

Department of the Army  
Pamphlet 205-1

Conservation

**Energy  
Conservation  
Guidelines for  
the Operation of  
Controlled  
Humidity  
Warehouses**

Headquarters  
Department of the Army  
Washington, DC  
1 January 1985

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# ***SUMMARY of CHANGE***

DA PAM 205-1

Energy Conservation Guidelines for the Operation of Controlled Humidity  
Warehouses

This change 1--

- o Changes have been made throughout this pamphlet.
- o Changes include type of forklift and allowed relative humidity in controlled humidity warehouses.

**RESERVED**

## **FOREWORD**

Rapidly rising fuel costs and directives to decrease energy consumption demand the implementation of all practical means of energy conservation. Controlled humidity (CH) warehouses impose a significant requirement on energy resources. It is imperative that all activities responsible for and using CH facilities take steps to assure the minimum consumption of energy consistent with the safe and economic operation of these facilities. This pamphlet outlines methods which will assist installation managers in achieving these goals.

## Conservation

# Energy Conservation Guidelines for the Operation of Controlled Humidity Warehouses

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By Order of the Secretary of the Army:

████████████████████  
General, United States Army  
Chief of Staff

Official:

████████████████████  
Administrative Assistant to the  
Secretary of the Army

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**Summary.** Changes have been made throughout this pamphlet. Changes include type of forklift and allowed relative humidity in controlled humidity warehouses.

**Applicability.** Not Applicable

**Proponent and exception authority.** The proponent agency of this pamphlet is the US Army Materiel Development and Readiness Command. Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) to Director, DARCOM Packaging,

Storage, and Containerization Center, ATTN: DRXTP-TO, Tobyhanna Army Depot, Tobyhanna, PA 18466.

**Suggested Improvements.** The proponent agency of this regulation is US Army Materiel Command. Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to Director, AMC Packaging, Storage, and Containerization Center, ATTN: SDSTO-TO, Tobyhanna, PA 18466-5097.

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## **1. Purpose**

This pamphlet summarizes humidity control management and maintenance techniques that can be used to minimize energy consumption and still assure an acceptable CH environment.

## **2. Scope**

This pamphlet is applicable to the storage activity and facilities engineering having responsibility for control, maintenance, and use of CH warehouse storage space. The success of the program depends on the concern and involvement of management, warehousing personnel, and utilities maintenance personnel.

## **3. General**

CH warehouse space is premium storage space. It will be used, to the maximum practicable extent, to store only those items that obtain optimum benefit from a CH environment. A relative humidity (RH) not exceeding 50 percent is required to be maintained in CH storage warehouses.

## **4. Responsibility**

The commander of an installation with a CH warehouse facility is responsible for establishing and maintaining an effective energy conservation program for CH storage operations.

## **5. CH Storage Space**

The Army has in excess of 8.5 million gross square feet of CH warehouse storage space. Efficient operation of these facilities requires intensified management.

## **6. Energy Conservation Guidelines**

Energy consumption in CH storage is directly related to the operation of the dehumidification equipment. Actions taken to minimize "run time" on dehumidification equipment will reduce both energy and operating costs. The guidelines in subsequent paragraphs will assist in reducing energy consumption and provide for peak efficiency.

*a.* Storage managers will assure that the following guidelines are adhered to:

(1) "Open door" time in CH warehouses must be kept to the absolute minimum. The greatest source of moisture penetration is through open doors. Cross ventilation caused by open doors on opposite sides of a warehouse is especially undesirable. Movement of supplies into and out of CH storage will be planned, to the greatest extent practicable, so that only one exterior cargo door is open at a time.

(2) When prolonged movement of materiel into or out of a CH warehouse section occurs, the connecting doors to adjacent sections should be closed to minimize the spread of moisture.

(3) Frequently used cargo doors should be power-actuated. This provides for rapid opening and closing of doors. To assure compliance with the "closed door" policy, consideration should be given to installation of a warning signal (bell or horn) with a timer. This signal would sound at the door site when the door is open in excess of a pre-set period of time and stop sounding when the door is closed. A warning device installed in this manner would pinpoint the open door and require prompt action by personnel to close the door and stop the warning signal. Since the warehouse foreman and warehousing personnel spend most of their time in various parts of the warehouse, any audio or visual warning device installed in the warehouse office has limited value.



Figure 1-1.

(4) All fire doors will be closed in CH warehouses at night.

(5) Cargo doors which are not needed for operations will be sealed. Firefighting and safety needs must be considered in the sealing of doors.

(6) When new receipts are transported to CH warehouses during inclement weather, covers should be placed over the material to prevent the introduction of excess moisture into the facility. This will help reduce the running time of dehumidification machines.

(7) Transfer of material between warehouses should be done during favorable weather.

(8) Material and/or pallets which are wet or damp should not be moved into CH storage areas until dry.



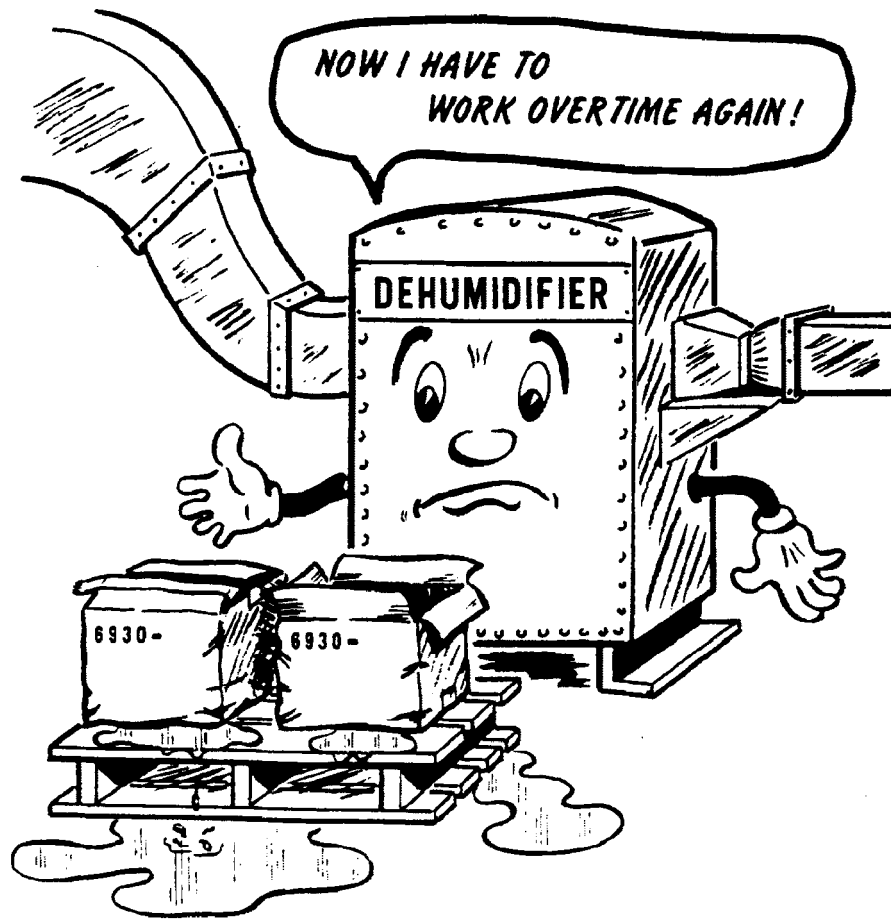


Figure 1-2.

(9) Moisture entry from other sources must be prevented. These sources may be steam line leaks, roof leaks, or defective seals on doors and windows. Such conditions should be immediately reported to facilities engineering for correction.

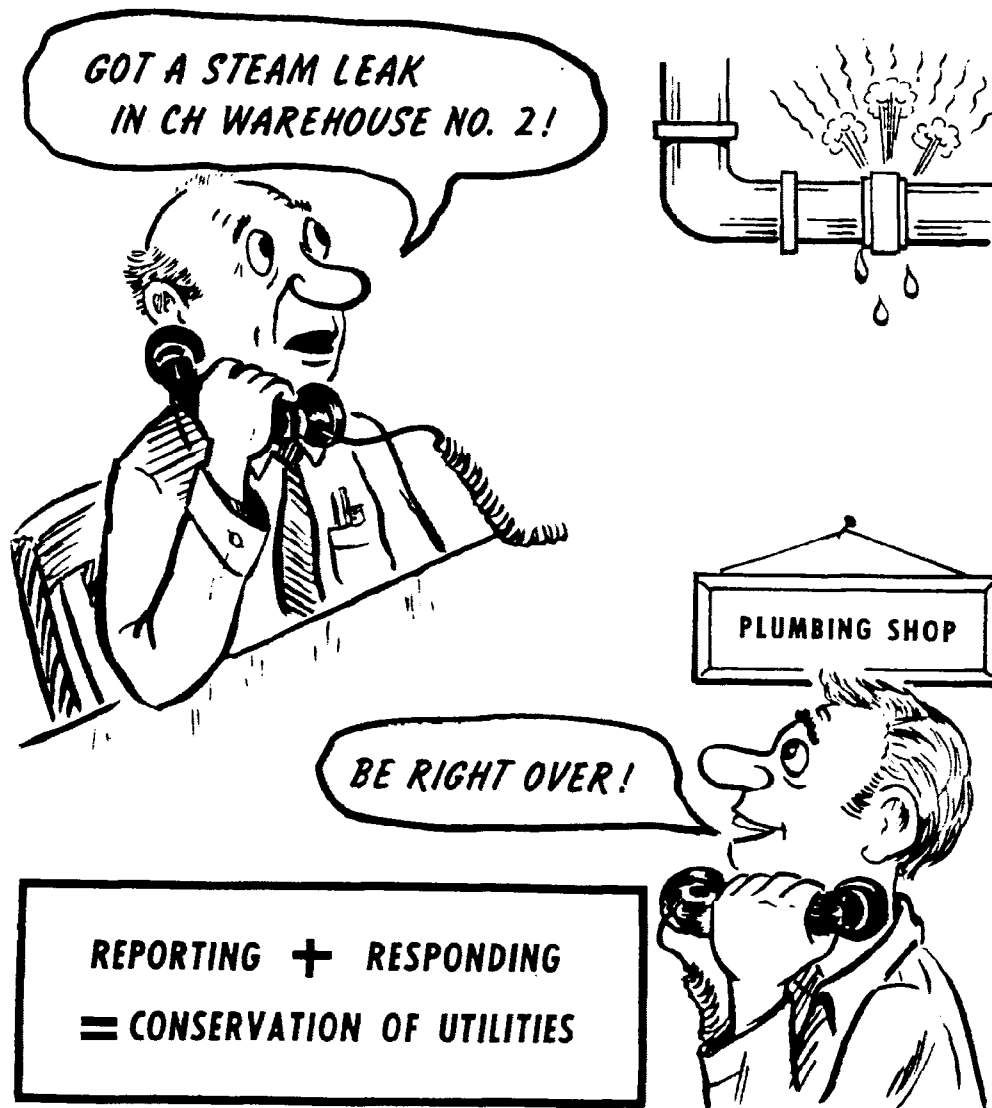


Figure 1-3.

(10) The warehouse foreman should periodically check CH equipment for the following:

- (a) That humidistats are set at 50.
- (b) That hygrothermographs are operating and recording RH data.
- (c) That hygrothermographs are calibrated once every 3 months.
- (d) That dehumidifiers are operating.

Equipment adjustments resulting from the above checks ((a) through (d)) will be accomplished by qualified repair technicians assigned to facilities engineering. Instrument calibration will be accomplished by qualified calibration specialists.

(11) All CH buildings will be identified. One method of accomplishing this is by constant visual reminders. Signs should be posted both inside and outside the warehouse, on walls near active cargo doors. The signs should identify the warehouse as CH storage and direct that open door time be minimized.

(12) As a further means of conserving power, storage managers should install a centrally located exterior hygrothermograph near the office of the chief of warehousing where it can be monitored. When the outside conditions equal or are more favorable than those conditions in the CH environment, the warehouse foreman will be notified to open doors

to substitute dryer, natural air. This action will conserve electrical power and provide ventilation. This centrally located exterior hygrothermograph need not be operational during seasons when it would serve no purpose.

(13) Because of reduced ventilation in CH warehouses, battery-powered materials handling equipment (MHE) is preferred. This is particularly recommended in very active areas. When gasoline-engine powered forklift trucks and warehouse tractors are used, they should be turned off when not engaged in actual movement of materiel. Forklift trucks parked at night outside of the warehouse should be warmed up before entering the building. Where such procedure is impractical, the exhaust during the warm-up period should be carried outside of the building by use of flexible metal tubing. This will eliminate the need for forced ventilation (opening doors) to remove concentrations of exhaust contaminants. Forced ventilation should be avoided because of the subsequent costly actions required to return the area to an acceptable RH level.

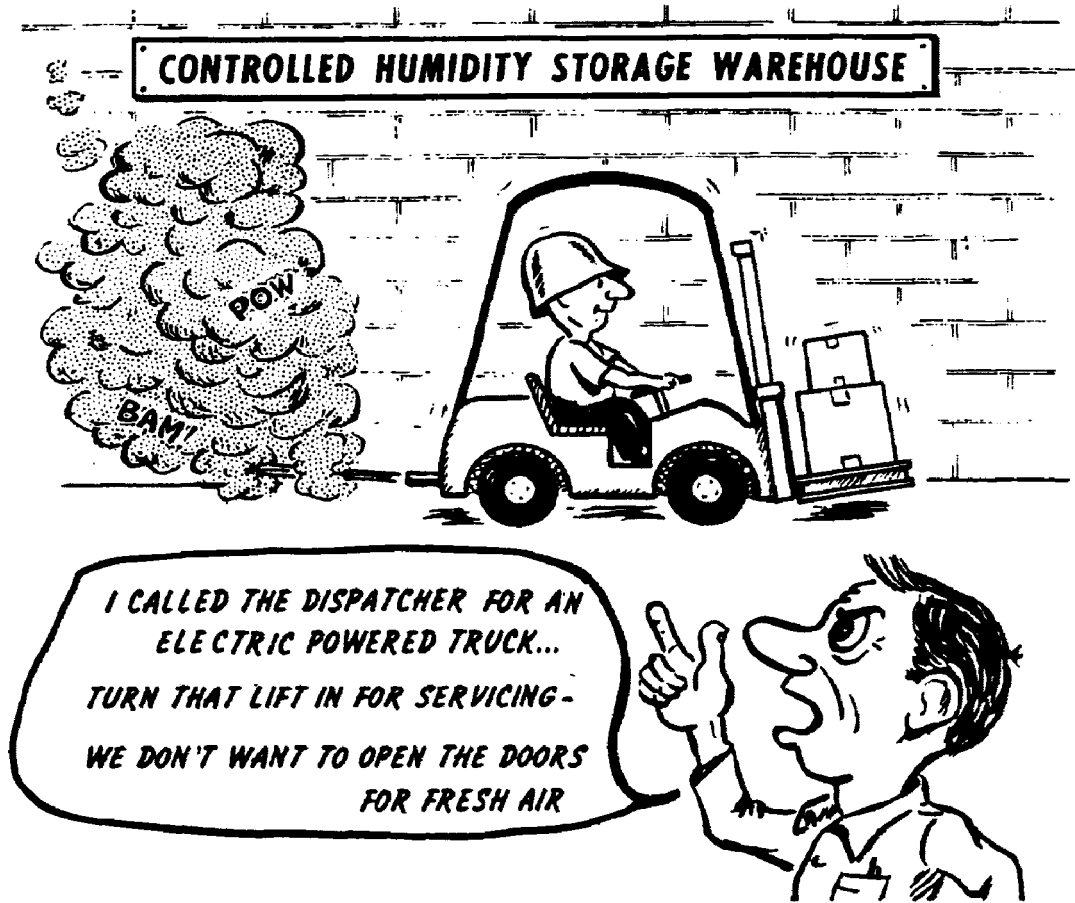


Figure 1-4.

b. Facilities engineering will assure the following guidelines are adhered to:

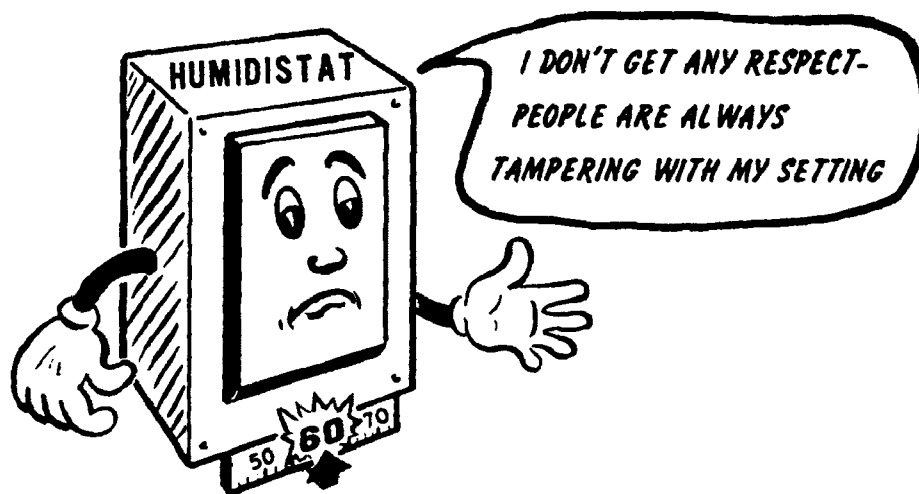


Figure 1-5.

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(1) Assure that dynamic humidity reduction equipment, meters, and recording devices are operating efficiently so that the RH in CH warehouses does not exceed 50%.

(2) Arrange to have instrument test and calibration conducted on a scheduled basis. Each hygrothermograph will be replaced with a newly calibrated one every 3 months. Humidistats will be exchanged for newly calibrated ones at intervals of approximately 2 months.

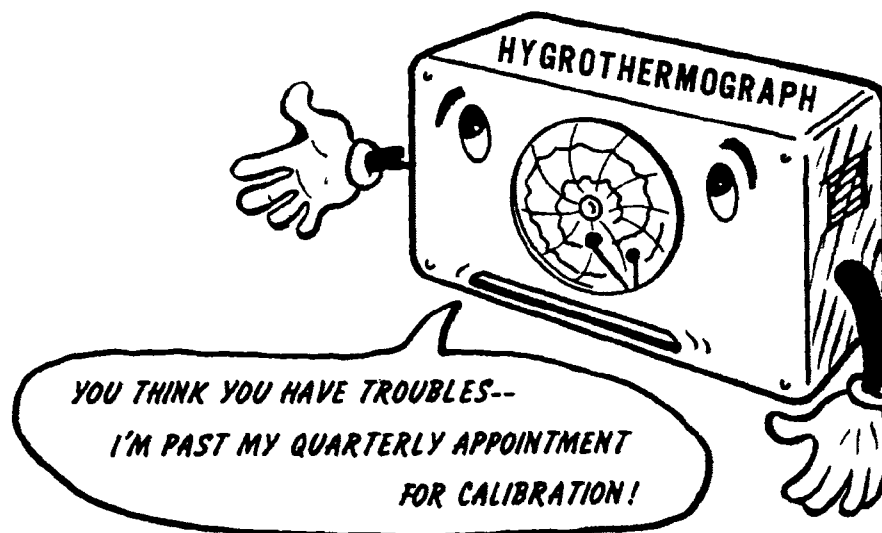


Figure 1-6.

(3) Correct, or immediately bring to the attention of the proper persons, any condition which indicates undesirable trends in RH levels, unreasonable continuous operation of dynamic dehumidifiers, excessive "open doors" time, or any other factor which suggests improper CH operations.



Figure 1-7.

(4) Prepare and forward to the storage manager, a report of the RH readings obtained from the hygrothermograph charts. This should be accomplished on a weekly basis. The report will provide storage managers with comprehensive data on the total CH environment and will specifically identify areas which warrant special attention.

(5) Take immediate action to accomplish repairs requested by the storage manager. Prompt repairs will assure continued, efficient operation of CH facilities.

(6) Maintain stand-by instruments and instrument supplies to assure continuity in operation during calibration or repair. These will consist of:

- (a) One hygrothermograph for each 20 installed.
- (b) One humidistat for each eight installed.
- (c) One human-hair element for each six humidistats.

(7) Replace active cargo doors which are worn and cannot be properly weatherproofed with metal clad insulated weatherproof doors or similar type doors. This will minimize air infiltration and conserve heat.

(8) Investigate reduced electric rates offered by many utility companies for off-peak periods. Each depot should seek this economic advantage in the operation of CH equipment. Local conditions must be assessed to assure the practicality of this approach in terms of maintaining an acceptable RH level.



Figure 1-8.

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