REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:8206070617 DOC.DATE: 82/05/28 NOTARIZED: NO DOCKET #
FACIL:50-397 WPPSS Nuclear Project, Unit 2, Washington Public Powe 05000397
AUTH.NAME AUTHOR AFFILIATION
BOUCHEY,G.D. Washington Public Power Supply System
RECIP.NAME RECIPIENT AFFILIATION
SCHWENCER,A. Licensing Branch 2

SUBJECT: Forwards rewrite to FSAR Section 3.5, "Missile Protection," closing out part of Open Item 2 in NUREG-0892.Remainder of open item, "Internally Generated Missiles (Outside Containment)," will be transmitted in June 1982.

DISTRIBUTION CODE: B001S COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 16
TITLE: PSAR/FSAR AMDTS and Related Correspondence

NOTES:

	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL
	A/D LICENSNG	1	0	LIC BR #2 BC	1	0
	LIC BR #2 LA	1	0	AULUCK,R. 01	1	1
INTERNAL:	ELD/HDS2	1	0	IE FILE	1	1
	IE/DEP EPDS 35	1	1	IE/DEP/EPLB 36	3	3
	MPA	1	0	NRR/DE/CEB 11	1	1
	NRR/DE/EQB 13	3	3	NRR/DE/GB 28	2	2
	NRR/DE/HGEB 30	2	2	NRR/DE/MEB 18	1	1
	NRR/DE/MTEB 17	1	1	NRR/DE/QAB 21	1	1
	NRR/DE/SAB 24	1	1	NRR/DE/SEB 25	1	1
	NRR/DHFS/HFEB40	1	1	NRR/DHFS/LQB 32	1	1
	NRR/DHFS/OLB 34	1	1	NRR/DHFS/PTRB20	1	1
	NRR/DSI/AEB 26	1	1	NRR/DSI/ASB 27	1	1
	NRR/DSI/CPB 10	1	1	NRR/DSI/CSB 09	1	1
	NRR/DSI/ETSB 12	1	1	NRR/DSI/ICSB 16	1	1
	NRR/DSI/PSB 19	1	1	NRR/DSI/RAB 22	1	1
	NRR/DSI/RSB 23	1	1	NRR/DST/LGB 33	1	1
	REG FILE 04	1	1	RGN5	2	2
EXTERNAL:	ACRS 41	16	16	BNL(AMDTS ONLY)	1	1
	FEMA-REP DIV 39	1	1	LPDR 03	1	1
	NRC PDR 02	1	1	NSIC 05	1	1
	NTIS	1	1			

TOTAL NUMBER OF COPIES REQUIRED: LTTR 63 ENCL 58

Washington Public Power Supply System
P.O. Box 968 3000 George Washington Way Richland, Washington 99352 (509) 372-5000

May 28, 1982
G02-82-492
SS-L-02-CDT-82-066

Docket No. 50-397

Mr. A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Schwencer:

Subject: NUCLEAR PROJECT NO. 2
INTERNALLY GENERATED MISSILES
(INSIDE CONTAINMENT)

Enclosed are sixty (60) copies of a rewrite to FSAR Section 3.5, "Missile Protection". This rewrite should close out part of open item No. 2 as listed in NUREG-0892.

The remaining part of this open item, Internally Generated Missiles (Outside Containment) will be transmitted to the NRC in June, 1982.

Very truly yours,

G D Bouchey

G. D. Bouchey
Deputy Director, Safety and Security

CDT/jca
Enclosure

cc: R Auluck - NRC
WS Chin - BPA
R Feil - NRC Site

B001
1/1

3.5 MISSILE PROTECTION

The WNP-2 missile protection design basis conforms to 10CFR50, Appendix A, General Design Criteria for Nuclear Power Plants; Criterion 4, Environmental and Missile Design Bases. The objectives of missile protection design are to ensure that the plant can be brought to and kept in a safe shutdown mode and to prevent off-site radiological consequences assuming an additional single component failure.

Design against generated missiles involves an initial selection process to define the postulated missiles, an evaluation of postulated missile credibility, then a damage assessment to evaluate the effects of credible missiles, and finally, if necessary to ensure safe shutdown, the provision of barriers or physical modifications of systems and components to preclude damage.

Structures housing systems and components essential for safe shutdown are designed to withstand externally generated missiles so that essential systems and components are not damaged by such missiles or by the secondary effects of such missiles.

3.5.1 MISSILE SELECTION AND DESCRIPTIONS

3.5.1.1 Internally Generated Missiles (Outside Containment)

3.5.1.1.1 Systems Available for Safe Shutdown

Systems available outside containment to facilitate safe shutdown include: High Pressure Core Spray (HPCS), Low Pressure Core Spray (LPCS), Residual Heat Removal (RHR), Standby Service Water (SSW), Reactor Core Isolation Cooling (RCIC), Control Rod Drives (CRD) and the Reactor Feedwater System (RFW). These systems and their function are described in Section 7.3. The calculation of credible missile kinetic energies, missile target determinations, and target and barrier damage evaluations are covered in Section 3.5.3.

Figures 3.5-1 through 15 illustrate the location of these systems. Seismic categories, quality group classifications and FSAR reference sections are provided in Table 3.5-1.

3.5.1.1.2 Missiles Due to Rotating Equipment Failure

The systems located outside the Primary Containment have been reviewed to identify potential rotating equipment missiles. The design objective is to prevent the generation of missiles and their effects.

All rotating equipment (e.g., pumps, turbines, fans, and compressors) outside the Primary Containment have been evaluated to determine missile generation potential (postulated missiles), missile credibility, and an analysis of credible missile effects. All ECCS rotating equipment outside the Primary Containment are grouped by division in different rooms or areas of the plant, separated by walls or barriers, so that a single missile cannot damage redundant systems.

The RCIC turbine is prevented from reaching a runaway speed, where component failure could occur, by overspeed tripping devices. In addition, as with the ECCS systems, the RCIC turbine is located in a separate compartment.

3.5.1.1.3 Missiles Due to Pressurized Component Failure

The potential of the following equipment to generate missiles was investigated:

a. High Energy Piping

Pressurized piping in systems where the service temperature exceeded 200°F and/or the service pressure exceeded 275 psig was evaluated for potential generation of missiles. High energy piping pipe whip is discussed in Section 3.6.

b. Valve Bonnets

(1) Pressurized Seal Bonnets

Valves with an ANSI rating of 900 psig and above are pressurized seal bonnet type valves, constructed in accordance with the ASME Boiler and Pressure Vessel Code, Section III. Valve bonnets, on pressure seal bonnet type valves, are prevented from becoming missiles by the retaining ring, which would have to fail in shear, and by the yoke, which would capture the bonnet or reduce bonnet energy.

The bonnet bolts preload the pressure seal gasket to seal the valve initially. When pressurized, the valve is sealed by process fluid pressure and the bonnet bolts are under

no load. All ASME III Class I, 900 # bonnet-seal type valves were analyzed per ASME Boiler and Pressure Vessel Code, Section III requirements. Valve design pressures used in these analyses were given by the ASME Boiler and Pressure Vessel Code, Section III, Division 1, subsection NB, Figure NB-3545.1-2 for weld-end valves. Using a typical pressure seal valve, the total thrust load on the retaining ring and valve body was calculated. The results demonstrated that both the retaining ring and valve body meet the ASME Boiler and Pressure Vessel Section III, Division 1, NB-3227 requirements for pressures much higher than the normal operating pressure of the valve.

The majority of valves inside containment have massive valve operators which are supported by the yoke. For these valves, the valve operators act as an additional limitation to the yoke becoming a missile.

For a yoke clamp to fail, it must be assumed that the retaining ring fails completely and instantaneously so that the bonnet could strike the yoke. The yoke is normally under no load and complete failure of the yoke clamp is not considered credible.

Because of the highly conservative design of the retaining ring of these valves, bonnet ejection is highly improbable and hence bonnets are not considered credible missiles.

(2) Bolted Bonnets

Most valves of ANSI rating 600 psig and below are valves with bolted bonnets. Valve bonnets are prevented from becoming missiles by limiting stresses in the bonnet-to-body bolting material by requirements set forth in the ASME Boiler and Pressure Vessel Code, Section III, and by designing flanges in accordance with applicable code requirements. Even if bolt failure were to occur, the likelihood of all bolts experiencing simultaneous complete severance failure is remote. A study of bolted valve bonnets was made in which 25% of the consecutive bolts in the circular pattern were assumed missing. The stresses occurring under operating conditions with these bolts missing

were found to be within acceptable limits. The widespread use of valves with bolted bonnets and the low historical incidence of complete severance failures of bonnets confirms that bolted valve bonnets need not be considered credible missiles.

(3) Screwed-Typed Bonnets

Some valves in the 1 inch to 2-1/2 inch size range have coarse threaded bonnets which screw into the valve body. These valves were analyzed and found to have low stress intensities in the bonnet retaining threads. The valve design stress intensities were found to be a minimum of 4.5 times the stress intensities that will be experienced by the valves. Because of the highly conservative design of these valves, they are not considered credible missiles.

c. Valve Stems

Valve stems are not considered credible missiles if at least one feature in addition to the stem threads is included in their design to prevent ejection; for example, valves with backseats.

d. Thermowells and Sample Probes

Temperature or other detectors installed on piping or in wells are evaluated as potential missiles if a single circumferential weld would cause their ejection. This is highly improbable, since a complete and sudden failure of a circumferential weld is needed for a detector to become a missile. These circumferential welds were analyzed and found to have design stress intensities at least 18 times the stress intensities that will be experienced in service. Because of their highly conservative design, thermowells and sample probes are not considered credible missiles.

e. Nuts and Bolts

Nuts, bolts, nut and bolt combinations, and nut and stud combinations are unlikely to fail because of the low stress intensities for these parts. The ASME and ANSI Codes limit the allowable stresses in bolts and studs to 20 to 30 percent of yield. These low stress intensities are assured by measuring the

torque of all bolts, studs, and nuts during installation. Because of their highly conservative design, nuts and bolts are not considered credible missiles.

f. Blind Flanges

Bolted blind flanges are not considered credible missiles because of the extremely unlikely occurrence of all bolts experiencing simultaneous complete severance failure as discussed in Item B(2) above.

g. Nitrogen Tanks and Bottles

Nitrogen tanks and bottles in the reactor building provide nitrogen for CRD drives, charging of main steam safety relief valve, isolation valve accumulator tanks, and instrument nitrogen inside containment. These tanks and bottles have design pressures considerably in excess of their operating pressures. Because of their highly conservative design, nitrogen tanks and bottles are not considered credible missiles.

3.5.1.1.4 Evaluation of Postulated Missiles

a. Assessment of Postulated Missile Credibility

Postulated missiles are analyzed to determine if a credible failure mode resulting in a missile exists. Failure modes determined to be credible are then assessed for impact on plant safe shutdown.

b. Assessment of Potential Credible Missile Damage

The ability of the plant to achieve safe shutdown is assumed by physical separation and redundancy of safety related systems. The adequacy of the physical separation and redundancy of safety related systems was evaluated using the following procedure:

(1) Target Determination

Based on the missile location and orientation, the target areas are predicted. Trajectories are selected to encompass the most adverse conditions. The essential systems within that region are assumed damaged and not available for a safe shutdown.

(2) Evaluation of System Damage

The essential systems which are available after the worst postulated missile accident and the most critical additional single failure are determined. An evaluation is then made to determine whether these remaining systems are sufficient to achieve safe reactor shutdown.

(3) Protection of Systems

When the separation and redundancy of the essential systems is not adequate, or when a redundant system is not available, one or more of the following measures are taken to ensure safe shutdown:

(a) The orientation of the credible missile is changed so that systems necessary for safe shutdown are not damaged.

(b) Missile barriers are provided.

(c) It is shown that the essential components will not be damaged by the credible missile.

c. Determination of Missile Energies

One of the following methods is used to calculate the extent of the damage caused by a credible missile:

(1) Piston Type Missiles

The velocity of a piston-type missile is calculated by assuming that the work done will be converted into kinetic energy of the missile with no losses of energy due to friction or air resistance.

Work is the integral of force times displacement, while the kinetic energy of the missile is one-half the product of the missile mass times the square of the missile velocity. Assuming the applied force constant (PA_o), the kinetic energy is equated to the work done (Reference 3.5-1). Subsequently, the missile velocity is obtained by the expression:

$$V = \left[\frac{2\ PA_oL}{m}\right]^{1/2}$$ (Reference 3.5.1)

Where:

V = the initial velocity at the end of a piston stroke (ft./sec.)

P = pressure of the fluid (psi)

A_o = cross-sectional area of the piston (in^2)

L = length of the stroke in ft.

m = mass of missile ($lb\text{-}sec^2/ft$)

(2) Jet Propelled Missiles

Postulated jet-propelled missiles propelled by fluid escaping from a pressurized system in which there is essentially no lateral containment of the fluid. The escaping jet will not only impinge on the missile, but will also flow around and past the missile.

The velocity of this type of postulated missile is estimated by (Reference 3.5.-1):

$$\left(1 - \frac{V}{V_f}\right) - \text{Log}_e \left(1 - \frac{V}{V_f}\right) = K_1 - \frac{K_2}{N_o + X \text{ Tan } B}$$

where:

$$K_1 = \left(1 - \frac{V_o}{V_f}\right) - \text{Log}_e \left(1 - \frac{V_o}{V_f}\right) + \frac{K_2}{N_o}$$

$$K_2 = \frac{A_o A_m P_b}{m\ \pi\ \rho (\text{Tan } B)}$$

V = missile velocity at distance X (fps)

V_f = jet velocity, (fps)

N_o = radius of throat (ft)

P_f = density of the Jet fluid (lb-sec^2/ft^4)

X = distance travelled (ft)

B = angle of jet expansion, degrees from normal

V_o = initial velocity of missiles

A_o = throat area (ft^2)

A_m = cross sectional area of missile (ft^2)

m = mass of missile (lb-sec^2/ft)

(3) Stored Strain Energy Missiles

Stored strain energy missiles are assumed to convert all the strain energy at which they fail into kinetic energy. The velocity is calculated from the following formula (Reference 3.5-1):

$$V = \left[\frac{g}{EW}\right]^{1/2} S$$

Where:

V = missile velocity (ft/sec)

E = modulus of elasticity (lb/ft^2)

W = specific weight of missile (lb/ft^3)

S = ultimate stress in the missile before failure (lb/ft^2)

g = acceleration of gravity (ft/sec^2)

(4) Rotating Machinery

A variety of missiles from rotating machinery can be treated by considering each as a rotating block. Because it is part of a rotating structure, the block is considered to be initially rotating about its axis of revolution at a speed, ω, radians per second. The kinetic energy of the block is given by (Reference 3.5-4):

$$KE = 1/2\left[R_{cg}^2 + K^2\right]\left(\frac{W}{g}\right)\omega^2, \text{ ft - lb}$$

where:

Rcg is the radius to the center of gravity (CG) of the rotating block, measured from the initial axis of rotation in the machinery, ft.

K is the radius of gyration of the rotating block, about the CG axis of the rotating block.

w is the block weight, lb.

g is the acceleration of gravity, ft/sec^2

ω is the angular velocity, rad/sec.

In this expression the Rcg term gives the kinetic energy due to translation, while the K term gives the kinetic energy due to rotation of the block about its cg axis.

d. Barrier Design

Missile velocity relationships in conjunction with applied penetration equations such as the Petry (Reference 3.5-2), Stanford (Reference 3.5-3), Modified National Defense Research Committee (Reference 3.5-14) and the Ballistic Research Laboratory (Reference 3.5-1) equations are used to conservatively predict the damage incurred in a missile event. The penetration analysis and the barrier design is described in 3.5.3.

3.5.1.1.5 Example of Postulated Missile Evaluation

a. Assessment of Postulated Missile Credibility

The reactor protection system motor-generator sets in the critical DC switchgear rooms in the Reactor Building (elevation 467'-0") were analyzed to determine their credibility as missiles. A structural failure of the 1800 rpm flywheel during the normal operation of the motor-generator would produce high energy missiles with the potential to damage systems, components, or structures in their paths. Motor-generator set modification to eliminate or contain the flywheel missiles was evaluated, but a feasible modification was not practical. The flywheels were, therefore, credible missiles.

b. Assessment of Potential Credible Missile Damage

The flywheel missiles were postulated to exit the motor-generator sets along a plane perpendicular to the motor-generator set, with the missile exiting a maximum of ten degrees from the perpendicular plane.

(1) Target Determination

The potential targets for the flywheel missiles were determined by reviewing the applicable drawings and visual inspection of the target area in the switchgear rooms. It was determined that safety-related cables in these rooms could potentially be damaged.

(2) Evaluation of System Damage

The safety-related cables which could be damaged by the flywheel provide DC power to instrument panels in the control room and to isolation valves inside containment. Damage to these cables was determined to be unacceptable.

(3) Protection of Systems

It was determined that there was not a feasible method of proving that the cables would not be damaged by the flywheel missiles. In order to preclude damage to the safety-related cables, the following alternatives were investigated:

(a) The motor-generator sets were analyzed to determine if a change in orientation was feasible. This was not a feasible alternative.

(b) The feasibility of constructing a barrier around the flywheel was investigated. This was a feasible alternative.

c. Barrier Design

A missile barrier proved to be the only feasible alternative. The barrier was designed to contain the highest-energy missile that could be produced by the flywheel. The barrier was constructed of steel and energy-absorbing aluminum honeycomb material and firmly anchored to the concrete floor. This eliminated the effects of the credible missile.

3.5.1.2 Internally Generated Missiles (Inside Containment)

3.5.1.2.1 Systems Available for Safe Shutdown

Figures 3.5-16 through 32 describe the mechanical and instrumentation locations of systems available for a safe shutdown. Each system (LPCS, HPCS, RHR, ADS, CRD and Primary Containment) is color coded to specify the location of structures, systems or components. In addition, the reactor protection system and isolation valves inside containment are available for safe shutdown of the plant and to prevent offsite radiological consequences. Information pertaining to applicable seismic category, quality group classification and reference sections in the FSAR, where these systems are described, is provided in Table 3.5-2. The evaluation of credible missile kinetic energies and missile target determinations is covered in Section 3.5.1.1.4. Target and barrier damage evaluations are covered in Section 3.5.3.

3.5.1.2.2 Missiles Due to Rotating Equipment

Rotating equipment inside containment consists of the following:

a. Recirculation Pump and Motor

   The most substantial piece of NSSS rotating machinery is the recirculation pump and motor. This potential missile source is covered in detail in Reference 3.5-4.

   It is concluded in Reference 3.5-4 that destructive pump overspeed is highly improbable. If it occurred, it could result in failure of certain pump and motor components having the potential to become missiles. A careful examination of the pump and motor structure shows that rotor or shaft failure will not result in ejection of motor-generated missiles, and impeller missiles cannot penetrate the pump case. Reference 3.5-4 concludes that in the unlikely event of impeller failure resulting in ejection of missiles through ruptured pipe, penetration of containment by missile fragments is highly improbable. Evaluation of the effects on safety-related systems of impeller fragments which might be ejected from openings in ruptured pipe is not evaluated because of the extreme improbability of this event, and because the effects would not be more severe than the assumed consequences of jet impingement due to pipe breaks inside containment is discussed in 3.6.

b. Fans as Potential Missiles

The fans inside primary containment are designed such that the casing will restrain any possible missile. Therefore, fans and parts thereof are not considered as possible sources of missiles.

3.5.1.2.3 Missiles Due to Pressurized Component Failure

A discussion of the potential for missile generation from the failure of pressurized components, e.g., valve stems, valve bonnets, and temperature element assemblies, is presented in Subsection 3.5.1.1.3. That discussion is also applicable to pressurized components inside containment. In addition, the following items are particular to inside containment:

Safety Relief Valve and Main Steam Isolation Valve Accumulators

Pressurized ASME III vessels such as SRV and MSIV accumulators are not considered credible missiles. These accumulators are operated at a maximum pressure and temperature of 150 psig and 150°F. These vessels have low stresses and operate in the "moderate energy" range and, therefore, any failures would be a crack type and not of concern for missile generation.

All potential sources of postulated missiles inside the primary containment were analyzed to determine missile credibility utilizing the criteria discussed in this Subsection and in Subsection 3.5.1.1.3 as required by General Design Criterion 4 "Environmental and Missile Design Basis." It was determined that all postulated missiles inside the primary containment incorporated design features that eliminated their credibility as potential sources of missiles.

3.5.1.2.4 Falling Objects

Structural elements, equipment, and components inside containment which could be considered as potential falling objects are supported to satisfy Seismic Category I requirements. The only exceptions to this are the monorail hoists inside containment which are not analyzed for Seismic I loading conditions, but are chained in place while not in use to ensure that they do not become falling objects which could damage safety systems. On this basis, falling objects are not postulated missiles. The physical separation and redundancy of safe shutdown systems also assures that falling objects do not present a threat to these systems.

3.5.1.2.5 Secondary Missiles Generated by Postulated Credible Primary Missiles

Secondary missiles are not considered credible missiles due to their low probability of occurrence and their low kinetic energy levels. The probability of damage due to a secondary missile is the probability of occurrence of a primary missile times the probability of hitting a part that can become a secondary missile times the probability that the part will actually become a missile. This probability is very low.

The level of stored kinetic energy in a secondary missile will be low because of the large energy required to produce a secondary missile. In addition, no reliable method to predict secondary missile characteristics is known, other than those characteristics in common with primary missiles.

3.5.3 BARRIER DESIGN PROCEDURES

The barrier design objectives emphasize missile containment and structural integrity without secondary missile generation.

3.5.3.1 Concrete Barriers

Concrete missile barriers are designed in accordance with the modified Petry equation (Reference 3.5-2). In all cases, except for barriers exposed to turbine missiles, a concrete thickness of twice the penetration thickness determined for an infinitely thick slab is provided to prevent perforation, spalling or scabbing. For discussion of turbine generated missiles see 3.5.1.3.

3.5.3.2 Steel Barriers

The Ballistic Research Laboratories Formula (Reference 3.5-1) is used to determine penetration depths of missiles into steel barriers.

The overall response of barriers subject to impact are investigated by the use of general energy equations given in "Introduction to Structural Dynamics", J. M. Biggs (Reference 3.5-9). Upon determination of penetration depth and duration of impact, an effective dynamic force is computed. The additional calculation of the natural period of the target structure and the selection of a ductility ratio facilitates the determination of the required structural resistance. In this manner, missile impact is translated to an equivalent static load in an effort to quantify bending moments and shear. The detailed method used for predicting the overall response of missile barriers, including the forcing function method of determining ductility in structural elements and the basis for the ductility ratios used in the calculations, is provided in Appendix C of the report "Protection Against Pipe Breaks Outside Containment" (Reference 3.5-13) that was presented to and approved by the NRC.

3.5.3.3 Earth Barriers

When the protective barrier is of earthen origin, the soil penetration studies are based on alternate techniques. Buried safety related piping and electrical systems required for a safe shutdown are ensured adequate protection from tornado generated missiles. Analysis of potential damage is performed using the "Tornado Design Considerations for Nuclear Power Plants" by Bates and Swanson, 1967 (Reference 3.5-8). The analysis procedure neglects soil interlocking under a suddenly applied load and ignores lateral soil resistance. A 5-foot embedment depth is calculated to be acceptable to ensure pipe integrity.

3.5.3.4 Applications

Examples of barrier design are as follows:

Steel covers for manholes containing cabling for safety related equipment required for safe shutdown are designed to withstand tornado generated missile impact and associated wind-pressure. These 2'-9" circular steel plates are designed using conventional elastic analysis and design methods for determining stress and strain. The design adopted uses two 1-1/8 inch plates of ASTM A 514 steel plate to prevent penetration and blowout.

The reactor building railroad airlock exterior doors and the standby service water pumphouse exterior equipment doors are designed and certified by the manufacturer to withstand the effects of tornado generated exterior missiles as described in 3.5.1.4.

All other doors in Seismic Category I and safety related structures are not designed to withstand the effects of the missiles described in 3.5.1. These doors are backed up, wherever missile protection is required, with reinforced concrete walls forming a labyrinth behind the door. Similarly, louvers in exterior walls, which are vulnerable to missile penetration are backed up by reinforced concrete plenums or walls.

Based upon the selection and description of missiles cited in 3.5.1, the interaction of missiles with structural elements is determined and the results are given in Table 3.5-5. The tabulations assume the missiles to impact at the most vulnerable point of a structure or component (e.g., at the center of a slab).

The reactor protection system motor-generator sets flywheels located in the critical DC switchgear rooms at elevation 467'-0" in the Radwaste Building were analyzed and determined to be credible missile sources, with the potential consequences affecting the safe shutdown of the plant. Barriers were constructed around these flywheels of steel and aluminum honeycomb material, which were designed to contain the credible missiles (see 3.5.1.1.5).