

## Case study

Belvoir Castle, United Kingdom

# Preserving historical family archives with dehumidification





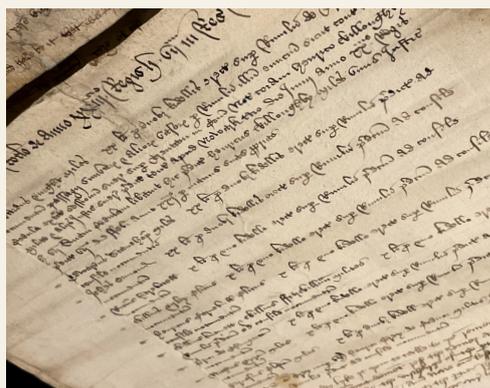
Belvoir Castle, located in the Vale of Belvoir, has been the ancestral home of the Duke of Rutland's family since 1067. From the days of the Norman conquest to modern day, it is one of the finest examples of Regency architecture in the world. The castle has been completely rebuilt at least three times, and to this day boasts grand interiors, exceptional landscaped gardens, and five archive rooms that house the family's historical records and other precious documents.

It was the late 9th Duke of Rutland, His Grace David Manners' grandfather, who began meticulously documenting the estate and family archives. After his death in 1940, his work remained in storage and now, more than eight decades later, archivists at the castle continue this important conservation work.

The archive rooms hold a vast array of books, documents, cartularies (title deeds and charters), maps, manuscripts, accounts, etc - housed in a variety of boxes, on bookshelves, and in glass fronted cabinets. The oldest document within the collection dates back to 1103.

### Advantages:

- Precisely control relative humidity levels in archive rooms to 50-55%RH all year round
- Prevent any further humidity damage to historical and family archive collection
- Meet British Standard BS4971 for conservation in archives
- Reduce need for additional heating, saving energy



## Preserving historical documents

Over time, dirt, dust, humidity, temperature, pests, and acidic packaging have all taken their toll in one way or another. There are visible signs of condensation damage such as mould growth, damage from silverfish (caused by moisture), yellowing and discolouration. The castle has tried keeping documents in boxes, which helps to protect them to some degree, but does not offer long term and consistent protection. Plus, even boxes with metal edges will succumb to rust if humidity levels are not maintained.



Historical archives require consistent humidity control below 60%RH

The archivist at Belvoir castle says “It’s not like everything gets ruined straight away. People might say it’s survived this long, but has it survived in good condition? They’re always deteriorating right from the beginning. If we can get the conditions right, we can slow down or stop any further damage.”

In the past, warm underfloor pipes were used to heat some of the archive rooms, successfully reducing the relative humidity levels to below 60%RH (as recommended by the BS4971 guidelines). This British Standard suggests maintaining relative humidity (RH) levels to a range of 30-60%RH (with gradual fluctuations) to prevent mould growth and preserve documents. However, this proved inconsistent, with significant fluctuations at different times of the year. Heating as a humidity control method often caused the rooms to become excessively warm, necessitating a reduction in heating, which in turn led to the humidity increasing again.



## Why dehumidification?

Preserving the family archives was the main driving factor for requiring dehumidification. Previously, Belvoir Castle had introduced a single domestic dehumidifier in their most problematic archive to control humidity. This had helped to some degree, but conditions were intermittent and unreliable. There were also differences in humidity levels in each of the archive rooms due to natural ventilation, type and placement of external walls, and the buildings' overall construction. It was therefore critical that an effective solution was sought that could control and maintain relative humidity levels correctly in each of these rooms.

*“You can see why an industrial solution is needed. Due to the thickness of the castle walls, having one dehumidifier in each of the archive rooms is essential.”*

His Grace David Manners, 11th Duke of Rutland.

The archivist at Belvoir Castle says “Conservation of this collection is critical. Documents have been damaged by mould and moisture. For example, title deeds have welded together, making it harder to catalogue and restore. It’s important that we prevent any further damage.”



His Grace David Manners,  
11th Duke of Rutland.

## Munters solution

Belvoir Castle approached Munters to size and select an appropriate dehumidification solution for all five archive rooms. Munters designed a solution that would maintain relative humidity levels to 50-55%RH, tracking ambient temperature. The dehumidifiers selected for this project were from the MK range of dehumidifiers, as the best solution to provide better humidity control in each of the archive rooms.

“Working within a castle presents additional challenges” says Glen Wilson, Munters Sales Team Leader, Southern UK Team. “Due to the castle being Grade I listed, we could not drill holes in the walls to duct wet air out of the archive. This is why condenser dehumidifiers were selected.” Munters worked with Belvoir Castle to offer a detailed design specification which, combined with their familiarity with Munters’ work at other historic sites, provided the assurance needed to select Munters for this project.



Munters MK dehumidifier



## Results

By implementing the Munters dehumidifiers, Belvoir Castle has been able to prevent condensation and control relative humidity in their archive rooms all year round. The consistent relative humidity levels of 50–55% relative humidity ensure this valuable collection can be stored safely in these rooms for generations to come. And while moisture damage cannot be undone, further damage can be prevented, and restoration and cataloguing can continue without further risk.

Installing dehumidifiers has also eradicated the need for heating the archive stores when these rooms are unoccupied. While condensation control, and not energy consumption, was the driving factor for this project, the substantial costs associated with running a castle make any savings in this area highly welcome.

Since the installation, Munters' experienced service team has made some adjustments to one of the rooms to maximize operation, further enhancing the effectiveness of the dehumidification solution.

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