Table 3.7-1

DAMPING FACTORS FOR STRONG VIBRATIONS WITHIN THE ELASTIC LIMIT[a]

Item	Percentage of Critical Damping
Reinforced Concrete Structures	5.0
Steel Frame Structures	2.0
Welded Assemblies	1.0
Bolted and Riveted Assemblies	2.0
Vital Piping Systems	0.5

a This table is not applicable to Unit 3 LPCI corner room structural steel. For SSE, use damping values of Table 1 of Regulatory Guide 1.61

3.8.4.1.3 Loads and Load Combinations

General requirements for the design of all structures and equipment include provisions for resisting the dead loads, live loads, and wind or seismic loads with impact loads considered part of the live load. Selection of materials to resist these loads is based on standard practice in the power plant field. Their use is governed by the building codes valid at the site of construction and the experience and knowledge of the designers and builders.

The loads of concern include the following:

D = dead load of structure and equipment plus any other permanent loads contributing stress, such as soil or hydrostatic loads or operating pressures, and live loads expected to be present when the plant is operating

P = pressure due to LOCA

R = jet force or pressure on structure due to rupture of any one pipe

H = force on structure due to thermal expansion of pipes under operating conditions

T = thermal loads on containment due to LOCA

E = OBE load (0.10 g horizontal ground acceleration, 0.067 g vertical acceleration)

E′ = SSE load (0.20 g horizontal ground acceleration, 0.133 g vertical acceleration)

3.8.4.1.4 Design and Analysis Procedures

The criteria for Class I structures and equipment with respect to stress levels and load combinations for the postulated events are noted below:

D + R + E (a) Normal allowable code stresses (AISC for structural steel, ACI for reinforced concrete). The customary increase in design stresses, when earthquake loads are considered, is not permitted.

D + R + E′ Stresses are limited to the minimum yield point as a general case. However in a few cases, stresses may exceed yield point (b). In this case an analysis, using the Limit-Design approach, is made to determine the energy absorption capacity which should be such that it exceeds the energy input. This method has been discussed in the NRC publication TID-7024, "Nuclear Reactor and Earthquakes," Section 5.7. The resulting distortion is limited to assure no loss of function and adequate factor of safety against collapse.

a Not applicable to Unit 3 corner room structural steel until the structural steel modifications are completed in D3R14

b. For cases where stresses exceed yield point, the maximum strain will be limited to ten times the yield strain.

in contact with the back of the expansion anchor baseplate. Self-drilling expansion anchors which were in contact with the back of the expansion anchor baseplate were either replaced with a wedge-type anchor, or the expansion anchored plate assembly was modified to support the design loads.

Future expansion anchor installations will consist of wedge-type anchors only, with an embedment length equal to eight anchor diameters. These anchors will be installed in accordance with approved QA/QC procedures, and the design load for these anchors will be less than the specified anchor preload.

3.8.4.6.1 INSERT "B"

3.8.5 Non-Class I Structures

3.8-29 Class II structures supporting Class I structures, systems and components were designed to Class II requirements and have been investigated to assure that the integrity of the Class I items is not compromised. Class I structures, systems and components located in Class II structures include the control room, standby gas treatment system, and the standby electrical power systems comprising of the station batteries, diesel generators, essential busses, and other electrical gear for power to critical equipment.

3.8-30 The following structures and systems were designed for Class II rather than Class I because none of them are required for safe shutdown of the plant under conditions of the DBA: the crib house, radioactive waste building and waste disposal system, condensate storage tanks and pumps, reactor building crane, auxiliary power buses, shutdown cooling system, the standby coolant supply system, service water system, fire protection system, and air compressors and receivers.

The containment cooling service water pumps and the emergency diesel generator cooling water pumps are located in Class II structures, but have been afforded Class I protection. The containment cooling service water pumps are located in the turbine building below grade on a reinforced concrete floor above the condensate and condensate booster pumps. The grade floor slab above these pumps protects them from debris and missiles during tornado-type conditions and the floors and surrounding structure in this area have been calculated to be earthquake resistant. The emergency diesel generator cooling water pumps are located at elevation 490'-8" in the crib house. This is the same floor that the circulating water pumps are located on and is below the reinforced concrete slab at grade. The concrete structure of the crib house would not be affected by tornado or earthquakes.

The auxiliary power buses are not required for a safe shutdown of the plant. The diesel generators supply power to the emergency buses which are Class I. The diesel generators and the emergency buses are both totally redundant.

Equipment which requires air from the air compressors and receivers are designed for fail-safe operation should a loss of air occur. Therefore, the air compressors and receivers are not designed to Class I.

Table 3.8-11

ALLOWABLE STRESSES FOR CLASS I STRUCTURES

Loading Conditions	Reinforcing Steel Maximum Allowable Stress (3)	Concrete Maximum Allowable Stress: Compression (3)	Concrete Maximum Allowable Stress: Shear (3)	Concrete Maximum Allowable Stress: Bearing	Tension on Net Section (3)	Structural Steel Shear on Gross Section (3)	Compression on Gross Section (3)	Bending (3)
Dead, live, operating, and OBE seismic (0.1 g)	0.5 F_y	0.45 f'_c	1.1 $\sqrt{f'_c}$	0.25 f'_c	0.60 F_y	0.40 F_y	Varies with slenderness ratio[2]	0.66 F_y to 0.60 F_y
Dead, live, operating, and wind	0.667 F_y	0.60 f'_c	1.467 $\sqrt{f'_c}$	0.333 f'_c	0.80 F_y	0.53 F_y	Varies with slenderness ratio[2]	0.88 F_y to 0.80 F_y
Dead, live, operating, and SSE seismic (0.2 g)	---	[Safe shutdown of the plant can be achieved][1]				---	---	---

F_y = minimum yield point of material f'_c = compressive strength of concrete

Notes:

1. The structure was analyzed to assure that a proper shutdown can be made during ground motion having twice the intensity of the spectra shown in Figure 3.7-1 even though stresses in some of the materials may exceed the yield point.
2. The slenderness ratio for compression members in ceiling mounted supports for cable trays, conduits, and HVAC ductwork is limited to 300.
3. Not applicable to Unit 3 corner room structural steel until the structural steel modifications are completed in D3R14

(Sheet 1 of 1)

In summary, the design of the TAP supports is adequate for the loads, load combinations, and acceptance criteria limits specified in NUREG-0661[5] and substantiates the piping analysis results.

3.9.3.4 INSERT "A"

3.9.4 Control Rod Drive Systems

The design of the CRD system is discussed in Section 4.6. Control rod drive materials are addressed in Section 4.5.

3.9.5 Reactor Pressure Vessel Internals

The following sections provide descriptions of the physical layout of the reactor pressure vessel internals (Section 3.9.5.1), of loading conditions applicable to their structural and functional integrity (Section 3.9.5.2), and of their design evaluation (Section 3.9.5.3). Design of the control rods is described in Section 4.6. Information on the reactor internals materials is provided in Section 4.5.2.

3.9.5.1 Design Arrangements

3.9-48 In addition to the fuel and control rods, reactor vessel internals include the following components:

A. Shroud,

B. Baffle plate (shroud support plate),

C. Baffle plate supports,

D. Fuel support piece,

E. Control rod guide tubes,

F. Core top grid,

G. Core bottom grid,

H. Jet pumps,

I. Feedwater sparger,

J. Core spray spargers,

K. Standby liquid control system sparger,

L. Steam separator assembly,

M. Steam dryer assembly, and

3.9.3.4 <u>Interim Operability Criteria</u>

If a piping system is found to exceed the limits provided in 3.9.3.1.3 and 3.9.3.3, it shall be evaluated for operability in accordance with the SER related to Piping system Operability Criteria issued September 27, 1991.

INSERT "A"

Insert "B"

3.8.4.6.1 Interim Operability Criteria

If a concrete expansion anchor assembly is found to exceed the limits provided in 3.8.4.6, it shall be evaluated for operability in accordance with the criteria provided in the SER related to Piping System Operability Criteria issued September 27, 1991.