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Exploration and testing of the authentic and alternative stone types for the monument repair: a case study of clastic sedimentary rocks at the Charles Bridge in Prague (Czech Republic)

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Gothic Charles Bridge in Prague (Czech Republic) belongs to the most important Czech monuments. For its construction and later repairs, several stone types have been used: prevailing Carboniferous arkoses and subsidiary Cretaceous sandstones. The stone facing masonry suffers from polluted atmosphere and improper repairs during previous decades. Recent repair plans require enormous amounts (thousands of cubic meters) of the replacement material. The original stone type – Carboniferous arkose – is not quarried at present. The research activity therefore focuses on two possible scenarios: (i) use of the authentic stone type, and (ii) use of alternative stone types. The first case means necessity of extensive exploration of the abandoned quarries and testing of Carboniferous arkoses. The second scenario involves numerous laboratory tests including long term durability testing (freeze/thaw cycling, resistance to salt crystallization) and test evaluation (by measurement of porosity, microporosity, water absorption, ultrasonic velocity, and uniaxial compressive strength) of alternative stone types – Cretaceous sandstones. According to the test results, certain stone varieties used for modern repair (19^{th} and 20 centuries) are less resistant to weathering agents than the original stones. This fact influences decision-making during stone selection for repairs.