COMPARISON OF PUBLISHED CRITERIA (JULY 11, 1967) AND REVISED CRITERIA (JULY 15, 1969)

PUBLISHED VERSION (JULY 11, 1967)

INTRODUCTION

Every applicant for a construction permit is required by the provisions of §50.34 to include the principal design criteria for the proposed facility in the application. These General Design Criteria are intended to be used as guidance in establishing the principal design criteria for a nuclear power plant. The General Design Criteria reflect the predominating experience with water power reactors as designed and located to date, but their applicability is not limited to these reactors. They are considered generally applicable to all power reactors.

Under the Commission's regulations, an applicant must provide assurance that its principal design criteria encompass all those facility design features required in the interest of public health and safety. There may be some power reactor cases for which fulfillment of some of the General Design Criteria may not be necessary or appropriate. There will be other cases in which these criteria are insufficient, and additional criteria must be identified and satisfied by the design in the interest of public safety. It is expected that additional criteria will be needed particularly for unusual sites and environmental conditions, and for new and advanced types of reactors. Within this context, the General Design Criteria should be used as a reference allowing additions or deletions as an individual case may warrant. Departures from the General Design Criteria should be justified.

The criteria are designated as "General Design Criteria for Nuclear Power Plant Construction Permits" to emphasize the key role they assume at this stage of the licensing process. The criteria have been categorized as Category A or Category B. Experience has shown that more definitive information is needed at the construction permit stage for the items listed in Category A than for th[illegible] in Category B.

REVISED VERSION (JULY 15, 1969)

INTRODUCTION

Pursuant to the provisions of § 50.34, applica[illegible] permits must include the principal design criteria [illegible] These General Design Criteria establish minimum req[illegible] principal design criteria for water-cooled nuclear [illegible] design and location to units previously approved fo[illegible] Commission. The General Design Criteria are also c[illegible] applicable to other types of nuclear power units an[illegible] used for guidance in establishing the principal des[illegible] units.

The principal design criteria for a nuclear po[illegible] necessary design, fabrication, construction, testin[illegible] requirements for structures, systems, and component[illegible] that is, structures, systems, and components that p[illegible] consequences or accidents which could cause undue r[illegible] safety of the public. There will be some nuclear p[illegible] these General Design Criteria are not sufficient fo[illegible] tional criteria must be established in the interest [illegible] is expected that additional or different criteria w[illegible] into account unusual sites and environmental condit[illegible] cooled nuclear power units of advanced design. Als[illegible] power units for which fulfillment of some of the Ge[illegible] may not be necessary or appropriate. For units suc[illegible] from the General Design Criteria must be identified

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 1 - QUALITY STANDARDS (Category A)

Those systems and components of reactor facilities which are essential to the prevention of accidents which could affect the public health and safety or to mitigation of their consequences shall be identified and then designed, fabricated, and erected to quality standards that reflect the importance of the safety function to be performed. Where generally recognized codes or standards on design, materials, fabrication, and inspection are used, they shall be identified. Where adherence to such codes or standards does not suffice to assure a quality product in keeping with the safety function, they shall be supplemented or modified as necessary. Quality assurance programs, test procedures, and inspection acceptance levels to be used shall be identified. A showing of sufficiency and applicability of codes, standards, quality assurance programs, test procedures, and inspection acceptance levels used is required.

ALSO SEE PUBLISHED VERSION OF CRITERION 5 (PAGE 6)

REVISED VERSION (JULY 15, 1!

CRITERION 1 - QUALITY STANDARDS AND RECORDS

Structures, systems, and components importa

designed, fabricated, erected, and tested to qua

with the importance of the safety function to be

generally recognized codes and standards are use

Codes and standards shall be supplemented and mo

assure a quality product in keeping with the requ

quality assurance program shall be established a

provide adequate assurance that these structures,

will satisfactorily perform their safety functio

fabrication, erection, and testing of structures,

important to safety shall be maintained by or und

nuclear power plant licensee throughout the life

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 2 - PERFORMANCE STANDARDS (Category A)

Those systems and components of reactor facilities which are essential to the prevention of accidents which could affect the public health and safety or to mitigation of their consequences shall be designed, fabricated, and erected to performance standards that will enable the facility to withstand, without loss of the capability to protect the public, the additional forces that might be imposed by natural phenomena such as earthquakes, tornadoes, flooding conditions, winds, ice, and other local site effects. The design bases so established shall reflect: (a) appropriate consideration of the most severe of these natural phenomena that have been recorded for the site and the surrounding area and (b) an appropriate margin for withstanding forces greater than those recorded to reflect uncertainties about the historical data and their suitability as a basis for design.

REVISED VERSION (JULY 15, 196

CRITERION 2 - DESIGN BASES FOR PROTECTION AGAINST NAT

Structures, systems, and components important to the effects of natural phenomena such as earthquakes, floods, tsunami, and seiches without loss of capabili safety functions. The design bases for these structu components shall reflect: (1) appropriate considerat of the natural phenomena that have been historically and surrounding area, (2) an appropriate margin for t quantity, and period of time in which the historical lated, (3) appropriate combinations of the effects of conditions with the effects of the natural phenomena of the safety function to be performed.

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 3 - FIRE PROTECTION (Category A)

The reactor facility shall be designed (1) to minimize the probability of events such as fires and explosions and (2) to minimize the potential effects of such events to safety. Noncombustible and fire resistant materials shall be used whenever practical throughout the facility, particularly in areas containing critical portions of the facility such as containment, control room, and components of engineered safety features.

REVISED VERSION (JULY 15,

CRITERION 3 - FIRE PROTECTION

Structures, systems, and components importa
designed and located to minimize the probability
explosions. Noncombustible and heat resistant m
wherever practicable throughout the unit particu
the containment and control room. Fire detectio
appropriate capacity and capability shall be pro
minimize the adverse effects of fires on structu
important to safety. Fire fighting systems shall
their rupture or inadvertent operation does not s
capability of these structures, systems, and comp

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 4 - SHARING OF SYSTEMS (Category A)

Reactor facilities shall not share systems or components unless it is shown safety is not impaired by the sharing.

REVISED VERSION (JULY

CRITERION 5 - SHARING OF STRUCTURES, SYSTEMS, A

Structures, systems, and components importa shared between nuclear power units unless it is to perform their safety functions is not signifi sharing.

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 5 - RECORDS REQUIREMENTS (Category A)

Records of the design, fabrication, and construction of essential components of the plant shall be maintained by the reactor operator or under its control throughout the life of the reactor.

ALSO SEE PUBLISHED VERSION OF CRITERION 1 (PAGE 2)

REVISED VERSION (JULY 15,

CRITERION 1 - QUALITY STANDARDS AND RECORDS

Structures, systems, and components importa designed, fabricated, erected, and tested to qua with the importance of the safety function to be generally recognized codes and standards are use Codes and standards shall be supplemented and mc assure a quality product in keeping with the rec quality assurance program shall be established a provide adequate assurance that these structures will satisfactorily perform their safety functic fabrication, erection, and testing of structures important to safety shall be maintained by or ur nuclear power plant licensee throughout the life

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 6 - REACTOR CORE DESIGN (Category A)

The reactor core shall be designed to function throughout its design lifetime, without exceeding acceptable fuel damage limits which have been stipulated and justified. The core design, together with reliable process and decay heat removal systems, shall provide for this capability under all expected conditions of normal operation with appropriate margins for uncertainties and for transient situations which can be anticipated, including the effects of the loss of power to recirculation pumps, tripping out of a turbine generator set, isolation of the reactor from its primary heat sink, and loss of all off-site power.

REVISED VERSION (JULY :

CRITERION 10 - REACTOR DESIGN

The reactor core and associated coolant systems shall be designed with appropriate m acceptable fuel damage limits are not exceed system designs shall assure this fuel integr normal operation, including the effects of a rences such as loss of power to recirculatio the capability of the reactor coolant makeup generator set, isolation of the main conden power.

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 7 - SUPPRESSION OF POWER OSCILLATIONS (Category B)

The core design, together with reliable controls, shall ensure that power oscillations which could cause damage in excess of acceptable fuel damage limits are not possible or can be readily suppressed.

REVISED VERSION (JUL

CRITERION 12 - SUPPRESSION OF REACTOR POWE

The reactor core and associated coola systems shall be designed to assure that p cause damage in excess of specified accept not possible or can be reliably and readil

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 8 - OVERALL POWER COEFFICIENT (Category B)

The reactor shall be designed so that the overall power coefficient in the power operating range shall not be positive.

REVISED VERSION (JULY

CRITERION 11 - REACTOR INHERENT PROTECTION

The reactor core and associated coolant so that in the power operating range the effe feedback characteristics tends to compensate reactivity.

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 9 - REACTOR COOLANT PRESSURE BOUNDARY (Category A)

The reactor coolant pressure boundary shall be designed and constructed so as to have an exceedingly low probability of gross rupture or significant leakage throughout its design lifetime.

REVISED VERSION (JULY 15, :

CRITERION 14 - REACTOR COOLANT PRESSURE BOUNDARY

The reactor coolant pressure boundary shall be erected, and tested so as to have an extremely low leakage, rapidly propagating failure, or gross rupt

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 10 - CONTAINMENT (Category A)

Containment shall be provided. The containment structure shall be designed to sustain the initial effects of gross equipment failures, such as a large coolant boundary break, without loss of required integrity and, together with other engineered safety features as may be necessary, to retain for as long as the situation requires the functional capability to protect the public.

REVISED VERSION (JULY 15

CRITERION 16 - CONTAINMENT DESIGN

Reactor containment shall be provided. Th
systems shall be designed to provide an essenti
against the uncontrolled release of radioactivi
to assure that the containment design condition
long as any postulated accident condition requi

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 11 - CONTROL ROOM (Category B)

The facility shall be provided with a control room from which actions to maintain safe operational status of the plant can be controlled. Adequate radiation protection shall be provided to permit access, even under accident conditions, to equipment in the control room or other areas as necessary to shut down and maintain safe control of the facility without radiation exposures of personnel in excess of 10 CFR 20 limits. It shall be possible to shut the reactor down and maintain it in a safe condition if access to the control room is lost due to fire or other cause.

REVISED VERSION (JULY

CRITERION 19 - CONTROL ROOM

A control room shall be provided from wh
to operate the nuclear power unit safely unde
to maintain it in a safe condition under acci
loss-of-coolant accidents. Adequate radiatio
room shall be provided to permit access and o
conditions without personnel receiving radiat
5 rem whole body, or its equivalent to any pa:
duration of the accidents.

Equipment at appropriate locations outsi‹
provided (1) having a design capability for p›
reactor, including necessary instrumentation a
unit in a safe condition during hot shutdown a
capability for subsequent cold shutdown of the
suitable emergency procedures.

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 12 - INSTRUMENTATION AND CONTROL SYSTEMS (Category B)

Instrumentation and controls shall be provided as required to monitor and maintain variables within prescribed operating ranges.

CRITERION 13 - FISSION PROCESS MONITORS AND CONTROLS (Category B)

Means shall be provided for monitoring and maintaining control over the fission process throughout core life and for all conditions that can reasonably be anticipated to cause variations in reactivity of the core, such as indication of position of control rods and concentration of soluble reactivity control poisons.

REVISED VERSION (JUI

CRITERION 13 - REACTOR INSTRUMENTATI

Instrumentation and control sha

variables and systems which can affe

integrity of the reactor core are mo

prescribed operating ranges.

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 14 - CORE PROTECTION SYSTEMS (Category B)

Core protection systems, together with associated equipment, shall be designed to act automatically to prevent or to suppress conditions that could result in exceeding acceptable fuel damage limits.

CRITERION 15 - ENGINEERED SAFETY FEATURES PROTECTION SYSTEMS (Category B)

Protection systems shall be provided for sensing accident situations and initiating the operation of necessary engineered safety features.

REVISED VERSION (JULY

CRITERION 20 - PROTECTION SYSTEM FUNCTION

The protection systemshall be design to assure that specified acceptable fuel as a result of anticipated operational oc accident conditions and to initiate the o components important to safety.

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 16 - MONITORING REACTOR COOLANT PRESSURE BOUNDARY (Category B)

Means shall be provided for monitoring the reactor coolant pressure boundary to detect leakage.

REVISED VERSION (JULY 15, 19

CRITERION 30 - QUALITY OF REACTOR COOLANT PRESSURE B

Components within the reactor coolant pressure designed, fabricated, erected, and tested to the hig standards practicable. Means shall be provided for to the extent practicable, identifying the location reactor coolant leakage.

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 17 - MONITORING RADIOACTIVITY RELEASES (Category B)

Means shall be provided for monitoring the containment atmosphere, the facility effluent discharge paths, and the facility environs for radioactivity that could be released from normal operations, from anticipated transients, and from accident conditions.

REVISED VERSION (JULY 1

CRITERION 64 - MONITORING RADIOACTIVITY RELEASE

Means shall be provided for monitoring the atmosphere, spaces containing components for re coolant accident fluids, effluent discharge pat for radioactivity that may be released from nor anticipated operational occurrences, and from p

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 18 - MONITORING FUEL AND WASTE STORAGE (Category B)

Monitoring and alarm instrumentation shall be provided for fuel and waste storage and handling areas for conditions that might contribute to loss of continuity in decay heat removal and to radiation exposures.

REVISED VERSION (JULY

CRITERION 63 - MONITORING FUEL AND WASTE STORA

Instrumentation shall be provided in fuel active waste systems and associated handling a conditions that may result in loss of decay he excessive radiation levels and (2) to initiate actions.

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 19 - PROTECTION SYSTEMS RELIABILITY (Category B)

Protection systems shall be designed for high functional reliability and in-service testability commensurate with the safety functions to be performed.

CRITERION 20 - PROTECTION SYSTEMS REDUNDANCY AND INDEPENDENCE (Category B)

Redundancy and independence designed into protection systems shall be sufficient to assure that no single failure or removal from service of any component or channel of a system will result in loss of the protection function. The redundancy provided shall include, as a minimum, two channels of protection for each protection function to be served. Different principles shall be used where necessary to achieve true independence of redundant instrumentation components.

ALSO SEE PUBLISHED VERSION OF CRITERION 25 (PAGE 23)

REVISED VERSION (JULY 15, 196

CRITERION 21 - PROTECTION SYSTEM RELIABILITY AND TES

The protection system shall be designed for hig and inservice testability commensurate with the safe performed. Redundancy and independence designed int shall be sufficient to assure that (1) no single fai of the protection function and (2) removal from serv channel does not result in loss of redundancy. Mea for testing the protection system when the reactor i determine failures and losses of redundancy and ind occurred.

"DIFFERENT PRINCIPLES..."COVERED B

OF CRITERION 22 (PAGE 21)

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 21 - SINGLE FAILURE DEFINITION (Category B)

Multiple failures resulting from a single event shall be treated as a single failure.

REVISED VERSION (JULY 15,

SINGLE FAILURE

A single failure means an occurrence which bility of a structure, system, or component to p Multiple failures resulting from a single occurr a single failure.

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 22 - SEPARATION OF PROTECTION AND CONTROL INSTRUMENTATION SYSTEMS (Category B)

Protection systems shall be separated from control instrumentation systems to the extent that failure or removal from service of any control instrumentation system component or channel, or of those common to control instrumentation and protection circuitry, leaves intact a system satisfying all requirements for the protection channels.

REVISED VERSION (JULY

CRITERION 24 - SEPARATION OF PROTECTION AND C(

The protection system shall be separated the extent that failure or removal from servi(component or channel, or any one of those com(tection systems, leaves intact a system satis redundancy, testability, and independence req(protection system.

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 23 - PROTECTION AGAINST MULTIPLE DISABILITY FOR PROTECTION SYSTEMS (Category B)

The effects of adverse conditions to which redundant channels or protection systems might be exposed in common, either under normal conditions or those of an accident, shall not result in loss of the protection function.

ALSO SEE PUBLISHED VERSION OF CRITERION 20 (PAGE 18)

REVISED VERSION (JULY 15, 19

CRITERION 22 - PROTECTION SYSTEM INDEPENDENCE

The effects of adverse conditions to which re protection system may be exposed in common, either or those of an accident, shall not result in loss tion, or shall be demonstrated to be acceptable on basis. Design techniques, such as diversity in co principles of operation, shall be used to the exte prevent loss of the protection function in the eve nonrandom, concurrent failures of redundant elemen

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 24 - EMERGENCY POWER FOR PROTECTION SYSTEMS (Category B)

In the event of loss of all offsite power, sufficient alternate sources of power shall be provided to permit the required functioning of the protection systems.

ALSO SEE PUBLISHED VERSION OF CRITERION 39 (PAGE 33)

REVISED VERSION (JULY 15

CRITERION 17 - ELECTRICAL POWER SYSTEMS

Onsite and offsite electrical power systems
sufficient capacity and capability to assure that
fuel damage limits and design conditions of the r
boundary are not exceeded during anticipated oper
(2) the core is cooled and containment integrity
are maintained following postulated accidents. T
for the onsite and offsite electrical power syste
provide sufficient capacity to permit functioning
and components important to safety. Offsite elec
provided to the site preferably by two physically
lines. The onsite system and the onsite portions
shall be designed with sufficient independency, r
to perform their safety function assuming failure
nent. Provisions shall be included to minimize t
offsite electrical power as a result of or coinci
electrical power generated by the nuclear power u

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 25 - DEMONSTRATION OF FUNCTIONAL OPERABILITY OF PROTECTION SYSTEMS (Category B)

Means shall be included for testing protection systems while the reactor is in operation to demonstrate that no failure or loss of redundancy has occurred.

ALSO SEE PUBLISHED VERSION OF CRITERIA 19 AND 20 (PAGE 18)

REVISED VERSION (JULY 15,

CRITERION 21 - PROTECTION SYSTEM RELIABILITY AND

The protection system shall be designed for and inservice testability commensurate with the s performed. Redundancy and independence designed shall be sufficient to assure that (1) no single of the protection function and (2) removal from s channel does not result in loss of redundancy. M for testing the protection system when the reacto determine failures and losses of redundancy and i occurred.

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 26 - PROTECTION SYSTEMS FAIL-SAFE DESIGN (Category B)

The protection systems shall be designed to fail into a safe state or into a state established as tolerable on a defined basis if conditions such as disconnection of the system, loss of energy (e.g., electric power, instrument air), or adverse environments (e.g., extreme heat or cold, fire, steam, or water) are experienced.

REVISED VERSION (JULY 1

CRITERION 23 - PROTECTION SYSTEM FAILURE MO

The protection system shall be designe
or into a state demonstrated to be acceptab
basis if conditions such as disconnection o
(e.g., electric power, instrument air), or
ments (e.g., extreme heat or cold, fire, pr
radiation) are experienced.

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 27 - REDUNDANCY OF REACTIVITY CONTROL (Category A)

At least two independent reactivity control systems, preferably of different principles, shall be provided.

CRITERION 28 - REACTIVITY HOT SHUTDOWN CAPABILITY (Category A)

At least two of the reactivity control systems provided shall independently be capable of making and holding the core subcritical from any hot standby or hot operating condition, including those resulting from power changes, sufficiently fast to prevent exceeding acceptable fuel damage limits.

CRITERION 29 - REACTIVITY SHUTDOWN CAPABILITY (Category A)

At least one of the reactivity control systems provided shall be capable of making the core subcritical under any condition (including anticipated operational transients) sufficiently fast to prevent exceeding acceptable fuel damage limits. Shutdown margins greater than the maximum worth of the most effective control rod when fully withdrawn shall be provided.

CRITERION 30 - REACTIVITY HOLDDOWN CAPABILITY (Category B)

At least one of the reactivity control systems provided shall be capable of making and holding the core subcritical under any conditions with appropriate margins for contingencies.

REVISED VERSION (JULY 15,

CRITERION 26 - REACTIVITY CONTROL SYSTEM REDI

Two independent reactivity control syst
design principles, shall be provided. Each s
bility to control reactivity changes (includi
from planned, normal power changes without ex
damage limits. One of the systems shall be c
reactivity changes to assure that under condi
including anticipated operational occurrences
for malfunctions such as stuck rods, specifie
are not exceeded. One of the systems shall b
reactor core subcritical under cold condition

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 31 - REACTIVITY CONTROL SYSTEMS MALFUNCTION (Category B)

The reactivity control systems shall be capable of sustaining any single malfunction, such as, unplanned continuous withdrawal (not ejection) of a control rod, without causing a reactivity transient which could result in exceeding acceptable fuel damage limits.

REVISED VERSION (JULY 15

CRITERION 25 - PROTECTION SYSTEM REQUIREMENTS FOF MALFUNCTIONS

The protection system shall be capable of pı single malfunction of the reactivity control syst withdrawal (not ejection or dropout) of control ı soluble poison, without exceeding acceptable fuel

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 32 - MAXIMUM REACTIVITY WORTH OF CONTROL RODS (Category A)

Limits, which include considerable margin, shall be placed on the maximum reactivity worth of control rods or elements and on rates at which reactivity can be increased to ensure that the potential effects of a sudden or large change of reactivity cannot (a) rupture the reactor coolant pressure boundary or (b) disrupt the core, its support structures, or other vessel internals sufficiently to impair the effectiveness of emergency core cooling.

CRITERION 33 - REACTOR COOLANT PRESSURE BOUNDARY CAPABILITY (Category A)

The reactor coolant pressure boundary shall be capable of accommodating without rupture, and with only limited allowance for energy absorption through plastic deformation, the static and dynamic loads imposed on any boundary component as a result of any inadvertent and sudden release of energy to the coolant. As a design reference, this sudden release shall be taken as that which would result from a sudden reactivity insertion such as rod ejection (unless prevented by positive mechanical means), rod dropout, or cold water addition.

REVISED VERSION (JULY 15

CRITERION 28 - REACTIVITY LIMITS FOR ACCIDE

The reactivity control systems shall b
limits on the potential amount and rate of
assure that the effects of postulated react
(1) result in damage to the reactor coolant
than limited local yielding nor (2) suffici
its support structures, or other reactor pr
to impair significantly the capability to c
reactivity accidents shall include consider
(unless prevented by positive means), rod d
coolant temperature and pressure, and cold

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 34 - REACTOR COOLANT PRESSURE BOUNDARY RAPID PROPAGATION FAILURE PREVENTION (Category A)

The reactor coolant pressure boundary shall be designed to minimize the probability of rapidly propagating type failures. Consideration shall be given (a) to the notch-toughness properties of materials extending to the upper shelf of the Charpy transition curve, (b) to the state of stress of materials under static and transient loadings, (c) to the quality control specified for materials and component fabrication to limit flaw sizes, and (d) to the provisions for control over service temperature and irradiation effects which may require operational restrictions.

REVISED VERSION (JULY 15, 1

CRITERION 14 - REACTOR COOLANT PRESSURE BOUNDA

The reactor coolant pressure boundary sha erected, and tested so as to have an extremely leakage, rapidly propagating failure, or gross

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 35 - REACTOR COOLANT PRESSURE BOUNDARY BRITTLE FRACTURE PREVENTION (Category A)

Under conditions where reactor coolant pressure boundary system components constructed of ferritic materials may be subjected to potential loadings, such as a reactivity-induced loading, service temperatures shall be at least 120°F above the nil ductility transition (NDT) temperature of the component material if the resulting energy release is expected to be absorbed by plastic deformation or 60°F above the NDT temperature of the component material if the resulting energy release is expected to be absorbed within the elastic strain energy range.

REVISED VERSION (JULY 15, 19

CRITERION 31 - FRACTURE PREVENTION OF REACTOR

The fracture toughness properties and th the reactor coolant pressure boundary shall a under operating, testing, and postulated acci

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 36 - REACTOR COOLANT PRESSURE BOUNDARY SURVEILLANCE (Category A)

Reactor coolant pressure boundary components shall have provisions for inspection, testing, and surveillance by appropriate means to assess the structural and leaktight integrity of the boundary components during their service lifetime. For the reactor vessel, a material surveillance program conforming with ASTM-E-185-66 shall be provided.

REVISED VERSION (JULY 15

CRITERION 32 - DESIGN OF COMPONENTS WITHIN REAC BOUNDARY

Components within the reactor coolant pres designed to permit periodic inspection and test and features, including an appropriate material the reactor pressure vessel, to assess their st integrity.

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 37 - ENGINEERED SAFETY FEATURES BASIS FOR DESIGN (Category A)

Engineered safety features shall be provided in the facility to back up the safety provided by the core design, the reactor coolant pressure boundary, and their protection systems. As a minimum, such engineered safety features shall be designed to cope with any size reactor coolant pressure boundary break up to and including the circumferential rupture of any pipe in that boundary assuming unobstructed discharge from both ends.

REVISED VERSION (JULY 15,

LOSS-OF-COOLANT ACCIDENTS

Loss-of-coolant accidents mean those post from the loss of reactor coolant at a rate in the reactor coolant makeup system from any siz vessels, pumps, and valves connected to the re within the reactor coolant pressure boundary, in these components equivalent in size to the largest pipe of the reactor coolant system.

ALSO COVERED BY REQUIRING INDIVIDU VERSION OF CRITERIA 16, 17, 35, 38 33, 37, 43, 62 AND 63)

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 38 - RELIABILITY AND TESTABILITY OF ENGINEERED SAFETY FEATURES (Category A)

All engineered safety features shall be designed to provide high functional reliability and ready testability. In determining the suitability of a facility for a proposed site, the degree of reliance upon and acceptance of the inherent and engineered safety afforded by the systems, including engineered safety features, will be influenced by the known and the demonstrated performance capability and reliability of the systems, and by the extent to which the operability of such systems can be tested and inspected where appropriate during the life of the plant.

COVERED BY REQUIREMENTS ON INDIVIDU VERSION OF CRITERIA 16, 17, 18, 35 (PAGES 11, 33, 58, 37, 38, 39, 43, 48 64, 40, 41, 45, 46, 44, 42, 65)

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 39 - EMERGENCY POWER FOR ENGINEERED SAFETY FEATURES (Category A)

Alternate power systems shall be provided and designed with adequate independency, redundancy, capacity, and testability to permit the functioning required of the engineered safety features. As a minimum, the onsite power system and the offsite power system shall each, independently, provide this capacity assuming a failure of a single active component in each power system.

ALSO SEE PUBLISHED VERSION OF CRITERION 24 (PAGE 22)

REVISED VERSION (JULY 15,

CRITERION 17 - ELECTRICAL POWER SYSTEMS

Onsite and offsite electrical power systen sufficient capacity and capability to assure th fuel damage limits and design conditions of the boundary are not exceeded during anticipated or (2) the core is cooled and containment integrit are maintained following postulated accidents. for the onsite and offsite electrical power sys provide sufficient capacity to permit functioni and components important to safety. Offsite el provided to the site preferably by two physical lines. The onsite system and the onsite portic shall be designed with sufficient independency, to perform their safety function assuming failı nent. Provisions shall be included to minimiz offsite electrical power as a result of or coi electrical power generated by the nuclear powe

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 40 - MISSILE PROTECTION (Category A)

Protection for engineered safety features shall be provided against dynamic effects and missiles that might result from plant equipment failures.

ALSO SEE PUBLISHED VERSION OF CRITERIA 42 AND 43 (PAGE 36)

REVISED VERSION (JULY 15,

CRITERION 4 - ENVIRONMENTAL AND MISSILE DESIGN

Structures, systems, and components import designed to accommodate the effects of and to b ronmental conditions associated with normal ope postulated accidents. These structures, system appropriately protected against dynamic effects result from equipment failures and sources outs

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 41 - ENGINEERED SAFETY FEATURES PERFORMANCE CAPABILITY (Category A)

Engineered safety features such as emergency core cooling and containment heat removal systems shall provide sufficient performance capability to accommodate partial loss of installed capacity and still fulfill the required safety function. As a minimum, each engineered safety feature shall provide this required safety function assuming a failure of a single active component.

COVERED BY REQUIREMENTS ON INDIVIDUAL SY

VERSION OF CRITERIA 17, 35, 38, 41, 44,

33, 37, 43, 62, 63, 44, 42, 65)

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 42 - ENGINEERED SAFETY FEATURES COMPONENTS CAPABILITY (Category A)

Engineered safety features shall be designed so that the capability of each component and system to perform its required function is not impaired by the effects of a loss-of-coolant accident.

CRITERION 43 - ACCIDENT AGGRAVATION PREVENTION (Category A)

Engineered safety features shall be designed so that any action of the engineered safety features which might accentuate the adverse after-effects of the loss of normal cooling is avoided.

ALSO SEE PUBLISHED VERSION OF CRITERION 40 (PAGE 34)

REVISED VERSION (JULY 15,

CRITERION 4 - ENVIRONMENTAL AND MISSILE DESIG

Structures, systems, and components impo designed to accommodate the effects of and to ronmental conditions associated with normal o postulated accidents. These structures, syst appropriately protected against dynamic effec result from equipment failures and sources ou

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 44 - EMERGENCY CORE COOLING SYSTEMS CAPABILITY (Category A)

At least two emergency core cooling systems, preferably of different design principles, each with a capability for accomplishing abundant emergency core cooling, shall be provided. Each emergency core cooling system and the core shall be designed to prevent fuel and clad damage that would interfere with the emergency core cooling function and to limit the clad metal-water reaction to negligible amounts for all sizes of breaks in the reactor coolant pressure boundary, including the double-ended rupture of the largest pipe. The performance of each emergency core cooling system shall be evaluated conservatively in each area of uncertainty. The systems shall not share active components and shall not share other features or components unless it can be demonstrated that a) the capability of the shared feature or component to perform its required function can be readily ascertained during reactor operation, (b) failure of the shared feature or component does not initiate a loss-of-coolant accident, and (c) capability of the shared feature or component to perform its required function is not impaired by the effects of a loss-of-coolant accident and is not lost during the entire period this function is required following the accident.

REVISED VERSION (JULY 15, 1

CRITERION 35 - EMERGENCY CORE COOLING SYSTEM

A system to provide abundant emergency core through two system flow paths and by different de be provided. The system safety function shall be the reactor core following any loss of coolant ac that (1) fuel and clad damage that could interfer effective core cooling are prevented and (2) clad is limited to negligible amounts. The performanc be evaluated conservatively in each area of uncer

Redundancy in components and features, suita and leak detection, isolation, and containment ca provided to assure that for onsite and for offsit system operation the system safety function can b (1) failure of any single active component and (2 passive component unless it can be demonstrated t acceptable on some other defined basis.

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 45 - INSPECTION OF EMERGENCY CORE COOLING SYSTEMS (Category A)

Design provisions shall be made to facilitate physical inspection of all ·itical parts of the emergency core cooling systems, including reactor vessel internals and water injection nozzles.

REVISED VERSION (JULY 15,

CRITERION 36 - DESIGN OF EMERGENCY CORE COOLING S'

Components of the emergency core cooling sys to permit periodic inspection and testing of impo features, such as spray rings in the reactor pres injection nozzles, and piping to assure their str integrity and the full design capability of the s

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 46 - TESTING OF EMERGENCY CORE COOLING SYSTEMS COMPONENTS (Category A)

Design provisions shall be made so that active components of the emergency core cooling systems, such as pumps and valves, can be tested periodically for operability and required functional performance.

CRITERION 47 - TESTING OF EMERGENCY CORE COOLING SYSTEMS (Category A)

A capability shall be provided to test periodically the delivery capability of the emergency core cooling systems at a location as close to the core as is practical.

CRITERION 48 - TESTING OF OPERATIONAL SEQUENCE OF EMERGENCY CORE COOLING SYSTEMS (Category A)

A capability shall be provided to test under conditions as close to design as practical the full operational sequence that would bring the emergency core cooling systems into action, including the transfer to alternate power sources.

REVISED VERSION (JULY

CRITERION 37 - TESTING OF EMERGENCY CORE COO

The emergency core cooling system shall
capability to test periodically (1) the oper
performance of the active components of the s
valves and (2) the operability of the system
conditions as close to design as practicable,
sequence that brings the system into operatio
between normal and emergency power sources, a
associated cooling water system.

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 49 - CONTAINMENT DESIGN BASIS (Category A)

The containment structure, including access openings and penetrations, and any necessary containment heat removal systems shall be designed so that the containment structure can accommodate without exceeding the design leakage rate the pressures and temperatures resulting from the largest credible energy release following a loss-of-coolant accident, including a considerable margin for effects from metal-water or other chemical reactions that could occur as a consequence of failure of emergency core cooling systems.

REVISED VERSION (JULY 15, 19

CRITERION 50 - CONTAINMENT DESIGN BASIS

The reactor containment structure, incl
penetrations, and any necessary containment
be designed so that the containment structur
ments can accommodate, without exceeding the
with an appropriate margin, the calculated p
conditions resulting from any loss-of-coolan
margin shall reflect consideration of (1) the
energy sources which have not been included i
peak conditions, such as energy in steam gene
metal water and other chemical reactions that
emergency core cooling functioning, (2) the p
of phenomena may be more severe than predicte
experience and experimental data available fo
ena and containment response.

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 50 - NDT REQUIREMENT FOR CONTAINMENT MATERIAL (Category A)

Principal load carrying components of ferritic materials exposed to the external environment shall be selected so that their temperatures under normal operating and testing conditions are not less than 30°F above nil ductility transition (NDT) temperature.

REVISED VERSION (JULY 15

CRITERION 51 - FRACTURE PREVENTION OF CONTAINMI

The fracture toughness properties and the of the reactor containment ferritic materials s behavior under operating, testing, and postulat

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 51 - REACTOR COOLANT PRESSURE BOUNDARY OUTSIDE CONTAINMENT (Category A)

If part of the reactor coolant pressure boundary is outside the containment, appropriate features as necessary shall be provided to protect the health and safety of the public in case of an accidental rupture in that part. Determination of the appropriateness of features such as isolation valves and additional containment shall include consideration of the environmental and population conditions surrounding the site.

REVISED VERSION (JULY 1

CRITERION 55 - REACTOR COOLANT PRESSURE BOUNDAI

Each line which is part of the reactor co(and which penetrates primary reactor containme1 one isolation valve inside and one isolation v The valve outside of containment shall be loca as practicable. The primary mode for actuatio automatic and upon loss of actuating power the: to fail safe.

Other appropriate requirements to minimiz(consequences of an accidental rupture of these connected to them shall be provided as necessa1 safety. Determination of the appropriateness c such as higher quality in design, fabrication a provisions for inservice inspection, protectior natural phenomena, and additional isolation val shall include consideration of the population d acteristics, and physical characteristics of th

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 52 - CONTAINMENT HEAT REMOVAL SYSTEMS (Category A)

Where active heat removal systems are needed under accident conditions to prevent exceeding containment design pressure, at least two systems, preferably of different principles, each with full capacity, shall be provided.

REVISED VERSION (JULY 15

CRITERION 38 - CONTAINMENT HEAT REMOVAL SYSTI

A system to remove heat from the reacto: through two system flow paths and by differei be provided. The system safety function sha consistent with the functioning of other ass(containment pressure and temperature followi accident and maintain them at low levels.

Redundancy in components and features, : and leak detection, isolation, and containme provided to assure that for onsite and for o system operation the system safety function (assuming (1) failure of any single active cor of any single passive component unless it ca system is acceptable on some other defined b

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 53 - CONTAINMENT ISOLATION VALVES (Category A)

Penetrations that require closure for the containment function shall be protected by redundant valving and associated apparatus.

ALSO SEE PUBLISHED VERSION OF CRITERION 57 (PAGE 47)

REVISED VERSION (JULY 15,

CRITERION 54 - SYSTEMS PENETRATING CONTAINMENT

Piping systems penetrating primary reactor c
provided with leak detection, isolation, and cont
having redundancy, reliability, testability, and
ities which reflect the importance to safety of
systems. Such piping systems shall be designed w
test periodically the operability of the isolatio
apparatus and to determine if valve leakage is wi

ALSO COVERED BY REQUIREMENTS FOR IS

REVISED VERSION OF CRITERIA 55 AND

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 54 - CONTAINMENT LEAKAGE RATE TESTING (Category A)

Containment shall be designed so that an integrated leakage rate testing can be conducted at design pressure after completion and installation of all penetrations and the leakage rate measured over a sufficient period of time to verify its conformance with required performance.

CRITERION 55 - CONTAINMENT PERIODIC LEAKAGE RATE TESTING (Category A)

The containment shall be designed so that integrated leakage rate testing can be done periodically at design pressure during plant lifetime.

REVISED VERSION (JULY 15

CRITERION 52 - CAPABILITY FOR CONTAINMENT

The reactor containment and other equ to containment text conditions shall be de integrated leakage rate testing can be conc pressure.

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 56 - PROVISIONS FOR TESTING OF PENETRATIONS (Category A)

Provisions shall be made for testing penetrations which have resilient seals or expansion bellows to permit leaktightness to be demonstrated at design pressure at any time.

REVISED VERSION (JULY 15,

CRITERION 53 - PROVISIONS FOR CONTAINMENT TESTIN(

The reactor containment shall have provisio of all important areas including penetrations, (2 materials surveillance program, and (3) for peri leaktightness of penetrations which have resilie bellows at containment design pressure.

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 57 - PROVISIONS FOR TESTING OF ISOLATION VALVES (Category A)

Capability shall be provided for testing functional operability of valves and associated apparatus essential to the containment function for establishing that no failure has occurred and for determining that valve leakage does not exceed acceptable limits.

ALSO SEE PUBLISHED VERSION OF CRITERION 53 (PAGE 44)

REVISED VERSION (JULY 15

CRITERION 54 - SYSTEMS PENETRATING CONTAINME

Piping systems penetrating primary reac provided with leak detection, isolation, and having redundancy, reliability, testability, ities which reflect the importance to safet systems. Such piping systems shall be desig test periodically the operability of the iso apparatus and to determine if valve leakage

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 58 - INSPECTION OF CONTAINMENT PRESSURE-REDUCING SYSTEMS (Category A)

Design provisions shall be made to facilitate the periodic physical inspection of all important components of the containment pressure-reducing systems, such as, pumps, valves, spray nozzles, torus, and sumps.

REVISED VERSION (JULY

CRITERION 39 - DESIGN OF CONTAINMENT HEAT RE

Components of the containment heat remo to permit periodic inspection and testing of tures, such as the torus, sumps, spray nozzl their structural and leaktight integrity and of the system.

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 59 - TESTING OF CONTAINMENT PRESSURE-REDUCING SYSTEMS COMPONENTS (Category A)

The containment pressure-reducing systems shall be designed so that active components, such as pumps and valves, can be tested periodically for operability and required functional performance.

CRITERION 60 - TESTING OF CONTAINMENT SPRAY SYSTEMS (Category A)

A capability shall be provided to test periodically the delivery capability of the containment spray system at a position as close to the spray nozzles as is practical.

CRITERION 61 - TESTING OF OPERATIONAL SEQUENCE OF CONTAINMENT PRESSURE-REDUCING SYSTEMS (Category A)

A capability shall be provided to test under conditions as close to the design as practical the full operational sequence that would bring the containment pressure-reducing systems into action, including the transfer to alternate power sources.

REVISED VERSION (JU

CRITERION 40 - TESTING OF CONTAINMENT HE

The containment heat removal system capability to test periodically (1) the performance of the active components of valves and (2) the operability of the sy conditions as close to the design as pra sequence that brings the system into ope between normal and emergency power sourc ciated cooling water system.

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 62 - INSPECTION OF AIR CLEANUP SYSTEMS (Category A)

Design provisions shall be made to facilitate physical inspection of all critical parts of containment air cleanup systems, such as, ducts, filters, fans, and dampers.

REVISED VERSION (JULY

CRITERION 42 - DESIGN OF CONTAINMENT ATMOSPHE COMPONENTS

Components of the containment atmosphere designed to permit periodic inspection of imp such as filter frames, ducts, and piping to a leaktight integrity and the full design capab

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 63 - TESTING OF AIR CLEANUP SYSTEMS COMPONENTS (Category A)

Design provisions shall be made so that active components of the air cleanup systems, such as fans and dampers, can be tested periodically for operability and required functional performance.

CRITERION 64 - TESTING OF AIR CLEANUP SYSTEMS (Category A)

A capability shall be provided for in situ periodic testing and surveillance of the air cleanup systems to ensure (a) filter bypass paths have not developed and (b) filter and trapping materials have not deteriorated beyond acceptable limits.

CRITERION 65 - TESTING OF OPERATIONAL SEQUENCE OF AIR CLEANUP SYSTEMS (Category A)

A capability shall be provided to test under conditions as close to design as practical the full operational sequence that would bring the air cleanup systems into action, including the transfer to alternate power sources and the design air flow delivery capability.

REVISED VERSION (JULY 1

CRITERION 43 - TESTING OF CONTAINMENT ATMOSPHERE

The containment atmosphere cleanup systems
a capability to test periodically (1) the operab
performance of the active components of the syst
dampers, pumps, and valves and (2) the operabili
whole and, under conditions as close to design a
operational sequence that brings the systems int
the transfer between normal and emergency power
of associated systems.

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 66 - PREVENTION OF FUEL STORAGE CRITICALITY (Category B)

Criticality in new and spent fuel storage shall be prevented by physical systems or processes. Such means as geometrically safe configurations shall be emphasized over procedural controls.

REVISED VERSION (JULY

CRITERION 62 - PREVENTION OF CRITICALITY IN F

Criticality in the fuel storage and hand prevented by physical systems or processes, p safe configurations.

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 67 - FUEL AND WASTE STORAGE DECAY HEAT (Category B)

Reliable decay heat removal systems shall be designed to prevent damage to the fuel in storage facilities that could result in radioactivity release to plant operating areas or the public environs.

CRITERION 68 - FUEL AND WASTE STORAGE RADIATION SHIELDING (Category B)

Shielding for radiation protection shall be provided in the design of spent fuel and waste storage facilities as required to meet the requirements of 10 CFR 20.

CRITERION 69 - PROTECTION AGAINST RADIOACTIVITY RELEASE FROM SPENT FUEL AND WASTE STORAGE (Category B)

Containment of fuel and waste storage shall be provided if accidents could lead to release of undue amounts of radioactivity to the public environs.

REVISED VERSION (JULY 1

CRITERION 60 - FUEL STORAGE AND HANDLING AND RAI

The fuel storage and handling and radioacti be designed to assure adequate safety under norn accident conditions. These systems shall be des significant reduction in fuel storage coolant ir conditions (2) with a decay heat removal capabil testability, and performance that reflect the in decay heat removal, (3) with suitable shielding (4) with a capability to permit inspection and t areas and features of the components of these sy appropriate containment, confinement, and filter

PUBLISHED VERSION (JULY 11, 1967)

CRITERION 70 - CONTROL OF RELEASES OF RADIOACTIVITY TO THE ENVIRONMENT (Category B)

The facility design shall include those means necessary to maintain control over the plant radioactive effluents, whether gaseous, liquid, or solid. Appropriate holdup capacity shall be provided for retention of gaseous, liquid, or solid effluents, particularly where unfavorable environmental conditions can be expected to require operational limitations upon the release of radioactive effluents to the environment. In all cases, the design for radioactivity control shall be justified (a) on the basis of 10 CFR 20 requirements for normal operations and for any transient situation that might reasonably be anticipated to occur and (b) on the basis of 10 CFR 100 dosage level guidelines for potential reactor accidents of exceedingly low probability of occurrence except that reduction of the recommended dosage levels may be required where high population densities or very large cities can be affected by the radioactive effluents.

REVISED VERSION (JULY :

CRITERION 61 - CONTROL OF RELEASES OF RADIO

The nuclear power unit design shall in
able control over gaseous, liquid, and soli
may be released from the unit during normal
operational occurrences, and postulated acc
capacity shall be provided for retention of
effluents, particularly where unfavorable s
can be expected to impose operational limit
radioactive effluents.

REVISED VERSION (JULY 15,

NUCLEAR POWER UNIT

A nuclear power unit means a nuclear rea
necessary for electrical power generation and
and components required to prevent or mitigat
which could cause undue risk to the health an

REACTOR COOLANT PRESSURE BOUNDARY

The reactor coolant pressure boundary means all those pressure-containing components, such as pressure vessels, piping, pumps, and valves, within the following systems or portions of systems of pressurized and boiling water-cooled nuclear power units:

(a) The reactor coolant system. For a nuclear power unit of the boiling water type, the reactor coolant system extends to and includes the outermost containment isolation valves capable of external actuation in the main steam and feed-water lines, and the reactor safety and relief valves.

(b) Portions of associated auxiliary syst reactor coolant system. For piping c penetrates primary reactor containmen to and includes the first containment side the containment capable of exter piping of these systems which contain which are normally closed during norm the boundary extends to and includes two valves (the second of which must l actuation), whether or not the system primary reactor containment.

(c) Portions of the emergency core coolin the reactor coolant system. For pipir penetrates primary reactor containment and includes the first containment iso containment capable of external actuat system which does not penetrate primar the boundary extends to and includes t normally closed during normal reactor

CRITERION 15 - REACTOR COOLANT SYSTEM DESIG

The reactor coolant system and associa and protection systems shall be designed wi that the design conditions of the reactor c exceeded. The reactor coolant system and a assure these design conditions under all co including the effects of anticipated operati of power to the recirculation pumps, trippi isolation of the main condenser, and loss o

CRITERION 18 - INSPECTION AND TESTING OF ELE(

Electrical power systems shall be design tion and testing of important areas and featu connections, and switchboards to assess the c the condition of their components. The syste capability to test periodically (1) the opera mance of the active components of the system, relays, switches, and buses, and (2) the oper whole and, under conditions as close to desig operational sequence that brings the system i transfer of power among the nuclear power uni and the onsite power system.

REVISED VERSION (JULY 1

CRITERION 27 - COMBINED REACTIVITY CONTROI

The reactivity control systems shall reliably controlling reactivity changes tc accident conditions the capability to cool

CRITERION 33 - REACTOR COOLANT MAKEUP SYST

A system to supply reactor coolant ma operation, preferably through two system f The system safety function shall be to ass fuel damage limits are not exceeded as a r leakage from the reactor coolant pressure piping within the boundary.

Redundancy in components and features and leak detection and isolation capabilit assure that for onsite and for offsite ele the system safety function can be accompli any single active component and (2) failur nent unless if can be demonstrated that th some other defined basis.

CRITERION 34 - DECAY HEAT REMOVAL SYSTEM

A system to remove decay heat, pref paths, shall be provided. The system sa transfer fission product decay heat and core when the reactor is shutdown at a r able fuel damage limits and the design coolant pressure boundary are not exceed

Redundancy in components and featur and leak detection and isolation capabil assure that for onsite and for offsite el the system safety function can be accompl any single active component and (2) failu nent unless it can be demonstrated that t some other defined basis.

CRITERION 41 - CONTAINMENT ATMOSPHERE CLE/

Systems to control fission products, substances which may be released into the provided. The systems safety functions sh tent with the functioning of other associa and quantity of fission products released any postulated accident and (2) to control hydrogen, oxygen, and other substances in following any postulated accident to assur is maintained.

Each system shall have redundancy in suitable interconnections, and leak detect to assure that for onsite and for offsite tion its safety function can be accomplish single active component and (2) failure of unless it can be demonstrated that the sys defined basis.

CRITERION 44 - COOLING WATER SYSTEM

A system to transfer heat from struc
important to safety, preferably through t
ultimate heat sink shall be provided. Th
be to transfer the combined heat load of
components under normal operating and acc

Redundancy in components and feature
and leak detection and isolation capabili
required to assure that for onsite and fo
system operation the system safety functi
(1) failure of any single active componen
passive component unless it can be demons
acceptable on some other basis.

CRITERION 45 - DESIGN OF COOLING WATER SY

Components of the cooling water syst periodic inspection of important areas an exchangers and piping, to assure their st grity and the full design capability of t

CRITERION 46 - TESTING OF COOLING WATER S

The cooling water system shall be de test periodically (1) the operability and active components of the system, such as operability of the system as a whole and, design as practicable, and full operation system into operation for reactor shutdow accidents, including the transfer between sources.

CRITERION 56 - CONTAINMENT ATMOSPHERE ISO

Each line which connects directly to and penetrates primary reactor containmen isolation valves. One of these valves sh and shall be located as close to containm primary mode for actuation of the valves loss of actuating power these valves shal unless it can be demonstrated that the sy some other defined basis.

CRITERION 57 - CLOSED SYSTEMS ISOLATION VA

Each line which penetrates primary re neither part of the reactor coolant pressu directly to the containment atmosphere sha valve. This valve shall be outside of con as close to containment as practicable.