

UNIVERSITY OF CALIFORNIA - DAVIS/MCCLELLAN NUCLEAR

RESEARCH CENTER REACTOR

SELECTION AND TRAINING PLAN

FOR REACTOR PERSONNEL

DOCUMENT NO. MNRC-0009-DOC-05

September 2021

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UCD/MNRC SELECTION AND
TRAINING PLAN
MNRC-0009-DOC Rev. 05

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1.0 SCOPE

1.1 General

This document provides criteria and requirements for the selection and training of operating personnel for the University of California – Davis/McClellan Nuclear Research Center (UCD/MNRC) research reactor. It addresses the selection, training, initial licensing and responsibilities, requalification, and re-licensing of UCD/MNRC operating personnel.

The training program outlined in this document complies with ANSI/ANS 15.4-1990.

1.2 Definitions

- A. Academic Training: Academic training is successfully completed job level work.
- B. Annually: Occurring every year, interval not to exceed twelve months.
- C. Biennially: Occurring every two years, interval not to exceed twenty-four months from the date of the last occurrence.
- D. Fitness for Duty Examination: An examination conducted by a licensed physician who has the discretion as to which test(s) to administer to determine what drug or substance, if any, an operator is using. These tests include, but are not limited to, physical examination, blood alcohol test, urinalysis, and/or breathalyzer.
- E. Illicit Drugs: Substances controlled under the Federal Controlled Substances Act as amended.
- F. Involvement with Illicit Drugs: The possession, purchase, sale or exchange of illicit drugs; the illegal or non-prescription use of illicit drugs; or the presence of illicit drugs in any screening described in this document.
- G. Licensed: The written authorization issued by the U.S. Nuclear Regulatory Commission (NRC) to an individual to carry out the duties and responsibilities associated with a position requiring licensing.

- H. Licensing: Confirmation in writing by the NRC attesting that an individual is qualified to perform the duties of a specific job based on medical condition, experience, education, training and testing.
- I. Quarterly: Occurring every calendar quarter, interval not to exceed three months.
- J. Screening: The process by which an individual demonstrates the absence (or presence) of illicit drugs in his or her body by submitting a urine specimen for illicit drug testing by an independent laboratory. Any specimen designated as positive must have been evaluated by at least two analytically distinct methodologies.
- K. Substance Abuse: The excessive use or misuse of any drug, including prescription drugs, or alcohol in a manner that has an adverse impact on job performance.
- L. Senior Reactor Operator: An individual who is licensed to direct the activities of reactor operators.
- M. Reactor Operator: An individual who is licensed to manipulate the controls of a reactor and perform reactor related maintenance.
- N. Controls: Apparatus and mechanisms of which the manipulation of directly affects the reactivity, power level, cooling, confinement or other requirements for safe operation of the reactor.
- O. Designated Medical Examiner: An accredited health care provider.
- P. Disqualification or Disqualifying Condition: Something which precludes medical approval for reactor operator licensing.
- Q. Nuclear Experience: Experience acquired in reactor facility startup activities or operation. Experience in design, construction, maintenance or related technical services that are job-related may also be considered. On-the-job training at the reactor facility may qualify as equivalent nuclear experience on a one-for-one time basis. Appropriate research or teaching, or both may be included as nuclear experience.
- R. Nuclear Regulatory Commission (NRC): Regulatory body that issues the license to individuals who meet the training requirements.

- S. On-the-Job Training: A systematic, structured method using a qualified person to provide the required job-related knowledge and skills to a trainee, usually in the actual work place, with proficiency documented.
- T. Research Reactor: A research reactor is a device designed to support a self-sustaining neutron chain reaction for research, development, educational, training or experimental purposes, and which may have provisions for the production of radioisotopes.
- U. Safety-Related Systems: Those systems, structures and components that perform functions necessary to shutdown the reactor and maintain it in a safe shutdown condition, and to minimize radioactive releases to the environment.
- V. Shall, Should and May: The word “shall” is used to denote a requirement; the word “should” to denote a recommendation; and the word “may” to denote permission, neither a requirement nor a recommendation.
- W. Solo Operation: Operation of the reactor controls including monitoring of instrumentation, during reactor operation by a single licensed Senior Reactor Operator, or Reactor Operator not under the direct observation of another Senior Reactor Operator or Reactor Operator.

2.0 FUNCTIONAL LEVELS AND ASSIGNMENTS OF RESPONSIBILITY

2.1 General

UCD/MNRC reactor personnel shall have a combination of academic and performance training, job-related experience, good health, and skills commensurate with their level of responsibility and which provides reasonable assurance that decisions and actions during all normal and abnormal operational situations will be such that the reactor is operated in a safe manner.

Nuclear experience acquired at a nuclear power, test, research or production reactor, or critical facility may qualify on a one-for-one basis (i.e., one year of nuclear experience for one year of research reactor experience as applicable to research reactors).

2.2 Organization

The University of California – Davis/McClellan Nuclear Research Center (UCD/MNRC) reports directly to the University of California – Davis Vice Chancellor for Research. The UCD/MNRC facility is organized and

administratively controlled as shown in the UCD/MNRC Technical Specifications.

2.3 Structure

The UCD/MNRC research reactor facility is under the direct supervision of the UCD/MNRC Director or his/her designated alternate. The UCD/MNRC reactor operating staff consists of the UCD/MNRC Director, the Reactor Supervisor, Senior Reactor Operators and Reactor Operators.

2.4 Responsibilities

A. University of California – Davis Vice Chancellor for Research: The University of California - Davis Vice Chancellor for Research is the license holder for the UCD/MNRC research reactor facility. The University of California – Davis Vice Chancellor for Research is accountable for ensuring all licensing requirements are adhered to in accordance with the USNRC codes and guides. The University of California – Davis Vice Chancellor for Research has delegated the implementation and enforcement authority of these requirements to the UCD/MNRC Director.

B. UCD/MNRC Director: The UCD/MNRC reactor is under the direct control of the UCD/MNRC Director. The UCD/MNRC Director is assigned responsibility and authority for all aspects of UCD/MNRC nuclear safety, security, operations and maintenance. The UCD/MNRC Director reports to the University of California – Davis Vice Chancellor for Research for nuclear safety and licensing matters.

At the time of appointment, the UCD/MNRC Director shall have an advanced professional degree in nuclear engineering or scientific field and experience at the senior engineering or scientific level. The position requires senior level knowledge concerning the policies and guidelines governing nuclear facilities, licensing and operations.

C. Reactor Supervisor: The Reactor Supervisor is responsible to the UCD/MNRC Director for all matters concerning the reactor. The Reactor Supervisor is responsible for directing the day-to-day activities of Senior Reactor Operators and Reactor Operators and for the day-to-day operation and maintenance of the reactor. The Reactor Supervisor shall be licensed as a Senior Reactor Operator.

At the time of appointment, the Reactor Supervisor shall have a minimum of six years of nuclear experience. The individual shall have a recognized baccalaureate or higher degree in an engineering or scientific field.

Education or experience that is job-related may be substituted for a degree on a case-by-case basis. The degree may fulfill four years of the six years of nuclear experience required on a one-for-one time basis. The individual shall receive appropriate facility-specific training based upon a comparison of the individual's background and abilities with the responsibilities and duties of the position.

- D. Senior Reactor Operators: Senior Reactor Operators report to the Reactor Supervisor. Senior Reactor Operators are responsible for directing the activities of Reactor Operators on their assigned shift. Senior Reactor Operators shall be licensed at the Senior Reactor Operator level.

At the time of appointment, the individual shall have received sufficient training at the facility or received a Senior Reactor Operator license (NRC equivalent) elsewhere to satisfy the requirements for licensing as a Senior Reactor Operator. The individual shall also have three years of nuclear experience with at least one year of experience at MNRC. Individuals assigned to Senior Reactor Operator positions shall have a high school diploma or have successfully completed a General Education Development (GED) test. Additional academic training is highly recommended.

- E. Reactor Operators: Reactor Operators report to the Senior Reactor Operator on their assigned shift. Reactor Operators are primarily involved in the manipulation of reactor controls, monitoring of instrumentation, and operation and maintenance of reactor related equipment. Reactor Operators shall be licensed at the Reactor Operator level.

At the time of appointment, the individual shall have received sufficient training at the facility or elsewhere to satisfy the requirements for licensing as a Reactor Operator. Individuals assigned to Reactor Operator positions shall have a high school diploma or have successfully completed a General Education Development (GED) test. Previous job-related experience or education shall also be considered. An individual's ability to successfully complete the training program for the Reactor Operator position and satisfy all job performance requirements should be determining factors for appointment to the position.

3.0 INITIAL TRAINING AND LICENSING

3.1 General

The initial training program has been established to train and qualify individuals for operation and maintenance of the UCD/MNRC research reactor. The content of the training program shall cover the as-built and existing facility, significant facility modifications, current procedures and administrative rules and regulations. Information and requirements for training of individuals to be licensed are given in the following sections.

The initial training program should take into account the previous experience and training of trainees, and shall be commensurate with the level of responsibility. After ensuring the applicant has the necessary level of competence, the UCD/MNRC Director shall send applications for licensing to the NRC, by letter, at least 90 (ninety) days before the desired licensing date. The following shall be provided with the application:

- A. current operational procedures (normal and emergency),
- B. current learning objectives, and
- C. suggested test questions (optional).

3.1.1 Content

The initial program shall carry the trainee through documented stages of academic and on-the-job training such that topics in the following paragraphs are adequately addressed. A trainee who manipulates the controls and performs the functions of a licensed reactor operator shall do so only under the direct supervision of personnel licensed as a Reactor Operator or Senior Reactor Operator. The objective of the initial training program shall be to produce a candidate who anticipates conditions, who communicates well, and who can perform required tasks during normal and abnormal operational situations. Licensing of a candidate as an initial Reactor Operator or Senior Reactor Operator is achieved after successful completion of the training and the following examinations:

3.1.1 (a) Written Examination

A written examination shall be given covering, but not limited to, selected topics listed below:

1. Nuclear Theory and Principles of Operation,
2. Facility Design and Operating Characteristics,
3. Facility Instrumentation and Control Systems,
4. Normal, Abnormal and Emergency Procedures,
5. Radiological Control and Safety,
6. Technical Specifications, to include bases for Senior Reactor Operator candidates,
7. Fuel Handling, and
8. Administrative Controls, Procedures and Regulations.

The minimum acceptance score in any category shall be 70%. Failures in no more than two categories can be made up by reexamination in those specific categories. Failure in more than two categories require repeating the entire examination.

The written examination's categories should be grouped and weighted to meet the needs of the UCD/MNRC facility. The criteria that shall be used for the selection of a specific topic are the applicability to the UCD/MNRC facility and the level of licensing desired, Reactor Operator or Senior Reactor Operator.

Examinations administered to Senior Reactor Operator candidates shall include additional questions and/or tasks commensurate with the additional duties and responsibilities required of that position.

3.1.1(b) Performance Examination

A performance examination shall be given to evaluate operational and/or maintenance skills. Performance testing shall be done under the supervision of supervisors and/or

training staff member, including evaluation of actions taken during actual or simulated abnormal and emergency procedures.

3.1.1(c) Remedial Training and Reexamination

Regardless of the test results, if the individual's test results indicate a deficiency in a critical area that affects safety, security or operational functions, remedial training shall be conducted to correct the deficiency. Correction of the deficiency shall be documented by administration of a reexamination in the critical area.

3.1.2 Licensing

Examinations for licensing shall be administered to each candidate. The NRC shall administer all final licensing examinations in coordination with the UCD/MNRC Director. The NRC may delegate this task to the UCD/MNRC Director (or the UCD/MNRC Director's designee) on a case-by-case basis. The NRC shall grant licensing contingent upon the examinee receiving a passing score on both the written and performance examinations.

3.1.2 (a) NRC Administered Examinations

If the NRC administers the final licensing examinations the UCD/MNRC Director shall ensure that the NRC has a copy of the current procedures (normal and emergency), Technical Specifications, Safety Analysis Report, facility data package (e.g., rod worth curves, equation sheets, etc.), and the initial training and/or requalification program.

3.1.2(b) UCD/MNRC Director Administered Examinations

If the UCD/MNRC Director or the UCD/MNRC Director's designee administers the final licensing examinations, the UCD/MNRC Director shall send to the NRC all documentation on the written and operational examinations given to the candidate to include questions asked, the candidate's responses and the grading criteria used.

3.2 Upgrade to Senior Reactor Operator From Reactor Operator

When the UCD/MNRC Director deems that a licensed reactor operator is eligible to become upgraded to senior reactor operator, the UCD/MNRC

Director shall send application for licensing to the NRC, by letter at least 90 (ninety) days before the desired licensing date. Appropriate operational procedures, learning objectives and optional suggested test questions listed in Section 3.1 shall also be provided with the application.

Upgrade to senior reactor operator from reactor operator does not necessarily require all examinations listed in Section 3.1.1, but rather those deemed necessary by the NRC.

4.0 REQUALIFICATION AND RELICENSING PROGRAM

4.1 General

A program for the periodic requalification of licensed individuals has been established herein. The objectives of the program are to refresh in areas of infrequent operation, to review facility and procedural changes, to address subject matter not reinforced by direct use, and to improve in areas of performance weakness. The program has been designed to evaluate an operator's knowledge and proficiency for continued duty and to retrain where necessary. The program takes into account the specialized nature and mode of operation of the UCD/MNRC research reactor and the background, skill, degree of responsibility and participation of UCD/MNRC reactor operations personnel in related activities. The program reflects UCD/MNRC facility modifications and/or changes in procedures. Individuals knowledgeable of the UCD/MNRC operation shall administer requalification examinations.

This program does not currently include provisions for alternative training programs.

Specific features of the requalification program are:

4.1.1 Schedule

The requalification program shall be conducted over a period not to exceed 24 months to be followed by successive two-year programs.

4.1.2 Content

To formulate the basis for determining the contents of the requalification program, changes in jobs, tasks and participation in related activities should be periodically reviewed. The following shall be adhered to:

4.1.2(a) Lectures

The requalification program shall include preplanned lectures in the categories listed in 3.1.1(a).

4.1.2(b) On-the-Job Training

To maintain active status, each licensed reactor operator shall manipulate the reactor controls and each licensed senior reactor operator shall either manipulate the reactor controls or direct the activities of individuals during reactor control manipulations for a minimum of four hours per calendar quarter in order to demonstrate satisfactory understanding of the operation of and procedures for operating the MNRC reactor. The goals of this on-the-job training shall be consistent with the subject matter in section 4.1.2 (d).

4.1.2(c) Comprehensive Written Examination

A comprehensive written examination covering the categories listed in 3.1.1(a) shall be administered biennially to determine whether weaknesses exist and to identify categories for which retraining and retesting may be required.

The written exam for operators shall include the following topics:

- a) Fundamentals of reactor theory, including fission process, neutron multiplication, source effects, control rod effects, criticality indications, reactivity coefficients, and poison effects.
- b) General design features of the core, including core structure, fuel elements, control rods, core instrumentation, and coolant flow.
- c) Mechanical components and design features of the reactor primary system.
- d) Secondary coolant and auxiliary systems that affect the facility.
- e) Facility operating characteristics during steady state and transient conditions, including coolant chemistry, causes and effects of temperature, pressure and reactivity changes, and

operating limitations and reasons for these operating characteristics.

f) Design, components, and functions of reactivity control mechanisms and instrumentation.

g) Design, components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.

h) Components, capacity, and functions of emergency systems.

i) Shielding, isolation, and containment design features, including access limitations.

j) Administrative, normal, abnormal, and emergency operating procedures for the facility.

k) Purpose and operation of radiation monitoring systems, including alarms and survey equipment.

l) Radiological safety principles and procedures.

m) Procedures and equipment available for handling and disposal of radioactive materials and effluents.

n) Principles of heat transfer thermodynamics and fluid mechanics.

o) Abnormal and emergency procedures, focusing on operator response.

The written exam for senior operators shall also include the following topics as applicable:

a) Conditions and limitations in the facility license.

b) Facility operating limitations in the technical specifications and their bases.

c) Facility licensee procedures required to obtain authority for design and operating changes in the facility.

- d) Radiation hazards that may arise during normal and abnormal situations, including maintenance activities and various contamination conditions.
- e) Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations.
- f) Procedures and limitations involved in initial core loading, alterations in core configuration, control rod programming, and determination of various internal and external effects on core reactivity.
- g) Fuel handling methods and procedures.

4.1.2(d) Annual Operating Examination

An operational examination shall be given annually that requires the senior reactor operator and the reactor operator to demonstrate an understanding of and the ability to perform the actions necessary to accomplish a comprehensive sample of the items listed below:

- a) Perform prestartup procedures for the facility,
- b) Perform a reactor startup, shutdown, and significant power change.
- b) Manipulate the console controls as required to operate the facility during normal, abnormal and emergency conditions specifically loss of coolant; loss of electrical power loss of reactor protection system, malfunction of control rod or rods, fuel cladding failure, and nuclear instrument failure.
- c) Identify annunciators and condition indicating signals and perform appropriate remedial actions,
- d) Identify the instrumentation systems and their significance,
- e) Describe the function of the facility's radiation monitoring system as it pertains to reactor operation,
- f) Demonstrate knowledge of significant radiation hazards and the steps taken to reduce personnel exposure,

- g) Demonstrate knowledge of the facility emergency plan including, as appropriate, the senior reactor operator's or reactor operator's responsibility to decide whether or not the plan should be executed and the duties under the plan, and
- h) Demonstrate that the senior reactor operator or reactor operator can function in the control room in such a way that the facility licensee's procedures are adhered to and that the limitations in it's license and amendments are not violated.
- i) Demonstrate that the senior reactor operator or reactor operator takes the appropriate immediate actions during actual or simulated abnormal and emergency procedures

4.1.2(e) Training on Procedural Changes

Licensed operators shall be trained on changes to the facility documentation, including technical specifications and procedures, before performing licensed duties that are affected by the changes.

4.1.2(f) Review of Normal, Abnormal and Emergency Procedures

All licensed operators shall review the contents of all normal, abnormal and emergency procedures on a regularly scheduled basis.

4.2 Evaluation and Retraining

The same testing and scoring criteria used in the original licensing (Section 3.1.1) shall be used for requalification and re-licensing. Additional requalification training in the form of formal lectures, tutoring, self-study or on-the-job training shall be based on the results of the requalification examinations. The following considerations should be used:

- (a) A score on the written examination equal to or greater than the acceptance criteria may require no additional training,
- (b) A score on the written examination below the acceptance criteria requires additional training in those areas where weakness or deficiencies are indicated. This retraining and retesting shall be completed prior to the operator being re-licensed.

- (c) A score on the written examination of less than 70% requires that an evaluation by the UCD/MNRC Director or designated representative be performed. The evaluation shall determine if the deficiencies require that the individual's duties be suspended pending completion of an accelerated retraining effort. The evaluation shall take into account the individuals' past performance records, supervisor's evaluation and past test scores, as well as current deficiencies. Additional operational examinations may also be given to aid in the evaluation. An individual who fails to achieve a passing score upon reexamination will be suspended from performing licensed duties.
- (d) Regardless of the score, if the evaluation indicates a deficiency in critical area that affects safety, training shall be administered to promptly correct the critical deficiency.
- (e) If a need is identified for an accelerated training program for an operator covering deficiencies in the content within 10 CFR 55.59 paragraphs (c)(4)(i) through (iv) or in section 4.2 (b,c,d) of this document, the facility director shall implement such an accelerated training program on a case-by-case basis. All such accelerated training programs shall be documented and signed off by the facility director once the program has been completed to satisfaction. Such a program may incorporate lectures, on-the-job-training, practical's or any other format needed to address the deficiency.

4.3 Requalification

The UCD/MNRC Director shall ensure that requalification examinations are administered. At the completion of the two-year (24 months) requalification cycle, the UCD/MNRC Director shall certify individuals who have successfully completed the UCD/MNRC requalification program. The NRC's review of the training program ensures personnel are meeting the requirements of the approved program.

4.4 Exemptions

An operator licensee preparing and giving the biennial written comprehensive and annual operating examinations shall be exempt from those examinations. However, an operator licensee shall not be exempt from the written and operating examinations for two consecutive iterations of those examinations.

4.5 Absence from Licensed Functions

An individual who has not actively performed licensed functions for four hours per calendar quarter shall demonstrate to the Reactor Supervisor or the UCD/MNRC Director that his/her knowledge and understanding of the

operation and administration of the UCD/MNRC facility are satisfactory before returning to licensed duties. This shall be accomplished through an interview and evaluation or a written or operational examination or a combination thereof. The individual shall be required to perform a minimum of six (6) hours of shift functions under the direction of a senior reactor operator.

4.6 Relicensing

The NRC operating license for Senior Reactor Operators and Reactor Operators is valid for six years from its issue date, contingent upon the Operator's successful participation and completion of the ongoing Qualification Program. At the conclusion of six years, the licensed operator must be relicensed. For relicensing, the UCD/MNRC Director shall send applications to the NRC by letter at least 90 (ninety) days before the expiration date given on the operator's current license. Documentation as listed in Section 3.1 shall also be provided as necessary to the NRC.

5.0 TRAINING METHODS

5.1 General

The training of UCD/MNRC reactor personnel shall take the form of academic lectures, performance training and self-study. Instructors and evaluators shall have the knowledge and the ability to teach their subject matter or evaluate candidates, or both.

5.2 Self-Study Methods

Self-study methods shall be structured and include appropriate monitoring and measurement of achievement of learning objectives.

5.3 On-the-Job Training

On-the-job training methods shall include instruction, followed by practice, then an evaluation of the trainee's performance.

5.4 Other Methods

Unstructured activities such as participation in facility-related design and safety review groups, experimental activities, related technical presentations and performance of maintenance and calibration activities are important contributors to operational knowledge and should be accounted for.

6.0 MEDICAL CERTIFICATION

6.1 Health Evaluation Responsibility

6.1.1 General Aspects

The primary responsibility for assuring that medically qualified personnel are on-duty rests with the UCD/MNRC Director. The health requirements set forth shall be considered to determine the physical condition and general health of the individual in order to perform certain assigned duties. Each requirement should be considered in the context of the consequences of health-induced operational errors endangering public health and safety. The designated medical examiner shall be conversant with the medical requirements of this document and current ANS/ANSI standards.

6.1.2 Medical Examination Frequency

Licensed UCD/MNRC reactor operators shall be examined biennially for continued medical qualification. The UCD/MNRC Director may request additional examinations as indicated by new requirements in specific situations. The examining physician is the final approval authority on the type and number of examinations needed to meet the requirements of this licensing/requalification program. A licensed physician shall perform all medical examinations. A document shall be sent to the UCD/MNRC Director from the examining physician attesting to an individual having met the medical requirements or not having met those requirements.

6.2 Health Requirements and Disqualifying Conditions

6.2.1 Basis of Requirements

The physical condition and the general health of UCD/MNRC reactor operations personnel shall be such that they are capable of properly operating under normal, abnormal and emergency conditions and able to perform the associated tasks. Conditions that can cause sudden incapacitation such as epilepsy, mental disorder, diabetes, fainting spells and defective hearing or vision are most serious in solo operation, but shall be considered for any operational task that may be assigned.

Many of the conditions indicated above may be accommodated by restricting the activities of the individual, requiring close surveillance of the condition, imposing a temporary medical regime, or requiring a second individual to be present when the individual in question is performing certain assigned duties. As a minimum, the second individual shall be able to shut down the reactor and summon competent help.

6.2.2 General Requirements

6.2.2(a) Capacity

The examinee shall demonstrate stability and capacity for all of the following:

- 1) mental alertness and emotional stability,
- 2) acuity of senses and ability of expression to allow accurate communications by spoken, written or other audible, visible or tactile signals,

- 3) physique, stamina, motor power, range of motion and dexterity as needed to allow ready access to and safe execution of assigned duties.

6.2.2(b) Freedom from Incapacity

The examinee shall be free of any of the following conditions that are considered by the designated medical examiner and the UCD/MNRC Director as significantly predisposing to incapacity for duty:

- 1) mental or physical impairments,
- 2) any medical, surgical or other condition or treatment,
- 3) Any condition, habit or practice, which might result in sudden or unexpected loss of ability to perform duties at required levels of proficiency.

6.2.3 Disqualifying Condition

The presence of any of the following conditions, that have a very high probability of sudden or unexpected incapacitation, unless adequately compensated, shall disqualify the individual for solo operation except as noted. Laboratory tests such as ECG (electrocardiogram), blood and urinalysis, X-rays and other tests should be used to rule out the following disqualifying conditions as applicable:

6.2.3(a) Respiratory Condition

- 1) frequent severe uncontrolled attacks of asthma within the previous two years,
- 2) tracheotomy or laryngectomy, or
- 3) severe chronic pulmonary disease.

6.2.3(b) Cardiovascular Condition

- 1) ischemic heart disease, myocardial infarction, coronary insufficiency or angina pectoris unless thorough history physical examinations, and other test procedures indicate satisfactory cardiac function and reserve,

- 2) heart failures,
- 3) arrhythmia other than benign extrasystole,
- 4) prosthetic valve,
- 5) pacemaker,
- 6) peripheral vascular insufficiency, or
- 7) arterial aneurysm.

6.2.3(c) Endocrine, Nutritional, Metabolic Condition

Diabetes mellitus, uncontrolled diabetes, ketoacidosis, diabetic coma or insulin shock within the previous two years,

- 1) Requirements for use of insulin may disqualify an examinee for solo operation. Well controlled diabetics who require insulin may qualify if history and examination findings indicate assigned duties are within their physical capacity and that such duties and scheduling do not interfere with control measures for their diabetes.
- 2) Stable diabetics adequately controlled by diet or oral medication may be qualified for solo operation.

6.2.3(d) Neurological Condition

History of epilepsy, unless the examinee has remained seizure-free for at least the previous five years with medication or has remained seizure-free during the previous two years without medication.

6.2.3(e) Mental Condition

An established history or clinical diagnoses of any of the following:

- 1) Any psychological or mental condition that could cause impaired alertness, judgment or motor ability. Clinically significant emotional or behavioral problems shall require thorough clinical evaluation that may include psychological testing and psychiatric evaluation.

- 2) A personality disorder that is severe enough to have repeatedly manifested itself by overt bizarre disruptive or similar acts, unless the condition has been relieved. Otherwise, the disorder shall be disqualifying for all operations.
- 3) History or threat of suicide attempt, disqualifying from all operations.
- 4) History of a psychotic disorder, disqualifying from all operations.
- 5) Intake of alcohol that is great enough to damage physical health, and personal or social functioning; or a condition in which alcohol has become a prerequisite to normal functioning.
- 6) Addiction to or dependence on drugs other than alcohol, tobacco, or ordinary caffeine-containing beverages, as evidenced by non-prescribed habitual use of the drug, unless the condition has been cured. Otherwise, the addiction or dependence shall be disqualifying for all operations.

6.2.3(f) Medication

Any medication taken in such a dosage that the taking or temporary delay of taking might be expected to result in very high probability of sudden incapacitation.

6.2.4 Specific Minimum Capacities Required for Medical Certification

6.2.4(a) Ears

Puretone audiometric threshold average better than 30 dB, for speech frequencies 500, 1000, 2000 Hz in better ear with or without the use of a hearing aid. If audiometric scores are unacceptable, qualification may be based upon on-site demonstration to the satisfaction of the facility operator of the examinee's ability to safely detect, interpret and respond to speech and other auditory signals.

6.2.4(b) Eyes

- 1) Near and distant visual acuity 20/40 in better eye, corrected or uncorrected.
- 2) Peripheral vision fields by confrontation to 120° or greater.
- 3) Color vision adequate to distinguish among red, green and orange-yellow signal lamps and any other unique coding required for safe operation of the UCD/MNRC facility as defined by the UCD/MNRC director.
- 4) Adequate depth perception, either by stereopsis or secondary clues as demonstrated by practical test.

6.2.4(c) Respiratory

Free of disqualifying conditions enumerated in 6.2.3(a).

6.2.4(d) Cardiovascular

Normal configuration and function including normal blood pressure with tolerance to postural changes and capacity for exertion during emergencies. The examining physician shall report whether asymmetrical neck and peripheral pulses or resting pulse rates less than 50 or more than 100 beats per minute are normal for the individual and of no significance. If the examination reveals significant cardiac arrhythmia, murmur, untreated hypertension (over 160/100 mm Hg), intolerance to postural changes, cardiac enlargement or other evidence of cardiovascular abnormality, a report of an evaluation shall accompany the medical examination report. This evaluation shall include, but is not limited to an interpretation of an ECG and chest X-ray to indicate whether the condition will cause sudden incapacitation.

6.2.4(e) Muscular-skeletal

Normal symmetrical structure, range of motion and power. If any impairment exists, the applicant shall demonstrate the ability to effectively perform certain assigned duties.

6.2.4(f) Hematopoietic

Normal function.

6.2.4(g) Lymphatic

Normal function.

6.2.4(h) Neurological

Normal central and peripheral nervous system function. Tactile discrimination (stereognosis) sufficient to distinguish among various shapes of control knobs and handles by touch.

6.3 Waiver

6.3.1 Application Requirements and Criteria

If an examinee fails to meet any of the preceding specified minimum requirements but can demonstrate to the satisfaction of the UCD/MNRC Director complete capacity to perform assigned tasks, the designated medical examiner may recommend waiver of that portion of this standard. It is the examinee's responsibility to supply additional information necessary for consideration of the granting of such a waiver. Documentation supporting the waiver shall include:

- 6.3.1(a) Medical history and results of physical examination and other pertinent medical findings;
- 6.3.1(b) Description by the UCD/MNRC Director of specific practical tests and demonstrations of ability to perform certain assigned duties which might be reasonably expected to have a very high probability to be affected by the impairment.
- 6.3.1(c) Letter from the UCD/MNRC Director indicating that the individual can safely perform his/her assigned duties.

6.3.2 Waiver Approval

Request for waivers shall be sent to the NRC. The NRC shall be the final approval authority for granting waivers. Any limitations associated with the waiver shall be detailed in the licensing letter. Examinees who do not meet all requirements for either certification or waiver for unrestricted UCD/MNRC reactor operations may be granted specifically limited approval. The following limitations shall apply.

6.3.2(a) A second person shall be present at the UCD/MNRC facility at all times when the individual is performing certain assigned duties (non-solo operation).

6.3.2(b) A system of communications or checks shall be established such that the second person is alerted when assistance is needed.

6.4 Medical Examination Documentation

Results of prescribed medical examinations shall be documented and the UCD/MNRC Director shall keep appropriate records of the most recent examination.

7.0 FITNESS FOR DUTY

7.1 Purpose

The purpose of the UCD/MNRC fitness for duty program is to achieve a work force and work environment free of illicit drugs and substance abuse by establishing a strong policy against such practices. The risk to public safety, employee safety and facility integrity associated with illicit drugs and substance abuse is high due to the nature of, and the perceptions associated with the nuclear industry.

7.2 Policy

7.2.1 Use of Illicit Drugs and Substance Abuse

All UCD/MNRC reactor operators and senior reactor operators are expected to refrain from the illicit use of drugs (as defined federally not by the State of California) and substance abuse. Such practices are contrary to the maintenance of health and safety in the work place and to the general public, and the performance of superior work expected of all UCD/MNRC employees. Operators found to be involved with illicit drugs or substance abuse will be subject to disciplinary action up to and including termination of employment.

7.2.2 Use of Prescribed Drugs

Any licensed operator using prescribed drugs shall be responsible for informing their supervisor if their ability to perform their licensed duties is affected.

7.2.3 Consumption of Alcohol Prior to Work

UCD/MNRC personnel responsible for reactor and radiation safety shall not consume alcohol five hours before coming to work at the UCD/MNRC research reactor facility.

7.2.4 Unscheduled Callback

If personnel are called in for unscheduled callback, and have consumed alcohol in the last (previous) five hours, they shall assess their capacity to function. If they deem they cannot function as required, they shall ask that the next person on the list be notified.

7.3 Operator Screening

7.3.1 Initial Screening

All offers of employment at the UCD/MNRC facility are contingent upon the applicant's compliance in submitting a urine specimen for illicit drug testing by an independent laboratory. Applicants who fail initial screening are not eligible to work at the UCD/MNRC facility.

7.3.2 Fitness for Duty Examination and Investigative Screening

An operator may be required to submit to a fitness-for-duty examination if reasonable suspicion exists that the operator may be involved with illicit drugs or may be under the influence of illicit drugs or substance abuse while at work. Reasonable suspicion is determined on a case-by-case basis in regard to the specific facts and circumstances involved. Reasonable suspicion may be inferred from, among other things:

- 7.3.2(a) involvement by the operator in a work place accident or an incident or other circumstances which resulted in, or could have resulted in, personnel injury or damage to equipment, and in which a supervisory employee reasonably suspects that the operator was impaired by illicit drugs or substance abuse at the time the acts or omissions contributed to the occurrence of the accident, incident, circumstances; or
- 7.3.2(b) evidence of illicit drug involvement or behavior of an operator which causes a supervisory employee to have reasonable belief, based upon observation of the employee's speech, hearing, motor coordination judgment, appearance, odors, or other observable factors, that the employee is impaired by illicit drugs or substance abuse. In all instances where this belief is based primarily on second-party observation, the supervisor shall make every reasonable effort to confirm these observations directly.

If the operator is required to submit to a fitness-for-duty examination, the UCD/MNRC Director shall inform the examining physician of the reasons for the referral. Based upon the examination and/or the results of the investigative screening test(s), the physician shall render an opinion whether the operator is fit for duty. An operator who fails to pass a fitness-for-duty examination or investigative screening shall be suspended from licensed duties and shall be subject to disciplinary action up to and including termination of employment.

7.3.3 Failure to Comply

Any operator suspected of being involved with illicit drug or substance abuse who refuses to submit to a fitness-for-duty examination and investigative screening shall be suspended from licensed duties and shall be subject to disciplinary action as deemed appropriate.

8.0 DOCUMENTATION AND RECORDS

8.1 Documentation

The qualifications of licensed personnel shall be appropriately documented. The documentation should include:

- 8.1.1 Education, experience, employment history, fitness for duty (as applicable) and medical/physical evaluation.
- 8.1.2 Operating procedures, training, reference material and other documentation used in licensing and requalification.
- 8.1.3 Training program completed.

8.2 Records

Records retention of the qualification, training, retraining, examinations and evaluations of each licensed individual in the organization shall be maintained by the UCD/MNRC Director in accordance with the UCD/MNRC Technical Specifications and should contain the following as a minimum:

- 8.2.1 Records of initial licensing examinations and most recent written requalification examinations, consisting of the candidate's answers and examiners evaluation.
- 8.2.2 Records of initial licensing letter issued by the NRC, amendments, pertinent correspondence and most recent re-licensing, with date.
- 8.2.3 Records of the UCD/MNRC Director's most recent letter certifying that a licensed individual has successfully completed the UCD/MNRC Requalification Program
- 8.2.4 Records of operational examinations.
- 8.2.5 Records of de-licensing.

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