

REQUALIFICATION PROGRAM FOR THE NBSR

LICENSE TR-5

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1.0 INTRODUCTION

The NBSR operator requalification program is designed to provide refresher training to the licensed operator 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 is designed to evaluate an operator's knowledge and proficiency to perform their duties and to retrain where necessary. Emphasis is placed on those subjects necessary for the continued proficiency. Successful completion of the program is required for the operator to continue licensed activities. The program conforms to the applicable content of ANSI/ANS-15.4-2016, "Selection and Training of Personnel for Research Reactors" and ANSI/ANS-3.4-2013 "medical certification and monitoring of personnel requiring operator licenses for nuclear power plants" section 5.7.

2.0 DEFINITIONS

controls. When used with respect to a nuclear reactor, means apparatus and mechanisms the manipulation of which directly affects the reactivity or power level of the reactor.

designated medical examiner. A licensed medical practitioner, either a Doctor of Medicine or a Doctor of Osteopathy, familiar with the medical provisions of this standard and the general responsibilities and work environment of the examinee.

disqualifying or disqualifying conditions. Something that precludes unconditional medical approval for research reactor operator licensing.

license. The written authorization, by the U.S. Nuclear Regulatory Commission (NRC), for an individual to carry out the duties and responsibilities associated with a position requiring licensing.

licensed. See licensee.

licensee. An individual or organization holding a license.

licensing. The confirmation by the NRC of the experience, education, medical condition, training, and testing pertinent to a specific job assignment.

nuclear experience. Experience acquired in reactor facility start-up 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 NBSR may qualify as equivalent experience on a one-for-one time basis. Appropriate research or teaching or both may be includable as nuclear experience.

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.

reactor operator. An individual who is licensed to manipulate the controls of a reactor.

reactor supervisor. An individual as described in the NBSR Technical Specifications and responsible for an operating crew or shift.

research reactor. A research reactor is defined as a device designed to support a self-sustaining neutron chain reaction for research, developmental, educational, training or experimental purposes, and that may have provisions for the production of radioisotopes.

research reactor facility. Includes all areas within which the owner or operator directs authorized activities associated with the reactor.

senior reactor operator. An individual who is licensed to direct the activities of reactor operators. Such an individual is also a reactor operator.

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.

significant power change. A tenfold increase in flux indication above critical or a change in thermal power of at least 1 MW.

solo operation. Operation of the controls, including monitoring of instrumentation, during reactor operation with no other person in the vicinity of the controls.

3.0 GENERAL

3.1 Administration. Responsibility for the administration of the requalification program rests with the Chief, Reactor Operations. The program shall be administered over a period not to exceed 24 months, followed by successive 24 month periods.

3.2 Description. During the 24-month period, the following shall be provided or accomplished:

- (a) Refresher training
- (b) Written examination
- (c) Medical evaluation
- (d) Reactivity manipulations

For every 12-month period the licensed individual shall

- (a) Complete an operating test or evaluation
- (b) Review selected documents, including abnormal and emergency procedures

The operating test or evaluation and Document review shall be completed no later than the last day of the 12th month

3.2.1 Refresher Training. This training shall be provided in critical areas not routinely used by the operator such as emergency planning, response to abnormal conditions, selected topics in radiation protection and reactor operation principles, and changes to facility design and procedures.

3.2.2 Written Examination. Written examinations shall be operationally oriented, practical, and objective. . The number and form of questions shall be selected to best evaluate a

particular examinee, but the number of questions successfully answered shall not preclude attainment of the minimum acceptance score specified in section 3.2.2.1. The exam should be of a multiple choice type, composed of multiple categories, with 20 questions per category, and with four answers per question. The following categories should comprise the exam:

- (a) Theory. Topics include nuclear theory, principles of reactor operations, general and specific facility operating characteristics, and applicable thermodynamics.
- (b) Procedures and Radiological Controls. Topics include normal procedures, abnormal procedures, emergency procedures, radiation protection principles and procedures, administrative rules, and technical specifications.
- (c) Systems. Topics include plant systems, radiation protection systems, instrumentation and controls, and facility protection and engineered safety features.

3.2.2.1 Examination Administration and Evaluation. The minimum acceptance score shall be 70% for each category of the written examination. Individuals who did not achieve passing scores in one or more of the categories listed in section 3.2.2 may be re-examined following retraining in the deficient areas. The Chief, Reactor Operations may waive re-examination in categories with passing scores providing the candidate has demonstrated proficiency in those portions of an examination.

3.2.2.2 Evaluation and Retraining. 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 examination. The following considerations should be used:

- (a) A score on the written examination equal to or greater than the acceptance criterion may require no additional training.
- (b) A score on the written examination below the acceptance criteria in section 3.2.2.1 shall require additional training in those topics where weakness or deficiencies are indicated. This retraining and retesting shall be completed prior to the candidate being relicensed.
- (c) An overall score on the written examination of less than 60% shall require that an evaluation by Chief, Reactor Operations or designated representative be performed. The evaluation shall determine if the deficiencies require that the individual's license be withdrawn pending completion of an accelerated retraining effort. The evaluation shall take into account the individual's past performance record, supervisor's evaluation and past test scores, as well as current deficiencies. Additional oral or operational examinations may also be given to aid in the evaluation. In any case, the individual shall be removed from licensed activities within four months if the candidate cannot achieve passing scores after re-examination.
- (d) Regardless of the score, if the evaluation indicates a deficiency in a critical area that affects safety, training shall be administered to promptly correct the critical deficiency.
- (e) An evaluation of the operating performance of the licensed individual shall be documented. The operational evaluation provides a measure of the knowledge, competence, and dexterity to operate the reactor and to take

proper action in response to situations that may arise. Additional operational training shall be provided to correct performance weaknesses. Such additional training shall be completed prior to the conclusion of the requalification program for that individual.

- 3.2.3 Medical Examination. Each licensed individual shall undergo medical examination and evaluation as part of the requalification program and shall meet the requirements of section 3.2.3.1. The primary responsibility for assuring that qualified personnel are on-duty rests with the Chief, Reactor Operations. The health requirements set forth herein shall be considered to determine the physical condition and general health of the individual in order to perform certain assigned duties as determined by the Chief, Reactor Operations. Each requirement should be considered in the context of the certain assigned duties of the individual as related to the consequences of health-induced operational errors endangering public health and safety. The designated medical examiner shall be conversant with the requirements.

Medical examinations shall be conducted every 2 years with the periodic examination completed no later than the last day of the 12th month of the second year. More frequent examinations may be required if conditions warrant as determined by the Chief, Reactor Operations or upon the recommendation of the designated medical examiner. The physical condition and the general health of an operator shall be such that they are capable of properly carrying out licensed activities under normal, abnormal and emergency conditions and able to perform the associated tasks. Conditions that can cause sudden incapacitation such as coronary heart disease, stroke, epilepsy, some mental disorders, diabetes, fainting spells, impaired hearing or vision, and effects of medication, shall be considered. Many of the conditions indicated above may be accommodated by restricting the activities of the individual, requiring close surveillance of the condition, imposing a 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.

3.2.3.1 General Requirements

- (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) Stamina, motor power, range of motion, and dexterity as needed to allow ready access to and safe execution of certain assigned duties.
- (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 Chief, Reactor Operations as predisposing to incapacity for duty:
- (1) Mental health impairment requirement;
 - i. Minimum Requirements – from ANSI/ANS-3.4 5.7.1. “The operator shall be free from any mental condition that could cause sudden

incapacitation, impaired alertness, impaired judgment, or impaired cognitive ability. The operator shall have the ability to function without mental impairment during routine operations and emergencies and in unusual environments such as, but not limited to, confined or crowded spaces, alone in darkness, at heights, on open grating, and on ladders. This ability shall be determined by the clinical judgment of the examining physician and/or documentation provided by a treating medical provider and in consideration of any evaluation and prognosis by mental health professionals that the examining physician determines necessary.”

ii. Conditional Restrictions – from ANSI/ANS-3.4 5.7.3. “An individual who has a current diagnosis or history of mental disorders (listed in [ANSI/ANS-3.4] Table 3) may meet this standard’s medical requirements. When considering conditional restrictions, the examining physician shall review all available health history, examination findings, and medication and any impairment to the individual’s capacity to perform licensed duties. Evaluation and prognosis by mental health professionals should be considered.

NOTE: The use of a psychotropic drug shall be evaluated by the examining physician to determine potential conditional restrictions. This includes all sedatives, tranquilizers, antipsychotic drugs, antidepressant drugs (including SSRIs [selective serotonin reuptake Inhibitors]), analeptics, anxiolytics, and hallucinogens. The conditional restrictions other than shall take medication as prescribed may be removed, if stable, resolved, no associated disturbance of thought, and no recurrent episodes. When removing the conditional restriction due to discontinuation of a psychotropic medication (or medications), a 3-month monitoring period shall occur prior to the examining physician removing the conditional restriction.”

iii. Examination methods – from ANSI/ANS-3.4 5.7.4. “Examination methods shall include an assessment of the individual’s emotional stability and mental alertness during the examination. Review of the individual’s medical history may alert the examiner to gather further important factual information. Any disclosure of current or previous alcohol or drug problems and/or use of psychotropic drugs shall require further clarification including current status and pertinent medical records. Side effects of the medications shall be considered.”

iv. Monitoring methods – Periodic medical status updates, continuous behavior observation programs, and reporting information from the facility may provide additional information for use in determining mental disorders.

- (2) Physical impairments;
- (3) Any medical, surgical, or other professional treatment;
- (4) Any condition, habit, or practice which might result in sudden or unexpected incapacitation.

- 3.2.3.2 Disqualifying Conditions. The presence of any of the following conditions, that have a high probability of sudden or unexpected incapacitation, unless adequately compensated shall disqualify the individual for unsupervised operation except as noted: Laboratory tests such as electrocardiogram (ECG) blood and urinalysis, x-rays and other tests should be used to rule out disqualifying conditions identified in this section.
- (a) Respiratory Condition
 - (1) Frequent severe uncontrolled attacks of asthma within the previous two years.
 - (2) Tracheostomy or laryngectomy if they severely impair speech or cause shortness of breath.
 - (3) Severe chronic pulmonary disease.
 - (b) Cardiovascular Condition
 - (1) Ischemic heart disease, myocardial infraction, coronary insufficiency or angina pectoris unless thorough history, physical examination, electrocardiogram (ECG), and other test procedures indicate satisfactory cardiac function and reserve.
 - (2) Heart failures.
 - (3) Arrhythmia other than benign extra systoles.
 - (4) Valve replacement.
 - (5) Pacemaker.
 - (6) Implantable defibrillator.
 - (7) Peripheral vascular insufficiency.
 - (8) Arterial aneurysm.
 - (c) Endocrine, Nutritional, Metabolic Conditions
 - (1) Diabetes mellitus. Uncontrolled diabetes, ketoacidosis, diabetic coma, or insulin shock within the previous two years.
 - (i) Stable diabetics adequately controlled by diet or oral medication may be qualified for solo operation.
 - (ii) Insulin dependent stable diabetics may also be qualified for solo operation providing adequate provisions are made to guard against insulin shock as certified by the designated medical examiner.
 - (d) Neurological Condition
 - (1) 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.
 - (e) Mental Health.
 - (1) Mental health conditions (listed in ANSI/ANS-3.4 Table 3), or a past history of their presence, that pose a potential threat to safety shall be disqualifying in accordance with ANSI/ANS-3.4 Table 3. The examining physician shall review and assess any indications of these conditions.
 - (f) Medication. Any medication taken in such a dosage that the taking or temporary delay of taking might be expected to result in high probability of sudden incapacitation.

3.2.3.3 Specific Minimum Capacities Required for Medical Qualification

- (1) Ears. Puretone audiometric threshold average better than 30 dB, for speech frequencies 500, 1000, 2000, and 3000 Hz in better ear with or without the use of a hearing aid. If audiometric scores are unacceptable, qualification may be based upon onsite 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.
- (2) Eyes
 - (a) Near and distant visual acuity 20/40 in better eye, corrected or uncorrected. Corrective lenses may be used only as needed to correct a specific vision deficiency.
 - (b) Field of vision shall be at least 70 degrees in the horizontal meridian in each eye measured by confrontation
 - (c) Color vision adequate to distinguish among red, green, and orange-yellow signal lamps, and any other unique coding if required for safe operation of the particular facility as defined by the facility operator.
- (3) Respiratory. Free of disqualifying conditions enumerated in 3.2.3.2(a).
- (4) 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 sustained) intolerance to postural changes, cardiac enlargement or other evidence to 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 condition will cause sudden incapacitation.
- (5) Musculo-skeletal. Normal symmetrical structure, range of motion and power. If any impairment exists, the applicant shall demonstrate ability to effectively perform certain assigned duties.
- (6) Hematopoietic. Normal function.
- (7) Lymphatic. Normal function.
- (8) Neurological. Normal central and peripheral nervous system function.
Tactile discrimination (Stereognosis) sufficient to distinguish among various shapes of control knobs and handles by touch.

3.2.3.4 Additional Examination. If the results of the examination including medical history are inconclusive, more comprehensive examination and testing as indicated by the designated medical examiner should be performed in order to determine whether or not the individual meets the requirements of section 3.2.3 and is free of disqualifying conditions.

3.2.4 Reactivity Control Manipulations. The licensed individual shall perform a number of reactivity manipulations in any combination of reactor startups, shut-downs, and significant power changes. The recommended number is 10 with the individual having

primary responsibility for at least 5 of those reactivity manipulations. For senior reactor operators, direct supervision of these operations may be considered equivalent to actual performance.

3.2.5 Operating Test or Evaluation. For the first and second 12 month intervals of the requalification period the licensed individual shall complete an operating test or evaluation. The operating test or evaluation shall be completed no later than the last day of the 12th month. At least five tasks selected from Section 3.2.5.1, including a reactor startup and shutdown, shall be performed and evaluated. The performance of the task may be actual or simulated.

3.2.5.1 Examples of tasks to be performed under normal and abnormal circumstances:

(a) Normal Circumstances

- (1) Operations and procedures tasks including pre-startup, restart, and shutdown checklists, reactor startup, shutdown, reactivity manipulations to change power, and application of administrative rules such as tagging of equipment and radiation work permits.
- (2) Other reactivity tasks including fuel movements, insertion and removal of experiments, and rod exchange or movements without power change.
- (3) Maintenance and monitoring tasks including verifying operability of equipment for the purpose of technical specification compliance, routine inspection of the facility, surveillance tests, water chemistry analysis, and demonstrating knowledge of reactor system and auxiliary systems' controls and indications.

(b) Abnormal Circumstances

- (1) Response to alarms and trips such as scrams, rundowns, high radiation, low water level, loss of coolant, loss of flow, and loss of electrical power.
- (2) Emergency action, such as initiation of emergency response to radioactive releases, contaminated personnel, failed fuel, loss of confinement, fire, security violations, and natural disasters.

3.2.6 Document Review. For the first and second 12 month intervals of the requalification period the licensed individual shall review the contents of abnormal and emergency procedures. All licensed individuals shall be cognizant of facility technical specifications, design, and procedure changes in a timely manner.

3.2.7 Relicensing. Licenses may be renewed prior to their expiration upon application and successful completion of the requalification program and medical certification.

3.2.8 Absence from Licensed Functions. Licensed individuals who have not actively performed the functions of an operator or senior operator for a minimum of four hours per calendar quarter shall perform a minimum of six hours of licensed functions under the direction of a qualified individual holding the same or higher level license prior to being reinstated.

3.2.9 Exemptions. At the discretion of the NRC, any portion of the requalification examination and operating evaluation may be waived for the Chief, Reactor Operations or for individuals preparing the requalification examination.

4.0 DOCUMENTATION AND RECORDS

4.1 Documentation. The qualifications of licensed personnel shall be appropriately documented. The documentation should include the following:

- (a) Medical/physical evaluation;
- (b) Copy of the currently valid license;
- (c) Records of requalification program including examinations.

4.2 Records. Records of the qualification, training, retraining, examinations, and evaluations of each licensed individual in the organization shall be retained for the duration of the currently valid license.