Using y and z as parameters, we have $\mathbf{r}(y,z) = (y + 4z^2)\,\mathbf{i} + y\,\mathbf{j} + z\,\mathbf{k}$,
$0 \le y \le 1$, $0 \le z \le 1$.
Then $\mathbf{r}_y \times \mathbf{r}_z = (\mathbf{i} + \mathbf{j}) \times (8z\,\mathbf{i} + \mathbf{k}) = \mathbf{i} - \mathbf{j} - 8z\,\mathbf{k}$
and $|\mathbf{r}_y \times \mathbf{r}_z| = \sqrt{2 + 64z^2}$. Thus
$\iint_S z\,dS = \int_0^1 \int_0^1 z\sqrt{2 + 64z^2}\,dy\,dz = \int_0^1 z\sqrt{2 + 64z^2}\,dz$
$= \left[\frac{1}{128} \cdot \frac{2}{3}(2 + 64z^2)^{3/2}\right]_0^1 = \frac{1}{192}(66^{3/2} - 2^{3/2})$.