We discuss the subalgebra structure of $sl(3,\mathbb{O})$, a particular real form of $E_6$ chosen for its relevance to particle physics [1]. We use an explicit octonionic representation of the Lie group $SL(3,\mathbb{O})$ to produce the multiplication table of the corresponding algebra. We identify various subalgebras of the form $sl(n,\mathbb{F})$ and $su(n,\mathbb{F})$ within $sl(3,\mathbb{O})$, and we also find algebras corresponding to generalized Lorentz groups. We identify six Casimir operators in $sl(3,\mathbb{O})$, and produce a nested sequence of subalgebras and Casimir operators containing not only $su(3) \oplus su(2) \oplus u(1)$, corresponding to the Standard Model of particle physics, but also $so(3,1)$, corresponding to the Lorentz group of special relativity.