

2.6.1 Containment systems and Radioactive release

The main safety concern with nuclear reactors has always been the possibility of an uncontrolled release of radioactive material leading to contamination and radiation exposure outside the plant. To prevent this, modern nuclear reactors incorporate three levels of containment. First the fuel and radioactive fission products contained in the fuel pellets are packed and sealed in zirconium alloy fuel rods (see section 4.3.4). This alloy is known by its trade name, zircaloy and the fabrication material of the rods is known in general as *cladding*. These fuel rods, in turn, are contained inside the large, steel primary containment vessel with walls that are about 30 *cm* thick. The associated primary cooling piping is similarly strong. All this is then enclosed in a massive reinforced concrete structure with walls that are at least 1 *m* thick. Moreover, these three barriers are monitored continuously. The fuel rod walls are monitored by checking for any radioactivity in the primary cooling water and that cooling system is monitored for any water leakage. Finally the concrete structure is monitored for any air leakage.

One of these systems is the containment surrounding the operational reactor core, a barrier that is known as reactor shielding and it is appropriate in the discussion of containment to review that topic.