The first order system for convection-diffusion can be written in a variety of ways. For $a, b \in [0,1]$, we can distribute the ϵ factor

$$\begin{aligned} \nabla \cdot (\beta u - \epsilon^a \sigma) &= f \\ \frac{1}{\epsilon^b} - \epsilon^{(1-a-b)} \nabla u &= 0. \end{aligned}$$

a controls the distribution of ϵ into the conservation equation, while b determines the distribution of ϵ onto either the σ or ∇u term in the stress equation.

Demkowicz and Heuer use $a = 0$, $b = 1$, while Broersen and Stevenson use the choice of $a = 1/2$ and $b = 0$, noting that, as $\epsilon \to 0$, the first order system decouples into the pure convection equation for u and a trivial equation for σ.

So long as $a + b > 0$, then the trace of u resulting from integration by parts of $\epsilon^{(1-a-b)} \nabla u$ will carry with it a power of ϵ, such that, as $\epsilon \to 0$, the outflow boundary condition will release in the limit.