



## Replacement stones for Eocene sandy limestones in 13<sup>th</sup> – 17<sup>th</sup> century Dutch monuments

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Especially in the western part of the Netherlands, Eocene sandy limestones from Belgium have elaborately been used in the construction of many 13<sup>th</sup> – 17<sup>th</sup> century monuments. These comprise both the Lede or Balegem stone from the Lede formation and the Gobertange stone from the Brussels formation. Over the centuries, both stones suffered serious damage in many monuments, manifest by typical black gypsum crusts. Whilst nowadays replacement with original stones would be favoured if enough material would be available, and is done at a small scale, several replacement stones have been used during end 19<sup>th</sup> and 20<sup>th</sup> century restorations. The typical white sandy limestones have been replaced by various French limestones, amongst them Anstrude, Brauvilliers, Coutarnoux, Euville, Faverolles, Massangis (Vaurion), Reffroy, Savonnières, St.-Joire, and St.-Pierre-Aigle. Recently, considerable amount of English Portland stone have been used.

The choice of replacement stone in end 19th, early 20th century restorations was only to a limited degree determined by expected durability. Considerations of (expected) weathering colour and patina matching that of the remaining original sandy limestones and availability (many restorations being in progress around the Great War) were prominent. Several of the replacement stones showed significant damage after few decades only. Several non-carbonaceous replacement stones have been applied in attempts to find more durable stones or because first generation replacement stones were not available anymore. Consecutive restorations over time have resulted in *replacement series*. Examples include: (a) Replacement of white Lede stone by Bentheim sandstone from Germany (after weathering showing a deep-black appearance), already in the 16<sup>th</sup> century at the New Church, Delft, and subsequent replacement

of part of the sandstone by a French (black!) bazalt, Volvic, in the 20<sup>th</sup> century; (b) replacement of white Belgian limestone by Ettringer tuff at St. John's cathedral, 's-Hertogenbosch in the 1930s, which was replaced in turn by Weidenhahn trachyte from the Westenwald, Germany, and Portland stone in the 1990s; (c) replacement, at the same monument, of white Belgian stone by French St. Joire limestone during 1908-1910, replaced in turn with Ettringer tuff in the 1930s; (d) again at the same monument, replacement of Gobertange by Udelfangen sandstone from the German Triass and French St. Joire limestone, subsequently replaced by a hard Italian tuff, peperino duro; and finally (e) replacement of Lede at Our Lady's Church, Breda, by French limestone, that in turn was replaced by Czech Tepla trachyte in the 1990s. Such replacement series following from consecutive restorations shifted the appearance of the architectural façade further away from the orginal white stone with each replacement.