THE PLANNING, CONSTRUCTION, AND OPERATION OF A COLD ROOM FOR PHOTOGRAPHIC STORAGE

By Jim Wallace

Introduction

The recommended technique for the preservation of processed photographic materials calls for storage under low temperature and relative humidity conditions assisted by the removal of oxidizing and reducing agents commonly found in most urban environments. For photographic collections this requires the construction of a special room or rooms with a variety of electronic and mechanical equipment. While the number of such photographic cold storage rooms is growing, the design and construction of each has special individual considerations. Factors to be considered in the design and construction of these rooms are discussed together with the continuing requirements for long-term, day-to-day operation.

General Observations

It is important to remember that the process of making a room cold is not new, or even difficult. Every grocery in the country has one. Rather, it is attempts at maintaining both low temperature *and* low humidity, which make the problem difficult. It is also important to remember that a cold storage room is constructed from a complicated series of inter-connected mechanical equipment. It will have continuing needs, some of them quite expensive, if it is to

continue to operate properly. And it is important to remember that, as with any mechanical equipment, it will break down. This is not necessarily a sign of failure. The amount of operating time prior to the breakdown must be judged to determine if it was a flaw, or merely old age which caused the problem.

It is because cold storage rooms have these built-in characteristics, that their operators must also keep in mind that they can be improved. Improvement must be constantly evaluated. The need for the room and the reason it was constructed will far outlast any of its mechanical equipment. Therefore, replacements must be anticipated and carefully planned based on actual operating experience. All of this points to a need for photographers, archivists, conservators, and others planning or using these rooms to be fully aware of the equipment they contain and how it operates. Nothing less is acceptable.

The Smithsonian Institution's Cold Storage Room

The cold storage room upon which this paper is based is operated by the Smithsonian Institution's Office of Printing and Photographic Services. The Office handles a wide range of photography for the Institution from the documentation of objects in studios, to the historic documentation of events in the street. While its central offices and cold storage facility are housed in the National Museum of American History, the Office also has branches in the National Museum of Natural History, National Air and Space Museum, Museum Support Center, and the Smithsonian Tropical Research Insti-

tute in Panama. The Office has a staff of approximately ten full-time photographers, plus laboratory staff. All completed work is maintained in the cold storage facility. In addition to current work, the Office also serves as custodian for many of the Smithsonian's other photographic collections dating to the 1860s. These include negatives from the National Anthropological Archives, The Pullman Railroad Collection, The Peter and Paul Juley Collection, and others. Only slides, transparencies, and negatives are stored. The Office does not maintain a print collection.

A cold storage room is best used to prolong the life of materials which are already being cared for properly. It should be understood that the availability of a cold storage area does not change or eliminate the need for maintaining accepted archival practices in storing and handling film. Darkroom processing techniques and storage containers should all meet applicable ANSI Standards.

It is not the purpose of this paper to discuss why cold storage and controlled humidity are needed. Nor is it to specify the temperature and humidity levels at which the room is maintained. Obviously, the ANSI Standards are the ideal to be sought. But the realities of equipment capacity, room location, and scale of operations can be limiting factors. Therefore, rooms are generally operated at the lowest levels where consistency is possible. Daily and annual fluctuations are to be avoided. One solution is to determine the lowest levels at which the room can operate on the hottest, most humid days of the summer and translate those conditions into the local operating standard. These should be optimum levels. As much as a full year of operation may be needed to determine them. The

relationship between temperature and humidity (lower temperatures raise RH and lowering the RH can raise the temperature) may dictate a balance point which achieves the best results for an individual room. The Smithsonian Photographic Services room operates at 5°C and 28% RH +/-2%.

Planning and Construction

Beyond determining the standards under which a room will run, there are a number of practical problems to be faced in its construction. Good planning is critical. Beginning with the architect's drawings and following through construction to routine preventative maintenance, the staff which is to operate the room must be closely involved. This is in part for self-defense. No one else cares as much about its operation. The designers and contractors may all be well-intentioned and of the highest calibre, but it is the operating staff which will ultimately make it work on a day-to-day basis.

Keep a full set of drawings on file together with operating and maintenance instructions for the mechanical equipment. The organization's maintenance staff should obviously have the primary responsibility for maintaining these documents, but an additional set should be located in or near the room itself. Ask questions of the designers. Recognize that they will usually be operating in new territory, as few people have actually designed and built these rooms. Keep good, constructive lines of communication open and document proposed changes. Once the time for construction comes be

prepared for the reality that the process is dirty and noisy, affecting all nearby operations. Dust barriers help, but only some. Take care that the collections for which the room is being constructed are not placed in jeopardy. Keep track of the construction. Ask questions. Know how the room insulating panels are constructed and how they go together. Know where electrical feeds are and how the ductwork functions. This is easiest to understand while it is still being put into place. It will be helpful later when storage or operating equipment is moved or changed.

Pay special attention to locations where the insulating panels are penetrated, regardless of the reason. Whether for ducts, lighting fixtures, security, or safety equipment, anywhere the insulation is penetrated there will be the potential for condensation leaks later. These probably cannot be totally prevented for reasons which will be discussed below. Rather, recognize where the potential problems are. Storage cabinets should not be located directly under these insulation panel penetrations. Make certain that the storage cabinets or shelves fit the room (or vice versa). If insulating panels are used on the floor be certain they will support the weight of loaded cabinets, especially if the collection contains a high percentage of glass plates.

Operation and Maintenance

For efficient operations, everything must not only fit, but must also be workable. Make certain that the staff knows the location of all the operating equipment and at least the principles of

its operation. Principal equipment will include a cooling compressor, air handler, air filter, dehumidifier, and possibly a humidifier. The location of the electrical disconnects should be marked, not only as to the equipment they serve, but also as to the location of the main electrical panel which feeds to them.

After the first year of operation, it became apparent that the Smithsonian Photographic Services room was not quite running as cold as planned by about $3^{0}C$. This was probably because the design did not fully take into account the heat generated during the reduction of humidity. A second compressor/air handler was added. Both units run full-time during the summer, but only one is needed during the cooler times of the year. The same was true with dehumidification, and a second dehumidifier was also added. Of all the operating equipment, the dehumidifiers have proven to be the weakest link, experiencing the most down time. This was caused by the rapid cycling of the units on and off to maintain a fine degree of humidity control. This cycling caused a heater coil to burn out. When the units were turned on full, however, the coils operated perfectly. In the summer full-time operation is needed to maintain the desired humidity. But during the rest of the year this full-time operation drives the humidity too low causing an unacceptable annual fluctuation. The problem was solved by the use of a steam injection humidifier installed in the main air handler. Now one or both of the humidifiers are always allowed to run full-time. The steam injector is used to bring the humidity level back up to the desired point.

For both the compressors and dehumidifiers, having two units provides independent backup for both cooling and humidity control. This enables the Office to deal more efficiently with equipment malfunctions. Malfunctions can also be best handled if there is a complete spare-parts kit on hand. Not even overnight delivery from the manufacturer can compete with having a replacement always available.

All the controls, thermostats, humidistats, alarms, etc., should be located in one control panel area. Each control should be marked clearly, and the staff should be briefed on their operations and interrelationships. There should also be good controls to monitor the status of the room at all times. A mechanical recording hygrothermograph is a minimum requirement. Newer electronic temperature and humidity sensors allow remote printouts to be maintained outside the room itself. These should be placed near desks where staff normally work so they can routinely keep track of conditions in the room merely by looking up. Completed charts from all recorders should be carefully dated and filed for future reference. They are the only means available for accurately determining any pattern of daily fluctuations.

One of the most annoying and potentially damaging problems in operating a cold storage room is the presence of water drips. These drips are caused by condensation, and usually occur only during the summer months. They can occur anywhere the insulation has been penetrated such as by electrical connections or air ducts, allowing an exchange between the cold, dry air inside and the warm, moist air outside. It requires only a pinhole for condensation to take place.

The greater the differential between the inside and outside conditions, the greater the potential for condensation. Foam sealants and putty can help, but each summer there may well be a new set of drips to be sealed. If properly controlled -- that is the design planning isolates potential drips to areas which are not over collection storage -- these drips can be unsightly but not dangerous. If located over storage shelves or cabinets, they have the potential for disaster.

Water and smoke detectors should be placed above the ceiling of the room and in any area which is not readily visible. This is not only to protect from condensation or fire created by the room, but also to warn of broken pipes, floods or fires within the building itself.

Conclusion

While a cold storage room for photographs is an important means in extending a collection's useful life, it is expensive and time-consuming to operate. It should not be considered a one-time budget item which once in place will solve all archival problems related to a photographic collection. Rather, it requires continuing funding, and more importantly continuing maintenance.

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