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A building-up construction is a way to construct all self-dual codes from smaller length self-dual codes. It depends on the size of the ground alphabet. In this paper, we complete the building-up construction for self-dual codes over $GF(q)$ with $q \equiv 3 \pmod{4}$, and over \mathbb{Z}_{p^m} and Galois rings $GR(p^m, r)$ with an odd prime p satisfying $p \equiv 3 \pmod{4}$. We also present a building-up construction for self-dual codes over finite chain rings and p -adic rings \mathbb{Z}_{p^∞} with any odd prime p . As examples, we reconstruct more than 600 extremal self-dual ternary $[28, 14, 9]$ codes, improving 32 previously known codes. We also construct many self-dual codes over \mathbb{Z}_9 of lengths 12, 16, 20 all with minimum Hamming weight 6, which is the best possible minimum Hamming weight among free self-dual codes over \mathbb{Z}_9 of these lengths. (Received July 23, 2008)