Let $(\pi, \mathcal{H})$ be a strongly continuous unitary representation of a 1-connected Lie group $G$ such that the Lie algebra $\mathfrak{g}$ of $G$ is generated by the positive cone $C_\pi := \{ x \in \mathfrak{g} : -i\partial \pi(x) \geq 0 \}$ and an element $h$ for which the adjoint representation of $h$ induces a 3-grading of $\mathfrak{g}$. Moreover, suppose that $(\pi, \mathcal{H})$ extends to an antiunitary representation of the extended Lie group $G_\tau := G \rtimes \{ 1, \tau_G \}$, where $\tau_G$ is an involutive automorphism of $G$ with $L(\tau_G) = e^{i\pi \text{ad} h}$. In a recent work by Neeb and Ólafsson, a method for constructing nets of standard subspaces of $\mathcal{H}$ indexed by open regions of $G$ has been introduced and applied in the case where $G$ is semisimple. In this paper, we extend this construction to general Lie groups $G$, provided the above assumptions are satisfied and the center of the ideal $\mathfrak{g}_C = C_\pi - C_\pi \subset \mathfrak{g}$ is one-dimensional. The case where the center of $\mathfrak{g}_C$ has more than one dimension will be discussed in a separate paper.

**Keywords**: Standard subspace, Lie group, covariant net, quantum field theory.

**MSC**: 22E45, 81R05, 81T05.