

# application note



## Rock Strength Testing

## OXRbl, School of Geography University of Oxford

**Monitoring of surface hardness, humidity and temperature allows us to constrain the physical weathering processes that lead to degradation of heritage buildings**

Prolonged exposure of limestone to both natural (temperature, humidity) and anthropogenic (air pollution) weathering factors influence the rate of decay. Conservation of buildings of cultural and historical importance made from limestone is of great concern, thus knowledge of the underlying processes of weathering in this situation furthers our ability to preserve our heritage for future generations.

### Application

A key advantage of the Equotip is the non-destructive nature of data collection. Use of high-impact, large-scale equipment would simply be unacceptable for testing buildings of cultural and historical significance.

Around Oxford city centre, limestone weathering is clearly evident by the occurrence of many pitted and blackened wall facings. The blackening is due to the incorporation of sulphur and associated soot into the limestone chemical structure, resulting in the formation of a gypsum crust. This gypsum crust is harder than the original limestone and is discernable using the Equotip.

Our field monitoring of heritage buildings was complemented by extensive laboratory testing of identical rocks taken from the same geological formations without any exposure to the weathering processes experienced at the field sites, ground-truthing our results.

### Customer Quote

"High spatial resolution measurements are achievable with the Equotips small plunger footprint. This ability to measure surface properties on a small scale helps us to understand how different processes affect rates of weathering. Equipment that measures on a larger scale would lose the detail we need for this study".

*Wes Fraser – OxRBL technician – Proceq customer since 2007*

### Profile

#### Customer

OXRbl uses a wide range of techniques to further understanding of rock breakdown and stone deterioration in a number of different settings. Their research aims to characterise the impacts of weathering, explain the processes going on, and search for sustainable management solutions.

#### Employees

Around 6 staff plus D. Phil., M. Sc. and undergraduate students

#### Requirements

- Accurate and repeatable results using state-of-the-art techniques
- Ability to measure weathered and fragile samples
- Application to a wide range of materials and surface strength
- Robust and simple methods for student use
- Speedy measurements to ensure efficient use within weathering simulations

#### Proceq Product

Equotip 3 with impact device D

#### Benefits to the Customer

- Fast and easy to use device with internal storage for data
- Light impact makes it suitable for fragile weathered samples
- Consistent and reproducible results
- High-spatial resolution achieved with small footprint