X-Ray diffraction, using high-energy photons from a synchrotron, was used to extend the investigation of $\text{(ZnO)}_x\text{(P}_2\text{O}_5)_1-x$ glasses to samples of ZnO content close to $x = 0.8$ which were obtained by roller-quenching. The isolated PO$_4$ tetrahedra are surrounded by ZnO polyhedra, where Zn−O coordination numbers of $\sim 4.5$ are determined. The small increase of $N_{\text{ZnO}}$ from $\sim 4$ at metaphosphate composition ($x = 0.5$) to $\sim 4.5$ is not sufficient to explain the strong increase of the packing density beyond the minimum at $x = 0.5$. The medium-range order was analyzed on the basis of partial $S_{\text{PP}}(Q)$ and $S_{\text{ZnZn}}(Q)$ factors obtained from Reverse Monte Carlo simulations of glasses with $0 \leq x \leq 0.8$. The positions of the first peaks in these factors, the number densities of P and Zn atoms and knowledge of definite P-P and Zn-Zn distances were used to check the applicability of simple models such as the dense packing of uniform P- and Zn-centered spherical environments for glasses with $x = 0.8$ and 0.5, the packing of corrugated sheets for vitreous P$_2$O$_5$ and the packing of phosphate chains for Zn metaphosphate glass.

Key words: X-Ray Diffraction; Glass Structure; Reverse Monte Carlo.