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A classical topic in Discrete Geometry with various applications to other fields are Delone subdivisions of discrete point sets. In two classical papers, Voronoi developed a theory of L-types, which classifies geometric lattices in  $d$ -dimensional Euclidean spaces according to their Delone subdivision or Dirichlet-Voronoi cell respectively. For a given dimension  $d$  such a classification can theoretically be used to solve the lattice covering problem. This is impractical though for  $d \geq 6$ . We therefore describe an extension of the classical theory, which enables us to classify Delone subdivisions with certain prescribed properties. Using convex optimization techniques, we apply the new theory to compute various new best known covering lattices. Moreover, we show how to use the theory to obtain a complete classification of totally real thin number fields. (Received September 02, 2005)