7.4.2 BWR Safety Systems

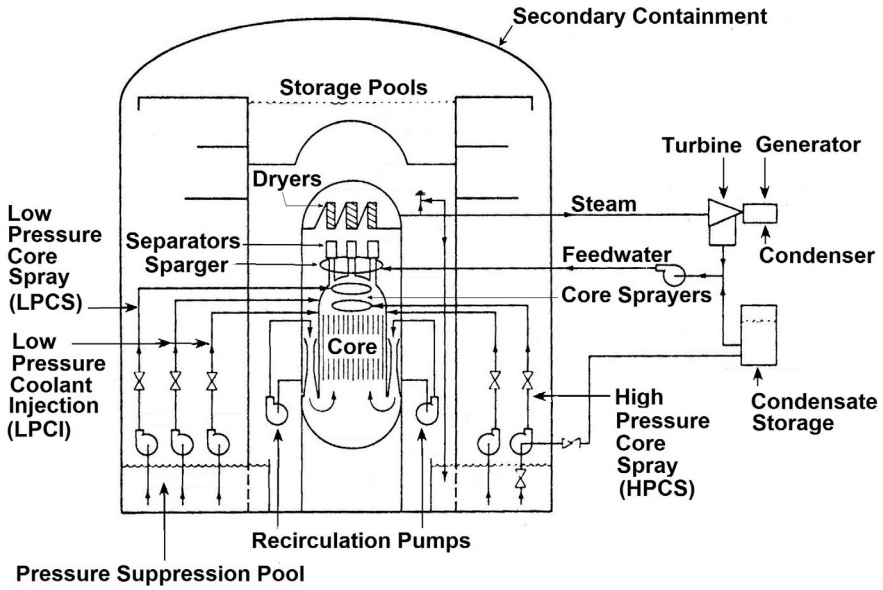

Figure 1: Schematic of the ECCS system in a GE Mark III BWR. Adapted from Dix and Anderson (1977), Lahey (1977).

A typical BWR ECCS (figure 1) has similar HPCI and LPCI systems as well as spray systems above the core and within the reactor vessel itself (see figure 2). Usually one spray system is designed to operate while the pressure within the reactor vessel is high (the High Pressure Core Spray, HPCS) and another for lower reactor vessel pressures (the Low Pressure Core Spray, LPCS). There is also a spray system outside the reactor vessel and inside the secondary containment structure whose purpose is to cool the primary containment vessel and its contents from the outside.

In a BWR the potential consequences of the release of all of the primary cooling water are handled differently than in a PWR. As described in section 6.6.4, the steam would be forced down into a *pressure suppression pool* or *wetwell* where it would condense and thus prevent a build-up of pressure in the primary containment. The first Mark I configuration of this suppression pool was a toroidal shape as shown in figure 3; General Electric introduced later Mark II and Mark III versions that are sketched in figure 4. Concerns about the oscillatory condensation phenomena that might occur if these suppression pools were to be brought into action (see section 6.6.4) raised issues of the structural loads that might result and the ability of the suppression pool structure to withstand those loads. Several very large scale experiments were carried out in order to answer those questions.

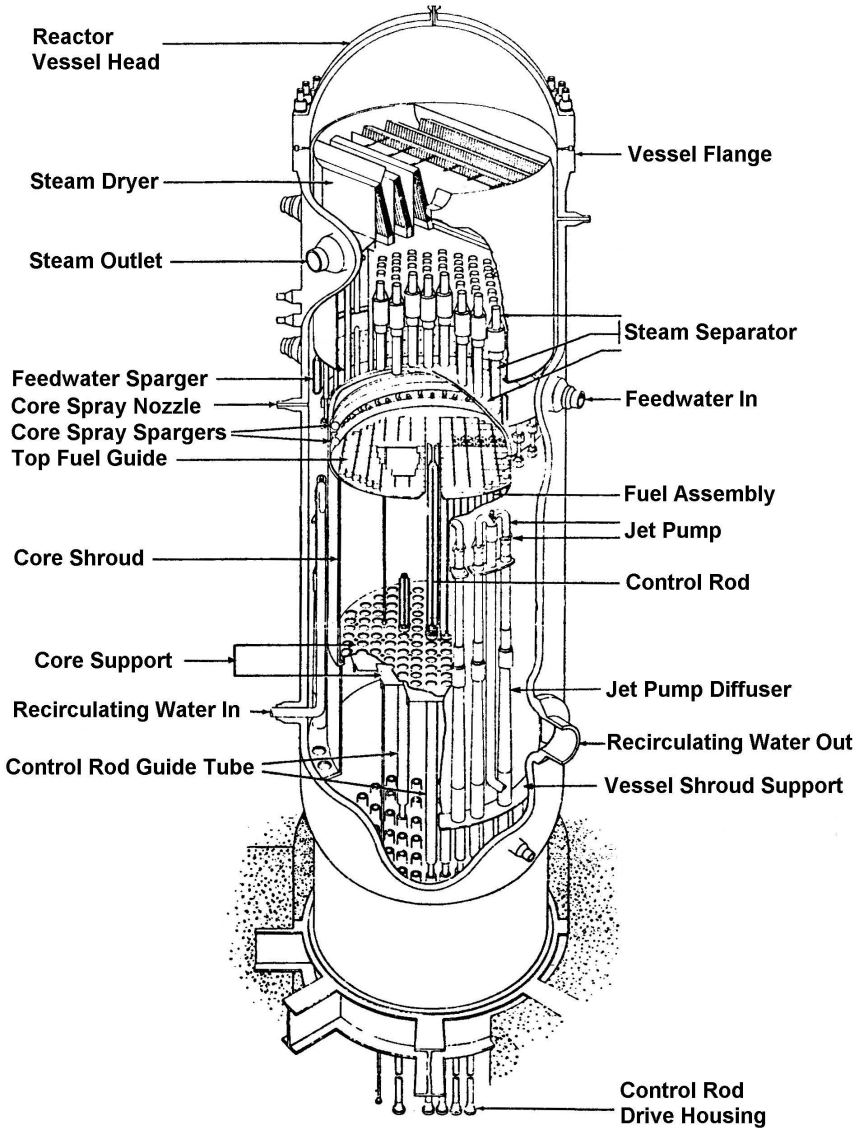

Figure 2: Typical BWR reactor vessel. Adapted from USAEC (1973).

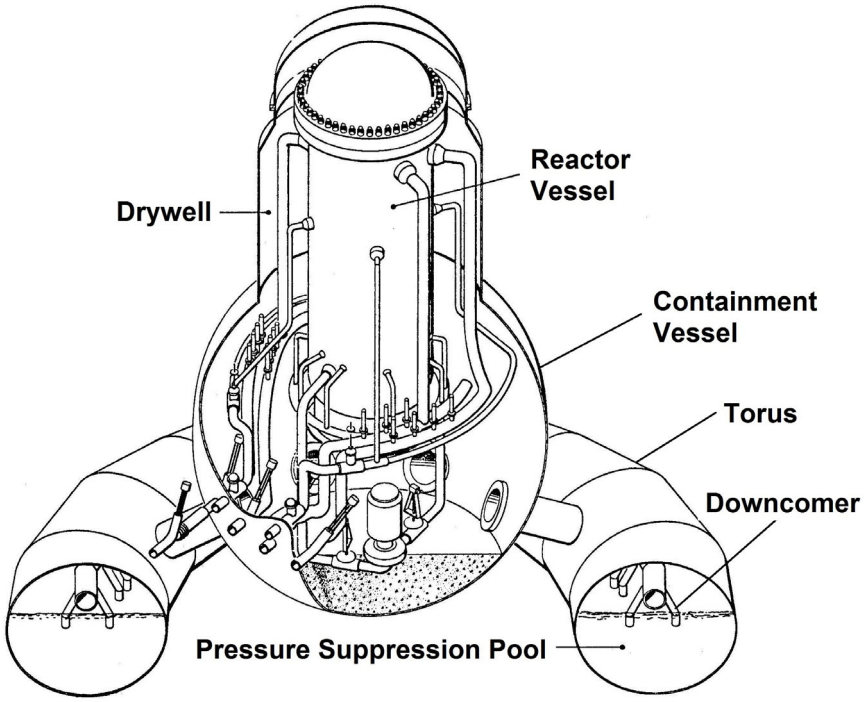

Figure 3: Schematic of the BWR (Mark I) primary containment and pressure suppression systems. Adapted from USAEC (1973).

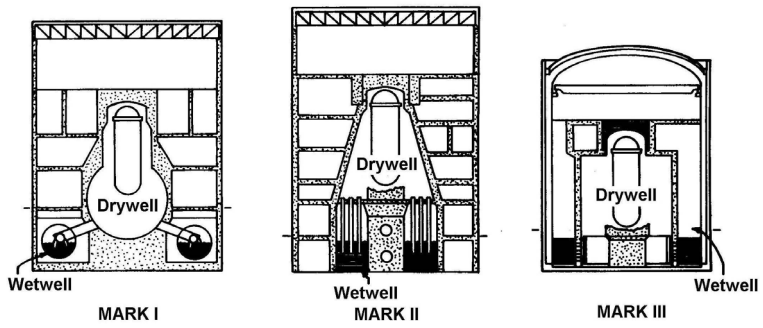

Figure 4: Mark I, Mark II and Mark III BWR pressure suppression systems. Adapted from Lahey (1977).