



Use and durability of Morley oolitic limestone (Dépt. Meuse, France) in the Netherlands

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Morley is a white to greyish oolitic limestone, quarried up to the 1970's in the Département Meuse, France. In the second part of the 19th century, many limestones from (northern) France, such as St. Joire, Savonnières, Euville, Massangis (Vaurion), Reffroy and Coutarnoux, have been introduced in the Netherlands, amongst others as replacement stones for white Belgian sandy limestones. Morley has been used more rarely. It has been used for newly constructed buildings since the 1890's, mostly for interiors but also as façade cladding, for example in the city theater in Amsterdam and the famous Hotel l'Europe in the same city. The Morley has also been used as replacement stone, notably on both major churches of the city of Leyden, viz viz. the Hooglandse or St. Pancras' Church and St. Peter's Church (Pieterskerk). The latter church, from which the Pilgrim Fathers left for America, dates back to 1390 and was repeatedly restored during the end of the 19th and the first half of the 20th century. In the period 1894 – 1940, Morley was applied several times, amongst others for trceries and cladding, in particular on the transept.

In the 1940's, by the end of the period in which Morley was used, i.e. after 40 – 50 years of experience with the stone, durability of Morley was appreciated variably, some authors considering the varieties *dur* and *demi dur* to be weather resistant, others considering this limestone not suited for exterior use at all. After 60 – 100 years of exposition on the transept of Leyden's St. Peter's Church, Morley used as cladding, mostly as isolated blocks or groups of a few blocks between the original cladding of Gobertange, a sandy limestone from the Belgian Eocene, is generally in good condition. In contrast, Morley used for trceries in the transept shows severe scaling, flak-

ing and powdering on the interior side of the montants. Though some minor gypsum is present, deterioration is mainly caused by presence of halite, whose concentration is strongly increased in the part of the montants facing the interior of the church, whereas the parts exposed to weather only show minor amounts of halite. Older montants of Bentheim sandstone with similar exposition contain almost no halite, and do not show any damage. Given that interior and exterior exposition, drying conditions and, probably, salt load are the same for both types of stones, physical and chemical–mineralogical properties of Morley oolitic limestone apparently favour a faster salt accumulation in the stone, resulting in the observed damage.