abstract The model of cylindrical gravitational waves is employed to work out and check a recent proposal in Ref. honnef how a diffeomorphism-invariant Hamiltonian dynamics is to be constructed. The starting point is the action by Ashtekar and Pierri because it contains the boundary term that makes it differentiable for non-trivial variations at infinity. With the help of parametrization at infinity, the notion of gauge transformation is clearly separated from that of asymptotic symmetry. The symplectic geometry of asymptotic symmetries and asymptotic time is described and the role of the asymptotic structures in defining a zero-motion frame for the Hamiltonian dynamics of Dirac observables is explained. Complete sets of Dirac observables associated with the asymptotic fields are found and the action of the asymptotic symmetries on them is calculated. The construction of the corresponding quantum theory is sketched: the Fock space, operators of asymptotic fields, the Hamiltonian and the scattering matrix are determined.