Locally Finite, Planar, Edge-Transitive Graphs

[**Jack E. Graver**](http://www.ams.org/cgi-bin/bookstore/booksearch?fn=100&pg1=CN&s1=Graver_Jack_E&arg9=Jack_E._Graver) and [**Mark E. Watkins**](http://www.ams.org/cgi-bin/bookstore/booksearch?fn=100&pg1=CN&s1=Watkins_Mark_E&arg9=Mark_E._Watkins),

*Syracuse University, NY*

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The nine finite, planar, 3-connected, edge-transitive graphs have been known and studied for many centuries. The infinite, locally finite, planar, 3-connected, edge-transitive graphs can be classified according to the number of their ends (the supremum of the number of infinite components when a finite subgraph is deleted). Prior to this study the 1-ended graphs in this class were identified by Grünbaum and Shephard as 1-skeletons of tessellations of the hyperbolic plane; Watkins characterized the 2-ended members. Any remaining graphs in this class must have uncountably many ends. In this work, infinite-ended members of this class are shown to exist. A more detailed classification scheme in terms of the types of Petrie walks in the graphs in this class and the local structure of their automorphism groups is presented. Explicit constructions are devised for all of the graphs in most of the classes under this new classification. Also included are partial results toward the complete description of the graphs in the few remaining classes.

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