If an embedding of a graph $G$ in the sphere is a quadrangulation of the sphere, then $G$ is necessarily bipartite. Assuming that $G$ has minimum vertex degree 3 and that all vertices in one block of $V(G)$ have degree 4, we refer to $G$ as a spherical grid. We discuss general structural properties in spherical grids, then use these to completely characterize rotationally symmetric spherical grids having two vertices of degree $n$, $2n$ vertices of degree 3, and all other vertices of degree 4. Furthermore, we show how to represent all possible examples as nets. (Received September 12, 2017)