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SHIPBUILDERS COUNCIL OF AMERICA

1730 K STREET N. W. ▪ WASHINGTON, D.C. 20006 ▪ 202|338-7722

February 18, 1971

TO: ACCIDENT PREVENTION COMMITTEE

SUBJECT: Draft Manual on Handling of Insulation Materials

Enclosed is self-explanatory correspondence from Duncan A. Holiday, Research Associate Professor at Mt. Sinai School of Medicine on the above subject.

Would appreciate your forwarding comments directly to:

Harry Howard
Assistant to the Vice President
Bethlehem Steel Corporation
25 Broadway
New York, New York 10004

Mr. Howard is a member of the Shipyard Manual Committee representing the Shipbuilders Council of America. I would also appreciate your making a copy available to Shipbuilders Council.

E. P. Ruddy
Secretary

cc: Edwin Hartzman
J. M. Conley, Jr.
Thomas J. Defoe
John A. Byington
W. B. Powell

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*Department of Community Medicine*

February 9, 1971

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To: Members of Shipyard Manual Committee

From: Duncan A. Holaday

Subject: Rough Draft of Manual for Shipyards

Mr. Reitze and I have composed a rough draft of a manual of recommended practices for handling insulation materials in shipbuilding, ship repair and shipbreaking. This is enclosed for your edification, comments and suggestions. This draft was prepared with the expectation that the committee members would each feel a compulsion to expand, add to, delete, or re write the material. Therefore, this document is not intended to be complete -- but simply a target. We plan on using pictures and design sketches of control procedures or equipment where appropriate. Some of these items we have obtained from Mr. Mangold and Mr. Ay, but would appreciate any material which you may have and suggestions on what would be desirable to include.

Particularly needed (in our opinion) are discussions of general dilution ventilation and substitute materials. Each of you should have suggestions on these or other topics, and you are urged to contribute. We would appreciate your comments by March 1, 1971. After these are received, we will rewrite the manual, snd you a copy and arrange a meeting at which we hope to arrive at a final form.

Sincerely,

Duncan A. Holaday

Duncan A. Holaday
Research Associate Professor

Dear Wm. Howard
In particular we hope that you can contribute a section on general dilution ventilation. We do need this -
DAH:lkh
Encl.

# Recommended Practices for Handling Insulation Materials in Shipbuilding, Ship Repair and Shipbreaking

I. Introduction

A. Biological effects of asbestos (succinct summary)

B. Tradesmen who are exposed to insulation dusts

(1) Insulation workmen

(2) Pipe fillers, steamfitters

(3) Other trades working in areas where insulation is being applied or removed

C. Operations which generate large amounts of dust

(1) Removal of insulation (rip-out)

(2) Mixing mortar

(3) Cutting insulation materials

(a) On site

(b) Fab shop

(4) Clean-up and waste handling

(5) Blocking or hammering on block or pipe covering to seat material

(6) Warehousing or storage

II. Control of Asbestos-containing dusts by use of substitute materials

A. Fiberglass for blanket and pad filling

B. Pipe covering and block with reduced asbestos content

C. Use of materials treated with dust suppressant

III. Reduction of dust by changes in work methods

A. Minimizing hand cutting at the job sites and use of down-draft, exhaust-ventilated tables

B. Premixing asbestos mortar dockside

C. Premixing asbestos mortar in plastic bags.

D. Wetting asbestos cloth and fillers before pad and blanket fabrication

E. The use of drop cloths at job sites

F. Collection and containment of wastes as they are produced

G. Clean-up at end of job or end of shift, using vacuum cleaners

H. Conducting all possible insulation work in the shop rather than on shipboard

I. Packaging of fabricated parts for transport from shop to ship

IV. Reduction of dusts by use of local exhaust ventilation

A. Ventilation of large power tools

(1) Band saws

(2) Gang saws

B. Ventilation of hand power tools

C. Use of hoods and down-draft tables for pad and blanket fabrication

V. Reduction of dusts by general dilution ventilation

VI. Control of numbers exposed

A. Scheduling insulation work to minimize numbers of other tradesmen in the area

B. Isolating areas in which insulation is being removed

C. Use of untrained men including ship's company, for rip-out should be held to a minimum.

VII. Personal Protective Equipment

A. Respirators -- give circumstances in which each type should be used

(1) Particulate filtering

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(b) Disposable

VII A (continued)

(2) Air-supplied

(a) Air-line

(b) Self-powered

B. Protective clothing

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Constant training and updating of information

IX. Medical supervision

X. Summary

A. Measures involving little cost which can immediately be adopted

B. Those measures involving more costly engineering and capital funds.

1. Introduction

Inhalation of asbestos fibers has caused serious injury to workmen. Many studies have found that cases of asbestosis, lung cancer and pleural and peritoneal mesothelioma occur following exposure to airborne asbestos. To prevent these serious effects, it is necessary to reduce exposure to asbestos dust to the lowest feasible level. Exposures to high concentrations, even those of only a few minutes' duration, should be avoided.

Handling insulating materials during ship construction, ship repair and shipbreaking operations can expose many people besides those described as insulation workers. Pipefitters and steamfitters may have to remove insulation during their work and rip-out of old insulation may be done by any group. Frequently, members of other construction trades are working in the same areas where insulation is being applied or removed and are thus also potentially exposed to airborne asbestos dust.

Although areas of responsibilities will differ from yard to yard, one responsible person, perhaps the industrial hygienist or the safety officer, should meet with the job superintendent and the job foreman to survey the job before any work is started. The object of this survey would be to

determine what and where the potential dust problems will be. This committee would then recommend procedures to reduce the asbestos dust exposures during the completion of the job. The committee report would be available to the cost estimators as well as those concerned for the day-to-day work schedule..

Operations which generate large amounts of dust include:

1. Rip-out of old insulation
2. Mixing asbestos mortar
3. Cutting insulation material either on site or in fabrication shops
4. Blocking or hammering on block or pipe covering to seat material.
5. Warehousing and storage of material
6. Clean-up and waste handling.

Particular efforts should be made to control dust dispersion during these operations to reduce peak exposures and prevent general contamination of the atmosphere of the work area.

The following sections of this manual discuss in detail procedures which have been used to reduce atmospheric contamination by asbestos dust. These procedures have been assembled from several sources with major contributions made by the programs developed at the Puget Sound and Long Beach Naval Shipyards.

## II. Control of Asbestos-Containing Dusts by Use of Substitute Materials

Substitution of materials containing less asbestos fiber or no fiber at all, is becoming more common in ship construction. Before a material is substituted for asbestos, certain points must be carefully considered. From a health point of view, one must guard against that which has happened in other environmental situations -- where in the haste to rid society of a known pollutant, a substance whose potential hazards are unknown has been substituted.

A second consideration must be: will the new material meet engineering specifications and will it perform adequately under conditions of use.

Materials containing reduced amounts of asbestos have been used in the following applications:

A. Fiber glass for blanket and pad filling

Amosite blanket covered with asbestos cloth is a standard material for making valve and flange pads. Substitution of the proper grade of fiber glass as a pad filler not only reduces asbestos dust during fabrication and installation but also tends to lessen the problems during subsequent "rip-out". Asbestos cloth which has been treated with a dust suppressant is available and its use should also be encouraged.

B. Pipe covering and block with reduced asbestos content

Over the years the manufacturers of calcium silicate materials have been steadily reducing the percentage of asbestos fiber in their material. Serious consideration should be given to those products containing lower amounts of asbestos fiber. Several British firms have introduced asbestos-free calcium silicate block and pipe covering. To date, however, this material has not been adequately evaluated in the United States to determine how it will perform in use.

## III. Reduction of Dust by Changes in Work Methods

In many operations, changes in work practices will reduce dust dispersion very significantly. All of the procedures discussed in this section have been utilized and found to be effective.

### A. Mixing Asbestos Mortar

This operation has usually been done at the job site. While the time spent in mixing is quite short, considerable dust is produced. A tested method of control is to mix the mortar dockside, package the mixed mortar in several containers for transportation to the job site. Mortar is available packaged in several sizes of plastic bags which have a spout through which water is introduced. Sufficient water is added to moisten the morta r; after premixing, the bag is opened and the remaining water added. The carton in which bag is packaged serves as a mixing box and waste container. Either of these methods eliminates dust dispersion at the job site.

### B. Pre-cutting pipe covering and block in the fabrication shop

Hand-cutting of pipe covering and block should be kept to an absolute minimum. Bend sections, pipe cover lengths and blocks should be cut in the fabrication shop on exhaust-ventilat

equipment. The cut sections are dipped in water, packed in plastic bags which are then labeled. This procedure insures that the cut sections are still damp and relatively dust-free when they are applied.

C. Pre-scoring blocks. Insulation blocks should not be scored at the job site. Blocks which have been pre-scored by the manufacturer can be purchased, or standard blocks can be scored in the fabrication shop using an exhaust-ventilated gang saw.

D. Insulating pipe assemblies in the shop.

Some pipe assemblies are quite intricate and are troublesome to lag while in place. A satisfactory method of doing these jobs, particularly during ship repair, is to remove the assembly in conveniently sized sections, transport them to the shop. Here the old insulation is removed, any necessary repair performed and the completed section re-lagged. Not only is dust dispersion reduced, but it is much more convenient to re-lag the section in the shop than when it is in place shipboard.

E. Hand-cutting at job sites

Some hand-cutting at job sites is unavoidable. Dust dispersion can be reduced to a minimum by doing all sawing on a downdraft table. The design of such a table is shown in Fig. ___. A small industrial vacuum cleaner serves as an air-mover. A plastic bag under the table contains the larger dusts and wastes.

F. Fabrication of pads and blankets

Where possible, pad filling and asbestos cloth should be done in laterally ventilated hoods. In all cases both the filler and the asbestos cloth should be dampened before use. See Figs. ____ ____

G. Housekeeping and Clean-up

Area and atmospheric contamination with asbestos dust can be reduced greatly by meticulous attention to the control of dust and larger wastes. Drop cloths should be placed on the deck under each working area to prevent spread of wastes. Scrap should be dropped into plastic bags as it is produced

rather than on the deck to be picked up later. Work areas should be vacuumed at the lunch break and end of the shift. In all possible instances, the workmen should be responsible for cleaning their own areas. Where work rules prohibit this, the clean-up men should be under the supervision and control of the insulation foreman to insure proper attention to this very important matter.

## IV. Reduction of Dusts by Use of Local Exhaust Ventilation

### A. Ventilation of large power tools

#### Band Saws

The extensive use of band saws both in dockside fabrication shops and on larger ships (aircraft carriers) in the vessel itself, make emissions from band saws a major source of asbestos dust. Control devices for such saws have been known for years and are relatively simple devices. Conventional low velocity, high volume systems using a negative pressure bag house are usually more practical in a fixed installation fabrication shop.

IV A (continued)

Because some degree of portability is desirable in a temporary shipboard fabrication area, a high velocity, low volume unit is desirable. (Fig. _____)

This type of unit can also be designed to control dust emissions from table saws and gang saws. Because of its portability, high velocity units can also be used to perform various housekeeping tasks on job sites.

B. Ventilation of hand power tools

High velocity, low volume collection systems adequately handle most small power tools. Saber saws for cutting pipe covering and rotary saws for cutting asbestos cement board are well controlled with these systems. (Fig. _____)

V.

## VI. Control of Number of Workmen Exposed

### A. Scheduling of insulation work

Standard industrial hygiene practices call for isolating operations which contaminate the atmosphere with toxic materials Areas where insulation work is being done should be isolated by plastic curtains or other means. Whenever possible, work should be scheduled to minimize the numbers of other tradesmen in the area. Ship construction operations are more readily scheduled than are ship reapir or ship-breaking jobs. However, every

effort should be made to keep the number of men exposed at a minimum. In particular, rip-out of old insulation should always be isolated and if necessary performed on an off-shift. Trained workmen supplied with proper protective equipment should always be used for rip-out work.

## VII. Personal Protective Equipment

In addition to dust-suppression and dust control procedures, personal protective equipment is often necessary to reduce exposure and limit the spread of contamination. The equipment described below is used in control programs.

### A. Protective clothing

Protective clothing is required to prevent carrying asbestos dust into locker rooms thus exposing other workmen and eventually into insulation workers' homes. A satisfactory type of protective clothing consists of resin impregnated paper coveralls. These are inexpensive, readily disposable, and eliminate laundering and pilferage problems. They are worn for one shift, then removed and placed in plastic bags for disposal with other asbestos-containing wastes. These coveralls provide sufficient protection for all but extreme conditions.

B. Respiratory protective equipment

Even if dust suppression and dust control procedures are used, some operations generate so much dust that it is impractical to maintain atmospheric concentrations of asbestos fibers below the Threshold Limit Value (TLV), and respiratory protection must be provided to the workers. A variety of respiratory protective equipment is available from which devices suitable for various situations can be selected. American National Standard Z88.3-1971, Safety Guide for Respiratory Protection Against Asbestos-Containing Dusts should be referred to for detailed information.

1. Air-supplied respirators

Extremely dusty jobs, such as rip-out of old insulation where dust concentrations exceed 10 times the TLV, require use of air-supplied respirators which will deliver clean, dust-free air to a facepiece or hood. Two general types are available: air-line and self-powered.

(a) Airline respirators in which air is supplied to a hood give the greatest degree of protection. Air is fed to the hood from a compressed airline. The air source must be located in an uncontaminated area and the air must be filtered to remove oil and water

mists before delivery. Plastic, disposable hoods are available commercially. Preferably the airline should be fastened to the hood with a quick-disconnect fitting.

(b) Self-powered air-line respirators

Air-line respirators connected to a compressed air supply impose limitations on movement, and this limitation can be troublesome. Self-powered respirators do not impose such limitations, but do add to the equipment which the workman must carry and require careful maintenance. Batteries must be recharged ~~after each use~~ daily, filters replaced and other maintenance done routinely. Workers usually prefer these devices to air-line respirators.

2. Particulate-filtering respirators

There are several types of particulate-filtering respirators. Those equipped with a half-mask facepiece are considered most suitable for use by insulators. Only those approved for protection against asbestos dust by the government agency responsible for testing respirators should be used. These devices are recommended for protection in those situations where

the atmospheric concentration of asbestos fibers does not exceed 10 times the TLV. All the recommendations for respirator fitting, training of workmen and maintenance, detailed in Z88.3-1971 snould be followed.

(a) Reusable particulate filtering respirators

A variety of reusable particulate filtering respirators are available. Tc insure proper fitting, several different makes should be available from which the worker can select one. No one model respirator facepiece will fit all faces. Routine maintenance is absolutely necessa to replace clogged filters and leaking inhalation or exhalation valves. Un-maintained respirators can be booby traps.

(b) Disposable particulate filtering respirators

Operation of an adequate respirator maintenance program can be troublesome and, if only a few men are involved, impractical. Disposable respirators are available which are designed to be worn for no longer than one shift and then discarded. Inherently, these devices are not as rugged as a resuable respirator and no attempt should be made to use them longer than one

## VIII. Education and Training

No dust control program can be effective unless workmen and supervisors understand the hazards associated with the jobs, the sources of the hazards and the reasons for following recommended procedures carefully. Understanding is only obtained by education of personnel and training in correct operating procedures. For an education and training program to be successful, both management and labor must be concerned and participate. As with all safety programs, it is essential that first-line supervisors be interested in and cooperate in the work.

The harmful effects of neglect of procedures for controlling asbestos dust are not apparent for many years. Therefore, it is more difficult to convince workmen of the necessity of following rules for working with insulating materials than if physical hazards were involved. However, those shipyards which conduct education and training programs report good success.

Education in hazards associated with use of insulating materials and instruction in correct work practices should be