

## 2.2 STRUCTURAL AND SYSTEMS ENGINEERING

### 2.2.1 Building Structures Design Description

The US-APWR includes the reactor building (R/B), which contains the prestressed concrete containment vessel (PCCV) and containment internal structure, two power source buildings (PS/Bs), power source fuel storage vaults (PSFSVs), auxiliary building (A/B), turbine building (T/B), access building (AC/B), and essential service water pipe tunnel (ESWPT). The seismic classifications for these structures are provided in Table 2.2-1.

Seismic Category I structures are designed and constructed to withstand design-basis loads without loss of structural integrity. Design basis loads are:

- Normal plant operation (including dead loads, live loads, lateral earth pressure loads, equipment loads, hydrodynamic loads, temperature, and equipment vibration)
- External events (including rain, snow, flood, tornado, hurricane, tornado generated missiles, hurricane generated missiles, and earthquake) DCD\_02-03  
S01
- Internal events (including flood, pipe rupture, equipment failure, and equipment failure generated missiles).

#### 2.2.1.1 Reactor Building (R/B)

The R/B has five main floors and contains the PCCV near its center. The R/B and PCCV are founded on a reinforced concrete common basemat, which is isolated from adjacent A/B, T/B, and PS/B basemats. The R/B roof, outer walls, and floor slabs are constructed of reinforced concrete.

The PCCV includes the containment vessel, internal structure, and the containment penetration area annulus to provide an efficient leak-tight barrier and environmental radiation protection under all postulated design basis conditions, including LOCA.

#### 2.2.1.2 Prestressed Concrete Containment Vessel (PCCV)

The PCCV is a vertically oriented cylindrical structure topped by a hemispherical dome. The structural form transitions from a cylinder to a dome without the use of a ring girder. The PCCV shell is constructed of reinforced concrete, pre-stressed by use of un-bonded tendons, and has the capacity to accept limiting design basis temperature and pressure loads while retaining design margin to inelastic deformation.

The PCCV inner surface is lined with SA-516 grade 60 or equivalent carbon steel plate, which is anchored to the concrete shell and dome by concrete embedments to form a leaktight pressure boundary. The liner plate is not credited in structural design load capacity calculations. The minimum concrete design compressive strengths ( $f'_c$ ) for the PCCV and basemat are 76000 psi and 54000 psi, respectively. The PCCV internal pressure load capacity is based on the cumulative yield strength of steel structural elements, such as concrete reinforcement bars and pre-stressing tendons. MIC-03-06-  
00073

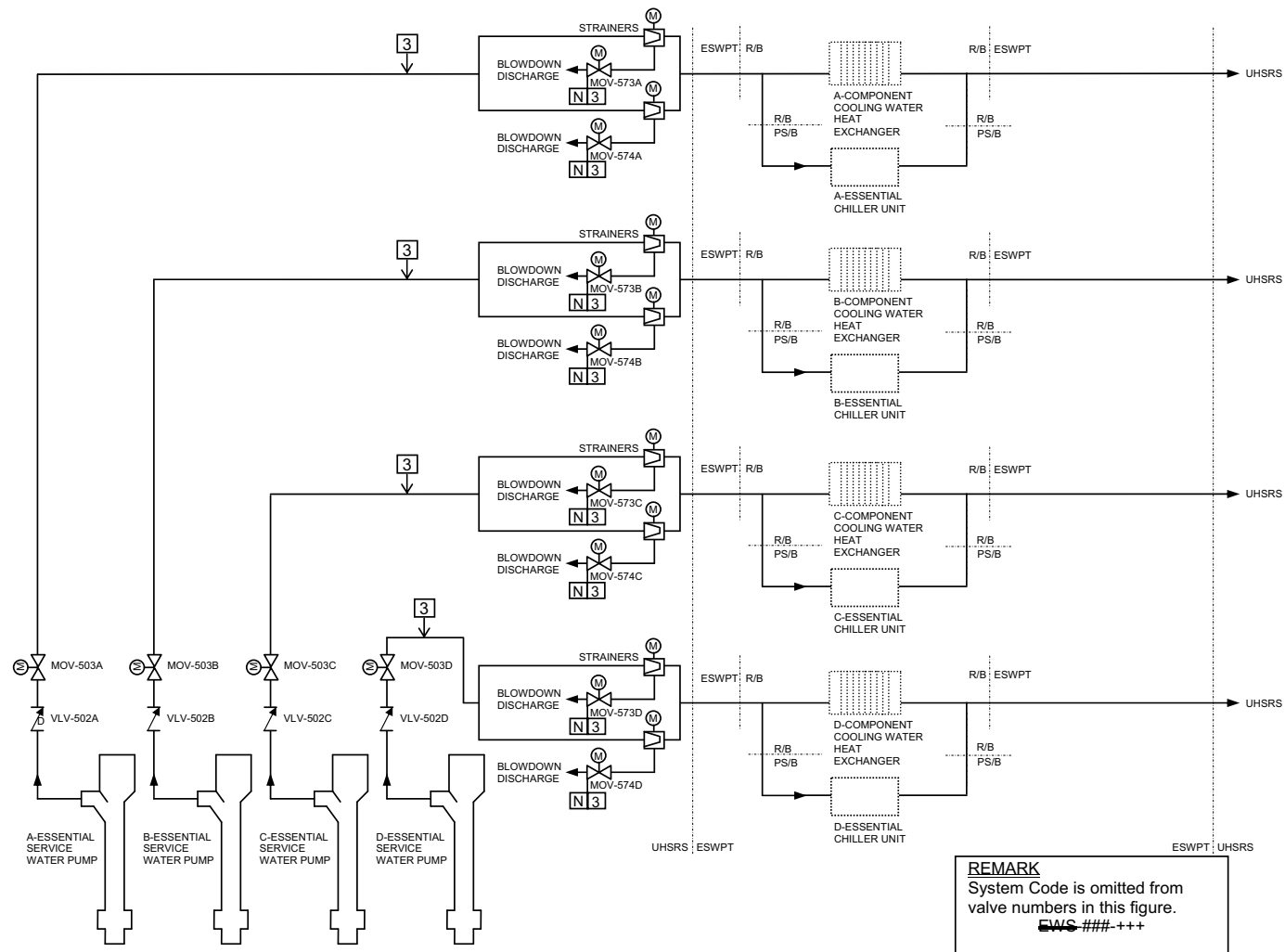
MIC-03-09-0  
0012

Figure 2.7.3.1-1 Essential Service Water System