



**Politecnico
di Torino**

Honors Thesis

**Master's degree Science in
Architecture Construction City**

Abstract

Beyond the Strait: Architecture and Engineering for a Possible Bridge

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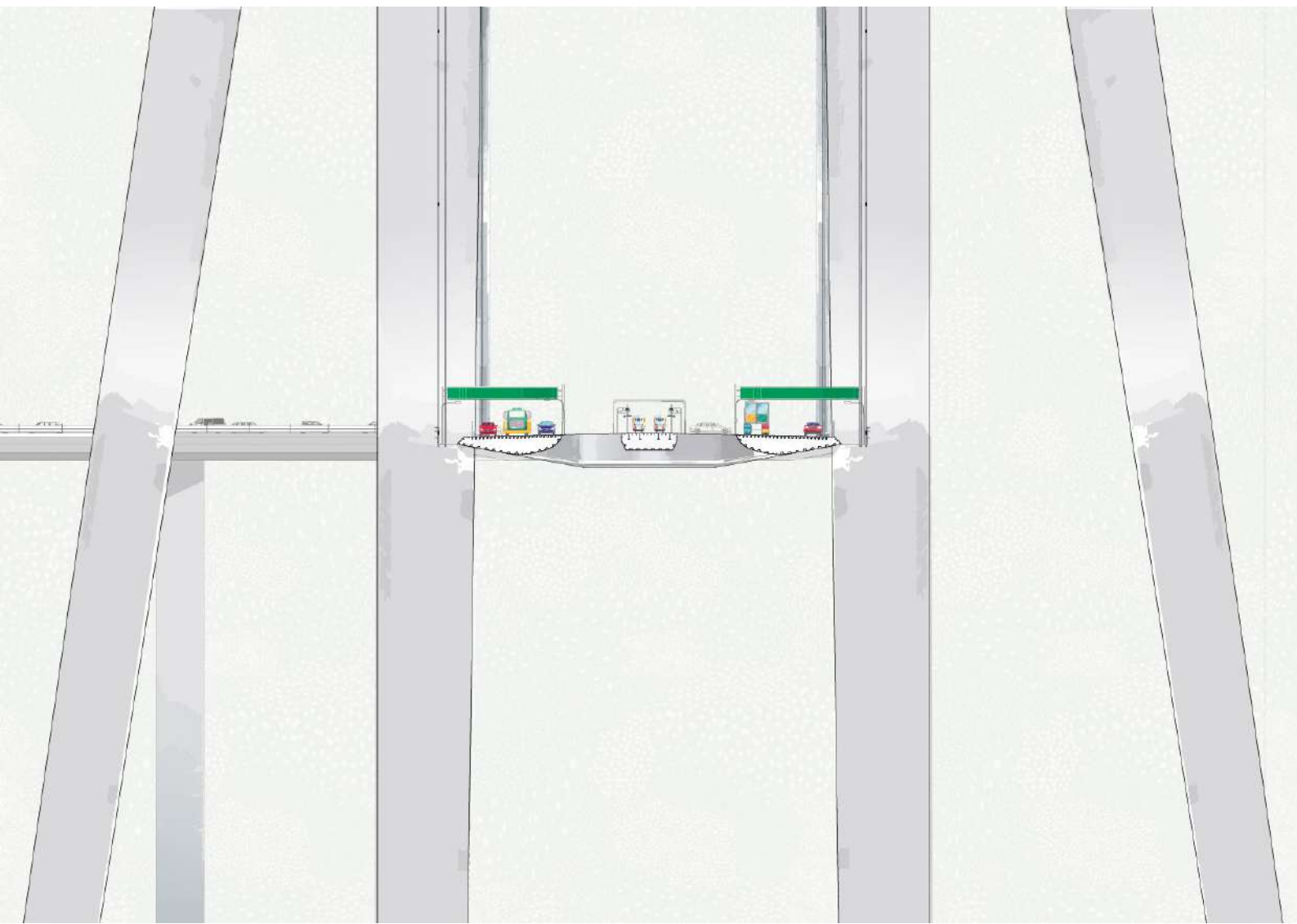
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In recent years, the debate over the construction of a permanent link between Sicily and Calabria has taken on renewed prominence within the Italian infrastructure landscape. This thesis aims to analyse the final design drawn up by Stretto di Messina S.p.A., highlighting the main technical, environmental, social and urban planning issues. The objective is to develop a new design proposal capable of integrating the various dimensions mentioned above in a coherent and unified manner, whilst respecting the local context. Chapter 1 is dedicated to the historical and geographical context of the project and presents an analysis of the two regions involved, considering both the economic motivations underlying the design choices and the role played by public opinion in the debate on the permanent link. In Chapter 2, the research focuses on the main 'blind spots' of the official design proposal, often perceived as a monumental project disconnected from real infrastructure needs and the intrinsic fragilities of the local context in which it is situated. In an attempt to address these critical issues, Chapter 3 develops, designs and verifies a proposed bridge capable of ensuring the continuity of the high-speed railway line. The new bridge is configured as a three-span structural solution, with two piers in the water, characterized by an integrated system of stay cables and guy wires supporting an aerodynamically efficient deck. A key departure from the traditional solutions analyzed in Chapter 2, and one that reflects a strong focus on innovation, is the choice of construction materials. The design proposal involves the use, for the foundations, of innovative cementitious materials based on volcanic ash from Mount Etna, which possess mechanical properties comparable to those of traditional cement but with a reduced clinker content. These materials were selected for their high performance in terms of strength and durability in a marine environment, as well as for their environmental sustainability, linked both to the reduction of the carbon footprint and to the local availability of resources. The effectiveness of the design proposal was validated through finite element modelling carried out using MIDAS Civil NX software. The design work involved studying the structural geometries in response to wind, seismic and snow loads, correctly identifying the loads (structural, permanent, variable and accidental), and defining the most effective design strategies. In Chapter 4, using a SWOT analysis (Strengths, Weaknesses, Opportunities, Threats), the technical feasibility and territorial impact of the proposed solution are compared with the project developed by Stretto di Messina S.p.A. To support the credibility of the design proposal, and in line with the work carried out in Chapter 3, there is finally an appendix dedicated to structural calculations.







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