiation or radioactive material as shown in records maintained by the licensee or registrant pursuant to subdivisions a and c of subsection 1 of section 33-10-04-05.
- c. Each licensee or registrant shall furnish to each worker a report of the worker's exposure to radiation or radioactive material upon termination of employment. Such report must be furnished within thirty days from the time of termination of employment, or within thirty days after the exposure of the individual has been determined by the licensee or registrant, whichever is later. The report must cover each calendar quarter in which the worker's activities involved exposure to radiation from radioactive material licensed by, or radiation machines registered with the department; and must include the dates and locations of work under the license or registration in which the worker participated.
- d. When a licensee or registrant is required pursuant to subsection 5 of section 33-10-04-05 to report to the department any exposure of an individual to radiation or radioactive material, the licensee or the registrant shall also provide the individual a report on the individual's exposure data included therein. Such reports must be transmitted at a time not later than the transmittal to the department.
- e. At the request of a worker who is terminating employment in a given calendar quarter with the licensee or registrant in work involving radiation dose, or of a worker who, while employed by another person, is terminating assignment to work involving radiation dose in the licensee's facility in that calendar quarter, each licensee or registrant shall provide to each such worker,

or to the worker's designee, at termination a written report regarding the radiation dose received by that worker from operations of the licensee or registrant during that specifically identified calendar quarter or fraction thereof, or provide a written estimate of that dose if the finally determined personnel monitoring results are not available at that time. Estimated doses must be clearly indicated as such.

4. Presence of representatives of licensees or registrants and workers during inspection.
 - a. Each licensee or registrant shall afford to the department at all reasonable times opportunity to inspect materials, machines, activities, facilities, premises, and records pursuant to this article.
 - b. During an inspection, department inspectors may consult privately with workers as specified in subsection 5. The licensee or registrant may accompany department inspectors during other phases of an inspection.
 - c. If, at the time of inspection, an individual has been authorized by the workers to represent them during department inspections, the licensee or registrant shall notify the inspectors of such authorization and shall give the workers' representative an opportunity to accompany the inspectors during the inspection of physical working conditions.
 - d. Each workers' representative must be routinely engaged in work under control of the licensee or registrant and must have received instructions as specified in subsection 2.
 - e. Different representatives of licensees or registrants and workers may accompany the inspectors during different phases of an inspection if there is no resulting interference with the conduct of the inspection. However, only one workers' representative at a time may accompany the inspectors.
 - f. With the approval of the licensee or registrant and the workers' representative, an individual who is not routinely engaged in work under control of the licensee or registrant, for example, a consultant to the licensee or registrant or to the workers' representative, must be afforded the opportunity to accompany department inspectors during the inspection of physical working conditions.
 - g. Notwithstanding the other provisions of this subsection, department inspectors are authorized to refuse to permit accompaniment by any individual who deliberately

interferes with a fair and orderly inspection. With regard to any area containing proprietary information, the workers' representative for that area must be an individual previously authorized by the licensee or registrant to enter that area. With regard to areas containing information classified by an agency of the United State government in the interest of national security, an individual who accompanies an inspector may have access to such information only if authorized to do so.

5. Consultation with workers during inspections.

- a. Department inspectors may consult privately with workers concerning matters of occupational radiation protection and other matters related to applicable provisions of department rules and licenses to the extent the inspectors deem necessary for the conduct of an effective and thorough inspection.
- b. During the course of an inspection any worker may bring privately to the attention of the inspectors, either orally or in writing, any past or present condition which the worker has reason to believe may have contributed to or caused any violation of North Dakota Century Code chapter 23-20.1, this article, or license condition, or any unnecessary exposure of an individual to radiation from licensed radioactive material or a registered radiation machine under the licensee's or registrant's control. Any such notice, in writing, must comply with the requirements of subdivision a of subsection 6.
- c. The provisions of subdivision b may not be interpreted as authorization to disregard instructions pursuant to subsection 2.

6. Requests by workers for inspections.

- a. Any worker or representative of workers believing that violations of North Dakota Century Code chapter 23-20.1, this article, or license conditions exist or have occurred in work under a license or registration with regard to radiological working conditions in which the worker is engaged, may request an inspection by giving notice of the alleged violation to the department. Any such notice must be in writing, must set forth the specific grounds for the notice, and must be signed by the worker or representative of the workers. A copy must be provided to the licensee or registrant by the department no later than at the time of inspection except that, upon the request of the worker giving such notice, the worker's name and the name of individuals referred to therein may not appear in such

copy or on any record published, released, or made available by the department, except for good cause shown.

b. If, upon receipt of such notice, the department determines that the complaint meets the requirements set forth in subdivision a and that there are reasonable grounds to believe that the alleged violation exists or has occurred, an inspection must be made as soon as practicable, to determine if such alleged violation exists or has occurred. Inspections pursuant to this subsection need not be limited to matters referred to in the complaint.

c. No license, registrant, or contractor or subcontractor of a licensee or registrant may discharge or in any manner discriminate against any worker because such worker has filed any complaint or instituted or caused to be instituted any proceeding under this article or has testified or is about to testify in any such proceeding or because of the exercise by such worker on behalf of the worker or others of any option afforded by this chapter.

7. Inspections not warranted - informal review.

a. (1) If the department determines, with respect to a complaint under subsection 6, that an inspection is not warranted because there are no reasonable grounds to believe that a violation exists or has occurred, the department shall notify the complainant in writing of such determination. The complainant may obtain review of such determination by submitting a written statement of position with the department which will provide the licensee or registrant with a copy of such statement by certified mail, excluding, at the request of the complainant, the name of the complainant. The licensee or registrant may submit an opposing written statement of position with the department which will provide the complainant with a copy of such statement by certified mail.

(2) Upon the request of the complainant, the department may hold an informal conference in which the complainant and the licensee or registrant may orally present their views. An informal conference may also be held at the request of the licensee or registrant but disclosure of the identity of the complainant will be made only following receipt of written authorization from the complainant. The department shall render an informal opinion after the close of the conference. The complainant shall have the right of petition for a formal administrative hearing as provided for by North Dakota Century Code chapter 28-32 and North Dakota Administrative Code article

33-22, following the decision of such formal conference.

- b. If the department determines that an inspection is not warranted because the requirements of subdivision a of subsection 6 have not been met, the department shall notify the complainant in writing of such determination. Such determination must be without prejudice to the filing of a new complaint meeting the requirements of subdivision a of subsection 6.

History: Effective June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

CHAPTER 33-10-11

33-10-11-01. Purpose. This chapter establishes fees charged for the issuance of licenses and registration certificates by the department. This chapter also establishes fees charged to recover costs associated with regulatory inspections and surveys of licensees and registrants based upon a prescribed schedule by licensee or registrant type.

History: Effective October 1, 1982; amended effective June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 23-20.1-04

33-10-11-03. Exemptions. No application fees, license fees, amendment fees, renewal fees, or special project fees, shall be required for:

1. A license authorizing the use of source material as shielding only in devices and containers; provided, however, that all other licensed byproduct material, source material, or special nuclear material in the device or container will be subject to the fees prescribed in Appendix A of this chapter.
2. ~~Agencies of the state of North Dakota shall be exempt from the fees prescribed in Appendix A of this chapter.~~ Nonprofit educational institutions are exempt from the fees prescribed in appendices A and B of this chapter. This exemption does not apply to those radioactive material licenses or machine registration certificates which authorize any of the following:
 - a. Human use.
 - b. Remunerated services to other persons.
 - c. Distribution of byproduct material, source material, or special nuclear material, or products containing byproduct material, sour material, or special nuclear material.
 - d. Activities performed under a government contract.
3. The department may, upon application by an interested person, or upon its own initiative, grant such exemptions from the requirements of this chapter as it determines are authorized by law and are otherwise in the public interest.

History: Effective October 1, 1982; amended effective June 1, 1986; June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 23-20.1-04

33-10-11-04. Payment of fees.

1. License and registration fees. The appropriate licensing or registration fee shall accompany the application for licensure or registration when filed with the department.
2. Amendment fees. The appropriate amendment fee shall accompany the application for amendment when filed with the department.
3. Renewal fees. The appropriate renewal fee shall accompany the renewal application when filed with the department.
4. Reciprocity fee. The appropriate reciprocity fee shall accompany the written notification as required in section sections 33-10-03-06 and 33-10-02-12.
5. Special project fees. Fees for special projects are payable upon notification by the department when the review of the project is completed. Special projects mean those projects submitted to the department for review and for which specific fees are not prescribed in this chapter. Special project fees will be based upon the current professional staff hourly rate (thirty-three percent of the current nuclear regulatory commission rate listed in 10 CFR 170.20).
6. Annual fees. Annual fees are required to be paid by all radioactive material licensees no later than the anniversary date of the license expiration date (e.g., a license that expires April 30, 1996, will have the annual fee due not later than April thirtieth of each calendar year). The initial application or renewal fee constitutes the first year annual fee and annual fees for North Dakota licensees will be only required for the second through fifth years of the license.
7. Inspection and survey fees. Fees for regulatory inspections and surveys of North Dakota licensees are included in the registration or application and renewal fees for each registration or license type. Special inspections will require the nonroutine inspection fee to be paid upon notification by the department when the inspection has been completed. Reciprocity licensees which are inspected will be billed for the routine or nonroutine inspection for the license type, as appropriate.
8. Method of payment. Fee payments shall be by check, draft, or money order made payable to the North Dakota state department of health and consolidated laboratories.
- ~~7-~~ 9. Return of application and fee payment. The application for licensure or registration shall be accompanied by the fee payment and shall be submitted to:

North Dakota State Department of Health

and Consolidated Laboratories
Division of Environmental Engineering
1200 Missouri Avenue, Room 304
Box 5520
Bismarck, ND 58502-5520

History: Effective October 1, 1982; amended effective June 1, 1986;
June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 23-20.1-04

APPENDIX A
SCHEDULE OF FEES FOR RADIOACTIVE MATERIAL LICENSES

Applicants for radioactive material licenses and other regulatory services and holders of radioactive material licenses shall pay the following fees:

Category of material licenses	Type of fee	Fee (in dollars)
a. Licenses for possession and use of special nuclear material in sealed sources contained in devices used in industrial measuring systems.	Application-New license	110
	Renewal	110
	Amendment	40
b. All other special nuclear material licenses, except licenses authorizing special nuclear material in unsealed form in combination that would constitute a critical quantity.	Application-New license	460
	Renewal	460
	Amendment	110
c. Licenses for possession and use of source material in milling operations, except in in-situ leaching and heap-leaching operations.	Application	11,000
	New license	96,700
	Renewal	100,800
	Amendment:	
	Major-safety and environmental	20,800
	Minor-safety and environmental	3,500
d. Licenses for processing and recovery of source material in in-situ leaching operations or heap-leaching operations.	Production scale activity:	
	Application	7,000
	New license	59,500
	Research and development scale activity:	
	Application	2,000
	New license	21,800
	Renewal	17,300
	Amendment:	
	Major-safety and environmental	4,200
	Minor-safety and environmental	760

	Administrative	150
e. Licenses for refining uranium mill concentrates to uranium hexafluoride.	Application	11,000
	New license	96,700
	Renewal	45,800
	Amendment:	
	Major safety and environmental	20,800
	Minor safety and environmental	3,500
	Administrative	150
f. All other source material licenses.	Application-New license	140
	Renewal	70
	Amendment	40
g. Licenses for possession and use of radioactive material issued pursuant to chapter 33-10-03 for processing or manufacturing of items containing radioactive material for commercial distribution.	Application-New license	460
	Renewal	460
	Amendment	110
h. Licenses issued pursuant to chapter 33-10-03 authorizing the processing or manufacture and distribution of radiopharmaceuticals containing radioactive material.	Application-New license	190
	Renewal	150
	Amendment	40
i. Licenses for radioactive material issued pursuant to chapter 33-10-05 for industrial radiography operations performed in shielded radiography installations or permanently designated areas at the addresses listed in the license.	Application-New license	190
	Renewal	150
	Amendment	40
j. Licenses for radioactive material issued pursuant to chapter 33-10-03 for industrial radiography operations performed in a shielded radiography	Application-New license	460
	Renewal	460
	Amendment	110

installations and at multiple temporary locations at the addresses shown in the licenses or at temporary jobsites of the licensee in the field.

k. Licenses for possession and use of radioactive material in sealed sources for irradiation of materials where the source is not removed from its shield (self-shielded units).	Application-New license	190
	Renewal	150
	Amendment	40
l. Licenses for possession and use of radioactive material in sealed sources for irradiation of materials where the source is exposed for irradiation purposes.	Application-New license	460
	Renewal	460
	Amendment	110
m. Licenses issued to distribute timepieces, hands, and dials containing hydrogen-3 or promethium-147 to persons exempt from the licensing requirements of chapter 33-10-03.	Application-New license	190
	Renewal	150
	Amendment	40
n. Licenses for possession and use of radioactive material for research and development, except those licenses covered by category g or h and licenses covered by category s(2) or s(3) authorizing material research.	Application-New license	190
	Renewal	150
	Amendment	40
o. All other specific radioactive material licenses, except those in categories p(1) through t.	Application-New license	110
	Renewal	110
	Amendment	40

p. Waste disposal:

(1) Licenses	Application	32,000
specifically	New license	291,100
authorizing the	Renewal	98,500
receipt of waste	Amendment:	
radioactive material	Major safety and	197,700
from other persons	environmental	
for the purpose of	Minor safety and	690
commercial disposal	environmental	
by land or sea	Administrative	150
burial by the		
licensee.		

(2) Licenses	Application New license	1,100
specifically	Renewal	570
authorizing the	Amendment:	
receipt of waste	Safety and	570
radioactive material	environmental	
from other persons	Administrative	150
for the purpose of		
packaging the		
material. The		
licensee will dispose		
of the material by		
transfer to another		
person authorized to		
receive or dispose		
of the material.		

(3) Licenses	Application New license	190
specifically	Renewal	150
authorizing the	Amendment	40
receipt of		
prepackaged waste		
radioactive		
material from		
other persons. The		
licensee will		
dispose of the		
material by		
transfer to another		
person authorized to		
receive or dispose		
of the material.		

q. Well logging and well	Application New license	460
surveys and tracer	Renewal	460
studies:	Amendment	110
Licenses for possession		
and use of radioactive		

material for well logging, well surveys, and tracer studies.

r.	Nuclear laundries:	Application-New license	460
	Licenses for commercial collection and laundry of items contaminated with radioactive material.	Renewal	460
		Amendment	110
s.	Human use of radioactive material, source material, or special nuclear material:		
	(1) Licenses issued for human use of radioactive material in sealed sources contained in teletherapy devices.	Application-New license	300
		Renewal	270
		Amendment	40
	(2) Licenses issued to medical institutions, or two or more physicians on a single license, for human use of radioactive material except licenses in category s(1).	Application-New license	190
		Renewal	150
		Amendment	40
	(3) Licenses issued to an individual physician for human use of radioactive material, source material, or special nuclear material, except licenses in category s(1).	Application-New license	190
		Renewal	150
		Amendment	40
t.	Civil defense: Licenses for possession and use of radioactive material for civil defense activities.	Application-New license	190
		Renewal	150
		Amendment	40
u.	Certificate in vitro testing with radioactive material under general	Application-3 yr. certificate	40

license.

v. Reciprocity.

Annual fee

300

Category of Materials Licenses and Types of Fees

Fee (\$)

<p>1. Special nuclear material:</p> <p>A. Licenses for possession and use of 200 grams or more of plutonium in unsealed form or 350 grams or more of contained U-235 in unsealed form or 200 grams or more of U-233 in unsealed form. This includes applications to terminate licenses as well as licenses authorizing possession only:</p> <p>Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>Full Cost Full Cost Full Cost Full Cost Full Cost 35,725</p>
<p>B. Licenses for receipt and storage of spent fuel at an independent spent fuel storage installation (ISFSI): (Regulated by NRC)</p>	<p>N/A</p>
<p>C. Licenses for possession and use of special nuclear material in sealed sources contained in devices used in industrial measuring systems, including X-ray fluorescence analyzers:</p> <p>Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>320 250 125 155 435 375</p>
<p>D. All other special nuclear material licenses, except licenses authorizing special nuclear material in unsealed form in combination that would constitute a critical quantity.</p> <p>Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>460 345 75 230 265 625</p>
<p>2. Source material:</p> <p>A. Licenses for possession and use of source material in recovery operations such as milling, in-situ leaching, heap-leaching, refining uranium mill concentrates to uranium hexafluoride, or buying stations, ion exchange facilities and in processing of ores containing source material for extraction of metals other than uranium or thorium, including licenses authorizing the possession of byproduct waste material (tailings) from source material recovery operations, as well as licenses authorizing the possession and maintenance of a facility in a standby mode:</p> <p>Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>Full Cost Full Cost Full Cost Full Cost Full Cost 189,565</p>
<p>B. Licenses for possession and use of source material for shielding:</p> <p>Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>110 55 40 95 115 105</p>

<p>C. All other source material licenses:</p> <ul style="list-style-type: none"> Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee 	<ul style="list-style-type: none"> 530 250 150 265 500 765
<p>3. Byproduct material:</p> <p>A. Licenses of broad scope for possession and use of byproduct material issued pursuant to chapter 33-10-03 for processing or manufacturing of items containing byproduct material for commercial distribution:</p> <ul style="list-style-type: none"> Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee 	<ul style="list-style-type: none"> 1465 1165 75 700 1050 2200
<p>B. Other licenses for possession and use of byproduct material issued pursuant to chapter 33-10-03 for processing or manufacturing of items containing byproduct material for commercial distribution:</p> <ul style="list-style-type: none"> Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee 	<ul style="list-style-type: none"> 765 435 185 335 665 1100
<p>C. Licenses issued pursuant to chapter 33-10-03 authorizing the processing or manufacturing and distribution or redistribution of radiopharmaceuticals, generators, reagent kits and/or sources and devices containing byproduct material:</p> <ul style="list-style-type: none"> Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee 	<ul style="list-style-type: none"> 1135 465 150 465 635 2500
<p>D. License and approvals issued pursuant to chapter 33-10-03 authorizing distribution or redistribution of radiopharmaceuticals, generators, reagent kits and/or sources or devices not involving processing of byproduct material:</p> <ul style="list-style-type: none"> Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee 	<ul style="list-style-type: none"> 365 165 105 265 400 875
<p>E. Licenses for possession and use of byproduct material in sealed sources for irradiation of materials in which the source is not removed from its shield (self-shielded units):</p> <ul style="list-style-type: none"> Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee 	<ul style="list-style-type: none"> 165 160 115 155 230 405
<p>F. License for possession and use of less than 10,000 curies of byproduct material in sealed sources for irradiation of materials in which the source is exposed for irradiation purposes:</p> <ul style="list-style-type: none"> Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee 	<ul style="list-style-type: none"> 400 135 115 195 425 840

<p>G. Licenses for possession and use of 10,000 curies or more of byproduct material in sealed sources for irradiation of materials in which the source is exposed for irradiation purposes:</p> <p>Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>1535 635 155 335 465 3575</p>
<p>H. Licenses issued pursuant to chapter 33-10-03 to distribute items containing byproduct material that require device review to persons exempt from the licensing requirements of chapter 33-10-03, except specific licenses authorizing redistribution of items that have been authorized for distribution to persons exempt from the licenses of chapter 33-10-03:</p> <p>Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>700 365 85 230 345 1440</p>
<p>I. Licenses issued pursuant to chapter 33-10-03 to distribute items containing byproduct material or quantities of byproduct material that do not require device evaluation to persons exempt from the licensing requirements of chapter 33-10-03, except for specific licenses authorizing redistribution of items that have been authorized for distribution to persons exempt from the licensing requirements of chapter 33-10-03:</p> <p>Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>865 400 115 155 230 1705</p>
<p>J. Licenses issued pursuant to chapter 33-10-03 to distribute items containing byproduct material that require sealed source and/or device review to persons generally licensed under chapter 33-10-03, except specific licenses authorizing redistribution of items that have been authorized for distribution to persons generally licensed under this chapter:</p> <p>Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>835 195 130 230 345 1705</p>
<p>K. Licenses issued pursuant to chapter 33-10-03 to distribute items containing byproduct material or quantities byproduct material that do not require sealed source and/or device review to persons generally licensed under this chapter, except specific licenses authorizing for redistribution of items that have been authorized for distribution to persons generally licensed under this chapter:</p> <p>Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>635 315 95 230 345 1340</p>

<p>L. License of broad scope for possessions and use of byproduct material issued pursuant to chapter 33-10-03 for research and development that do not authorize commercial distribution:</p> <p>Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>765 665 165 310 400 600</p>
<p>M. Other licenses for possession and use of byproduct material issued pursuant to chapter 33-10-03 for research and development that do not authorize commercial distribution:</p> <p>Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>365 365 210 265 310 935</p>
<p>N. Licenses that authorize services for other licensees, except (1) licenses that authorize calibration and/or leak testing services only are subject to the fees specified in fee Category 3P, and (2) licenses that authorize waste disposal services are subject to the fees specified in fee Categories 4A, 4B, and 4C:</p> <p>Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>465 265 135 230 345 1065</p>
<p>O. License for possession and use of byproduct material issued pursuant to chapter 33-10-05 for industrial radiography operations:</p> <p>Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>1000 600 165 400 835 600</p>
<p>P. All other specific byproduct material licenses, except those in Categories 4A through 9D:</p> <p>Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>250 165 125 400 600 475</p>
<p>4. Waste disposal and processing:</p> <p>A. Licenses specifically authorizing the receipt of waste byproduct material, source material or special nuclear material from other persons for the purpose of contingency storage or commercial land disposal by the licensee; or licenses authorizing contingency storage of low level radioactive waste at the site of nuclear power reactors; or licenses for receipt of waste from other persons for incineration or other treatment, packaging of resulting waste and residues, and transfer of packages to another person authorized to receive or dispose of waste material:</p> <p>Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>Full Cost Full Cost Full Cost Full Cost Full Cost 21,295</p>

<p>B. Licenses specifically authorizing the receipt of waste byproduct material, source material from other persons for the purpose of packaging or repackaging the material. The license will dispose of the material by transfer to another person authorized to receive or dispose of the material:</p> <p>Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>935 635 65 535 700 3165</p>
<p>C. Licenses specifically authorizing the receipt of prepackaged waste byproduct material, source material, or special nuclear material from other persons. The licensee will dispose of the material by transfer to another person authorized to receive or dispose of the material:</p> <p>Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>635 310 75 535 700 1800</p>
<p>5. Well logging:</p> <p>A. A licenses for possession and use of byproduct material, source material, and/or special nuclear material for well logging, well surveys, and tracer studies other than field flooding tracer studies:</p> <p>Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>1135 665 180 265 400 2305</p>
<p>B. Licenses for possession and use of byproduct material for field flooding tracer studies:</p> <p>Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>Full Cost Full Cost Full Cost 230 335 3435</p>
<p>6. Nuclear laundries:</p> <p>A. Licenses for commercial collection and laundry of items contaminated with byproduct material, source material, or special nuclear material:</p> <p>Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>700 465 115 400 635 1200</p>
<p>7. Human use of byproduct, source, or special nuclear material:</p> <p>A. Licenses issued pursuant to chapter 33-10-03 for human use of byproduct material, source material, or special nuclear material in sealed sources contained in teletherapy devices:</p> <p>Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>1135 265 145 400 635 3205</p>

<p>B. Licenses of broad scope issued to medical institutions or two or more physicians pursuant to chapter 33-10-03 authorizing research and development, including human use of byproduct material, except licenses for byproduct material, source material, or special nuclear material in sealed sources contained in teletherapy devices:</p> <p>Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>765 665 120 535 600 2900</p>
<p>C. Other licenses issued pursuant to chapter 33-10-03 for human use of byproduct material, source material, and/or special nuclear material, except licenses for byproduct material, source material, or special nuclear material in sealed sources contained in teletherapy devices:</p> <p>Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>235 335 145 335 500 1140</p>
<p>8. Civil defense:</p> <p>A. Licenses for possession and use of byproduct material, source material, or special nuclear material for civil defense activities:</p> <p>Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>195 135 105 230 230 440</p>
<p>9. Device, product or sealed source safety evaluation:</p> <p>A. Safety evaluation of devices or products containing byproduct material, source material, or special nuclear material, except reactor fuel devices, for commercial distribution:</p> <p>Application-each device Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>1100 1100 400 Full Cost Full Cost 2040</p>
<p>B. Safety evaluation of devices or products containing byproduct material, source material, or special nuclear material manufactured in accordance with the unique specifications of, and for use by a single applicant, except reactor fuel devices:</p> <p>Application-each device Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>800 535 195 Full Cost Full Cost 1040</p>
<p>C. Safety evaluation of sealed sources containing byproduct material, source material, or special nuclear material, except reactor fuel, for commercial distribution:</p> <p>Application-each device Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>345 230 75 Full Cost Full Cost 440</p>

D. Safety evaluation of sealed sources containing byproduct material, source material, or special nuclear material, manufactured in accordance with the unique specifications of, and for use by a single applicant, except reactor fuel: Application-each source Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee	175 115 40 Full Cost Full Cost 225
10. Transportation of radioactive material: (Regulated by NRC)	N/A
11. Review of standardized spent fuel facilities: (Regulated by NRC)	N/A
12. Special projects:	Full Cost
13. A. Spent fuel storage cask Certificate of Compliance: (Regulated by NRC)	N/A
B. Inspections related to spent fuel storage cask Certificate of Compliance: (Regulated by NRC)	N/A
C. Inspections related to storage of spent fuel under of this chapter: (Regulated by NRC)	N/A
14. Byproduct, source or special nuclear material licenses and other approvals authorizing decommissioning, decontamination, reclamation or site restoration activities pursuant to 10 CFR parts 30, 40, 70 and 72 of this chapter: Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee	Full Cost Full Cost Full Cost Full Cost Full Cost Full Cost
15. Import and Export licenses: (Regulated by NRC)	N/A
16. Reciprocity: Other agreement state and NRC licensees who conduct activities in North Dakota under the reciprocity provisions of chapters 33-10-02 and 33-10-03. Application fee (due 3 days prior to entry into State) Inspections (routine and nonroutine)	Fees as specified in annual fees for license type Fees as specified under inspection fees for license type
17. Demonstration and sales of devices containing radioactive materials.	100 per year
18. Radiation training courses.	100 per year
19. Decontamination services.	500 per year
20. Installation, removal, repair and servicing of devices containing radioactive materials.	475 per year

<p>21. Multiple offices: Add the following fees per additional office location: Application-New License Renewal Amendment Inspection (routine) Inspection (nonroutine) Annual Fee</p>	<p>25% of base fee 25% of base fee same as base fee same as base fee same as base fee 25% of base fee</p>
<p>22. Administrative amendment (limited to the following amendment requests: - Corporate name change - Minor O&E manual changes (industrial sources) - Filing of training certificates (gauge users)</p>	<p>\$55</p>
<p>23. Inspection of radioactive materials package shipments to low-level radioactive waste disposal facility.</p>	<p>Full cost</p>
<p>24. Certificate - in vitro testing with radioactive material under general license. Application - 3 year certificate.</p>	<p>\$75</p>

History: Effective October 1, 1982; amended effective June 1, 1986; June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 23-20.1-04

APPENDIX B
SCHEDULE OF FEES FOR REGISTRATION CERTIFICATION AND INSPECTIONS

Applications for registration of radiation machines and other regulatory services shall pay the following fees for each machine that they possess and use at their facilities. The fees cover a three-year registration period and the renewal fee is the amount listed.

Registration Category	Fee/Machine (in dollars)
Dentistry	30 <u>60</u>
Medical:	
A. Radiographic Machine <u>including computed tomography</u>)	40 <u>100</u>
B. Fluoroscopic Machine	40 <u>150</u>
C. Combined Radiographic-Fluoroscopic	60 <u>200</u>
D. (1) Therapeutic: Linear Accelerator (<10 MEV)	50 <u>150</u>
(2) Therapeutic: Linear Accelerator (>10 MEV)	50 <u>250</u>
E. Superficial X-ray	30 <u>75</u>
Chiropractic	40 <u>90</u>
Podiatry	40 <u>75</u>
Veterinary Medicine	30 <u>60</u>
Industrial Radiography	50 <u>250</u>
Accelerators (Industrial and Research)	50 <u>150</u>
Education <u>and</u> Research	50 <u>150</u>
<hr/>	
<u>Other Registration Fee and Services</u>	<u>Annual Service Fees</u> (in dollars)
<u>X-ray Service and Installers</u>	<u>150</u>
<u>Radiation Training Courses</u>	<u>100</u>
<u>X-ray Sales and Demonstrations</u>	<u>150</u>
<u>Combined Sales and Service (Assembler)</u>	<u>200</u>
<u>Dosimeterists and Physicists</u>	<u>100</u>

Shielding Evaluations (Routine) 150 per evaluation

Shielding Evaluations (Nonroutine) Full cost

Reciprocity (X-ray producing machines) 150 per year

History: Effective October 1, 1982; amended effective June 1, 1986;
June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 23-20.1-04

CHAPTER 33-10-12

33-10-12-01. Purpose. This chapter establishes radiation safety requirements for persons using sources of radiation for ~~wire line~~ wireline service operations including mineral logging, radioactive markers, and subsurface tracer studies. The requirements of this chapter are in addition to, and not in substitution for, the requirements of chapters 33-10-01, 33-10-02, 33-10-03, 33-10-04, and 33-10-10.

History: Effective June 1, 1986; amended effective June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-12-03. Definitions. As used in this chapter, the following definitions apply:

1. "Field station" means a facility where radioactive sources may be stored or used and from which equipment is dispatched to temporary jobsites.
2. "Injection tool" means a device used for controlled subsurface injection of radioactive tracer material.
3. "Logging assistant" means any individual who, under the personal supervision of a logging supervisor, handles sealed sources or tracers that are not in logging tools or shipping containers or who performs surveys required by subsection 1 of section 33-10-12-08.
4. "Logging supervisor" means the individual who uses sources of radiation or provides personal supervision of the utilization of sources of radiation at the well site.
- ~~4.~~ 5. "Logging tool" means a device used subsurface to perform well logging.
- ~~5.~~ 6. "Mineral logging" means any logging performed for the purpose of mineral exploration other than oil or gas.
- ~~6.~~ 7. "Personal supervision" means guidance and instruction by the supervisor who is physically present at the jobsite and watching the performance of the operation in such proximity that contact can be maintained and immediate assistance given as required.
- ~~7.~~ 8. "Radioactive marker" means radioactive material placed subsurface or on a structure intended for subsurface use for the purpose of depth determination or direction orientation.

- ~~8-~~ 9. "Source holder" means a housing or assembly into which a radioactive source is placed for the purpose of facilitating the handling and use of the source in well logging operations.
- ~~9-~~ 10. "Subsurface tracer study" means the release of a substance tagged with radioactive material for the purpose of tracing the movement or position of the tagged substance in the well bore or adjacent formation.
- ~~10-~~ 11. "Temporary jobsite" means a location ~~to which~~ where radioactive materials ~~have been dispatched to perform wireline~~ are present for the purpose of performing wireline service operations or subsurface tracer studies.
- 12. "Uranium sinker bar" means a weight containing depleted uranium used to pull a logging tool down toward the bottom of a well.
- ~~11-~~ 13. "Well bore" means a drilled hole in which ~~wire line~~ wireline service operations and subsurface tracer studies are performed.
- ~~12-~~ 14. "Well logging" means that all operations involving the lowering and raising of measuring devices or tools which may contain sources of radiation into well bores or cavities for the purpose of obtaining information about the well and or adjacent formations.
- ~~13-~~ 15. "~~Wire line~~ Wireline" means a cable containing one or more electrical conductors which is used to lower and raise logging tools in the well bore.
- ~~14-~~ 16. "~~Wire line~~ Wireline service operation" means any evaluation or mechanical service which is performed in the well bore using devices on a ~~wire line~~ wireline.

History: Effective June 1, 1986; amended effective June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-12-04. Prohibition. No licensee may perform ~~wire line~~ wireline service operations with a sealed source unless, prior to commencement of the operations, the licensee has a written agreement with the well operator, wellowner, drilling contractor, or landowner that:

1. In the event a sealed source is lodged downhole, a reasonable effort, at recovery will be made; and
2. In the event a decision is made to abandon the sealed source downhole, the requirements of ~~subdivision c~~ of subsection ~~+~~ 3 of section 33-10-12-09 shall be met.

History: Effective June 1, 1986; amended effective June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

33-10-12-05. Equipment control.

1. Limits on levels of radiation. Sources of radiation shall be used, stored, and transported in such a manner that the transportation requirements of chapter ~~33-10-03~~ 33-10-13 and the dose limitation requirements of chapter 33-10-04 are met.
2. Storage precautions.
 - a. Each source of radiation, except accelerators, must be provided with a storage or transport container. The container shall be provided with a lock, or tamper seal for calibration sources, to prevent unauthorized removal of, or exposure to, the source of radiation.
 - b. Sources of radiation shall be stored in a manner which will minimize danger from explosion or fire.
3. Transport precautions. Transport containers shall be physically secured to the transporting vehicle to prevent accidental loss, tampering, or unauthorized removal.
4. Radiation survey instruments.
 - a. The licensee or registrant shall maintain sufficient calibrated and operable radiation survey instruments at each field station to make physical radiation surveys as required by this chapter and by subsection 1 of section 33-10-04-03. Instrumentation shall be capable of measuring one-tenth milliroentgen [25.8 nanocoulombs per kilogram] per hour through at least ~~twenty~~ twenty five milliroentgens [12.9 microcoulombs per kilogram] per hour. Survey instruments acquired before March 1, 1992, and capable of measuring one-tenth milliroentgen [25.8 nanocoulombs per kilogram] per hour through at least twenty milliroentgens [5.16 microcoulombs per kilogram] per hour also satisfy this requirement until March 1, 1997.
 - b. Each radiation survey instrument shall be calibrated:
 - (1) At intervals not to exceed six months and after each instrument servicing;
 - (2) ~~At energies and radiation levels appropriate for use.~~ For linear scale instruments, at two points located approximately one-third and two-thirds of full-scale on each scale; for logarithmic scale instruments, at

midrange of each decade, and at two points of at least one decade; and for digital instruments, at appropriate points; and

(3) So that accuracy within plus or minus twenty percent of the true radiation level can be demonstrated on each scale.

c. Calibration records shall be maintained for a period of ~~two~~ three years for inspection by the department.

5. Leak testing of sealed sources.

a. Requirements. Each licensee using sealed sources of radioactive material shall have the sources tested for leakage. Records of leak test results shall be kept in units of microcuries [becquerels] and maintained for inspection by the department for ~~six months after the next required leak test is performed or until transfer or disposal of the sealed source~~ three years from the date the leak test is performed.

b. Method of testing. Tests for leakage shall be performed only by persons specifically authorized to perform such tests by the department, the United States nuclear regulatory commission, an agreement state, or a licensing state. The test sample shall be taken from the surface of the source, source holder, or from the surface of the device in which the source is stored or mounted and on which one might expect contamination to accumulate. The test sample shall be analyzed for radioactive contamination, and the analysis shall be capable of detecting the presence of five-thousandths microcurie [185 becquerels] of radioactive material on the test sample.

c. Interval of testing. Each sealed source of radioactive material shall be tested at intervals not to exceed six months. In the absence of a certificate from a transferor indicating that a test has been made prior to the transfer, the sealed source may not be put into use until tested. If, for any reason, it is suspected that a sealed source may be leaking, it shall be removed from service immediately and tested for leakage as soon as practical.

d. Leaking or contaminated sources. If the test reveals the presence of five-thousandths microcurie [185 becquerels] or more of leakage or contamination, the licensee shall immediately withdraw the source from use and shall cause it to be decontaminated, repaired, or disposed of in accordance with this article. A report describing the equipment involved, the test results, and the corrective action taken shall be filed with the department within five days of receiving the test results.

- e. Exemptions. The following sources are exempt from the periodic leak test requirements of subdivisions a, b, c, and d of this subsection:
- (1) Hydrogen-3 sources.
 - (2) Sources of radioactive material with a half-life of thirty days or less.
 - (3) Sealed sources of radioactive material in gaseous form.
 - (4) Sources of beta and/or gamma emitting radioactive material with an activity of one hundred microcuries [3.7 megabecquerels] or less.
 - (5) Sources of alpha emitting radioactive material with an activity of ten microcuries [370 kilobecquerels] or less.
6. Quarterly inventory. Each licensee or registrant shall conduct a quarterly physical inventory to account for all sources, of radiation. Records or inventories shall be maintained for ~~two~~ three years from the date of the inventory for inspection by the department and shall include the quantities and kinds of sources of radiation, the location where sources of radiation are assigned, the date of the inventory, and the name of the individual conducting the inventory.
7. Utilization records. Each licensee or registrant shall maintain current records, which shall be ~~kept available~~ maintained for inspection by the department for ~~two~~ three years from the date of the recorded event, showing the following information for each source of radiation:
- a. Make, model number, and a serial number or a description of each source of radiation used.
 - b. The identity of the well-logging supervisor or field unit to whom assigned.
 - c. Locations where used and dates of use.
 - d. In the case of tracer materials and radioactive markers, the utilization record shall indicate the radionuclide and activity used in a particular well.
8. Design, performance, and certification criteria for sealed sources used in downhole operations.
- a. Each sealed source, except those containing radioactive material in gaseous form, used in downhole operations and

manufactured after June 1, 1986, shall be certified by the manufacturer, or other testing organization acceptable to the department, to meet the following minimum criteria:

- (1) Be of doubly encapsulated construction.
 - (2) Contain radioactive material whose chemical and physical forms are as insoluble and nondispersible as practical.
 - (3) Has been individually pressure tested to at least twenty-four thousand, six hundred fifty-six pounds per square inch absolute without failure.
- b. For sealed sources, except those containing radioactive material in gaseous form, acquired after June 1, 1986, in the absence of a certificate from a transferor certifying that an individually sealed source meets the requirements of subdivision a, the sealed source shall not be put into use until such determinations and testing have been performed.
- c. Each sealed source, except those containing radioactive material in gaseous form, used in downhole operations after June 1, 1986, shall be certified by the manufacturer, or other testing organization acceptable to the department, as meeting the sealed source performance requirements for oil well logging as contained in the American national standard ~~N542, Sealed Radioactive Sources,~~ N43.6, "Classification of Sealed Radioactive Sources," (formerly N542, ANSI/NBS 126) in effect on June 1, 1986.
- d. Certification documents shall be maintained for inspection by the department for a period of ~~two~~ three years after source disposal. If the source is abandoned downhole, the certification documents shall be maintained until the department authorizes disposition.

9. Labeling.

- a. Each source, source holder, or logging tool containing radioactive material shall bear a durable, legible, and clearly visible marking or label, which has, as a minimum, the standard radiation caution symbol, without the conventional color requirement, and the following wording:

DANGER*
RADIOACTIVE

This labeling shall be on the smallest component transported as a separate piece of equipment.

- b. Each transport container shall have permanently attached to it a durable, legible, and clearly visible label which has, as a minimum, the standard radiation caution symbol and the following wording:

DANGER*
RADIOACTIVE
NOTIFY CIVIL AUTHORITIES (OR NAME OF COMPANY)

* or CAUTION

10. Inspection and maintenance.

- a. Each licensee or registrant shall conduct, at intervals not to exceed six months, a program of inspection and maintenance of source holders, logging tools, source handling tools, storage containers, transport containers, and injection tools to assure proper labeling and physical condition. Records of inspection and maintenance shall be maintained for a period of ~~two~~ three years for inspection by the department.
- b. If any inspection conducted pursuant to subdivision a of this subsection reveals damage to labeling or components critical to radiation safety, the device shall be removed from service until repairs have been made.
- c. If a sealed source is stuck in the source holder, the licensee may not perform any operation, such as drilling, cutting, or chiseling, on the source holder unless the licensee is specifically approved by the United States nuclear regulatory commission, an agreement state, or a licensing state to perform this operation.
- d. The repair, opening, or modification of any sealed source shall be performed only by persons specifically authorized to do so by the department, the United States nuclear regulatory commission, an agreement state, or a licensing state.

History: Effective June 1, 1986; amended effective June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-12-06. Requirement for personnel safety.

1. Training requirements.

- a. No licensee or registrant may permit any individual to act as a logging supervisor as defined in this chapter until such individual has:

- (1) Received, in a course recognized by the department, the United States nuclear regulatory commission, an agreement state, or a licensing state, instruction in the subjects outlined in appendix A of this chapter and demonstrated an understanding thereof.
 - (2) Read and received instruction in the rules contained in this chapter and the applicable sections of chapters 33-10-01, 33-10-04, and 33-10-10 or their equivalent, conditions of appropriate license or certificate of registration, and the licensee's or registrant's operating and emergency procedures, and demonstrated an understanding thereof.
 - (3) Demonstrated competence to use sources of radiation, related handling tools, and radiation survey instruments which will be used on the job.
- b. No licensee or registrant may permit any individual to assist in the handling of sources of radiation until such individual has:
- (1) Read or received instruction in the licensee's or registrant's operating and emergency procedures and demonstrated an understanding thereof.
 - (2) Demonstrated competence to use, under the personal supervision of the logging supervisor, the sources of radiation, related handling tools, and radiation survey instruments which will be used on the job.
- c. The licensee or registrant shall maintain employee training records for inspection by the department for ~~two~~ three years following termination of employment.
2. Operating and emergency procedures. The licensee's or registrant's operating and emergency procedures shall include instructions in at least the following:
- a. Handling and use of sources of radiation to be employed so that no individual is likely to be exposed to radiation doses in excess of the standards established in chapter 33-10-04.
 - b. Methods and occasions for conducting radiation surveys.
 - c. Methods and occasions for locking and securing sources of radiation.
 - d. Personnel monitoring and the use of personnel monitoring equipment.

- e. Transportation to temporary jobsites and field stations, including the packaging and placing of sources of radiation in vehicles, placarding the vehicles, and securing sources of radiation during transportation.
- f. Minimizing exposure of individuals in the event of an accident.
- g. Procedure for notifying proper personnel in the event of an accident.
- h. Maintenance of records.
- i. Inspection and maintenance of source holders, logging tools, source handling tools, storage containers, transport containers, and injection tools.
- j. Procedures to be followed in the event a sealed source is lodged downhole.
- k. Procedures to be used for picking up, receiving, and opening packages containing radioactive material.
- l. For the use of tracers, decontamination of the environment, equipment, and personnel.
- m. Maintenance of records generated by logging personnel at temporary jobsites.
- n. Actions to be taken if a sealed source is ruptured, including actions to prevent the spread of contamination and minimize inhalation and ingestion of radioactive material and actions to obtain suitable radiation survey instruments as required by subsection 4 of section 33-10-12-05.

3. Personnel monitoring.

- a. No licensee or registrant may permit any individual to act as a logging supervisor or to assist in the handling of sources of radiation unless each such individual wears either a film badge or a thermoluminescent dosimeter (TLD). Each film badge or thermoluminescent dosimeter shall be assigned to and worn by only one individual. Film badges must be replaced at least monthly and thermoluminescent dosimeters replaced at least quarterly. After replacement, each film badge or thermoluminescent dosimeter must be promptly processed.
- b. Personnel monitoring records shall be maintained for inspection until the department authorizes disposition.

History: Effective June 1, 1986; amended effective June 1, 1992.

General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

33-10-12-07. Precautionary procedures in logging and subsurface tracer operations.

1. Security. During each logging or tracer application, the logging supervisor or other designated employee shall maintain direct surveillance of the operation to protect against unauthorized ~~and~~ or unnecessary entry into a restricted area, as defined in chapter 33-10-01.
2. Handling tools. The licensee shall provide and require the use of tools that will assure remote handling ~~or~~ of sealed sources other than low activity calibration sources.
3. Subsurface tracer studies.
 - a. Protective gloves and other appropriate protective clothing and equipment shall be used by all personnel handling radioactive tracer material. Precautions shall be taken to avoid ingestion or inhalation of radioactive material.
 - b. No licensee may cause the injection of radioactive material into potable aquifers without prior written authorization from the department.
4. Particle accelerators. No licensee or registrant may permit aboveground testing of particle accelerators, designed for use in well logging, which results in the production of radiation, except in areas or facilities controlled or shielded so that the requirements of subsections 1 and 5 of section 33-10-04-02, as applicable, are met.

History: Effective June 1, 1986; amended effective June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

33-10-12-08. Radiation surveys and records.

1. Radiation surveys.
 - a. Radiation surveys ~~and~~ or calculations shall be made and recorded for each area where radioactive materials are used or stored.
 - b. Radiation surveys ~~and~~ or calculations shall be made and recorded for the radiation levels in occupied positions and on the exterior of each vehicle used to transport radioactive material. Such surveys ~~and~~ or calculations

shall include each source of radiation or combination of sources to be transported in the vehicle.

- c. After removal of the sealed source from the logging tool and before departing the jobsite, the logging tool detector shall be energized, or a survey meter used, to assure that the logging tool is free of contamination.
 - d. Radiation surveys shall be made and recorded at the jobsite or wellhead for each tracer operation, except those using hydrogen-3, carbon-14, and sulfur-35. These surveys shall include measurements of radiation levels before and after the operation.
 - e. Records required pursuant to subdivisions a, b, c, and d shall include the dates, the identification of individuals making the survey, the identification of survey instruments used, and an exact description of the location of the survey. Records of these surveys shall be maintained for inspection by the department for ~~two~~ three years after completion of the survey.
2. Documents and records required at field stations. Each licensee or registrant shall maintain, for inspection by the department, the following documents and records for the specific devices and sources used at the field station:
- a. Appropriate license, certificate of registration, or equivalent ~~document~~ documents.
 - b. Operating and emergency procedures.
 - c. Applicable chapters of this article.
 - d. Records of the latest survey instrument calibrations pursuant to subsection 4 of section 33-10-12-05.
 - e. Records of the latest leak test results pursuant to subsection 5 of section 33-10-12-05.
 - f. Quarterly inventories required pursuant to subsection ~~7~~ 6 of section 33-10-12-05.
 - g. Utilization records required pursuant to subsection 7 of section 33-10-12-05.
 - h. Records of inspection and maintenance required pursuant to subsection 10 of section 33-10-12-05.
 - i. Survey records required pursuant to subsection 1 of ~~this~~ the section.

j. Training records required pursuant to subsection 1 of section 33-10-12-06.

3. Documents and records required at temporary jobsites. Each licensee or registrant conducting operations at a temporary jobsite shall have the following documents and records available at that site for inspection by the department.
 - a. Operating and emergency procedures.
 - b. Survey records required pursuant to subsection 1 for the period of operation at ~~this~~ the site.
 - c. Evidence of current calibration for the radiation survey instruments in use at the site.
 - d. When operating in the state under reciprocity, a copy of the appropriate license, certificate of registration, or equivalent documents.
 - e. Shipping papers for the transportation of radioactive material.

History: Effective June 1, 1986; amended effective June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-12-09. Notification - ~~Incidents~~ of incidents, abandonment, and lost sources.

1. Notification of incidents and sources lost in other than downhole logging operations shall be made in accordance with appropriate provisions of chapter 33-10-04.
2. Whenever a sealed source or device containing radioactive material is lodged downhole, the licensee shall:
 - a. Monitor at the surface for the presence of radioactive contamination with a radiation survey instrument or logging tool during logging tool recovery operations.
 - b. Notify the department immediately by telephone if radioactive contamination is detected at the surface or if the source appears to be damaged and subsequently within thirty days, by confirmatory letter if the licensee knows or has reason to believe that a sealed source has been ruptured. This letter must identify the well or other location, describe the magnitude and extent of the escape of radioactive material, assess the consequences of the rupture, and explain efforts planned or being taken to mitigate these consequences.

3. When it becomes apparent that efforts to recover the radioactive source will not be successful, the licensee shall:
- a. Advise the well operator of an appropriate method of abandonment, which shall include:
 - (1) The immobilization and sealing in place of the radioactive source with a cement plug.
 - (2) The setting of a whipstock or other deflection device.
 - (3) The mounting of a permanent identification plaque, at the surface of the well, containing the appropriate information required by ~~subdivision d of this subsection 4.~~
 - b. Notify the department by telephone, facsimile, or overnight express mail giving the circumstances of the loss, and request approval of the proposed abandonment procedures.
 - c. File a written report with the department within thirty days of the abandonment, setting forth. The licensee shall send a copy of the report to:

North Dakota Industrial Commission
Oil and Gas Division
600 East Boulevard
Bismarck, North Dakota 58505

The report must contain the following information:

- (1) Date of occurrence ~~and a brief description of attempts to recover the source.~~
- (2) A description of the radioactive well logging source involved, including the radionuclide, and its quantity, ~~and chemical,~~ and physical form.
- (3) Surface location and identification of well.
- (4) Results of efforts to immobilize and set the source in place.
- (5) A brief description of the attempted recovery effort.
- (6) Depth of the radioactive source.
- ~~←6→~~ (7) Depth of the top of the cement plug.
- ~~←7→~~ (8) Depth of the well.

- (8) (9) Information Any other information, such as a warning statement, contained on the permanent identification plaque.
- (10) The names of the state agencies receiving a copy of this report.
4. Whenever a sealed source containing radioactive material is abandoned downhole, the licensee shall provide a permanent plaque for posting the well or well bore. An example of a suggested plaque is shown in Appendix B of this chapter. This plaque shall:
- a. Be constructed of long-lasting material, such as stainless steel or monel.
 - b. Contain the following information engraved on its face:
 - (1) The word "CAUTION".
 - (2) The radiation symbol without the conventional color requirement.
 - (3) The date of abandonment.
 - (4) The name of the well operator or well owner.
 - (5) The well name and well identification numbers or other designation.
 - (6) The sealed sources by radionuclide and quantity of activity.
 - (7) The source depth and the depth to the top of the plug.
 - (8) An appropriate warning, depending on the specific circumstances of each abandonment. Appropriate warnings may include: (a) "Do not drill below plug back depth;" (b) "Do not enlarge casing;" or (c) "Do not reenter the hole", followed by the words, "before contacting the North Dakota State Department of Health and consolidated laboratories".
5. The licensee shall immediately notify the department by telephone and subsequently by confirming letter if the licensee knows or has reason to believe that radioactive material has been lost in or in proximity to an underground potable water source aquifer. Such notice shall designate the well location and shall describe the magnitude and extent of loss of radioactive material, assess the consequences of such loss, and explain efforts planned or being taken to mitigate these consequences.

History: Effective June 1, 1986; amended effective June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

APPENDIX A
SUBJECTS TO BE INCLUDED IN TRAINING COURSES
FOR LOGGING SUPERVISORS

- I. Fundamentals of radiation safety.
 - A. Characteristics of radiation.
 - B. Units of radiation dose and quantity of radioactivity.
 - C. Significance of radiation dose.
 - 1. Radiation protection standards.
 - 2. Biological effects of radiation dose.
 - D. Levels of radiation from sources of radiation.
 - E. Methods of minimizing radiation dose.
 - 1. Working time.
 - 2. Working distance.
 - 3. Shielding.
 - F. Radiation safety practices including prevention of contamination and methods of decontamination.
- II. Radiation detection instrumentation to be used.
 - A. Use of radiation survey instruments.
 - 1. Operation.
 - 2. Calibration.
 - 3. Limitations.
 - B. Survey techniques.
 - C. Use of personnel monitoring equipment.
- III. Equipment to be used.
 - A. Handling equipment.
 - B. Sources of radiation.
 - C. Storage and control of equipment.

D. Operation and control of equipment.

IV. The requirements of pertinent federal regulations and this article.

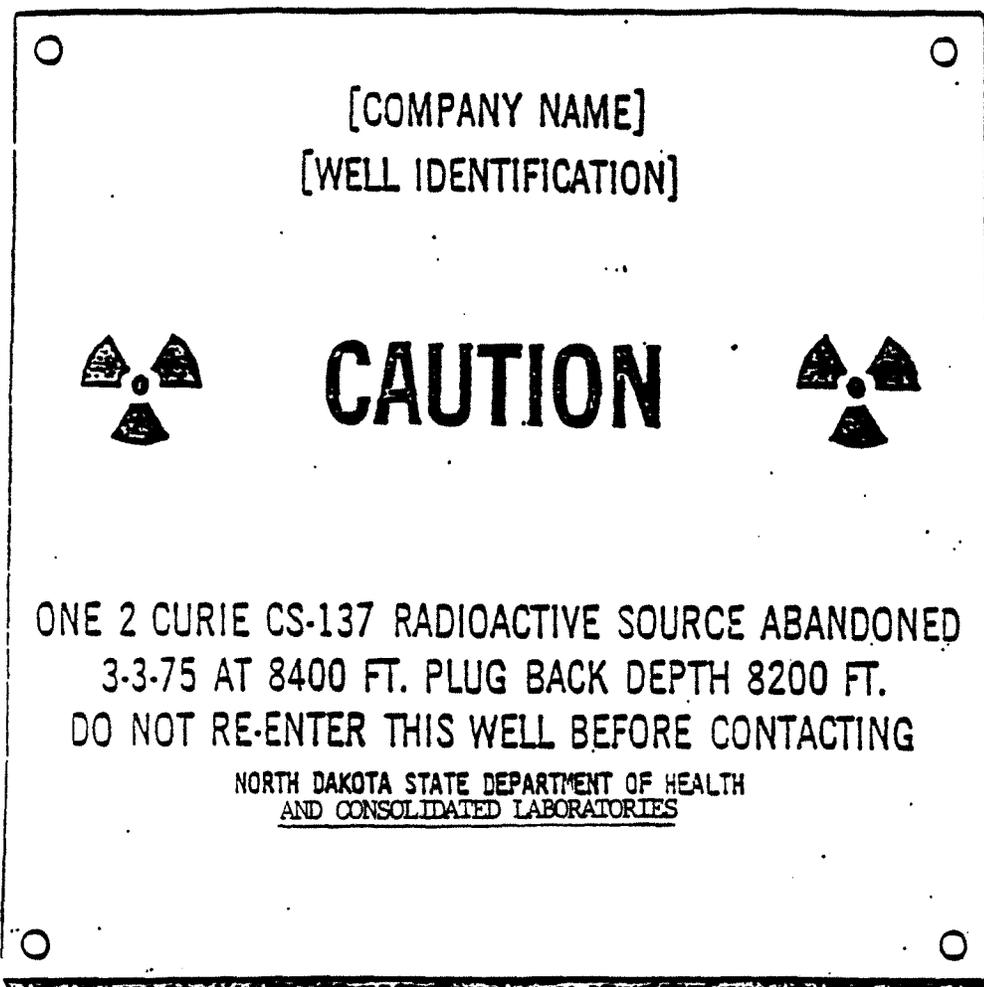
V. The licensee's or registrant's written operating and emergency procedures.

VI. The licensee's or registrant's recordkeeping procedures.

History: Effective June 1, 1986; amended effective June 1, 1992.

APPENDIX B

Example of Plaque for Identifying Wells Containing Sealed Sources
Containing Radioactive Material Abandoned Downhole



The size of the plaque should be convenient for use on active or inactive wells, e.g., a seven-inch square. Letter size of the word "CAUTION" should be approximately twice the letter size of the rest of the information, e.g., one-half-inch and one-fourth-inch letter size, respectively.

History: Effective June 1, 1986; amended effective June 1, 1992.

CHAPTER 33-10-13

STAFF COMMENT: Chapter 33-10-13 contains all new material but is not underscored so as to improve readability.

CHAPTER 33-10-13 TRANSPORTATION OF RADIOACTIVE MATERIAL

Section	
33-10-13-01	Purpose and Scope
33-10-13-02	Definitions
33-10-13-03	Requirement for License
33-10-13-04	Exemptions
33-10-13-05	Transportation of Licensed Material
33-10-13-06	General Licenses for Carriers
33-10-13-07	General License - Approved Packages
33-10-13-08	General License - Previously Approved Type B Packages
33-10-13-09	General License - Specification Container
33-10-13-10	General License - Use of Foreign Approved Package
33-10-13-11	General License - Type A, Fissile Class II Package
33-10-13-12	General License - Restricted, Fissile Class II Package
33-10-13-13	Fissile Material - Assumptions as to Unknown Properties
33-10-13-14	Preliminary Determinations
33-10-13-15	Routine Determinations
33-10-13-16	Air Transport of Plutonium
33-10-13-17	Shipment Records
33-10-13-18	Reports
33-10-13-19	Advance Notification of Transport of Nuclear Waste
33-10-13-20	Quality Assurance Requirements

33-10-13-01. Purpose and scope. The rules in this chapter establish requirements for packaging, preparation for shipment, and transportation of radioactive material and apply to any person who transports radioactive material or delivers radioactive material to a carrier for transport.

History: Effective June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

33-10-13-02. Definitions. As used in this chapter, the following definitions apply:

1. "Carrier" means any person engaged in the transportation of passengers or property by land or water as a common, contract, or private carrier, or by civil aircraft.
2. "Closed transport vehicle" means a transport vehicle equipped with a securely attached exterior enclosure that during normal transportation restricts the access of unauthorized individuals to the cargo space containing the radioactive material. The enclosure may be either temporary or permanent but must limit access from top, sides, and ends. In the case of packaged materials, it may be of the "see-through" type.
3. "Exclusive use" means the sole use of a conveyance by a single consignor and for which all initial, intermediate, and final loading and unloading are carried out in accordance with the direction of the consignor or consignee. The term "exclusive use" is used interchangeably with the terms "sole use" or "full load" in other regulations, such as title 49 of the Code of Federal Regulations.
4. "Fissile material" means any special nuclear material consisting of or containing one or more fissile radionuclides. Fissile radionuclides are plutonium-238, plutonium-239, plutonium-241, uranium-233, and uranium-235. Neither natural nor depleted uranium is fissile material. Department jurisdiction extends only to special nuclear material if quantities are not sufficient to form a critical mass as defined in chapter 33-10-01 of this article.
 - a. Fissile Class I: A package which may be transported in unlimited numbers and in any arrangement, and which requires no nuclear criticality safety controls during transportation. A transport index is not assigned for purposes of nuclear criticality safety but may be required because of external radiation levels.
 - b. Fissile Class II: A package which may be transported together with other packages in any arrangement but, for criticality control, in numbers which do not exceed an aggregate transport index of fifty. These shipments require no other nuclear criticality safety control during transportation. Individual packages may have a transport index not less than one-tenth and not more than ten.
5. "Low specific activity material" means any of the following:
 - a. Uranium or thorium ores and physical or chemical concentrates of those ores.
 - b. Unirradiated natural or depleted uranium or unirradiated natural thorium.

- c. Tritium oxide in aqueous solutions provided the concentration does not exceed five millicuries [185 megabecquerels] per milliliter.
- d. Material in which the radioactivity is essentially uniformly distributed and in which the estimated average concentration per gram of contents does not exceed:
- (1) 0.0001 millicurie [3.7 kilobecquerels] of radionuclides for which the A_2 quantity in appendix A of this chapter is not more than five-hundredths curie [1.85 gigabecquerels];
 - (2) 0.005 millicurie [185 kilobecquerels] of radionuclides for which the A_2 quantity in appendix A of this chapter is more than five-hundredths curie [1.85 gigabecquerels] but not more than one curie [37 gigabecquerels]; or
 - (3) 0.3 millicurie [11.1 megabecquerels] of radionuclides for which the A_2 quantity in appendix A of this chapter is more than one curie [37 gigabecquerels].
- e. Objects of nonradioactive material externally contaminated with radioactive material, provided that the radioactive material is not readily dispersible, and the surface contamination, when averaged over an area of one square meter, does not exceed 0.0001 millicurie per square centimeter [3.7 kilobecquerels per centimeter²] of radionuclides for which the A_2 quantity in appendix A of this chapter is not more than 0.05 curie [1.85 gigabecquerels] or 0.0001 millicurie per square centimeter [37 kilobecquerels per centimeter²] for other radionuclides.
6. "Normal form radioactive material" means radioactive material which has not been demonstrated to qualify as special form radioactive material.
7. "Packaging" means the assembly of components necessary to ensure compliance with the packaging requirements of this chapter. It may consist of one or more receptacles, absorbent materials, spacing structures, thermal insulation, radiation shielding, and devices for cooling or absorbing mechanical shocks. The vehicle, tie-down system, and auxiliary equipment may be designated as part of the packaging.
8. "Rules of the United States department of transportation" means the regulations in 49 CFR parts 100-189.
9. "Specific activity" of a radionuclide means the radioactivity of a radionuclide per unit mass of that nuclide. The specific activity of a material in which the radionuclide is

essentially uniformly distributed is the radioactivity per unit mass of the material.

10. "Transport index" means the dimensionless number, rounded up to the first decimal place, placed on the label of a package to designate the degree of control to be exercised by the carrier during transportation. The transport index is the number expressing the maximum radiation level in millirem per hour at one meter from the external surface of the package.
11. "Type A quantity" means a quantity of radioactive material, the aggregate radioactivity of which does not exceed A_1 for special form radioactive material or A_2 for normal form radioactive material, where A_1 and A_2 are given in appendix A of this chapter or may be determined by procedures described in appendix A of this chapter.
12. "Type B package" means a Type B packaging together with its radioactive contents. A Type B package design is designated as B(U) or B(M). B(U) refers to the need for unilateral approval of international shipments; B(M) refers to the need for multilateral approval. There is no distinction made in how packages with these designations may be used in domestic transportation. To determine their distinction for international transportation, refer to 49 CFR part 173. A Type B package approved prior to September 6, 1983, was designated only as Type B. Limitations on its use are specified in section 33-10-13-08.
13. "Type B packaging" means a packaging designed to retain the integrity of containment and shielding when subjected to the normal conditions of transport and hypothetical accident test conditions set forth in 10 CFR part 71.
14. "Type B quantity" means a quantity of radioactive material greater than a Type A quantity.

History: Effective June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

33-10-13-03. Requirement for license. No individual may transport radioactive material or deliver radioactive material to a carrier for transport except as authorized in a general or specific license issued by the department or as exempted in section 33-10-13-04.

History: Effective June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

33-10-13-04. Exemptions.

1. Common and contract carriers, freight forwarders, and warehousemen which are subject to the requirements of the United States department of transportation in 49 CFR 170 through 189 or the United States postal service in the postal service manual (Domestic Mail Manual), section 124.3 incorporated by reference, 39 CFR 111.11 (1974), and the United States postal service are exempt from the requirements of this chapter to the extent that they transport or store radioactive material in the regular course of their carriage for others or storage incident thereto. Common and contract carriers who are not subject to the requirements of the United States department of transportation or United States postal service are subject to section 33-10-13-03 and other applicable requirements of this article.
2. Any licensee is exempt from the requirements of this chapter to the extent that the licensee delivers to a carrier for transport a package containing radioactive material having a specific activity not greater than 0.002 microcurie per gram [74 becquerels per gram].
3. With the exception of sections 33-10-13-05 and 33-10-13-16, a licensee is exempt from all requirements of this chapter, with respect to shipment or carriage of the following:
 - a. A package containing no more than a Type A quantity of radioactive material if the package contains no fissile material; or
 - b. Packages transported between locations within the United States which contain only americium or plutonium in special form with an aggregate radioactivity not to exceed 20 curies [740 gigabecquerels].

History: Effective June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

33-10-13-05. Transportation of licensed material.

1. Each licensee who transports licensed material outside of the confines of the licensee's plant or other place of use, or who delivers licensed material to a carrier for transport, shall:
 - a. Comply with the applicable requirements, appropriate to the mode of transport, of the regulations of the United States department of transportation; and
 - b. Assure that any special instructions needed to safely open the package are sent to or have been made available to the consignee.

2. If, for any reason, the regulations of the United States department of transportation are not applicable to a shipment of licensed material, the licensee shall conform to the standards and requirements of those regulations to the same extent as if the shipment was subject to the regulations.

History: Effective June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

33-10-13-06. General licenses for carriers.

1. A general license is hereby issued to any common or contract carrier not exempt under section 33-10-13-04 to receive, possess, transport, and store radioactive material in the regular course of their carriage for others or storage incident thereto, provided the transportation and storage is in accordance with the applicable requirements, appropriate to the mode of transport, of the United States department of transportation insofar as such requirements relate to the loading and storage of packages, placarding of the transporting vehicle, and incident reporting. Any notification of incidents referred to in those United States department of transportation requirements must be filed with, or made to, the department.
2. A general license is hereby issued to any private carrier to transport radioactive material, provided the transportation is in accordance with the applicable requirements, appropriate to the mode of transport, of the United States department of transportation insofar as such requirements relate to the loading and storage of packages, placarding of the transporting vehicle, and incident reporting. Any notification of incidents referred to in those United States department of transportation requirements must be filed with, or made to, the department.
3. Individuals who transport radioactive material pursuant to the general licenses in subsection 1 or 2 are exempt from the requirements of chapters 33-10-04 and 33-10-10 to the extent that they transport radioactive material.

History: Effective June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

33-10-13-07. General license - Approved packages.

1. A general license is hereby issued to any licensee of the department to transport, or to deliver to a carrier for transport, licensed material in a package for which a license,

certificate of compliance, or other approval has been issued by the United States nuclear regulatory commission.

2. This general license applies only to a licensee who:
 - a. Has a copy of the specific license, certificate of compliance, or other approval of the package and has the drawings and other documents referenced in the approval relating to the use and maintenance of the packaging and to the actions to be taken prior to shipment;
 - b. Complies with the terms and conditions of the license, certificate, or other approval, as applicable, and the applicable requirements of this chapter;
 - c. Prior to the licensee's first use of the package, has registered with the United States nuclear regulatory commission; and
 - d. Has a quality assurance program required by section 33-10-13-20 and approved by the department.
3. The general license in subsection 1 applies only when the package approval authorizes use of the package under this general license.
4. For previously approved Type B packages which are not designated as either B(U) or B(M) in the certificate of compliance, this general license is subject to additional restrictions of section 33-10-13-08.

History: Effective June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-13-08. General license - Previously approved Type B packages.

1. A Type B package previously approved by the United States nuclear regulatory commission, but not designated as B(U) or B(M) in the certificate of compliance, may be used under the general license of section 33-10-13-07 with the following additional limitations:
 - a. Fabrication of the packaging was satisfactorily completed before August 31, 1986, as demonstrated by application of its model number in accordance with United States nuclear regulatory commission regulations; and
 - b. The package may not be used for a shipment to a location outside the United States after August 31, 1986, except

approved under special arrangement in accordance with 49 CFR 173.471.

History: Effective June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

33-10-13-09. General license - Specification container.

1. A general license is issued to any licensee of the department to transport, or to deliver to a carrier for transport, licensed material in a specification container for a Type B quantity of radioactive material as specified in 49 CFR parts 173 and 178.
2. This general license applies only to a licensee who has a quality assurance program required by section 33-10-13-20 and approved by the department.
3. This general license applies only to a licensee who:
 - a. Has a copy of the specification; and
 - b. Complies with the terms and conditions of the specification and the applicable requirements of this chapter.
4. The general license in subsection 1 is subject to the limitation that the specification container may not be used for a shipment to a location outside the United States after August 31, 1986, except approved under special arrangements in accordance with 49 CFR 173.472.

History: Effective June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

33-10-13-10. General license - Use of foreign approved package.

1. A general license is issued to any licensee of the department to transport, or to deliver to a carrier for transport, licensed material in a package the design of which has been approved in a foreign national competent authority certificate which has been revalidated by the United States department of transportation as meeting the applicable requirements of 49 CFR 171.12.
2. This general license applies only to international shipments.
3. This general license applies only to a licensee who:

- a. Has a copy of the applicable certificate, the revalidation, and the drawings and other documents referenced in the certificate relating to the use and maintenance of the packaging and to the actions to be taken prior to shipment; and
- b. Complies with the terms and conditions of the certificate and revalidation and with the applicable requirements of this chapter.

History: Effective June 1, 1992.
 General Authority: NDCC 28-32-02
 Law Implemented: NDCC 28-32-02

33-10-13-11. General license - Type A, fissile class II package.

1. A general license is hereby issued to any licensee to transport fissile material, or to deliver fissile material to a carrier for transport, if the material is shipped as a fissile class II package.
2. This general license applies only when a package contains no more than a Type A quantity of radioactive material, including only one of the following:
 - a. Up to forty grams of uranium-235;
 - b. Up to thirty grams of uranium-233;
 - c. Up to twenty-five grams of the fissile radionuclides of plutonium, except that for encapsulated plutonium-beryllium neutron sources in special form, an A_1 quantity of plutonium may be present; or
 - d. A combination of fissile radionuclides in which the sum of the ratios of the amount of each radionuclide to the corresponding maximum amounts in subdivisions a, b, and c of this subsection does not exceed unity.
3. a. Except as specified in subdivision b of this subsection this general license applies only when a package containing more than fifteen grams of fissile radionuclides is labeled with a transport index not less than the number given by the following equation:

$$\text{Minimum Transport Index} = \frac{(0.4x + 0.67y + z)(1 - 15)}{x+y+z}$$

where the package contains x grams of uranium-235, y grams of uranium-233, and z grams of the fissile radionuclides of plutonium.

- b. For a package in which the only fissile material is in the form of encapsulated plutonium-beryllium neutron sources in special form, the transport index based on criticality considerations may be taken as 0.026 times the number of grams of the fissile radionuclides of plutonium in excess of fifteen grams.
- c. In all cases, the transport index must be rounded up to one decimal place and may not exceed ten.

History: Effective June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

33-10-13-12. General license - Restricted, fissile class II package.

- 1. A general license is hereby issued to any licensee to transport fissile material, or to deliver fissile material to a carrier for transport, if the material is shipped as a fissile class II package.
- 2. This general license applies only when all of the following requirements are met.
 - a. The package contains no more than a Type A quantity of radioactive material.
 - b. Neither beryllium nor hydrogenous material enriched in deuterium is present.
 - c. The total mass of graphite present does not exceed one hundred fifty times the total mass of uranium-235 plus plutonium.
 - d. Substances having a higher hydrogen density than water are not present, except that polyethylene may be used for packing or wrapping.
 - e. Uranium-233 is not present, and the amount of plutonium does not exceed one percent of the amount of uranium-235.
 - f. The amount of uranium-235 is limited as follows:
 - (1) If the fissile radionuclides are not uniformly distributed, the maximum amount of uranium-235 per package may not exceed the value given in the following table:

Table 1

Uranium enrichment in weight percent of uranium-235 not exceeding	Permissible maximum grams of uranium-235 per package
24	40
20	42
15	45
11	48
10	51
9.5	52
9	54
8.5	55
8	57
7.5	59
7	60
6.5	62
6	65
5.5	68
5	72
4.5	76
4	80
3.5	88
3	100
2.5	120
2	164
1.5	272
1.35	320
1	680*
0.92	1200*

*Pursuant to the department's agreement with the United States nuclear regulatory commission, jurisdiction extends only to three hundred fifty grams of uranium-235.

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- (2) If the fissile radionuclides are distributed uniformly, the maximum amount of uranium-235 per package may not exceed the value given in the following table:

Table 2

Uranium enrichment in weight percent of uranium-235 not exceeding	Permissible maximum grams of uranium-235 per package
4	84
3.5	92
3	112
2.5	148
2	240
1.5	560*
1.35	800*

*Pursuant to the department's agreement with the United States nuclear regulatory commission, jurisdiction extends only to three hundred fifty grams of uranium-235.

- g. The transport index of each package based on criticality considerations is taken as ten times the number of grams of uranium-235 in the package divided by the maximum allowable number of grams per package in accordance with table 1 or 2 above as applicable.

History: Effective June 1, 1992.
 General Authority: NDCC 28-32-02
 Law Implemented: NDCC 28-32-02

33-10-13-13. Fissile material - Assumptions as to unknown properties. When the isotopic abundance, mass, concentration, degree of irradiation, degree of moderation, or other pertinent property of fissile material in any package is not known, the licensee shall package the fissile material as if the unknown properties had credible values that would cause the maximum nuclear reactivity.

History: Effective June 1, 1992.
 General Authority: NDCC 28-32-02
 Law Implemented: NDCC 28-32-02

33-10-13-14. Preliminary determinations. Prior to the first use of any packaging for the shipment of radioactive material:

1. The licensee shall ascertain that there are no defects which could significantly reduce the effectiveness of the packaging;

2. Where the maximum normal operating pressure will exceed thirty-four and three-tenths kilopascal [5 pounds per square inch] gauge, the licensee shall test the containment system at an internal pressure at least fifty percent higher than the maximum normal operating pressure to verify the capability of that system to maintain its structural integrity at that pressure;
3. The licensee shall determine that the packaging has been fabricated in accordance with the design approved by the United States nuclear regulatory commission; and
4. The licensee shall conspicuously and durably mark the packaging with its model number, gross weight, and a package identification number assigned by the United States nuclear regulatory commission.

History: Effective June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-13-15. Routine determinations. Prior to each shipment of licensed material, the licensee shall determine that:

1. The package is proper for the contents to be shipped;
2. The package is in unimpaired physical condition except for superficial defects such as marks or dents;
3. Each closure device of the packaging, including any required gasket, is properly installed and secured and free of defects;
4. Any system for containing liquid is adequately sealed and has adequate space or other specified provision for expansion of the liquid;
5. Any pressure relief device is operable and set in accordance with written procedures;
6. The package has been loaded and closed in accordance with written procedures;
7. Any structural part of the package which could be used to lift or tie down the package during transport is rendered inoperable for that purpose unless it satisfies design requirements specified by the United States nuclear regulatory commission;
8. a. The level of removable radioactive contamination on the external surfaces of each package offered for shipment is as low as reasonably achievable. The level of removable radioactive contamination may be determined by wiping an

area of three hundred square centimeters of the surface concerned with an absorbent material, using moderate pressure, and measuring the activity on the wiping material. Sufficient measurements must be taken in the most appropriate locations to yield a representative assessment of the removable contamination levels. Except as provided in subdivision b of this subsection, the amount of radioactivity measured on any single wiping material, when averaged over the surface wiped, must not exceed the limits given in table 3 below at any time during transport. Other methods of assessment of equal or greater efficiency may be used. When other methods are used, the detection efficiency of the method used must be taken into account and in no case may the removable contamination on the external surfaces of the package exceed ten times the limits listed in table 3.

Table 3
Removable External Radioactive Contamination Wipe Limits

<u>Contaminant</u>	Maximum Permissible Limits	
	* $\mu\text{Ci}/\text{cm}^2$	dpm/cm^2
Beta-gamma emitting radionuclides; all radionuclides with half-lives less than ten days; natural uranium; natural thorium; uranium-235; uranium-238; thorium-232; thorium-228 and thorium-230 when contained in ores or physical concentrates	10^5	22
All other alpha emitting radionuclides	10^6	2.2

*To convert microcuries (μCi) to SI units of megabecquerels, multiply the values by 37.

- b. In the case of packages transported as exclusive use shipments by rail or highway only, the removable radioactive contamination at any time during transport must not exceed ten times the levels prescribed in subdivision a. The levels at the beginning of transport must not exceed the levels in subdivision a;
9. External radiation levels around the package and around the vehicle, if applicable, will not exceed two hundred millirems per hour [2 millisieverts per hour] at any point on the external surface of the package at any time during transportation. The transport index may not exceed ten;

10. For a package transported in exclusive use by rail, highway, or water, radiation levels external to the package may exceed the limits specified in subsection 9 but may not exceed any of the following:
 - a. Two hundred millirems per hour [2 millisieverts per hour] on the accessible external surface of the package unless the following conditions are met, in which case the limit is one thousand millirems per hour [10 millisieverts per hour];
 - (1) The shipment is made in a closed transport vehicle;
 - (2) Provisions are made to secure the package so that its position within the vehicle remains fixed during transportation; and
 - (3) There are no loading or unloading operations between the beginning and end of the transportation.
 - b. Two hundred millirems per hour [2 millisieverts per hour] at any point on the outer surface of the vehicle, including the upper and lower surfaces, or, in the case of a flatbed style vehicle, with a personnel barrier (A flatbed style vehicle with a personnel barrier shall have radiation levels determined at vertical planes. If no personnel barrier, the package cannot exceed 200 millirems per hour [2 millisieverts per hour] at the surface.), at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load (or enclosure, if used) and on the lower external surface of the vehicle;
 - c. Ten millirems per hour [0.1 millisieverts per hour] at any point two meters from the vertical planes represented by the outer lateral surfaces of the vehicle, or, in the case of a flatbed style vehicle, at any point two meters from the vertical planes projected from the outer edges of the vehicle; and
 - d. Two millirems per hour [0.02 millisieverts per hour] in any normally occupied positions of the vehicle, except that this provision does not apply to private motor carriers when individuals occupying these positions are provided with special health supervision, personnel radiation exposure monitoring devices, and training in accordance with subsection 2 of section 33-10-10-02; and
11. A package must be prepared for transport so that in still air at one hundred degrees Fahrenheit [38 degrees Celsius] and in the shade, no accessible surface of a package would have a temperature exceeding one hundred twenty-two degrees Fahrenheit [50 degrees Celsius] in a nonexclusive use shipment

or one hundred eighty degrees Fahrenheit [82 degrees Celsius] in an exclusive use shipment. Accessible package surface temperatures may not exceed these limits at any time during transportation.

History: Effective June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

33-10-13-16. Air transport of plutonium. Notwithstanding the provisions of any general licenses and notwithstanding any exemptions stated directly in this chapter or included indirectly by citation of the United States department of transportation regulations, as may be applicable, the licensee shall assure that plutonium in any form is not transported by air, or delivered to a carrier for air transport, unless:

1. The plutonium is contained in a medical device designed for individual human application;
2. The plutonium is contained in a material in which the specific activity is not greater than two thousandths microcuries per gram [74 becquerel per gram] of material and in which the radioactivity is essentially uniformly distributed;
3. The plutonium is shipped in a single package containing no more than an A_2 quantity of plutonium in any isotope or form and is shipped in accordance with section 33-10-13-05; or
4. The plutonium is shipped in a package specifically authorized for the shipment of plutonium by air in the certificate of compliance for that package issued by the United States nuclear regulatory commission.

History: Effective June 1, 1992.
General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

33-10-13-17. Shipment records. Each licensee shall maintain for a period of two years after shipment a record of each shipment of licensed material not exempt under section 33-10-13-04, showing, where applicable:

1. Identification of the packaging by model number;
2. Verification that there were no significant defects in the packaging, as shipped;
3. Volume and identification of coolant;
4. Type and quantity of licensed material in each package, and the total quantity of each shipment;

5. Date of the shipment;
6. Name and address of the transferee;
7. Address to which the shipment was made; and
8. Results of the determinations required by section 33-10-13-15.

History: Effective June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-13-18. Reports. The licensee shall report to the department within thirty days:

1. Any instance in which there is significant reduction in the effectiveness of any authorized packaging during use; and
2. Details of any defects with safety significance in the packaging after first use, with the means employed to repair the defects and prevent their recurrence.

History: Effective June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-13-19. Advance notification of transport of nuclear waste.

1. Prior to the transport of any nuclear waste outside of the confines of the licensee's facility or other place of use or storage, or prior to the delivery of any nuclear waste to a carrier for transport, each licensee shall provide advance notification of such transport to the governor, or governor's designee (A list of the mailing addresses of the governors and governors' designees is available upon request from the director, state programs, office of governmental and public affairs, United States nuclear regulatory commission, Washington, D.C. 20555.), of each state through which the waste will be transported.
2. Advance notification is required only when:
 - a. The nuclear waste is required to be in Type B packaging for transportation;
 - b. The nuclear waste is being transported to, through, or across state boundaries to a disposal site or to a collection point for transport to a disposal site; and
 - c. The quantity of licensed material in a single package exceeds;

- (1) Five thousand curies [185 terabecquerels] of special form radionuclides;
 - (2) Five thousand curies [185 terabecquerels] of uncompressed gases of argon-41, krypton-85m, krypton-87, xenon-131m, or xenon-135;
 - (3) Fifty thousand curies [1.85 petabecquerels] of argon-37, or of uncompressed gases of krypton-85 or xenon-133, or of hydrogen-3 as a gas, as luminous paint, or absorbed on solid material;
 - (4) Twenty curies [740 gigabecquerels] of other nonspecial form radionuclides for which A_2 is less than or equal to four curies [148 gigabecquerels]; or
 - (5) Two hundred curies [7.4 terabecquerels] of other nonspecial form radionuclides for which A_2 is greater than four curies [148 gigabecquerels].
3. Each advance notification required by subsection 1 must contain the following information:
- a. The name, address, and telephone number of the shipper, carrier, and receiver of the shipment;
 - b. A description of the nuclear waste contained in the shipment as required by 49 CFR 172.202 and 172.203(d);
 - c. The point of origin of the shipment and the seven-day period during which departure of the shipment is estimated to occur;
 - d. The seven-day period during which arrival of the shipment at state boundaries is estimated to occur;
 - e. The destination of the shipment, and the seven-day period during which arrival of the shipment is estimated to occur; and
 - f. A point of contact with a telephone number for current shipment information.
4. The notification required by subsection 1 must be made in writing to the office of each appropriate governor, or governor's designee, and to the department. A notification delivered by mail must be postmarked at least seven days before the beginning of the seven-day period during which departure of the shipment is estimated to occur. A notification delivered by messenger must reach the office of the governor, or governor's designee, at least four days before the beginning of the seven-day period during which departure of the shipment is estimated to occur. A copy of

the notification must be retained by the licensee for one year.

5. The licensee shall notify each appropriate governor, or governor's designee, and the department of any changes to schedule information provided pursuant to subsection 1. Such notification must be by telephone to a responsible individual in the office of the governor, or governor's designee, of the appropriate state or states. The licensee shall maintain for one year a record of the name of the individual contacted.
6. Each licensee who cancels a nuclear waste shipment, for which advance notification has been sent, shall send a cancellation notice to the governor, or governor's designee, of each appropriate state and to the department. A copy of the notice must be retained by the licensee for one year.

History: Effective June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

33-10-13-20. Quality assurance requirements.

1. Each licensee shall establish, maintain, and execute a quality assurance program to verify by procedures such as checking, auditing, and inspection that deficiencies, deviations, and defective material and equipment relating to the shipment of packages containing radioactive material are promptly identified and corrected.
2. The licensee shall identify the material and components to be covered by the quality assurance program.
3. Each licensee shall document the quality assurance program by written procedures or instructions and shall carry out the program in accordance with those procedures throughout the period during which packaging is used.
4. Prior to the use of any package for the shipment of radioactive material, each licensee shall obtain approval by the department of its quality assurance program.
5. The licensee shall maintain sufficient written records to demonstrate compliance with the quality assurance program. Records of quality assurance pertaining to the use of a package for shipment of radioactive material must be maintained for a period of two years after shipment.

History: Effective June 1, 1992.

General Authority: NDCC 28-32-02

Law Implemented: NDCC 28-32-02

APPENDIX A

DETERMINATION OF A_1 and A_2

1. Single radionuclides.

- a. For a single radionuclide of known identity, the values of A_1 and A_2 are taken from table I if listed there. The values A_1 and A_2 in table I are also applicable for the radionuclide contained in (,n) or (,n) neutron sources.
- b. For any single radionuclide whose identity is known but which is not listed in table I, the value of A_1 and A_2 are determined according to the following procedure:

(1) If the radionuclide emits only one type of radiation, A_1 is determined according to the following method. For radionuclides emitting different kinds of radiation, A_1 is the most restrictive value of those determined for each kind of radiation. However, in either case, A_1 is restricted to a maximum of one thousand curies [37 terabecquerels]. If a parent nuclide decays into a shorter lived daughter with a half-life not greater than ten days, A_1 is calculated for both the parent and the daughter, and the more limiting of the two values is assigned to the parent nuclide.

- (a) For gamma emitters, A_1 is determined by the expression:

$$A_1 = \frac{9}{\Gamma} \text{ Ci}$$

where Γ is the gamma-ray constant, corresponding to the dose in roentgens per curie-hour at one meter, and the number nine results from the choice of one rem per hour at a distance of three meters as the reference dose-equivalent rate.

- (b) For x-ray emitters, A_1 is determined by the atomic number of the nuclide:

for $Z = 55$, $A_1 = 1000 \text{ Ci}$ [37 TBq]; and

for $Z = 55$, $A_1 = 200 \text{ Ci}$ [7.4 TBq]

where Z is the atomic number of the nuclide.

(c) For beta emitters, A_1 is determined by the maximum beta energy (E_{max}) according to table II; and

(d) For alpha emitters, A_1 is determined by the expression:

$$A_1 = 1000 A_3$$

where A_3 is the value listed in table III;

(2) A_2 is the more restrictive of the following two values:

(a) The corresponding A_1 ; and

(b) The value A_3 obtained from table III.

c. For any single radionuclide whose identity is unknown, the value of A_1 is taken to be two curies [74 gigabecquerels] and the value of A_2 is taken to be two-thousandths curie [74 megabecquerels]. However, if the atomic number of the radionuclide is known to be less than eighty-two, the value of A_1 is taken to be ten curies [370 gigabecquerels] and the value of A_2 is taken to be four-tenths curie [14.8 gigabecquerels].

2. Mixtures of radionuclides, including radioactive decay chains.

a. For mixed fission products, the activity limit may be assumed if a detailed analysis of the mixture is not carried out,

$$A_1 = 10 \text{ Ci} [370 \text{ GBq}]$$

$$A_2 = 0.4 \text{ Ci} [14.8 \text{ GBq}]$$

b. A single radioactive decay chain is considered to be a single radionuclide when the radionuclides are present in their naturally occurring proportions and no daughter nuclide has a half-life either longer than ten days or longer than that of the parent nuclide. The activity to be taken into account and the A_1 or A_2 value from table I

to be applied are those corresponding to the parent nuclide of that chain. When calculating A_1 or A_2 values, radiation emitted by daughters must be considered. However, in the case of radioactive decay chains in which any daughter nuclide has a half-life either longer than ten days or greater than that of the parent nuclide, the parent and daughter nuclides are considered to be mixtures of different nuclides.

- c. In the case of a mixture of different radionuclides, where the identity and activity of each radionuclide are known, the permissible activity of each radionuclide $R_1, R_2 \dots R_n$ is such that $F_1 + F_2 + \dots + F_n$ is not greater than unity, where:

$$F_1 = \frac{\text{Total activity of } R_1}{A_i(R_1)}$$

$$F_2 = \frac{\text{Total activity of } R_2}{A_i(R_2)}$$

$$F_n = \frac{\text{Total activity of } R_n}{A_i(R_n)}$$

$A_i (R_1, R_2 \dots R_n)$ is the value of A_1 or A_2 as appropriate for the nuclide $R_1, R_2 \dots R_n$.

- d. When the identity of each radionuclide is known but the individual activities of some of the radionuclides are not known, the formula given in paragraph c is applied to establish the values of A_1 or A_2 as appropriate. All the radionuclides whose individual activities are not known (their total activity will, however, be known) are classed in a single group and the most restrictive value of A_1 and A_2 applicable to any one of them is used as the value of A_1 or A_2 in the denominator of the fraction.
- e. Where the identity of each radionuclide is known but the individual activity of none of the radionuclides is known, the most restrictive value of A_1 or A_2 applicable to any one of the radionuclides present is adopted as the applicable value.

- f. When the identity of none of the nuclides is known, the value of A_1 is taken to be two curies [74 gigabecquerels] and the value of A_2 is taken to be two-thousandths curie [74 megabecquerels]. However, if alpha emitters are known to be absent, the value of A_2 is taken to be four-tenths curie [14.8 gigabecquerels].

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General Authority: NDCC 28-32-02
Law Implemented: NDCC 28-32-02

Table I
 A_1 and A_2 Values for Radionuclides
(See Footnotes at end of Table)

Symbol of radionuclide	Element and atomic number	A_1 (ci)	A_2 (Ci)	Specific Activity (Ci/g)
Ac-227	Actinium (89)	1000	0.003	7.2×10^1
Ac-228		10	4	2.2×10^6
Ag-105	Silver (47)	40	40	3.1×10^4
Ag-110m		7	7	4.7×10^3
Ag-111		100	20	1.6×10^5
Am-241	Americium (95)	8	0.008	3.2
Am-243		8	0.008	1.9×10^{-1}
Ar-37 (compressed or uncompressed)*	Argon (18)	1000	1000	1.0×10^5
Ar-41 (uncompressed)*		20	20	4.3×10^7
Ar-41 (compressed)*		1	1	4.3×10^7
As-73	Arsenic (33)	1000	400	2.4×10^4
As-74		20	20	1.0×10^5
As-76		10	10	1.6×10^6
As-77		300	20	1.1×10^6
At-211	Astatine (85)	200	7	2.1×10^6
Au-193	Gold (79)	200	200	9.3×10^5
Au-196		30	30	1.2×10^5
Au-198		40	20	2.5×10^5
Au-199		200	25	2.1×10^5
Ba-131	Barium (56)	40	40	8.7×10^4
Ba-133		40	40	4.0×10^2
Ba-140		20	20	7.3×10^4
Be-7	Beryllium (4)	300	300	3.5×10^5
Bi-206	Bismuth (83)	5	5	9.9×10^4
Bi-207		10	10	2.2×10^2
Bi-210 (RaE)		100	4	1.2×10^5
Bi-212		6	6	1.5×10^7
Bk-249	Berkelium (97)	1000	1	1.8×10^3

Br-77	Bromine (35)	70	25	7.1×10^5
Br-82		6	6	1.1×10^6
C-11	Carbon (6)	20	20	8.4×10^8
C-14		1000	60	4.6
Ca-45	Calcium (20)	1000	25	1.9×10^4
Ca-47		20	20	5.9×10^5
Cd-109	Cadmium (48)	1000	70	2.6×10^3
Cd-115m		30	30	2.6×10^4
Cd-115		80	20	5.1×10^5
Ce-139	Cerium (58)	100	100	6.5×10^3
Ce-141		300	25	2.8×10^4
Ce-143		60	20	6.6×10^5
Ce-144		10	7	3.2×10^3
Cf-249	Californium (98)	2	0.002	3.1
Cf-250		7	0.007	1.3×10^2
Cf-252		2	0.009	6.5×10^2
Cl-36	Chlorine (17)	300	10	3.2×10^2
Cl-38		10	10	1.3×10^8
Cm-242	Curium (96)	200	0.2	3.3×10^3
Cm-243		9	0.009	4.2×10^1
Cm-244		10	0.01	8.2×10^1
Cm-245		6	0.006	1.0×10^{-1}
Cm-246		6	0.006	3.6×10^{-1}
Co-56	Cobalt (27)	5	5	3.0×10^4
Co-57		90	90	8.5×10^3
Co-58m		1000	1000	5.9×10
Co-58		20	20	3.1×10^4
Co-60		7	7	1.1×10^3
Cr-51	Chromium (24)	600	600	9.2×10^4
Cs-129	Cesium (55)	40	40	7.6×10^5
Cs-131		1000	1000	1.0×10^5
Cs-134m		1000	10	7.4×10^6
Cs-134		10	10	1.2×10^3
Cs-135		1000	25	8.8×10^{-4}
Cs-136		7	7	7.4×10^4

Cs-137		30	10	9.8×10^1
Cu-64	Copper (29)	80	25	3.8×10^6
Cu-67		200	25	7.9×10^5
Dy-165	Dysprosium (66)	100	20	8.2×10^6
Dy-166		1000	200	2.3×10^5
Er-169	Erbium (68)	1000	25	8.2×10^4
Er-171		50	20	2.4×10^6
Eu-152m	Europium (63)	30	30	2.2×10^6
Eu-152		20	10	1.9×10^2
Eu-154		10	5	1.5×10^2
Eu-155		400	60	1.4×10^3
F-18	Fluorine (9)	20	20	9.3×10^7
Fe-52	Iron (26)	5	5	7.3×10^6
Fe-55		1000	1000	2.2×10^3
Fe-59		10	10	4.9×10^4
Ga-67	Gallium (31)	100	100	6.0×10^5
Ga-68		20	20	4.0×10^7
Ga-72		7	7	3.1×10^6
Gd-153	Gadolinium (64)	200	100	3.6×10^3
Gd-159		300	20	1.1×10^6
Ge-68	Germanium (32)	20	10	7.0×10^3
Ge-71		1000	1000	1.6×10^5
H-3	Hydrogen (1) see T-Tritium			
Hf-181	Hafnium (72)	30	25	1.6×10^4
Hg-197m	Mercury (80)	200	200	6.6×10^5
Hg-197		200	200	2.5×10^5
Hg-203		80	25	1.4×10^4
Ho-166	Holmium (67)	30	30	6.9×10^5
I-123	Iodine (53)	50	50	1.9×10^6
I-125		1000	70	1.7×10^4
I-126		40	10	7.8×10^4
I-129		1000	2	1.6×10^{-4}
I-131		40	10	1.2×10^5
I-132		7	7	1.1×10^7
I-133		30	10	1.1×10^6

I-134		8	8	2.7×10^7
I-135		10	10	3.5×10^6
In-111	Indium (49)	30	25	4.2×10^5
In-113m		60	60	1.6×10^7
In-114m		30	20	2.3×10^4
In-115m		100	20	6.1×10^6
Ir-190	Iridium (77)	10	10	6.2×10^4
Ir-192		20	10	9.1×10^3
Ir-194		10	10	8.5×10^5
K-42	Potassium (19)	10	10	6.0×10^6
K-43		20	10	3.3×10^6
Kr-85m (uncompressed)*	Krypton (36)	100	100	8.4×10^6
Kr-85m (compressed)*		3	3	8.4×10^6
Kr-85 (uncompressed)*		1000	1000	4.0×10^2
Kr-85 (compressed)*		5	5	4.0×10^2
Kr-87 (uncompressed)*		20	20	2.8×10^7
Kr-87 (compressed)*		0.6	0.6	2.8×10^7
La-140	Lanthanum (57)	30	30	5.6×10^5
Lu-177	Lutetium (71)	300	25	1.1×10^5
MFP	Mixed Fission products	10	0.4	--
Mg-28	Magnesium (12)	6	6	5.2×10^6
Mn-52	Manganese (25)	5	5	4.4×10^5
Mn-54		20	20	8.3×10^3
Mn-56		5	5	2.2×10^7
Mo-99	Molybdenum (42)	100	20	4.7×10^5
N-13	Nitrogen (7)	20	10	1.5×10^9
Na-22	Sodium (11)	8	8	6.3×10^3
Na-24		5	5	8.7×10^6
Nb-93m	Niobium (41)	1000	200	1.1×10^3
Nb-95		20	20	3.9×10^4
Nb-97		20	20	2.6×10^7
Nd-147	Neodymium (60)	100	20	8.0×10^4
Nd-149		30	20	1.1×10^7

Ni-59	Nickel (28)	1000	900	8.1×10^{-2}
Ni-63		1000	100	4.6×10^1
Ni-65		10	10	1.9×10^7
Np-237	Neptunium (93)	5	0.005	6.9×10^{-4}
Np-239		200	25	2.3×10^5
Os-185	Osmium (76)	20	20	7.3×10^3
Os-191		600	200	4.6×10^4
Os-191m		200	200	1.2×10^6
Os-193		100	20	5.3×10^5
P-32	Phosphorus (15)	30	30	2.9×10^5
Pa-230	Protactinium (91)	20	0.8	3.2×10^4
Pa-231		2	0.002	4.5×10^{-2}
Pa-233		100	100	2.1×10^4
Pb-201	Lead (82)	20	20	1.7×10^6
Pb-210		100	0.2	8.8×10^1
Pb-212		6	5	1.4×10^6
Pd-103	Palladium (46)	1000	700	7.5×10^4
Pd-109		100	20	2.1×10^6
Pm-147	Promethium (61)	1000	25	9.4×10^2
Pm-149		100	20	4.2×10^5
Po-210	Polonium (84)	200	0.2	4.5×10^3
Pr-142	Praseodymium (59)	10	10	1.2×10^4
Pr-143		300	20	6.6×10^4
Pt-191	Platinum (78)	100	100	2.3×10^5
Pt-193m		200	200	2.0×10^5
Pt-197m		300	20	1.2×10^7
Pt-197		300	20	8.8×10^5
Pu-238	Plutonium (94)	3	0.003	1.7×10^1
Pu-239		2	0.002	6.2×10^{-2}
Pu-240		2	0.002	2.3×10^{-1}
Pu-241		1000	0.1	1.1×10^2
Pu-242		3	0.003	3.9×10^{-3}
Ra-223	Radium (88)	50	0.2	5.0×10^4
Ra-224		6	0.5	1.6×10^5
Ra-226		10	0.05	1.0
Ra-228		10	0.05	2.3×10^2

Rb-81	Rubidium (37)	30	24	8.2×10^6
Rb-86		30	30	8.1×10^4
Rb-87		Unlimited	Unlimited	6.6×10^{-8}
Rb (natural)		Unlimited	Unlimited	1.8×10^{-8}
Re-186	Rhenium (75)	100	20	1.9×10^5
Re-187		Unlimited	Unlimited	3.8×10^{-8}
Re-188		10	10	1.0×10^6
Re (natural)		Unlimited	Unlimited	2.4×10^{-8}
Rh-103m	Rhodium (45)	1000	1000	3.2×10^7
Rh-105		200	25	8.2×10^5
Rn-222	Radon (86)	10	2	1.5×10^5
Ru-97	Ruthenium (44)	80	80	5.5×10^5
Ru-103		30	25	3.2×10^4
Ru-105		20	20	6.6×10^6
Ru-106		10	7	3.4×10^3
S-35	Sulphur (16)	1000	60	4.3×10^4
Sb-122	Antimony (51)	30	30	3.9×10^5
Sb-124		5	5	1.8×10^4
Sb-125		40	25	1.4×10^3
Sc-46	Scandium (21)	8	8	3.4×10^4
Sc-47		200	20	8.2×10^5
Sc-48		5	5	1.5×10^6
Se-75	Selenium (34)	40	40	1.4×10^4
Si-31	Silicon (14)	100	20	3.9×10^7
Sm-147	Samarium (62)	Unlimited	Unlimited	2.0×10^{-8}
Sm-151		1000	90	2.6×10^1
Sm-153		300	20	4.4×10^5
Sn-113	Tin (50)	60	60	1.0×10^4
Sn-119m		100	100	4.4×10^3
Sn-125		10	10	1.1×10^5
Sr-85m	Strontium (38)	80	80	3.2×10^7
Sr-85		30	30	2.4×10^4
Sr-85m		50	50	1.2×10^7
Sr-89		100	10	2.9×10^4
Sr-90		10	0.4	1.5×10^2
Sr-91		10	10	3.6×10^6
Sr-92		10	10	1.3×10^7

T (uncompressed)*	Tritium (1)	1000	1000	9.7×10^3
T (compressed)*		1000	1000	9.7×10^3
T (activated luminous paint)		1000	1000	9.7×10^3
T adsorbed on solid carrier)		1000	1000	9.7×10^3
T (tritiated water)		1000	1000	9.7×10^3
T (other forms)		20	20	9.7×10^3
Ta-182	Tantalum (73)	20	20	6.2×10^3
Tb-160	Terbium (65)	20	10	1.1×10^4
Tc-96m	Technetium (43)	1000	1000	3.8×10^7
Tc-96		6	6	3.2×10^5
Tc-97m		1000	200	1.5×10^4
Tc-97		1000	400	1.4×10^{-3}
Tc-99m		100	100	5.2×10^6
Tc-99		1000	25	1.7×10^{-2}
Te-125m	Tellurium (52)	1000	100	1.8×10^4
Te-127m		300	20	4.0×10^4
Te-127		300	20	2.6×10^6
Te-129m		30	10	2.5×10^4
Te-129		100	20	2.0×10^7
Te-131m		10	10	8.0×10^5
Te-132		7	7	3.1×10^5
Th-227	Thorium (90)	200	0.2	3.2×10^4
Th-228		6	0.008	8.3×10^2
Th-230		3	0.003	1.9×10^{-2}
Th-231		1000	25	5.3×10^5
Th-232		Unlimited	Unlimited	1.1×10^{-7}
Th-234		10	10	2.3×10^4
Th (natural)		Unlimited	Unlimited	2.2×10^{-7}
Th (irradiated)**		---	---	---
Tl-200	Thallium (81)	20	20	5.8×10^5
Tl-201		200	200	2.2×10^5
Tl-202		40	40	5.4×10^4
Tl-204		300	10	4.3×10^2
Tm-170	Thulium (69)	300	10	6.0×10^3
Tm-171		1000	100	1.1×10^3

U-230	Uranium (92)	100	0.1	2.7×10^4
U-232		30	0.03	2.1×10^1
U-233		100	0.1	9.5×10^{-3}
U-234		100	0.1	6.2×10^{-3}
U-235		100	0.2	2.1×10^{-6}
U-236		200	0.2	6.3×10^{-5}
U-238		Unlimited	Unlimited	3.3×10^{-7}
U (natural)		Unlimited	Unlimited	(see Table IV)
U (enriched)	20%	Unlimited	Unlimited	(see Table IV)
	20% or greater	100	0.1	(see Table IV)
U (depleted)		Unlimited	Unlimited	(see Table IV)
U (irradiated)***		---	---	---
V-48	Vanadium (23)	6	6	1.7×10^5
W-181	Tungsten (74)	200	100	5.0×10^3
W-185		1000	25	9.7×10^{-3}
W-187		40	20	7.0×10^5
Xe-127 (uncompressed)*	Xenon (54)	70	70	2.8×10^4
Xe-127 (compressed)*		5	5	2.8×10^4
Xe-131m (compressed)*		10	10	1.0×10^5
Xe-131m (uncompressed)*		100	100	1.0×10^5
Xe-133 (uncompressed)*		1000	1000	1.9×10^5
Xe-133 (compressed)*		5	5	1.9×10^5
Xe-135 (uncompressed)*		70	70	2.5×10^5
Xe-135 (compressed)*		2	2	2.5×10^5
Y-87	Yttrium (39)	20	20	4.5×10^1
Y-90		10	10	2.5×10^5
Y-91m		30	30	4.1×10^7
Y-91		30	30	2.5×10^4
Y-92		10	10	9.5×10^6
Y-93		10	10	3.2×10^6
Yb-169	Ytterbium (70)	80	80	2.3×10^5
Yb-175		400	25	1.8×10^5
Zn-65	Zinc (30)	30	30	8.0×10^3
Zn-69m		40	20	3.3×10^6
Zn-69		300	20	5.3×10^7

Zr-93	Zirconium (40)	1000	200	3.5×10^{-3}
Zr-95		20	20	2.1×10^4
Zr-97		20	20	2.0×10^6

* For the purpose of table I, compressed gas means a gas at a pressure which exceeds the ambient atmospheric pressure at the location where the containment system was closed.

** The values of A_1 and A_2 must be calculated in accordance with the procedure specified in appendix A, paragraph c, taking into account the activity of the fission products and of the uranium-233 in addition to that of the thorium.

*** The values of A_1 and A_2 must be calculated in accordance with the procedure specified in Appendix A, paragraph c, taking into account the activity of the fission products and plutonium isotopes in addition to that of the uranium.

Table II
 Relationship Between A_1 and E_{\max} for Beta Emitters

E_{\max} (MeV)	A_1 (Ci)
0.5	1000
0.5 - 1.0	300
1.0 - 1.5	100
1.5 - 2.0	30
- 2.0	10

Table III
 Relationship Between A_3 and the
 Atomic Number of the Radionuclide

Atomic Number	Half-life less than 1000 days	A_3	Half-life greater than 10^6 years
		Half-life 1000 days to 10^6 years	
1 to 81	3 Ci	0.05 Ci	3 Ci
82 and above	0.002 Ci	0.002 Ci	3 Ci

Table IV
Activity-Mass Relationships for Uranium/Thorium

Thorium and Uranium Enrichment* wt % U-235 present	Specific Activity	
	Ci/g	g/Ci
0.45	5.0×10^{-7}	2.0×10^6
0.72 (natural)	7.06×10^{-7}	1.42×10^6
1.0	7.6×10^{-7}	1.3×10^6
1.5	1.0×10^{-6}	1.0×10^6
5.0	2.7×10^{-6}	3.7×10^5
10.0	4.8×10^{-6}	2.1×10^5
20.0	1.0×10^{-5}	1.0×10^5
35.0	2.0×10^{-5}	5.0×10^4
50.0	2.5×10^{-5}	4.0×10^4
90.0	5.8×10^{-5}	1.7×10^4
93.0	7.0×10^{-5}	1.4×10^4
95.0	9.1×10^{-5}	1.1×10^4
Natural Thorium	2.2×10^{-7}	4.6×10^6

*The figures for uranium include representative values for the activity of the uranium-234 which is concentrated during the enrichment process. The activity for thorium includes the equilibrium concentration of thorium-228.

CHAPTER 33-15-01

33-15-01-04. Definitions. As used in this article, except as otherwise specifically provided or where the context indicates otherwise, the following words shall have the meanings ascribed to them in this section:

1. "Act" means North Dakota Century Code chapter 23-25.
2. "Air contaminant" means any solid, liquid, gas, or odorous substance or any combination thereof.
3. "Air pollution" means the presence in the outdoor atmosphere of one or more air contaminants in such quantities and duration as is or may be injurious to human health, welfare, or property, animal or plant life, or which unreasonably interferes with the enjoyment of life or property.
4. "Ambient air" means the surrounding outside air.
5. "ASME" means the American society of mechanical engineers.
6. "Control equipment" means any device or contrivance which prevents or reduces emissions.
7. "Department" means the North Dakota state department of health and consolidated laboratories.
8. "Emission" means a release of air contaminants into the ambient air.
9. "Existing" means equipment, machines, devices, articles, contrivances, or installations which are in being on or before July 1, 1970, unless specifically designated within this article; except that any existing equipment, machine, device, contrivance, or installation which is altered, repaired, or rebuilt after July 1, 1970, must be reclassified as "new" if such alternation, rebuilding, or repair results in the emission of an additional or greater amount of air contaminants.
10. "Fuel burning equipment" means any furnace, boiler apparatus, stack, or appurtenances thereto used in the process of burning fuel or other combustible material for the primary purpose of producing heat or power by indirect heat transfer.
11. "Fugitive emissions" means solid airborne particulate matter, fumes, gases, mist, smoke, odorous matter, vapors, or any combination thereof generated incidental to an operation process procedure or emitted from any source other than through a well-defined stack or chimney.

12. "Garbage" means putrescible animal and vegetable wastes resulting from the handling, preparation, cooking, and consumption of food, including wastes from markets, storage facilities, handling, and sale of produce and other food products.
13. "Heat input" means the aggregate heat content of all fuels whose products of combustion pass through a stack or stacks. The heat input value to be used shall be the equipment manufacturer's or designer's guaranteed maximum input, whichever is greater.
14. "Incinerator" means any article, machine, equipment, device, contrivance, structure, or part of a structure used for the destruction of garbage, rubbish, or other wastes by burning or to process salvageable material by burning.
15. "Inhalable particulate matter" means particulate matter with an aerodynamic diameter less than or equal to a nominal ten micrometers. Also known as PM₁₀.
16. "Installation" means any property, real or personal, including, but not limited to, processing equipment, manufacturing equipment, fuel burning equipment, incinerators, or any other equipment, or construction, capable of creating or causing emissions.
17. "Multiple chamber incinerator" means any article, machine, equipment, contrivance, structure, or part of a structure used to dispose of combustible refuse by burning, consisting of three or more refractory lined combustion furnaces in series physically separated by refractory walls, interconnected by gas passage ports or ducts and employing adequate parameters necessary for maximum combustion of the material to be burned.
18. "New" means equipment, machines, devices, articles, contrivances, or installations built or installed on or after July 1, 1970, unless specifically designated within this article, and installations existing at said stated time which are later altered, repaired, or rebuilt and result in the emission of an additional or greater amount of air contaminants.
19. "Opacity" means the degree to which emissions reduce the transmission of light and obscure the view of an object in the background.
20. "Open burning" means the burning of any matter in such a manner that the products of combustion resulting from the burning are emitted directly into the ambient air without passing through an adequate stack, duct, or chimney.

21. "Particulate matter" means any airborne finely divided solid or liquid material with an aerodynamic diameter smaller than one hundred micrometers.
22. "Particulate matter emissions" means all finely divided solid or liquid material, other than uncombined water, emitted to the ambient air.
23. "Person" means any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, agency, political subdivision of this state, any other state or political subdivision or agency thereof and any legal successor, representative agent, or agency of the foregoing.
24. "Pesticide" includes (a) any agent, substance, or mixture of substances intended to prevent, destroy, control, or mitigate any insect, rodent, nematode, predatory animal, snail, slug, bacterium, weed, and any other form of plant or animal life, fungus, or virus, that may infect or be detrimental to persons, vegetation, crops, animals, structures, or households or be present in any environment or which the department may declare to be a pest, except those bacteria, fungi, protozoa, or viruses on or in living man or other animals; (b) any agent, substance, or mixture of substances intended to be used as a plant regulator, defoliant, or desiccant; and (c) any other similar substance so designated by the department, including herbicides, insecticides, fungicides, nematocides, molluscacides, rodenticides, lampreycides, plant regulators, gametocides, post-harvest decay preventatives, and antioxidants.
25. "PM₁₀" means particulate matter with an aerodynamic diameter less than or equal to a nominal ten micrometers.
26. "PM₁₀ emissions" means finely divided solid or liquid material with an aerodynamic diameter less than or equal to a nominal ten micrometers emitted to the ambient air.
27. "Premises" means any property, piece of land or real estate, or building.
28. "Process weight" means the total weight of all materials introduced into any specific process which may cause emissions. Solid fuels charged will be considered as part of the process weight, but liquid and gaseous fuels and combustion air will not.
29. "Process weight rate" means the rate established as follows:
 - a. For continuous or longrun steady state operations, the total process weight for the entire period of continuous operation or for a typical portion thereof, divided by the number of hours of such period or portion thereof.

- b. For cyclical or batch operations, the total process weight for a period that covers a complete operation or an integral number of cycles, divided by the hours of actual process operation during such a period. Where the nature of any process or operation or the design of any equipment is such as to permit more than one interpretation of this definition, the interpretation that results in the minimum value for allowable emission shall apply.
30. "Public nuisance" means any condition of the ambient air beyond the property line of the offending person which is offensive to the senses, or which causes or constitutes an obstruction to the free use of property, so as to interfere with the comfortable enjoyment of life or property.
31. "Refuse" means any combustible waste material, trade waste, rubbish, or garbage containing carbon in a free or combined state.
32. "Rubbish" means nonputrescible solid wastes consisting of both combustible and noncombustible wastes. Combustible rubbish includes paper, rags, cartons, wood, furniture, rubber, plastics, yard trimmings, leaves, and similar materials. Noncombustible rubbish includes glass, crockery, cans, dust, metal furniture and like materials which will not burn at ordinary incinerator temperatures (one thousand six hundred to one thousand eight hundred degrees Fahrenheit [1144 degrees Kelvin to 1255 degrees Kelvin]).
33. "Salvage operation" means any operation conducted in whole or in part for the salvaging or reclaiming of any product or material.
34. "Smoke" means small gasborne particles resulting from incomplete combustion, consisting predominantly, but not exclusively, of carbon, ash, and other combustible material, that form a visible plume in the air.
35. "Source" means any property, real or personal, or person contributing to air pollution.
36. "Source operation" means the last operation preceding emission which operation (a) results in the separation of the air contaminant from the process materials or in the conversion of the process materials into air contaminants, as in the case of combustion fuel; and (b) is not an air pollution abatement operation.
37. "Stack or chimney" means any flue, conduit, or duct arranged to conduct emissions.
38. "Submerged fill pipe" means any fill pipe the discharge opening of which is entirely submerged when the liquid level

is six inches [15.24 centimeters] above the bottom of the tank; or when applied to a tank which is loaded from the side, means any fill pipe the discharge opening of which is entirely submerged when the liquid level is one and one-half times the fill pipe diameter in inches [centimeters] above the bottom of the tank.

39. "Standard conditions" means a dry gas temperature of sixty-eight degrees Fahrenheit [293 degrees Kelvin] and a gas pressure of fourteen and seven-tenths pounds per square inch absolute [101.3 kilopascals].
40. "Trade waste" means solid, liquid, or gaseous waste material resulting from construction or the conduct of any business, trade, or industry, or any demolition operation, including, but not limited to, wood, wood containing preservatives, plastics, cartons, grease, oil, chemicals, and cinders.
41. "Volatile organic compounds" means any compound containing carbon and hydrogen or containing carbon and hydrogen in combination with any other element which has a modified Reid vapor pressure of one and one-half pounds per square inch absolute [10.3 kilopascals] or greater under actual storage conditions. The following compounds are excluded unless each is subject to an emissions standard under sections 111 or 112 of the Federal Clean Air Act: methane; ethane; methylene chloride; 1,1,1 trichloroethane (methyl chloroform); trichlorotrifluoroethane (CFC-113) (Freon 113); trichlorofluoromethane (CFC-11); dichlorodifluoromethane (CFC-12); chlorodifluoromethane (CFC-22); trifluoromethane (FC-23); dichlorotetrafluoroethane (CFC-114); chloropentafluoroethane (CFC-115); dichlorotrifluoroethane (HCFC-123); tetrafluoroethane (HCFC-134a); dichlorofluoroethane (HCFC-141b); and chlorodifluoroethane (HCFC-142b).
42. "Waste classification" means the seven classifications of waste as defined by the incinerator institute of America and American society of mechanical engineers.

History: Amended effective October 1, 1987; January 1, 1989; June 1, 1990; June 1, 1992.

General Authority: NDCC 23-25-03

Law Implemented: NDCC 23-25-03

33-15-01-13. Shutdown and malfunction of an installation - Requirement for notification.

1. Maintenance shutdowns. In the case of shutdown of air pollution control equipment for necessary scheduled maintenance, the intent to shut down such equipment shall be reported to the department at least twenty-four hours prior to

the planned shutdown provided that the air contaminating source will be operated while the control equipment is not in service. Such prior notice shall include the following:

- a. Identification of the specific facility to be taken out of service as well as its location and permit number.
- b. The expected length of time that the air pollution control equipment will be out of service.
- c. The nature and estimated quantity of emissions of air pollutants likely to be emitted during the shutdown period.
- d. Measures such as the use of off-shift labor and equipment that will be taken to minimize the length of the shutdown period.
- e. The reasons that it would be impossible or impractical to shut down the source operation during the maintenance period.

2. Malfunctions.

- a. When a malfunction in any installation occurs that can be expected to last longer than twenty-four hours and cause the emission of air contaminants in violation of this article or other applicable rules and regulations, the person responsible for such installation shall notify the department of such malfunction as soon as possible during normal working hours. The notification must contain a statement giving all pertinent facts, including the estimated duration of the breakdown. On receipt of this notification, the department may permit the continuance of the operation for a period not to exceed ten days provided that written application is made to the department. Such application shall be made within twenty-four hours of the malfunction or within such other time period as the department may specify. In cases of major equipment failure, additional time period may be granted by the department provided a corrective program has been submitted by the person and approved by the department. The department shall be notified when the condition causing the malfunction has been corrected.
- b. Immediate notification to the department is required for any malfunction that would threaten health or welfare, or pose an imminent danger. During normal working hours the department can be contacted at ~~701-224-2348~~ 701-221-5188. After hours the department can be contacted through the twenty-four-hour state radio emergency number 1-800-472-2121. If calling from out of state, the twenty-four-hour number is 701-224-2121.

3. Continuous emission monitoring system failures. When a failure of a continuous emission monitoring system occurs, an alternative method, acceptable to the department, for measuring or estimating emissions must be undertaken as soon as possible. Timely repair of the emission monitoring system must be made.

History: Amended effective October 1, 1987; January 1, 1989; June 1, 1992.

General Authority: NDCC 23-25-03

Law Implemented: NDCC 23-25-03

CHAPTER 33-15-05

33-15-05-02. Maximum allowable emission of particulate matter from fuel burning equipment used for indirect heating.

1. General provisions.

- a. This section applies to installations in which fuel is burned for the primary purpose of producing steam, hot water, hot air or other indirect heating of liquids, gases, or solids and, in the course of doing so, the products of combustion do not come into direct contact with process materials. Fuels include those such as coal, coke, lignite, coke breeze, fuel oil, and wood but do not include refuse. When any products or byproducts of a manufacturing process are burned for the same purpose or in conjunction with any fuel, the same maximum emission limitations shall apply.
- b. The maximum allowable particulate matter which may be emitted from fuel burning units at a source is determined by the maximum or manufacturer's rated heat input of each unit.

2. Emission limitations.

- a. Existing installations. No person shall cause or permit the emission of particulate matter, caused by combustion of fuel in any existing fuel burning equipment, from any stack or chimney in excess of eighty-hundredths pounds of particulates per million British thermal units [344 nanograms per joule] heat input. Provided, however, as technology develops for making new control equipment compatible, both technically and economically, with present plants they shall comply with limitations on emissions of particulate matter from fuel burning installations as outlined in subdivision b when directed by the department.
- b. New installations. No person shall cause or permit the emission of particulate matter, caused by the combustion of fuel in any new fuel burning equipment, from any stack or chimney in excess of the quantity set forth in table 4.
- c. Means shall be provided in all newly constructed units and wherever practicable in existing units to allow the periodic measurement of fly ash and other particulate matter.
- d. No person may burn or cause or permit the burning of refuse including preservative treated wood in any

installation which was designed for the sole purpose of burning fuel unless approved by the department.

- e. Existing or new installations, with a heat input of not more than ten million British thermal units per hour and sources with multiple boilers with a total aggregate heat input of not more than ten million British thermal units per hour, shall be exempt from the applicable allowable emission rate set forth in subdivision a or in table 4, respectively. These sources shall be subject to visible emission and ambient air quality standards.
- f. Any new or existing source whose heat input is greater than two hundred fifty million British thermal units per hour and is equipped with state of the art control technology capable of complying with the particulate emission limitations of ~~paragraph f of subdivision c of subsection f of section 33-15-12-04~~ subparagraph 1 of paragraph a of section 60.42 of subpart D of chapter 33-15-12 [40 CFR 60.42(a)(1)] shall comply with such limitations when directed by the department.
- g. If any party is aggrieved by the department's decision as referenced in subdivision a or f, that party may request a hearing before the department to review such decision. Such hearing must be conducted according to article 33-22 and North Dakota Century Code chapter 28-32. If a hearing is requested, the emission limitations as referenced in subdivision a or f (whichever is applicable) are not effective until ordered by the department at the conclusion of the hearing process.

Table 4.

Maximum Allowable Rates of Emission of
Particulate Matter from New
Fuel Burning Equipment

Heat Input (H)	Allowable Emission Rate (E)	Heat Input (H)	Allowable Emission Rate (E)
10^6 Btu/hr	lb/ 10^6 Btu	joules/hr	nanogram/ joule
10 or less	0.600	1.05×10^{10}	258
20	0.548	2.11×10^{10}	235
30	0.519	3.16×10^{10}	224
40	0.500	4.22×10^{10}	215
50	0.486	5.27×10^{10}	209
100	0.444	1.05×10^{11}	191
150	0.421	1.58×10^{11}	181
200	0.405	2.11×10^{11}	174
250	0.394	2.64×10^{11}	169

Interpolation and extrapolation of the data in this table shall be accomplished by the use of equations:

$$E = 0.811 H^{-0.131} \quad (\text{English units})$$

$$E = 5307 H^{-0.131} \quad (\text{Metric units})$$

where E = allowable emission rate in lb/million Btu of heat input [nanogram/joule] and H = heat input in millions of Btu/hr [joules/hr].

History: Amended effective October 1, 1987; June 1, 1990; June 1, 1992.

General Authority: NDCC 23-25-03

Law Implemented: NDCC 23-25-03

33-15-05-03. Incinerators.

1. General provisions.

- a. This section applies to any incinerator used to dispose of refuse or other wastes by burning and the processing of salvageable material by burning.

- b. The burning capacity of an incinerator shall be the manufacturer's or designer's guaranteed maximum rate or such other rate as may be determined by the department in accordance with good engineering practices. In case of conflict, the determination made by the department shall govern.
2. Restriction of emissions of particulate matter from incinerators.
 - a. No person shall cause or permit the emission of particulate matter from the stack or chimney of any incinerator in excess of the amount shown in table 5 for the refuse burning rate allocated to such incinerator.
 - b. All new incinerators and all existing incinerators to be modified to meet the requirements of this section and which are to burn type 2, 3, 4, 5, and 6 waste as classified by the incinerator institute of America must be equipped with auxiliary fuel burners of such capacity and design as to assure a temperature in the secondary combustion chamber of at least one thousand five hundred degrees Fahrenheit [1088 degrees Kelvin] for a minimum of three-tenths second retention time.
 - c. No incinerator shall be used for the burning of refuse unless such incinerator is a multiple chamber incinerator. Existing incinerators which are not multiple chamber incinerators may be altered, modified, or rebuilt as may be necessary to meet this requirement. ~~The department may approve any other alteration or modification to an existing incinerator if such be found by it to be equally effective for the purpose of air pollution control as a modification or alteration which would result in a multiple chamber incinerator.~~ All new incinerators shall be multiple chamber incinerators, provided that the department may approve any other kind of incinerator if it finds in advance of construction or installation that such other kind of incinerator is equally effective for purposes of air pollution control.

Existing incinerators burning type 2 and type 3 waste which are not multiple chamber incinerators and do not otherwise meet the requirements of subdivision a shall be modified or rebuilt in compliance with this section. Existing incinerators burning type 4, 5, or 6 waste require the specific approval of the department. Incinerators handling any garbage and organic waste must have auxiliary fuel burners that maintain a minimum temperature of one thousand five hundred degrees Fahrenheit [1088 degrees Kelvin] for a minimum of three-tenths second retention time.

Table 5.

Maximum Allowable Rates of
Emission of Particulate Matter From
Incinerators

Refuse Burning Rate (R)	Allowable Emission Rate (E)	Refuse Burning Rate (R)	Allowable Emission Rate (E)
lb/hr	lb/hr	kg/hr	kg/hr
10	0.041	4.54	0.019
50	0.174	22.68	0.079
300	0.873	136.08	0.396
700	1.87	317.51	0.850
1,000	2.58	453.59	1.17
1,500	3.38	681.39	1.53
3,500	5.97	1,587.57	2.71
8,000	10.39	3,628.72	4.71
25,000	22.29	11,339.75	10.10
100,000	56.42	45,359.00	25.57

Interpolation of the data in this table for refuse burning rates up to 1,000 lb/hr [453.59 kg/hr] shall be accomplished by the use of the equations:

$$E = 0.00515 R^{0.90} \quad (\text{English units})$$

$$E = 0.00476 R^{0.90} \quad (\text{Metric units})$$

and interpolation and extrapolation of the data for refuse burning rates in excess of 1,000 lb/hr [453.59 kg/hr] shall be accomplished by the use of the equations:

$$E = 0.0252 R^{0.67} \quad (\text{English units})$$

$$E = 0.0194 R^{0.67} \quad (\text{Metric units})$$

where E = allowable emission rate in lb/hr [kg/hr] and R = refuse burning rate in lb/hr [kg/hr].

History: Amended effective October 1, 1987; June 1, 1992.

General Authority: NDCC 23-25-03

Law Implemented: NDCC 23-25-03

33-15-05-04. Methods of measurement.

1. The reference methods in appendix A to chapter 33-15-12, its replacement or other methods, as approved by the department shall be used to determine compliance with sections 33-15-05-01, 33-15-05-02, and 33-15-05-03 as follows:
 - a. Method 1 for selection of sampling site and sample traverses.
 - b. Method 2 for determination of stack gas velocity and volumetric flow rate.
 - c. Method 3 for gas analysis.
 - d. Method 4 for determination of moisture in the stack gas.
 - e. Method 5 for concentration of particulate matter and the associated moisture content. The sampling time for each run shall be at least sixty minutes and the minimum sampling volume shall be thirty dry cubic feet at standard conditions [0.85 dry cubic meter at standard conditions] except that smaller sampling times or volumes when necessitated by process variables or other factors may be approved by the department.
 - (1) For each run using method 5 for fuel burning equipment, the emissions expressed in pounds per million British thermal units [nanograms per joule] shall be determined by the following procedures:

$$E = CF \left(\frac{20.9}{20.9 - \%O_2} \right) \text{ or } E = CF_C \left(\frac{100}{\%CO_2} \right)$$

where:

- (a) E = pollutant emission, lb/million Btu [ng/j].
- (b) C = pollutant concentration, lb/dscf [ng/dscm].
- (c) %O₂ = oxygen content by volume, dry basis.
- (d) %CO₂ = carbon dioxide content by volume, dry basis.

The percent oxygen and percent carbon dioxide shall be determined by using the integrated or grab sampling and analysis procedures of method 3 by traversing the duct at the same sampling locations used for each run of method 5.

- (e) F and F_C = factors listed in the following table:

F FACTORS FOR VARIOUS FUELS

FUEL TYPE	F	F _c
	<u>dscf/10⁶Btu</u>	<u>scf/10⁶Btu</u>
Coal		
Anthracite	10140	1980
Bituminous	9820	1810
Lignite	9900	1920
Oil	9220	1430
Gas		
Natural	8740	1040
Propane	8740	1200
Butane	8740	1260
Wood	9280	1840 1860
Wood Bark	9640	1860 1840

For facilities firing combinations of fuels for F or F_c factors designated in this section shall be prorated in accordance with the applicable formula as follows:

$$F = \sum_{i=1}^n x_i F_i \text{ OR } F_c = \sum_{i=1}^n x_i (F_c)_i$$

where:

x_i = the fraction of total heat input derived from each type of fuel.

F_i or (F_c)_i = the applicable F or F_c factor for each fuel type.

n = the number of fuels being burned in combination.

- (2) For each run using method 5 for industrial processes, the emission rate expressed in pounds per hour shall be determined by the equation, lb/hr = (Q_s) (c)

where:

Q_s = volumetric flow rate of the total effluent in dscf/hr and

c = particulate concentration in lb/dscf.

2. The heat content of fuels shall be determined in accordance with A.S.T.M. methods D2015-66(72) (solid fuels), D240-64(73) (liquid fuels), or D1826-64(70) (gaseous fuels) as applicable.

3. The determination of particulate matter emissions with an aerodynamic diameter less than ten micrometers [PM₁₀] must be made in accordance with the methods established in 40 Code of Federal Regulations, part 51, appendix M as applicable.

History: Amended effective October 1, 1987; June 1, 1992.

General Authority: NDCC 23-25-03

Law Implemented: NDCC 23-25-03

CHAPTER 33-15-06

33-15-06-01. Restriction of emissions of sulfur dioxide from use of fuel.

1. General provisions.

- a. ~~This~~ Except as provided in subdivision c of this subsection, this section applies to any installation in which fuel is burned and in which the sulfur dioxide ~~emission is~~ emissions are substantially due to the content of the fuel burned, and in which the fuel is burned primarily to produce heat.
- b. For purposes of this section, a fuel burning installation is any single fuel burning furnace or boiler or other unit, device, or contrivance in which fuel is burned or any grouping of two or more such furnaces or boilers or other units, devices, or contrivances on the same premises or otherwise located in close proximity to each other and under control of the same person. The capacity of such installations shall be the manufacturer's or designer's guaranteed maximum heat input rate.
- c. This chapter does not apply to installations which are subject to a sulfur dioxide emission limit under chapter 33-15-12.

2. Restrictions applicable to fuel burning installations. No person shall cause or permit the emission of sulfur dioxide to the ambient air from any fuel burning installation in an amount greater than three pounds of sulfur dioxide per million British thermal units [1290 nanograms/joule] of heat input to the installation on a one-hour-block-average basis. The department may establish alternative averaging periods provided the requirements of chapter 33-15-02 are met. All averaging periods must begin on the hour and averaging periods greater than one hour must be rolling averages.

3. The department shall establish more restrictive emission limits for a source if it is determined that such source is causing the ambient air quality standards of chapter 33-15-02 or the prevention of significant deterioration increments of chapter 33-15-15 for sulfur dioxide to be exceeded. However, the department may consider alternative measures which will achieve compliance with the ambient air quality standards or prevention of significant deterioration increments.

History: Amended effective June 1, 1992.

General Authority: NDCC 23-25-03, 28-32-02

Law Implemented: NDCC 23-25-03

33-15-06-02. Restriction of emissions of sulfur oxides from industrial processes.

1. General provisions. This section applies to all emissions except those in which all of the following are met:
 - a. Fuel is burned primarily to produce heat.
 - b. The sulfur compound emission is due primarily to the sulfur in the fuel burned.
2. Concentration of sulfur compounds in emissions restricted. The department shall establish emission limitations on the amount of sulfur dioxide, sulfur trioxide, and sulfuric acid which may be emitted into the ambient air from any source specified in subsection 1 in any area, if it is determined that such source is causing the ambient air quality standards of chapter 33-15-02 or the prevention of significant deterioration increments of chapter 33-15-15 for sulfur dioxide to be exceeded.

History: Amended effective June 1, 1992.

General Authority: NDCC 23-25-03, 28-32-02

Law Implemented: NDCC 23-25-03

33-15-06-03. Methods of measurement. Testing must be done in accordance with the provisions of chapter 33-15-12 as applicable. The reference methods in appendix A to chapter 33-15-12, its replacement or other applicable alternative methods as approved by the department, shall be used to determine compliance with this chapter ~~33-15-06~~ as follows:

1. Method 1 for selection of sampling site and sample traverses.
2. Method 2 for stack gas velocity and volumetric flow rate.
3. Method 3 for gas analysis.
4. Method 4 for moisture content.
- ~~3.~~ 5. Method 6, 6A, 6C, and 20, as applicable, for concentration of sulfur dioxide. The minimum sampling time shall be twenty at least sixty minutes, and the minimum sampling volume seventy-one hundredths dscf {0.02 dscm} for each sample. The arithmetic mean of two samples shall constitute one run. Samples shall be taken at approximately thirty minute intervals. Testing shall be done in accordance with subsection 7 of section 33-15-12-01 as applicable per run and a test must consist of three runs.
 - a. For each run using method 6 for fuel burning equipment the emissions expressed in pounds per million British thermal

units [nanogram per joule] shall be determined by the following procedures:

$$E = CF \left(\frac{20.9}{20.9 - \%O_2} \right) \quad \text{Or} \quad E = CF_c \left(\frac{100}{\%CO_2} \right)$$

where:

- (1) E = pollutant emission, lb/million Btu [ng/j].
- (2) C = pollutant concentrations, lb/dscf [ng/dscm].
- (3) %O₂ = oxygen content by volume, dry basis.
- (4) %CO₂ = carbon dioxide content by volume, dry basis.

The percent oxygen and percent carbon dioxide shall be determined by using the integrated or grab sampling and analysis procedures of method 3.

- (5) F and F_c = factors listed in the following table:

F FACTORS FOR VARIOUS FUELS

FUEL TYPE	F dscf/10 ⁶ Btu	F _c scf/10 ⁶ Btu
Coal		
Anthracite	10140	1980
Bituminous	9820	1810
Lignite	9900	1920
Oil	9220	1430
Gas		
Natural	8740	1040
Propane	8740	1200
Butane	8740	1260
Wood	9280	1840 1860
Wood bark	9640	1860 1840

For facilities firing combinations of fuels the F or F_c factors designated in this section shall be prorated in accordance with the applicable formula as follows:

$$F = \sum_{i=1}^n x_i F_i \quad \text{or} \quad F_c = \sum_{i=1}^n x_i (F_c)_i$$

where:

x_i = the fraction of total heat input derived from each type of fuel.

F_i or $(F_C)_i$ = the applicable F or F_C factor for each fuel type.

n = the number of fuels being burned in combination.

History: Amended effective June 1, 1992.

General Authority: NDCC 23-25-03

Law Implemented: NDCC 23-25-03

33-15-06-04. Continuous emission monitoring requirements.

1. General provisions.

a. For sources subject to continuous emission monitoring requirements in their permit to operate, the monitoring systems must be used to demonstrate compliance with emission limits on a continuous basis after the initial compliance test and certification of the system.

b. Emission rates must be recorded in the units of the applicable standard. Conversion of monitor data to an emission rate expressed in pounds per million British thermal units [nanogram per joule] shall be calculated in accordance with the equations in section 33-15-06-03. Equations for calculating emission rates with different units will be supplied by the department.

2. Installation, operation, and certification. The installation operation, and certification of continuous monitoring systems and monitoring devices must comply with the provisions of chapter 33-15-12 that apply to monitoring systems and monitoring devices.

3. Quality assurance. All continuous monitoring systems and monitoring devices must be recertified in accordance with the provisions of appendix B of chapter 33-15-12 every three years unless otherwise directed.

History: Effective June 1, 1992.

General Authority: NDCC 23-25-03

Law Implemented: NDCC 23-25-04

33-15-06-05. Reporting and recordkeeping requirements.

1. Excess emissions reports. Not later than thirty days following the end of a calendar quarter, any owner or operator required to monitor emissions shall submit a report of excess emissions to the department. The report must include the following information:

- a. The magnitude of excess emissions, any conversion factor or factors used, and the date and time of commencement and completion of each time period of excess emissions.
 - b. Specific identification of each period of excess emissions that occurs during startups, shutdowns, and malfunctions of the affected facility. The nature and cause of any malfunction (if known), the corrective action taken or preventative measures adopted.
 - c. The date and time identifying each period during which the continuous monitoring system was inoperative except for zero and span checks and the nature of the system repairs or adjustments.
 - d. When no excess emissions have occurred or the continuous monitoring systems have not been inoperative, repaired, or adjusted, such information must be stated in the report.
2. Records. Any owner or operator subject to continuous emission monitoring requirements shall maintain a file of all measurements, including continuous monitoring system, monitoring device, and performance testing measurements; all continuous monitoring system performance evaluations; all continuous monitoring system or monitoring device calibration checks; adjustments and maintenance performed on these systems or devices; and all other information required by the department recorded in a permanent form suitable for inspection. The file must be retained for at least two years following the date of such measurements, maintenance, reports, and records.

History: Effective June 1, 1992.
General Authority: NDCC 23-25-03
Law Implemented: NDCC 23-25-03

CHAPTER 33-15-07

33-15-07-01. Requirements for construction of organic compounds facilities.

1. Scope. This section applies only to those facilities considered "new" as defined in subsection ~~17~~ 18 of section 33-15-01-04.
2. Water separation from petroleum products. No person may build or install any single or multiple compartment volatile organic ~~liquid~~ compounds - water separator which normally receives effluent water containing two hundred gallons [757.08 liters] per day or more of any volatile organic liquid from any equipment processing, refining, treating, storing, or handling volatile organic ~~liquids~~ compounds unless such compartment is equipped with ~~one of the vapor loss control devices, a closed-vent system and control device as defined in 40 CFR part 60, subpart QQQ, section 60.691, as adopted in chapter 33-15-12, or a floating roof as described in 40 CFR part 60, subpart QQQ, section 60.693-2, as adopted in chapter 33-15-12, which is properly installed, and in good working order and in operation as described in subsection 8 of section 33-15-12-04.~~ For the purposes of this section, a volatile organic compounds - water separator means a device used to separate an oil water mixture into its separate components, which include volatile organic compounds and water, by gravity separation and skimming.
3. Submerged fill pipes required. No person may build or install or permit the building or installation of a stationary volatile organic compounds storage tank with a capacity of one thousand gallons [3,785.41 liters] or more unless such tank is equipped with a submerged fill pipe during filling operations or is a pressure tank as described in ~~subsection 8 of section 33-15-12-04~~ 40 CFR part 60, subpart K, subparagraph 60.111(a)(1), as adopted in chapter 33-15-12, or fitted with a vapor recovery system also defined in subsection 8 of section 33-15-12-04 40 CFR part 60, subpart K, paragraph 60.111(k), as adopted in chapter 33-15-12.
4. Volatile organic compounds loading facilities. No person may build or install or permit the building or installation of volatile organic compounds tank car or tank truck loading facilities handling twenty thousand gallons [75,708.24 liters] per day or more unless such facilities are equipped operated with ~~submersible~~ a submerged filling arms arm or other vapor emission control ~~systems~~ system. Any emissions control system utilized must have a minimum control efficiency necessary to meet the requirements of chapters 33-15-02 and 33-15-16.

5. Pumps and compressors. All rotating pumps and compressors handling volatile organic compounds must be equipped with mechanical seals or other equipment of equal efficiency for purposes of air pollution control as may be approved by the department and operated with properly maintained seals designed for their specific product service and operating conditions.

History: Amended effective October 1, 1987; June 1, 1992.

General Authority: NDCC 23-25-03, 28-32-02

Law Implemented: NDCC 23-25-03

CHAPTER 33-15-12

33-15-12-01. General provisions. Repealed effective June 1, 1992.

1. Applicability. The provisions of this chapter apply to the owner or operator of any stationary source whose construction or modification is commenced after the effective date of each section and subsection. These standards shall be applied in conjunction with the procedure set out in chapter 33-15-14.
2. Definitions. As used in this chapter, all terms not defined herein shall have the meaning given them in North Dakota Century Code chapter 23-25 or in section 33-15-01-04.
 - a. "Administrator" means the administrator of the United States environmental protection agency or his authorized representative.
 - b. "Affected facility" means, with reference to a stationary source, any apparatus to which a standard is applicable.
 - c. "Alternative method" means any method of sampling and analyzing for an air pollutant which is not a reference or equivalent method but which has been demonstrated to the department's and administrator's satisfaction, in specific cases, to produce results adequate for the department's and administrator's determination of compliance.
 - d. "Capital expenditure" means an expenditure for a physical or operational change to an existing facility which exceeds the product of the applicable "annual asset guideline repair allowance percentage" specified in the latest edition of Internal Revenue Service Publication 534 and the existing facility's basis, as defined by section 1012 of the Internal Revenue Code. However, the total expenditure for a physical or operational change to an existing facility must not be reduced by any "excluded additions" as defined in Internal Revenue Service Publication 534, as would be done for tax purposes.
 - e. "Commenced" as applied to construction of a new source means that an owner or operator has undertaken a continuous program of construction or modification or that an owner or operator has entered into a contractual obligation to undertake and complete, within a reasonable time, a continuous program of construction or modification.
 - f. "Construction" means fabrication, erection, or installation of an affected facility.

- g. "Continuous monitoring system" means the total equipment, required under the emission monitoring divisions in applicable subsections; used to sample and condition (if applicable); to analyze; and to provide a permanent record of emissions or process parameters.
- h. "Equivalent method" means any method of sampling and analyzing for an air pollutant which has been demonstrated to the department's and administrator's satisfaction to have a consistent and quantitatively known relationship to the reference method; under specified conditions.
- i. "Existing facility" means; with reference to a stationary source; any apparatus of the type for which a standard is promulgated in this chapter and the construction or modification of which was commenced before the effective date of that standard; or any apparatus which could be altered in such a way as to be of that type.
- j. "Isokinetic sampling" means sampling in which the linear velocity of the gas entering the sampling nozzle is equal to that of the undisturbed gas stream at the sample point.
- k. "Malfunction" means any sudden and unavoidable failure of air pollution control equipment or process equipment or of a process to operate in a normal or usual manner. Failures that are caused entirely or in part by poor maintenance; careless operation; or any other preventable upset condition or preventable equipment breakdown shall not be considered malfunctions.
- l. "Modification" means any physical change in; or change in the method of operation of; an existing facility which increases the amount of any air pollutant (to which a standard applies) emitted into the atmosphere by that facility or which results in the emission of any air pollutant (to which a standard applies) into the atmosphere not previously emitted.
- m. "Monitoring device" means the total equipment; required under the monitoring of operations divisions in applicable subsections; used to measure and record (if applicable) process parameters.
- n. "New source" means any stationary source; the construction or modification of which is commenced after the effective date of a standard of performance in this chapter which will be applicable to such source.
- o. "Nitrogen oxides" means all oxides of nitrogen except nitrous oxide; as measured by test methods set forth in this chapter.

- p. "One-hour period" means any sixty-minute period commencing on the hour.
- q. "Opacity" means the degree to which emissions reduce the transmission of light and obscure the view of an object in the background.
- r. "Owner or operator" means any person who owns, leases, operates, controls, or supervises an affected facility or a stationary source of which an affected facility is a part.
- s. "Particulate matter" means any finely divided solid or liquid material, other than uncombined water, as measured by method 5 of appendix A to this chapter or an equivalent or alternative method.
- t. "Proportional sampling" means sampling at a rate that produces a constant ratio of sampling rate to stack gas flow rate.
- u. "Reference method" means any method of sampling and analyzing for an air pollutant as specified in the applicable subsection.
- v. "Run" means the net period of time during which an emission sample is collected. Unless otherwise specified, a run may be either intermittent or continuous within the limits of good engineering practice.
- w. "Shutdown" means the cessation of operation of an affected facility for any purpose.
- x. "Six-minute period" means any one of the ten equal parts of a one-hour period.
- y. "Standard" means a standard of performance promulgated under this chapter.
- z. "Standard conditions" means a temperature of two hundred ninety-three degrees Kelvin {68 degrees Fahrenheit} and a pressure of one hundred one and three-tenths kilopascals {29.92 inches} of mercury.
- aa. "Startup" means the setting in operation of an affected facility for any purpose.
- bb. "Stationary source" means any building, structure, facility, or installation which emits or may emit any air pollutant.
- cc. "Volatile organic compound" means any organic compound which participates in atmospheric photochemical reactions;

or which is measured by a reference method; an equivalent method; an alternative method; or which is determined by procedures specified under any subsection.

3. Abbreviations. The abbreviations used in this chapter have the following meanings:

A - ampere
A.S.T.M. - American society for testing and materials
Btu - British thermal unit
°C - degree Celsius (centigrade)
cal - calorie
CdS - cadmium sulfide
cfm - cubic feet per minute
cu ft - cubic feet
CO - carbon monoxide
CO₂ - carbon dioxide
dcf - dry cubic feet
dcm - dry cubic meter
dscm - dry cubic meter at standard conditions
dscf - dry cubic feet at standard conditions
eq - equivalents
F - degree Fahrenheit
ft - feet
g - gram
gal - gallon
g eq - gram equivalents
gr - grain
hr - hour
HCl - hydrochloric acid
Hg - mercury
H₂O - water
H₂S - hydrogen sulfide
H₂SO₄ - sulfuric acid
Hz - hertz
in. - inch
j - joule
K - degree Kelvin
k - 1,000
kg - kilogram
l - liter
lpm - liter per minute
lb - pound
m - meter
m³ - cubic meter
meq - milliequivalent
Mg - megagram - 10⁶ gram
min - minute
mg - milligram
ml - milliliter
mm - millimeter
mol - mole
mol. wt. - molecular weight

N₂ - nitrogen

N - newton

ng - nanogram - 10^{-9} gram

nm - nanometer - 10^{-9} meter

NO - nitric oxide

NO₂ - nitrogen dioxide

NO_x - nitrogen oxides

O₂ - oxygen

Pa - pascal

ppb - parts per billion

ppm - parts per million

psia - pounds per square inch absolute

psig - pounds per square inch gauge

R - degree Rankine

sec - second

scf - cubic feet at standard conditions

scfh - cubic feet per hour at standard conditions

scm - cubic meter at standard conditions

SO₂ - sulfur dioxide

SO₃ - sulfur trioxide

SO_x - sulfur oxides

sq ft - square feet

std - at standard conditions

ug - microgram - 10^{-6} gram

V - volt

W - watt

- ohm

4. Determination of construction or modification:

a. When requested to do so by an owner or operator, the department will make a determination of whether action taken or intended to be taken by such owner or operator constitutes construction (including reconstruction) or modification or the commencement thereof within the meaning of this section:

b. The department will respond to any request for a determination under subdivision a within thirty days of receipt of such request:

5. Review of plans:

a. When requested to do so by an owner or operator, the department will review plans for construction or modification for the purpose of providing technical advice to the owner or operator:

b. (1) A separate request shall be submitted for each construction or modification project:

(2) Each request shall identify the location of such project, and be accompanied by technical information

describing the proposed nature, size, design, and method of operation of each affected facility involved in such project, including information on any equipment to be used for measurement or control of emissions.

- c. Neither a request for plans review nor advice furnished by the department in response to such request shall (1) relieve an owner or operator of legal responsibility for compliance with any provision of this chapter or of any applicable federal or local requirement, or (2) prevent the department from implementing or enforcing any provision of this article.

6. Notification and recordkeeping.

- a. Any owner or operator subject to the provisions of this chapter shall furnish the department written notification as follows:

- (1) A notification of the date construction (or reconstruction as defined under subsection 13) of an affected facility is commenced postmarked no later than thirty days after such date. This requirement shall not apply in the case of mass-produced facilities which are purchased in completed form.
- (2) A notification of the anticipated date of initial startup of an affected facility not more than sixty days or less than thirty days prior to such date.
- (3) A notification of the actual date of initial startup of an affected facility within fifteen days after such date.
- (4) A notification of any physical or operational change to an existing facility which may increase the emission rate of any pollutant to which a standard applies, unless that change is specifically exempted under an applicable section or in subdivision e of subsection 12. This notice shall be postmarked sixty days or as soon as practicable before the change is commenced and shall include information describing the precise nature of the change, present and proposed emission control systems, productive capacity of the facility before and after the change, and the expected completion date of the change. The department may request additional relevant information subsequent to this notice.
- (5) A notification of the date upon which demonstration of the continuous monitoring system performance commences in accordance with subdivision c of

subsection 11. Notification shall be postmarked not less than thirty days prior to such date.

- (6) A notification of the anticipated date for conducting the opacity observations required by paragraph f of subdivision e of subsection 9. The notification must include, if appropriate, a request for the department to provide a visible emissions reader during a performance test. The notification must be postmarked not less than thirty days prior to such date.
 - (7) A notification that continuous opacity monitoring system data results will be used to determine compliance with the applicable opacity standard during a performance test required by subsection 7 of section 33-15-12-01 in lieu of method 9 observation data as allowed by paragraph 5 of subdivision e of subsection 9 of section 33-15-12-01. This notification shall be postmarked not less than thirty days prior to the date of the performance test.
- b. Any owner or operator subject to the provisions of this chapter shall maintain records of the occurrence and duration of any startup, shutdown, or malfunction in the operation of an affected facility; any malfunction of the air pollution control equipment; or any periods during which a continuous monitoring system or monitoring device is inoperative.
- c. Each owner or operator required to install a continuous monitoring system shall submit a written report of excess emissions (as defined in applicable subsections) to the department for every calendar quarter. All quarterly reports shall be postmarked by the thirtieth day following the end of each calendar quarter and shall include the following information:
- (1) The magnitude of excess emissions computed in accordance with subdivision h of subsection 11, any conversion factor or factors used, and the date and time of commencement and completion of each time period of excess emissions.
 - (2) Specific identification of each period of excess emissions that occurs during startups, shutdowns, and malfunctions of the affected facility. The nature and cause of any malfunction (if known), the corrective action taken or preventative measures adopted.
 - (3) The date and time identifying each period during which the continuous monitoring system was

inoperative except for zero and span checks and the nature of the system repairs or adjustments.

(4) When no excess emissions have occurred or the continuous monitoring systems have not been inoperative, repaired, or adjusted, such information shall be stated in the report.

d. Any owner or operator subject to the provisions of this chapter shall maintain a file of all measurements, including continuous monitoring system, monitoring device, and performance testing measurements; all continuous monitoring system performance evaluations; all continuous monitoring system or monitoring device calibration checks; adjustments and maintenance performed on these systems or devices; and all other information required by this chapter recorded in a permanent form suitable for inspection. The file shall be retained for at least two years following the date of such measurements, maintenance, reports, and records.

e. Individual sections of this chapter may include specific provisions which clarify or make more inapplicable the provisions set forth in this subsection.

7. Performance tests.

a. Within sixty days after achieving the maximum production rate at which the affected facility will be operated, but not later than one hundred eighty days after initial startup of such facility, and at such other times as may be required by the department, the owner or operator of such facility shall conduct performance tests and furnish the department a written report of the results of such performance tests. The period during which performance tests are conducted shall be a period of operation pursuant to a permit to construct.

b. Performance tests shall be conducted and data reduced in accordance with the test methods and procedures contained in each applicable subsection of section 33-15-12-04, unless the department and administrator (1) specifies or approves, in specific cases, the use of a reference method with minor changes in methodology; (2) approves the use of an equivalent method; (3) approves the use of an alternative method the results of which it has determined to be adequate for indicating whether a specific source is in compliance; (4) waives the requirement for performance tests because the owner or operator of a source has demonstrated by other means to the department's satisfaction that the affected facility is in compliance with the standard; or (5) approves shorter sampling times and smaller sample volumes when necessitated by process

- variables or other factors. Nothing in this subdivision may be construed to abrogate the department's authority to require testing.
- c. Performance tests shall be conducted under such conditions as the department shall specify to the plant operator based on representative performance of the affected facility. The owner or operator shall make available to the department such records as may be necessary to determine the conditions for the performance tests. Operations during periods of startup, shutdown, and malfunction shall not constitute representative conditions for the purpose of a performance test nor shall emissions in excess of the level of the applicable emission limit during periods of startup, shutdown, and malfunction be considered a violation of the applicable emission limit unless otherwise specified in the applicable standard.
- d. The owner or operator of an affected facility shall provide the department thirty days' prior notice of the performance test, except as specified under other subsections, to afford the department the opportunity to have an observer present.
- e. The owner or operator of an affected facility shall provide, or cause to be provided, performance testing facilities as follows:
- (1) Sampling ports adequate for test methods applicable to such facility. This includes (1) constructing the air pollution control system such that volumetric flow rates and pollutant emission rates can be accurately determined by applicable test methods and procedures and (2) providing a stack or duct free of cyclonic flow during performance tests, as demonstrated by applicable test methods and procedures.
 - (2) Safe sampling platform or platforms.
 - (3) Safe access to sampling platform or platforms.
 - (4) Utilities for sampling and testing equipment.
- f. Unless otherwise specified in an applicable subsection, each performance test shall consist of three separate runs using the applicable test method. Each run shall be conducted for the time and under the conditions specified in the applicable standard. For the purpose of determining compliance with an applicable standard, the arithmetic mean of results of the three runs shall apply. In the event that a sample is accidentally lost or conditions occur in which one of the three runs must be

discontinued because of forced shutdown; failure of an irreplaceable portion of the sample train; extreme meteorological conditions; or other circumstances beyond the owner or operator's control; compliance may, upon the department's approval, be determined using the arithmetic mean of the results of the two other runs; or the department may require a new performance test.

8- Availability of information:

a- Emission data provided to, or otherwise obtained by, the department in accordance with the provisions of this chapter shall be available to the public at the department's offices.

b- As provided in subdivision a, any records, reports, or information provided to, or otherwise obtained by, the department in accordance with the provisions of this chapter shall be available to the public, except that (1) upon a showing satisfactory to the department by any person that such records, reports, or information, or particular part thereof (other than emission data), if made public, would divulge methods or processes entitled to protection as trade secrets of such person; the department shall consider such records, reports, or information, or particular part thereof, confidential in accordance with the purposes of section 1905 of title 18 of the United States Code, except that such records, reports, or information, or particular part thereof considered confidential, may be disclosed to other officers, employees, or authorized representatives of the department and the United States concerned with carrying out the provisions of this chapter or when relevant in any proceeding under this chapter; and (2) information received by the department solely for the purposes of subsection 4 and subdivisions a and b of subsection 5 shall not be disclosed by the department if it is identified by the owner or operator and found by the department to be a trade secret or confidential, commercial, or financial information.

9- Compliance with standards and maintenance requirements.

a- Compliance with standards in this chapter, other than opacity standards, shall be determined only by performance tests established by subsection 7, unless otherwise specified in the applicable standard.

b- Compliance with opacity standards in this chapter shall be determined by conducting observations in accordance with reference method 9 in appendix A of this chapter; any alternative method that is approved by the department and administrator, or as provided in paragraph 5 of

subdivision e of this subsection. For purposes of determining initial compliance, the minimum total time of observations shall be three hours (thirty 6-minute averages) for the performance test or other set of observations (meaning those fugitive-type emission sources subject only to an opacity standard).

- c. The opacity standards set forth in this chapter shall apply at all times except during periods of startup, shutdown, malfunction, and as otherwise provided in the applicable standard.
- d. At all times, including periods of startup, shutdown, and malfunction, owners and operators shall, to the extent practicable, maintain and operate any affected facility including associated air pollution control equipment in a manner consistent with good air pollution control practice for minimizing emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the department which may include, but is not limited to, monitoring results, opacity observations, review of operating and maintenance procedures, and inspection of the source.
- e. (1) For the purpose of demonstrating initial compliance, opacity observations must be conducted concurrently with the initial performance test required in subsection 7, unless one of the following conditions apply. If no performance test under subsection 7 is required, then opacity observations must be conducted within sixty days after achieving the maximum production rate at which the affected facility will be operated but no later than one hundred eighty days after initial startup of the facility. If visibility or other conditions prevent the opacity observations from being conducted concurrently with the initial performance test required under subsection 7, the source owner or operator shall reschedule the opacity observations as soon after the initial performance test as possible, but not later than thirty days thereafter, and shall advise the department of the rescheduled date. In these cases, the thirty-day prior notification to the department required in paragraph 6 of subdivision a of subsection 6 shall be waived. The rescheduled opacity observations must be conducted (to the extent possible) under the same operating conditions that existed during the initial performance test conducted under subsection 7. The visible emissions observer shall determine whether visibility or other conditions prevent the opacity observations from being made concurrently with the initial performance test in accordance with

procedures contained in reference method 9 of appendix A of this chapter. Opacity readings of portions of plumes which contain condensed, uncombined water vapor may not be used for purposes of determining compliance with opacity standards. The owner or operator of an affected facility shall make available, upon request by the department, such records as may be necessary to determine the conditions under which the visual observations were made and shall provide evidence indicating proof of current visible observer emission certification. Except as provided in paragraph 5 of subdivision e of subsection 9 of section 33-15-12-01, the results of continuous monitoring by transmissometer which indicate that the opacity at the time visual observations were made was not in excess of the standard are probative but not conclusive evidence of the actual opacity of an emission, provided that the source shall meet the burden of proving that the instrument used meets (at the time of the alleged violation) performance specification † in appendix B, has been properly maintained and (at the time of the alleged violation) that the resulting data have not been altered in any way.

- (2) Except as provided in paragraph 3 of this subdivision, the owner or operator of an affected facility to which an opacity standard in this chapter applies shall conduct opacity observations in accordance with subdivision b of this subsection, shall record the opacity of emissions, and shall report to the department the opacity results along with the results of the initial performance test required under subsection 7. The inability of an owner or operator to secure a visible emissions observer may not be considered a reason for not conducting the opacity observations concurrent with the initial performance test.
- (3) The owner or operator of an affected facility to which an opacity standard in this chapter applies may request the department to determine and to record the opacity of emissions from the affected facility during the initial performance test and at such times as may be required. The owner or operator of the affected facility shall report the opacity results. Any request to the department to determine and to record the opacity of emissions from an affected facility must be included in the notification required in paragraph 6 of subdivision a of subsection 6. If, for some reason, the department cannot determine and record the opacity of emissions from the affected facility during the performance

test, then the provisions of paragraph 4 of subdivision e of this subsection shall apply.

- (4) An owner or operator of an affected facility using a continuous opacity monitor (transmissometer) shall record the monitoring data produced during the initial performance test required by subsection 7 and shall furnish the department a written report of the monitoring results along with method 9 and subsection 7 performance test results.
- (5) An owner or operator of an affected facility subject to an opacity standard may submit for compliance purposes, continuous opacity monitoring system (COMS) data results produced during any performance test required under subsection 7 of section 33-15-12-01 in lieu of method 9 observation data. If an owner or operator elects to submit continuous opacity monitoring system (COMS) data for compliance with the opacity standard, the owner or operator must notify the department of that decision, in writing, at least thirty days before any performance test required under subsection 7 of section 33-15-12-01 is conducted. Once the owner or operator of an affected facility has notified the department to that effect, the continuous opacity monitoring system (COMS) data results will be used to determine opacity compliance during subsequent tests required under subsection 7 of section 33-15-12-01 until the owner or operator notifies the department, in writing, to the contrary. For the purpose of determining compliance with the opacity standard during a performance test required under subsection 7 of section 33-15-12-01 using continuous opacity monitoring system (COMS) data, the minimum total time of continuous opacity monitoring system (COMS) data collection shall be averages of all six-minute continuous periods within the duration of the mass emission performance test. Results of the continuous opacity monitoring system (COMS) opacity determinations shall be submitted along with the results of the performance test required under subsection 7 of section 33-15-12-01. The owner or operator of an affected facility using a continuous opacity monitoring system (COMS) for compliance purposes is responsible for demonstrating that the continuous opacity monitoring system (COMS) meets the requirements specified in subdivision c of subsection 11 of section 33-15-12-01, and that the continuous opacity monitoring system (COMS) has been properly maintained and operated, and that the resulting data have not been altered in any way. If continuous opacity monitoring system (COMS) data results are submitted for compliance with the opacity

standard for a period of time during which method 9 data indicates noncompliance, the method 9 data will be used to determine opacity compliance.

- (6) Upon receipt from an owner or operator of the written reports of the results of the performance tests required by subsection 7 of section 33-15-12-01, the opacity observation results and observer certification required by paragraph 4 of subdivision e of subsection 9 of section 33-15-12-01, and the continuous opacity monitoring system (COMS) results, if applicable, the department will make a finding concerning compliance with opacity and other applicable standards. If continuous opacity monitoring system (COMS) data results are used to comply with an opacity standard, only those results are required to be submitted along with the performance test results required by subsection 7 of section 33-15-12-01. If the department and administrator finds that an affected facility is in compliance with all applicable standards for which performance tests are conducted in accordance with subsection 7 of section 33-15-12-01 of this chapter but during the time such performance tests are being conducted fails to meet any applicable opacity standard, he shall notify the owner or operator and advise him that he may petition the department within ten days of receipt of notification to make appropriate adjustment to the opacity standard for the affected facility.
- (7) The department and administrator will grant such a petition upon a demonstration by the owner or operator that the affected facility and associated air pollution control equipment were operated and maintained in a manner to minimize the opacity of emissions during the performance tests; that the performance tests were performed under the conditions established by the department and administrator; and that the affected facility and associated air pollution control equipment were performing under the conditions established by the department and administrator; and that the affected facility and associated air pollution control equipment were incapable of being adjusted or operated to meet the applicable opacity standard.
- (8) The department and administrator will establish an opacity standard for the affected facility meeting the above requirements at a level at which the source will be able, as indicated by the performance and opacity tests, to meet the opacity standard at all times during which the source is meeting the mass or

concentration emission standard. The department and administrator will then promulgate the new opacity standard for such facility.

10. Circumvention. No owner or operator subject to the provisions of this chapter shall build, erect, install, or use any article, machine, equipment, or process, the use of which conceals an emission which would otherwise constitute a violation of an applicable standard. Such concealment includes, but is not limited to, the use of gaseous diluents to achieve compliance with an opacity standard or with a standard which is based on the concentration of a pollutant in the gases discharged to the atmosphere.
11. Monitoring requirements.
- a. For the purposes of this subsection, all continuous monitoring systems required under applicable subsections shall be subject to the provisions of this subsection upon promulgation of performance specifications for continuous monitoring systems under appendix B, and if the continuous monitoring system is used to demonstrate compliance with emission limits on a continuous basis, appendix F, unless otherwise specified in an applicable subsection or by the department is applicable December 4, 1987.
 - b. All continuous monitoring systems and monitoring devices must be installed and operational prior to conducting performance tests under subsection 7. Verification of operational status shall, as a minimum, include completion of the manufacturer's written requirements or recommendations for installation, operation, and calibration of the device.
 - c. If the owner or operator of an affected facility elects to submit continuous opacity monitoring system (COMS) data for compliance with the opacity standard as provided under paragraph 5 of subdivision e of subsection 9 of section 33-15-12-01, the owner or operator shall conduct a performance evaluation of the continuous opacity monitoring system (COMS) as specified in performance specification 1, appendix B, before the performance test required under subsection 7 of section 33-15-12-01 is conducted. Otherwise, the owner or operator of an affected facility shall conduct a performance evaluation of the continuous opacity monitoring system (COMS) or continuous emission monitoring system (CEMS) during any performance test required under subsection 7 of section 33-15-12-01 or within thirty days thereafter in accordance with the applicable performance specification in appendix B. The owner or operator of an affected facility shall conduct continuous opacity monitoring system (COMS) or continuous emission monitoring system (CEMS)

performance evaluations at such other times as may be required by the department.

- (1) The owner or operator of an affected facility using a continuous opacity monitoring system (COMS) to determine opacity compliance during any performance test required under subsection 7 of section 33-15-12-01 and as described in paragraph 5 of subdivision e of subsection 9 of section 33-15-12-01 shall furnish the department two or, upon request, more copies of a written report of the results of the continuous opacity monitoring system (COMS) performance evaluation described in subdivision c of this subsection at least ten days before the performance test required under subsection 7 of section 33-15-12-01 is conducted.
 - (2) Except as provided in paragraph 1 of subdivision c of this subsection, the owner or operator of an affected facility shall furnish the department within sixty days of completion two or, upon request, more copies of a written report of the results of the performance evaluation.
- d. (1) Owners and operators of all continuous monitoring systems installed in accordance with the provisions of this chapter shall check the zero (or low-level value between zero and twenty percent of span value) and span (fifty to one hundred percent of span value) calibration drifts at least once daily in accordance with a written procedure. The zero and span shall, as a minimum, be adjusted whenever the twenty-four-hour zero drift or twenty-four-hour span drift exceeds two times the limits of the applicable performance specifications in appendix B. The system must allow the amount of excess zero and span drift measured at the twenty-four-hour interval checks to be recorded and quantified whenever specified. For continuous monitoring systems measuring opacity of emissions, the optical surfaces exposed to the effluent gases shall be cleaned prior to performing the zero or span drift adjustments except that for systems using automatic zero adjustments, the optical surfaces shall be cleaned when the cumulative automatic zero compensation exceeds four percent opacity.
- (2) For continuous monitoring systems measuring opacity of emissions, minimum procedures shall include a method for producing a simulated zero opacity condition and an upscale (span) opacity condition using a certified neutral density filter or other related technique to produce a known obscuration of

the light beam. Such procedures shall provide a system check of the analyzer internal optical surfaces and all electronic circuitry including the lamp and photodetector assembly.

- e. Except for system breakdowns, repairs, calibration checks, and zero and span adjustments required under subdivision d, all continuous monitoring systems shall be in continuous operation and shall meet minimum frequency of operation requirements as follows:
 - (1) All continuous monitoring systems referenced by subdivision c for measuring opacity of emissions shall complete a minimum of one cycle of operation (sampling, analyzing, and data recording) for each successive ten-second period and one cycle of data recording for each successive six-minute period.
 - (2) All continuous monitoring systems referenced by subdivision c for measuring emissions, except opacity, shall complete a minimum of one cycle of operation (sampling, analyzing, and data recording) for each successive fifteen-minute period.
- f. All continuous monitoring systems or monitoring devices shall be installed such that representative measurements of emissions or process parameters from the affected facility are obtained. Additional procedures for location of continuous monitoring systems contained in the applicable performance specifications of appendix B of this chapter shall be used.
- g. When the effluents from a single affected facility or two or more affected facilities subject to the same emission standards are combined before being released to the atmosphere, the owner or operator may install applicable continuous monitoring systems on each effluent or on the combined effluent. When the affected facilities are not subject to the same emission standards, separate continuous monitoring systems shall be installed on each effluent. When the effluent from one affected facility is released to the atmosphere through more than one point, the owner or operator shall install applicable continuous monitoring systems on each separate effluent unless the installation of fewer systems is approved by the department. When more than one continuous monitoring system is used to measure emissions from one affected facility (e.g. multiple breechings, multiple outlets), the owner or operator shall report the results as required from each continuous monitoring system.
- h. Owners or operators of all continuous monitoring systems for measurement of opacity shall reduce all data to six-

minute averages and for continuous monitoring systems other than opacity to one-hour averages for time periods defined in subsection 2. Six-minute opacity averages shall be calculated from thirty-six or more data points equally spaced over each six-minute period. For continuous monitoring systems other than opacity, one-hour averages shall be computed from four or more data points equally spaced over each one-hour period. Data recorded during periods of continuous monitoring system breakdowns, repairs, calibration checks, and zero and span adjustments shall not be included in the data averages computed under this subdivision. An arithmetic or integrated average of all data may be used. The data output of all continuous monitoring systems may be recorded in reduced or nonreduced form (e.g., parts per million pollutant and percent oxygen or pounds per million British thermal units of pollutant). All excess emissions shall be converted into units of the standard using the applicable conversion procedures specified in subsections. After conversion into units of the standard, the data may be rounded to the same number of significant digits used in applicable subsections to specify the emission limit (e.g., rounded to the nearest one percent opacity).

- i. After receipt and consideration of written application, the department may approve alternatives to any monitoring procedures or requirements of this chapter including, but not limited to, the following:
 - (1) Alternative monitoring requirements when installation of a continuous monitoring system or monitoring device specified by this regulation would not provide accurate measurements due to liquid water or other interferences caused by substances with the effluent gases.
 - (2) Alternative monitoring requirements when the affected facility is infrequently operated.
 - (3) Alternative monitoring requirements to accommodate continuous monitoring systems that require additional measurements to correct for stack moisture conditions.
 - (4) Alternative locations for installing continuous monitoring systems or monitoring devices when the owner or operator can demonstrate that installation at alternate locations will enable accurate and representative measurements.
 - (5) Alternative methods of converting pollutant concentration measurements to units of the standards.

- (6) Alternative procedures for performing daily checks of zero and span drift that do not involve use of span gases or test cells.
- (7) Alternatives to the American society for testing and materials test methods or sampling procedures specified by any subsection.
- (8) Alternative continuous monitoring systems that do not meet the design or performance requirements in performance specification 1, appendix B, but adequately demonstrate a definite and consistent relationship between its measurements and the measurements of opacity by a system complying with the requirements in performance specification 1. The department may require that such demonstration be performed for each affected facility.
- (9) Alternative monitoring requirements when the effluent from a single affected facility or the combined effluent from two or more affected facilities are released to the atmosphere through more than one point.
- (10) An alternative to the relative accuracy test specified in performance specification 2 of appendix B may be requested as follows:
 - (a) An alternative to the reference method tests for determining relative accuracy is available for sources with emission rates demonstrated to be less than fifty percent of the applicable standard. A source owner or operator may petition the department to waive the relative accuracy test in section 7 of performance specification 2 and substitute the procedures in section 10 if the results of a performance test conducted according to the requirements in subsection 7 of this section or other tests performed following the criteria in subsection 7 of this section demonstrate that the emission rate of the pollutant of interest in the units of the applicable standard is less than fifty percent of the applicable standard. For sources subject to standards expressed as control efficiency levels, a source owner or operator may petition the department to waive the relative accuracy test and substitute the procedures in section 10 of performance specification 2 if the control device exhaust emission rate is less than fifty percent of the level needed to meet the control efficiency requirement. The alternative procedures do not

apply if the continuous emission monitoring system is used to determine compliance continuously with the applicable standard. The petition to waive the relative accuracy test shall include a detailed description of the procedures to be applied. Included shall be location and procedure for conducting the alternative, the concentration or response levels of the alternative relative accuracy materials, and the other equipment checks included in the alternative procedure. The department will review the petition for completeness and applicability. The determination to grant a waiver will depend on the intended use of the continuous emission monitoring system (GEMS) data (e.g., data collection purposes other than NSPS) and may require specifications more stringent than in performance specification 2 (i.e., the applicable emission limit is more stringent than NSPS).

(b) The waiver of a continuous emission monitoring system (GEMS) relative accuracy test will be reviewed and may be rescinded at such time following successful completion of the alternative relative accuracy procedures that the continuous emission monitoring system (GEMS) data indicate the source emissions approaching the level of the applicable standard. The criterion for reviewing the waiver is the collection of continuous emission monitoring system (GEMS) data showing that emissions have exceeded seventy percent of the applicable standard for seven, consecutive, averaging periods as specified by the applicable regulations. For sources subject to standards expressed as control efficiency levels, the criterion for reviewing the waiver is the collection of continuous emission monitoring system (GEMS) data showing that exhaust emissions have exceeded seventy percent of the level needed to meet the control efficiency requirement for seven, consecutive, averaging periods as specified by the applicable rules. It is the responsibility of the source operator to maintain records and determine the level of emissions relative to the criterion on the waiver of relative accuracy testing. If this criterion is exceeded, the owner or operator must notify the department within ten days of such occurrence and include a description of the nature of the cause of the increasing emissions.

The department will review the notification and may rescind the waiver and require the owner or operator to conduct a relative accuracy test of the continuous emission monitoring system (CEMS) as specified in section 7 of performance specification 2.

~~12.~~ Modification:

a. Except as provided under subdivisions e and f of this subsection, any physical or operational change to an existing facility which results in an increase in the emission rate to the atmosphere of any pollutant to which a standard applies shall be considered a modification within the meaning of section 111 of the Act. Upon modification, an existing facility shall become an affected facility for each pollutant to which a standard applies and for which there is an increase in the emission rate to the atmosphere.

b. Emission rate shall be expressed as kilograms per hour of any pollutant discharged into the atmosphere for which a standard is applicable. The department shall use the following to determine emission rate:

(1) Emission factors as specified in the latest issue of "Compilation of Air Pollution Emission Factors", EPA Publication No. AP-42, or other emission factors determined by the department to be superior to AP-42 emission factors, in cases where utilization of emission factors demonstrate that the emission level resulting from the physical or operational change will either clearly increase or clearly not increase.

(2) Material balances, continuous monitor data, or manual emission tests in cases where utilization of emission factors as referenced in paragraph 1 does not demonstrate to the department's satisfaction whether the emission level resulting from the physical or operational change will either clearly increase or clearly not increase, or where an owner or operator demonstrates to the department's satisfaction that there are reasonable grounds to dispute the result obtained by the department utilizing emission factors as referenced in paragraph 1. When the emission rate is based on results from manual emission tests or continuous monitoring systems, procedures approved by the department shall be used to determine whether an increase in emission rate has occurred. Tests shall be conducted under such conditions as the department shall specify to the owner or operator based on representative performance of the facility. At least three valid test runs must be conducted before and at

least three after the physical or operational change. All operating parameters which may affect emissions must be held constant to the maximum feasible degree for all test runs.

- c. The addition of an affected facility to a stationary source as an expansion to that source or as a replacement for an existing facility shall not by itself bring within the applicability of this chapter any other facility within that source.
- d. [Reserved]
- e. The following shall not, by themselves, be considered modifications under this chapter:
 - (1) Maintenance, repair, and replacement which the department determines to be routine for a source category, subject to the provisions of subdivision c of this subsection and subsection 13.
 - (2) An increase in production rate of an existing facility, if that increase can be accomplished without a capital expenditure on that facility.
 - (3) An increase in the hours of operation.
 - (4) Use of an alternative fuel or raw material if, prior to the date any standard under this subsection becomes applicable to that source type as provided by subsection 4 of section 33-15-01-01, the existing facility was designed to accommodate that alternative use. A facility shall be considered to be designed to accommodate an alternative fuel or raw material if that use could be accomplished under the facility's construction specifications, as amended, prior to the change. Conversion to coal required for energy conservation, as specified in section 111(a)(8) of the Clean Air Act, may not be considered a modification.
 - (5) The addition or use of any system or device whose primary function is the reduction of air pollutants, except when an emission control system is removed or is replaced by a system which the department determines to be less environmentally beneficial.
 - (6) The relocation or change in ownership of an existing facility.
- f. Special provisions set forth under an applicable subdivision of this subsection shall supersede any conflicting provisions of this chapter.

g. Within one hundred eighty days of the completion of any physical or operational change subject to the control measures specified in subdivision a of this subsection, compliance with all applicable standards must be achieved.

~~13.~~ Reconstruction.

a. An existing facility, upon reconstruction, becomes an affected facility, irrespective of any change in emission rate.

b. "Fixed capital cost" means the capital needed to provide all the depreciable components.

c. "Reconstruction" means the replacement of components of an existing facility to such an extent that:

(1) The fixed capital cost of the new components exceeds fifty percent of the fixed capital cost that would be required to construct a comparable entirely new facility; and

(2) It is technologically and economically feasible to meet the applicable standards set forth in this section.

d. If an owner or operator of an existing facility proposes to replace components, and the fixed capital cost of the new components exceeds fifty percent of the fixed capital cost that would be required to construct a comparable entirely new facility, the owner or operator shall notify the department of the proposed replacements. The notice must be postmarked sixty days (or as soon as practicable) before construction of the replacements is commenced and must include the following information:

(1) Name and address of the owner or operator.

(2) The location of the existing facility.

(3) A brief description of the existing facility and the components which are to be replaced.

(4) A description of the existing air pollution control equipment and the proposed air pollution control equipment.

(5) An estimate of the fixed capital cost of the replacements and of constructing a comparable entirely new facility.

(6) The estimated life of the existing facility after the replacements.

- (7) A discussion of any economic or technical limitations the facility may have in complying with the applicable standards of performance after the proposed replacements.
 - e. The department will determine, within thirty days of the receipt of the notice required by subdivision d and any additional information it may reasonably require, whether the proposed replacement constitutes reconstruction.
 - f. The department's determination under subdivision e shall be based on all of the following:
 - (1) The fixed capital cost of the replacement in comparison to the fixed capital cost that would be required to construct a comparable entirely new facility.
 - (2) The estimated life of the facility after the replacements compared to the life of a comparable entirely new facility.
 - (3) The extent to which the components being replaced cause or contribute to the emissions from the facility.
 - (4) Any economic or technical limitations on compliance with applicable standards of performance which are inherent in the proposed replacements.
 - g. Individual subdivisions of this subsection may include specific provisions which refine and delimit the concept of reconstruction set forth in this chapter.
14. General control device requirements.
- a. Introduction. This subsection contains requirements for control devices used to comply with applicable sections of chapters ~~33-15-12~~ and ~~33-15-13~~. The requirements are placed here for administrative convenience and only apply to facilities covered by sections referring to this subsection.
 - b. Flares. Subdivisions c through f apply to the flares types which are used to comply with this section.
 - c. (1) Flares must be designed for and operated with no visible emissions as determined by the methods specified in subdivision f except for periods not to exceed a total of five minutes during any two consecutive hours.

- (2) Flares must be operated with flame present at all times, as determined by the methods specified in subdivision f.
- (3) Flares shall be used only when the net heating value of the gas being combusted is 11.2 Mj/scm [300 Btu/scf] or greater, if the flare is steam assisted or air assisted; or when the net heating value of the gas being combusted is 7.45 Mj/scm [200 Btu/scf] or greater if the flare is nonassisted. The net heating value of the gas being combusted must be determined by the methods specified in subdivision f.
- (4) (a) Steam-assisted and nonassisted flares must be designed for and operated with an exit velocity, as determined by the methods specified in paragraph 4 of subdivision f, less than 18.3 meters per second [60 feet per second], except as provided in subparagraphs b and c.
- (b) Steam-assisted and nonassisted flares designed for and operated with an exit velocity, as determined by the methods specified in paragraph 4 of subdivision f, equal to or greater than 18.3 meters per second [60 feet per second] but less than one hundred twenty-two meters per second [400 feet per second] are allowed if the net heating value of the gas being combusted is greater than 37.3 Mj/scm [1,000 Btu/scf].
- (c) Steam-assisted and nonassisted flares designed for and operated with an exit velocity, as determined by the methods specified in paragraph 4 of subdivision f, less than the velocity, V_{max} , as determined by the method specified in paragraph 5 of subdivision f, and less than one hundred twenty-two meters per second [400 feet per second] are allowed.
- (5) Air-assisted flares must be designed and operated with an exit velocity less than the velocity, V_{max} , as determined by the method specified in paragraph 6 of subdivision f.
- (6) Flares used to comply with this subsection must be steam assisted, air assisted, or nonassisted.
- d. Owners or operators of flares used to comply with the provisions of this section shall monitor these control devices to ensure that they are operated and maintained in conformance with their designs. Applicable sections will

provide provisions stating how owners or operators of flares shall monitor these control devices.

- e. Flares used to comply with provisions of this section shall be operated at all times when emissions may be vented to them.
- f. (1) Reference method 22 must be used to determine the compliance of flares with the visible emission provisions of this section. The observation period is two hours and must be used according to method 22.
- (2) The presence of a flare pilot flame must be monitored using a thermocouple or any other equivalent device to detect the presence of a flame.
- (3) The net heating value of the gas being combined in a flare must be calculated using the following equation:

$$H_T = K \sum_{i=1}^n \epsilon_i H_i$$

where:

H_T = Net heating value of the sample,
Mj/scm; where the net enthalpy per mole of off-gas is based on combustion at 25 degrees C and 760 mm Hg, but the standard temperature for determining the volume corresponding to one mole is 20 degrees C;

K = Constant,

$$1.740 \times 10^{-7} \left(\frac{+}{\text{ppm}} \right) \left(\frac{\text{g mole}}{\text{scm}} \right) \left(\frac{\text{Mj}}{\text{kcal}} \right)$$

where the standard temperature for (g mole/scm) is 20 degrees C;

ϵ_i = Concentration of sample component i in ppm on a wet basis, as measured for organics by reference method 18 and measured for hydrogen and carbon monoxide by A.S.T.M. D1946-77; and

H_i = Net heat of combustion of sample component i, kcal/g mole at 25 degrees C and 760 mm Hg. The heats of combustion may be determined using A.S.T.M. D2382-76 if published values are not available or cannot be calculated.

(4) The actual exit velocity of a flare must be determined by dividing the volumetric flow rate (in units of standard temperature and pressure), as determined by reference methods 2, 2A, 2C, or 2D as appropriate, by the unobstructed (free) cross sectional area of the flare tip.

(5) The maximum permitted velocity, V_{max} , for flares complying with subparagraph c of paragraph 4 of subdivision c must be determined by the following equation:

$$\log_{10} (V_{max}) = (H_T + 28.8) / 31.7$$

V_{max} = Maximum permitted velocity, m/sec

28.8 = Constant

31.7 = Constant

H_T = The net heating value as determined in paragraph 3

(6) The maximum permitted velocity, V_{max} , for air-assisted flares must be determined by the following equation:

$$V_{max} = 8.706 + 0.7084 (H_T)$$

V_{max} = Maximum permitted velocity, m/sec

8.706 = Constant

0.7084 = Constant

H_T = The net heating value as determined in paragraph 3.

History: Amended effective October 1, 1987; January 1, 1989; June 1, 1990.

General Authority: ~~NDCC 23-25-03, 28-32-02~~

Law Implemented: ~~NDCC 23-25-03~~

33-15-12-01.1. Scope. The subparts and appendices of 40 Code of Federal Regulations, part 60 [40 CFR 60] as they exist on May 1, 1991, which are listed in section 33-15-12-02 are incorporated into this chapter by reference. Any changes to the standards of performance are listed below the title of the standard.

History: Effective June 1, 1992.

General Authority: NDCC 23-25-03

Law Implemented: NDCC 23-25-03

33-15-12-02. ~~{Reserved}~~ Standards of performance.

Subpart A - General provisions.

*60.2. The definition of administrator is deleted and replaced with the following:

Administrator means the department except for those duties that cannot be delegated by the United States environmental protection agency. For those duties that cannot be delegated, administrator means the department and the administrator of the United States environmental protection agency.

Subpart C - Emission guidelines and compliance times.

Subpart Ca - Emissions guidelines and compliance times for municipal waste combustors.

Subpart D - Standards of performance for fossil-fuel fired steam generators for which construction is commenced after August 17, 1971.

Subpart Da - Standards of performance for electric utility steam generating units for which construction is commenced after September 18, 1978.

Subpart Db - Standards of performance for industrial-commercial-institutional steam generating units.

Subpart Dc - Standards of performance for small industrial-commercial-institutional steam generating units.

Subpart E - Standards of performance for incinerators.

Subpart Ea - Standards of performance for municipal waste combustors.

Subpart F - Standards of performance for portland cement plants.

Subpart G - Standards of performance for nitric acid plants.

Subpart H - Standards of performance for sulfuric acid plants.

Subpart I - Standards of performance for asphalt concrete plants.

Subpart J - Standards of performance for petroleum refineries.

Subpart K - Standards of performance for storage vessels for petroleum liquids for which construction, reconstruction, or modification commenced after July 1, 1970, and prior to May 19, 1978.

*60.110(c) is deleted in its entirety and replaced with the following:

(c) Any facility under 60.110(a) that commenced construction, reconstruction, or modification after July 1, 1970, and prior to May 19, 1978, is subject to the requirements of this subpart.

Subpart Ka - Standards of performance for storage vessels for petroleum liquids for which construction, reconstruction, or modification commenced after May 18, 1978, and prior to July 23, 1984.

Subpart Kb - Standards of performance for volatile organic liquid storage vessels (including petroleum liquid storage vessels) for which construction, reconstruction, or modification commenced after July 23, 1984.

Subpart L - Standards of performance for secondary lead smelters.

Subpart M - Standards of performance for secondary brass and bronze ingot production plants.

Subpart N - Standards of performance for primary emissions from basic oxygen process furnaces for which construction is commenced after June 11, 1973.

Subpart Na - Standards of performance for secondary emissions from basic oxygen process steelmaking facilities for which construction is commenced after January 20, 1983.

Subpart O - Standards of performance for sewage treatment plants.

Subpart P - Standards of performance for primary copper smelters.

Subpart Q - Standards of performance for primary zinc smelters.

Subpart R - Standards of performance for primary lead smelters.

Subpart S - Standards of performance for primary aluminum reduction plants.

Subpart T - Standards of performance for the phosphate fertilizer industry: wet-process phosphoric acid plants.

Subpart U - Standards of performance for the phosphate fertilizer industry: superphosphoric acid plants.

Subpart V - Standards of performance for the phosphate fertilizer industry: diammonium phosphate plants.

Subpart W - Standards of performance for the phosphate fertilizer industry: triple superphosphate plants.

Subpart X - Standards of performance for the phosphate fertilizer industry: granular triple superphosphate storage facilities.

Subpart Y - Standards of performance for coal preparation plants.

Subpart Z - Standards of performance for ferroalloy production facilities.

Subpart AA - Standards of performance for steel plants: Electric arc furnaces.

Subpart AAa - Standards of performance for steel plants: electric arc furnaces and argon-oxygen decarburization vessels constructed after August 17, 1983.

Subpart BB - Standards of performance for kraft pulp mills.

Subpart CC - Standards of performance for glass manufacturing plants.

Subpart DD - Standards of performance for grain elevators.

Subpart EE - Standards of performance for surface coatings of metal furniture.

Subpart FF - [Reserved]

Subpart GG - Standards of performance for stationary gas turbines.

Subpart HH - Standards of performance for lime manufacturing plants.

Subpart KK - Standards of performance for lead-acid battery manufacturing plants.

Subpart LL - Standards of performance for metallic mineral processing plants.

Subpart MM - Standards of performance for automobile and light-duty truck surface coating operations.

Subpart NN - Standards of performance for phosphate rock plants.

Subpart PP - Standards of performance for ammonium sulfate manufacture.

Subpart QQ - Standards of performance for the graphic arts industry: publication rotogravure printing.

Subpart RR - Standards of performance for pressure-sensitive tape and label surface coating operations.

Subpart SS - Standards of performance for industrial surface coating: large appliances.

Subpart TT - Standards of performance for metal coil surface coating.

Subpart UU - Standards of performance for asphalt processing and asphalt roofing manufacture.

Subpart VV - Standards of performance for equipment leaks of VOC in the synthetic organic chemicals manufacturing industry.

Subpart WW - Standards of performance for the beverage can surface coating industry.

Subpart XX - Standards of performance for bulk gasoline terminals.

Subpart AAA - Standards of performance for new residential wood heaters.

Subpart BBB - Standards of performance for the rubber tire manufacturing industry.

Subpart CCC - [Reserved]

Subpart EEE - [Reserved]

Subpart FFF - Standards of performance for flexible vinyl and urethane coating and printing.

Subpart GGG - Standards of performance for equipment leaks of VOC in petroleum refineries.

Subpart HHH - Standards of performance for synthetic fiber production facilities.

Subpart III - Standards of performance for volatile organic compound (VOC) emissions from the synthetic organic chemical manufacturing industry (SOCMI) air oxidation unit processes.

Subpart JJJ - Standards of performance for petroleum dry cleaners.

Subpart KKK - Standards of performance for equipment leaks of VOC from onshore natural gas processing plants.

Subpart LLL - Standards of performance for onshore natural gas processing; SO₂ emissions.

Subpart NNN - Standards of performance for volatile organic compound (VOC) emissions from synthetic organic chemical manufacturing industry (SOCMI) distillation operations.

Subpart 000 - Standards of performance for nonmetallic mineral processing plants.

Subpart PPP - Standards of performance for wool fiberglass insulation manufacturing plants.

Subpart QQQ - Standards of performance for VOC emissions from petroleum refinery wastewater systems.

Subpart SSS - Standards of performance for magnetic tape coating facilities.

Subpart TTT - Standards of performance for industrial surface coating: surface coating of plastic parts for business machines.

Subpart VVV - Standards of performance for polymeric coating of supporting substrates facilities.

Appendix A - Test methods.

Appendix B - Performance specifications.

Appendix C - Determination of emission rate changes.

Appendix D - Required emission inventory information.

Appendix E - [Reserved]

Appendix F - Quality assurance procedures.

Appendix I - Removable label and owner's manual.

History: Effective June 1, 1992.

General Authority: NDCC 23-25-03

Law Implemented: NDCC 23-25-03

33-15-12-04. Standards of performance. Repealed effective June 1, 1992.

~~†. Standards of performance for fossil fuel steam generators.~~

~~a. Applicability and designation of affected facility.~~

~~(†) The affected facilities to which the provisions of this subsection apply are:~~

~~(a) Each fossil fuel fired steam generating unit of more than seventy three megawatts {250 million Btu/hour} heat input rate.~~

~~(b) Each fossil fuel fired and wood residue fired steam generating unit capable of firing fossil~~

fuel at a heat input rate of more than seventy-three megawatts [250 million Btu/hour].

- (2) Any change to an existing fossil fuel-fired steam generating unit to accommodate the use of combustible materials, other than fossil fuels as defined in this subsection, shall not bring that unit under the applicability of this subsection.
- (3) Except as provided in paragraphs 4 and 5 any facility under paragraph 1 that commenced construction or modification after August 17, 1971, is subject to the requirements of this subsection.
- (4) The requirements of subparagraphs d and e of paragraph 1 and paragraphs 2 and 4 of subdivision e are applicable to lignite-fired steam generating units that commenced construction or modification after December 22, 1976.
- (5) Any facility covered under subsection 2 is not covered under this subsection.

b. Definitions. As used in this subsection, all terms not defined herein shall have the meaning given them in North Dakota Century Code chapter 23-25, and in subsection 2 of section 33-15-12-01.

- (1) "Coal" means all solid fuels classified as anthracite, bituminous, subbituminous, or lignite by the American society for testing material, Designation D388-77.
- (2) "Coal refuse" means waste products of coal mining, cleaning, and coal preparation operations, e.g., culm, gob, etc., containing coal, matrix material, clay, and other organic and inorganic material.
- (3) "Fossil fuel" means natural gas, petroleum, coal, and any form of solid, liquid, or gaseous fuel derived from such materials for the purpose of creating useful heat.
- (4) "Fossil fuel-fired steam generating unit" means furnace or boiler used in the process of burning fossil fuel for the purpose of producing steam by heat transfer.
- (5) "Fossil fuel-fired and wood residue-fired steam generating unit" means a furnace or boiler used in the process of burning fossil fuel and wood residue for the purpose of producing steam by heat transfer.

(6) "Wood residue" means bark, sawdust, slabs, chips, shavings, mill trim, and other wood products derived from wood processing and forest management operations.

c. Standard for particulate matter. On and after the date on which the performance test required to be conducted by subsection 7 of section ~~33-15-12-01~~ is completed, no owner or operator subject to the provisions of this subsection shall cause to be discharged into the atmosphere from any affected facility any gases which:

(1) Contain particulate matter in excess of forty-three nanograms per joule [~~0.10~~ lb/million Btu] heat input derived from fossil fuel or fossil fuel and wood residue.

(2) Exhibit greater than twenty percent opacity except for one 6-minute period per hour of not more than twenty-seven percent opacity.

d. Standard for sulfur dioxide.

(1) On and after the date on which the performance test required to be conducted by subsection 7 of section ~~33-15-12-01~~ is completed, no owner or operator subject to the provisions of this subsection shall cause to be discharged into the atmosphere from any affected facility any gases which contain sulfur dioxide in excess of:

(a) Three hundred forty nanograms per joule [~~0.80~~ lb/million Btu] heat input derived from liquid fossil fuel or liquid fossil fuel and wood residue.

(b) Five hundred twenty nanograms per joule [~~1.2~~ lb/million Btu] heat input derived from solid fossil fuel or solid fossil fuel and wood residue.

(2) When different fossil fuels are burned simultaneously in any combination, the applicable standard (in nanograms per joule) shall be determined by proration using the following formula:

$$PS_{SO_2} = \frac{y(340) + z(520)}{y + z}$$

where:

PS_{SO_2} = prorated standard for sulfur dioxide when burning different fuels simultaneously;

in nanograms per joule heat input derived from all fossil fuels fired or from all fossil fuels and wood residue fired.

y = percentage of total heat input derived from liquid fossil fuel.

z = percentage of total heat input derived from solid fossil fuel.

(3) Compliance shall be based on the total heat input from all fossil fuels burned, including gaseous fuels.

e. Standard for nitrogen oxides.

(1) On and after the date on which the performance test required to be conducted by subsection 7 of section 33-15-12-01 is completed, no owner or operator subject to the provisions of this subsection shall cause to be discharged into the atmosphere from any affected facility any gases which contain nitrogen oxides expressed as NO_2 in excess of:

(a) Eighty-six nanograms per joule {0.20 lb/million Btu} heat input derived from gaseous fossil fuel.

(b) One hundred twenty-nine nanograms per joule {0.30 lb/million Btu} heat input derived from liquid fossil fuel, liquid fossil fuel and wood residue, or gaseous fossil fuel and wood residue.

(c) Three hundred nanograms per joule {0.70 lb/million Btu} heat input derived from solid fossil fuel or solid fossil fuel and wood residue (except lignite or a solid fossil fuel containing twenty-five percent by weight, or more of coal refuse).

(d) Two hundred sixty nanograms per joule {0.60 lb/million Btu} heat input derived from lignite or lignite and wood residue (except as provided under subparagraph e).

(e) Three hundred forty nanograms per joule {0.80 lb/million Btu} heat input derived from lignite which is mined in North Dakota, South Dakota, or Montana and which is burned in a cyclone-fired unit.

- (2) Except as provided under paragraphs 3 and 4, when different fossil fuels are burned simultaneously in any combination, the applicable standard (in nanograms per joule) is determined by proration using the following formula:

$$PS_{NO_x} = \frac{w(260) + x(86) + y(130) + z(300)}{w + x + y + z}$$

where:

PS_{NO_x} = prorated standard for nitrogen oxides when burning different fuels simultaneously, in nanograms per joule heat input derived from all fossil fuels fired or from all fossil fuels and wood residue fired.

w = percentage of total heat input derived from lignite.

x = percentage of total heat input derived from gaseous fossil fuel.

y = percentage of total heat input derived from liquid fossil fuel.

z = percentage of total heat input derived from solid fossil fuel (except lignite).

- (3) When a fossil fuel containing at least twenty-five percent, by weight, of coal refuse is burned in combination with gaseous, liquid, or other solid fossil fuel or wood residue, the standard for nitrogen oxides does not apply.

- (4) Cyclone-fired units which burn fuels containing at least twenty-five percent of lignite that is mined in North Dakota, South Dakota, or Montana remain subject to subparagraph e of paragraph 1 regardless of the types of fuel burned in combination with that lignite.

f. Emission and fuel monitoring:

- (1) Each owner or operator shall install, calibrate, maintain, and operate continuous monitoring systems for measuring the opacity of emissions, sulfur dioxide emissions, nitrogen oxides emissions, and either oxygen or carbon dioxide except as provided in paragraph 2.

(2) Certain of the continuous monitoring system requirements under paragraph † do not apply to owners or operators under the following conditions:

(a) For a fossil fuel-fired steam generator that burns only gaseous fossil fuel, continuous monitoring systems for measuring the opacity of emissions and sulfur dioxide emissions are not required.

(b) For a fossil fuel-fired steam generator that does not use a flue gas desulfurization device, a continuous monitoring system for measuring sulfur dioxide emissions is not required if the owner or operator monitors sulfur dioxide emissions by fuel sampling and analysis under paragraph †.

(c) Notwithstanding subdivision b of subsection †† of section 33-15-12-01, installation of a continuous monitoring system for nitrogen oxides may be delayed until after the initial performance tests under subsection 7 of section 33-15-12-01 have been conducted. If the owner or operator demonstrates during the performance test that emissions of nitrogen oxides are less than seventy percent of the applicable standards in subdivision e, a continuous monitoring system for measuring nitrogen oxides emissions is not required. If the initial performance test results show that nitrogen oxides emissions are greater than seventy percent of the applicable standard, the owner or operator shall install a continuous monitoring system for nitrogen oxides within one year after the date of the initial performance tests under subsection 7 of section 33-15-12-01 and comply with all other applicable monitoring requirements under this subdivision.

(d) If an owner or operator does not install any continuous monitoring systems for sulfur oxides and nitrogen oxides, as provided under subparagraphs a and c or subparagraphs b and c, a continuous monitoring system for measuring either oxygen or carbon dioxide is not required.

(3) For performance evaluations under subdivision c of subsection †† of section 33-15-12-01 and calibration checks under subdivision d of subsection †† of section 33-15-12-01, the following procedures shall be used:

- (a) Methods 6, 7, and 3, as applicable, must be used for the performance evaluations of sulfur dioxide and nitrogen oxides continuous monitoring systems. Acceptable alternative methods for methods 6, 7, and 3 are given in paragraph 4 of subdivision g of this subsection.
- (b) Sulfur dioxide or nitric oxide, as applicable, must be used for preparing calibration gas mixtures under performance specification 2 of appendix B to this chapter.
- (c) For affected facilities burning fossil fuel, the span value for a continuous monitoring system measuring the opacity of emissions shall be eighty, ninety, or one hundred percent and for a continuous monitoring system measuring sulfur oxides or nitrogen oxides the span value shall be determined as follows:

(In parts per million)

Fossil fuel	Span value for sulfur dioxide	Span value for nitrogen oxides
Gas	*	500
Liquid	+1,000	500
Solid	+1,500	500
Combinations	$+1,000y + 1,500z$	$500(x+y) + 1,000z$

* Not applicable.

where:

x = fraction of total heat input derived from gaseous fossil fuel.

y = fraction of total heat input derived from liquid fossil fuel.

z = fraction of total heat input derived from solid fossil fuel.

- (d) All span values computed under subparagraph c for burning combinations of fossil fuels shall be rounded to the nearest five hundred parts per million.
- (e) For a fossil fuel-fired steam generator that simultaneously burns fossil fuel and nonfossil

fuel, the span value of all continuous monitoring systems shall be subject to the department's approval.

(4) {Reserved}

(5) For any continuous monitoring system installed under subparagraph 4, the following conversion procedures must be used to convert the continuous monitoring data into units of the applicable standards (nanograms per joule, pounds per million Btu):

(a) When a continuous monitoring system for measuring oxygen is selected, the measurement of the pollutant concentration and oxygen concentration shall each be on a consistent basis (wet or dry). Alternative procedures approved by the department shall be used when measurements are on a wet basis. When measurements are on a dry basis, the following conversion procedure shall be used:

$$E = GF \left[\frac{20.9}{20.9 - \text{percent } \theta_2} \right]$$

where:

E, G, F, and percent θ_2 , are determined under paragraph 6.

(b) When a continuous monitoring system for measuring carbon dioxide is selected, the measurements of the pollutant concentration and carbon dioxide concentration shall each be on a consistent basis (wet or dry) and the following conversion procedure shall be used:

$$E = GF_c \left[\frac{100}{\text{percent } \theta_2} \right]$$

where:

E, G, F_c , and percent θ_2 are determined under paragraph 6.

(6) The values used in the equations under paragraph 5 are derived as follows:

(a) E = pollutant emission, ng/j [lb/million Btu].

(b) G = pollutant concentration, ng/dscm [lb/dscf], determined by multiplying the average concentration (ppm) for each one-hour period by

4.15×10^4 M ng/dscm per ppm $(2.59 \times 10^{-9}$ M lb/dscf per ppm) where M = pollutant molecular weight; g/g mole lb/lb-mole; M = 64.07 for sulfur dioxide and 46.01 for nitrogen oxides.

(c) Percent θ_2 ; percent θ_{O_2} = oxygen or carbon dioxide volume (expressed as percent) determined with equipment specified under paragraph 1 of this subdivision.

(d) F , F_c = a factor representing a ratio of the volume of dry flue gases generated to the calorific value of the fuel combusted (F) and a factor representing a ratio of the volume of carbon dioxide generated to the calorific value of the fuel combusted (F_c), respectively. Values of F and F_c are given as follows:

(1) For anthracite coal as classified according to A.S.T.M. D300-77, $F = 2.723 \times 10^{-7}$ dscm/l $(10140 \text{ dscf/million Btu})$ and $F_c = 0.532 \times 10^{-7}$ scm θ_2 /l $(1900 \text{ scf } \theta_2/\text{million Btu})$.

(2) For subbituminous and bituminous coal as classified according to A.S.T.M. D300-77, $F = 2.637 \times 10^{-7}$ dscm/l $(9820 \text{ dscf/million Btu})$ and $F_c = 0.486 \times 10^{-7}$ scm θ_2 /l $(1810 \text{ scf } \theta_2/\text{million Btu})$.

(3) For liquid fossil fuels including cruder, residua, and distillate oils, $F = 2.476 \times 10^{-7}$ dscm/l $(9220 \text{ dscf/million Btu})$ and $F_c = 0.304 \times 10^{-7}$ scm θ_2 /l $(1130 \text{ scf } \theta_2/\text{million Btu})$.

(4) For gaseous fossil fuels, $F = 2.347 \times 10^{-7}$ dscm/l $(8740 \text{ dscf/million Btu})$. For natural gas, propane, and butane fuels, $F_c = 0.279 \times 10^{-7}$ scm θ_2 /l $(1040 \text{ scf } \theta_2/\text{million Btu})$ for natural gas, 0.322×10^{-7} scm θ_2 /l $(1200 \text{ scf } \theta_2/\text{million Btu})$ for propane, and 0.330×10^{-7} scm θ_2 /l $(1260 \text{ scf } \theta_2/\text{million Btu})$ for butane.

f5] For bark $F = 2.589 \times 10^{-7}$ dscm/j {9,640 dscf/million Btu} and $F_c = 0.500 \times 10^{-7}$ dscm/j {1,840 dscf/million Btu}. For wood residue other than bark $F = 2.492 \times 10^{-7}$ dscm/j {9,280 dscf/million Btu} and $F_c = 0.494 \times 10^{-7}$ dscm/j {1,860 dscf/million Btu}.

f6] For lignite coal as classified according to A.S.T.M. D388-77, $F = 2.659 \times 10^{-7}$ dscm/j {9900 dscf/million Btu} and $F_c = 0.516 \times 10^{-7}$ scm CO_2 /j {1920 scf CO_2 /million Btu}.

(e) The owner or operator may use the following equations to determine an F factor (dscm/j, or dscf/million Btu) on a dry basis (if it is desired to calculate F on a wet basis, consult with the department) or F_c factor (scm CO_2 /j, or scf CO_2 /million Btu) on either basis in lieu of the F or F_c factors specified in subparagraph d of this paragraph:

$$F = 10^{-6} \{227.2(\%H) + 95.5(\%C) + 35.6(\%S) + 8.7(\%N) - 28.7(\%O)\} \\ \text{GCV} \quad \text{(metric units)}$$

$$F = 10^6 \{3.64(\%H) + 1.53(\%C) + 0.57(\%S) + 0.14(\%N) - 0.46(\%O)\} \\ \text{GCV} \quad \text{(English units)}$$

$$F_c = 2.0 \times 10^{-5} (\%C) \\ \text{GCV} \quad \text{(metric units)}$$

$$F_c = 321 \times 10^{-3} (\%C) \\ \text{GCV} \quad \text{(English units)}$$

f1] H, C, S, N, and O are content by weight of hydrogen, carbon, sulfur, nitrogen, and oxygen (expressed as percent), respectively, as determined on the same basis as GCV by ultimate analysis of the fuel fired, using A.S.T.M. method D3178-74 or D3176 (solid fuels), or computed from results using A.S.T.M. methods D1137-53(75), D1945-64(76), or D1946-77 (gaseous fuels) as applicable.

(2) GCV is the gross calorific value (kj/kg, Btu/lb) of the fuel combusted, determined by the A.S.T.M. test methods B2015-77 for solid fuels and B1826-77 for gaseous fuels as applicable.

(3) For affected facilities which fire both fossil fuels and nonfossil fuels, the F or F_c value shall be subject to the department's approval.

(f) For affected facilities firing combinations of fossil fuels or fossil fuels and wood residue, the F or F_c factors determined by subparagraph d or e of this paragraph shall be prorated in accordance with the applicable formula as follows:

where:

$$F = \frac{F}{F_c} = \frac{1}{n} \sum X_i F_i \text{ or } F_c = \frac{F}{F_c} = \frac{1}{n} \sum X_i (F_c)_i$$

X_i = fraction of total heat input derived from each type fuel (e.g., natural gas, bituminous coal, wood residue, etc.).

F_i or $(F_c)_i$ = applicable F_c factor for each fuel type determined in accordance with subparagraph d or e.

n = number of fuels being burned in combination.

(7) For the purpose of reports required under subdivision c of subsection 6 of section 33-15-12-01, periods of excess emissions that shall be reported are defined as follows:

(a) Opacity. Excess emissions are defined as any six-minute period during which the average opacity of emissions exceeds twenty percent opacity, except that one 6-minute average per hour of up to twenty-seven percent opacity need not be reported.

(b) Sulfur dioxide. Excess emissions for affected facilities are defined as:

{1} Any three-hour period during which the average emissions (arithmetic average of three contiguous one-hour periods) of sulfur dioxide as measured by a continuous monitoring system exceed the applicable standard under subdivision d.

(c) Nitrogen oxides: Excess emissions for affected facilities using a continuous monitoring system for measuring nitrogen oxides are defined as any three-hour period during which the average emissions (arithmetic average of three contiguous one-hour periods) exceed the applicable standards under subdivision e.

g. Test methods and procedures:

(1) In conducting the performance tests required in subsection 7 of section 33-15-12-01, the owner or operator shall use as reference methods and procedures the test methods in appendix A of this chapter or other methods and procedures as specified in this subdivision, except as provided in subdivision b of subsection 7 of section 33-15-12-01. Acceptable alternative methods and procedures are given in paragraph 4 of this subdivision.

(2) The owner or operator shall determine compliance with the particulate matter, sulfur dioxide, and nitrogen oxides standards in subdivisions c, d, and e of this subsection:

(a) The emission rate (E) of particulate matter, sulfur dioxide, or nitrogen oxides must be computed for each run using the following equation:

$$E = CF_d (20.9) / (20.9 - \% \theta_2)$$

E = emission rate of pollutant, ng/j
(lb/million Btu).

C = concentration of pollutant, ng/dscm
(lb/dscf).

% θ_2 = oxygen concentration, percent
dry basis.

F_d = factor as determined in method 19.

(b) Method 5 must be used to determine the particulate matter concentration (C) at affected facilities without wet flue gas desulfurization

(FGD) systems and method 5B must be used to determine the particulate matter concentration (C) after FGD systems.

{1} The sampling time and sample volume for each run must be at least sixty minutes and 0.85 dry cubic meters at standard conditions {30 dscf}. The probe and filter holder heating systems in the sampling train may be set to provide a gas temperature no greater than one hundred sixty plus or minus fourteen degrees Celsius {320 plus or minus 25 degrees Fahrenheit}.

{2} The emission rate correction factor, integrated or grab sampling and analysis procedure of method 3 must be used to determine the oxygen concentration (%O₂). The oxygen sample must be obtained simultaneously with, and at the same traverse points as, the particulate sample. If the grab sampling procedure is used, the oxygen concentration for the run must be the arithmetic mean of all the individual oxygen sample concentrations at each traverse point.

{3} If the particulate run has more than twelve traverse points, the oxygen traverse points may be reduced to twelve provided that method 4 is used to locate the twelve oxygen traverse points.

(c) Method 9 and the procedures in subsection 9 of section ~~33-15-12-01~~ must be used to determine opacity.

(d) Method 6 must be used to determine the sulfur dioxide concentration.

{1} The sampling site must be the same as that selected for the particulate sample. The sampling location in the duct must be at the centroid of the cross section or at a point no closer to the walls than one meter {3.28 feet}. The sampling time and sample volume for each sample run must be at least twenty minutes and 0.020 dry cubic meters at standard conditions {0.71 dscf}. Two samples must be taken during a one-hour period, with each sampling taken within a thirty-minute interval.

- {2} The emission rate correction factor, integrated sampling and analysis procedure of method 3 must be used to determine the oxygen concentration ($\%O_2$). The oxygen sample must be taken simultaneously with, and at the same point as, the sulfur dioxide sample. The sulfur dioxide emission rate must be computed for each pair of sulfur dioxide and oxygen samples. The sulfur dioxide emission rate (E) for each run must be the arithmetic mean of the results of the two pairs of samples.
- (e) Method 7 must be used to determine the nitrogen oxides concentration.
- {1} The sampling site and location must be the same as for the sulfur dioxide sample. Each run must consist of four grab samples, which each sample taken at about fifteen-minute intervals.
- {2} For each nitrogen oxides sample, the emission rate correction factor, grab sampling, and analysis procedure of method 3 must be used to determine the oxygen concentration ($\%O_2$). The sample must be taken simultaneously with, and at the same point as, the nitrogen oxides sample.
- {3} The nitrogen oxides emission rate must be computed for each pair of nitrogen oxides and oxygen samples. The nitrogen oxides emission rate (E) for each run must be the arithmetic mean of the results of the four pairs of samples.
- (3) When combinations of fossil fuels or fossil fuel and wood residue are fired, the owner or operator (in order to compute the prorated standards as shown in paragraph 2 of subdivision d and paragraph 2 of subdivision e shall determine the percentage (w, x, y, or z) of the total heat input derived from each type of fuel as follows:
- (a) The heat input rate of each fuel must be determined by multiplying the gross calorific value of each fuel fired by the rate of each fuel burned.
- (b) A.S.T.M. methods D2015-77 (solid fuels), D240-76 (liquid fuels), or D1826-77 (gaseous fuels) must

be used to determine the gross calorific values of the fuels. The method used to determine the calorific value of wood residue must be approved by the department.

(c) Suitable methods must be used to determine the rate of each fuel burned during each test period, and a material balance over the steam generating system must be used to confirm the rate.

(4) The owner or operator may use the following alternatives to the reference methods and procedures in this subdivision or in other subdivisions as specified:

(a) The emission rate (E) of particulate matter, sulfur dioxide, and nitrogen oxides may be determined by using the F_c factor, provided that the following procedure is used:

[1] The emission rate (E) must be computed using the following equation:

$$E = E F_c (100/\%CO_2)$$

where:

E = emission rate of pollutant,
ng/J (lb/million Btu).

E = concentration of pollutant,
ng/dscm (lb/dscf).

$\%CO_2$ = carbon dioxide concentration,
percent dry basis.

F_c = factor as determined in
appropriate sections of
method 19.

[2] If and only if the average F_c factor in method 19 is used to calculate E and either E is from 0.97 to 1.00 of the emission standard or the relative accuracy of a continuous emission monitoring system is from seventeen to twenty percent, then three runs of method 3 must be used to determine the oxygen and carbon dioxide concentration according to the procedures in item 2 of subparagraphs b, d, and e of paragraph 2 of this subdivision. If F_c (average of three runs), as calculated from

the equation in method 3, is more than plus or minus three percent than the average F_o value, as determined from the average values of F_d and F_c in method 19, i.e., $F_{oa} = 0.209 (F_{da} \frac{F_o}{c_a})$, then the following procedure must be followed:

(a) When F_o is less than $0.97 F_{oa}$, then E must be increased by that proportion under $0.97 F_{oa}$; e.g., if F_o is $0.95 F_{oa}$, E must be increased by two percent. This recalculated value must be used to determine compliance with the emission standard.

(b) When F_o is less than $0.97 F_{oa}$ and when the average difference (d) between the continuous monitor minus the reference methods is negative, then E must be increased by that portion under $0.97 F_{oa}$; e.g., if F_o is $0.95 F_{oa}$, E must be increased by two percent. This recalculated value must be used to determine compliance with the relative accuracy specification.

(c) When F_o is greater than $1.03 F_{oa}$ and when the average difference d is positive, then E must be decreased by that proportion over $1.03 F_{oa}$; e.g., if F_o is $1.05 F_{oa}$, E must be decreased by two percent. This recalculated value must be used to determine compliance with the relative accuracy specification.

(b) For method 5 or 5B, method 17 may be used at facilities with or without wet fine-gas-desulfurization (FGD) systems if the stack gas temperature at the sampling location does not exceed an average temperature of one hundred sixty degrees Celsius (320 degrees Fahrenheit). The procedures of sections 2.1 and 2.3 of method 5B may be used with method 19 only if it is used after wet fine-gas-desulfurization (FGD) systems. Method 17 may not be used after wet fine-gas-desulfurization (FGD) systems if the effluent gas is saturated or laden with water droplets.

(c) Particulate matter and sulfur dioxide may be determined simultaneously with the method 5

train provided that the following changes are made:

{1} The filter and impinger apparatus in sections 2.1.5 and 2.1.6 of method 8 is used in place of the condenser (section 2.1.7) of method 5.

{2} All applicable procedures in method 8 for the determination of sulfur dioxide (including moisture) are used.

(d) For method 6, method 6C may be used. Method 6A may also be used whenever method 6 and 3 data are specified to determine the sulfur dioxide emission rate, under the conditions in subparagraph a of paragraph 4 of this subdivision.

(e) For method 7, method 7A, 7C, 7D, or 7E may be used. If method 7C, 7D, or 7E is used, the sampling time for each run must be at least one hour and the integrated sampling approach must be used to determine the oxygen concentration (%O₂) for the emission rate correction factor.

(f) For method 3, method 3A may be used.

2. Standards of performance of electric utility steam generating units.

a. Applicability and designation of affected facility.

(1) The affected facility to which this subsection applies is each electric utility steam generating unit:

(a) That is capable of combusting more than seventy-three megawatts [250 million Btu/hour] heat input of fossil fuel (either alone or in combination with any other fuel); and

(b) For which construction or modification is commenced after September 18, 1978.

(2) This subsection applies to electric utility combined cycle gas turbines that are capable of combusting more than seventy-three megawatts [250 million Btu/hour] heat input of fossil fuel in the steam generator. Only emissions resulting from combustion of fuels in the steam generating unit are subject to this subsection.

(3) Any change in an existing fossil fuel-fired steam generating unit to accommodate the use of combustible materials, other than fossil fuels, shall not bring that unit under the applicability of this subsection.

(4) Any change in an existing steam generating unit originally designed to fire gaseous or liquid fossil fuels, to accommodate the use of any other fuel (fossil or nonfossil) shall not bring that unit under the applicability of this subsection.

b. Definitions. As used in this subsection, all terms not defined herein shall have the meaning given them in North Dakota Century Code chapter 23-25 and in subsection 2 of section 33-15-12-01.

(1) "Anthracite" means coal that is classified as anthracite according to the American society of testing and materials' standard specification for classification of coals by rank D388-77.

(2) "Available purchase power" means the lesser of the following:

(a) The sum of available system capacity in all neighboring companies.

(b) The sum of the rated capacities of the power interconnection devices between the principal company and all neighboring companies, minus the sum of the electric power load on these interconnections.

(c) The rated capacity of the power transmission lines between the power interconnection devices and the electric generating units (the unit in the principal company that has the malfunctioning flue gas desulfurization system and the units in the neighboring company supplying replacement electrical power) less the electric power load on these transmission lines.

(3) "Available system capacity" means the capacity determined by subtracting the system load and the system emergency reserves from the net system capacity.

(4) "Boiler operating day" means a twenty-four-hour period during which fossil fuel is combusted in a steam generating unit for the entire twenty-four hours.

- (5) "Coal refuse" means waste products of coal mining, physical coal cleaning, and coal preparation operations, e.g., culm, gob, etc., containing coal, matrix material, clay, and other organic and inorganic material.
- (6) "Combined cycle gas turbine" means a stationary turbine combustion system where heat from the turbine exhaust gases is recovered by a steam generating unit.
- (7) "Commercial demonstration permit" means a permit which is issued by the administrator of the United States environmental protection agency in accordance with 40 CFR 60.45a.
- (8) "Electric utility combined cycle gas turbine" means any combined cycle gas turbine used for electric generation that is constructed for the purpose of supplying more than one-third of its potential electric output capacity and more than twenty-five megawatts electric output to any utility power distribution system for sale. Any steam distribution system that is constructed for the purpose of providing steam to a steam electric generator that would produce electrical power for sale is also considered in determining the electrical energy output capacity of the affected facility.
- (9) "Electric utility company" means the largest interconnected entity that generates electric power for sale, e.g., a holding company with operating subsidiary companies.
- (10) "Electric utility steam generating unit" means any steam electric generating unit that is constructed for the purpose of supplying more than one-third of its potential electric output capacity and more than twenty-five megawatts electrical output to any utility power distribution system for sale. Any steam supplied to a steam distribution system for the purpose of providing steam to a steam electric generator that would produce electrical energy for sale is also considered in determining the electrical energy output capacity of the affected facility.
- (11) "Emergency condition" means that period of time when:
- (a) The electric generation output of an affected facility with a malfunctioning flue gas desulfurization system cannot be reduced or electrical output must be increased because:

- (1) All available system capacity in the principal company interconnected with the affected facility is being operated; and
 - (2) All available purchase power interconnected with the affected facility is being obtained; or
- (b) The electric generation demand is being shifted as quickly as possible from an affected facility with a malfunctioning flue gas desulfurization system to one or more electrical generating units held in reserve by the principal company or by a neighboring company; or
- (c) An affected facility with a malfunctioning flue gas desulfurization system becomes the only available unit to maintain a part or all of the principal company's system emergency reserves and the unit is operated spinning reserve at the lowest practical electric generation load consistent with not causing significant physical damage to the unit. If the unit is operated at a higher load to meet load demand, an emergency condition would not exist unless the conditions under subparagraph a apply.
- (12) "Fossil fuel" means natural gas, petroleum, coal and any form of solid, liquid, or gaseous fuels derived from such material for the purpose of creating useful heat.
 - (13) "Interconnected" means that two or more electric generating units are electrically tied together by a network of power transmission lines, and other power transmission equipment.
 - (14) "Lignite" means coal that is classified as lignite A or B according to the American society of testing and materials' standard specification for classification of coals by rank D388-77.
 - (15) "Neighboring company" means any one of those electric utility companies with one or more electric power interconnections to the principal company and which have geographically adjoining service areas.
 - (16) "Net system capacity" means the sum of the net electric generating capability (not necessarily equal to rated capacity) of all electric generating equipment owned by an electric utility company (including steam generating units, internal combustion engines, gas turbines, nuclear units,

hydroelectric units, and all other electric generating equipment) plus firm contractual purchases that are interconnected to the affected facility that has the malfunctioning flue gas desulfurization system. The electric generating capability of equipment under multiple ownership is prorated based on ownership unless the proportional equipment to electric output is otherwise established by contractual arrangement.

(17) "Potential combustion concentration" means the theoretical emissions (nanograms per joule, pounds per million Btu heat input) that would result from combustion of a fuel in an uncleaned state without emission control systems and:

(a) For particulate matter is:

f1] Three thousand nanograms per joule [7.0 lb/million Btu] heat input for solid fuel; and

f2] Seventy-five nanograms per joule [0.17 lb/million Btu] heat input for liquid fuels.

(b) For sulfur dioxide is determined under paragraph 2 of subdivision h.

(c) For nitrogen oxides is:

f1] Two hundred ninety nanograms per joule [0.67 lb/million Btu] heat input for gaseous fuels;

f2] Three hundred ten nanograms per joule [0.72 lb/million Btu] heat input for liquid fuels; and

f3] Nine hundred ninety nanograms per joule [2.30 lb/million Btu] heat input for solid fuels.

(18) "Potential electric output capacity" is defined as thirty-three percent of the maximum design heat input capacity of the steam generating unit, e.g., a steam generating unit with a one hundred megawatt [340 million Btu/hour] fossil-fuel heat input capacity would have a thirty-three megawatt potential electrical output capacity. For electric utility combined cycle gas turbines the potential electrical output capacity is determined on the basis of the fossil-fuel firing capacity of the steam generator

exclusive of the heat input and electrical power contribution by the gas turbine.

- (19) "Principal company" means the electric utility company or companies which own the affected facility.
- (20) "Resource recovery unit" means a facility that combusts more than seventy-five percent nonfossil fuel on a quarterly (calendar) heat input basis.
- (21) "Solid derived fuel" means any solid, liquid, or gaseous fuel derived from solid fuel for the purpose of creating useful heat and includes, but is not limited to, solvent refined coal, liquefied coal, and gasified coal.
- (22) "Spare flue gas desulfurization system module" means a separate system of sulfur dioxide emission control equipment capable of treating an amount of flue gas equal to the total amount of flue gas generated by an affected facility when operated at maximum capacity divided by the total number of nonspare flue gas desulfurization modules in the system.
- (23) "Spinning reserve" means the sum of the unutilized net generating capability of all units of the electric utility company that are synchronized to the power distribution system and that are capable of immediately accepting additional load. The electric generating capability of equipment under multiple ownership is prorated based on ownership unless the proportional entitlement to the electric output is otherwise established by contractual arrangement.
- (24) "Steam generating unit" means any furnace, boiler, or other device used for combusting fuel for the purpose of producing steam (including fossil fuel-fired steam generators associated with combined cycle gas turbines; nuclear steam generators are not included).
- (25) "Subbituminous coal" means coal that is classified as subbituminous A, B, or C according to the American society of testing and materials' standard specification for classification of coals by rank B300-77.
- (26) "System emergency reserves" means an amount of electric generating capacity equivalent to the rated capacity of the single largest electric generating unit in the electric utility company (including steam generating unit, internal combustion engines, gas turbines, nuclear units, hydroelectric units, and all other electric generating equipment) which is

interconnected with the affected facility that has the malfunctioning flue gas desulfurization system. The electric generating capability of equipment under multiple ownership is prorated based on ownership unless the proportional entitlement to electric output is otherwise established by contractual arrangement.

- (27) "System load" means the entire electric demand of an electric utility company's service area interconnected with the affected facility that has the malfunctioning flue gas desulfurization system plus firm contractual sales to other electric utility companies. Sales to other electric utility companies, e.g., emergency power, not on a firm contractual basis may also be included in the system load when no available system capacity exists in the electric utility company to which the power is supplied for sale.
- (28) "Twenty-four hour period" means the period of time between 12:01 a.m. and 12:00 midnight.

c. Standard for particulate matter.

- (1) On and after the date on which the performance test required to be conducted under subsection 7 of section 33-15-12-01 is completed, no owner or operator subject to the provisions of this subsection may cause to be discharged into the atmosphere from any affected facility any gases which contain particulate matter in excess of:
- (a) Thirteen nanograms per joule {0.03 lb/million Btu} heat input derived from the combustion of solid, liquid, or gaseous fuel;
 - (b) One percent of the potential combustion concentration {ninety-nine percent reduction} when combusting solid fuel; and
 - (c) Thirty percent of potential combustion concentration {seventy percent reduction} when combusting liquid fuel.
- (2) On and after the date the particulate matter performance test required to be conducted under subsection 7 of section 33-15-12-01 is completed, no owner or operator subject to the provisions of this subsection may cause to be discharged into the atmosphere from any affected facility any gases which exhibit greater than twenty percent opacity {six-minute average}, except for one 6-minute period

per hour of not more than twenty-seven percent opacity.

d. Standard for sulfur dioxide.

(1) On and after the date on which the initial performance test required to be conducted under subsection 7 of section 33-15-12-01 is completed, no owner or operator subject to the provisions of this subsection may cause to be discharged into the atmosphere from any affected facility which combusts solid fuel or solid-derived fuel, except as provided under paragraph 3, 4, 5, or 7, any gases which contain sulfur dioxide in excess of:

(a) Five hundred twenty nanograms per joule {1.20 lb/million Btu} heat input and ten percent of the potential combustion concentration (ninety percent reduction); or

(b) Thirty percent of the potential combustion concentration (seventy percent reduction), when emissions are less than two hundred sixty nanograms per joule {0.60 lb/million Btu} heat input.

(2) On and after the date on which the initial performance test required to be conducted under subsection 7 of section 33-15-12-01 is completed, no owner or operator subject to the provisions of this subsection may cause to be discharged into the atmosphere from any affected facility which combusts liquid or gaseous fuels (except for liquid or gaseous fuels derived from solid fuels and as provided under paragraph 7) any gases which contain sulfur dioxide in excess of:

(a) Three hundred forty nanograms per joule {0.80 lb/million Btu} heat input and ten percent of the potential combustion concentration (ninety percent reduction); or

(b) One hundred percent of the potential combustion concentration (zero percent reduction) when emissions are less than eighty-six nanograms per joule {0.20 lb/million Btu} heat input.

(3) On and after the date on which the initial performance test required to be conducted under subsection 7 of section 33-15-12-01 is complete, no owner or operator subject to the provisions of this subsection may cause to be discharged into the atmosphere from any affected facility which combusts

solid solvent refined coal (SCR-I) any gases which contain sulfur dioxide in excess of five hundred twenty nanograms per joule {1.20 lb/million Btu} heat input and fifteen percent of the potential combustion concentration (eighty-five percent reduction), except as provided under paragraph 5, compliance with the emission limitation is determined on a thirty-day rolling average basis and compliance with the percent reduction requirement is determined on a twenty-four-hour basis.

(4) Sulfur dioxide emissions are limited to five hundred twenty nanograms per joule {1.20 lb/million Btu} heat input from any affected facility which:

(a) Combusts one hundred percent anthracite; and

(b) Is classified as a resource recovery facility.

(5) The emission reduction requirements under this subsection do not apply to any affected facility that is operated under a sulfur dioxide commercial demonstration permit issued by the administrator of the United States environmental protection agency.

(6) Compliance with the emission limitation and percent reduction requirements under this subdivision are both determined on a thirty-day rolling average basis except as provided under paragraph 3.

(7) When different fuels are combusted simultaneously, the applicable standard is determined by proration using the following formula:

(a) If emissions of sulfur dioxide to the atmosphere are greater than two hundred sixty nanograms per joule {0.60 lb/million Btu} heat input:

$$E_S = \{340 x + 520 y\}/100$$

$$\%P_S = 10$$

(b) If emissions of sulfur dioxide to the atmosphere are equal to or less than two hundred sixty nanograms per joule {0.60 lb/million Btu} heat input:

$$E_S = \{340 x + 520 y\}/100$$

$$\%P_S = \{10 x + 30 y\}/100$$

where:

E_S is the prorated sulfur dioxide emission limit (ng/j heat input);

$\%P_S$ is the percentage of potential sulfur dioxide emission allowed;

x = the percentage of total heat input derived from the combustion of liquid or gaseous fuels (excluding solid-derived fuels);

y = the percentage of total heat input derived from the combustion of solid fuel (including solid-derived fuels);

e. Standard for nitrogen oxides.

(1) On and after the date on which the initial performance test required to be conducted under subsection 7 of section 33-15-12-01 is completed, no owner or operator subject to the provisions of this subsection may cause to be discharged into the atmosphere from any affected facility, except as provided under paragraph 2, any gases which contain nitrogen oxides in excess of the following emission limits based on a thirty-day rolling average.

(a) Nitrogen oxide emission limits.

Fuel type	Emission limit ng/j (lb/million Btu) heat input
Gaseous Fuels:	
Coal-derived fuels	210 (0.50)
All other fuels	86 (0.20)
Liquid Fuels:	
Coal-derived fuels	210 (0.50)
Shale oil	210 (0.50)
All other fuels	130 (0.30)
Solid Fuels:	
Coal-derived fuels	210 (0.50)
Any fuel containing more than 25% by weight, coal refuse	Exempt from NO ₂ standards and NO ₂ monitoring requirements
Any fuel containing more than 25% by weight, lignite if the lignite is mined in North Dakota, South Dakota, or	

Montana, and is combusted in a slag tap furnace [†]	340	(0.80)
Any fuel containing more than 25%, by weight, lignite not subject to the 340 ng/J heat input emission limit [†]		
Lignite not subject to the 340 ng/j heat input emission limit	260	(0.60)
Subbituminous coal	210	(0.50)
Bituminous coal	260	(0.60)
Anthracite coal	260	(0.60)
All other fuels	260	(0.60)
[†] Any fuel containing less than 25%, by weight, lignite is not prorated, but its percentage is added to the percentage of the predominant fuel.		

(b) Nitrogen oxide reduction requirements.

Fuel type	Percent reduction of potential combustion concentration
Gaseous fuels	25%
Liquid fuels	30%
Solid fuels	65%

(2) The emission limitations under subparagraph a do not apply to any affected facility which is combusting coal-derived liquid fuel and is operating under a commercial demonstration permit issued by the administrator of the United States environmental protection agency.

(3) When two or more fuels are combusted simultaneously, the applicable standard is determined by proration using the following formula:

$$E_n = \{86w + 130x + 210y + 260z + 340v\} / 100$$

where:

E_n = the applicable standard for nitrogen oxides when multiple fuels are combusted simultaneously (ng/j heat input).

- w = the percentage of total heat input derived from the combustion of fuels subject to the eighty-six nanograms per joule heat input standard.
- x = the percentage of total heat input derived from the combustion of fuels subject to the one hundred thirty nanograms per joule heat input standard.
- y = the percentage of total heat input derived from the combustion of fuels subject to the two hundred ten nanograms per joule heat input standard.
- z = the percentage of total heat input derived from the combustion of fuels subject to the two hundred sixty nanograms per joule heat input standard.
- v = the percentage of total heat input delivered from the combustion of fuels subject to the 340 ng/J heat input standard.

f. Compliance provisions.

- (1) Compliance with the particulate matter emission limitation under subparagraph a of paragraph 1 of subdivision c constitutes compliance with the percent reduction requirements for particulate matter under subparagraphs b and c of paragraph 1 of subdivision c.
- (2) Compliance with the nitrogen oxides emission limitation under paragraph 1 of subdivision e constitutes compliance with the percent reduction requirements under subparagraph b of paragraph 1 of subdivision e.
- (3) The particulate matter emission standards under subdivision c and the nitrogen oxides emission standards under subdivision e apply at all times except during periods of startup, shutdown, or malfunction. The sulfur dioxide emission standards under subdivision d apply at all times except during periods of startup, shutdown, or when both emergency conditions exist and the procedures under paragraph 4 are implemented.
- (4) During emergency conditions in the principal company, an affected facility with a malfunctioning flue gas

desulfurization system may be operated if sulfur dioxide emissions are minimized by:

- (a) Operating all operable flue gas desulfurization system modules, and bringing back into operation any malfunctioned module as soon as repairs are completed.
 - (b) Bypassing flue gases around only those flue gas desulfurization system modules that have been taken out of operation because they were incapable of any sulfur dioxide emission reduction or which would have suffered significant physical damage if they had remained in operation.
 - (c) Designing, constructing, and operating a spare flue gas desulfurization system module for an affected facility larger than three hundred sixty-five megawatts [± 250 million Btu/hour] heat input (approximately one hundred twenty-five megawatts electrical output capacity). The department may at its discretion require the owner or operator within sixty days of notification to demonstrate spare module capability. To demonstrate this capability, the owner or operator must demonstrate compliance with the appropriate requirements under paragraphs 1, 2, 4, and 7 of subdivision d for any period of operation lasting from twenty-four hours to thirty days when:
 - [1] Any one flue gas desulfurization module is not operated;
 - [2] The affected facility is operating at the maximum heat input rate;
 - [3] The fuel fired during the twenty-four-hour to thirty-day period is representative of the type and average sulfur content of fuel used over a typical thirty-day period; and
 - [4] The owner or operator has given the department at least thirty days' notice of the date and period of time over which the demonstration will be performed.
- (5) After the initial performance test required under subsection 7 of section 33-15-12-01, compliance with the sulfur dioxide emission limitations and percentage reduction requirements under subdivision d and the nitrogen oxides emission limitations under

subdivision c is based on the average emission rate for thirty successive boiler operating days. A separate performance evaluation based on continuous emission monitoring data must be completed at the end of each boiler operating day after the initial performance test, and a new thirty-day average emission rate for both sulfur dioxide and nitrogen oxides and a new percent reduction for sulfur dioxide are calculated to show compliance with the standards.

- (6) For the initial performance test required under subsection 7 of section ~~33-15-12-01~~, compliance with the sulfur dioxide emission limitations and percent reduction requirements under subdivision d and the nitrogen oxides emission limitation under subdivision e is based on the average emission rates for sulfur dioxide, nitrogen oxides, and percent reduction for sulfur dioxide for the first thirty successive boiler operating days. The initial performance test is the only test in which at least thirty days' prior notice is required unless otherwise specified by the department. The initial performance test is to be scheduled so that the first boiler operating day of the thirty successive boiler operating days is completed within sixty days after achieving the maximum production rate at which the affected facility will be operated, but not later than one hundred eighty days after initial startup of the facility.
- (7) Compliance is determined by calculating the arithmetic average of all hourly emission rates for sulfur dioxide and nitrogen oxide for the thirty successive boiler operating days, except for data obtained during startup, shutdown, malfunction (nitrogen oxide only), or emergency conditions (sulfur dioxide only). Compliance with the percentage reduction requirements for sulfur dioxide is determined based on the average inlet and average outlet sulfur dioxide emission rates for the thirty successive boiler operating days.
- (8) If an owner or operator has not obtained the minimum quantity of emission data as required under subdivision g, compliance of the affected facility with the emission requirements under subdivisions d and e for the day on which the thirty-day period ends may be determined by the department by following the applicable procedures in section 7.0 of method 19.

g. Emission monitoring.

- (1) The owner or operator of an affected facility shall install, calibrate, maintain, and operate a continuous monitoring system, and record the output of the system, for measuring the opacity of emissions discharged to the atmosphere, except where gaseous fuel is the only fuel combusted. If opacity interference due to water droplets exists in the stack, e.g., from the use of a flue gas desulfurization system, the opacity is monitored upstream of the interference (at the inlet to the flue gas desulfurization system). If opacity interference is experienced at all locations (both at the inlet and outlet of the sulfur dioxide control system), alternate parameters indicative of the particulate matter control system's performance are monitored (subject to the approval of the department).
- (2) The owner or operator of an affected facility shall install, calibrate, maintain, and operate a continuous monitoring system, and record the output of the system, for measuring sulfur dioxide emissions, except where natural gas is the only fuel combusted, as follows:
- (a) Sulfur dioxide emissions are monitored at both the inlet and outlet of the sulfur dioxide control device.
 - (b) For a facility which qualifies under the provisions of paragraph 4 of subdivision d, sulfur dioxide emissions are only monitored as discharged to the atmosphere.
 - (c) An "as fired" fuel monitoring system (upstream of coal pulverizers) meeting the requirements of method 19 may be used to determine potential sulfur dioxide emissions in place of a continuous sulfur dioxide emission monitor at the inlet to the sulfur dioxide control device as required under subparagraph a.
- (3) The owner or operator of an affected facility shall install, calibrate, maintain, and operate a continuous monitoring system, and record the output of the system, for measuring nitrogen oxides emissions discharged to the atmosphere.
- (4) The owner or operator of an affected facility shall install, calibrate, maintain, and operate a continuous monitoring system, and record the output of the system, for measuring the oxygen or carbon dioxide content of the flue gases at each location

where sulfur dioxide or nitrogen oxides emissions are monitored.

- (5) The continuous monitoring systems under paragraphs 2, 3, and 4 are operated and data recorded during all periods of operation of the affected facility including periods of startup, shutdown, malfunction, or emergency conditions, except for continuous monitoring system breakdowns, repairs, calibration checks, and zero and span adjustments.
- (6) The owner or operator shall obtain emission data for at least eighteen hours in at least twenty-two out of thirty successive boiler operating days. If this minimum data requirement cannot be met with a continuous monitoring system, the owner or operator shall supplement emission data with other monitoring systems approved by the department and administrator or the reference methods and procedures as described in paragraph 8 of this subdivision.
- (7) The one-hour averages required under subdivision h of subsection 11 of section 33-15-12-01 are expressed in nanograms per joule [lb/million Btu] heat input and used to calculate the average emission rates under subdivision f. The one-hour averages are calculated using the data points required under subdivision h of subsection 11 of section 33-15-12-01. At least two data points must be used to calculate the one-hour average.
- (8) When it becomes necessary to supplement continuous monitoring system data to meet the minimum data requirements in paragraph 6 of this subdivision, the owner or operator shall use the reference methods and procedures as specified in this paragraph. Acceptable alternative methods and procedures are given in paragraph 7 of this subdivision.
 - (a) Method 6 must be used to determine the sulfur dioxide concentration at the same location as the sulfur dioxide monitor. Samples must be taken at sixty-minute intervals. The sampling time and sample volume for each sample must be at least twenty minutes and 0.020 dry cubic meter at standard condition [0.71 dscf]. Each sample represents a one-hour average.
 - (b) Method 7 must be used to determine the nitrogen oxides concentration at the same location as the nitrogen oxides monitor. Samples must be taken at thirty-minute intervals. The arithmetic

average of two consecutive samples represents a one-hour average.

- (c) The emission rate correction factor, integrated bag sampling, and analysis procedure for method 3 must be used to determine the oxygen or carbon dioxide concentration at the same location as the oxygen or carbon dioxide monitor. Samples must be taken for at least thirty minutes in each hour. Each sample represents a one-hour average.
 - (d) The procedures in method 19 must be used to compute each one-hour average concentration in nanograms per joule [lb/million Btu] heat input.
- (9) The owner or operator shall use methods and procedures in this paragraph to conduct monitoring system performance evaluations under subdivision c of subsection 11 of section 33-15-12-01 and calibration checks under subdivision d of subsection 11 of section 33-15-12-01. Acceptable alternative methods and procedures are given in paragraph 10 of this subdivision.
- (a) Methods 6, 7, and 3, as applicable, must be used to determine oxygen, sulfur dioxide, and nitrogen oxides concentrations.
 - (b) Sulfur dioxide or nitrogen oxides (NO), as applicable, must be used for preparing the calibration gas mixtures (in N₂, as applicable) under performance specification 2 of appendix B of this chapter.
 - (c) For affected facilities burning only fossil fuel, the span value for a continuous monitoring system for measuring opacity is between sixty and eighty percent and for a continuous monitoring system measuring nitrogen oxides is determined as follows:

Fossil fuel	Span value for nitrogen oxides (ppm)
Gas	500
Liquid	500
Solid	1000
Combination	500 (x+y)+1000z

where:

x = the fraction of total heat input derived from gaseous fossil fuel.

y = the fraction of total heat input derived from liquid fossil fuel.

z = the fraction of total heat input derived from solid fossil fuel.

- (d) All span values computed under subparagraph c for burning combinations of fossil fuels are rounded to the nearest five hundred parts per million.
- (e) For affected facilities burning fossil fuel, alone or in combination with nonfossil fuel, the span value of the sulfur dioxide continuous monitoring system at the inlet to the sulfur dioxide control device is one hundred twenty-five percent of the maximum estimated hourly potential emissions of the fuel fired, and the outlet of the sulfur dioxide control device is fifty percent of maximum estimated hourly potential emissions of fuel fired.
- (10) The owner or operator may use the following as alternatives to the reference methods and procedures specified in this subdivision:
- (1) For method 6, method 6A or 6B (whenever methods 6 and 3 data are used) or 6C may be used. Each method 6B sample obtained over twenty-four hours represents twenty-four one-hour averages. Each method 6A or 6B is used under paragraph 9 of this subdivision, the conditions under subparagraph a of paragraph 4 of subdivision g apply; these conditions do not apply under paragraph 8 of this subdivision.
 - (2) For method 7, method 7A, 7C, 7D, or 7E may be used. If method 7C, 7D, or 7E is used, the sampling time for each run shall be one hour.
 - (3) For method 3, method 3A may be used if the sampling time is one hour.

h. Compliance determination test methods and procedures.

- (1) In conducting the performance tests required in subsection 7 of section 33-15-12-01, the owner or

operator shall use as reference methods and procedures the methods in appendix A of this chapter or the methods and procedures as specified in this subdivision, except as provided in subdivision b of subsection 7 of section 33-15-12-01. Subdivision f of subsection 7 of section 33-15-12-01 does not apply to this subdivision for sulfur dioxide or nitrogen oxide. Acceptable alternative methods are given in paragraph 5 of this subdivision.

(2) The owner or operator shall determine compliance with the particulate matter standards in subdivision c of this subsection as follows:

(a) The dry basis F factor (θ_2) procedures in method 19 must be used to compute the emission rate of particulate matter.

(b) For the particulate matter concentration, method 5 must be used at affected facilities without wet flue gas desulfurization (FGD) systems and method 5B must be used after wet flue gas desulfurization (FGD) systems.

{1} The sampling time and sample volume for each run must be at least one hundred twenty minutes and 1.70 dry cubic meter at standard condition {60 dscf}. The probe and filter holder heating system in the sampling train may be set to provide an average gas temperature of no greater than one hundred sixty plus or minus fourteen degrees Celsius {320 plus or minus 25 degrees Fahrenheit}.

{2} For each particulate run, the emission rate correction factor, integrated or grab sampling and analysis procedures of method 3 must be used to determine the oxygen concentration. The oxygen sample must be obtained simultaneously with, and at the same traverse points as, the particulate run. If the particulate run has more than twelve traverse points, the oxygen traverse points may be reduced to twelve provided that method 1 is used to locate the twelve oxygen traverse points. If the grab sampling procedure is used, the oxygen concentration for the run must be the arithmetic mean of all the individual oxygen concentrations at each traverse point.

(c) Method 9 and the procedures in subsection 9 of section 33-15-12-01 must be used to determine opacity.

(3) The owner or operator shall determine compliance with the sulfur dioxide standards in subdivision d of this subsection as follows:

(a) The percent of potential sulfur dioxide emissions ($\%P_S$) to the atmosphere must be computed using the following equation:

$$\%P_S = [(100 - \%R_f)(100 - \%R_s)] / 100$$

where:

$\%P_S$ = percent of potential SO_2 emissions, percent.

$\%R_f$ = percent reduction from fuel pretreatment, percent.

$\%R_s$ = percent reduction by SO_2 control system, percent.

(b) The procedures in method 19 may be used to determine percent reduction ($\%R_f$) of sulfur by such processes as fuel pretreatment (physical coal cleaning, hydrodesulfurization of fuel oil, etc.), coal pulverizers, and bottom and fly ash interactions. This determination is optional.

(c) The procedures in method 19 must be used to determine the percent sulfur dioxide reduction ($\%R_s$) of any sulfur dioxide control system. Alternatively, a combination of an "as fired" fuel monitor and emission rates measured after the control system, following the procedures in method 19, may be used if the percent reduction is calculated using the average emission average sulfur dioxide input rate from the "as fired" fuel analysis for thirty successive boiler operating days.

(d) The appropriate procedures in method 19 must be used to determine the emission rate.

(e) The continuous monitoring system in paragraphs 2 and 4 of subdivision g of this subsection must be used to determine the concentrations of sulfur dioxide and carbon dioxide or oxygen.

- (4) The owner or operator shall determine compliance with the nitrogen oxide standard in subdivision d of this subsection as follows:
- (a) The appropriate procedures in method 19 must be used to determine the emission rate of nitrogen oxides.
 - (b) The continuous monitoring system in paragraphs 3 and 4 of subdivision g of this subsection must be used to determine the concentrations of nitrogen oxide and carbon dioxide or oxygen.
- (5) The owner or operator may use the following as alternatives to the reference methods and procedures specified in this subdivision:
- (a) For method 5 or 5B, method 17 may be used at facilities with or without wet flue gas desulfurization (FGD) systems if the stack temperature at the sampling location does not exceed an average temperature of one hundred sixty degrees Celsius [320 degrees Fahrenheit]. The procedures of sections 2.1 and 2.3 of method 5B may be used in method 17 only if it is used after wet flue gas desulfurization (FGD) systems. Method 17 may not be used after wet flue gas desulfurization (FGD) systems if the effluent is saturated or laden with water droplets.
 - (b) The F_c factor (CO_2) procedures in method 19 may be used to compute the emission rate of particulate matter under the stipulations of subparagraph a of paragraph 4 of subdivision g of subsection 1. The carbon dioxide must be determined in the same manner as the oxygen concentration.
- (6) Electric utility combined cycle gas turbines are performance tested for particulate matter, sulfur dioxide, and nitrogen oxides using the procedures of method 19 (appendix A). The sulfur dioxide and nitrogen oxides emission rates from the gas turbine used in method 19 calculations are determined when the gas turbine is performance tested under subsection 21. The potential uncontrolled particulate matter emission rate from a gas turbine is defined as seventeen nanograms per joule [0.04 lb/million Btu] heat input.

i. Reporting requirements.

- (1) For sulfur dioxide, nitrogen oxides, and particulate matter emissions, the performance test data from the initial performance test and from the performance evaluation of the continuous monitors (including the transmissometer) are submitted to the department.
- (2) For sulfur dioxide and nitrogen oxides the following information is reported to the department for each twenty-four-hour period:
 - (a) Calendar date.
 - (b) The average sulfur dioxide and nitrogen oxide emission rates (nanogram per joule or pound per million British thermal units) for each thirty successive boiler operating days, ending with the last thirty-day period in the quarter; reasons for noncompliance with the emission standards; and description of corrective actions taken.
 - (c) Percent reduction of the potential combustion concentration of sulfur dioxide for each thirty successive boiler operating days, ending with the last thirty-day period in the quarter; reasons for noncompliance with the standard; and description of corrective actions taken.
 - (d) Identification of the boiler operating days for which pollutant or diluent data have not been obtained by an approved method for at least eighteen hours of operation of the facility; justification for not obtaining sufficient data; and description of corrective actions taken.
 - (e) Identification of the times when emissions data have been excluded from the calculation of average emission rates because of startup, shutdown, malfunction (nitrogen oxide only), emergency conditions (sulfur dioxide only), or other reasons, and justification for excluding data for reasons other than startup, shutdown, malfunction, or emergency conditions.
 - (f) Identification of "P" factor used for calculations, method of determination, and type of fuel combusted.
 - (g) Identification of times when hourly averages have been obtained based on manual sampling methods.

- (h) Identification of the times when the pollutant concentration exceeded full span of the continuous monitoring system.
 - (i) Description of any modifications to the continuous monitoring system which could affect the ability of the continuous monitoring system to comply with performance specification 2 or 3.
- (3) If the minimum quantity of emission data as required by subdivision g is not obtained for any thirty successive boiler operating days, the following information obtained under the requirements of paragraph 8 of subdivision f is reported to the department for that thirty-day period:
- (a) The number of hourly averages available for outlet emission rates (n_o) and inlet emission rates (n_i) as applicable.
 - (b) The standard deviation of hourly averages for outlet emission rates (s_o) and inlet emission rates (s_i) as applicable.
 - (c) The lower confidence limit for the mean outlet emission rate (E_o^*) and the upper confidence limit for the mean inlet emission rate (E_i^*) as applicable.
 - (d) The applicable potential combustion concentration.
 - (e) The ratio of the upper confidence limit for the mean outlet emission rate (E_o^*) and the allowable emission rate (E_{std}) as applicable.
- (4) If any standards under subdivision d are exceeded during emergency conditions because of control system malfunction, the owner or operator of the affected facility shall submit a signed statement:
- (a) Indicating if emergency conditions existed and requirements under paragraph 4 of subdivision f were met during each period; and
 - (b) Listing the following information:
 - f1) Time periods the emergency condition existed.
 - f2) Electrical output and demand on the owner's or operator's electric utility system and the affected facility.

[3] Amount of power purchased from interconnected neighboring utility companies during the emergency period.

[4] Percent reduction in emissions achieved.

[5] Atmospheric emission rate (nanograms per joule) of the pollutant discharged.

[6] Actions taken to correct control system malfunction.

(5) If fuel pretreatment credit toward the sulfur dioxide emission standard under subdivision d is claimed, the owner or operator of the affected facility shall submit a signed statement:

(a) Indicating what percentage cleaning credit was taken for the calendar quarter, and whether the credit was determined in accordance with the provisions of subdivision h and method 19; and

(b) Listing the quantity, heat content, and date each pretreated fuel shipment was received during the previous quarter; the name and location of the fuel pretreatment facility; and the total quantity and total heat content of all fuels received at the affected facility during the previous quarter.

(6) For any periods for which opacity, sulfur dioxide or nitrogen oxides emissions data are not available, the owner or operator of the affected facility shall submit a signed statement indicating if any changes were made in operation of the emission control system during the period of data unavailability. Operations of the control system and affected facility during periods of data unavailability are to be compared with operation of the control system and affected facility before and following the period of data unavailability.

(7) The owner or operator of the affected facility shall submit a signed statement indicating whether:

(a) The required continuous monitoring system calibration, span, and drift checks or other periodic audits have or have not been performed as specified.

(b) The data used to show compliance was or was not obtained in accordance with approved methods and

procedures of this part and is representative of plant performance.

- (c) The minimum data requirements have or have not been met; or the minimum data requirements have not been met for errors that were unavoidable.
 - (d) Compliance with the standards has or has not been achieved during the reporting period.
- (8) For the purposes of the reports required under subsection 6 of section ~~33-15-12-01~~, periods of excess emissions are defined as all six-minute periods during which the average opacity exceeds the applicable opacity standards under paragraph 2 of subdivision c. Opacity levels in excess of the applicable opacity standard and the date of such excesses are to be submitted to the department each calendar quarter.
- (9) The owner or operator of an affected facility shall submit the written reports required under this subdivision and section ~~33-15-12-01~~ to the department for every calendar quarter. All quarterly reports must be postmarked by the thirtieth day following the end of each calendar quarter.

3. Standards of performance for ~~industrial-commercial-institutional~~ steam generating units.

a. Applicability and delegation of authority.

- (1) The affected facility to which this subsection applies is each steam generating unit that commences construction, modification, or reconstruction after June 19, 1984, and that has a heat input capacity from fuels combusted in the steam generating unit of greater than twenty-nine megawatts [~~100~~ million Btu/hour].
- (2) Any affected facility meeting the applicability requirements under paragraph 1 of this subdivision and commencing construction, modification, or reconstruction after June 19, 1984, but on or before June 19, 1986, is subject to the following standards:
 - (a) Coal-fired affected facilities having a heat input capacity between twenty-nine and seventy-three megawatts [~~100~~ and 250 million Btu/hour], inclusive, are subject to the particulate matter and nitrogen oxides standards under this subsection.

- (b) Coal-fired affected facilities having a heat input capacity greater than seventy-three megawatts [250 million Btu/hour] and meeting the applicability requirements under subsection † of section 33-15-12-04 (standards of performance for fossil-fuel-fired steam generators) are subject to the particulate matter and nitrogen oxides standards under this subsection and to the sulfur dioxide standards under subsection † of section 33-15-12-04.
- (c) Oil-fired affected facilities having a heat input capacity between twenty-nine and seventy-three megawatts [100 and 250 million Btu/hour], inclusive, are subject to the nitrogen oxides standards under this subsection.
- (d) Oil-fired affected facilities having a heat input capacity greater than seventy-three megawatts [250 million Btu/hour] and meeting the applicability requirements under subsection † of section 33-15-12-04 (standards of performance for fossil-fuel-fired steam generators) are also subject to the nitrogen oxides standards under this subsection and the particulate matter and sulfur dioxide standards under subsection † of section 33-15-12-04.
- (3) Affected facilities which also meet the applicability requirements under subsection 8 of section 33-15-12-04 (standards of performance for petroleum refineries) are subject to the particulate matter and nitrogen oxides standards under this subsection and the sulfur dioxide standards under subsection 8 of section 33-15-12-04.
- (4) Affected facilities which also meet the applicability requirements under subsection †2 of section 33-15-12-04 (standards of performance for incinerators) are subject to the nitrogen oxides and particulate matter standards under this subsection.
- (5) Steam generating units meeting the applicability requirements under subsection 2 of section 33-15-12-04 (standards of performance for electric utility steam generating units) are not subject to this subsection.
- (6) Any change to an existing steam generating unit for the sole purpose of combusting gases containing FRS, as defined under paragraph 35 of subdivision b of this subsection, is not considered a modification under subsection †2 of section 33-15-12-04 and the

steam generating unit is not subject to this subsection.

(7) In delegating implementation and enforcement authority to a state under section 111(c) of the Act, the following authorities shall be retained by the administrator and not transferred to a state:

(a) Paragraph 6 of subdivision e of this subsection.

(b) Paragraph 7 of subdivision e of this subsection.

(c) Subparagraph d of paragraph 1 of subdivision j of this subsection.

b. Definitions. As used in this subsection, all terms not defined herein shall have the meaning given them in North Dakota Century Code chapter 23-25 and subsection 2 of section 33-15-12-01.

(1) "Annual capacity factor" means the ratio between the actual heat input to a steam generating unit from the fuels listed in paragraph 1 of subdivision c, paragraph 1 of subdivision d, or paragraph 1 of subdivision e, as applicable, during a calendar year and the potential heat input to the steam generating unit had it been operated for eight thousand seven hundred sixty hours during a calendar year at the maximum steady state design heat input capacity. In the case of steam generating units that are rented or leased, the actual heat input shall be determined based on the combined heat input from all operations of the affected facility in a calendar year.

(2) "Byproduct/waste" means any liquid or gaseous substance produced at chemical manufacturing plants or petroleum refineries (except natural gas, distillate oil, or residual oil) and combusted in a steam generating unit for heat recovery or for disposal. Gaseous substances with carbon dioxide levels greater than fifty percent or carbon monoxide levels greater than ten percent are not byproduct/waste for the purposes of this subsection.

(3) "Chemical manufacturing plants" means industrial plants which are classified by the department of commerce under standard industrial classification (SIC) code 28.

(4) "Coal" means all solid fuels classified as anthracite, bituminous, subbituminous, or lignite by the American society of testing and materials in A.S.T.M. D388-77, standard specification for

classification of coals by rank, coal refuse, and petroleum coke. Coal-derived synthetic fuels, including but not limited to solvent refined coal, gasified coal, coal-oil mixtures and coal-water mixtures, are also included in this definition for the purposes of this subsection.

- (5) "Coal refuse" means any byproduct of coal mining or coal cleaning operations with an ash content greater than fifty percent, by weight, and a heating value less than thirteen thousand nine hundred kilojoules per kilogram [6,000 Btu/pound] on a dry basis.
- (6) "Combined cycle system" means a system in which a separate source, such as a gas turbine, internal combustion engine, kiln, etc., provides exhaust gas to a heat recovery steam generating unit.
- (7) "Conventional technology" means wet flue gas desulfurization (FGD) technology, dry FGD technology, atmospheric fluidized bed combustion technology, and oil hydrodesulfurization technology.
- (8) "Distillate oil" means fuel oils that contain 0.05 weight percent nitrogen or less and comply with the specifications for fuel oils number one and two, as defined by the American society of testing and materials in A.S.T.M. D396-78, standard specifications for fuel oils.
- (9) "Dry flue gas desulfurization technology" means a sulfur dioxide control system that is located downstream of the steam generating unit and removes sulfur oxides from the combustion gases of the steam generating unit by contacting the combustion gases with an alkaline slurry or solution and forming a dry powder material. This definition includes devices where the dry powder material is subsequently converted to another form. Alkaline slurries or solutions used in dry flue gas desulfurization technology include, but are not limited to, lime and sodium.
- (10) "Duct burner" means a device that combusts fuel and that is placed in the exhaust duct from another source, such as a stationary gas turbine, internal combustion engine, kiln, etc., to allow the firing of additional fuel before the exhaust gas enters a heat recovery steam generating unit.
- (11) "Emerging technology" means any sulfur dioxide control system that is not defined as a conventional technology under this subdivision, and for which the

owner or operator of the facility has applied to the department and administrator and received approval to operate as an emerging technology under subparagraph d of paragraph i of subdivision j.

- (12) "Federally enforceable" means all limitations and conditions which are enforceable by the administrator, including those requirements of 40 CFR parts 60 and 61, requirements within any applicable state implementation plan, and any permit requirements established under 40 CFR 52.21 or under 40 CFR 51.18 and 40 CFR 51.24.
- (13) "Fluidized bed combustion technology" means combustion of fuel in a bed or series of beds (including but not limited to bubbling bed units and circulating bed units) of limestone aggregate (or other sorbent materials) in which these materials are forced upward by the flow of combustion air and the gaseous products of combustion.
- (14) "Fuel pretreatment" means a process that removes a portion of the sulfur in a fuel before combustion of the fuel in a steam generating unit.
- (15) "Full capacity" means operation of the steam generating unit at ninety percent or more of the maximum steady-state design heat input capacity.
- (16) "Heat input" means heat derived from combustion of fuel in a steam generating unit and does not include the heat input from preheated combustion air, recirculated flue gases, or exhaust gases from other sources, such as gas turbines, internal combustion engines, kilns, etc.
- (17) "Heat release rate" means the steam generating unit design heat input capacity (in MW or Btu per hour) divided by the furnace volume (in cubic meters or cubic feet); the furnace volume is that volume bounded by the front furnace wall where the burner is located, the furnace side waterwall, and extending to the level just below or in front of the first row of convection pass tubes.
- (18) "Heat transfer medium" means any material that is used to transfer heat from one point to another point.
- (19) "High heat release rate" means a heat release rate greater than seven hundred thirty thousand joules per second-meter cubed [$70,000 \text{ Btu/hour-foot}^3$].

- (20) "Lignite" means a type of coal classified as lignite A or lignite B by the American society of testing and materials in A.S.T.M. D388-77, standard specification for classification of coals by rank.
- (21) "Low heat release rate" means a heat release rate of seven hundred thirty thousand joules per second-meter cubed {70,000 Btu/hour-foot³} or less.
- (22) "Mass feed stoker steam generating unit" means a steam generating unit where solid fuel is introduced directly into a retort or is fed directly onto a grate where it is combusted.
- (23) "Maximum heat input capacity" means the ability of a steam generating unit to combust a stated maximum amount of fuel on a steady-state basis, as determined by the physical design and characteristics of the steam generating unit.
- (24) "Municipal-type solid waste" means refuse, more than fifty percent of which is waste consisting of a mixture of paper, wood, yard wastes, food wastes, plastics, leather, rubber, and other combustible materials, and noncombustible materials such as glass and rock.
- (25) "Natural gas" means (1) a naturally occurring mixture of hydrocarbon and nonhydrocarbon gases found in geologic formations beneath the earth's surface, of which the principal hydrocarbon constituent is methane; or (2) liquid petroleum gas, as defined by the American society for testing and materials in A.S.T.M. D1835-82 (standard specification for liquid petroleum gases).
- (26) "Oil" means crude oil or petroleum or a liquid fuel derived from crude oil or petroleum, including distillate and residual oil.
- (27) "Petroleum refinery" means industrial plants which are classified by the department of commerce under standard industrial classification (SIC) code 29.
- (28) "Potential sulfur dioxide emission rate" means the theoretical sulfur dioxide emissions (nanograms per joule, pounds per million Btu heat input) that would result from combusting fuel in an uncleaned state and without using emission control systems.
- (29) "Process heater" means a device that is primarily used to heat a material to initiate or promote a

chemical reaction in which the material participates as a reactant or catalyst.

- (30) "Pulverized coal-fired steam generating unit" means a steam generating unit in which pulverized coal is introduced into an airstream that carries the coal to the combustion chamber of the steam generating unit where it is fired in suspension. This includes both conventional pulverized coal-fired and micropulverized coal-fired steam generating units.
- (31) "Residual oil" means crude oil, fuel oils number one and two which have a nitrogen content of greater than 0.05 weight percent, and all fuel oils number four, five, and six, as defined by the American society of testing and materials in A.S.T.M. D396-78, standard specifications for fuel oils.
- (32) "Spreader stoker steam generating unit" means a steam generating unit in which solid fuel is introduced to the combustion zone by a mechanism that throws the fuel onto a grate from above. Combustion takes place both in suspension and on the grate.
- (33) "Steam generating unit" means a device that combusts any fuel or byproduct/waste to produce steam or to heat water or any other heat transfer medium. This term includes any municipal-type solid waste incinerator with a heat recovery steam generating unit or any steam generating unit which combusts fuel and is part of a cogeneration system or a combined cycle system. This term does not include process heaters as they are defined in this subsection.
- (34) "Steam generating unit operating day" means a twenty-four-hour period between midnight and the following midnight during which any fuel is combusted at any time in the steam generating unit. It is not necessary for fuel to be combusted continuously for the entire twenty-four-hour period.
- (35) "Total reduced sulfur (TRS)" means the sum of the sulfur compounds hydrogen sulfide, methyl mercaptan, dimethyl sulfide, and dimethyl disulfide, that are released during the kraft pulping operation and measured by reference method 16.
- (36) "Very low sulfur oil" means a distillate oil or residual oil that when combusted without postcombustion sulfur dioxide control has a sulfur dioxide emission rate equal to or less than one hundred thirty nanograms per joule {0.30 pound SO_2 /million Btu}.

- (37) "Wet fuel gas desulfurization technology" means a sulfur dioxide control system that is located downstream of the steam generating unit and removes sulfur oxides from the combustion gases of the steam generating unit by contacting the combustion gas with an alkaline slurry or solution and forming a liquid material. This definition applies to devices where the aqueous liquid material product of this contact is subsequently converted to other forms. Alkaline reagents used in wet flue gas desulfurization technology include, but are not limited to, lime, limestone, and sodium.
- (38) "Wet scrubber system" means any emission control device that mixes an aqueous stream or slurry with the exhaust gases from a steam generating unit to control emissions of particulate matter or sulfur dioxide.
- (39) "Wood" means wood, wood residue, bark, or any derivative fuel or residue thereof, in any form, including, but not limited to, sawdust, sanderdust, wood chips, scraps, slabs, millings, shavings, and processed pellets made from wood or other forest residues.

c. Standard for sulfur dioxide.

- (1) Except as provided in paragraph 2, 3, or 4 of this subdivision, on and after the date on which the performance test is completed or required to be completed under subsection 7 of section 33-15-12-01, whichever date comes first, no owner or operator of an affected facility that combusts coal or oil shall cause to be discharged into the atmosphere any gases that contain sulfur dioxide in excess of ten percent of the potential sulfur dioxide emission rate (90 percent reduction) and that contain sulfur dioxide in excess of the emission limit determined according to the following formula:

$$E_s = (K_a H_a + K_b H_b) / (H_a + H_b)$$

where:

- E_s is the sulfur dioxide emission limit,
in nanograms per joule or pound per million Btu heat input;
- K_a is 520 ng/j for 1.2 lb/million Btu;
- K_b is 340 ng/j for 0.80 lb/million Btu;

H_a is the heat input from the combustion of coal, in joules [million Btu],

H_b is the heat input from the combustion of oil, in joules [million Btu].

Only the heat input supplied to the affected facility from the combustion of coal and oil is counted under this subdivision. No credit is provided for the heat input to the affected facility from the combustion of natural gas, wood, municipal-type solid waste, or other fuels or heat input to the affected facility from exhaust gases from another source, such as gas turbines, internal combustion engines, kilns, etc.

(2) On and after the date on which the performance test is completed or required to be completed under subsection 7 of section 33-15-12-01, whichever comes first, no owner or operator of an affected facility that combusts coal refuse alone in a fluidized bed combustion steam generating unit shall cause to be discharged into the atmosphere any gases that contain sulfur dioxide in excess of twenty percent of the potential sulfur dioxide emission rate (80 percent reduction) and that contain sulfur dioxide in excess of five hundred twenty nanograms per joule [1.2 lb/million Btu] heat input. If coal or oil is fired with coal refuse, the affected facility is subject to paragraph 1 or 4 of this subdivision, as applicable.

(3) On and after the date on which the performance test is completed or is required to be completed under subsection 7 of section 33-15-12-01, whichever comes first, no owner or operator of an affected facility that combusts coal or oil, either alone or in combination with any other fuel, and that uses an emerging technology for the control of sulfur dioxide emissions, shall cause to be discharged into the atmosphere any gases that contain sulfur dioxide in excess of fifty percent of the potential sulfur dioxide emissions rate (50 percent reduction) and that contain sulfur dioxide in excess of the emission limit determined according to the following formula:

$$E_s = (K_c H_c + K_d H_d) / (H_c + H_d)$$

where:

E_s is the sulfur dioxide emission limit, expressed in nanograms per joule or pound per million Btu heat input,

K_c is 260 ng/j [0.60 lb/million Btu],

K_d is 170 ng/j {0.40 lb/million Btu};

H_c is the heat input from the combustion of coal;
j {million Btu};

H_d is the heat input from the combustion of oil;
j {million Btu}.

Only the heat input supplied to the affected facility from the combustion of coal and oil is counted under this subdivision. No credit is provided for the heat input to the affected facility from the combustion of natural gas, wood, municipal-type solid waste, or other fuels, or from the heat input to the affected facility from exhaust gases from another source, such as gas turbines, internal combustion engines, kilns, etc.

(4) On and after the date on which the performance test is completed or required to be completed under subsection 7 of section 33-15-12-01, whichever comes first, no owner or operator of an affected facility listed in subparagraph a, b, or c of paragraph 4 of this subdivision shall cause to be discharged into the atmosphere any gases that contain sulfur dioxide in excess of five hundred twenty nanograms per joule {1.2 lb/million Btu} heat input if the affected facility combusts coal, or one hundred thirty nanograms per joule {0.30 lb/million Btu} heat input if the affected facility combusts oil. Percent reduction requirements are not applicable to affected facilities under this paragraph:

(a) Affected facilities that have an annual capacity factor for coal and oil of thirty percent or less and are subject to an enforceable permit limiting the operation of the affected facility to an annual capacity factor for coal and oil to thirty percent or less;

(b) Affected facilities combusting coal or oil, alone or in combination with any other fuel, in a duct burner as part of a combined cycle system where thirty percent or less of the heat input to the steam generating unit is from combustion of coal and oil in the duct burner and seventy percent or more of the heat input to the steam generating unit is from the exhaust gases entering the duct burner; or

(c) Affected facilities combusting very low sulfur oil.

- (5) Except as provided in paragraph 6 of this subdivision, compliance with the emission limits and percent reduction requirements under this subdivision are determined on a thirty-day rolling average basis.
- (6) Compliance with the emission limits under this subdivision are determined on a twenty-four-hour average basis for affected facilities which (1) have a federally enforceable permit limiting the annual capacity factor for oil to ten percent or less; (2) combust only oil which emits less than one hundred thirty nanograms per joule (0.30 lb SO₂ per million Btu); and (3) do not combust any other fuel.
- (7) Except as provided in paragraph 9 of this subdivision, the sulfur dioxide emission limits and percent reduction requirements under this subdivision apply at all times, including periods of startup, shutdown, and malfunction.
- (8) Reductions in the potential sulfur dioxide emission rate through fuel pretreatment are not credited toward the percent reduction requirement under paragraph 3 of this subdivision unless:
 - (a) Fuel pretreatment results in a fifty percent or greater reduction in potential sulfur dioxide emissions and
 - (b) Emissions from the pretreated fuel (without combustion or postcombustion sulfur dioxide control) are equal to or less than the emission limits specified in paragraph 3 of this subdivision.
- (9) An affected facility subject to paragraph 1, 2, or 3 of this subdivision may combust very low sulfur oil or natural gas when the sulfur dioxide control system is not being operated because of malfunction or maintenance of the sulfur dioxide control system.

d. Standard for particulate matter.

- (1) On and after the date on which the initial performance test is completed or is required to be completed under subsection 7 of section 33-15-12-01, whichever date comes first, no owner or operator of an affected facility which combusts coal or combusts mixtures of coal with other fuels, shall cause to be discharged into the atmosphere from that affected facility any gases that contain particulate matter in excess of the following emission limits:

- (a) Twenty-two nanograms per joule {0.05 lb/million Btu} heat input;
 - {1} If the affected facility combusts only coal, or
 - {2} If the affected facility combusts coal and other fuels and has an annual capacity factor for the other fuels of ten percent or less.
- (b) Forty-three nanograms per joule {0.10 lb/million Btu} heat input if the affected facility combusts coal and other fuels and has an annual capacity factor for the other fuels greater than ten percent and is subject to a federally enforceable requirement limiting operation of the affected facility to an annual capacity factor greater than ten percent for fuels other than coal.
- (c) Eighty-six nanograms per joule {0.20 lb/million Btu} heat input if the affected facility combusts coal or coal and other fuels, and
 - {1} Has an annual capacity factor for coal or coal and other fuels of thirty percent or less;
 - {2} Has a maximum heat input capacity of seventy-three megawatts {250 million Btu/hour} or less;
 - {3} Has a federally enforceable requirement limiting operation of the affected facility to an annual capacity factor thirty percent or less for coal or coal and other solid fuels; and
 - {4} Construction of the affected facility commenced after June 19, 1984, and before November 25, 1986.
- (2) On or after the date on which the performance test is completed or is required to be completed under subsection 7 of section 33-15-12-01, whichever date comes first, no owner or operator of an affected facility that combusts mixtures of oil with other fuels shall cause to be discharged from that affected facility any gases which contain particulate matter in excess of forty-three nanograms per joule {0.10 lb/million Btu} heat input.

(3) On and after the date on which the initial performance test is completed or is required to be completed under subsection 7 of section 33-15-12-01, whichever date comes first, no owner or operator of an affected facility that combusts wood, or wood with other fuels, except coal, shall cause to be discharged from that affected facility any gases that contain particulate matter in excess of the following emission limits:

(a) Forty-three nanograms per joule {0.10 lb/million Btu} heat input if the affected facility has an annual capacity factor greater than thirty percent for wood:

(b) Eighty-six nanograms per joule {0.20 lb/million Btu} heat input if:

{1} The affected facility has an annual capacity factor of thirty percent or less for wood;

{2} Is subject to an enforceable requirement limiting operation of the affected facility to an annual capacity factor of thirty percent or less for wood; and

{3} Has a maximum heat input capacity of seventy-three megawatts {250 million Btu/hour} or less.

(4) On and after the date on which the initial performance test is completed or is required to be completed under subsection 7 of section 33-15-12-01, whichever date comes first, no owner or operator of an affected facility that combusts municipal-type solid waste or mixtures of municipal-type solid waste with other fuels, shall cause to be discharged into the atmosphere from that affected facility any gases which contain particulate matter in excess of the following emission limits:

(a) Forty-three nanograms per joule {0.10 lb/million Btu} heat input;

{1} If the affected facility combusts any municipal-type solid waste; or

{2} If the affected facility combusts municipal-type solid waste and other fuels and has an annual capacity factor for the other fuels of ten percent or less.

(b) Eighty-six nanograms per joule [~~0.20 lb/million Btu~~] heat input if the affected facility combusts municipal-type solid waste or municipal-type solid waste and other fuels; and

[1] Has an annual capacity factor for municipal-type solid waste and other fuels of thirty percent or less;

[2] Has a maximum heat input capacity of seventy-three megawatts [~~250 million Btu/hour~~] or less;

[3] Has a federally enforceable requirement limiting operation of the affected facility to an annual capacity factor of thirty percent for municipal-type solid waste and other fuels; and

[4] Construction of the affected facility commenced after June 19, 1984, but before November 25, 1986.

(5) For the purposes of this subdivision, the annual capacity factor is determined by dividing the actual heat input to the steam generating unit during the calendar year from the combustion of coal, wood, or municipal-type solid waste, and other fuels, as applicable, by the potential heat input to the steam generating unit if the steam generating unit had been operated for eight thousand seven hundred sixty hours at the maximum design heat input capacity.

(6) On and after the date on which the initial performance test is completed or is required to be completed under subsection 7 of section 33-15-12-01, whichever date comes first, no owner or operator of an affected facility subject to the particulate matter emission limits under paragraph 1, 2, or 3 of this subdivision shall cause to be discharged into the atmosphere any gases which exhibit greater than twenty percent opacity [six-minute average], except for one 6-minute period per hour of not more than twenty-seven percent opacity.

(7) The particulate matter and opacity standards apply at all times, except during periods of startup, shutdown, or malfunction.

e. Standard for nitrogen oxides.

(1) On and after the date on which the initial performance test is completed or is required to be

completed under subsection 7 of section 33-15-12-01, whichever date comes first, no owner or operator of an affected facility that is subject to the provisions of this subdivision and that combusts only coal, oil, or natural gas shall cause to be discharged into the atmosphere from that affected facility any gases that contain nitrogen oxides (expressed as NO_2) in excess of the following emission limits:

Fuel/steam generating unit type	Nitrogen Oxide emission limits ng/j (lb/million Btu expressed as NO_2) heat input
(a) Natural gas and distillate oil, except (d):	
f1] Low heat release rate.....	43(0.10)
f2] High heat release rate.....	86(0.20)
(b) Residual oil:	
f1] Low heat release rate.....	130(0.30)
f2] High heat release rate.....	170(0.40)
(c) Coal:	
f1] Mass feed stoker.....	210(0.50)
f2] Spreader stoker and fluidized bed combustion.....	260(0.60)
f3] Pulverized coal.....	300(0.70)
f4] Lignite, except f5].....	260(0.60)
f5] Lignite mined in North Dakota, South Dakota, or Montana and combusted in a slag tap furnace.....	340(0.80)
f6] Coal-derived synthetic fuels.....	210(0.50)
(d) Duct burner used in a combined cycle system:	
f1] Natural gas and distillate oil.....	86(0.20)
f2] Residual oil.....	170(0.40)

(2) On and after the date on which the initial performance test is completed or is required to be completed under subsection 7 of section 33-15-12-01, whichever date comes first, no owner or operator of an affected facility that simultaneously combusts mixtures of coal, oil, or natural gas shall cause to be discharged into the atmosphere from that affected facility any gases that contain nitrogen oxides in excess of a limit determined by use of the following formula:

$$E_n = \frac{[(EL_{go} H_{go}) + (EL_{ro} H_{ro}) + (EL_c H_c)]}{(H_{go} + H_{ro} + H_c)}$$

where:

- E_n is the nitrogen oxides emission limit (expressed as NO_2), ng/j [lb/million Btu],
- El_{go} is the appropriate emission limit from subparagraph a of paragraph † of this subdivision for combustion of natural gas or distillate oil, ng/j [lb/million Btu],
- H_{go} is the heat input from combustion of natural gas or distillate oil,
- El_{ro} is the appropriate emission limit from subparagraph b of paragraph † of this subdivision for combustion of residual oil,
- H_{ro} is the heat input from combustion of residual oil,
- El_c is the appropriate emission limit from subparagraph c of paragraph † of this subdivision for combustion of coal,
- H_c is the heat input from combustion of coal.

(3) On and after the date on which the initial performance test is completed or is required to be completed under subsection 7 of section ~~33-15-12-01~~, whichever comes first, no owner or operator of an affected facility that simultaneously combusts coal or oil, or a mixture of these fuels with natural gas, and wood, municipal-type solid waste, or any other fuel shall cause to be discharged into the atmosphere any gases that contain nitrogen oxides in excess of the emission limit for the coal or oil, or mixture of these fuels with natural gas combusted in the affected facility, as determined pursuant to paragraph † or 2 of this subdivision, unless the affected facility has an annual capacity factor for coal or oil, or a mixture of these fuels with natural gas of ten percent or less and is subject to a federally enforceable requirement that limits operation of the facility to an annual capacity factor of ten percent or less for coal, oil, or a mixture of these fuels with natural gas.

(4) On and after the date on which the initial performance test is completed or is required to be completed under subsection 7 of section ~~33-15-12-01~~, whichever date comes first, no owner or operator of an affected facility that simultaneously combusts natural gas with wood, municipal-type solid waste, or other solid fuel, except coal, shall cause to be discharged into the atmosphere from that affected

facility any gases that contain nitrogen oxides in excess of one hundred thirty nanograms per joule {0.30 lb/million Btu} heat input unless the affected facility has an annual capacity factor for natural gas of ten percent or less and is subject to a federally enforceable requirement that limits operation of the affected facility to an annual capacity factor of ten percent or less for natural gas.

- (5) On and after the date on which the initial performance test is completed or is required to be completed under subsection 7 of section 33-15-12-01, whichever date comes first, no owner or operator of an affected facility that simultaneously combusts coal, oil, or natural gas with byproduct/wastes shall cause to be discharged into the atmosphere from that affected facility any gases that contain nitrogen oxides in excess of an emission limit determined by the following formula unless the affected facility has an annual capacity factor for coal, oil, and natural gas of ten percent or less and is subject to a federally enforceable requirement which limits operation of the affected facility to an annual capacity factor of ten percent or less:

$$E_n = \frac{(EL_{go} H_{go}) + (EL_{ro} H_{ro}) + (EL_c H_c)}{(H_{go} + H_{ro} + H_c)}$$

where:

- E_n is the nitrogen oxides emission limit (expressed as NO_2), ng/j {lb/million Btu},
- EL_{go} is the appropriate emission limit from subparagraph a of paragraph 4 of this subdivision for combustion of natural gas or distillate oil, ng/j {lb/million Btu},
- H_{go} is the heat input from combustion of natural gas or distillate oil and gaseous byproduct/waste, ng/j {lb/million Btu},
- EL_{ro} is the appropriate emission limit from subparagraph b of paragraph 4 of this subdivision for combustion of residual oil, ng/j {lb/million Btu},
- H_{ro} is the heat input from combustion of residual oil, and/or liquid byproduct/waste,
- EL_c is the appropriate emission limit from subparagraph c of paragraph 4 of this subdivision for combustion of coal, and
- H_c is the heat input from combustion of coal.

(6) Any owner or operator of an affected facility that combusts byproduct/waste with either natural gas or oil may petition the department and administrator within one hundred eighty days of the initial startup of the affected facility to establish a nitrogen oxides emission limit which shall apply specifically to that affected facility when the byproduct/waste is combusted. The petition shall include sufficient and appropriate data, as determined by the administrator, such as nitrogen oxides emissions from the affected facility, waste composition (including nitrogen content), and combustion conditions to allow the administrator to confirm that the affected facility is unable to comply with the emission limits in paragraph 5 of this subdivision and to determine the appropriate emission limit for the affected facility.

(a) Any owner or operator of an affected facility petitioning for a facility-specific nitrogen oxides emission limit under this subdivision shall:

[1] Demonstrate compliance with the emission limits for natural gas and distillate oil in subparagraph a of paragraph 4 of this subdivision or for residual oil in subparagraph b of paragraph 4 of this subdivision, as appropriate, by conducting a thirty-day performance test as provided in paragraph 5 of subdivision g. During the performance test only natural gas, distillate oil, or residual oil shall be combusted in the affected facility; and

[2] Demonstrate that the affected facility is unable to comply with the emission limits for natural gas and distillate oil in subparagraph a of paragraph 4 of this subdivision or for residual oil in subparagraph b of paragraph 4 of this subdivision, as appropriate, when gaseous or liquid byproduct/waste is combusted in the affected facility under the same conditions and using the same technological system of emission reduction applied when demonstrating compliance under item 1 of subparagraph a of paragraph 6 of this subdivision.

(b) The nitrogen oxides emission limits for natural gas or distillate oil in subparagraph a of paragraph 4 or for residual oil in

subparagraph b of paragraph † of this subdivision, as appropriate, shall be applicable to the affected facility until and unless the petition is approved by the administrator. If the petition is approved by the department and administrator, a facility-specific nitrogen oxides emission limit will be established at the nitrogen oxides emission level achievable when the affected facility is combusting oil, or natural gas and byproduct/waste in a manner that the administrator determines to be consistent with minimizing nitrogen oxides emissions.

- (7) Any owner or operator of an affected facility which combusts hazardous waste (as defined by 40 CFR part 261 or 40 CFR part 761) with natural gas or oil may petition the department and administrator within one hundred eighty days of the initial startup of the affected facility for a waiver from compliance with the nitrogen oxides emission limit which applies specifically to that affected facility. The petition must include sufficient and appropriate data, as determined by the department and administrator, on nitrogen oxides emissions from the affected facility, waste destruction efficiencies, waste composition (including nitrogen content), the quantity of specific wastes to be combusted and combustion conditions to allow the department and administrator to determine if the affected facility is able to comply with the nitrogen oxides emission limits required by this subdivision. The owner or operator of the affected facility shall demonstrate that when hazardous waste is combusted in the affected facility, thermal destruction efficiency requirements for hazardous waste specified in an applicable federally enforceable requirement preclude compliance with the nitrogen oxides emission limits of this subdivision. The nitrogen oxides emission limits for natural gas or distillate oil in subparagraph a of paragraph † of this subdivision or for residual oil in subparagraph b of paragraph † of this subdivision, as appropriate, are applicable to the affected facility until and unless the petition is approved by the department and administrator. (See 40 CFR 761.70 for regulations applicable to the incineration of materials containing polychlorinated biphenyls (PCB's).)
- (8) The nitrogen oxide standards under this subdivision apply at all times including periods of startup, shutdown, or malfunction.

f. Compliance and performance test methods and procedures for sulfur dioxide.

(1) The sulfur dioxide emission standards under subdivision c apply at all times.

(2) In conducting the performance tests required under subsection 7 of section 33-15-12-01, the owner or operator shall use the methods and procedures in appendix A or the method and procedures as specified in this subdivision, except as provided in subdivision b of subsection 7 of section 33-15-12-01. Subdivision f of subsection 7 of section 33-15-12-01 does not apply to this subsection. The thirty-day notice required in subdivision d of subsection 7 of section 33-15-12-01 applies only to the initial performance test unless otherwise specified by the department.

(3) The owner or operator of an affected facility shall conduct performance tests to determine compliance with the percent of potential sulfur dioxide emission rate ($\%P_s$) and the sulfur dioxide emission rate (E_s) pursuant to subdivision c following the procedures listed below, except as provided under paragraph 4 of this subdivision.

(a) The initial performance test shall be conducted over the first thirty consecutive operating days of the steam generating unit. Compliance with the sulfur dioxide standards shall be determined using a thirty-day average. The first operating day included in the initial performance test shall be scheduled within thirty days after achieving the maximum production rate at which the affected facility will be operated, but not later than one hundred eighty days after initial startup of the facility.

(b) If only coal or only oil is combusted, the following procedures are used:

(1) The procedures in method 19 are used to determine the hourly sulfur dioxide emission rate (E_{ho}) and the thirty-day average emission rate (E_{ao}). The hourly averages used to compute the thirty-day averages are obtained from the continuous emission monitoring system of paragraph 1 or 2 of subdivision h.

(2) The percent of potential sulfur dioxide emission rate ($\%P_s$) emitted to the

atmosphere is computed using the following formula:

$$\%P_s = 100(1 - \%R_g / 100)(1 - \%R_f / 100)$$

where:

$\%R_g$ is the sulfur dioxide removal efficiency of the control device as determined by method 19, in percent,

$\%R_f$ is the sulfur dioxide removal efficiency of fuel pretreatment as determined by method 19, in percent.

(c) If coal or oil is combusted with other fuels, the same procedures required in subparagraph b of paragraph 3 are used, except as provided in the following:

(1) An adjusted hourly sulfur dioxide emission rate (E_{ho}) is used in equation 19-19 of method 19 to compute an adjusted thirty-day average emission rate (E_{30}). The E_{ho} is computed using the following formula:

$$E_{ho} = (E_{ho} - E_w (1 - X_k)) / X_k$$

where:

E_{ho} is the adjusted hourly sulfur dioxide emission rate, ng/j [lb/million Btu],

E_w is the hourly sulfur dioxide emission rate, ng/j [lb/million Btu],

E_w is the sulfur dioxide concentration in fuels other than coal and oil combusted in the affected facility, as determined by the fuel sampling and analysis procedures in method 19, ng/j [lb/million Btu]. The value E_w for each fuel lot is used for each hourly average during the time that the lot is being combusted.

X_k is the fraction of total heat input from fuel combustion

derived from coal, oil, or coal and oil, as determined by applicable procedures in method 19.

f2] To compute the percent of potential sulfur dioxide emission rate ($\%P_s$), an adjusted $\%R_g$ ($\%R_g$) is computed from the adjusted E_{ao} from item 1 of subparagraph c of paragraph 3 and an adjusted average sulfur dioxide inlet rate (E_{ai}) using the following formula:

$$\%R_g = 100(1.0 - E_{ao} / E_{ai})$$

To compute E_{ai} , an adjusted hourly sulfur dioxide inlet rate (E_{hi}) is used. The E_{hi} is computed using the following formula:

$$E_{hi} = (E_{hi} - E_w (1 - X_k)) / X_k$$

where:

E_{hi} is the adjusted hourly sulfur dioxide inlet rate, ng/j [lb/million Btu],

E_w is the hourly sulfur dioxide inlet rate, ng/j [lb/million Btu].

(d) The owner or operator of an affected facility subject to subparagraph c of paragraph 3 does not have to measure parameters E_w or X_k if the owner or operator elects to assume that $X_k = 1.0$. Owners or operators of affected facilities who assume $X_k = 1.0$ shall:

f1] Determine $\%P_s$ following the procedures in subparagraph b of paragraph 3, and

f2] Sulfur dioxide emissions (E_s) are considered to be in compliance with sulfur dioxide emission limits under subdivision c.

(e) The owner or operator of an affected facility that qualifies under the provisions of paragraph 4 of subdivision c does not have to measure parameters E_w or X_k under subparagraph c of paragraph 3 if the owner or operator of the affected facility elects to measure sulfur dioxide emission rates of the coal or oil

following the fuel sampling and analysis procedures under method 19.

- (4) The owner or operator of an affected facility that combusts only oil emitting less than one hundred thirty nanograms per joule [0.30 lb/million Btu] sulfur dioxide, has an annual capacity factor for oil of ten percent or less, and is subject to a federally enforceable requirement limiting operation of the affected facility to an annual capacity for oil of ten percent or less shall:
- (a) Conduct the initial performance test over twenty-four consecutive steam generating unit operating hours at full load;
 - (b) Determine compliance with the standards after the initial performance test based on the arithmetic average of the hourly emissions data during each steam generating unit operating day if a continuous emission measurement system (CEMS) is used, or based on a daily average if method 6B or fuel sampling analysis procedures under method 19 are used.
- (5) The owner or operator of an affected facility subject to subparagraph a of paragraph 4 of subdivision c shall demonstrate the maximum design capacity of the steam generating unit by operating the facility at maximum capacity for twenty-four hours. This demonstration will be made during the initial performance test and a subsequent demonstration may be requested at any other time. If the twenty-four-hour average firing rate for the affected facility is less than the maximum design capacity provided by the manufacturer of the affected facility, the twenty-four-hour average firing rate shall be used to determine the capacity utilization rate for the affected facility, otherwise the maximum design capacity provided by the manufacturer is used.
- (6) For the initial performance test required under subsection 7 of section 33-15-12-01, compliance with the sulfur dioxide emission limits and percent reduction requirements under subdivision c is based on the average emission rates and the average percent reduction for sulfur dioxide for the first thirty consecutive steam generating unit operating days, except as provided under paragraph 4 of this subdivision. The initial performance test is the only test for which at least thirty days' prior notice is required unless otherwise specified by the department. The initial performance test is to be

scheduled so that the first steam generating unit operating day of the thirty successive steam generating unit operating days is completed within thirty days after achieving the maximum production rate at which the affected facility will be operated, but not later than one hundred eighty days after initial startup of the facility. The boiler load during the thirty-day period does not have to be the maximum design load, but must be representative of future operating conditions and include at least one twenty-four-hour period at full load.

- (7) After the initial performance test required under subsection 7 of section 33-15-12-01, compliance with the sulfur dioxide emission limits and percent reduction requirements under subdivision c is based on the average emission rates and the average percent reduction for sulfur dioxide for thirty successive steam generating unit operating days, except as provided under paragraph 4 of this subdivision. A separate performance test is completed at the end of each steam generating unit operating day after the initial performance test, and a new thirty-day average emission rate and percent reduction for sulfur dioxide are calculated to show compliance with the standard.
- (8) Except as provided under paragraph 9 of this subdivision, the owner or operator of an affected facility shall use all valid sulfur dioxide emissions data in calculating $\%P_s$ and E_{ho} under paragraph 3 of this subdivision whether or not the minimum emissions data requirements under subdivision g are achieved. All valid emissions data, including valid sulfur dioxides emission data collected during periods of startup, shutdown, and malfunction, shall be used in calculating $\%P_s$ and E_{ho} pursuant to paragraph 3 of this subdivision.
- (9) During periods of malfunction or maintenance of the sulfur dioxide control systems when oil is combusted as provided under paragraph 9 of subdivision c, emission data are not used to calculate $\%P_s$ or E_s under paragraph 1, 2, or 3 of subdivision c, however, the emissions data are used to determine compliance with the emission limit under paragraph 9 of subdivision c.
- g. Compliance and performance test methods and procedures for particulate matter and nitrogen oxides.
- (1) The particulate matter emission standards and opacity limits under subdivision d apply at all times except

during periods of startup, shutdown, or malfunction. The nitrogen oxides emission standards under subdivision e apply at all times.

- (2) Compliance with the particulate matter emission standards under subdivision d shall be determined through performance testing as described in paragraph 4 of this subdivision.
- (3) Compliance with the nitrogen oxides emission standards under subdivision e shall be determined through performance testing as described in paragraph 5 or 6 of this subdivision.
- (4) The following procedures and reference methods are used to determine compliance with the standards for particulate matter emissions under subdivision d:
 - (a) Method 3 is used for gas analysis when applying method 5 or method 17.
 - (b) Method 5, method 5B, or method 17 shall be used to measure the concentration of particulate matter as follows:
 - {1} Method 5 shall be used at affected facilities without wet flue gas desulfurization (FGD) systems; and
 - {2} Method 17 may be used at facilities with or without wet scrubber systems provided that the stack gas temperature does not exceed a temperature of one hundred sixty degrees Celsius {320 degrees Fahrenheit}. The procedures of sections 2.1 and 2.3 of method 5B may be used in method 17 only if it is used after a wet flue gas desulfurization (FGD) system. Do not use method 17 after wet flue gas desulfurization (FGD) systems if the effluent is saturated or laden with water droplets.
 - {3} Method 5B is used only after wet flue gas desulfurization (FGD) systems.
 - (c) Method 1 is used to select the sampling site and the number of traverse sampling points. The sampling time for each run is at least one hundred twenty minutes and the minimum sampling volume is 1.7 dry cubic meter at standard conditions {60 dscf} except that smaller sampling times or volumes may be approved by the

department when necessitated by process variables or other factors.

(d) For method 5, the temperature of the sample gas in the probe and filter holder is monitored and is maintained at one hundred sixty degrees Celsius [320 degrees Fahrenheit].

(e) For determination of particulate matter emissions, the oxygen or carbon dioxide sample is obtained simultaneously with each run of method 5, method 5B, or method 17 by traversing the duct at the same sampling location.

(f) For each run using method 5, method 5B, or method 17, the emission rate expressed in nanograms per joule heat input is determined using:

[1] The oxygen or carbon dioxide measurements and particulate matter measurements obtained under this subdivision.

[2] The dry basis F factor, and

[3] The dry basis emission rate calculation procedure contained in reference method 19 (appendix A).

(g) Method 9 is used for determining the opacity of stack emissions.

(5) To determine compliance with the emission limits for nitrogen oxides required under subdivision e, the owner or operator of an affected facility shall conduct the performance test as required under subsection 7 of section 33-15-12-01 using the continuous system for monitoring nitrogen oxides under paragraph 2 of subdivision i.

(a) For the initial compliance test, nitrogen oxides from the steam generating unit are monitored for thirty successive steam generating unit operating days and the thirty-day average emission rate is used to determine compliance with the nitrogen oxides emission standards under subdivision e. The thirty-day average emission rate is calculated as the average of all hourly emissions data recorded by the monitoring system during the thirty-day test period.

- (b) Following the date on which the initial performance test is completed or is required to be completed under subsection 7 of section 33-15-12-01, whichever date comes first, the owner or operator of an affected facility which combusts coal or which combusts residual oil having a nitrogen content greater than 0.30 weight percent shall determine compliance with the nitrogen oxides emission standard under subdivision e on a continuous basis through the use of a thirty-day rolling average emission rate. A new thirty-day rolling average emission rate is calculated each steam generating unit operating day as the average of all of the hourly nitrogen oxides emission data for the preceding thirty steam generating unit operating days.
- (c) Following the date on which the initial performance test is completed or is required to be completed under subsection 7 of section 33-15-12-01, whichever date comes first, the owner or operator of an affected facility which has a heat input capacity greater than seventy-three megawatts {250 million Btu/hour} and which combusts natural gas, distillate oil, or residual oil having a nitrogen content of 0.30 weight percent or less shall determine compliance with the nitrogen oxides standards under subdivision e on a continuous basis through the use of a thirty-day rolling average emission rate. A new thirty-day rolling average emission rate is calculated each steam generating unit operating day as the average of all of the hourly nitrogen oxide emission data for the preceding thirty steam generating unit operating days.
- (d) Following the date on which the initial performance test is completed or required to be completed under subsection 7 of section 33-15-12-01, whichever date comes first, the owner or operator of an affected facility which has a heat input capacity of seventy-three megawatts {250 million Btu/hour} or less and which combusts natural gas, distillate oil, or residual oil having a nitrogen content of 0.30 weight percent or less shall upon request determine compliance with the nitrogen oxides standards under subdivision e through the use of a thirty-day performance test. During periods when performance tests are not requested, nitrogen oxides emissions data collected

pursuant to subparagraph a or b of paragraph 7 of subdivision i are used to calculate a thirty-day rolling average emission rate on a daily basis and used to prepare excess emission reports, but will not be used to determine compliance with the nitrogen oxides emission standards. A new thirty-day rolling average emission rate is calculated each steam generating unit operating day as the average of all of the hourly nitrogen oxides emission data for the preceding thirty steam generating unit operating days.

(e) If the owner or operator of an affected facility which combusts residual oil does not sample and analyze the residual oil for nitrogen content, as specified in paragraph 5 of subdivision j, the requirements of subparagraph c of paragraph 5 of this subdivision apply and the provisions of subparagraph d of paragraph 5 of this subdivision are inapplicable.

(6) To determine compliance with the emission limit for nitrogen oxides required by subparagraph d of paragraph 4 of subdivision e for duct burners used in combined cycle systems, the owner or operator of an affected facility shall conduct the performance test required under subsection 7 of section 33-15-12-01 using the nitrogen oxides and oxygen measurement procedures in 40 CFR part 60 appendix A, method 20. During the performance test, one sampling site shall be located as close as practical to the exhaust of the turbine, as provided by section 6.1.1 of method 20. A second sampling site shall be located at the outlet to the steam generating unit. Measurements of nitrogen oxides and oxygen shall be taken at both sampling sites during the performance test. The nitrogen oxides emission rate from the combined cycle system shall be calculated by subtracting the nitrogen oxides emission rate measured at the sampling site at the outlet from the turbine from the nitrogen oxides emission rate measured at the sampling site at the outlet from the steam generating unit.

h. Emission monitoring for sulfur dioxide.

(1) Except as provided in paragraph 2 of this subdivision, the owner or operator of an affected facility subject to the sulfur dioxide standards under subdivision c shall install, calibrate, maintain, and operate continuous emission monitoring systems (CEMS) for measuring sulfur dioxide

concentrations and either oxygen (O_2) or carbon dioxide (CO_2) concentrations and shall record the output of the systems. The sulfur dioxide and either oxygen or carbon dioxide concentrations shall both be monitored at the inlet and outlet of the sulfur dioxide control device.

- (2) As an alternative to operating continuous emission monitoring systems (CEMS) as required under paragraph 4 of this subdivision, an owner or operator may elect to determine the average sulfur dioxide emissions and percent reduction by:
- (a) Collecting coal or oil samples in an as-fired condition at the inlet to the steam generating unit and analyzing them for sulfur and heat content according to method 19. Method 19 provides procedures for converting these measurements into the format to be used in calculating the average sulfur dioxide input rate, or
 - (b) Measuring sulfur dioxide according to method 6B at the inlet or outlet to the sulfur dioxide control system. An initial stratification test is required to verify the adequacy of the method 6B sampling location. The stratification test shall consist of three paired runs of a suitable sulfur dioxide and carbon dioxide measurement train operated at the candidate location and a second similar train operated according to the procedures in section 3.2 and the applicable procedures in section 7 of performance specification 2. Method 6B, method 6A, or a combination of methods 6 and 3 or methods 6C and 3A are suitable measurement techniques. If method 6B is used for the second train, sampling time and timer operation may be adjusted for the stratification test as long as an adequate sample volume is collected; however, both sampling trains are to be operated similarly. For the location to be adequate for method 6B twenty-four-hour tests, the mean of the absolute difference between the three paired runs must be less than ten percent.
 - (c) A daily sulfur dioxide emission rate, E_p , shall be determined using the procedure described in method 6A, section 7.6.2 (equation 6A-8) and stated in ng/j [lb/million Btu] heat input.
 - (d) The mean thirty-day emission rate is calculated using the daily measured values in ng/j

[lb/million Btu] for thirty successive steam generating unit operating days using equation 19-20 of method 19.

- (3) The owner or operator of an affected facility shall obtain emission data for at least seventy-five percent of the operating hours in at least twenty-two out of thirty successive boiler operating days. If this minimum data requirement is not met with a single monitoring system, the owner or operator of the affected facility shall supplement the emission data with data collected with other monitoring systems as approved by the department or the reference methods and procedures as described in paragraph 2 of this subdivision.
- (4) The one-hour average sulfur dioxide emission rates measured by the continuous emission monitoring system (CEMS) required by paragraph 4 of this subdivision and required under subdivision h of subsection 11 of section 33-15-12-01 is expressed in nanograms per joule or pounds per million British thermal unit heat input and is used to calculate the average emission rates under subdivision c. Each one-hour average sulfur dioxide emission rate must be based on more than thirty minutes of steam generating unit operation and include at least two data points with each representing a fifteen-minute period. Hourly sulfur dioxide emission rates are not calculated if the affected facility is operated less than thirty minutes in a one-hour period and are not counted toward determination of a steam generating unit operating day.
- (5) The procedures under subsection 11 of section 33-15-12-01 shall be followed for installation, evaluation, and operation of the continuous emission monitoring system (CEMS).
 - (a) All continuous emission monitoring systems (CEMS) shall be operated in accordance with the applicable procedures under performance specifications 1, 2, and 3 (appendix B).
 - (b) Quarterly accuracy determinations and daily calibration drift tests shall be performed in accordance with procedure 1 (appendix F).
 - (c) For affected facilities combusting coal or oil, alone or in combination with other fuels, the span value of the sulfur dioxide continuous emission monitoring system (CEMS) at the inlet to the sulfur dioxide control device is one

hundred twenty-five percent of the maximum estimated hourly potential sulfur dioxide emissions of the fuel combusted; and the span value of the continuous emission monitoring system (CEMS) at the outlet to the sulfur dioxide control device is fifty percent of the maximum estimated hourly potential sulfur dioxide emissions of the fuel combusted.

i. Emission monitoring for particulate matter and nitrogen oxides.

- (1) The owner or operator of an affected facility subject to the opacity standard under subdivision d shall install, calibrate, maintain, and operate a continuous monitoring system for measuring the opacity of emissions discharged to the atmosphere and record the output of the system.
- (2) Except as provided in paragraphs 7 and 8 of this subdivision, the owner or operator of an affected facility subject to the nitrogen oxides standard of paragraph 4 of subdivision e shall install, calibrate, maintain, and operate a continuous monitoring system for measuring nitrogen oxides emissions discharged to the atmosphere and record the output of the system.
- (3) The continuous monitoring systems required under paragraph 2 of this subdivision shall be operated and data recorded during all periods of operation of the affected facility except for continuous monitoring system breakdowns and repairs; data is recorded during calibration checks; and zero and span adjustments.
- (4) The one-hour average nitrogen oxides emission rates measured by the continuous nitrogen oxides monitor required by paragraph 2 of this subdivision and required under subdivision h of subsection 11 of section ~~33-15-12-01~~ shall be expressed in nanograms per joule or pounds per million British thermal unit heat input and shall be used to calculate the average emission rates under subdivision e. The one-hour averages shall be calculated using the data points required under subdivision h of subsection 11 of section ~~33-15-12-01~~. At least two data points must be used to calculate each one-hour average.
- (5) The procedures under subsection 11 of section ~~33-15-12-01~~ shall be followed for installation, evaluation, and operation of the continuous monitoring systems.

- (a) For affected facilities combusting coal, wood, or municipal-type solid waste, the span value for a continuous monitoring system for measuring opacity shall be between sixty and eighty percent.
- (b) For affected facilities combusting coal, oil, or natural gas, the span value for nitrogen oxides is determined as follows:

Fuel	Span values for nitrogen oxides (PPM)
Natural gas.....	500
Oil.....	500
Coal.....	1000
Mixtures.....	$500(x+y)+1000z$

where:

- x is the fraction of total heat input derived from natural gas,
- y is the fraction of total heat input derived from oil, and
- z is the fraction of total heat input derived from coal.

- (c) All span values computed under subparagraph b of paragraph 5 of this subdivision for combusting mixtures of regulated fuels are rounded to the nearest five hundred parts per million.
- (6) When nitrogen oxides emission data are not obtained because of continuous monitoring system breakdowns, repairs, calibration checks, and zero and span adjustments, emission data will be obtained by using standby monitoring systems. Method 7, method 7A, or other approved reference methods to provide emission data for a minimum of seventy-five percent of the operating hours in each steam generating unit operating day, in at least twenty-two out of thirty successive steam generating unit operating days.
- (7) The owner or operator of an affected facility which has a heat input capacity of seventy-three megawatts [250 million Btu/hour] or less, and which has an annual capacity factor for residual oil having a nitrogen content of 0.30 weight percent or less,

natural gas, distillate oil, or any mixture of these fuels, greater than ten percent shall:

- (a) Comply with the provisions of paragraphs 2, 3, 4, subparagraph b of paragraph 5, subparagraph c of paragraph 5, and paragraph 6 of this subdivision; or
- (b) Monitor steam generating unit operating conditions and predict nitrogen oxides emission rates as specified in a plan submitted pursuant to paragraph 3 of subdivision j.

(8) The owner or operator of an affected facility which is subject to the nitrogen oxides standards of subparagraph d of paragraph 1 of subdivision e is not required to install or operate a continuous monitoring system to measure nitrogen oxides emissions.

j. Reporting and recordkeeping requirements.

- (1) The owner or operator of each affected facility shall submit notification of the date of initial startup, as provided by subsection 6 of section 33-15-12-01. This notification shall include:
 - (a) The design heat input capacity of the affected facility and identification of the fuels to be combusted in the affected facility;
 - (b) If applicable, a copy of any federally enforceable requirement that limits the annual capacity factor for any fuel or mixture of fuels under subparagraph a of paragraph 4 of subdivision c, subparagraph b of paragraph 1 of subdivision d, item 3 of subparagraph c of paragraph 1 of subdivision d, item 2 of subparagraph b of paragraph 3 of subdivision d, item 3 of subparagraph b of paragraph 4 of subdivision d, paragraphs 3, 4, and 5 of subdivision e or paragraph 4 of subdivision f.
 - (c) The annual capacity factor at which the owner or operator anticipates operating the facility based on all fuels fired and based on each individual fuel fired; and
 - (d) Notification that an emerging technology will be used for controlling emissions of sulfur dioxide. The administrator will examine the description of the emerging technology and will determine whether the technology qualifies as an

emerging technology. In making this determination, the department and administrator may require the owner or operator of the affected facility to submit additional information concerning the control device. The affected facility is subject to the provisions of paragraph 4 of subdivision c unless and until this determination is made by the administrator.

- (2) The owner or operator of each affected facility subject to the sulfur dioxide, particulate matter, and nitrogen oxides emission limits under subdivisions c, d, and e shall submit to the department the performance test data from the initial performance test and the performance evaluation of the continuous emission monitoring system (CEMS) using the applicable performance specifications in appendix B.
- (3) The owner or operator of each affected facility subject to the nitrogen oxides standard of subdivision e who seeks to demonstrate compliance with those standards through the monitoring of steam generating unit operating conditions under the provisions of subparagraph b of paragraph 7 of subdivision i shall submit to the department for approval a plan that identifies the operating conditions to be monitored under subparagraph b of paragraph 7 of subdivision i and the records to be maintained under paragraph 10 of this subdivision. This plan shall be submitted to the department for approval within three hundred sixty days of the initial startup of the affected facility. The plan shall:
 - (a) Identify the specific operating conditions to be monitored and the relationship between these operating conditions and nitrogen oxides emission rates (i.e., nanograms per joule or pounds per million Btu heat input). Steam generating unit operating conditions include, but are not limited to, degree of staged combustion (i.e., the ratio of primary air to secondary and/or tertiary air) and the level of excess air (i.e., flue gas oxygen level);
 - (b) Include the data and information which the owner or operator used to identify the relationship between nitrogen oxides emission rates and these operating conditions;
 - (c) Identify how these operating conditions, including steam generating unit load, will be

monitored under paragraph 7 of subdivision i on an hourly basis by the owner or operator during the period of operation of the affected facility; the quality assurance procedures or practices that will be employed to ensure that the data generated by monitoring these operating conditions will be representative and accurate; and the type and format of the records of these operating conditions, including steam generating unit load, that will be maintained by the owner or operator under paragraph 10 of this subdivision. If the plan is approved, the owner or operator shall maintain records of predicted nitrogen oxide emission rates and the monitored operating conditions, including steam generating unit load, identified in the plan.

- (4) The owner or operator of an affected facility shall record and maintain records of the amounts of each fuel combusted during each day and calculate the annual capacity factor for coal, distillate oil, residual oil, natural gas, wood, and municipal-type solid waste for each calendar quarter. The annual capacity factor is determined on a twelve-month rolling average basis with a new annual capacity factor calculated at the end of each calendar month.
- (5) For affected facilities that (1) combust residual oil having a nitrogen content of 0.30 weight percent or less; (2) have heat input capacities of seventy-three megawatts [250 million Btu/hour] or less; and (3) monitor nitrogen oxides emission or steam generating unit operating conditions under paragraph 7 of subdivision i, the owner or operator shall maintain records of the nitrogen content of the oil combusted in the affected facility and calculate the average fuel nitrogen content on a per calendar quarter basis. The nitrogen content shall be determined using A.S.T.M. method D3431-80, test method for trace nitrogen in liquid petroleum hydrocarbons or fuel specification data obtained from fuel suppliers. If residual oil blends are being combusted, fuel nitrogen specifications may be prorated based on the ratio of residual oils of different nitrogen content in the fuel blend.
- (6) For facilities subject to the opacity standard under subdivision d, the owner or operator shall maintain records of opacity.
- (7) For facilities subject to nitrogen oxides standards under subdivision e, the owner or operator shall

maintain records of the following information for each steam generating unit operating day:

- (a) Calendar date.
- (b) The average hourly nitrogen oxides emission rates (expressed as NO_2) (nanograms per joule or pounds per million Btu heat input) measured or predicted.
- (c) The thirty-day average nitrogen oxides emission rates (nanograms per joule or pounds per million Btu heat input) calculated at the end of each steam generating unit operating day from the measured or predicted hourly nitrogen oxide emission rates for the preceding thirty steam generating unit operating days.
- (d) Identification of the steam generating unit operating days when the calculated thirty-day average nitrogen oxides emission rates are in excess of the nitrogen oxides emissions standards under subdivision e, with the reasons for such excess emissions as well as a description of corrective actions taken.
- (e) Identification of the steam generating unit operating days for which pollutant data have not been obtained, including reasons for not obtaining sufficient data and a description of corrective actions taken.
- (f) Identification of the times when emission data have been excluded from the calculation of average emission rates and the reasons for excluding data.
- (g) Identification of "F" factor used for calculations, method of determination, and type of fuel combusted.
- (h) Identification of the times when the pollutant concentration exceeded full span of the continuous monitoring system.
- (i) Description of any modifications to the continuous monitoring system that could affect the ability of the continuous monitoring system to comply with performance specification 2 or 3.
- (j) Results of daily continuous emission monitoring systems (CEMS) drift tests and quarterly

accuracy assessments as required under appendix F procedure 1.

- (8) The owner or operator of any affected facility in any category listed below in subparagraph a or b of paragraph 8 of this subdivision is required to submit excess emission reports for any calendar quarter during which there are excess emissions from the affected facility. If there are no excess emissions during the calendar quarter, the owner or operator shall submit a report semiannually stating that no excess emissions occurred during the semiannual reporting period.
- (a) Any affected facility subject to the opacity standards under paragraph 5 of subdivision d or to the operating parameter monitoring requirements under subparagraph a of paragraph 1 of subdivision h of subsection 11 of section 33-15-12-01.
- (b) Any affected facility that is subject to the nitrogen oxides standard of subdivision e and that:
- 11 Combusts natural gas, distillate oil, or residual oil with a nitrogen content of 0.30 weight percent or less, or
- 12 Has a heat input capacity of seventy-three megawatts {250 million Btu/hour} or less, and is required to monitor nitrogen oxides emissions on a continuous basis under subparagraph a of paragraph 7 of subdivision i or steam generating unit operating conditions under subparagraph b of paragraph 7 of subdivision i.
- (c) For the purpose of subdivision d, excess emissions are defined as all six-minute periods during which the average opacity exceeds the opacity standards under paragraph 6 of subdivision d.
- (d) For purposes of subparagraph a of paragraph 7 of subdivision i, excess emissions are defined as any calculated thirty-day rolling average nitrogen oxides emission rate, as determined under paragraph 5 of subdivision g, which exceeds the applicable emission limits in subdivision e.

- (9) The owner or operator of any affected facility subject to the continuous monitoring requirements for nitrogen oxides under paragraph 2 of subdivision 1 shall submit a quarterly report containing the information recorded under paragraph 7 of this subdivision. All quarterly reports shall be postmarked by the thirtieth day following the end of each calendar quarter.
- (10) The owner or operator of any affected facility subject to the sulfur dioxide standards under subdivision c shall submit written reports to the department for every calendar quarter. All quarterly reports shall be postmarked by the thirtieth day following the end of the calendar quarter.
- (11) For each affected facility subject to the compliance and performance testing requirements of subdivision f and the reporting requirements in paragraph 10 of this subdivision, the following information shall be reported to the department:
 - (a) Calendar dates covered in the reporting period.
 - (b) Each thirty-day average sulfur dioxide emission rate (nanograms per joule or pounds per million Btu heat input) measured during the reporting period, ending with the last thirty-day period in the quarter; reasons for noncompliance with the emission standards; and a description of corrective actions taken.
 - (c) Each thirty-day average percent reduction in the sulfur dioxide emissions calculated during the reporting period, ending with the last thirty-day period in the quarter; reasons for noncompliance with the emission standards; and a description of corrective actions taken.
 - (d) Identification of the steam generating unit operating days that coal or oil was combusted and for which sulfur dioxide or diluent (oxygen or carbon dioxide) data have not been obtained by an approved method for at least seventy-five percent of the operating hours in the steam generating unit operating day; justification for not obtaining sufficient data; and description of corrective action taken.
 - (e) Identification of the times when emissions data have been excluded from the calculation of average emission rates; justification for excluding data; and description of corrective

action taken if data have been excluded for periods other than those during which coal or oil were not combusted in the steam generating unit.

- (f) Identification of ppm factor used for calculations; method of determination; and type of fuel combusted.
- (g) Identification of times when hourly averages have been obtained based on manual sampling methods.
- (h) Identification of the times when the pollutant concentration exceeded full span of the continuous emission monitoring system (GEMS).
- (i) Description of any modifications to the continuous emission monitoring system (GEMS) that could affect the ability of the continuous emission monitoring system (GEMS) to comply with performance specification 2 or 3.
- (j) Results of daily continuous emission monitoring system (GEMS) drift tests and quarterly accuracy assessments as required under appendix F procedure 1.
- (k) The annual capacity factor of each fired as provided under paragraph 4 of this subdivision.
- (l2) For each affected facility subject to the compliance and performance testing requirements of paragraph 4 of subdivision f and the reporting requirements of paragraph 10 of this subdivision, the following information shall be reported to the department:
 - (a) Calendar dates when the facility was in operation during the reporting period.
 - (b) The twenty-four-hour average sulfur dioxide emission rate measured for each steam generating unit operating day during the reporting period that coal or oil was combusted, ending in the last twenty-four-hour period in the quarter; reasons for noncompliance with the emission standards; and a description of corrective actions taken.
 - (c) Identification of the steam generating unit operating days that coal or oil was combusted for which sulfur dioxide or diluent (oxygen or carbon dioxide) data have not been obtained by

an approved method for at least seventy-five percent of the operating hours; justification for not obtaining sufficient data; and description of corrective action taken.

- (d) Identification of the times when emissions data have been excluded from the calculation of average emission rates; justification for excluding data; and description of corrective action taken if data have been excluded for periods other than those during which coal or oil were not combusted in the steam generating unit.
 - (e) Identification of "F" factor used for calculations; method determination; and type of fuel combusted.
 - (f) Identification of times when hourly averages have been obtained based on manual sampling methods.
 - (g) Identification of the times when the pollutant concentration exceeded full span of the continuous emission monitoring system (CEMS).
 - (h) Description of any modifications to the continuous emission monitoring system (CEMS) to comply with performance specification 2 or 3.
 - (i) Results of daily continuous emission monitoring system (CEMS) drift tests and quarterly accuracy assessments as required under appendix F, procedure 1.
- (13) For each affected facility subject to the sulfur dioxide standards under subdivision c for which the minimum amount of data required under paragraph 6 of subdivision h were not obtained during a calendar quarter, the following information is reported to the department in addition to that required under paragraph 11 of this subdivision:
- (a) The number of hourly averages available for outlet emission rates and inlet emission rates.
 - (b) The standard deviation of hourly averages for outlet emission rates and inlet emission rates, as determined in method 19, section 7.
 - (c) The lower confidence limit for the mean outlet emission rate and the upper confidence limit for

the mean inlet emission rate, as calculated in method 19, section 7.

(d) The ratio of the lower confidence limit for the mean outlet emission rate and the allowable emission rate, as determined in method 19, section 7.

(14) If a percent removal efficiency by fuel pretreatment (i.e., $\%R_f$) is used to determine the overall percent reduction (i.e., $\%R_o$) under subdivision f, the owner or operator of the affected facility shall submit a signed statement with the quarterly report:

(a) Indicating what removal efficiency by fuel pretreatment (i.e., $\%R_f$) was credited for the calendar quarter.

(b) Listing the quantity, heat content, and date each pretreated fuel shipment was received during the previous calendar quarter, the name and location of the fuel pretreatment facility, and the total quantity and total heat content of all fuels received at the affected facility during the previous calendar quarter.

(c) Documenting the transport of the fuel from the fuel pretreatment facility to the steam generating unit.

(d) Including a signed statement from the owner or operator of the fuel pretreatment facility certifying that the percent removal efficiency achieved by fuel pretreatment was determined in accordance with the provisions of method 19 (appendix A) and listing the heat content and sulfur content of each fuel before and after fuel pretreatment.

(15) All records required under this subdivision shall be maintained by the owner or operator of the affected facility for a period of two years following the date of such record.

4. Standards of performance for portland cement plants.

a. Applicability, and designation of affected facility. The provisions of this subsection are applicable to the following affected facilities in portland cement plants: kiln; clinker cooler; raw mill system; finish mill system; raw mill dryer; raw material storage; clinker storage; conveyor transfer points; bagging and bulk loading and unloading systems. Any facility that commences

construction or modification after August 17, 1971, is subject to the requirements of this subsection.

b. Definitions. As used in this subsection, all terms not defined herein shall have the meaning given them in North Dakota Century Code chapter 23-25 and in subsection 2 of section 33-15-12-01.

(1) "Portland cement plant" means any facility manufacturing portland cement by either the wet or dry process.

(2) "Bypass" means any system that prevents all or a portion of the kiln or clinker cooler exhaust gases from entering the main control device and ducts the gases through a separate control device. This does not include emergency systems designed to duct exhaust gases directly to the atmosphere in the event of a malfunction of any control device controlling kiln or clinker cooler emissions.

(3) "Bypass stack" means the stack that vents exhaust gases to the atmosphere from the bypass control device.

(4) "Monovent" means an exhaust configuration of a building or emission control device (e.g., positive-pressure fabric filter) that extends the length of the structure and has a width very small in relation to its length (i.e., length to width ratio is typically greater than 5:1). The exhaust may be an open vent with or without a roof, louvered vents, or a combination of such features.

c. Standard for particulate matter.

(1) On and after the date on which the performance test required to be conducted by subsection 7 of section 33-15-12-01 is completed, no owner or operator subject to the provisions of this subsection may cause to be discharged into the atmosphere from any kiln any gases which:

(a) Contain particulate matter in excess of fifteen-hundredths kilogram per metric ton (0.30 lb/ton) of feed (dry basis) to the kiln.

(b) Exhibit greater than ten percent opacity.

(2) On and after the date on which the performance test required to be conducted by subsection 7 of section 33-15-12-01 is completed, no owner or operator subject to the provisions of this subsection may

cause to be discharged into the atmosphere from any clinker cooler any gases which:

(a) Contain particulate matter in excess of five-hundredths kilogram per metric ton [0.10 lb/ton] of feed (dry basis) to the kiln.

(b) Exhibit ten percent opacity, or greater.

(3) On and after the date on which the performance test required to be conducted by subsection 7 of section 33-15-12-01 is completed, no owner or operator subject to the provisions of this subsection may cause to be discharged into the atmosphere from any affected facility, other than the kiln and clinker cooler, any gases which exhibit ten percent opacity or greater.

d. Monitoring of operations.

(1) The owner or operator of any portland cement plant subject to the provisions of this subsection shall record the daily production rates and kiln feed rates.

(2) Except as provided in paragraph 3 of this subdivision, each owner or operator of a kiln or clinker cooler that is subject to the provisions of this subsection shall install, calibrate, maintain, and operate in accordance with subsection 11 of section 33-15-12-01 a continuous opacity monitoring system to measure the opacity of emissions discharged into the atmosphere from any kiln or clinker cooler. Except as provided in paragraph 3 of this subdivision, a continuous opacity monitoring system must be installed on each stack of any multiple stack device controlling emissions from any kiln or clinker cooler. If there is a separate bypass installed, each owner or operator of a kiln or clinker shall also install, calibrate, maintain, and operate a continuous opacity monitoring system on each bypass stack in addition to the main control device stack. Each owner or operator of an affected kiln or clinker cooler for which the performance test required under subsection 7 of section 33-15-12-01 has been completed on or prior to December 14, 1988, shall install the continuous opacity monitoring system within one hundred eighty days after December 14, 1988.

(3) Each owner or operator of a kiln or clinker cooler subject to the provisions of this subsection using a positive-pressure fabric filter with multiple stacks,

or a negative-pressure fabric filter with multiple stacks, or an electrostatic precipitator with multiple stacks may, in lieu of installing the continuous opacity monitoring system required by paragraph 2 of this subdivision, monitor visible emissions at least once per day by using a certified visible emissions observer. If the control device exhausts gases through a monovent, visible emission observations in lieu of a continuous opacity monitoring system are required. These observations must be taken in accordance with EPA method 9. Visible emissions must be observed during conditions representative of normal operation. Observations must be recorded for at least three 6-minute periods each day. In event that visible emissions are observed for a number of emission sites from the control device with multiple stacks, method 9 observations must be recorded for the emission site with the highest opacity. All records of visible emissions must be maintained for a period of two years.

- (4) For the purpose of reports under subdivision f, periods of excess emissions that must be reported are defined as all six-minute periods during which the average opacity exceeds that allowed by subparagraph b of paragraph 1 of subdivision c or subparagraph b of paragraph 2 of subdivision c.
- (5) The provisions of paragraphs 1, 2, and 3 of this subdivision apply to kilns and clinker coolers for which construction, modification, or reconstruction commenced after August 17, 1971.

e. Test methods and procedures.

- (1) In conducting the performance tests required in subsection 7 of section 33-15-12-01, the owner or operator shall use as reference methods and procedures the test methods in appendix A of this chapter or other methods and procedures as specified in this subsection, except as provided in subdivision b of subsection 7 of section 33-15-12-01.
- (2) The owner or operator shall determine compliance with the particulate matter standard in subdivision c as follows:
 - (a) The emission rate (E) of particulate matter must be computed for each run using the following equation:

$$E = (C_s \cdot Q_{sd}) / (P \cdot K)$$

where:

E = emission rate of particulate matter, kg/metric ton (lb/ton) of kiln feed.

C_s = concentration of particulate matter, g/dscm (g/dscf).

Q_{sd} = volumetric flow rate of effluent gas, dscm/hr (dscf/hr).

P = total kiln feed (dry basis) rate, metric ton/hr (ton/hr).

K = conversion factor, 1000 g/kg [453.6 g/lb].

- (b) Method 5 must be used to determine the particulate matter concentration (C_s) and the volumetric flow rate (Q_{sd}) of the effluent gas. The sampling time and sample volume for each run must be at least sixty minutes and 0.85 dry standard cubic meters [30.0 dscf] for the kiln and at least sixty minutes and 1.15 dry standard cubic meters [40.6 dscf] for the clinker cooler.
- (c) Suitable methods must be used to determine the kiln feed rate (P), except fuels, for each run. Material balance over the production system shall be used to confirm the feed rate.
- (d) Method 9 and the procedures in subsection 9 of section 33-15-12-01 must be used to determine opacity.

f. Recordkeeping and reporting requirements.

- (1) Each owner or operator required to install a continuous opacity monitoring system under paragraph 2 of subdivision d shall submit reports of excess emissions as defined in paragraph 4 of subdivision d. The content of these reports must comply with the requirements in subdivision c of subsection 6 of section 33-15-12-01. Notwithstanding the provisions of subdivision c of subsection 6 of section 33-15-12-01, such reports must be submitted semiannually.
- (2) Each owner or operator monitoring visible emissions under paragraph 3 of subdivision d shall submit semiannual reports of observed excess emissions as defined in paragraph 4 of subdivision d.

(3) Each owner or operator of facilities subject to the provisions of paragraph 3 of subdivision d shall submit semiannual reports of the malfunction information required to be recorded by subdivision b of subsection 6 of section 33-15-12-01. These reports must include the frequency, duration, and cause of any incident resulting in deenergization of any device controlling kiln emissions or in the venting of emissions directly to the atmosphere.

5. Standards of performance for nitric acid plants.

a. Applicability and designation of affected facility. The provisions of this subsection are applicable to each nitric acid production unit, which is the affected facility. Any facility that commences construction or modification after August 17, 1971, is subject to the requirements of this subsection.

b. Definitions. As used in this subsection, all terms not defined herein shall have the meaning given them in North Dakota Century Code chapter 23-25 and in subsection 2 of section 33-15-12-01.

(1) "Nitric acid production unit" means any facility producing weak nitric acid by either the pressure or atmospheric pressure process.

(2) "Weak nitric acid" means acid which is thirty to seventy percent in strength.

c. Standard for nitrogen oxides. On and after the date on which the performance test required to be conducted by subsection 7 of section 33-15-12-01 is completed, no owner or operator subject to the provisions of this subsection shall cause to be discharged into the atmosphere from any affected facility any gases which:

(1) Contain nitrogen oxides, expressed as nitrogen dioxide, in excess of one and five-tenths kilograms per metric ton {3.0 lb/ton} of acid produced, the production being expressed as one hundred percent nitric acid.

(2) Exhibit ten percent opacity, or greater.

d. Emission monitoring.

(1) The source owner or operator shall install, calibrate, maintain, and operate a continuous monitoring system for measuring nitrogen oxides (NO_x). The pollutant gas mixtures under performance specification 2 and for calibration checks under

subdivision d of subsection 11 of section 33-15-12-01 must be nitrogen dioxide (NO_2). The span value must be five hundred parts per million of nitrogen dioxide. Method 7 must be used for the performance evaluations under subdivision c of subsection 11 of section 33-15-12-01. Acceptable alternative methods to method 7 are given in paragraph 3 of subdivision e.

(2) The owner or operator shall establish a conversion factor for the purpose of converting monitoring data into units of the applicable standard (kilograms per metric ton; pounds per ton). The conversion factor must be established by measuring emissions with the continuous monitoring system concurrent with measuring emissions with the applicable reference method tests. Using only that portion of the continuous monitoring emission data that represents emission measurements concurrent with the reference method test periods, the conversion factor must be determined by dividing the reference method test data averages by the monitoring data averages to obtain a ratio expressed in units of the applicable standard to units of the monitoring data, i.e., kilograms per metric ton per parts per million (pounds per ton per parts per million). The conversion factor must be reestablished during any performance test under subsection 7 of section 33-15-12-01 or any continuous monitoring system performance evaluation under subdivision c of subsection 11 of section 33-15-12-01.

(3) The owner or operator shall record the daily production rate and hour of operation.

(4) {Reserved}

(5) For the purpose of reports required under subdivision c of subsection 6 of section 33-15-12-01, periods of excess emissions that must be reported are defined as any three-hour period during which the average nitrogen oxides emissions (arithmetic average of three contiguous one-hour periods) as measured by a continuous monitoring system exceed the standard under subdivision c.

e. Test methods and procedures.

(1) In conducting the performance tests required in subsection 7 of section 33-15-12-01, the owner or operator shall use as reference methods and procedures the test methods in appendix A of this chapter or other methods and procedures as specified

in this subdivision, except as provided in subdivision b of subsection 7 of section 33-15-12-01. Acceptable alternative methods and procedures are given in paragraph 3 of this subdivision.

(2) The owner or operator shall determine compliance with the nitrogen oxides standard in subdivision c as follows:

(a) The emission rate (E) of nitrogen oxides must be computed for each run using the following equation:

$$E = (C_s Q_{sd}) / (P K)$$

where:

E = emission rate of NO_x as NO_2 ,
kg/metric ton (lb/ton) of 100
percent nitric acid.

C_s = concentration of NO_x as NO_2 ,
g/dscm (lb/dscf).

Q_{sd} = volumetric flow rate of effluent
gas, dscm/hr (dscf/hr).

P = acid production rate, metric ton/hr
(ton/hr) or 100 percent nitric acid.

K = conversion factor, 1000 g/Kg
(1.0 lb/lb).

(b) Method 7 must be used to determine the nitrogen oxides concentration of each grab sample. Method 1 must be used to select the sampling site, and the sampling point must be the centroid of the stack or duct or at a point no closer to the walls than one meter (3.28 feet). Four grab samples must be taken at approximately fifteen-minute intervals. The arithmetic mean of the four sample concentrations must constitute the run value (C_s).

(c) Method 2 must be used to determine the volumetric flow rate (Q_{sd}) of the effluent gas. The measurement site must be the same as for the nitrogen oxides sample. A velocity traverse must be made once per run within the hour that the nitrogen oxides samples are taken.

(d) The methods of paragraph 3 of subdivision d must be used to determine the production rate (P) of

one hundred percent nitric acid for each run. Materials balance over the production system must be used to confirm the production rate.

(3) The owner or operator may use the following as alternatives to the reference methods and procedures specified in this subdivision: for method 7, 7A, 7B, 7C, or 7D may be used; if method 7C or 7D is used, the sampling time must be at least one hour.

(4) The owner or operator shall use the procedure in paragraph 2 of subdivision d to determine the conversion factor for converting the monitoring data to the units of the standard.

6. Standards of performance for sulfuric acid plants.

a. Applicability and designation of affected facility. The provisions of this subsection are applicable to each sulfuric acid production unit, which is the affected facility. Any facility that commences construction or modification after August 17, 1971, is subject to the requirements of this subsection.

b. Definitions. As used in this subsection, all terms not defined herein shall have the meaning given them in North Dakota Century Code chapter 23-25 and in subsection 2 of section 33-15-12-01.

(1) "Acid mist" means sulfuric acid mist, as measured by method 8 of appendix A to this chapter or an equivalent or alternative method.

(2) "Sulfuric acid production unit" means any facility producing sulfuric acid by the contact process by burning elemental sulfur, alkylation acid, hydrogen sulfide, organic sulfides and mercaptans, or acid sludge, but does not include facilities where conversion to sulfuric acid is utilized primarily as a means of preventing emissions to the atmosphere of sulfur dioxide or other sulfur compounds.

c. Standard for sulfur dioxide. On and after the date on which the performance test required to be conducted by subsection 7 of section 33-15-12-01 is completed, no owner or operator subject to the provisions of this subsection may cause to be discharged into the atmosphere from any affected facility any gases which contain sulfur dioxide in excess of two kilograms per metric ton [4 lb/ton] of acid produced; the production being expressed as one hundred percent sulfuric acid.

d. Standard for acid mist. On and after the date on which the performance test required to be conducted by subsection 7 of section 33-15-12-01 is completed, no owner or operator subject to the provisions of this subsection may cause to be discharged into the atmosphere from any affected facility any gases which:

(1) Contain acid mist, expressed as sulfuric acid, in excess of seventy-five thousandths kilogram per metric ton [0.15 lb/ton] of acid produced, the production being expressed as one hundred percent sulfuric acid.

(2) Exhibit ten percent opacity, or greater.

e. Emission monitoring.

(1) A continuous monitoring system for the measurement of sulfur dioxide must be installed, calibrated, maintained, and operated by the owner or operator. The pollutant gas used to prepare calibration gas mixtures under performance specification 2 and for calibration checks under subdivision d of subsection 11 of section 33-15-12-01 shall be sulfur dioxide. Method 8 must be used for conducting monitoring system performance evaluations under subdivision c of subsection 11 of section 33-15-12-01 except that only the sulfur dioxide portion of the method 8 results must be used. The span value must be set at one thousand parts per million of sulfur dioxide.

(2) The owner or operator shall establish a conversion factor for the purpose of converting monitoring data into units of the applicable standard (kilograms per metric ton, pounds per ton). The conversion factor must be determined, as a minimum, three times daily by measuring the concentration of sulfur dioxide entering the converter using suitable methods, e.g., the Reich test, national air pollution control administration Publication No. 999-AP-13, and calculating the appropriate conversion factor for each eight-hour period as follows:

$$GF = k \left(\frac{1.000 - 0.015r}{r - s} \right)$$

where:

GF = conversion factor (kg/metric ton per ppm;
lb/ton per ppm).

k = constant derived from material balance.

For determining GF in metric units,
 $k = 0.0653$; for determining GF in
 English units, $k = 0.1306$.

r = percentage of sulfur dioxide by volume entering the gas converter. Appropriate corrections must be made for air injection plants subject to the department's approval.

s = percentage of sulfur dioxide by volume in the emissions to the atmosphere determined by the continuous monitoring system required under paragraph 1.

(3) The owner or operator shall record all conversion factors and values under paragraph 2 from which they were computed, i.e., GF, r , and s .

(4) Alternatively, a source that processes elemental sulfur or an ore that contains elemental sulfur and uses air to supply oxygen may use the following continuous emission monitoring approach and calculation procedures in determining sulfur dioxide emission rates in terms of the standard. This procedure is not required, but is an alternative that would alleviate problems encountered in the measurement of gas velocities or production rate. Continuous emission monitoring of sulfur dioxide, oxygen, and carbon dioxide (if required) must be installed, calibrated, maintained, and operated by the owner or operator and subjected to the certification procedures in performance specifications 2 and 3. The calibration procedure and span value for this sulfur dioxide monitor must be as specified in paragraph 2 of this subdivision. The span value for carbon dioxide (if required) shall be ten percent and for oxygen shall be 20.9 percent (air). A conversion factor based on process rate data is not necessary. Calculate the sulfur dioxide emission rate as follows:

$$E_S = \{ (C_S) / [0.265 - (0.126 \%O_2)] - (A \%CO_2) \}$$

where:

E_S = emission rate of SO_2 , kg/metric ton
 (lb/ton) of 100 percent of H_2SO_4
 produced.

C_S = concentration of SO_2 , kg/dscm
 (lb/dscf).

S = acid production rate factor, 368 dscm/
metric ton [11,800 dscf/ton] of 100
percent H₂SO₄ produced.

%O₂ = oxygen concentration, percent by
basis.

A = auxiliary fuel factor.
= 0.00 for no fuel.
= 0.0226 for methane.
= 0.0217 for natural gas.
= 0.0196 for propane.
= 0.0172 for no. 2 oil.
= 0.0161 for no. 6 oil.
= 0.0148 for coal.
= 0.0126 for coke.

%CO₂ = carbon dioxide concentration, percent
dry basis.

Note: It is necessary in some cases to convert
measured concentration units to other units for these
calculations:

Use the following table for such conversions:

From	To	Multiply by
g/scm	kg/scm	10 ⁻³
mg/scm	kg/scm	10 ⁻⁶
ppm (SO ₂)	kg/scm	2.660 x 10 ⁻⁶
ppm (SO ₂)	lb/scf	1.660 x 10 ⁻⁷

(5) For the purpose of reports under subdivision c of
subsection 6 of section 33-15-12-01, periods of
excess emission must be all three hour periods (or
the arithmetic average of three consecutive one hour
periods) during which the integrated average sulfur
dioxide emissions exceed the applicable standards
under subdivision c of subsection 6.

f. Test methods and procedures:

(1) In conducting the performance tests required in
subsection 7 of section 33-15-12-01, the owner or
operator shall use as reference methods and
procedures the test methods in appendix A of this
chapter or other methods and procedures as specified
in this subdivision, except as provided in
subdivision b of subsection 7 of section 33-15-12-01.
Acceptable alternative methods and procedures are
given in paragraph 3 of this subdivision.

(2) The owner or operator shall determine compliance with the sulfur dioxide acid mist, and visible emission standards in subdivisions c and d as follows:

(a) The emission rate (E) of acid mist or sulfur dioxide shall be computed for each run using the following equation:

$$E = (C Q_{sd}) / (P K)$$

where:

E = emission rate of acid mist or SO_2
kg/metric ton (lb/ton) of 100
percent H_2SO_4 produced.

C = concentration of acid mist or SO_2 ,
g/dscm (lb/dscf).

Q_{sd} = volumetric flow rate of the
effluent gas, dscm/hr (dscf/hr).

P = production rate of 100 percent
 H_2SO_4 , metric ton/hr (ton/hr).

K = conversion factor, 1000 g/kg
{1.0 lb/lb}.

(b) Method 8 must be used to determine the acid mist and sulfur dioxide concentrations (C's) and the volumetric flow rate (Q_{sd}) of the effluent gas.

The moisture content may be considered to be zero. The sampling time and sample volume for each run must be at least sixty minutes and 1.15 dry cubic meters at standard conditions {40.6 dscf}.

(c) Suitable methods must be used to determine the production rate (P) of one hundred percent H_2SO_4 for each run. Material balance over the production system must be used to confirm the production rate.

(d) Method 9 and the procedures in subsection 9 of section 33-15-12-01 must be used to determine opacity.

(3) The owner or operator may use the following as alternatives to the reference methods and procedures specified in this subdivision: if a source processes elemental sulfur or an ore that contains elemental sulfur and uses air to supply oxygen, the following

procedure may be used instead of determining the volumetric flow rate and production rate:

(a) The integrated technique of method 2 is used to determine the oxygen concentration and, if required, carbon dioxide concentration.

(b) The sulfur dioxide or acid mist emission rate is calculated as described in paragraph 4 of subdivision e, substituting the acid mist concentration for θ_s as appropriate.

7. Standards of performance for asphalt concrete plants.

a. Applicability and designation of affected facility. The affected facility to which the provisions of this subsection apply is each hot mix asphalt facility. For the purpose of this subsection, a hot mix asphalt facility is comprised only of any combination of the following: dryers; systems for screening, handling, storing, and weighing hot aggregate; systems for loading, transferring, and storing mineral filler; systems for mixing hot mix asphalt; and the loading, transfer, and storage systems associated with emission control systems. Any facility that commences construction or modification after June 11, 1973, is subject to the requirements of this subsection.

b. Definitions. As used in this subsection, all terms not defined herein shall have the meaning given them in North Dakota Century Code chapter 23-25 and in subsection 2 of section 33-15-12-01. "Hot mix asphalt facility" means any facility, as described in subdivision a, used to manufacture hot mix asphalt by heating and drying aggregate and mixing with asphalt cements.

c. Standard for particulate matter. On and after the date on which the performance test required to be conducted by subsection 7 of section 33-15-12-01 is completed, no owner or operator subject to the provisions of this subsection may discharge or cause the discharge into the atmosphere from any affected facility any gases which:

(1) Contain particulate matter in excess of ninety milligrams per dry cubic meter at standard conditions 10-04 grains per dscf.

(2) Exhibit twenty percent opacity, or greater.

d. Test methods and procedures.

(1) In conducting the performance tests required in subsection 7 of section 33-15-12-01, the owner or operator shall use as reference methods and

procedures the test methods in appendix A of this chapter or other methods and procedures as specified in this subdivision, except as provided in subdivision b of subsection 7 of section 33-15-12-01.

(2) The owner or operator shall determine compliance with the particulate matter standards in subdivision c as follows:

(a) Method 5 must be used to determine the particulate matter concentration. The sampling time and sample volume for each run must be at least sixty minutes and 0.90 dry cubic meter at standard condition {31.8 dscf}.

(b) Method 9 and the procedures in subsection 9 of section 33-15-12-01 must be used to determine opacity.

8. Standards of performance for petroleum refineries.

a. Applicability and designation of affected facility. The provisions of this subsection are applicable to the following affected facilities in petroleum refineries: fluid catalytic cracking unit catalyst regenerators, fuel gas combustion devices, and all Claus sulfur recovery plants except Claus plants of twenty long tons per day or less. The Claus sulfur recovery plant need not be physically located within the boundaries of a petroleum refinery to be an affected facility, provided it processes gases produced within a petroleum refinery. Any fluid catalytic cracking unit catalyst regeneration or fuel gas combustion device which commences construction or modification after June 11, 1973, or any Claus sulfur recovery plant which commences construction or modification after October 4, 1976, is subject to the requirements of this subsection.

b. Definitions. As used in this subsection, all terms not defined herein shall have the meaning given them in North Dakota Century Code chapter 23-25 and in subsection 2 of section 33-15-12-01.

(1) "Claus sulfur recovery plant" means a process unit which recovers sulfur from hydrogen sulfide by a vapor-phase catalytic reaction of sulfur dioxide and hydrogen sulfide.

(2) "Coke burn-off" means the coke removed from the surface of the fluid catalytic cracking unit catalyst by combustion in the catalyst regenerator. The rate of coke burn-off is calculated by the formula specified in subdivision g.

- (3) "Fuel gas" means any gas which is generated by a petroleum refinery process unit and which is combusted. Fuel gas also includes natural gas when the natural gas is combined and combusted in any proportion with a gas generated at a refinery. Fuel gas does not include gases generated by catalytic cracking unit catalyst regenerators and fluid coking burners.
- (4) "Fuel gas combustion device" means any equipment, such as process heaters, boilers, and flares used to combust fuel gas, except facilities in which gases are combusted to produce sulfur or sulfuric acid.
- (5) "Oxidation control system" means an emission control system which reduces emissions from sulfur recovery plants by converting these emissions to sulfur dioxide.
- (6) "Petroleum" means the crude oil removed from the earth and the oils derived from tar sands, shale, and coal.
- (7) "Petroleum refinery" means any facility engaged in producing gasoline, kerosene, distillate fuel oils, residual fuel oils, lubricants, or other products through distillation of petroleum or through redistillation, cracking, or reforming of unfinished petroleum derivatives.
- (8) "Process gas" means any gas generated by a petroleum refinery process unit, except fuel gas and process upset gas as defined in this subdivision.
- (9) "Process upset gas" means any gas generated by a petroleum refinery process unit as a result of startup, shutdown, upset, or malfunction.
- (10) "Reduced sulfur compounds" means hydrogen sulfide (H_2S), carbonyl sulfide (CO_2S), and carbon disulfide (CS_2).
- (11) "Reduction control system" means an emission control system which reduces emissions from sulfur recovery plants by converting these emissions to hydrogen sulfide.
- (12) "Refinery process unit" means any segment of the petroleum refinery in which a specific processing operation is conducted.
- (13) {Reserved}

c. Standard for particulate matter.

(1) On and after the date on which the performance test required to be conducted by subsection 7 of section 33-15-12-01 is completed, no owner or operator subject to the provisions of this subsection may discharge or cause the discharge into the atmosphere from any fluid catalytic cracking unit catalyst regenerator:

(a) Particulate matter in excess of one kilogram per one thousand kilograms [1.0 pound per 1000 pounds] of coke burn-off in the catalyst regenerator.

(b) Gases exhibiting greater than thirty percent opacity, except for one 6-minute average opacity reading in any one-hour period.

(2) Where the gases discharged by the fluid catalytic cracking unit catalyst regenerator pass through an incinerator or waste heat boiler in which auxiliary or supplemental liquid or solid fossil fuel is burned, particulate matter in excess of that permitted by subparagraph a of paragraph 1 may be emitted to the atmosphere, except that the incremental rate of particulate matter emissions shall not exceed forty-three nanograms per joule [0.10 lb/million Btu] of heat input attributable to such liquid or solid fossil fuel.

d. Standard for carbon monoxide. On and after the date on which the performance test required to be conducted by subsection 7 of section 33-15-12-01 is completed, no owner or operator subject to the provisions of this subsection may discharge or cause the discharge into the atmosphere from the fluid catalytic cracking unit catalyst regenerator any gases which contain carbon monoxide in excess of five-hundredths percent by volume.

e. Standard for sulfur dioxide.

(1) On and after the date on which the performance test required to be conducted by subsection 7 of section 33-15-12-01 is completed, no owner or operator subject to the provisions of this subsection may:

(a) Burn in any fuel gas combustion device any fuel gas which contains hydrogen sulfide in excess of two hundred thirty milligrams per dry cubic meter at standard conditions [0.10 gr/dscf], except that the gases resulting from the combustion of fuel gas may be treated to control

sulfur dioxide emissions provided the owner or operator demonstrates to the satisfaction of the department that this is as effective in preventing sulfur dioxide emissions to the atmosphere as restricting the hydrogen sulfide concentration in the fuel gas to two hundred thirty milligrams per dry cubic meter at standard conditions [0.10 gr/dscf] or less. The combustion in a flare of process upset gas, or fuel gas which is released to the flare as a result of relief valve leakage, is exempt from this subparagraph.

(b) Discharge or cause the discharge of any gases into the atmosphere from any Claus sulfur recovery plant containing in excess of:

[1] Twenty-five thousandths percent by volume of sulfur dioxide at zero percent oxygen on a dry basis if emissions are controlled by an oxidation control system, or a reduction control system followed by incineration; or

[2] Thirty thousandths percent by volume of reduced sulfur compounds and one thousandths percent by volume of hydrogen sulfide calculated as sulfur dioxide at zero percent oxygen on a dry basis if emissions are controlled by a reduction control system not followed by incineration.

f. Emission monitoring.

(1) Continuous monitoring systems must be installed, calibrated, maintained, and operated by the owner or operator as follows:

(a) A continuous monitoring system for the measurement of the opacity of emissions discharged into the atmosphere from the fluid catalytic cracking unit catalyst regenerator. The continuous monitoring system must be spanned at sixty, seventy, or eighty percent opacity.

(b) An instrument for continuously monitoring and recording the concentration of carbon monoxide in gases discharged into the atmosphere from fluid catalytic cracking unit catalyst regenerators. The span of this continuous monitoring system must be one thousand parts per million. Installation of carbon monoxide continuous monitoring systems is not required if

the owner or operator files a written request for exemption to the department and demonstrates, by the exemption performance test described below, that the average carbon monoxide emissions are less than ten percent of the applicable standard listed in subdivision d of this subsection. The exemption performance test shall consist of continuously monitoring carbon monoxide emissions for thirty days using an instrument that meets the requirements of performance specification 4 of appendix B, except the span value must be one hundred parts per million instead of one thousand parts per million, and if required, the relative accuracy limits shall be ten percent or five parts per million, whichever is greater.

- (c) A continuous monitoring system for the measurement of sulfur dioxide in the gases discharged into the atmosphere from the combustion of fuel gases (except where a continuous monitoring system for the measurement of hydrogen sulfide is installed under subparagraph d). The pollutant gas used to prepare calibration gas mixtures under paragraph 2.1, performance specification 2, and for calibration checks under subdivision d of subsection †† of section 33-15-12-01 must be sulfur dioxide. The span must be set at one hundred parts per million. For conducting monitoring system performance evaluations under subdivision c of subsection †† of section 33-15-12-01, reference method 6 must be used.
- (d) An instrument for continuously monitoring and recording concentrations of hydrogen sulfide in fuel gases burned in any fuel gas combustion device, if compliance with subparagraph a of paragraph † of subdivision e is achieved by removing hydrogen sulfide from the fuel gas before it is burned; fuel gas combustion devices having a common source of fuel gas may be monitored at one location, if monitoring at this location accurately represents the concentration of hydrogen sulfide in the fuel gas burned. The span of this continuous monitoring system must be three hundred parts per million.
- (e) An instrument for continuously monitoring and recording concentrations of sulfur dioxide in the gases discharged into the atmosphere from any Claus sulfur recovery plant if compliance with subparagraph b of paragraph † of

subdivision e is achieved through the use of an oxidation control system or a reduction control system followed by incineration. The span of this continuous monitoring system must be set at five hundred parts per million.

(f) An instrument or instruments for continuously monitoring and recording the concentration of hydrogen sulfide and reduced sulfur compounds in the gases discharged into the atmosphere from any Claus sulfur recovery plant if compliance with subparagraph b of paragraph 4 of subdivision e is achieved through the use of a reduction control system not followed by incineration. The span or spans of this continuous monitoring system or systems must be set at twenty parts per million for monitoring and recording the concentration of hydrogen sulfide and six hundred parts per million for monitoring and recording the concentration of reduced sulfur compounds.

(2) [Reserved]

(3) The average coke burn-off rate (thousands of kilograms per hour) and hours of operation for any fluid catalytic cracking unit catalyst regenerator subject to subdivisions c and d must be recorded daily.

(4) For any fluid catalytic cracking unit catalyst regenerator which is subject to subdivision c and which utilizes an incinerator-waste heat boiler to combust the exhaust gases from the catalyst regenerator, the owner or operator shall record daily the rate of combustion of liquid or solid fossil fuels (liters per hour or kilograms per hour) and the hours of operation during which liquid or solid fossil fuels are combusted in the incinerator-waste heat boiler.

(5) For the purpose of reports under subdivision c of subsection 6 of section 33-15-12-01, periods of excess emissions that must be reported are defined as follows:

(a) Opacity. All one-hour periods which contain two or more six-minute periods during which the average opacity as measured by the continuous monitoring system exceeds thirty percent.

(b) Carbon monoxide. All hourly periods during which the average carbon monoxide concentration

in the gases discharged into the atmosphere from any fluid catalytic cracking unit catalyst regenerator subject to subdivision d of subsection 8 exceeds five hundredths percent by volume.

(c) Sulfur dioxide.

f1) Any three-hour period during which the average concentration of hydrogen sulfide in any fuel gas combusted in any fuel gas combustion device subject to subparagraph a of paragraph 1 of subdivision e exceeds two hundred thirty milligrams per dry cubic meter at standard conditions {0-10 gr/dscf}, if compliance is achieved by removing hydrogen sulfide from the fuel gas before it is burned or any three-hour period during which the average concentration of sulfur dioxide in the gases discharged into the atmosphere from any fuel gas combustion device subject to subparagraph a of paragraph 1 of subdivision e exceeds the level specified in subparagraph a of paragraph 1 of subdivision e if compliance is achieved by removing sulfur dioxide from the combusted fuel gases.

f2) Any twelve-hour period during which the average concentration of sulfur dioxide in the gases discharged into the atmosphere from any Claus sulfur recovery plant subject to subparagraph b of paragraph 1 of subdivision e exceeds two hundred fifty parts per million at zero percent oxygen on a dry basis if compliance with paragraph 2 of subdivision e is achieved through the use of an oxidation control system or a reduction control system followed by incineration or any twelve-hour period during which the average concentration of hydrogen sulfide or reduced sulfur compounds in the gases discharged into the atmosphere of any Claus sulfur plant subject to item 2 of subparagraph b of paragraph 1 of subdivision e exceeds ten parts per million or three hundred parts per million, respectively, at zero percent oxygen and on a dry basis if compliance is achieved through the use of a reduction control system not followed by incineration.

(d) Any six-hour period during which the average emissions (arithmetic average of six contiguous one-hour periods) of sulfur dioxide as measured by a continuous monitoring system exceed the standard under subdivision e of this subsection.

g. Test methods and procedures.

(1) For the purpose of determining compliance with subparagraph a of paragraph 1 of subdivision c of this subsection, the following reference methods and calculation procedures must be used:

(a) For gases released to the atmosphere from the fluid catalytic cracking unit catalyst regenerator:

[1] Method 5B or 5F is to be used to determine particulate matter emissions and associated moisture content from affected facilities without wet FGD systems; only method 5B is to be used after wet FGD systems.

[2] Method 1 for sample and velocity traverses.

[3] Method 2 for velocity and volumetric flow rate.

(b) For method 5B or 5F, the sampling time for each run must be at least sixty minutes and the sampling rate must be at least fifteen-thousandths dry cubic meter at standard conditions per minute {0.53 dscf per minute}, except that shorter sampling times may be approved by the department when process variables or other factors preclude sampling for at least sixty minutes.

(c) For exhaust gases from the fluid catalytic cracking unit catalyst regenerator prior to the emission control system: the integrated sample techniques of method 3 and method 4 for gas analysis and moisture content, respectively; method 1 for velocity traverses; and method 2 for velocity and volumetric flow rate.

(d) Goke burn-off rate must be determined by the following formula:

$$R_c = 0.2982 Q_{re}(\%CO_2 + \%CO) + 2.088 Q_{ra} - 0.0994 Q_{re} (\%CO + \%CO_2 + \%O_2)$$

2

(metric units)

or

$$R_c = 0.0186 Q_{re}(\%CO_2 + \%CO) + 0.1303 Q_{ra} - 0.0062 Q_{re} (\%CO + \%CO_2 + \%O_2) \quad 2$$

(English units)

where:

R_c = coke burn-off rate, kg/hr (English units: lb/hr).

0.2982 = metric units material balance factor divided by 100, kg-min/hr-m³.

0.0186 = English units material balance factor divided by 100, lb-min/hr-ft³.

Q_{re} = fluid catalytic cracking unit catalyst regenerator exhaust gas flow rate before entering the emission control system, as determined by method 2, dscm/min (English units: dscf/min).

$\%CO_2$ = percent carbon dioxide by volume, dry basis, as determined by method 3.

$\%CO$ = percent carbon monoxide by volume, dry basis, as determined by method 3.

$\%O_2$ = percent oxygen by volume, dry basis, as determined by method 3.

2.088 = metric units material balance factor divided by 100, kg-min/hr-m³.

0.1303 = English units material balance factor divided by 100, lb-min/hr-ft³.

Q_{ra} = air rate to fluid catalytic cracking unit catalyst regenerator, as determined from fluid catalytic cracking unit control room instrumentation dscm/min (English units: dscf/min).

0.0994 = metric units material balance factor divided by 100, kg-min/hr-m³.

0.0062 = English units material balance factor by 100, lb-min/hr-ft³.

(e) Particulate emissions must be determined by the following equation:

$$R_E = (60 \times 10^{-6}) Q_{rv} C_3 \text{ (metric units)}$$

$$R_E = (8.57 \times 10^{-3}) Q_{rv} C_3 \text{ (English units)}$$

where:

R_E = particulate emission rate, kg/hr
{English units: lb/hr}.

60×10^{-6} = metric units conversion factor,
min/kg/hr-mg.

0.57×10^{-3} = English units conversion factor,
min/lb/hr-gr.

Q_{rv} = volumetric flow rate of gases
discharged into the atmosphere
from the fluid catalytic cracking
unit catalyst regenerator following
the emission control system, as
determined by method 2, dscm/min
{English units: dscf/min}.

C_p = particulate emission concentration
discharged into the atmosphere, as
determined by method 5, mg/dscm
{English units: gr/dscf}.

(f) For each run, emissions expressed in kilograms
{English units: pounds per one thousand pounds}
of coke burn-off in the catalyst regenerator
must be determined by the following equation:

$$R_s = 1000 \frac{R_E}{R_c} \text{ (metric or English units)}$$

where:

R_s = particulate emission rate, kilograms per
one thousand kilograms {English units:
pounds per one thousand pounds} of
coke burn-off in the fluid catalytic
cracking unit catalyst regenerator.

1000 = conversion factor, kilograms to one
thousand kilograms {English units:
pounds to one thousand pounds}.

R_E = particulate emission rate,
kilograms per hour {English units:
pounds per hour}.

R_c = coke burn-off rate, kilograms
per hour {English units: pounds
per hour}.

(g) In those instances in which auxiliary liquid or solid fossil fuels are burned in an incinerator-waste heat boiler, the rate of particulate matter emissions permitted under paragraph 2 of subdivision c must be determined. Auxiliary fuel heat input, expressed in millions of calories per hour [English units: millions of Btu per hour] must be calculated for each run by fuel flow rate measurement and analysis of the liquid or solid auxiliary fossil fuels. For each run, the rate of particulate emissions permitted under paragraph 2 of subdivision c must be calculated from the following equation:

$$R_s = 1.0 + 0.10 H \text{ (metric units)}$$

$$R_c$$

or

$$R_s = 1.0 + 0.10 H \text{ (English units)}$$

$$R_c$$

where:

R_s = allowable particulate emission rate, kilograms per one thousand kilograms [English units: pounds per one thousand pounds] of coke burn-off in the fluid catalytic cracking unit catalyst regenerator.

1.0 = emission standard, one kilogram per one thousand kilograms [English units: one pound per one thousand pounds] of coke burn-off in the fluid catalytic cracking unit regenerator.

0.10 = metric units maximum allowable incremental rate of particulate emissions, grams per million calories.

0.10 = English units maximum allowable incremental rate of particulate emissions, pounds per million Btu.

H = heat input from solid or liquid fossil fuel, million calories per hour [English units: million Btu per hour].

R_c = coke burn-off rate, kilograms per hour [English units: pounds per hour].

- (2) For the purpose of determining compliance with subdivision d, the integrated sample technique of method 10 must be used. The sample must be extracted at a rate proportional to the gas velocity at a sampling point near the centroid of the duct. The sampling time may not be less than sixty minutes.
- (3) For the purpose of determining compliance with subparagraph a of paragraph 1 of subdivision e, method 11 must be used to determine the concentration of hydrogen sulfide and method 6 must be used to determine the concentration of sulfur dioxide.
- (a) If method 11 is used, the gases sampled must be introduced into the sampling train at approximately atmospheric pressure. Where refinery fuel gaslines are operating at pressures substantially above atmosphere, this may be accomplished with a flow control valve. If the line pressure is high enough to operate the sampling train without a vacuum pump, the pump may be eliminated from the sampling train. The sample must be drawn from a point near the centroid of the fuel gasline. The minimum sampling time must be ten minutes and the minimum sampling volume one-hundredths dry cubic meter at standard conditions {0.35 dscf} for each sample. The arithmetic average of two samples of equal sampling time shall constitute one run. Samples must be taken at approximately one-hour intervals. For most fuel gases, sample times exceeding twenty minutes may result in depletion of the collection solution, although fuel gases containing low concentrations of hydrogen sulfide may necessitate sampling for longer periods of time.
- (b) If method 6 is used, method 1 must be used for velocity traverses and method 2 for determining velocity and volumetric flow rate. The sampling site for determining sulfur dioxide concentration by method 6 must be the same as for determining volumetric flow rate by method 2. The sampling point in the duct for determining sulfur dioxide concentration by method 6 must be at the centroid of the cross section if the cross sectional area is less than five square meters {54 square feet} or at a point no closer to the walls than one meter {39 inches} if the cross sectional area is five square meters {54 square feet} or more and the centroid is more than one meter {39 inches} from

the wall. The sample must be extracted at a rate proportional to the gas velocity at the sampling point. The minimum sampling time must be ten minutes and the minimum sampling volume one-hundredths dry cubic meter at standard conditions {0.35 dscf} for each sample. The arithmetic average of two samples of equal sampling time must constitute one run. Samples must be taken at approximately one-hour intervals.

(4) For the purpose of determining compliance with subparagraph b of paragraph 3 of subdivision 6, method 6 must be used to determine the concentration of sulfur dioxide and method 15 must be used to determine the concentration of hydrogen sulfide and reduced sulfur compounds. Method 15A may be used as an alternative method for determining reduced sulfur compounds.

(a) If method 6 is used, the procedure outlined in subparagraph b of paragraph 3 must be followed except that each run shall span a minimum of four consecutive hours of continuous sampling. A number of separate samples may be taken for each run, provided the total sampling time of these samples adds up to a minimum of four consecutive hours. Where more than one sample is used, the average sulfur dioxide concentration for the run shall be calculated as the time weighted average of the sulfur dioxide concentration for each sample according to the formula:

$$C_R = \frac{\sum_{i=1}^N C_{Si} t_{Si}}{T}$$

where:

C_R = SO_2 concentration for the run.

N = number of samples.

C_{Si} = SO_2 concentration for sample i .

t_{Si} = continuous sampling time of sample i .

T = total continuous sampling time of all N samples.

(b) If method 15 is used, each run shall consist of sixteen samples taken over a minimum of three hours. If method 15A is used, each run shall

consist of one 3-hour sample, or three 1-hour samples. The sampling point must be at the centroid of the cross section of the duct if the cross sectional area is less than five square meters (54 square feet) or at a point no closer to the walls than one meter (39 inches) if the cross sectional area is five square meters (54 square feet) or more and the centroid is more than one meter (39 inches) from the wall. For method 15, to ensure minimum residence time for the sample inside the sample lines, the sampling rate must be at least three liters per minute (0.1 cubic foot per minute). The sulfur dioxide equivalent for each run must be calculated as the arithmetic average of the sulfur dioxide equivalent of each sample during the run. Reference method 4 must be used to determine the moisture content of the gases when using method 15. The sampling point for method 4 shall be adjacent to the sampling point for method 15. The sample must be extracted at a rate proportional to the gas velocity at the sampling point. Each run must span a minimum of four consecutive hours of continuous sampling. A number of separate samples may be taken for each run provided the total sampling time of these samples adds up to a minimum of four consecutive hours. Where more than one sample is used, the average moisture content for the run must be calculated as the time weighted average of the moisture content of each sample according to the formula:

$$B_{wo} = \frac{\sum_{i=1}^N B_{si} t_{si}}{T}$$

where:

B_{wo} = proportion by volume of water vapor in the gas stream for the run.

N = number of samples.

B_{si} = proportion by volume of water vapor in the gas stream for the sample i .

t_{si} = continuous sampling time for sample i .

T = total continuous sampling time of all N samples.

9. Standards of performance for storage vessels for petroleum liquids for which construction, reconstruction, or modification commenced after July 1, 1970, and prior to May 19, 1978.

a. Applicability and designation of affected facility.

(1) Except as provided in paragraph 2, the affected facility to which this subsection applies is each storage vessel for petroleum liquids which has a storage capacity greater than one hundred fifty-one thousand four hundred twelve liters [40,000 gallons].

(2) This subsection does not apply to storage vessels for petroleum or condensate stored, processed, or treated at a drilling and production facility prior to custody transfer.

(3) Any facility under paragraph 1 that commenced construction, reconstruction, or modification after July 1, 1970, and prior to May 19, 1978, is subject to the requirements of this subsection.

b. Definitions. As used in this section, all terms not defined herein shall have the meaning given them in North Dakota Century Code chapter 23-25 and in subsection 2 of section 33-15-12-01.

(1) "Condensate" means hydrocarbon liquid separated from natural gas which condenses due to changes in the temperature or pressure, or both, and remains liquid at standard conditions.

(2) "Custody transfer" means the transfer of produced petroleum or condensate, or both, after processing or treating, or both, in the producing operations, from storage tanks or automatic transfer facilities to pipelines or any other forms of transportation.

(3) "Drilling and production facility" means all drilling and servicing equipment, wells, flow lines, separators, equipment, gathering lines, and auxiliary non-transportation related equipment used in the production of petroleum but does not include natural gasoline plants.

(4) "Floating roof" means a storage vessel cover consisting of a double deck, pontoon single deck, internal floating cover or covered floating roof, which rests upon and is supported by the petroleum liquid being contained, and is equipped with a

closure seal or seals to close the space between the roof edge and tank wall.

- (5) "Hydrocarbon" means any organic compound consisting predominantly of carbon and hydrogen.
- (6) "Petroleum" means the crude oil removed from the earth and the oils derived from tar sands, shale, and coal.
- (7) "Petroleum liquids" means petroleum, condensate, and any finished or intermediate products manufactured in a petroleum refinery but does not mean number 2 through number 6 fuel oils as specified in A.S.T.M. D396-78, gas turbine fuel oils numbers 2-GT through 4-GT as specified in A.S.T.M. D2880-78, or diesel fuel oils numbers 2-D and 4-D as specified in A.S.T.M. D975-78.
- (8) "Petroleum refinery" means any facility engaged in producing gasoline, kerosene, distillate fuel oils, residual fuel oils, lubricants, or other products through distillation of petroleum or through redistillation, cracking, or reforming of unfinished petroleum derivatives.
- (9) "Reid vapor pressure" is the absolute vapor pressure of volatile crude oil and volatile nonviscous petroleum liquids, except liquefied petroleum gases, as determined by A.S.T.M. D323-82.
- (10) "Storage vessel" means any tank, reservoir, or container used for the storage of petroleum liquids, but does not include:
 - (a) Pressure vessels which are designed to operate in excess of fifteen pounds {6.80 kilograms} per square inch {6.45 square centimeters} gauge without emissions to the atmosphere except under emergency conditions.
 - (b) Subsurface caverns or porous rock reservoirs.
 - (c) Underground tanks if the total volume of petroleum liquids added to and taken from a tank annually does not exceed twice the volume of the tank.
- (11) "True vapor pressure" means the equilibrium partial pressure exerted by a petroleum liquid as determined in accordance with methods described in American petroleum institute bulletin 2517, Evaporation Loss

from External Floating Roof Tanks, second edition, February 1980.

- (12) "Vapor recovery system" means a vapor gathering system capable of collecting all hydrocarbon vapors and gases discharged from the storage vessel and a vapor disposal system capable of processing such hydrocarbon vapors and gases so as to prevent their emission to the atmosphere.
- c. Standard for volatile organic compounds (VOC). The owner or operator of any storage vessel to which this subsection applies shall store petroleum liquids as follows:
- (1) If the true vapor pressure of the petroleum liquid, as stored, is equal to or greater than seventy-eight millimeters mercury [1.5 pounds per square inch absolute] but not greater than five hundred seventy millimeters mercury [11.1 pounds per square inch absolute], the storage vessel shall be equipped with a floating roof, a vapor recovery system, or their equivalents.
 - (2) If the true vapor pressure of the petroleum liquid as stored is greater than five hundred seventy millimeters mercury [11.1 pounds per square inch absolute], the storage vessel must be equipped with a vapor recovery system or its equivalent.
- d. Monitoring of operations.
- (1) Except as provided in paragraph 4, the owner or operator of any storage vessel to which this subsection applies shall maintain a record of the petroleum liquid stored, the period of storage, and the maximum true vapor pressure of that liquid during the respective storage period.
 - (2) Available data on the typical Reid vapor pressure and the maximum expected storage temperature of the stored product may be used to determine the maximum true vapor pressure from nomographs contained in American petroleum institute bulletin 2517, unless the department specifically requests that the liquid be sampled, the actual storage temperature determined, and the Reid vapor pressure determined from the samples.
 - (3) The true vapor pressure of each type of crude oil with a Reid vapor pressure less than 13.8 kilopascals [2.0 psia] or whose physical properties preclude determination by the recommended method is to be determined from available data and recorded if the

estimated true vapor pressure is greater than 6.9 kilopascals [1.0 psia].

(4) The following are exempt from the requirements of this subdivision:

(a) Each owner or operator of each affected facility which stores petroleum liquids with a Reid vapor pressure of less than 6.9 kilopascals [1.0 psia] provided the maximum true vapor pressure does not exceed 6.9 kilopascals [1.0 psia].

(b) Each owner or operator of each affected facility equipped with a vapor recovery and return or disposal system in accordance with the requirements of subdivision c.

10. Standards of performance for storage vessels for petroleum liquids for which construction, reconstruction, or modification commenced after May 18, 1978, and prior to July 23, 1984.

a. Applicability and designation of affected facility.

(1) The affected facility to which this subsection applies is each storage vessel for petroleum liquids which has a storage capacity greater than one hundred fifty-one thousand four hundred sixteen liters [40,000 gallons] and for which construction is commenced after May 18, 1978.

(2) Each petroleum liquid storage vessel with a capacity of less than one million five hundred eighty-nine thousand eight hundred seventy-three liters [420,000 gallons] used for petroleum or condensate stored, processed, or treated prior to custody transfer is not an affected facility and, therefore, is exempt from the requirements of this subsection.

b. Definitions. As used in this section, all terms not defined herein shall have the meaning given them in North Dakota Century Code chapter 23-25 and in subsection 2 of section 33-15-12-01.

(1) "Condensate" means hydrocarbon liquid separated from natural gas which condenses due to changes in the temperature or pressure, or both, and remains liquid at standard conditions.

(2) "Custody transfer" means the transfer of produce petroleum or condensate, or both, after processing or treating, or both, in the producing operations, from

storage tanks or automatic transfer facilities to pipelines or any other forms of transportation.

- (3) "Liquid mounted seal" means a foam or liquid filled primary seal mounted in contact with the liquid between the tank wall and the floating roof continuously around the circumference of the tank.
- (4) "Metallic shoe seal" includes, but is not limited to, a metal sheet held vertically against the tank wall by springs or weighted levers and is connected by braces to the floating roof. A flexible coated fabric (envelope) spans the annular space between the metal sheet and the floating roof.
- (5) "Petroleum liquids" means petroleum, condensate, and any finished or intermediate products manufactured in a petroleum refinery but does not mean numbers 2 through 6 fuel oil as specified in A.S.T.M. D396-78, gas turbine fuel oils numbers 2-GT through 4-GT as specified in A.S.T.M. D2880-78, or diesel fuel oils numbers 2-D and 4-D as specified in A.S.T.M. D975-78.
- (6) "Petroleum" means the crude oil removed from the earth and the oils derived from tar sands, shale, and coal.
- (7) "Petroleum refinery" means each facility engaged in producing gasoline, kerosene, distillate fuel oils, residual fuel oils, lubricants, or other products through distillation of petroleum or through redistillation, cracking, extracting, or reforming of unfinished petroleum derivatives.
- (8) "Reid vapor pressure" is the absolute vapor pressure of volatile crude oil and nonviscous petroleum liquids, except liquefied petroleum gases, as determined by A.S.T.M. D323-82.
- (9) "Storage vessel" means each tank, reservoir, or container used for the storage of petroleum liquids, but does not include:
 - (a) Pressure vessels which are designed to operate in excess of 204.9 kilopascals [15 psig] without emissions to the atmosphere except under emergency conditions;
 - (b) Subsurface caverns or porous rock reservoirs; or
 - (c) Underground tanks if the total volume of petroleum liquids added to and taken from a tank

annually does not exceed twice the volume of the tank.

(10) "True vapor pressure" means the equilibrium partial pressure exerted by a petroleum liquid such as determined in accordance with methods described in American petroleum institute bulletin 2517, Evaporation Loss from External Floating Roof Tanks, second edition, February 1980.

(11) "Vapor-mounted seal" means a foam-filled primary seal mounted continuously around the circumference of the tank so there is an annular vapor space underneath the seal. The annular vapor space is bounded by the bottom of the primary seal, the tank wall, the liquid surface, and the floating roof.

c. Standard for volatile organic compounds.

(1) The owner or operator of each storage vessel to which this subsection applies which contains a petroleum liquid which, as stored, has a true vapor pressure equal to or greater than 10.3 kilopascals (1.5 psia) but not greater than 76.6 kilopascals (11.1 psia) shall equip the storage vessel with one of the following:

(a) An external floating roof, consisting of a pontoon-type or double-deck-type cover that rests on the surface of the liquid contents and is equipped with a closure device between the tank wall and the roof edge. Except as provided in subitem d of item 2 of subparagraph a of paragraph 1 of this subdivision, the closure device is to consist of two seals, one above the other. The lower seal is referred to as the primary seal and the upper seal is referred to as the secondary seal. The roof is to be floating on the liquid at all times (i.e., off the roof leg supports) except during initial fill and when the tank is completely emptied and subsequently filled. The process of emptying and refilling when the roof is resting on the leg supports must be continuous and must be accomplished as rapidly as possible.

(1) The primary seal is to be either a metallic shoe seal, a liquid-mounted seal, or a vapor-mounted seal. Each seal is to meet the following requirements:

(a) The accumulated area of gaps between the tank wall and the metallic shoe

seal or the liquid-mounted seal may not exceed two hundred twelve cm^2 per meter of tank diameter [10.0 in^2 per ft of tank diameter] and the width of any portion of any gap may not exceed 3.0 centimeters [$1 \frac{1}{2}$ inches].

- fb] The accumulated area of gaps between the tank wall and the vapor-mounted seal may not exceed 21.2 cm^2 per meter of tank diameter [1.0 in^2 per ft of tank diameter] and the width of any portion of any gap may not exceed 1.27 centimeters [$\frac{1}{2}$ inch].
 - fc] One end of the metallic shoe is to extend into the stored liquid and the other end is to extend a minimum vertical distance of sixty-one centimeters [24 inches] above the stored liquid surface.
 - fd] There are to be no holes, tears, or other openings in the shoe, seal fabric, or seal envelope.
- f2] The secondary seal is to meet the following requirements:
- fa] The secondary seal is to be installed above the primary seal so that it completely covers the space between the roof edge and the tank wall except as provided in subitem b of item 2 of subparagraph a of paragraph 1 of this subdivision.
 - fb] The accumulated area of gaps between the tank wall and the secondary seal used in combination with a metallic shoe or liquid-mounted primary seal may not exceed 21.2 cm^2 per meter of tank diameter [1.0 in^2 per ft of tank diameter] and the width of any portion of any gap may not exceed 1.27 centimeters [$\frac{1}{2}$ inch]. There may be no gaps between the tank wall and the secondary seal used in combination with a vapor-mounted primary seal.
 - fc] There are to be no holes, tears, or other openings in the seal or seal fabric.

- [d] The owner or operator is exempted from the requirements for secondary seals and the secondary seal gap criteria when performing gap measurements or inspections of the primary seal.
- [3] Each opening in the roof except for automatic bleeder vents and rim space vents is to provide a projection below the liquid surface. Each opening in the roof except for automatic bleeder vents, rim space vents, and leg sleeves is to be equipped with a cover, seal, or lid which is to be maintained in a closed position at all times (i.e., no visible gap) except when the device is in actual use or as described in item 4 of subparagraph a of paragraph 1 of this subdivision. Automatic bleeder vents are to be closed at all times when the roof is floating, except when the roof is being floated off or is being landed on the roof leg supports. Rim vents are to be set to open when the roof is being floated off the roof leg supports or at the manufacturer's recommended setting.
- [4] Each emergency roof drain is to be provided with a slotted membrane fabric cover that covers at least ninety percent of the area of the opening.
- (b) A fixed roof with an internal floating-type cover equipped with a continuous closure device between the tank wall and the cover edge. The cover is to be floating at all times (i.e., off the leg supports) except during initial fill and when the tank is completely emptied and subsequently refilled. The process of emptying and refilling when the cover is resting on the leg supports must be continuous and must be accomplished as rapidly as possible. Each opening in the cover except for automatic bleeder vents and the rim space vents is to provide a projection below the liquid surface. Each opening in the cover except for automatic bleeder vents, rim space vents, stub drains, and leg sleeves is to be equipped with a cover, seal, or lid which is to be maintained in a closed position at all times (i.e., no visible gap), except when the device is in actual use. Automatic blender vents are to be closed at all times when the cover is floating except when the cover is being floated off or is being landed on

the leg supports. Rim vents are to be set to open only when the cover is being floated off the leg supports or at the manufacturer's recommended setting.

(c) A vapor recovery system which collects all volatile organic compounds vapors and gases discharged from the storage vessel; and a vapor return or disposal system which is designed to process such volatile organic compounds vapors and gases so as to reduce their emission to the atmosphere by at least ninety-five percent by weight.

(d) A system equivalent to those described in subparagraph a, b, or c of paragraph 1 of this subdivision as provided in subdivision e.

(2) The owner or operator of each storage vessel to which this subsection applies which contains a petroleum liquid which, as stored, has a true vapor pressure greater than 76.6 kilopascals [11.1 psia] shall equip the storage vessel with a vapor recovery system which collects all volatile organic compounds vapors and gases discharged from the storage vessel; and a vapor return or disposal system which is designed to process such volatile organic compounds vapors and gases so as to reduce their emission to the atmosphere by at least ninety-five percent by weight.

d. Testing and procedures.

(1) Except as provided in subdivision b of subsection 7 of section 33-15-12-01, compliance with the standard prescribed in subdivision c must be determined as follows or in accordance with an equivalent procedure as provided in subdivision e.

(a) The owner or operator of each storage vessel to which this subsection applies which has an external floating roof shall meet the following requirements:

[1] Determine the gap areas and maximum gap widths between the primary seal and the tank wall and between the secondary seal and the tank wall according to the following frequency:

[a] For primary seals, gap measurements shall be performed within sixty days of the initial fill with petroleum liquid and at least once every five

years thereafter. All primary seal inspections or gap measurements which require the removal or dislodging of the secondary seal must be accomplished as rapidly as possible and the secondary seal must be replaced as soon as possible.

{b} For secondary seals, gap measurements must be performed within sixty days of the initial fill with petroleum liquid and at least once every year thereafter.

{c} If any storage vessel is out of service for a period of one year or more, subsequent refilling with petroleum liquid must be considered initial fill for the purposes of subitems a and b of item 1 of subparagraph a of paragraph 1 of this subdivision.

{2} Determine gap widths in the primary and secondary seals individually by the following procedures:

{a} Measure seal gaps, if any, at one or more floating roof levels when the roof is floating off the roof leg supports.

{b} Measure seal gaps around the entire circumference of the tank in each place where a one-eighth-inch diameter uniform probe passes freely (without forcing or binding against seal) between the seal and the tank wall and measure the circumferential distance of each such location.

{c} The total surface area of each gap described in subitem b of item 2 of subparagraph a of paragraph 1 of this subdivision must be determined by using probes of various widths to accurately measure the actual distance from the tank wall to the seal and multiplying each such width by its respective circumferential distance.

{d} Keep records of each gap measurement at the plant for a period of at least

two years following the date of measurement. Each record shall identify the vessel on which the measurement was performed and shall contain the date of the seal gap measurement, the raw data obtained in the measurement process required by item 2 of subparagraph a of paragraph 1 of this subdivision and the calculation required by item 3 of subparagraph a of paragraph 1 of this subdivision.

- (e) If either the seal gap calculated in accord with item 3 of subparagraph a of paragraph 1 of this subdivision or the measured maximum seal gap exceeds the limitations specified by subdivision c of this subsection, a report shall be furnished to the department within sixty days of the date of measurements. The report shall identify the vessel and list each reason why the vessel did not meet the specifications of subdivision c of this subsection. The report shall also describe the actions necessary to bring the storage vessel into compliance with the specifications of subdivision c of this subsection.
- (3) Add the gap surface area of each gap location for the primary seal and the secondary seal individually. Divide the sum for each seal by the nominal diameter of the tank and compare each ratio to the appropriate ratio in the standard in items 1 and 2 of subparagraph a of paragraph 1 of subdivision c.
- (4) Provide the department thirty days¹ prior notice of the gap measurement to afford the department the opportunity to have an observer present.
- (b) The owner or operator of each storage vessel to which this subsection applies which has a vapor recovery and return or disposal system shall provide the following information to the department on or before the date on which construction of the storage vessel commences:

- f1] Emission data, if available, for a similar vapor recovery and return or disposal system used on the same type of storage vessel, which can be used to determine the efficiency of the system. A complete description of the emission measurement method used must be included.
- f2] The manufacturer's design specifications and estimated emission reduction capability of the system.
- f3] The operation and maintenance plan for the system.
- f4] Any other information which will be useful to the department in evaluating the effectiveness of the system in reducing volatile organic compounds emissions.

e. Alternative means of emission limitation.

- (1) If, in the department's and administrator's judgment, an alternative means of emission limitation will achieve a reduction in emissions at least equivalent to the reduction in emissions achieved by any requirement in subdivision c, the department and administrator will publish a notice permitting the use of the alternative means for purposes of compliance with that requirement.
- (2) Any notice under paragraph 1 of this subdivision will be published only after notice and an opportunity for a hearing.
- (3) Any person seeking permission under this section shall submit to the department and administrator a written application including:
 - (a) An actual emissions test that uses a full-sized or scale-model storage vessel that accurately collects and measures all volatile organic compound emissions from a given control device and that accurately simulates wind and accounts for other emission variables such as temperature and barometric pressure.
 - (b) An engineering evaluation that the department determines is an accurate method of determining equivalence.
- (4) The department and administrator may condition the permission on requirements that may be necessary to

ensure operation and maintenance to achieve the same emissions reduction as specified in subdivision c.

- (5) The primary vapor-mounted seal in the "volume-maximizing seal" manufactured by R.F.I. services corporation is approved as equivalent to the vapor-mounted seal required by item 1 of subparagraph a of paragraph 1 of subdivision c and must meet the gap criteria specified in subitem b of item 1 of subparagraph a of paragraph 1 of subdivision c. There shall be no gaps between the tank wall and any secondary seal used in conjunction with the primary seal in the "volume-maximizing seal".

f. Monitoring of operations.

- (1) Except as provided in paragraph 4 of this subdivision, the owner or operator subject to this subsection shall maintain a record of the petroleum liquid stored, the period of storage, and the maximum true vapor pressure of that liquid during the respective storage period.
- (2) Available data on the typical Reid vapor pressure and the maximum expected storage temperature of the stored product may be used to determine the maximum true vapor pressure from nomographs contained in American petroleum institute bulletin 2517, unless the department specifically requests that the liquid be sampled, the actual storage temperature determined, and the Reid vapor pressure determined from the samples.
- (3) The true vapor pressure of each type of crude oil with a Reid vapor pressure less than 13.8 kilopascals [2.0 psia] or whose physical properties preclude determination by the recommended method is to be determined from available data and recorded if the estimated true vapor pressure is greater than 6.9 kilopascals [1.0 psia].
- (4) The following are exempt from the requirements of this subdivision:
 - (a) Each owner or operator of each storage vessel storing a petroleum liquid with a Reid vapor pressure of less than 6.9 kilopascals [1.0 psia] provided the maximum true vapor pressure does not exceed 6.9 kilopascals [1.0 psia].
 - (b) Each owner or operator of each storage vessel equipped with a vapor recovery and return or

disposal system in accordance with the requirements of subparagraph c of paragraph 1 and paragraph 2 of subdivision c.

11. Standards of performance for volatile organic liquid storage vessels (including petroleum liquid storage vessels) for which construction, reconstruction, or modification commenced after July 23, 1984.

a. Applicability and designation of affected facility.

- (1) Except as provided in paragraphs 2, 3, and 4 of this subdivision, the affected facility to which this subsection applies is each storage vessel with a capacity greater than or equal to forty cubic meters (m^3) that is used to store volatile organic liquids (VOLs) for which construction, reconstruction, or modification is commenced after July 23, 1984.
- (2) Except as specified in paragraphs 1 and 2 of subdivision g, storage vessels with design capacity less than seventy-five cubic meters are exempt from the general provisions (section 33-15-12-01) and from the provisions of this subsection.
- (3) Except as specified in paragraphs 2 and 3 of subdivision g, vessels either with a capacity greater than or equal to one hundred fifty-one cubic meters storing a liquid with a maximum true vapor pressure less than 3.5 kilopascals or with a capacity greater than or equal to seventy-five cubic meters but less than one hundred fifty-one cubic meters storing a liquid with a maximum true vapor pressure less than 15.0 kilopascals are exempt from the general provisions (section 33-15-12-01) and from the provisions of this subsection.
- (4) This subsection does not apply to the following:
 - (a) Vessels at coke oven byproduct plants.
 - (b) Pressure vessels designed to operate in excess of 204.9 kilopascals and without emissions to the atmosphere.
 - (c) Vessels permanently attached to mobile vehicles such as trucks, railcars, barges, or ships.
 - (d) Vessels with a design capacity less than or equal to 1,589.874 cubic meters used for petroleum or condensate stored, processed, or treated prior to custody transfer.

- (e) Vessels located at bulk gasoline plants.
- (f) Storage vessels located at gasoline service stations.
- (g) Vessels used to store beverage alcohol.

b. Definitions. As used in this subsection, all terms not defined herein shall have the meaning given them in North Dakota Century Code chapter 23-25 and subsection 2 of section 33-15-12-01.

- (1) "Bulk gasoline plant" means any gasoline distribution facility that has a gasoline throughput less than or equal to seventy-five thousand seven hundred liters per day. Gasoline throughput shall be the maximum calculated design throughput as may be limited by compliance with an enforceable condition under federal requirement or federal, state, or local law, and discoverable by the department and any other person.
- (2) "Condensate" means hydrocarbon liquid separated from natural gas that condenses due to changes in the temperature or pressure, or both, and remains liquid at standard conditions.
- (3) "Custody transfer" means the transfer of produced petroleum or condensate, or both, after processing or treatment, or both, in the producing operations, from storage vessels or automatic transfer facilities to pipelines or any other forms of transportation.
- (4) "Fill" means the introduction of volatile organic liquids (VOL) into a storage vessel but not necessarily to complete capacity.
- (5) "Gasoline service station" means any site where gasoline is dispensed to motor vehicle fuel tanks from stationary storage tanks.
- (6) "Maximum true vapor pressure" means the equilibrium partial pressure exerted by the stored liquid at the temperature equal to the highest calendar-month average of the liquid storage temperature for liquids stored above or below the ambient temperature or at the local maximum monthly average temperature as reported by the national weather service for liquids stored at the ambient temperature, as determined:
 - (a) In accordance with methods described in American petroleum institute bulletin 2517, evaporation loss from external floating roof tanks, or

- (b) As obtained from standard reference texts; or
- (c) As determined by A.S.T.M. method D2879-83;
- (d) Any other method approved by the department and administrator.

(7) "Reid vapor pressure" means the absolute vapor pressure to volatile crude oil and volatile nonviscous petroleum liquids except liquefied petroleum gases; as determined by A.S.T.M. D323-82.

(8) "Petroleum" means the crude oil removed from the earth and the oils derived from tar sand, shale, and coal.

(9) "Petroleum liquids" means petroleum, condensate, and any finished or intermediate products manufactured in a petroleum refinery.

(10) "Storage vessel" means each tank, reservoir, or container used for the storage of volatile organic liquids but does not include:

(a) Frames, housing, auxiliary supports, or other components that are not directly involved in the containment of liquids or vapors; or

(b) Subsurface caverns or porous rock reservoirs.

(11) "Volatile organic liquid" (VOL) means any organic liquid which can emit volatile organic compounds into the atmosphere except those volatile organic liquids (VOLs) that emit only those compounds which the department has determined do not contribute appreciably to the formation of ozone. These compounds are identified in environmental protection agency statements on ozone abatement policy for SIP revisions (42 FR 35314, 44 FR 32042, 45 FR 32424, and 45 FR 48941).

(12) "Waste" means any liquid resulting from industrial, commercial, mining or agricultural operations, or from community activities that is discarded or is being accumulated, stored, or physically, chemically, or biologically treated prior to being discarded or recycled.

c. Standard for volatile organic compounds (VOC).

(1) The owner or operator of each storage vessel either with a design capacity greater than or equal to one hundred fifty-one cubic meters containing a volatile

organic liquid (VOL) that, as stored, has a maximum true vapor pressure equal to or greater than 5.2 kilopascals but less than 76.6 kilopascals or with a design capacity greater than or equal to seventy-five cubic meters but less than one hundred fifty-one cubic meters containing a volatile organic liquid (VOL) that, as stored, has a maximum true vapor pressure equal to or greater than 27.6 kilopascals but less than 76.6 kilopascals shall equip each storage vessel with one of the following:

(a) A fixed roof in combination with an internal floating roof meeting the following specifications:

{1} The internal floating roof shall rest or float on the liquid surface (but not necessarily in complete contact with it) inside a storage vessel that has a fixed roof. The internal floating roof shall be floating on the liquid surface at all times, except during initial fill and during those intervals when the storage vessel is completely emptied or subsequently emptied and refilled. When the roof is resting on the leg supports, the process of filling, emptying, or refilling shall be continuous and shall be accomplished as rapidly as possible.

{2} Each internal floating roof shall be equipped with one of the following closure devices between the wall of the storage vessel and the edge of the internal floating roof:

{a} A foam-filled or liquid-filled seal mounted in contact with the liquid (liquid-mounted seal). A liquid-mounted seal means a foam-filled or liquid-filled seal mounted in contact with the liquid between the wall of the storage vessel and the floating roof continuously around the circumference of the tank.

{b} Two seals mounted one above the other so that each forms a continuous closure that completely covers the space between the wall of the storage vessel and the edge of the internal floating roof. The lower seal may be

vapor-mounted, but both must be continuous.

- [c] A mechanical shoe seal. A mechanical shoe seal is a metal sheet held vertically against the wall of the storage vessel by springs or weighted levers and is connected by braces to the floating roof. A flexible coated fabric (envelope) spans the annular space between the metal sheet and the floating roof.
- [3] Each opening in a noncontact internal floating roof except for automatic bleeder vents (vacuum breaker vents) and the rim space vents is to provide a projection below the liquid surface.
- [4] Each opening in the internal floating roof except for leg sleeves, automatic bleeder vents, rim space vents, column wells, ladder wells, sample wells, and stub drains is to be equipped with a cover or lid which is to be maintained in a closed position at all times (i.e., no visible gap) except when the device is in actual use. The cover or lid shall be equipped with a gasket. Covers on each access hatch and automatic gauge float well shall be bolted except when they are in use.
- [5] Automatic bleeder vents shall be equipped with a gasket and are to be closed at all times when the roof is floating except when the roof is being floated off or is being landed on the roof leg supports.
- [6] Rim space vents shall be equipped with a gasket and are to be set to open only when the internal floating roof is not floating or at the manufacturer's recommended setting.
- [7] Each penetration of the internal floating roof for the purpose of sampling shall be a sample well. The sample well shall have a slit fabric cover that covers at least ninety percent of the opening.
- [8] Each penetration of the internal floating roof that allows for passage of a column supporting the fixed roof shall have a

flexible fabric sleeve seal or a gasketed sliding cover.

f9} Each penetration of the internal floating roof that allows for passage of a ladder shall have a gasketed sliding cover.

(b) An external floating roof. An external floating roof means a pontoon-type or double-deck type cover that rests on the liquid surface in a vessel with no fixed roof. Each external floating roof must meet the following specifications:

f1} Each external floating roof shall be equipped with a closure device between the wall of the storage vessel and the roof edge. The closure device is to consist of two seals, one above the other. The lower seal is referred to as the primary seal, and the upper seal is referred to as the secondary seal.

fa} The primary seal shall be either a mechanical shoe seal or a liquid-mounted seal. Except as provided in subparagraph d of paragraph 2 of subdivision d, the seal shall completely cover the annular space between the edge of the floating roof and tank wall.

fb} The secondary seal shall completely cover the annular space between the external floating roof and the wall of the storage vessel in a continuous fashion except as allowed in subparagraph d of paragraph 2 of subdivision d.

f2} Except for automatic bleeder vents and rim space vents, each opening in a noncontact external floating roof shall provide a projection below the liquid surface. Except for automatic bleeder vents, rim space vents, roof drains, and leg sleeves, each opening in the roof is to be equipped with a gasketed cover, seal, or lid that is to be maintained in a closed position at all times (i.e., no visible gap) except when the device is in actual use. Automatic bleeder vents are to be closed at all times when the roof is floating except

when the roof is being floated off or is being landed on the roof leg supports. Rim vents are to be set to open when the roof is being floated off the roof leg supports or at the manufacturer's recommended setting. Automatic bleeder vents and rim space vents are to be gasketed. Each emergency roof drain is to be provided with a slotted membrane fabric cover that covers at least ninety percent of the area of the opening.

f3j The roof shall be floating on the liquid at all times (i.e., off the roof leg supports) except during initial fill until the roof is lifted off leg supports and when the tank is completely emptied and subsequently refilled. The process of filling, emptying, or refilling when the roof is resting on the leg supports shall be continuous and shall be accomplished as rapidly as possible.

(c) A closed vent system and control device meeting the following specifications:

f1j The closed vent system shall be designed to collect all volatile organic compounds (VOC) vapors and gases discharged from the storage vessel and operated with no detectable emissions as indicated by an instrument reading of less than five hundred parts per million above background and visual inspections, as determined in subsection 25.

f2j The control device shall be designed and operated to reduce inlet volatile organic compounds (VOC) emissions by ninety-five percent or greater. If a flare is used as the control device, it shall meet the specifications described in the general control device requirements of subsection 14 of section 33-15-12-01.

(d) A system equivalent to those described in subparagraph a, b, or c of paragraph 1 of this subdivision as provided in subdivision e of this subsection.

(2) The owner or operator of each storage vessel with a design capacity greater than or equal to seventy-five cubic meters which contains a volatile organic liquid

(VOL) that, as stored, has a maximum true vapor pressure greater than or equal to 76.6 kilopascals shall equip each storage vessel with one of the following:

(a) A closed vent system and control device as specified in subparagraph c of paragraph 1 of subdivision c.

(b) A system equivalent to that described in subparagraph a of paragraph 2 as provided in subdivision e of this subsection.

d. Testing and procedures. The owner or operator of each storage vessel as specified in paragraph 1 of subdivision c shall meet the requirements of paragraph 1, 2, or 3 of this subdivision. The applicable paragraph for a particular storage vessel depends on the control equipment installed to meet the requirements of subdivision c.

(1) After installing the control equipment required to meet subparagraph a of paragraph 1 of subdivision c (permanently affixed roof and internal floating roof), each owner or operator shall:

(a) Visually inspect the internal floating roof, the primary seal, and the secondary seal (if one is in service), prior to filling the storage vessel with volatile organic liquids (VOL). If there are holes, tears, or other openings in the primary seal, the secondary seal, or the seal fabric or defects in the internal floating roof, or both, the owner or operator shall repair the items before filling the storage vessel.

(b) For vessels equipped with a liquid-mounted or mechanical shoe primary seal, visually inspect the internal floating roof and the primary seal or the secondary seal (if one is in service) through manholes and roof hatches on the fixed roof at least one every twelve months after initial fill. If the internal floating roof is not resting on the surface of the volatile organic liquids (VOL) inside the storage vessel, or there is liquid accumulated on the roof, or the seal is detached, or there are holes or tears in the seal fabric, the owner or operator shall repair the items or empty and remove the storage vessel from service within forty five days. If a failure that is detected during inspections required in this paragraph cannot be repaired within forty five days and if the

vessel cannot be emptied within forty-five days; a thirty-day extension may be requested from the department in the inspection report required in subparagraph c of paragraph 1 of subdivision f. Such a request for an extension must document that alternate storage capacity is unavailable and specify a schedule of actions the company will take that will assure that the control equipment will be repaired or the vessel will be emptied as soon as possible.

(c) For vessels equipped with a double-seal system as specified in subitem b of item 2 of subparagraph a of paragraph 1 of subdivision c:

[1] Visually inspect the vessel as specified in subparagraph d of paragraph 1 of this subdivision at least every five years; or

[2] Visually inspect the vessel as specified in subparagraph b of paragraph 1 of this subdivision.

(d) Visually inspect the internal floating roof, the primary seal, the secondary seal (if one is in service), gaskets, slotted membranes (if any), and sleeve seals (if any) each time the storage vessel is emptied and degassed. If the internal floating roof has defects, the primary seal has holes, tears, or other openings in the seal or the seal fabric, or the secondary seal has holes, tears, or other openings in the seal or the seal fabric, or the gaskets no longer close off the liquid surfaces from the atmosphere, or the slotted membrane has more than ten percent open area, the owner or operator shall repair the items as necessary so that none of the conditions specified in this paragraph exist before refilling the storage vessel with volatile organic liquids (VOL). In no event shall inspections conducted in accordance with this provision occur at intervals greater than ten years in the case of vessels conducting the annual visual inspection as specified in subparagraph b of paragraph 1 of this subdivision and at intervals no greater than five years in the case of vessels specified in subparagraph c of paragraph 1 of this subdivision.

(e) Notify the department in writing at least thirty days prior to the filling or refilling of each storage vessel for which an inspection is

required by subparagraphs a and d of paragraph 1 of this subdivision to afford the department the opportunity to have an observer present. If the inspection required by subparagraph d of paragraph 1 of this subdivision is not planned and the owner or operator could not have known about the inspection thirty days in advance or refilling the tank, the owner or operator shall notify the department at least seven days prior to the refilling of the storage vessel. Notification shall be made by telephone immediately followed by written documentation demonstrating why the inspection was unplanned. Alternatively, this notification including the written documentation may be made in writing and sent by express mail so that it is received by the department at least seven days prior to the refilling.

(2) After installing the control equipment required to meet subparagraph b of paragraph 1 of subdivision c (external floating roof), the owner or operator shall:

(a) Determine the gap areas and maximum gap widths, between the primary seal and the wall of the storage vessel and between the secondary seal and the wall of the storage vessel according to the following frequency:

{1} Measurements of gaps between the tank wall and the primary seal (seal gaps) shall be performed during the hydrostatic testing of the vessel or within sixty days of the initial fill with volatile organic liquids (VOL) and at least once every five years thereafter.

{2} Measurements of gaps between the tank wall and the secondary seal shall be performed within sixty days of the initial fill with volatile organic liquids (VOL) and at least once per year thereafter.

{3} If any source ceases to store volatile organic liquids (VOL) for a period of one year or more, subsequent introduction of volatile organic liquids (VOL) into the vessel shall be considered an initial fill for the purposes of items 1 and 2 of subparagraph a of paragraph 2 of this subdivision.

(b) Determine gap widths and areas in the primary and secondary seals individually by the following procedures:

{1} Measure seal gaps, if any, at one or more floating roof levels when the roof is floating off the roof leg supports.

{2} Measure seal gaps around the entire circumference of the tank in each place where a 0.32-centimeter diameter uniform probe passes freely (without forcing or binding against seal) between the seal and the wall of the storage vessel and measure the circumferential distance of each such location.

{3} The total surface area of each gap described in item 2 of subparagraph b of paragraph 2 of this subdivision shall be determined by using probes of various widths to measure accurately the actual distance from the tank wall to the seal and multiplying each such width by its respective circumferential distance.

(c) Add the gap surface area of each gap location for the primary seal and the secondary seal individually and divide the sum for each seal by the nominal diameter of the tank and compare each ratio to the respective standards in subparagraph d of paragraph 2 of this subdivision.

(d) Make necessary repairs or empty the storage vessel within forty-five days of identification in any inspection for seals not meeting the requirements listed in items 1 and 2 of subparagraph d of paragraph 2 of this subdivision.

{1} The accumulated area of gaps between the tank wall and the mechanical shoe or liquid-mounted primary seal shall not exceed two hundred twelve centimeter squared per meter of tank diameter, and the width of any portion of any gap shall not exceed 3.81 centimeters.

{a} One end of the mechanical shoe is to extend into the stored liquid, and the other end is to extend a minimum vertical distance of sixty-one

centimeters above the stored liquid surface.

[b] There are to be no holes, tears, or other openings in the shoe, seal fabric, or seal envelope.

[2] The secondary seal is to meet the following requirements:

[a] The secondary seal is to be installed above the primary seal so that it completely covers the space between the roof edge and the tank wall except as provided in item 3 of subparagraph b of paragraph 3 of this subdivision.

[b] The accumulated area of gaps between the tank wall and the secondary seal shall not exceed 21.2 centimeters squared per meter of tank diameter, and the width of any portion of any gap shall not exceed 1.27 centimeters.

[c] There are to be no holes, tears, or other openings in the seal or seal fabric.

[3] If a failure that is detected during inspections required in subparagraph a of paragraph 2 of subdivision d cannot be repaired within forty five days and if the vessel cannot be emptied within forty five days, a thirty-day extension may be requested from the department in the inspection report required in subparagraph d of paragraph 2 of subdivision f. Such extension request must include a demonstration of unavailability of alternate storage capacity and a specification of a schedule that will assure that the control equipment will be repaired or the vessel will be emptied as soon as possible.

(e) Notify the department thirty days in advance of any gap measurements required by subparagraph a of paragraph 2 of this subdivision to afford the department the opportunity to have an observer present.

(f) Visually inspect the external floating roof, the primary seal, secondary seal, and fittings each time the vessel is emptied and degassed.

(1) If the external floating roof has defects, the primary seal has holes, tears, or other openings in the seal or the seal fabric, or the secondary seal has holes, tears, or other openings in the seal or the seal fabric, the owner or operator shall repair the items as necessary so that none of the conditions specified in this paragraph exist before filling or refilling the storage vessel with volatile organic liquids (VOL).

(2) For all the inspections required by subparagraph f of paragraph 2 of this subdivision, the owner or operator shall notify the department in writing at least thirty days prior to the filling or refilling of each storage vessel to afford the department the opportunity to inspect the storage vessel prior to refilling. If the inspection required by subparagraph f of paragraph 2 of this subdivision is not planned and the owner or operator could not have known about the inspection thirty days in advance of refilling the tank, the owner or operator shall notify the department at least seven days prior to the refilling of the storage vessel. Notification shall be made by telephone immediately followed by written documentation demonstrating why the inspection was unplanned. Alternatively, this notification including the written documentation may be made in writing and sent by express mail so that it is received by the department at least seven days prior to the refilling.

(3) The owner or operator of each source that is equipped with a closed vent system and control device as required in subparagraph c of paragraph 4 or subparagraph b of paragraph 2 of subdivision c (other than a flare) is exempt from subsection 7 of section 33-15-12-01 of the general provisions and shall meet the following requirements:

(a) Submit for approval by the department as an attachment to the notification required by paragraph 4 of subdivision a of subsection 6 of section 33-15-12-01 or if the facility is exempt

from paragraph 1 of subdivision a of subsection 6 of section 33-15-12-01, as an attachment to the notification required by paragraph 2 of subdivision a of subsection 6 of section 33-15-12-01, an operating plan containing the information listed below:

{1} Documentation demonstrating that the control device will achieve the required control efficiency during maximum loading conditions. This documentation is to include a description of the gas stream which enters the control device, including flow and volatile organic compounds (VOC) content under varying liquid level conditions (dynamic and static) and manufacturer's design specifications for the control device. If the control device or the closed vent capture system receives vapors, gases, or liquids other than fuels from sources that are not designated sources under this subsection, the efficiency demonstration is to include consideration of all vapors, gases, and liquids received by the closed vent capture system and control device. If an enclosed combustion device with a minimum residence time of 0.75 seconds and a minimum temperature of eight hundred sixteen degrees Celsius is used to meet the ninety-five percent requirement, documentation that those conditions will exist is sufficient to meet the requirements of this paragraph.

{2} A description of the parameter or parameters to be monitored to ensure that the control device will be operated in conformance with its design and an explanation of the criteria used for selection of that parameter or parameters.

(b) Operate the closed vent system and control device and monitor the parameters of the closed vent system and control device in accordance with the operating plan submitted to the department in accordance with subparagraph a of paragraph 3 of this subdivision, unless the plan was modified by the department during the review process. In this case, the modified plan applies.

(4) The owner or operator of each source that is equipped with a closed vent system and a flare to meet the requirements in subparagraph c of paragraph 1 or subparagraph b of paragraph 2 of subdivision c shall meet the requirements as specified in the general control device requirements of subdivisions e and f of subsection 14 of section 33-15-12-01.

e. Alternative means of emission limitation.

(1) If, in the department's and administrator's judgment, an alternative means of emission limitation will achieve a reduction in emissions at least equivalent to the reduction in emissions achieved by any requirement in subdivision c, the department and administrator will publish a notice permitting the use of the alternative means for purposes of compliance with that requirement.

(2) Any notice under paragraph 1 of this subdivision will be published only after notice and an opportunity for a hearing.

(3) Any person seeking permission under this subdivision shall submit to the department and administrator a written application including:

(a) An actual emissions test that uses a full-sized or scale model storage vessel that accurately collects and measures all volatile organic compounds (VOC) emissions from a given control device and that accurately simulates wind and accounts for other emission variables such as temperature and barometric pressure.

(b) An engineering evaluation that the department determines is an accurate method of determining equivalence.

(4) The department may condition the permission on requirements that may be necessary to ensure operation and maintenance to achieve the same emissions reduction as specified in subdivision c.

f. Reporting and recordkeeping requirements. The owner or operator of each storage vessel as specified in paragraph 1 of subdivision c shall keep records and furnish reports as required by paragraphs 1, 2, and 3 of this subdivision depending upon the control equipment installed to meet the requirements of subdivision c. The owner or operator shall keep copies of all reports and records required by this subdivision, except for the record required by subparagraph a of paragraph 3, for at

least two years. The record required by subparagraph a of paragraph 3 will be kept for the life of the control equipment.

(1) After installing control equipment in accordance with subparagraph a of paragraph 1 of subdivision c (fixed roof and internal floating roof), the owner or operator shall meet the following requirements:

(a) Furnish the department with a report that describes the control equipment and certifies that the control equipment meets the specifications of subparagraph a of paragraph 1 of subdivision c and subparagraph a of paragraph 1 of subdivision d. This report shall be an attachment to the notification required by paragraph 3 of subdivision a of subsection 6 of section 33-15-12-01.

(b) Keep a record of each inspection performed as required by subparagraphs a, b, c, and d of paragraph 1 of subdivision d. Each record shall identify the storage vessel on which the inspection was performed and shall contain the date the vessel was inspected and the observed condition of each component of the control equipment (seals, internal floating roof, and fittings).

(c) If any of the conditions described in subparagraph b of paragraph 1 of subdivision d are detected during the annual visual inspection required by subparagraph b of paragraph 1 of subdivision d, a report shall be furnished to the department within thirty days of the inspection. Each report shall identify the storage vessel, the nature of the defects, and the date the storage vessel was emptied or the nature of and date the repair was made.

(d) After each inspection required by subparagraph c of paragraph 1 of subdivision d that finds holes or tears in the seal or seal fabric, or defects in the internal floating roof, or other control equipment defects listed in item 2 of subparagraph c of paragraph 1 of subdivision d, a report shall be furnished to the department within thirty days of the inspection. The report shall identify the storage vessel and the reason it did not meet the specifications of subparagraph a of paragraph 1 of subdivision c or subparagraph c of paragraph 1 of subdivision d and list each repair made.

- (2) After installing control equipment in accordance with subparagraph b of paragraph 1 of subdivision c (external floating roof), the owner or operator shall meet the following requirements:
- (a) Furnish the department with a report that describes the control equipment and certifies that the control equipment meets the specifications of subparagraph b of paragraph 1 of subdivision c and subparagraphs b, c, and d of paragraph 2 of subdivision d. This report shall be an attachment to the notification required by paragraph 3 of subdivision a of subsection 6 of section ~~33-15-12-01~~.
 - (b) Within sixty days of performing seal gap measurements required by subparagraph a of paragraph 2 of subdivision d, furnish the department with a report that contains:
 - {1} The date of the measurement.
 - {2} The raw data obtained in the measurement.
 - {3} The calculations described in subparagraphs b and c of paragraph 2 of subdivision d.
 - (c) Keep a record of each gap measurement performed as required by paragraph 2 of subdivision d. Each record shall identify the storage vessel in which the measurement was performed and shall contain:
 - {1} The date of measurement.
 - {2} The raw data obtained in the measurement.
 - {3} The calculations described in subparagraphs b and c of paragraph 2 of subdivision d.
 - (d) After each seal gap measurement that detects gaps exceeding the limitations specified by subparagraph d of paragraph 2 of subdivision d, submit a report to the department within thirty days of the inspection. The report will identify the vessel and contain the information specified in subparagraph b of paragraph 2 of this subdivision and the date the vessel was emptied or the repairs made and date of repair.

(3) After installing control equipment in accordance with subparagraph c of paragraph 1 or subparagraph a of paragraph 2 of subdivision c (closed vent system and control device other than a flare), the owner or operator shall keep the following records:

(a) A copy of the operating plan.

(b) A record of the measured values of the parameters monitored in accordance with subparagraph b of paragraph 3 of subdivision d.

(4) After installing a closed vent system and flare to comply with subdivision c, the owner or operator shall meet the following requirements:

(a) A report containing the measurements required by subsection 7 of section 33-15-12-01 shall be furnished to the department as required by paragraphs 1, 2, 3, 4, 5, and 6 of subdivision f of subsection 14 of section 33-15-12-01. This report shall be submitted within six months of the initial startup date.

(b) Records shall be kept of all periods of operation during which the flare pilot flame is absent.

(c) Semiannual reports of all periods recorded under subparagraph b of paragraph 4 of subdivision f in which the pilot flame was absent shall be furnished to the department.

g. Monitoring of operations:

(1) The owner or operator shall keep copies of all records required by this subdivision, except for the record required by paragraph 2 of this subdivision, for at least two years. The record required by paragraph 2 of this subdivision will be kept for the life of the source.

(2) The owner or operator of each storage vessel as specified in paragraph 1 of subdivision a shall keep readily accessible records showing the dimension of the storage vessel and an analysis showing the capacity of the storage vessel. Each storage vessel with a design capacity less than seventy-five cubic meters is subject to no provision of this subsection other than those required by this paragraph.

(3) Except as provided in paragraphs 6 and 7 of this subdivision, the owner or operator of each storage

vessel either with a design capacity greater than or equal to one hundred fifty-one cubic meters storing a liquid with a maximum true vapor pressure greater than or equal to 3.5 kilopascals or with a design capacity greater than or equal to seventy-five cubic meters but less than one hundred fifty-one cubic meters storing a liquid with a maximum true vapor pressure greater than or equal to 15.0 kilopascals shall maintain a record of the volatile organic liquids (VOL) stored, the period of storage, and the maximum true vapor pressure of that volatile organic liquids (VOL) during the respective storage period.

(4) Except as provided in paragraph 7 of this subdivision, the owner or operator of each storage vessel either with a design capacity greater than or equal to one hundred fifty-one cubic meters storing a liquid with a maximum true vapor pressure that is normally less than 5.2 kilopascals or with a design capacity greater than or equal to seventy-five cubic meters but less than one hundred fifty-one cubic meters storing a liquid with a maximum true vapor pressure that is normally less than 27.6 kilopascals shall notify the department within thirty days when the maximum true vapor pressure of the liquid exceeds the respective maximum true vapor pressure values for each volume range.

(5) Available data on the storage temperature may be used to determine the maximum true vapor pressure as determined below.

(a) For vessels operated above or below ambient temperatures, the maximum true vapor pressure is calculated based upon the highest expected calendar-month average of the storage temperature. For vessels operated at ambient temperatures, the maximum true vapor pressure is calculated based upon the maximum local monthly average ambient temperature as reported by the national weather service.

(b) For crude oil or refined petroleum products the vapor pressure may be obtained by the following:

{+} Available data on the Reid vapor pressure and the maximum expected storage temperature based on the highest expected calendar-month average temperature of the stored product may be used to determine the maximum true vapor pressure from nomographs contained in American petroleum institute bulletin 2517 unless the department

specifically requests that the liquid be sampled; the actual storage temperature determined; and the Reid vapor pressure determined from the samples.

f2} The true vapor pressure of each type of crude oil with a Reid vapor pressure less than ± 3.8 kilopascals or with physical properties that preclude determination by the recommended method to be determined from available data and recorded if the estimated maximum true vapor pressure is greater than 3.5 kilopascals.

(c) For other liquids, the vapor pressure:

f1} May be obtained from standard reference texts; or

f2} Determined by A.S.T.M. method D2879-93; or

f3} Measured by an appropriate method approved by the department and administrator; or

f4} Calculated by an appropriate method approved by the department and administrator.

(6) The owner or operator of each vessel storing a waste mixture of indeterminate or variable composition shall be subject to the following requirements:

(a) Prior to the initial filling of the vessel, the highest maximum true vapor pressure for the range of anticipated liquid compositions to be stored will be determined using the methods described in paragraph 5 of this subdivision.

(b) For vessels in which the vapor pressure of the anticipated liquid composition is above the cutoff for monitoring but below the cutoff for control as defined in paragraph 4 of subdivision c, an initial physical test of the vapor pressure is required; and a physical test at least once every six months thereafter is required as determined by the following methods:

f1} A.S.T.M. method D2879-83;

f2} A.S.T.M. method D323-82;

[3] As measured by an appropriate method as approved by the department and administrator.

(7) The owner or operator of each vessel equipped with a closed vent system and control device meeting the specifications of subdivision c is exempt from the requirements of paragraphs 3 and 4 of this subdivision.

12. Standards of performance for incinerators.

a. Applicability and designation of affected facility. The provisions of this subsection are applicable to each incinerator of more than forty-five metric tons [50 tons] per day charging rate, which is the affected facility. Any facility that commences construction or modification after August 17, 1971, is subject to the requirements of this subsection.

b. Definitions. As used in this subsection, all terms not defined herein shall have the meaning given them in North Dakota Century Code chapter 23-25 and in subsection 2 of section 33-15-12-01.

(1) "Day" means twenty-four hours.

(2) "Incinerator" means any furnace used in the process of burning solid waste for the purpose of reducing the volume of the waste by removing combustible matter.

(3) "Solid waste" means refuse, more than fifty percent of which is municipal-type waste consisting of a mixture of paper, wood, yard wastes, food wastes, plastics, leather, rubber, and other combustibles, and noncombustible materials such as glass and rock.

c. Standard for particulate matter. On and after the date on which the performance test required to be conducted by subsection 7 of section 33-15-12-01 is completed, no owner or operator subject to the provisions of this subsection shall cause to be discharged into the atmosphere from any affected facility any gases which contain particulate matter in excess of 0.18 gram per dry cubic meter at standard conditions [0.08 gr/dscf] corrected to twelve percent carbon dioxide.

d. Monitoring of operations. The owner or operator of any incinerator subject to the provisions of this subsection shall record the daily charging rates and hours of operation.

e. Test methods and procedures.

- (1) In conducting the performance tests required in subsection 7 of section 33-15-12-01, the owner or operator shall use as reference methods and procedures the test methods in appendix A of this chapter or other methods and procedures as specified in this subdivision, except as provided in subdivision b of subsection 7 of section 33-15-12-01.
- (2) The owner or operator shall determine compliance with the particulate matter standard in subdivision c as follows:

- (a) The emission rate (E_{+2}) of particulate matter, corrected to twelve percent carbon dioxide, must be computed for each run using the following equation:

$$E_{+2} = E_s (12/\%CO_2)$$

where:

E_{+2} = concentration of particulate matter, corrected to 12 percent CO_2 , g/dscm (gr/dscf).

E_s = concentration of particulate matter, g/dscm (gr/dscf).

$\%CO_2$ = CO_2 concentration, percent dry basis.

- (b) Method 5 must be used to determine the particulate matter concentration (E_s). The sampling time and sample volume for each run must be at least sixty minutes and 0.85 dry cubic meter at standard conditions {30 dscf}.
- (c) The emission rate correction factor, integrated or grab sampling and analysis procedure of method 3 must be used to determine carbon dioxide concentration ($\%CO_2$).

{1} The carbon dioxide sample must be obtained simultaneously with, and at the same traverse points as, the particulate run. If the particulate run has more than twelve traverse points, the carbon dioxide traverse points may be reduced to twelve if method 4 is used to locate the twelve carbon dioxide traverse points. If individual carbon dioxide samples are taken

at each traverse point, the carbon dioxide concentration $\langle \%CO_2 \rangle$ used in the correction equation must be the arithmetic mean of all the individual carbon dioxide sample concentrations at each traverse point.

{2} If sampling is conducted after a wet scrubber, an "adjusted" carbon dioxide concentration $\langle \%CO_2 \rangle_{adj}$, which accounts for the effects of carbon dioxide absorption and dilution air, may be used instead of the carbon dioxide concentration determined in this paragraph. The adjusted carbon dioxide concentration must be determined by either of the procedures in paragraph 3 of this subdivision.

{3} The owner or operator may use either of the following procedures to determine the adjusted carbon dioxide concentration:

(a) The volumetric flow rates at the inlet and outlet of the wet scrubber and the inlet carbon dioxide concentration may be used to determine the adjusted carbon dioxide concentration $\langle \%CO_2 \rangle_{adj}$ using the following equation:

$$\langle \%CO_2 \rangle_{adj} = \langle \%CO_2 \rangle_{di} \frac{Q_{di}}{Q_{di} + Q_{do}}$$

where:

$\langle \%CO_2 \rangle_{adj}$ = adjusted outlet CO_2 concentration, percent dry basis.

$\langle \%CO_2 \rangle_{di}$ = CO_2 concentration measured before the scrubber, percent dry basis.

Q_{di} = volumetric flow rate of effluent gas before the wet scrubber, dscm/min (dscf/min).

Q_{do} = volumetric flow rate of effluent gas after the wet scrubber, dscm/min (dscf/min).

{1} At the outlet, method 5 is used to determine the volumetric flow rate $\langle Q_{do} \rangle$ of the effluent gas.

{2} At the inlet, method 2 is used to determine the volumetric flow rate $\langle Q_{di} \rangle$ of the

effluent gas as follows: Two full velocity traverses are conducted, one immediately before and one immediately after each particulate run conducted at the outlet, and the results are averaged.

{3} At the inlet, the emission rate correction factor, integrated sampling and analysis procedure of method 3 is used to determine the carbon dioxide concentration $\{(\%CO_2)_{di}\}$ as follows: At least nine sampling points are selected randomly from the velocity traverse points and are divided randomly into three sets, equal in number of points; the first set of three or more points is used for the first run, the second set for the second run, and the third set for the third run. The carbon dioxide sample is taken simultaneously with each particulate run being conducted at the outlet, by traversing the three sampling points (or more) and sampling at each point for equal increments of time.

(b) Excess air measurements may be used to determine the adjusted carbon dioxide concentration $\{(\%CO_2)_{adj}\}$ using the following equation:

$$(\%CO_2)_{adj} = (\%CO_2)_{di} \frac{[(100+\%EA)_i]}{[(100+\%EA)_o]}$$

where:

$(\%CO_2)_{adj}$ = adjusted outlet CO_2 concentration, percent dry basis.

$(\%CO_2)_{di}$ = CO_2 concentration at the inlet of the wet scrubber, percent dry basis.

$\%EA_i$ = excess air at the inlet of the scrubber, percent.

$\%EA_o$ = excess air at the outlet of the scrubber, percent.

{1} A gas sample is collected as in item 3 of subparagraph a of paragraph 3 of this subdivision and the gas samples at both the inlet and outlet locations are analyzed for carbon dioxide, oxygen, and nitrates.

{2} Equation 3-1 of method 3 is used to compute the percentages of excess air at the inlet and outlet of the wet scrubber.

13. Standards of performance for sewage treatment plants.

- a. Applicability and designation of affected facility. The affected facility is each incinerator that combusts wastes containing more than ten percent sewage sludge (dry basis) produced by municipal sewage treatment plants; or each incinerator that charges more than one thousand kilograms {2205 pounds} per day municipal sewage sludge (dry basis). Any facility that commences construction after June 11, 1973, is subject to the requirements of this subsection.
- b. Definitions. As used in this subsection, all terms not defined herein shall have the meaning given them in North Dakota Century Code chapter 23-25 and in subsection 2 of section 33-15-12-01.
- c. Standard for particulate matter. On and after the date on which the performance test required to be conducted by subsection 7 of section 33-15-12-01 is completed, no owner or operator of any sewage sludge incinerator subject to the provisions of this subsection may discharge or cause the discharge into the atmosphere of:
- (1) Particulate matter at a rate in excess of sixty-five hundredths grams per kilogram dry sludge input {1.30 pounds per ton dry sludge input}.
 - (2) Any gases which exhibit twenty percent opacity or greater.
- d. Monitoring of operations.
- (1) The owner or operator of any sludge incinerator subject to the provisions of this subsection shall:
 - (a) Install, calibrate, maintain, and operate a flow measuring device which can be used to determine either the mass or volume of sludge charged to the incinerator. The flow measuring device shall be certified by the manufacturer to have an accuracy of plus or minus five percent over its operating range. Except as provided in paragraph 4 of this subdivision, the flow measuring device must be operated continuously and data recorded during all periods of operation of the incinerator.

- (b) Provide access to the sludge charged so that a well-mixed representative grab sample of the sludge can be obtained.
 - (c) Install, calibrate, maintain, and operate a weighing device for determining the mass of any municipal solid waste charged to the incinerator when sewage sludge and municipal solid waste are incinerated together. The weighing device shall have an accuracy of plus or minus five percent over its operating range.
- (2) The owner or operator of any multiple hearth, fluidized bed, or electric sludge incinerator subject to the provisions of this subsection shall comply with the requirements of paragraph † of this subdivision and:
- (a) For incinerators equipped with a wet scrubbing device, install, calibrate, maintain, and operate a monitoring device that continuously measures and records the pressure drop of the gas flow through the wet scrubbing device. Where a combination of wet scrubbers is used in series, the pressure drop of the gas flow through the combined system must be continuously monitored. The device used to monitor scrubber pressure drop must be certified by the manufacturer to be accurate within plus or minus two hundred fifty pascals (plus or minus one inch water gauge) and must be calibrated on an annual basis in accordance with the manufacturer's instructions.
 - (b) Install, calibrate, maintain, and operate a monitoring device that continuously measures and records the oxygen content of the incinerator exhaust gas. The oxygen monitor must be located upstream of any rabble shaft cooling air inlet into the incinerator exhaust gas stream, fan, ambient air recirculation damper, or any other source of dilution air. The oxygen monitoring device must be certified by the manufacturer to have a relative accuracy of plus or minus five percent over its operating range and must be calibrated according to methods prescribed by the manufacturer at least once each twenty-four hour operating period.
 - (c) Install, calibrate, maintain, and operate temperature measuring devices at every hearth in multiple hearth furnaces; in the bed and outlet of fluidized bed incinerators; and in the

drying, combustion, and cooling zones of electric incinerators. For multiple hearth furnaces, a minimum of one thermocouple must be installed in each hearth in the cooling and drying zones, and a minimum of two thermocouples must be installed in each hearth in the combustion zone. For electric incinerators, a minimum of one thermocouple must be installed in the drying zone and one in the cooling zone, and a minimum of two thermocouples must be installed in the combustion zone. Each temperature measuring device must be certified by the manufacturer to have an accuracy of plus or minus five percent over its operating range. Except as provided in paragraph d of this subdivision, the temperature monitoring device must be operated continuously and data recorded during all periods of operation of the incinerator.

- (d) Install, calibrate, maintain, and operate a device for measuring the fuel flow to the incinerator. The flow measuring device must be certified by the manufacturer to have an accuracy of plus or minus five percent over its operating range. Except as provided in paragraph 4 of this subdivision, the fuel flow measuring device must be operated continuously and data recorded during all periods of operation of the incinerator.
 - (e) Except as provided in paragraph 4 of this subdivision, collect and analyze a grab sample of the sludge fed to the incinerator once per day. The dry sludge content and the volatile solids content of the sample must be determined in accordance with the method specified under subparagraph e of paragraph 2 of subdivision c, except that the determination of volatile solids, step (3)(b) of the method, may not be deleted.
- (3) The owner or operator of any multiple hearth, fluidized bed, or electric sludge incinerator subject to the provisions of this subsection shall retain the following information and make it available for inspection by the department for a minimum of two years:
- (a) For incinerators equipped with a wet scrubbing device, a record of the measured pressure drop of the gas flow through the wet scrubbing

device, as required by subparagraph a of paragraph 2 of this subdivision.

(b) A record of the measured oxygen content of the incinerator exhaust gas, as required by subparagraph b of paragraph 2 of this subdivision.

(c) A record of the rate of sludge charged to the incinerator, the measured temperatures of the incinerator, the fuel flow to the incinerator, and the total solids and volatile solids content of the sludge charged to the incinerator, as required by subparagraph a of paragraph 1 and by subparagraphs c, d, and e of paragraph 2 of this subdivision.

(4) The owner or operator of any multiple hearth, fluidized bed, or electric sludge incinerator subject to the provisions of this subsection from which the particulate matter emission rate measured during the performance test required under paragraph 4 of subdivision e is less than or equal to 0.38 grams per kilogram of dry sludge input [0.75 lb/ton] shall comply with the requirements in paragraphs 1, 2, and 3 of this subdivision during all periods of this incinerator following the performance test except that:

(a) Continuous operation of the monitoring devices and data recorders in subparagraph a of paragraph 1 and subparagraphs c and d of paragraph 2 of this subdivision is not required.

(b) Daily sampling and analysis of sludge feed in subparagraph e of paragraph 2 of this subdivision is not required.

(c) Recordkeeping specified in subparagraph c of paragraph 3 of this subdivision is not required.

(5) The owner or operator of any sludge incinerator other than a multiple hearth, fluidized bed, or electric incinerator or any sludge incinerator equipped with a control device other than a wet scrubber shall submit to the administrator for approval a plan for monitoring and recording incinerator and control device operation parameters. The plan must be submitted to the administrator.

(a) No later than ninety days after October 6, 1988, for sources which have provided notification of

commencement of construction prior to October 6, 1988.

- (b) No later than ninety days after the notification of commencement of construction; for sources which provide notification of commencement of construction on or after October 6, 1988.
- (c) At least ninety days prior to the date on which the new control device becomes operative; for sources switching to a control device other than a wet scrubber.

e. Test methods and procedures.

(1) In conducting the performance tests required in subsection 7 of section 33-15-12-01, the owner or operator shall use as reference methods and procedures the test methods in appendix A of this chapter or other methods and procedures as specified in this section; except as provided for in subdivision b of subsection 7 of section 33-15-12-01.

(2) The owner or operator shall determine compliance with the particulate matter emission standards in subdivision c as follows:

(a) The emission rate (E) of particulate matter for each run must be computed using the following equation:

$$E = K \left(\frac{C_s}{Q_{sd}} \right) / S$$

where:

E = emission rate of particulate matter, g/kg (lb/ton) of dry sludge input.

C_s = concentration of particulate matter, g/dscm (g/dscf).

Q_{sd} = volumetric flow rate of effluent gas, dscm/hr (dscf/hr).

S = charging rate of dry sludge during the run, kg/hr (lb/hr).

K = conversion factor, 1.0 g/g [4.409 lb²/(g-ton)].

(b) Method 5 must be used to determine the particulate matter concentration (C_s) and the volumetric flow rate (Q_{sd}) of the effluent gas.

The sampling time and sample volume for each run must be at least sixty minutes and 0.90 dry cubic meter at standard conditions {31.0 dscf}.

- (c) The dry sludge charging rate (S) for each run must be computed using either of the following equations:

$$S = K_m S_m R_{dm} \theta$$

$$S = K_v S_v R_{dv} \theta$$

where:

S = charging rate of dry sludge, kg/hr (lb/hr).

S_m = total mass of sludge charged, kg (lb).

R_{dm} = average mass of dry sludge per unit mass of sludge charged, mg/mg (lb/lb).

θ = duration of run, min.

K_m = conversion factor, 60 min/hr.

S_v = total volume of sludge charged, m^3 (gal).

R_{dv} = average mass of dry sludge per unit volume of sludge charged, mg/liter (lb/ft³).

K_v = conversion factor, 60×10^{-3} (liter kg min) / (m³ mg hr) {0.021 (ft³ min) / (gal hr)}.

- (d) The flow measuring device of subparagraph a of paragraph 4 of subdivision d must be used to determine the total mass (S_m) or volume (S_v) of sludge charged to the incinerator during each run. If the flow measuring device is on a time rate basis, readings must be taken and recorded at five minute intervals during the run and the total charge of sludge must be computed using the following equations, as applicable:

$$S_m = \sum_{i=1}^n Q_{mi} \theta_i$$

$$S_v = \sum_{i=1}^n Q_{vi} \theta_i$$

where:

Q_{mi} = average mass flow rate calculated by averaging the flow rates at the beginning and end of each interval "i", kg/min (lb/min).

Q_{vi} = average volume flow rate calculated by averaging the flow rates at the beginning and end of each interval "i", m³/min (gal/min).

θ_i = duration of interval "i", min.

(e) Samples of the sludge charged to the incinerator must be collected in nonporous jars at the beginning of each run and at approximately one-hour intervals thereafter until the test ends; and "209 F Method for Solid and Semisolid Samples" must be used to determine dry sludge content of each sample (total solids residue); except that:

{1} Evaporating dishes must be ignited to at least one hundred three degrees Celsius rather than the five hundred fifty degrees Celsius specified in step 3(a)(1).

{2} Determination of volatile residue; step 3(b) may be deleted.

{3} The quantity of dry sludge per unit sludge charged must be determined in terms of mg/liter (lb/ft³) or mg/mg (lb/lb).

{4} The average dry sludge content must be the arithmetic average of all the samples taken during the run.

(f) Method 9 and the procedures in subsection 9 of section 33-15-12-04 must be used to determine opacity.

(3) The owner or operator of any sludge incinerator subject to the provisions of this subsection shall conduct a performance test during which the monitoring and recording devices under subparagraph a of paragraph 4 of subdivision d and subparagraphs a, b, c, and d of paragraph 2 of subdivision d are

installed and operating and for which the sampling and analysis procedures required under subparagraph e of paragraph 2 of subdivision d are performed. The owner or operator shall provide the department at least thirty days' prior notice of the performance test to afford the department the opportunity to have an observer present.

- (a) For incinerators that commenced construction or modification on or before April 18, 1986, the performance test must be conducted within three hundred sixty days of June 1, 1990, unless the monitoring and recording devices required under subparagraph a of paragraph 1 of subdivision d and subparagraphs a, b, c, and d of paragraph 2 of subdivision d were installed and operating and the sampling and analysis procedures required under subparagraph e of paragraph 2 of subdivision d were performed during the most recent performance test and a record of the measurements taken during the performance test is available.
- (b) For incinerators that commence construction or modification after April 18, 1986, the date of the performance test must be determined by the requirements in subsection 7 of section 33-15-12-01.
- (c) For the initial performance test required by paragraph 4 of this subdivision, the three samples collected by test method 5 must be analyzed first for particulate mass and then in one of the following two ways:
 - [1] Two samples must be analyzed by neutron activation for arsenic, cadmium, chromium, copper, nickel, selenium, and zinc, and one sample must be analyzed by atomic absorption for beryllium and lead. The sample analyzed for beryllium and lead must be analyzed according to methods 104 and 12, respectively.
 - [2] Three samples must be analyzed by atomic absorption for arsenic, beryllium, cadmium, chromium, copper, lead, nickel, selenium, and zinc. The samples must be analyzed for arsenic, beryllium, and lead according to methods 108, 104, and 12, respectively. The samples must be analyzed for cadmium, chromium, copper, nickel, selenium, and zinc according to standard analytical

procedures as recommended by atomic absorption equipment manufacturers.

(d) During the initial performance test required by paragraph 4 of this subdivision, sludge samples must be collected for the purpose of determining the metals content of the sludge. Samples must be collected from the sludge charged to the incinerator at the beginning of each run and at approximately thirty-minute intervals thereafter until the test run ends. The sludge samples collected during each test run must be combined into a single composite sample. During the performance test, three composite samples must be generated. The composite samples must be analyzed in one of the following two ways:

{1} The composite samples must be analyzed for arsenic, cadmium, chromium, copper, nickel, selenium, and zinc by neutron activation procedures, and for beryllium and lead by atomic absorption according to methods 104 and 12, respectively.

{2} The composite samples must be analyzed by atomic absorption for arsenic, beryllium, cadmium, chromium, copper, lead, nickel, selenium, and zinc. The samples must be analyzed for arsenic, beryllium, and lead according to methods 108, 104, and 12, respectively. The samples must be analyzed for cadmium, chromium, copper, nickel, selenium, and zinc according to standard analytical procedures as recommended by atomic absorption equipment manufacturers.

(e) The requirements of subparagraphs c and d of paragraph 4 of this subdivision apply only during the first performance test required pursuant to this section.

f. Reporting.

(1) The owner or operator of any multiple hearth, fluidized bed, or electric sludge incinerator subject to the provisions of this subsection shall submit to the department semiannually a report in writing which contains the following:

(a) A record of average scrubber pressure drop measurements for each period of fifteen minutes duration or more during which the pressure drop of the scrubber was less than, by a percentage

specified in this subparagraph, the average scrubber pressure drop measured during the most recent performance test. The percent reduction in scrubber pressure drop for which a report is required must be determined as follows:

{1} For incinerators that achieved an average particulate matter emission rate of 0.38 kilogram per megagram {0.75 lb/ton} dry sludge input or less during the most recent performance test, a scrubber pressure drop reduction of more than thirty percent from the average scrubber pressure drop recorded during the most recent performance test must be reported.

{2} For incinerators that achieved an average particulate matter emission rate of greater than 0.38 kilogram per megagram {0.75 lb/ton} dry sludge input during the most recent performance test, a percent reduction in pressure drop greater than that calculated according to the following equation must be reported:

where:

$$P = -111E + 72.15$$

P = percent reduction in pressure drop; and

E = average particulate matter emissions {kg/megagram}

{b} A record of average oxygen content in the incinerator exhaust gas for each period of one-hour duration or more that the oxygen content of the incinerator exhaust gas exceeds the average oxygen content measured during the most recent performance test by more than three percent.

{2} The owner or operator of any multiple hearth, fluidized bed, or electric sludge incinerator from which the average particulate matter emission rate measured during the performance test required under paragraph 4 of subdivision c exceeds 0.38 kilogram per megagram of dry sludge input {0.75 lb/ton of dry sludge input} shall include in the report for each calendar day that a decrease in scrubber pressure drop or increase in oxygen content of exhaust gas is reported a record of the following: