



**Case Study:
Preserving National
Archives of the
Dominican Republic**

A milestone in Cultural
Heritage Conservation



REGISTRO NACIONAL DE ARCHIVOS PRIVADOS



The Archivo General de la Nación (National Archives) of the Dominican Republic holds invaluable historical and cultural records, safeguarding the nation's documentary heritage. Among its most fragile assets are cinematographic movies, whose preservation demands highly controlled environmental conditions. In 2012, the Dominican Republic required the development of an 84 m² preservation vault, designed to protect these delicate film reels from the country's naturally humid Caribbean climate.

Cobeal, a leader in engineering solutions for environmental control, was engaged to provide a state-of-the-art preservation system that adhered to global standards for archival storage. This project was part of a broader mission to ensure that historical records remain accessible for future generations, a responsibility aligned with the principles of the Image Permanence Institute's 150-year preservation framework.

Project Challenges

The project's primary challenge was achieving and maintaining a relative humidity (RH) of 30% at a temperature of 18°C, despite the external atmospheric and environmental conditions typical of the Caribbean.

The region's naturally high humidity levels and fluctuating temperatures posed a significant risk to the integrity of delicate film materials, making the implementation of a precise and reliable climate control system imperative.

Engineering and Technical Solutions

Cobeal's approach combined innovative engineering with proven archival preservation techniques. The implemented solution included:

- **A Direct Expansion Cooling System** – This system ensured precise temperature control, critical for preventing film degradation caused by heat exposure.
- **Silica Gel Dehumidification System** – A highly effective method for controlling humidity, silica gel absorbs excess moisture, providing a stable environment within the vault.



- **Integration with International Standards** – The system was designed in accordance with the Image Permanence Institute's guidelines, ensuring a 150-year preservation plan for archival materials.

By working closely with local Dominican authorities and contractors, Cobeal ensured that the controlled environment met both global best practices and local operational requirements.

This collaborative approach resulted in a seamlessly integrated system, setting a new benchmark for archival preservation in the Caribbean.

A handwritten signature in black ink that reads 'Sophy Laughing'.

CHIEF EXECUTIVE OFFICER

Technical Considerations

Understanding the Vulnerability of Cinematographic Film

Cinematographic film is a complex, multi-layered material composed of a cellulose base (nitrate, acetate, or polyester), an emulsion layer containing silver halide or dye-based images, and protective coatings. Over time, environmental factors such as temperature fluctuations, high humidity, pollutants, and light exposure contribute to chemical degradation, leading to irreversible damage such as:

- **Vinegar Syndrome** – A chemical breakdown of cellulose acetate film, producing acetic acid and a distinctive vinegar-like odor.
- **Nitrate Decomposition** – Highly flammable and unstable, nitrate film deteriorates through oxidation, leading to potential loss of image quality and safety hazards.
- **Hydrolysis of Polyester Film** – Though more stable, polyester-based films can still suffer from hydrolysis in humid environments.
- **Silver Mirroring** – The oxidation of silver particles in black-and-white films, creating a reflective, metallic sheen over images.

Optimal Environmental Conditions for Film Preservation

To combat these issues, stringent environmental controls must be implemented. The internationally accepted standards for long-term film storage, as defined by the International Federation of Film Archives (FIAF) and the Image Permanence Institute, recommend the following parameters:

Storage Type	Temperature	Relative Humidity (RH%)	Expected Lifespan
Room Storage	21°C	40-50%	50 years
Cold Storage	10°C	30-40%	100 years
Frozen Storage	-5°C to -10°C	25-30%	500+ years



For the Archivo General de la Nación, Cobéal designed and installed a controlled environment maintaining:

- ✓ 18°C temperature
- ✓ 30% relative humidity

This balance ensures moisture content control while preventing film shrinkage, brittleness, or mold growth.



Climate Control Systems for Archival Storage

To achieve the strict preservation conditions, Cobéal implemented an advanced environmental regulation system, consisting of:

1. Direct Expansion (DX) Cooling System

- A DX cooling system was installed to maintain a stable low-temperature environment, countering the high heat and humidity typical of the Caribbean climate.
- This system allows precise temperature regulation, preventing thermal expansion and contraction that can cause warping or buckling of the film base.

2. Silica Gel Dehumidification System

- A customized silica gel-based dehumidification system was integrated to absorb excess atmospheric moisture while maintaining stable humidity levels.
- This is essential for preventing fungal growth, hydrolysis, and acidic degradation that accelerate film deterioration.

3. Air Filtration and Purification

- A multi-stage filtration system was employed to remove airborne contaminants, dust, and chemical pollutants such as ozone and peroxides, which can accelerate oxidation and fading.
- Activated carbon filters were used to absorb volatile organic compounds (VOCs) that contribute to film degradation.

4. Ventilation and Positive Air Pressure

- Positive air pressure was maintained to prevent the infiltration of external contaminants and fluctuations in environmental conditions.
- Air exchange rates were optimized to minimize exposure to pollutants while ensuring adequate ventilation to prevent chemical buildup.

5. Light and UV Protection

- The storage vault was designed with zero direct exposure to natural light, and all artificial lighting was low-heat LED with UV filtration to prevent photochemical damage to film emulsions.





Long-Term Monitoring and Maintenance

Preservation is an ongoing process that requires continuous monitoring and system calibration. To ensure optimal conditions, the following protocols were established:

- ✓ **Digital Sensors & Remote Monitoring** – Temperature and RH sensors provide real-time data, with alerts for any deviations.
- ✓ **Quarterly HVAC Maintenance** – Ensuring dehumidifiers, air filters, and climate controls operate at peak efficiency.
- ✓ **Archival Rotation & Inspection** – Periodic film inspections for early signs of degradation, with preventive conservation techniques applied as needed.

A Technological Benchmark for Film Preservation

The Archivo General de la Nación preservation vault represents a state-of-the-art solution for archival conservation in tropical climates. By integrating advanced climate control, air purification, and strict monitoring protocols, Cobéal has successfully safeguarded the Dominican Republic's priceless cinematographic heritage for future generations.

This project highlights the importance of precision engineering in cultural preservation, ensuring that historical records remain intact for centuries through innovative environmental management.



Movies filmed in the Dominican Republic, from the Godfather II (above image) to Pirates of the Caribbean (below image).



Cobeal's Commitment to Cultural Heritage Preservation

As a company with a distinguished record in engineering, procurement, construction, installation, and commissioning (EPCIC), Cobeal has consistently contributed to the global preservation of cultural heritage.

From historical archives to environmentally sensitive infrastructure projects, Cobeal's expertise lies in delivering tailored, high-performance solutions that meet the demands of preservation science.

This project exemplifies Cobeal's leadership in archival conservation, demonstrating how technical intelligence and strategic planning can safeguard a nation's history against environmental threats.

The successful completion of the Archivo General de la Nación vault has had far-reaching implications for archival science in the region. The implementation of this climate-controlled environment has not only extended the lifespan of invaluable historical records but also established a model for future preservation projects in tropical climates.

By addressing the unique preservation challenges faced by Caribbean archives, this project highlights the importance of interdisciplinary collaboration in heritage conservation. It also reinforces the necessity for continuous innovation in environmental monitoring technologies.



"When we build, let us think that we build forever. Let it not be for present delight nor for present use alone. Let it be such work as our descendants will thank us for."

Without intervention, entire eras of visual history can be lost—eras that hold stories, identities, and perspectives crucial to understanding the evolution of a nation.

By implementing advanced environmental control systems, Cobeal has ensured that the Dominican Republic's cinematic and documentary heritage will remain intact for centuries to come. This is not merely an achievement in engineering; it is a commitment to history, a bridge between the past and the future. Every reel of film preserved is a piece of a nation's soul protected from time's decay.

A REFLECTION ON PRESERVATION

The preservation of historical and cultural heritage is not merely a technical challenge but a profound responsibility—one that transcends time and speaks to the essence of human continuity. As historian and conservationist John Ruskin once said:

"When we build, let us think that we build forever. Let it not be for present delight nor for present use alone. Let it be such work as our descendants will thank us for."

These words resonate deeply with the mission of Cobeal, whose contribution to the Dominican Republic's National Archives embodies this enduring philosophy. The safeguarding of historical records is an investment in the collective memory of a nation, ensuring that future generations will not only inherit the knowledge of the past but will be able to interpret, learn from, and build upon it.

In the case of cinematographic film preservation, the stakes are particularly high. Unlike written records, which can often be transcribed and digitized without significant loss, film archives are uniquely vulnerable to environmental degradation.





The National Archives of the Dominican Republic project serves as a model for sustainable heritage conservation in regions with challenging climatic conditions. By combining cutting-edge dehumidification, temperature control, and air purification technologies, Cobeal has demonstrated that cultural preservation can be both scientifically rigorous and deeply humanistic.

Preservation is, at its core, an act of foresight and reverence—an acknowledgment that the past is not just behind us, but within us, shaping our present and inspiring our future. Through projects like this, Cobeal reinforces the idea that true progress is not only measured in innovation but in the careful stewardship of what came before, ensuring that the stories, wisdom, and artistry of previous generations continue to illuminate the path forward.