

PLAINTIFF'S EXHIBIT

MBL-195

ASBESTOS HANDLING GUIDE LINES

HUMBLE OIL & REFINING COMPANY
ENJAY CHEMICAL COMPANY
Houston, Texas

Report by: James W. Hammond

Assisted by: Industrial Hygiene Staff

Date: September 1, 1972

18-0000748

002168

ASBESTOS HANDLING GUIDE LINES

HUMBLE OIL & REFINING COMPANY
ENJAY CHEMICAL COMPANY
Houston, Texas

Table of Contents

	Page
Summary	1
Standard for Exposure to Asbestos Dust	3
A. Acceptable Concentration	3
B. Methods of Compliance	3
C. Monitoring.	4
D. Warning Signs	5
E. Record Keeping of Environmental Exposures . .	6
F. Medical Examination	6
G. Medical Records	6
H. Housekeeping.	7
I. Employee Education	7
J. Respiratory Protective Equipment.	9
K. Corrective Action by Humble and Enjay plants.	12
Appendices	
Copy of Standard (F.R. Vol. 37, No. 110, June 7, 1972)	13
Baytown Engineering Standards	18
A Nonasbestos Insulation by Pabco	38

18-0000749

002169

SUMMARY
ASBESTOS HANDLING GUIDE LINES

Effective Date: July 7, 1972

Dust Limitations: As of July 1, 1976, exposures to time-weighted average concentrations of asbestos fibers longer than 5 micrometers will not be allowed to exceed 2 fibers per cubic centimeter of air. The current time-weighted average concentrations of 5 fibers will be permitted until July 1, 1976. A ceiling limit of 10 fibers per cc will apply for both 5 and 2 fibers/cc TWA standards.

Monitoring Schedule:

1. Within 6 months after effective date, July 7, 1972, both employee's exposure and the environment or work place dust concentrations must be determined and recorded (Time-weighted average and ceiling levels must be determined by prescribed methods).
2. Afterward, at least every 6 months.
3. The results of air sampling must be maintained and available for inspection for at least 3 years.

Warning Signs:

1. In work areas wherever concentration of asbestos dust may exceed TLV or TWA.
2. On container for new, used and waste asbestos materials.
3. The legend or text to be used is expressed.

Records on Dust:

1. Environmental concentrations of asbestos dust maintained for inspection.
2. Personnel exposure data determined by procedures established in regulations while employee carries out all dusty operations.

(Records on Dust - Continued)

3. These continuous data stored for at least 3 years after the last exposure.

Medical Examinations for Potentially Exposed Employees:

1. X-rays, pulmonary test within 30 days of reporting on-job handling asbestos.
2. X-rays, pulmonary test within 30 days of termination.
3. Annual examinations by 1-31-73 for all employees exposed to asbestos after December 1971.

Records on Medical Matters:

1. Examination record available to employers, employees' physicians and Government physician on request.
2. Medical examination record must be maintained 20 years.

STANDARD FOR EXPOSURE TO ASBESTOS DUST

The new standard provides the following:

A. Acceptable concentrations.

As of July 1, 1976, time-weighted average concentrations of asbestos fibers longer than 5 micrometers will not be allowed to exceed 2 fibers per cubic centimeter of air. The current time-weighted average concentrations of 5 fibers will be permitted until July 1, 1976. A ceiling limit of 10 fibers per cc will apply for both 5 and 2 fibers/cc TWA standards.

B. Methods of compliance.

Feasible technological controls and appropriate work practices are required as the primary means of compliance. Rotation of employees to reduce their exposures is allowed only in "exceptional circumstances." Personal protective equipment, such as respirators, cannot be relied upon, in large part because such devices are so uncomfortable as to be burdensome except for short periods.

The standard includes these other compliance requirements:

Hand tools that may produce or release asbestos fibers in excess of the limits must be provided with local exhaust ventilation systems.

Insofar as practicable, asbestos must be handled, mixed, applied, removed, cut, scored or otherwise worked in a wet state to reduce fiber emissions unless this would diminish the usefulness of the product.

No asbestos cement, mortar, coating, grout, plaster or similar material containing asbestos can be removed from shipping bags or other containers without being either wetted, enclosed or ventilated.

Where respirators are permitted, they must be selected from among the types approved by the Bureau of Mines or NIOSH. Extensive details are given on types of respirators and conditions for their use. No employee may be assigned to a task requiring a respirator if a physician determines it would affect his job functioning or his health.

The employer must provide and require the use of special protective clothing, change rooms, and two separate lockers for the employees' street and work clothes. The employer also must exercise care in laundering and other handling of contaminated clothing.

External work area surfaces must be kept free of excessive accumulations of asbestos fibers. Waste must be collected in sealed, impermeable bags or other such containers.

Restrict the number of potentially exposed employees by isolating the work area. Use barricades and signs to limit unauthorized entrance.

Where respirators may be used, they are subjected to the following limitation:

1. Reusable or single use air-purifying respirators may be used for exposures up to 10 times the TWA or TLV.
2. Powered air-purifying respirators may be used for exposures from 10 to 100 times the TWA or TLV.
3. Type "C" supplied-air respirator must be used above 100 times the TWA or TLV and must be used for specific operations. These are spraying, demolition and/or removal of asbestos materials.

Where conditions of exposure exceed the ceiling level prescribed in Sec. 1910.93a, (b)(3), 10 fibers/cc., the employer shall provide special clothing, whole body clothing, head covers, gloves and foot coverings. Under these exposures, in regular work locations, the employer must furnish double locker and shower facilities for employees. The responsibility for clothing and respirator cleaning and maintenance will also be that of the employer.

C. Monitoring

Employers must establish monitoring systems to make certain every employee's exposure to asbestos fibers is below the prescribed limits. If the limits are exceeded, the employer must undertake a compliance program. Therefore, the standard also requires monitoring at intervals no longer than 6 months and gives employees or their representatives the opportunity to observe the monitoring and to have access to such records.

D. Warning signs

Caution signs are to be displayed in areas where asbestos concentrations may exceed the exposure limits. Caution labels must be affixed to all raw materials, mixtures, scrap, waste, debris and other products containing loose asbestos fibers, or to their containers. However, no label is required where asbestos has been modified by a bonding agent, coating, binder or other means that would prevent release of TLV concentrations into the breathing air.

Caution signs and labels for asbestos work areas and asbestos material in containers should conform to the specification in Section 1910.145(d)(4). Descriptions of signs and labels suitable to meet these requirements are given here.

The warning sign shall be a 20"x14" vertical format. The word "Caution" shall be in yellow on a black background of 3 1/4" x 13 3/8" upper panel. The legend (text) shall be in black letters on a yellow background in the lower panel of 15 1/2" x 13 3/8" size. An example:

CAUTION
ASBESTOS
Dust Hazard
Avoid Breathing Dust. Wear Assigned Protective Equipment. Do Not Remain in Area Unless Your Work Requires It. Breathing Asbestos Dust May Be Hazardous to Your Health

Label Specifications

These labels shall be easily legible at reasonable distances.

CAUTION
Contains Asbestos Fibers. Avoid Breathing Dust. Breathing Asbestos Dust May Cause Serious Bodily Harm.

E. Record keeping of environmental exposures

Employers must maintain records of personal and environmental monitoring, keep them for at least 3 years after last exposure, and make them available upon request to OSHA or NIOSH. Every current and former employee is to be given opportunity for reasonable access to any records indicating their current and past exposure to asbestos dust. Any employee found to have been exposed at any time to airborne concentrations in excess of the limits (TWA or ceiling) must be notified in writing no later than 5 days after the finding, and informed as to corrective action being taken.

F. Medical examinations.

The employer must provide, or make available at his cost, medical examinations for all asbestos handlers. Within 30 days of an employee's first employment in a job involving asbestos exposure, the employer must provide a comprehensive medical examination, including a chest X-ray and pulmonary tests. By January 31, 1973, and at least annually thereafter, employer shall provide or make available comprehensive medical examinations to employees in asbestos exposure areas. A similar examination is to be provided within 30 days before or after termination of employment.

G. Medical records

Employers whose employees have been examined under the standard must maintain complete records of these examinations and retain them for at least 20 years. The contents of the records are to be made available for inspection and copying to the Assistant Secretary of Labor for OSHA, the Director of NIOSH, authorized physicians and medical consultants of either agency, and upon request of an employee or former employee, to his physician. Any physician who conducts an examination under the standard must furnish the employer all medical information required by the standard, and any other medical findings related to occupational exposure to asbestos fibers.

H. Housekeeping

Use dropcloths under all delagging or rip-off. Completely saturate the insulation or lagging by inserting manifolded injection heads with numerous holes so that water can seep into the material. Use water fog or fine spray to soak insulation and then direct spray on cutting tools during delagging. If needed, use plastic sheeting to form a tent around the job to prevent dust dispersal.

Do not permit the insulation to dry while handling or before bagging. If wet waste falls, drips or splashes, remove it by squeegee or push brush. If material dries it should be re-wet before handling. It is necessary to clean up dry materials with a vacuum sweeper having a suitable filter collector.

Part of the housekeeping involves the proper practices in handling soiled work clothes. Dust covered clothes can dislodge fibers into the breathing zone. Contaminated clothing must be segregated into labeled and sealed plastic bags or containers. The employee should continue to wear a dust respirator throughout the undressing and until the soiled clothing is sealed in containers. If the clothing is sent out for cleaning or laundrying, it is the employer's responsibility to explain the nature of the hazard to the laundryman. These clothes or their sealed container must be properly labeled.

All waste and loose asbestos materials should be stored in impenetrable containers and suitably labeled.

Waste asbestos should be wetted, moved in disposable bags or containers firmly closed, with labels, and buried on land or disposed of at sea with permission.

I. Employee education

Because asbestos is used in many insulation materials, fireproofing, packing, coatings and caulking compounds, these uses are of great concern throughout the Humble and Enjay companies. For as many places as feasible, it is recommended that the companies in all their operations discontinue using material containing asbestos. Asbestos-free materials are available and many substitutes come at

no higher cost. Today's goal is to eliminate exposure of personnel to asbestos when installing new materials. All Company Engineering Standards should remove those materials that contain asbestos and provide substitutes. If special jobs require its use, because asbestos-free material is not satisfactory, then safe practices for a special application should be established for each job. Safe practices for bringing in and using asbestos materials in a company facility should be approved only by the facility's top management.

Special effort will be required by each person to break old habits. The practices of replacing insulating materials in kind is a typical case or example. The remaining area of concern, though less important, is the reuse of existing pipe and block insulation and asbestos materials on hand.

The safe practices for those jobs where asbestos material is approved for use should include:

1. Pre-wet all mortar while in "airfree" plastic bags.
2. Cut blocks, pipe forms, head sections and transite boards only in the shop on saws with suitable exhaust ventilation.
3. Pre-dip in water the cut pipe covering, blocks, boards, gaskets, etc., and transfer to the job site in sealed plastic bags while damp.
4. Use drop cloths under all asbestos applications.
5. Clean the asbestos work areas daily with water fog, spray or an industrial-type vacuum cleaner.
6. Limit the worst dusty jobs to shortest possible time and to the least number of employees in area.
7. Restrict number of employees in dusty area and then use only best respiratory protection.
8. Use easily washed coveralls or disposable garments for high dust exposure. Resin sealed paper coveralls are cheaper and available for single use.

8.

002177

18-0000757

9. Control of employees' exposure by rotation of the employee is not an acceptable means under OSHA regulations. Engineering methods for dust control and substitution of nonasbestos materials must be exhausted first.
10. Although respiratory equipment may be used, it cannot be the principal method used to eliminate exposure. Engineering methods and substitute means also should be used fully.
11. Employees who are not involved should be restricted from the dust exposure area by a barrier with warning markings.
12. Where engineering controls are not feasible, respirators may be used, subject to the following limitations:
 - a. For exposures up to 10 times the TWA or TLV, reusable or single use air-purifying respirators are acceptable.
 - b. From 10 - 100 times the TWA or TLV, powered air-purifying respirators may be used.
 - c. Above 100 times the TWA or TLV, type "C" supplied-air respirator must be used.
 - d. The spraying, demolition, ripping-off, delagging or asbestos material removal requires protection of a type "C" supplied-air respirator only, regardless of the dust concentration.

Also, special clothing and bath facilities are required for these jobs.

- e. Identify all material purchased with as much as 1% or more asbestos content.

J. Respiratory uses, availability and limitation

Refer to the following sheets A and B (pages 10 and 11).

RESPIRATORY PROTECTION REQUIREMENTS

AIRBORNE ASBESTOS CONCENTRATIONS IN FIBERS > 5 MICRONS PER ML AIR

<u>Time-Weighted Avg.</u>	<u>Before July 1, 1976</u>	<u>After July 1, 1976</u>
Less than 2	0	0
2 - 5	0	1
6 - 20	1	1
21 - 50	1	2
51 - 200	2	2
201 - 500	2	3
501 - 1000	3	3
Over 1000	3	3

Ceiling Values

Less than 10	0	0
10 - 100	1	1
100 - 1000	2	2
Over 1000	3	3

- 0 No Respiratory Protection Required
- 1 Reusable or Single Use *Respirator
- 2 Powered Air Purifying **Respirator
- 3 Type "C" Air Supplied ***Respirator

A very significant requirement concerning use of type "C" supplied-air respiratory ONLY is contained in Sec. C(2)(iii). It covers the jobs of spraying, demolition, rip-off, or removal of asbestos materials. It forces the use of only Type "C" supplied-air in continuous flow or pressure-demand class respirator. Special clothing, lockers and shower baths must be provided under these conditions.

* See page 11.

** Not commercially available at this time.

*** A respirator equipped with a half-mask or full face-piece with a positive pressure maintained in the face-piece at all times by a spring-loaded or balanced regulator and exhalation valve. Also known as a pressure-demand type respirator.

BM Schedule 21B Approved Respirators*
(Containing Exhalation Valves)

<u>Manufacturer</u>	<u>Model</u>	<u>Small Volume Unit Cost</u>
<u>Reusable Type*</u>		
<u>Disposable Type</u>		
American Optical Southbridge, Mass. 01550	R-1040	\$1.65
Welsh Manufacturing Co. Providence, R.I. 02909	No. 7165	\$1.50
Safeline Products Putnam, Conn.	No. 5340	\$1.65

*Major respirator manufacturers have reusable units meeting Schedule 21B.

BM Schedule 21C Approved Respirators
(Disposable, Valveless Type)

<u>Manufacturer</u>	<u>Model</u>	<u>Approx. Cost</u>
3M Company St. Paul, Minn.	No. 8710	\$.50
Safeline Products Putnam, Conn.	No. 5350	\$.50
American Optical Southbridge, Mass. 01550	R-1050 R-9100	\$.50

These respirators could be applied to asbestos exposure conditions for which respirators meeting Schedule 21B would be suitable.

Respiratory protective equipment should be used according to Safety Guide for Respiratory Protection Against Asbestos containing dust, AM. Nat. Std. 288.3-1971. (ANSI, 1430 Broadway, New York City, New York 10018)

K. Corrective action by Humble and Enjay Plants

The Baton Rouge Engineering, Baytown Engineering, and other company facilities have issued new nonasbestos standards. The suggested substitutes have been found to be acceptable from a technical standpoint for the service indicated.

In addition to the attached sheet regarding the availability of a nonasbestos insulation, the Johns-Manville (Thermobestos) and Owens-Corning (Kaylor) have promised suitable materials by December of 1972.

RULES AND REGULATIONS

ions for an Occupational Exposure Standard for Asbestos by the National Institute for Occupational Safety and Health (NIOSH). Public notice was given of the receipt of the recommendations and their availability for inspection and copying. On or about February 25, 1972, the Advisory Committee on Asbestos Dust submitted its written recommendations to the Assistant Secretary of Labor for Occupational Safety and Health.

Pursuant to the notice of rule making, a hearing was held on March 14 through 17, 1972, for the purpose of receiving oral data, views, and arguments concerning the proposed standard. On or about March 31, 1972, the presiding hearing examiner certified to the Assistant Secretary of Labor for Occupational Safety and Health the record of the proceeding. The record includes prehearing written comments, a transcript of the oral presentations made at the hearing, and numerous exhibits received during the course of the hearing or within the period allowed after the close of the hearing.

The proposed standard dealt with (1) permissible concentrations of asbestos fibers; (2) methods of compliance; (3) warning signs; (4) monitoring; (5) medical examinations; and (6) recordkeeping. Each of these major proposals elicited comments, arguments, objections, and counterproposals. They all have been examined and considered.

1. *Acceptable concentrations of asbestos dust.* The proposed standard would limit occupational exposure to 8-hour time-weighted average (TWA) airborne concentrations of asbestos dust not exceeding five fibers longer than five micrometers per milliliter. Concentrations above five fibers but not to exceed 10 fibers (ceiling concentration) would be permitted up to 15 minutes in an hour, but for not more than 5 hours in any one 8-hour day.

NIOSH in effect has recommended that the five-fiber TWA and 10-fiber peak concentrations be permitted only for 2 years; thereafter, TWA concentrations should be not more than 2 fibers per cubic centimeter (cm.³) of air, and peak concentrations should not exceed 10 fibers/cm.³, with no time restriction. Numerous objections and counterproposals have been made, with regard to both the limits of asbestos fiber concentrations and the time periods to comply with them. Some, for example, have recommended return to a 12-fiber standard of an earlier day; i.e., a level adopted under the Walsh-Healey Public Contracts Act in 1969. Others have recommended a two-fiber standard to become effective in 6 months, then a one-fiber standard for 2 years, and finally a zero-fiber standard after 3 years. These recommendations give a fair indication of the wide spread of the counterproposals.

No one has disputed that exposure to asbestos of high enough intensity and long enough duration is causally related to asbestosis and cancers. The dispute is as to the determination of a specific level below which exposure is safe. Various studies attempting to establish quantitative relations between specific levels of

exposure to asbestos fibers and the appearance of adverse biological manifestations, such as asbestosis, lung cancers, and mesothelioma, have given rise to controversy as to the validity of the measuring techniques used and the reliability of the relations attempted to be established. Because of the long lapse of time between onset of exposure and biological manifestations, we have now evidence of the consequences of exposure, but we do not have, in general, accurate measures of the levels of exposure occurring 20 or 30 years ago, which have given rise to these consequences. There are also controversies concerning the relative toxicity of the various kinds of asbestos, and varying hazards in different workplaces.

It is fair to say that the controversy has centered in the area between a two-fiber TWA concentration and five-fiber TWA concentration, with variations on the time needed for compliance. Many employers support a five-fiber TWA. Most medical opinion is divided between a two-fiber standard and a five-fiber standard.

In view of the undisputed grave consequences from exposure to asbestos fibers, it is essential that the exposure be regulated now, on the basis of the best evidence available now, even though it may not be as good as scientifically desirable. An asbestos standard can be re-evaluated in the light of the results of ongoing studies, and future studies, but cannot wait for them. Lives of employees are at stake.

It is concluded that there should be one minimum standard of exposure to asbestos applicable to all workplaces exposed to any kind, or mixture of kinds, of asbestos. Reasons of practical administration preclude a variety of standards for different kinds of asbestos and of workplaces. Also, while the evidence tends to show that crocidolite, for instance, is more harmful than chrysotile, the evidence is not sufficient to establish separate standards for varieties of asbestos.

Because there must be one standard governing exposure to all varieties of asbestos, and in workplaces apparently more hazardous than others; because some present employees with regular exposure to asbestos have probably already accumulated great doses of asbestos fibers, due to higher levels of exposure in the past; because it appears that levels of exposure which may be safe with regard to asbestosis are not safe with regard to mesothelioma; because the statute requires the protection of every employee, even of one who may have regular exposure to asbestos during a working life which may reach, or even exceed, 40 years; and because of several other considerations which have been urged and are reflected in the record of the proceeding, the conflict in the medical evidence is resolved in favor of the health of employees. As of July 1, 1973, TWA concentrations of asbestos fibers longer than 5 micrometers will not be allowed to exceed two fibers/cc., with a ceiling value of 10 fibers/cc. The current TWA concentrations of five fibers, and

TITLE 29—LABOR

Chapter XVII—Occupational Safety and Health Administration, Department of Labor

PART 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS

Standard for Exposure to Asbestos Dust

On December 7, 1971, an emergency temporary standard concerning exposure to asbestos fibers was published in the Federal Register (36 F.R. 23207). In accordance with section 6(c)(3) of the Williams-Steiger Occupational Safety and Health Act of 1970, a notice of proposed rulemaking regarding a permanent standard for exposure to asbestos fibers was published in the Federal Register on January 12, 1972 (37 F.R. 466). The notice invited interested persons to submit both orally and in writing, data, views, and arguments concerning the proposal.

On or about January 24, 1972, the Advisory Committee on Asbestos Dust was established and requested to make written recommendations with regard to the proposed standard on asbestos. On or about February 1, 1972, the Department of Health, Education, and Welfare transmitted to the Secretary of Labor a criteria document containing Recommendations

ceiling concentrations of 10 fibers/cc. will be permitted until July 1, 1976, during what will be a transitional period deemed necessary to allow employers to make the needed changes for coming into compliance with the more stringent standard.

The record shows that the many work operations subject to the single asbestos standard (textile, manufacturing, industrial, and marine installation, etc.) will meet varying degrees of difficulty in complying with the standard. In some plants, extensive redesign and relocation of equipment may be needed. It appears, however, the delay in the effective date of the two-fiber standard will provide all employers a reasonable time to comply. At the same time, so long as the ceiling limit is complied with, no harm is reasonably expected to result from exposures during the transitional period.

2. Methods of compliance. It has been pointed out by many persons, that protection against asbestos fibers is best obtained by controlling the generation of fibers first, and secondly, by controlling the dispersion of released fibers into the ambient air of the workplaces. Therefore, the standard requires feasible technological controls and appropriate work practices as the primary means of compliance. Rotation of employees as a way of meeting the TWA concentration requirement is allowed only in stated exceptional circumstances, because, as a general rule, it would be difficult to implement. Personal protective equipment, such as respirators, cannot be relied upon because, among other reasons, they may be so uncomfortable as to be burdensome, except for short periods of time. Therefore, it is expected that respirators and shift rotation will be used during the period necessary to install engineering controls and to train employees in sound work practices, but, after technological compliance has been achieved, their use must be limited to special work situations and emergencies. Where both are practicable, shift rotation is required.

3. Labeling. The proposed standard stopped short of requiring labeling asbestos and asbestos-containing products. The proposed standard would have required only warning signs at locations where asbestos hazards are present. However, labeling, rather than warning signs, has proved to be a point of controversy. Both NIOSH and the Advisory Committee on Asbestos Dust recommended labels for asbestos products and containers, and these recommendations became very controversial in the course of the proceeding. Many counterproposals have been made as to the language of the warning as well as to the products to be subject to the labeling requirements. Employers, in general, strongly contend that (1) finished products which effectively entrap asbestos

fibers, so that these would not be released in the normal use of the products, should not be required to be labeled; and (2) words such as "danger" and "cancer" are unwarrantedly alarming.

Both contentions have merit, and the standard has been changed accordingly.

4. Monitoring. The proposed standard would have required personal monitoring and environmental monitoring. Many issues have been raised concerning the availability and reliability of measuring instruments, frequency of monitoring, and conditions in which monitoring should be required. The adopted standard takes the objections into consideration. It requires periodic monitoring at intervals no longer than 6 months, thus allowing considerable time and discretion, and prescribes the use of the membrane filter method, which is an acceptable method for determination of asbestos fibers.

It has also been recommended that employees or their representatives should have an opportunity to observe the monitoring. The recommendation has been accepted.

5. Medical examinations. The proposed standard would only require an appropriate medical examination on a periodic basis. The generality of the proposal has attracted many objections and also many helpful comments. The recommendations of NIOSH and of the Advisory Committee on Asbestos Dust were much more specific with respect to both frequency and type of medical examinations to be required. The comments vary as to the class of employees to be examined and as to the frequency of the examinations.

The adopted standard requires medical examinations both at the beginning and the termination of employments exposed to concentrations of asbestos fibers, and also requires annual medical examinations of every employee exposed to airborne concentrations of asbestos. It has been pointed out that in certain industries, such as construction, an employee may work for several employers during the same year. Accordingly, the standard does not require either preemployment, or termination, or periodic examination of any employee who has been examined in accordance with the standard within the past year.

One question which has been raised goes to whether the employer or the employee should be allowed to choose the examining physician. The standard gives the option to the employer. Since some employers already have a medical examination program in operation, and, also, have medical departments with some expertise in the diagnosis of asbestos-related diseases, it seems more reasonable to permit them to utilize the present programs and expertise, than to permit an employee to choose a private general practitioner.

6. Records. The standard, as proposed and as adopted, requires maintenance of records of monitoring and of medical examinations. Most of the controversy in this area has revolved around the question whether an employer should be allowed to have access to the results of the required medical examinations. The apprehension of those who have argued against employer access is based on the expectation that some employers will use the medical examinations as a means of screening employment applicants, and worse, as grounds for discharging current employees, who show signs of being affected by exposure to asbestos. Since the purpose of the medical examinations is to monitor the health of employees exposed to the hazards of asbestos, employees cannot in reason be granted the privilege of refusing to disclose to their employers results of occupational exposure. It does not make sense to require employers to provide medical examinations if they cannot know and use the results of the examinations. For these reasons the standard provides that employers may have a restricted access to some medical information.

On the other hand, there is no intention to allow employers to abuse medical information obtained pursuant to the Act, to the detriment of employees. Therefore, the administration of the medical records requirement will be closely watched, and, in cases of abuse, appropriate action will be considered.

The issues discussed above are believed to be the major ones. Numerous other issues have been raised in the rulemaking proceedings. Some have been referred to incidentally. Many recommendations, for instance, about work practices, are so obviously meritorious that their adoption needs no exposition here. Other recommendations and many objections have not been adopted for a variety of reasons which should be manifest. Several, for instance, have recommended the use of respirators only pursuant to a variance, or in cases of emergency and occasional short-term exposures. The recommendation with respect to variances undoubtedly has many merits, but is considered administratively impractical.

Accordingly, after consideration of the whole record of the proceeding, and pursuant to sections 6 (b) and (c) and 8(c) of the Williams-Steiger Occupational Safety and Health Act of 1970 (84 Stat. 1593, 1596, 1599; 29 U.S.C. 655, 657), 29 CFR 1910.4, and to Secretary of Labor's Order No. 12-71 (35 FR. 3754), Part 1910 of Title 29 of the Code of Federal Regulations is amended as set forth below.

(1) Section 1910.93 is amended by revising Table G-3 to read as follows:

18-0000763

602183

§ 1910.93 Air contaminants.

TABLE O-3—MINERAL DUSTS

Substance	Mppcf	Mg/M ³
Silica:		
Crystalline:		
Quartz (respirable).....	250	10mg/M ³ =
	%SiO ₂ +8	%SiO ₂ +2
Quartz (total dust).....		30mg/M ³
		%SiO ₂ +2
Chalchihuite: Use 1/2 the		
value calculated from the		
count or mass formulae for		
quartz.		
Tridymite: Use 1/2 the value		
calculated from the for-		
mulae for quartz.		
Amorphous, including natural	20	80mg/M ³
diatomaceous earth.....		%SiO ₂
Silicates (less than 1% crys-		
talline silica):		
Mica.....	20	
Soapstone.....	20	
Talc.....	20	
Portland cement.....	20	
Graphite (natural).....	15	
Coal dust (respirable fraction		2.4mg/M ³
less than 5% SiO ₂).....		or
		10mg/M ³
For more than 5% SiO ₂		%SiO ₂ +2
Inert or nuisance dust:		
Respirable fraction.....	15	8mg/M ³
Total dust.....	20	15mg/M ³

NOTE: Conversion factors—
mppcfX35.3=million particles per cubic meter
= particles per c.c.

1/Millions of particles per cubic foot of air, based on
lumpier samples counted by light-field techniques.

The percentage of crystalline silica in the formula
is the amount determined from air-borne samples,
except in those instances in which other methods have
been shown to be applicable.

As determined by the membrane filter method at
40X phase contrast magnification.

Both concentration and percent quartz for the
application of this limit are to be determined from
the fraction passing a size-selector with the following
characteristics:

Aerodynamic diameter (unit density sphere)	Percent passing selector
2	90
2.5	75
2.8	50
3.0	25
10	0

The measurements under this note refer to the use of
an AEC instrument. If the respirable fraction of coal
dust is determined with a MRE the figure corresponding
to that of 2.4 Mg/M³ in the table for coal dust is 4.4 Mg/M³.

2. A new § 1910.93a is added to Part
1910, reading as follows:

§ 1910.93a Asbestos.

(a) **Definitions.** For the purpose of
this section, (1) "Asbestos" includes
chrysotile, amosite, crocidolite, tremo-
lite, anthophyllite, and actinolite.

(2) "Asbestos fibers" means asbestos
fibers longer than 5 micrometers.

(b) **Permissible exposure to airborne
concentrations of asbestos fibers—**(1)
Standard effective July 7, 1972. The
8-hour time-weighted average airborne
concentrations of asbestos fibers to
which any employee may be exposed
shall not exceed five fibers, longer than
5 micrometers, per cubic centimeter of
air, as determined by the method pre-
scribed in paragraph (e) of this section.

(2) **Standard effective July 1, 1976.**
The 8-hour time-weighted average air-
borne concentrations of asbestos fibers

to which any employee may be exposed
shall not exceed two fibers, longer than
5 micrometers, per cubic centimeter of
air, as determined by the method pre-
scribed in paragraph (e) of this section.

(3) **Ceiling concentration.** No em-
ployee shall be exposed at any time to
airborne concentrations of asbestos
fibers in excess of 10 fibers, longer than
5 micrometers, per cubic centimeter of
air, as determined by the method pre-
scribed in paragraph (e) of this section.

(c) **Methods of compliance—**(1) **En-
gineering methods.** (i) **Engineering con-
trols.** Engineering controls, such as, but
not limited to, isolation, enclosure, ex-
haust ventilation, and dust collection,
shall be used to meet the exposure limits
prescribed in paragraph (b) of this
section.

(ii) **Local exhaust ventilation.** (a)
Local exhaust ventilation and dust col-
lection systems shall be designed, con-
structed, installed, and maintained in
accordance with the American National
Standard Fundamentals Governing the
Design and Operation of Local Exhaust
Systems, ANSI Z9.2-1971, which is in-
corporated by reference herein.

(b) See § 1910.6 concerning the avail-
ability of ANSI Z9.2-1971, and the
maintenance of a historic file in connec-
tion therewith. The address of the Amer-
ican National Standards Institute is
given in § 1910.100.

(iii) **Particular tools.** All hand-op-
erated and power-operated tools which
may produce or release asbestos fibers
in excess of the exposure limits pre-
scribed in paragraph (b) of this section,
such as, but not limited to, saws, scorers,
abrasive wheels, and drills, shall be pro-
vided with local exhaust ventilation sys-
tems in accordance with subdivision (ii)
of this subparagraph.

(2) **Work practices—**(i) **Wet methods.**
Insofar as practicable, asbestos shall be
handled, mixed, applied, removed, cut,
scored, or otherwise worked in a wet
state sufficient to prevent the emission
of airborne fibers in excess of the ex-
posure limits prescribed in paragraph
(b) of this section, unless the usefulness
of the product would be diminished
thereby.

(ii) **Particular products and opera-
tions.** No asbestos cement, mortar, coat-
ing, grout, plaster, or similar material
containing asbestos shall be removed
from bags, cartons, or other containers
in which they are shipped, without being
either wetted, or enclosed, or ventilated
so as to prevent effectively the release of
airborne asbestos fibers in excess of the
limits prescribed in paragraph (b) of
this section.

(iii) **Spraying, demolition, or removal.**
Employees engaged in the spraying of
asbestos, the removal, or demolition of
pipes, structures, or equipment covered
or insulated with asbestos, and in the
removal or demolition of asbestos in-
sulation or coverings shall be provided
with respiratory equipment in accord-
ance with paragraph (d) (2) (iii) of this
section and with special clothing in ac-
cordance with paragraph (d) (3) of this
section.

(d) **Personal protective equipment—**
(1) Compliance with the exposure limits
prescribed by paragraph (b) of this sec-
tion may not be achieved by the use of
respirators or shift rotation of em-
ployees, except:

(i) During the time period necessary
to install the engineering controls and
to institute the work practices required
by paragraph (e) of this section;

(ii) In work situations in which the
methods prescribed in paragraph (c) of
this section are either technically not
feasible or feasible to an extent insuffi-
cient to reduce the airborne concentra-
tions of asbestos fibers below the limits
prescribed by paragraph (b) of this
section; or

(iii) In emergencies.

(iv) Where both respirators and per-
sonnel rotation are allowed by subdivi-
sions (i), (ii), or (iii) of this subpara-
graph, and both are practicable, person-
nel rotation shall be preferred and used.

(2) Where a respirator is permitted by
subparagraph (1) of this paragraph, it
shall be selected from among those ap-
proved by the Bureau of Mines, Depart-
ment of the Interior, or the National In-
stitute for Occupational Safety and
Health, Department of Health, Educa-
tion, and Welfare, under the provisions of
30 CFR Part 11 (37 F.R. 6244, Mar. 25,
1972), and shall be used in accordance
with subdivisions (i), (ii), (iii), and (iv)
of this subparagraph.

(i) **Air purifying respirators.** A reus-
able or single use air purifying respirator,
or a respirator described in subdivision
(ii) or (iii) of this subparagraph, shall
be used to reduce the concentrations of
airborne asbestos fibers in the respirator
below the exposure limits prescribed in
paragraph (b) of this section, when the
ceiling or the 8-hour time-weighted aver-
age airborne concentrations of asbestos
fibers are reasonably expected to exceed
no more than 10 times those limits.

(ii) **Powered air purifying respirators.**
A full facepiece powered air purifying
respirator, or a powered air purifying
respirator, or a respirator described in
subdivision (iii) of this subparagraph,
shall be used to reduce the concentra-
tions of airborne asbestos fibers in the
respirator below the exposure limits pre-
scribed in paragraph (b) of this section,
when the ceiling or the 8-hour time-
weighted average concentrations of
asbestos fibers are reasonably expected
to exceed 10 times, but not 100 times,
those limits.

(iii) **Type "C" supplied-air respirators,
continuous flow or pressure-demand
class.** A type "C" continuous flow or pres-
sure-demand, supplied-air respirator
shall be used to reduce the concentra-
tions of airborne asbestos fibers in the
respirator below the exposure limits pre-
scribed in paragraph (b) of this section,
when the ceiling or the 8-hour time-
weighted average airborne concentra-
tions of asbestos fibers are reasonably
expected to exceed 100 times those limits.

(iv) **Establishment of a respirator pro-
gram.** (a) The employer shall establish
a respirator program in accordance with

the requirements of the American National Standards Practices for Respiratory Protection, ANSI Z88.2-1969, which is incorporated by reference herein.

b. Sec. 1910.6 concerning the availability of ANSI Z88.2-1969 and the maintenance of an historic file in connection therewith. The address of the American National Standards Institute is given in § 1910.100.

(c) No employee shall be assigned to tasks requiring the use of respirators if, based upon his most recent examination, an examining physician determines that the employee will be unable to function normally wearing a respirator, or that the safety or health of the employee or other employees will be impaired by his use of a respirator. Such employee shall be rotated to another job or given the opportunity to transfer to a different position whose duties he is able to perform with the same employer, in the same geographical area and with the same seniority, status, and rate of pay he had just prior to such transfer, if such a different position is available.

(3) Special clothing: The employer shall provide, and require the use of, special clothing, such as coveralls or similar whole body clothing, head coverings, gloves, and foot coverings for any employee exposed to airborne concentrations of asbestos fibers, which exceed the ceiling level prescribed in paragraph (b) of this section.

(4) Change rooms: (i) At any fixed place of employment exposed to airborne concentrations of asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section, the employer shall provide change rooms for employees working regularly at the place.

(ii) Clothes lockers: The employer shall provide two separate lockers or containers for each employee, so separated or isolated as to prevent contamination of the employee's street clothes from his work clothes.

(iii) Laundering: (a) Laundering of asbestos contaminated clothing shall be done so as to prevent the release of airborne asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section.

(b) Any employer who gives asbestos-contaminated clothing to another person for laundering shall inform such person of the requirement in (a) of this subdivision to effectively prevent the release of airborne asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section.

(c) Contaminated clothing shall be transported in sealed impermeable bags, or other closed, impermeable containers, and labeled in accordance with paragraph (2) of this section.

(e) Method of measurement. All determinations of airborne concentrations of asbestos fibers shall be made by the membrane filter method at 400-450 X (magnification) (4 millimeter objective) with phase contrast illumination.

(f) Monitoring—(1) Initial determinations. Within 6 months of the publication of this section, every employer shall cause every place of employment

where asbestos fibers are released to be monitored in such a way as to determine whether every employee's exposure to asbestos fibers is below the limits prescribed in paragraph (b) of this section. If the limits are exceeded, the employer shall immediately undertake a compliance program in accordance with paragraph (c) of this section.

(2) Personal monitoring—(i) Samples shall be collected from within the breathing zone of the employees, on membrane filters of 0.8 micrometer porosity mounted in an open-face filter holder. Samples shall be taken for the determination of the 8-hour time-weighted average airborne concentrations and of the ceiling concentrations of asbestos fibers.

(ii) Sampling frequency and patterns. After the initial determinations required by subparagraph (1) of this paragraph, samples shall be of such frequency and pattern as to represent with reasonable accuracy the levels of exposure of employees. In no case shall the sampling be done at intervals greater than 6 months for employees whose exposure to asbestos may reasonably be foreseen to exceed the limits prescribed by paragraph (b) of this section.

(3) Environmental monitoring—(1) samples shall be collected from areas of a work environment which are representative of the airborne concentrations of asbestos fibers which may reach the breathing zone of employees. Samples shall be collected on a membrane filter of 0.8 micrometer porosity mounted in an open-face filter holder. Samples shall be taken for the determination of the 8-hour time-weighted average airborne concentrations and of the ceiling concentrations of asbestos fibers.

(ii) Sampling frequency and patterns. After the initial determinations required by subparagraph (1) of this paragraph, samples shall be of such frequency and pattern as to represent with reasonable accuracy the levels of exposure of the employees. In no case shall sampling be at intervals greater than 6 months for employees whose exposures to asbestos may reasonably be foreseen to exceed the exposure limits prescribed in paragraph (b) of this section.

(4) Employee observation of monitoring. Affected employees, or their representatives, shall be given a reasonable opportunity to observe any monitoring required by this paragraph and shall have access to the records thereof.

(g) Caution signs and labels. (1) Caution signs. (i) Posting. Caution signs shall be provided and displayed at each location where airborne concentrations of asbestos fibers may be in excess of the exposure limits prescribed in paragraph (b) of this section. Signs shall be posted at such a distance from such a location so that an employee may read the signs and take necessary protective steps before entering the area marked by the signs. Signs shall be posted at all approaches to areas containing excessive concentrations of airborne asbestos fibers.

(ii) Sign specifications. The warning signs required by subdivision (i) of this

subparagraph shall conform to the requirements of 20" x 14" vertical format signs specified in 1519.14710-4, and to this subdivision. The signs shall display the following legend in the lower panel, with letter sizes and styles of a visibility at least equal to that specified in this subdivision.

Legend	Notation
Asbestos	1" Sans Serif, Gothic or Block.
Dust Hazard	1/4" Sans Serif, Gothic or Block.
Avoid Breathing Dust...	1/4" Gothic.
Wear Assigned Protective Equipment.	1/4" Gothic.
Do Not Remain In Area Unless Your Work Requires It.	1/4" Gothic.
Breathing Asbestos Dust May Be Hazardous To Your Health.	14 point Gothic.

Spacing between lines shall be at least equal to the height of the upper of any two lines.

(2) Caution labels—(i) Labeling. Caution labels shall be affixed to all raw materials, mixtures, scrap, waste, debris, and other products containing asbestos fibers, or to their containers, except that no label is required where asbestos fibers have been modified by a bonding agent, coating, binder, or other material so that during any reasonably foreseeable use, handling, storage, disposal, processing, or transportation, no airborne concentrations of asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section will be released.

(ii) Label specifications. The caution labels required by subdivision (i) of this subparagraph shall be printed in letters of sufficient size and contrast as to be readily visible and legible. The label shall state:

CAUTION
Contains Asbestos Fibers
Avoid Creating Dust
Breathing Asbestos Dust May Cause Serious Bodily Harm

(h) Housekeeping—(1) Cleaning. All external surfaces in any place of employment shall be maintained free of accumulations of asbestos fibers if, with their dispersion, there would be an excessive concentration.

(2) Waste disposal. Asbestos waste, scrap, debris, bags, containers, equipment, and asbestos-contaminated clothing, consigned for disposal, which may produce in any reasonably foreseeable use, handling, storage, processing, disposal, or transportation airborne concentrations of asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section shall be collected and disposed of in sealed impermeable bags, or other closed, impermeable containers.

(i) Recordkeeping—(1) Exposure records. Every employer shall maintain records of any personal or environmental monitoring required by this section. Records shall be maintained for a period of at least 3 years and shall be made available upon request to the Assistant Secretary of Labor for Occupational Safety and Health, the Director of the National

Institute for Occupational Safety and Health, and to authorized representatives of either.

(2) *Employee access.* Every employee and former employee shall have reasonable access to any record required to be maintained by subparagraph (1) of this paragraph, which indicates the employee's own exposure to asbestos fibers.

(3) *Employee notification.* Any employee found to have been exposed at any time to airborne concentrations of asbestos fibers in excess of the limits prescribed in paragraph (b) of this section shall be notified in writing of the exposure as soon as practicable but not later than 5 days of the finding. The employee shall also be timely notified of the corrective action being taken.

(4) *Medical examinations—(1) General.* The employer shall provide or make available at his cost, medical examinations relative to exposure to asbestos required by this paragraph.

(2) *Preplacement.* The employer shall provide or make available to each of his employees, within 30 calendar days following his first employment in an occupation exposed to airborne concentrations of asbestos fibers, a comprehensive medical examination, which shall include, as a minimum, a chest roentgenogram (posterior-anterior 14 x 17 inches), a history to elicit symptomatology of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at 1 second (FEV₁).

(3) *Annual examinations.* On or before January 31, 1973, and at least annually thereafter, every employer shall provide, or make available, comprehensive medical examinations to each of his employees engaged in occupations exposed to airborne concentrations of asbestos fibers. Such annual examination shall include, as a minimum, a chest roentgenogram (posterior-anterior 14 x 17 inches), a history to elicit symptomatology of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at 1 second (FEV₁).

(4) *Termination of employment.* The employer shall provide, or make available, within 30 calendar days before or after the termination of employment of any employee engaged in an occupation exposed to airborne concentrations of asbestos fibers, a comprehensive medical examination which shall include, as a minimum, a chest roentgenogram (posterior-anterior 14 x 17 inches), a history to elicit symptomatology of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at 1 second (FEV₁).

(5) *Recent examinations.* No medical examination is required of any employee, if adequate records show that the employee has been examined in accordance with this paragraph within the past 1-year period.

(6) *Medical records—(1) Maintenance.* Employers of employees examined pursuant to this paragraph shall cause to be maintained complete and accurate records of all such medical examina-

tions. Records shall be retained by employers for at least 20 years.

(2) *Access.* The contents of the records of the medical examinations required by this paragraph shall be made available, for inspection and copying, to the Assistant Secretary of Labor for Occupational Safety and Health, the Director of NIOSH, to authorized physicians and medical consultants of either of them, and, upon the request of an employee or former employee, to his physician. Any physician who conducts a medical examination required by this paragraph shall furnish to the employer of the examined employee all the information specifically required by this paragraph, and any other medical information related to occupational exposure to asbestos fibers.

3. A new § 1910.19 is added to Subpart B of Part 1910, reading as follows:

§ 1910.19 Asbestos dust.

Section 1910.93a shall apply to the exposure of every employee to asbestos dust in every employment and place of employment covered by § 1910.12, § 1910.13, § 1910.14, § 1910.15, or § 1910.16, in lieu of any different standard on exposure to asbestos dust which would otherwise be applicable by virtue of any of those sections.

Effective date. Paragraph (b) (2) of § 1910.93a shall become effective July 1, 1976. All other provisions of §§ 1910.93a, 1910.93, and 1910.19 shall become effective July 7, 1972. The current emergency temporary standard remains in effect until July 7, 1972.

(Secs. 8, 2, 24 Stat. 1593, 1598; 29 U.S.C. 655, 657; 29 CFR 1910.4; Secretary of Labor's Order No. 12-71, 36 F.R. 8754)

Signed at Washington, D.C., this 2d day of June 1972.

G. C. GUENTHER,
Assistant Secretary of Labor.

[FR Doc.72-8574 Filed 6-6-72; 8:48 am]

Title 41—PUBLIC CONTRACTS AND PROPERTY MANAGEMENT

Chapter 9—Atomic Energy Commission

PART 9-1—GENERAL

Subpart 9-1.1—Procurement Regulations

MISCELLANEOUS AMENDMENTS

The changes made in AECPR Subpart 9-1.1, Procurement Regulations, have been made in order to establish the AECPR Temporary Regulations, which are a part of the AEC Procurement Regulations and the Federal Procurement Regulations System. The AECPR Temporary Regulations implement and supplement the FPR Temporary Regulations. They also contain policies and procedures initiated by the AEC which are to be effective for a period of 6 months or less. The AEC Procurement

Instruction section has been revised accordingly. Minor editorial changes have also been made.

1. Section 9-1.101 *Scope of Subpart 1*, revised to read as follows:

§ 9-1.101 Scope of subpart.

This subpart describes the Atomic Energy Commission Procurement Regulations and the AECPR Temporary Regulations. It also describes exclusions from the AECPR as contained in the AEC Procurement Instructions.

2. Section 9-1.102 *Establishment of AEC Procurement Regulations*, is revised to read as follows:

§ 9-1.102 Establishment of the AEC Procurement Regulations and the AECPR Temporary Regulations.

§ 9-1.102-1 AEC Procurement Regulations.

(a) The AEC Procurement Regulations (AECPR) are hereby established.

(b) These regulations implement and supplement the Federal Procurement Regulations (FPR) and are a part of the Federal Procurement Regulations System.

(c) The effective date of FPR issuances throughout AEC will be the date indicated in the respective issuances unless otherwise provided in the AEC Procurement Regulations.

(d) The effective date of AECPR issuances throughout AEC will be the date indicated in the respective issuances.

§ 9-1.102-2 AECPR Temporary Regulations.

(a) The AECPR Temporary Regulations are hereby established.

(b) These regulations implement and supplement the Federal Procurement Regulations Temporary Regulations. They also contain policies and procedures initiated by the AEC which are expected to be effective for a period of 6 months or less.

(c) The effective date of the FPR Temporary Regulations issuances throughout AEC will be the date indicated in the respective issuances unless otherwise provided in the AECPR Temporary Regulations.

(d) The effective date of the AECPR Temporary Regulations issuances throughout AEC will be the date indicated in the respective issuances.

(e) The AECPR Temporary Regulations are a part of the AEC Procurement Regulations and the Federal Procurement Regulations System. All references to the AEC Procurement Regulations or AECPR in §§ 9-1.103 through 9-1.109 of this subpart shall be deemed to include the AECPR temporary regulations.

3. Section 9-1.103 *Authority*, is revised to read as follows:

§ 9-1.103 Authority.

The AEC Procurement Regulations are prescribed by the General Manager, Assistant General Manager for Administration, or the Director, Division of Contracts of the AEC, pursuant to the authority of the Atomic Energy Act of 1954, and the Federal Property and Administrative Services Act of 1949.

 BAYTOWN ENGINEERING STANDARD 		HOT EQUIPMENT INSULATION APPLICATION	BTES 14-1-2.1C
HUMBLE OIL & REFINING COMPANY	ENJAY CHEMICAL COMPANY		Page 1 of 6
REVISION 1	MARCH 1972		

SCOPE

- 1.1 This standard covers the mandatory requirements for materials and application of external insulation for equipment within the design temperature range of 78 to 1200°F.
- 1.2 This standard is not applicable to boilers, furnaces, and storage tanks.

SUMMARY OF ADDITIONAL REQUIREMENTS

- 2.1 Baytown Engineering Standard BTES 14-2-50.1B, "Insulation Materials, Purchase Descriptions," shall be used with this standard.
- 2.2 The following information shall be obtained from the drawings or insulation schedules:
 - a. Equipment to be insulated and extent of insulation if partial coverage is required.
 - b. Equipment that requires special insulation to prevent stress corrosion cracking of austenitic stainless steel.
 - c. Total thickness of insulation required.
 - d. Insulation design temperature.
 - e. Extent of insulation designated as fireproofing.
 - f. Equipment that requires insulation only for personnel protection.
 - g. Equipment to be heat traced.

DEFINITIONS

- 3.1 The term equipment is both mechanical equipment and vessels.
- 3.2 The term mechanical equipment is defined to include turbines and pumps.
- 3.3 The term vessel is defined to include drums, towers, reactors, spheres, and exchangers.

MATERIALS

- 4.1 Materials shall be per BTES 14-2-50.1B with code numbers, sizes, widths, etc., as specified herein. Insulation materials, insulation covering, cements, accessories, etc. shall not contain any asbestos.

INSULATION

- 4.2 Board insulation shall be semirigid mineral wool Code No. I34, good for at least 700°F.
- 4.3 Block insulation shall be flat or curved calcium silicate blocks per Code No. II.

602187



- 4.4 Pipe insulation shall be calcium silicate sectional or segmental pipe covering Code No. I4.
- 4.5 Special insulation shall be mineral wool board, calcium silicate block, or calcium silicate pipe covering that contains less than 25 ppm chlorides or contains an inhibitor that will prevent stress corrosion cracking of austenitic stainless steel.
- 4.6 Blanket insulation shall be 3-inch-thick mineral fiber material with high permanent resilience per Code No. I31.
- 4.7 Insulating cement shall be mineral fiber per Code No. I103.

INSULATION COVERING

- 4.8 The color of all finish coatings and mastics shall be gray to match the color of Enjay coating Rust-Ban AK-6414.
- 4.9 Weatherproofing jacket shall be aluminum according to the following:
- Sheets shall be 1-1/4-inch corrugated by 33-inch minimum width, Code No. J5, and rolls shall be 3/16-inch corrugated by 48-inch minimum width per Code No. J6 according to the following thickness schedule:

Outside Diameter of Vessel in Feet	Jacket Thickness in Inches
Under 6	0.012
6 to 18	0.016
18 and Over	0.019

- Prefabricated heads shall be per Code No. J4.
- 4.10 Weatherproofing mastic shall be a breathing type per Code No. J17.
- 4.11 Fireproof covering shall be electrogalvanized carbon steel jacket according to the following:
- Sheets shall be 0.010 inch thick by 33-inch minimum width with 1-1/4-inch corrugations in the long direction per Code No. J13.
 - Rolls shall be 0.010 inch thick by 48-inch minimum width with 3/16-inch cross corrugations per Code No. J15.
 - Preformed heads shall be 0.010 inch thick, smooth, interlocking gore type per Code No. J14.
- 4.12 Fireproofing mastic shall be a breather type per Code No. J19.

ACCESSORIES

- 4.13 Bands shall be stainless steel, 3/4 inch wide x 0.015 inch thick, Code No. A2.
- 4.14 Seals shall be stainless steel, closed type, for 3/4-inch x 0.015-inch bands, Code No. A23.
- 4.15 Wire shall be 16 BWG stainless steel, Code No. A30.
- 4.16 Wire mesh shall be Monel, Code No. A37.

18-0000768



- 4.17 Screws shall be No. 8 x 1/2 inch long, sheet metal, stainless steel, Code No. A19.
- 4.18 Welding stud caps shall be aluminum to match weld stud, Code No. A19.
- 4.19 Expansion springs shall be stainless steel for 3/4-inch-wide bands, Code No. A5.
- 4.20 Mastic sealer/flashing shall be per Code No. J20.

INSULATION APPLICATION

GENERAL

- 5.1 Manholes and nozzles of vessels and equipment that are specified to be insulated shall only be insulated when required for personnel protection or when they are heat traced or contain steam.
- 5.2 Skirts or the bottom head of vessels inside skirts where the diameter is less than 4 feet 0 inch shall not be insulated, unless otherwise specified by Owner.
- 5.3 Surfaces to which insulation is applied shall be dry and free of all foreign matter.
- 5.4 Insulation for personnel protection shall extend to a minimum height of 7 feet 0 inch above grade or platform.
- 5.5 Pressure test shall be completed and all repairs made prior to installing insulation over welds, flanges, or threaded connections.
- 5.6 Insulation shall be kept dry and protected against the elements during storage and all stages of application until the weatherproofing has been installed.
- 5.7 Install insulation with all joints tightly butted together. Stagger joints of multilayer construction. Point up cracks and voids with insulating cement.
- 5.8 Install each board of mineral wool insulation in a slightly compressed condition in both directions.
- 5.9 Install insulation in two layers of equal thickness if the insulation design temperature is above 600°F.
- 5.10 For insulation design temperatures through 700°F, install board insulation. Above 700°F, install pipe or block insulation as the inner layer and board insulation as the outer layer.
- 5.11 When special insulation is specified to prevent stress corrosion cracking, use low chloride insulation and/or inhibited insulation.

VESSELS

- 5.12 Secure insulation on cylindrical vessels as follows:
 - a. Use wire on the bottom head of skirt-supported vessels. Use bands and seals in all other cases, except wire may be used to secure block or pipe insulation on vessels less than 4 feet in diameter.



- b. Space bands and wires as required to secure insulation but in no case shall they be spaced more than 12 inches apart.
- c. Secure insulation on the top head of vertical vessels per Figure 1 and the heads of horizontal vessels and the bottom head of vessels not supported on skirts per Figure 2.
- d. Secure insulation on the bottom head of skirt-supported vertical vessels by diagonally crossing wires in both directions between adjacent rows of clips. Secure ends of wire by twisting at every third clip.
- e. Install expansion springs on all bands that secure the outer layer of insulation on the cylindrical sections of vessels equally spaced around the circumference according to the following schedule:

QUANTITY OF EXPANSION SPRINGS
REQUIRED PER BAND

Diameter Section in Feet	Insulation Design Temperature Range, °F			
	400-600	601-800	801-1000	1001-1200
4 to 8	-	1	1	2
8 to 12	1	1	1	2
12 to 16	1	2	2	3
16 to 20	1	2	2	3
20 to 24	2	3	3	4
24 to 26	2	3	3	4
26 to 30	3	3	4	5

- f. With vessel in the cold condition, each spring shall be installed in tension to produce a 3/4-inch spring expansion.
- 5.13 Secure insulation on noncylindrical vessels (spheres, spheroids, etc.) by diagonally crossing wires in both directions between adjacent rows of clips. Secure ends of wire by twisting at every third clip.
- 5.14 Vertical vessels having insulation design temperatures above 400°F shall have expansion joints installed below all support rings except at the bottom support. Installation shall be per Figure 3.
- 5.15 Weatherproof cylindrical vessels as follows:
- a. Install aluminum weatherproofing jacket on all sections except the bottom head of skirt-supported vertical vessels.
 - b. Use sheets on vertical vessels and rolls on horizontal or inclined vessels.
 - c. Install the jacket to shed water and overlap all edges 3 inches, but in no case less than two full corrugations. This includes lapping the bottom course over the lower insulation support ring of vertical vessels.
 - d. Support the bottom course on vertical vessels using welding studs and caps. A minimum of two studs shall be used through each sheet. Owner will provide studs installed on not more than 14-inch centers and installer of jacket shall provide caps. Support the other courses with "S" clips fabricated from 1-inch-wide x 0.030-inch-thick stainless steel, Type 302 or 304 material per Figure 4. Space "S" clips on centers not to exceed 14 inches.
 - e. Secure the rolls and sheets with bands spaced on not more than 6-inch centers. On vertical vessels, secure bands to sheets with screws on not more than 5-foot centers and in no case less than two screws per band.

- f. Expansion springs shall be provided for each band on cylindrical sections according to the schedule for securing insulation. With the vessel in the cold condition, each spring shall have an initial tension to produce 1-1/2-inch spring expansion.
 - g. Secure gore sections of prefabricated heads with screws on not more than 6-inch centers. Attach prefabricated heads to shell jacket with screws on not more than 6-inch centers.
- 5.16 Weatherproof the bottom head of skirt-supported vessels and noncylindrical vessels such as spheres, spheroids, etc., as follows:
- a. Cover insulation with wire mesh and lace with wire.
 - b. Apply a 1/4-inch-thick wet coat of weatherproofing mastic over the wire mesh. The mastic shall be smooth and completely cover the netting.
- 5.17 For insulation design temperatures below 401°F, apply a 1/4-inch minimum fillet of sealer/flashings mastic to weatherproof small openings between the jacket and vessel surfaces such as nozzles, manholes, etc. For temperatures of 401°F and above, do not install the sealer/flashings but take extra precautions to insure a good fit-up.

MECHANICAL EQUIPMENT

- 5.18 If those insulating materials specified in the General Section of this specification cannot be economically applied, insulating cement may be installed but the thickness shall be increased 50%.
- 5.19 Weatherproof the insulation with weatherproofing mastic and wire mesh as specified for noncylindrical vessels.

APPLICATION FOR FIREPROOFING

- 6.1 Application for fireproofing shall be per the section, "Application for Insulation," with the following exceptions:
- a. Use calcium silicate insulation and insulating cement only. Do not use mineral fiber insulation.
 - b. Insulation used to fireproof equipment composed of low melting point metals such as aluminum shall be installed in two layers regardless of the insulation design temperature.
 - c. Fireproofing jacketing shall be installed in place of aluminum jacketing.
 - d. A band shall be installed not more than 2 inches above all rows of studs supporting fireproofing jacket on vertical cylindrical vessels.
 - e. The insulation of equipment, noncylindrical vessels, and the bottom head of vertical vessels supported on skirts shall be coated with the fireproofing mastic reinforced with wire mesh in place of the weatherproofing mastic.

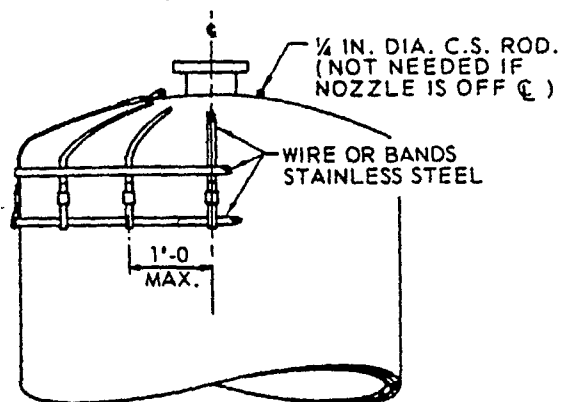


FIGURE 1 - ATTACHMENT OF INSULATION TO TOP OF VERTICAL VESSELS

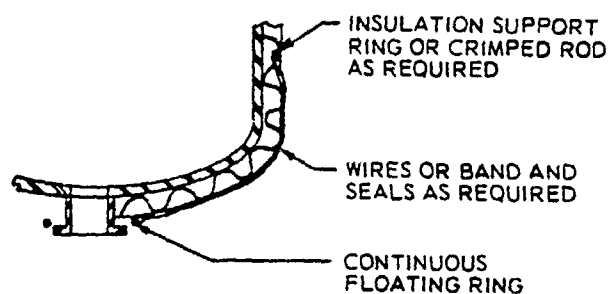


FIGURE 2 - ATTACHMENTS FOR HORIZONTAL VESSEL HEADS AND BOTTOM HEAD OF VERTICAL VESSELS WITHOUT SKIRT

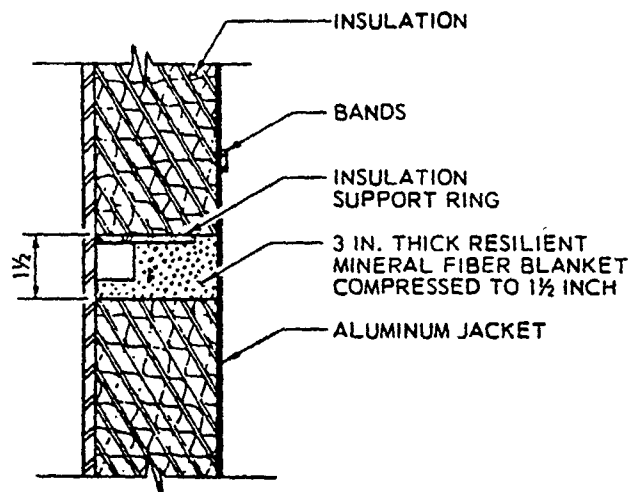


FIGURE 3 - EXPANSION JOINT DETAILS

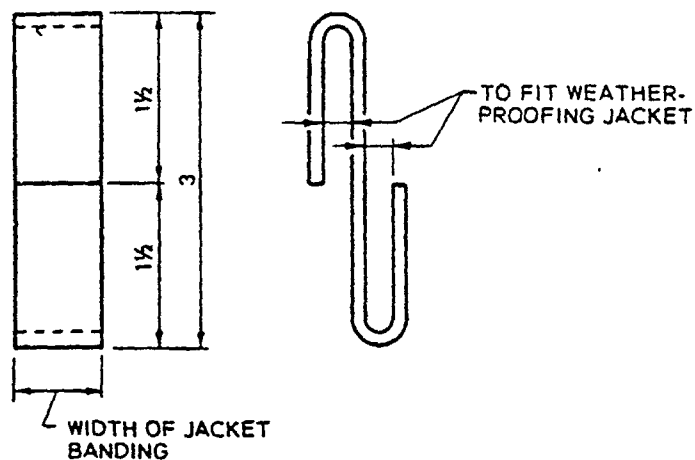


FIGURE 4 - "S" CLIP

18-0000772

 BAYTOWN ENGINEERING STANDARD 		HOT PIPING INSULATION APPLICATION	BTES 14-1-2.5C
HUMBLE OIL & REFINING COMPANY	ENJAY CHEMICAL COMPANY		Page 1 of 5
REVISION 1	MARCH 1972		

SCOPE

- 1.1 This standard covers the mandatory requirements for materials and application of external insulation for aboveground piping and instruments within the insulation design temperature range of 78 to 1200°F.

SUMMARY OF ADDITIONAL REQUIREMENTS

- 2.1 Baytown Engineering Standard BTES 14-2-50.1B, "Insulation Materials, Purchase Descriptions," shall be used with this standard.
- 2.2 The following information shall be obtained from piping drawings, instrument sketches, or insulation schedules:
- Piping and instruments to be insulated and extent of insulation if only partial coverage is required.
 - The piping and instruments that require a special insulation to prevent stress corrosion cracking.
 - Total thickness of insulation required.
 - Insulation design temperature.
 - Extent of insulation designated as fireproofing.
 - Piping and instruments that only require insulation for personnel protection.
 - Piping and instruments that are heat traced.
 - Areas specified to be insulated and subject to foot traffic.

MATERIALS

- 3.1 Materials shall be per BTES 14-2-50.1B with code numbers, sizes, widths, etc., as specified herein. Insulation materials, insulation covering, cements, accessories, etc. shall not contain any asbestos.

INSULATION

- 3.2 Mineral fiber insulation shall be molded pipe covering per Code Number I40, prefabricated ell fitting Code Number I36, and prefabricated flange insulation Code Number I38.
- 3.3 Calcium silicate shall be molded pipe covering per Code Number I4, prefabricate ell fitting Code Number I2, and prefabricated flange insulation Code Number I3.
- 3.4 Special insulation shall be mineral fiber or calcium silicate pipe covering that contains less than 25 ppm chlorides or contains an inhibitor that will prevent stress corrosion cracking of austenitic stainless steel.
- 3.5 Blanket insulation shall be 3-inch-thick mineral fiber material with high permanent resilience per Code Number I31.
- 3.6 Insulation cement shall be mineral fiber type per Code Number I103.



INSULATION COVERING

- 3.7 The color of all outside coatings and mastics shall be gray to match the color of Enjay coating Rust-Ban AK-6414.
- 3.8 Weatherproofing for pipe, weld tees, and end pieces shall be 0.012-inch-thick aluminum jacket, preformed sections with a longitudinal lock joint or roll stock per Code Number J6.
- 3.9 Weatherproofing for weld ells shall be 0.016-inch-thick aluminum jacket, preformed or gore type with overlapping beaded joints per Code Number J1.
- 3.10 Weatherproofing mastic shall be a breathing type per Code Number J17.
- 3.11 Fireproof covering for pipe, weld tees, and end pieces shall be 0.010-inch-thick electrogalvanized steel jacket, preformed sections with a longitudinal lock joint or roll stock per Code Number J15.
- 3.12 Fireproof covering for weld ells shall be 0.010-inch-thick, electrogalvanized steel jacket, preformed or gore type with overlapping beaded joints per Code Number J16.
- 3.13 Fireproof mastic shall be a breathing type per Code Number J19.

ACCESSORIES

- 3.14 Fiber cloth shall be white, glass fiber per Code Number A7.
- 3.15 Wire shall be 16 Bwg stainless steel per Code Number A30.
- 3.16 Bands shall be:
a. Aluminum, 3/8 inch wide x 0.020 inch thick per Code Number A3.
b. Stainless steel, 3/4 inch wide x 0.015 inch thick per Code Number A2.
- 3.17 Seals shall be:
a. Aluminum, short-wing type, for 3/8-inch x 0.020-inch aluminum bands per Code Number A24.
b. Stainless steel, regular-wing type, for 3/4-inch x 0.015-inch stainless steel bands per Code Number A23.
- 3.18 Screws shall be 1/2 inch long x No. 8 pan head.
a. Code Number A18 for aluminum.
b. Code Number A19 for stainless steel.
- 3.19 Insulation supports shall be 1/8-inch-thick carbon steel clamp-on type. The outside diameter, after installation, shall be 1/2 to 3/4 inch less than the outside diameter of the insulation.

APPLICATION

18-0000774

GENERAL

- 4.1 Because of painting and pressure testing requirements, permission shall be obtained from Owner's representative before installing insulation.

- 4.2 Piping, instruments, and heat tracing shall be dry and free of loose scale and foreign matter before insulation application.
- 4.3 Insulation and electric tracing shall be kept dry and shall be protected from the weather until the final weatherproofing or fireproofing covering has been installed.
- 4.4 All heat-traced lines and instruments shall be insulated.

INSULATION

- 4.5 Lines and instruments specified to be insulated shall be insulated individually and all components of the lines shall be insulated completely with the following exceptions:
 - a. Only valves, flanges, and flanged fittings that are in steam service, are heat traced, or that are specified to be fireproofed shall be insulated.
 - b. When specified for personnel protection only, insulation shall be installed to a height of 7 feet above grade or platforms.
 - c. Rotation joints, steam traps, corrugated pipe expansion joints, and similar mechanical equipment shall not be insulated.
 - d. Insulation shall be notched 5 inches on each side of obstructions that protrude into insulation, such as pipe supports adjacent to pipe flanges, etc.
 - e. Steam traps, bypass block valve, and piping downstream of both shall not be insulated.
- 4.6 Mineral fiber insulation shall be used for design temperatures below 451°F, calcium silicate shall be used for design temperatures of 451°F and above, and insulation cement shall be used for all design temperatures with the following additions and exceptions:
 - a. Use special insulation for stainless steel tubing and for piping and instruments where special insulation to prevent stress corrosion cracking of stainless steel is specified. Insulation cement shall not be used on these items. Use blanket insulation to point-up cracks and to insulate instruments that cannot be insulated with pipe covering.
 - b. Insulation cement shall only be used when special insulation is not specified and only to insulate 1-1/2-inch and smaller valves, connections, and fittings or point-up cracks. The thickness shall be 1-1/2 times the pipe insulation thickness specified.
- 4.7 Insulation for tees and valves shall be fabricated from pipe insulation (all joints glued) except where insulation cement is allowed herein.
- 4.8 Insulation shall be installed in two layers of equal thickness if the insulation design temperature is above 600°F.
- 4.9 Insulation joints shall be butted together tightly and the joints of multilayer construction shall be staggered.
- 4.10 The insulation shall be secured with wires spaced on centers not to exceed 9 inches for pipe and not less than three wires each for each fitting, flange, or valve.



- 4.11 Pipe insulation shall be stopped at flanges and the ends shall be tapered so flange bolts can be removed without damaging insulation or covering.
- 4.12 Clamp-on-type insulation supports shall be provided on existing piping according to the following:
- Near the base of vertical lines when the insulation will extend more than 12 feet vertically.
 - Above flanges when the insulation will extend more than 6 feet vertically above the flange.
 - Space the supports on not more than 21 feet 1-1/2-inch centers.
 - Locate supports above flanges so the flange bolts can be removed.
- 4.13 When the insulation design temperature is above 400°F, insulation expansion joints shall be installed below insulation supports or where effective for expansion.

WEATHERPROOFING

- 4.14 Aluminum jacket shall be installed on all insulation except fittings smaller than 2 inches NPS, all insulated valves, flanges, flanged fittings, and items insulated with insulation cement. For these exceptions weatherproofing shall be mastic reinforced with glass cloth.
- 4.15 Weatherproofing covering shall be installed over insulation so as to shed water, lapping all weatherproofing joints a minimum of 3 inches. Lock-type joints that are self-sealing do not require a 3-inch lap.
- 4.16 Jacket, except self-supporting lock jacket, shall be secured on centers not to exceed 6 inches according to the following:
- Use aluminum bands on horizontal lines.
 - Use aluminum screws on the longitudinal joint of vertical lines and support each section with a minimum of three "S" clips per Figure 2. In addition, install one aluminum band at the middle of each section and secure to jacket with at least two aluminum screws.
 - Use no less than three aluminum screws per joint on weld ell jacket.
- 4.17 Junctions of end pieces to pipe for insulation design temperatures below 401°F and all projections through the jacket shall be sealed with a 1/4-inch fillet of sealer/flashing mastic.
- 4.18 Weatherproofing mastic shall be 3/32-inch minimum dry film thickness with glass cloth completely embedded in the mastic.

18-0000776

APPLICATION FOR FIREPROOFING

- 5.1 Application for fireproofing shall be per the section "Application for Insulation" with the following exceptions:
- Install calcium silicate insulation and insulation cement only; not mineral fiber insulation.
 - Insulation, used to fireproof piping composed of low melting metals such as aluminum, shall be installed in two layers regardless of the insulation design temperature.
 - Install fireproofing jackets and mastics in place of weatherproofing.
 - Use only stainless steel bands, clips, screws, and wire, not aluminum.

002196

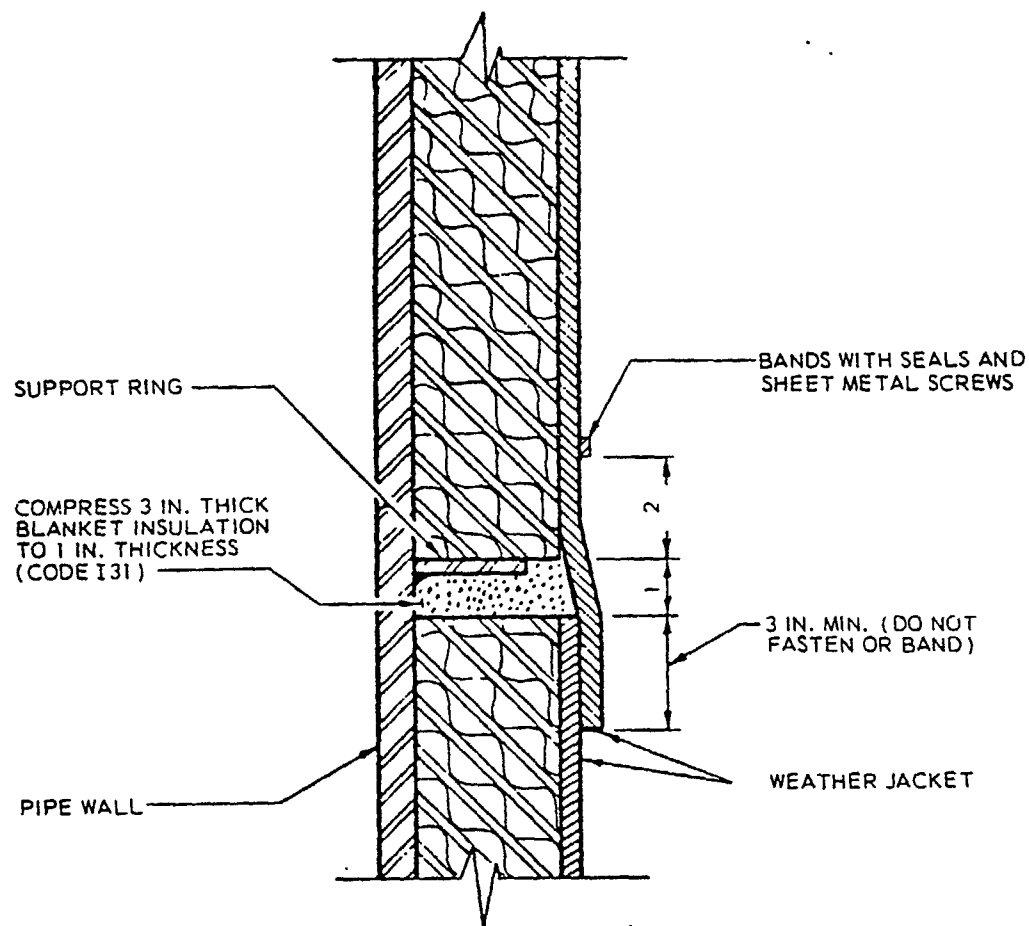
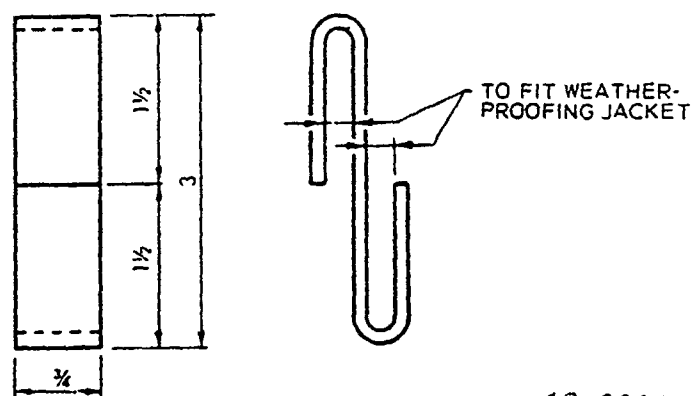


FIGURE 1 - TYPICAL INSULATION EXPANSION JOINT



18-0000777

FIGURE 2 - STAINLESS STEEL 'S' CLIP

 BAYTOWN ENGINEERING STANDARD 		INSULATION MATERIALS PURCHASE DESCRIPTIONS	BTES 14-2-50.18
MURBLE OIL & REFINING COMPANY	ENJAY CHEMICAL COMPANY		Page 1 of 9
REVISION 1	MARCH 1972		

SCOPE

- 1.1 This standard contains purchase descriptions of insulation materials. The term "NIT" used herein is the abbreviation for nominal insulation thickness. The contents of this standard are arranged as follows:

<u>Item</u>	<u>Code Numbers</u>	<u>Page</u>
ACCESSORIES		
Bands.....	A2 - A3	2
Breather Springs.....	A5	2
Fiber Cloth.....	A6 - A7	2
Finger Straps.....	A9	2
Joint Sealer.....	A12 - A13	2
Rivets.....	A15	2
Screws.....	A18 - A19	2
Seals.....	A23 - A24	2
Welding Pins.....	A26	3
Welding Studs and Caps...	A27 - A28	3
Wire.....	A30 - A31	3
Wire Mesh.....	A37	3
INSULATION		
← Calcium Silicate.....	I1 - I4	3,4
Diatomaceous Earth.....	I21 - I25	4
Mineral Fiber.....	I31 - I40	5
Polyurethane.....	I51 - I57	5,6
INSULATION CEMENT		
Mineral Fiber.....	I103	7
JACKETS AND MASTICS		
← Aluminum Jackets.....	J1 - J6	7,8
Felt Jackets.....	J11	8
Steel Jackets.....	J13 - J16	8,9
Mastics.....	J17 - J20	9

18-0000778



PURCHASE DESCRIPTIONS

2.1 Accessories

Code Nos.	Description
A2	Bands, specify size (thickness x width x length), 18-8 Cr-Ni stainless steel, AISI Type 302 or Type 304, annealed temper.
A3	Bands, specify size (thickness x width x length), aluminum alloy Type 3003 or Type 5005, annealed temper.
A5	Breather springs, to fit (specify size of band) 18-8 Cr-Ni stainless steel, AISI Type 302 or Type 304, 5-inch minimum expansion with 125 pounds pull, 98% minimum return after relaxation.
A6	Fiber cloth, specify number of square feet, specify width, open weave (10 x 10) mesh, asphalt-coated glass fiber.
A7	Glass fiber cloth, specify number of square feet, specify roll width, open weave, 10 x 10 mesh, white starch sized, 0.256 ounce per square foot, equal to Perma-Glass-Mesh Corporation's No. 207.
A9	Finger straps, 0.020-inch minimum thickness x 3/4-inch minimum width x specify length, with approximately 1/4-inch-wide x 1-1/2-inch-long fingers spaced on 9-inch centers, 18-8 Cr-Ni stainless steel, AISI Type 302 or Type 304, annealed temper.
A12	Joint sealer, specify container size, permanently soft mastic sealer (Benjamin Foster Company 30-45).
A13	Rubber cement, insulation bonding adhesive, equal to Benjamin Foster 81-81, in 5-gallon or 1-gallon containers (specify which).
A15	Rivets, pop, specify size (diameter x length), aluminum.
A18	Screws, self-tapping, slotted pan head, sheet metal, specify size (number x length), aluminum.
A19	Screws, self-tapping, sheet metal, specify size (number x length), slotted pan-head type, AISI Type 302 or Type 304 stainless steel.
A23	Seals, banding, specify band size (thickness x width), specify type (closed, regular wing, or short wing), 18-8 Cr-Ni stainless steel, AISI Type 302 or Type 304.
A24	Seals, banding, specify band size (thickness x width), specify type (closed, regular wing, or short wing), aluminum alloy Type 3003 or Type 5005.

PURCHASE DESCRIPTIONS (CONT'D)

Code Nos.	Description
A26	Rectangular welding pin, 1/4 inch x 1-1/4 inches, specify length, pierced, specify hole diameter, carbon steel equal to KSM Division of Omark Industries' Type AW.
A27	Welding stud, specify size, 18-8 Cr-Ni stainless steel, AISI Type 302 or Type 304. (Nelson Stud Welding's S2F Setlok Stud or KSM's Multiple Groove Korr Pin No. FB-5)
A28	Welding stud cap, aluminum, to fit Nelson Stud Welding's S2F Setlok Stud or KSM's Multiple Groove Korr Pin No. FB-5 with a 3/16-inch-diameter x 3/8-inch-long extension.
A30	Wire, specify size (Bwg x length), 18-8 Cr-Ni stainless steel, AISI Type 302 or Type 304, annealed temper.
A31	Wire, specify size (Bwg x length), aluminum, annealed temper.
A37	Wire mesh, specify width, specify square feet, 0.028-inch-diameter wire, 1-inch-hexagonal openings, Monel, poultry netting.

2.2 Insulation

Code Nos.	Description
I1	Block insulation, <u>calcium silicate</u> , ASTM C 533, except contains no asbestos, specify number of square feet, specify NIT, specify block width, 36 inches long, flat blocks or curved blocks, specify which; if curved, specify diameter to fit.
I2	Fitting insulation, <u>calcium silicate</u> , ASTM C 533, except contains no asbestos, specify NPS, specify NIT, specify fitting (if ell, specify long or short radius and 45 or 90 degree), specify flange, weld or screw ends; if flange ends, specify rating, if for weld ells and tees, specify with or without 2-inch tangent. If fabricated, pieces shall be fitted without gaps and shall be permanently joined, dimensions shall be equal to pipe fitting dimensions plus insulation thickness with a plus 3/16-inch tolerance.

18-0000780



PURCHASE DESCRIPTIONS (CONT'D)

Code Nos.	Description
I3	Flange insulation, <u>calcium silicate</u> , ASTM C 533, except contains no asbestos, specify NPS, specify NIT, specify flange type and rating. If fabricated, pieces shall be fitted without gaps and shall be permanently joined, dimensions shall be equal to flange dimensions plus insulation thickness with a plus 3/16-inch tolerance.
I4	Pipe insulation, <u>calcium silicate</u> , ASTM C 533, except contains no asbestos, specify number of feet, specify NPS, specify NIT; if for lines with parallel tracers, specify location and size of grooving, when required.
I21	Block insulation, <u>diatomaceous earth</u> , ASTM C 517, except contains no asbestos, specify Class 1 or Class 2, specify number of square feet, specify NIT, specify class, specify block width, 36 inches long, specify flat blocks or curved blocks; if curved blocks, specify diameter to fit.
I22	Fitting insulation, <u>diatomaceous earth</u> , ASTM C 517, except contains no asbestos, specify Class 1 or Class 2, specify NIT, specify class, specify fitting (if ell, specify long or short radius and 45 or 90 degree), specify flange, weld, or screw ends; if flange end, specify rating; if for weld ells and tees, specify with or without 2-inch tangent. If fabricated, pieces shall be fitted without gaps and shall be permanently joined, dimensions shall be equal to pipe fitting dimensions plus insulation thickness with a plus 3/16-inch tolerance.
I23	Flange insulation, <u>diatomaceous earth</u> , ASTM C 517, except contains no asbestos, specify Class 1 or Class 2, specify NPS, specify NIT, specify class, specify flange type and rating. If fabricated, pieces shall be fitted without gaps and shall be permanently joined, dimensions shall be equal to flange dimensions plus insulation thickness with a plus 3/16-inch tolerance.
I24	Pipe insulation, <u>diatomaceous earth</u> , ASTM C 517, except contains no asbestos, specify Class 1 or Class 2, less jacket, specify number of feet, specify NPS, specify NIT, specify class; if for lines with parallel tracers, specify location and size of grooving.
I25	Valve insulation, <u>diatomaceous earth</u> , ASTM C 517, except contains no asbestos, specify Class 1 or Class 2, specify NPS, specify NIT, specify class, specify valve description (manufacturer name, valve identification number, type ends, and rating), insulate to valve bonnet; if fabricated, pieces shall be fitted without gaps and shall be permanently joined, dimensions shall be equal to valve dimensions plus insulation thickness with a plus 3/16-inch tolerance.



PURCHASE DESCRIPTIONS (CONT'D)

Code Nos.	Description
I31	Blanket insulation, <u>mineral fiber</u> , specify number of square feet, specify NIT, specify size (width x length), without metal fabric backing, -250 to 1500°F continuous temperature limit of fiber, high permanent resilience.
I32	Block insulation, <u>mineral fiber</u> , ASTM C 612, specify class, specify number of square feet, specify NIT, specify block size, specify flat blocks or curved blocks, if curved blocks, specify diameter to fit.
I34	Board insulation, <u>mineral fiber</u> , ASTM C 612, specify Class 3 with a minimum density of 8 lbs/ft ³ , a minimum continuous service temperature of 700°F, and a minimum compressive strength of 200 psf at 10% deflection, specify number of square feet, specify NIT, specify size (width x length), nonpinking binder.
I36	Fitting insulation, <u>mineral fiber</u> , ASTM C 547, 450°F minimum service temperature and 7 pcf minimum density, specify NPS, specify NIT, specify fitting (if ell, specify long or short radius and 45 or 90 degree) specify flange, weld or screw ends; if flange ends, specify rating, nonpinking binder; if fabricated, pieces shall be fitted without gaps and shall be permanently joined, dimensions shall be equal to pipe fitting dimensions plus insulation thicknesses with a plus 3/16-inch tolerance.
I38	Flange insulation, <u>mineral fiber</u> , ASTM C 547, 450°F minimum service temperature and 7 pcf minimum density, specify NPS, specify NIT, specify flange type and rating, nonpinking binder; if fabricated, pieces shall be fitted without gaps and shall be permanently joined, dimensions shall be equal to flange dimensions plus insulation thicknesses with a plus 3/16-inch tolerance.
I40	Pipe insulation, <u>mineral fiber</u> , ASTM C 547, 450°F minimum service temperature and 7 pcf minimum density, specify number of feet, specify NPS, specify NIT; if for lines with parallel tracers, specify location and size of grooving, nonpinking binder.
I51	Block insulation, <u>rigid polyurethane foam</u> , ASTM C 591 Type II, Grade 2 (self-extinguishing), -250 to +230°F continuous service temperature limits, specify number of square feet, specify NIT, specify block width, 36 inches long, flat blocks.



PURCHASE DESCRIPTIONS (CONT'D)

Code Nos.	Description
I53	Fitting insulation, <u>rigid polyurethane</u> foam, ASTM C 591 Type II, Grade 2 (self-extinguishing), -250 to +230°F continuous service temperature limits, specify NPS, specify NIT, specify fitting (if ell, specify long or short radius and 45 or 90 degree), specify flange, weld, or screw ends (if flange end, specify rating); if fabricated, all pieces shall be fitted without gaps and shall be permanently joined, dimensions shall be equal to pipe fitting dimensions plus insulation thickness with a plus 3/16-inch tolerance.
I54	Flange insulation, <u>rigid polyurethane</u> foam, ASTM C 591 Type II, Grade 2 (self-extinguishing), -250 to +230°F continuous service temperature limits, specify NPS, specify NIT, specify flange type and rating; if fabricated, pieces shall be fitted without gaps and shall be permanently joined, dimensions shall be equal to flange dimensions plus insulation thickness with a plus 3/16-inch tolerance.
I55	Pipe insulation, <u>rigid polyurethane</u> foam, ASTM C 591 Type II, Grade 2 (self-extinguishing), -250 to +230°F continuous service temperature limits, sectional, specify number of feet, specify NPS, specify NIT.
I56	Valve insulation, <u>rigid polyurethane</u> foam, ASTM C 591 Type II, Grade 2 (self-extinguishing), -250 to +230°F continuous service temperature limits, specify NPS, specify NIT, specify valve description (manufacturer's name, valve identification number, type ends, rating); if fabricated, pieces shall be fitted without gaps and shall be permanently joined, dimensions shall be equal to valve dimensions plus insulation thickness with a plus 3/16-inch tolerance.
I57	Pipe insulation, <u>load-bearing rigid polyurethane</u> , ASTM C 591 Grade 2 (self-extinguishing), sectional, -250 to +230°F continuous service temperature limits, 250 psi minimum yield strength in compression, 180 psi minimum compressive strength at 5% deflection, specify number of linear feet, specify NPS, specify NIT, 3 perm-inches maximum water vapor transmission rate. Thermal conductivity per ASTM C 177 and C 420, aged at 140°F for 150 days expressed in Btu per (hour) (square foot) (Fahrenheit degree per inch) shall not exceed 0.25 at 100°F mean temperature and 0.22 at -100°F mean temperature.

002203

PURCHASE DESCRIPTIONS (CONT'D)

2.3 Insulation Cement

Code Nos.	Description
I103	Insulation cement, <u>mineral fiber</u> , ASTM C 195, containing no asbestos, specify number of sacks.

2.4 Jackets and Mastics

Code Nos.	Description
J1	Jacket, insulated fitting, smooth <u>aluminum</u> alloy Type 3003-H14 or Type 5005-H14, 0.016-inch minimum metal thickness, 2-inch minimum extension on both ends of weld ells, joints designed to effectively and permanently shed water, free of burrs and sharp edges, baked-on colored converted epoxy on inside and outside, specify the following: Type of fitting (if ell, specify long or short radius and degree of direction change), type ends (if flanged, give rating), NPS, NIT, and color of outside coating.
J2	Jacket, <u>aluminum</u> alloy Type 3003-H14 or Type 5005-H14, for insulated flange, specify NPS, specify NIT, specify flange type and rating, 0.012-inch minimum thickness, smooth surface, tinted, converted epoxy coating on inside, outside coating, baked-on, converted epoxy (specify color), all joints and seams shall be joined to effectively and permanently shed water, 1-inch minimum overlap at longitudinal joints, free of all burrs and sharp edges.
J3	Jacket, <u>aluminum</u> alloy Type 3003-H14 or Type 5005-H14, for insulated valve, specify NPS, specify NIT, specify valve description (manufacturer name, valve identification number, type ends and rating), specify if valve is insulated to bonnet or to packing gland, 0.012-inch minimum thickness, smooth surface, tinted, converted epoxy coating on inside, outside coating, baked-on, converted epoxy (specify color) all joints and seams shall be joined to effectively and permanently shed water, 1-inch minimum overlap at longitudinal joints, free of all burrs and sharp edges.
J4	Jacket, <u>prefabricated head</u> , <u>aluminum</u> alloy Type 3003-H14 or Type 5005-H14, gore type with overlapping beaded joints and screws on centers not to exceed 6 inches, 0.020-inch minimum metal thickness, smooth surface, 6-inch minimum flange length, free of burrs and sharp edges; colored polyethylene, colored converted epoxy, or 50-pound polyethylene-kraft paper moisture barrier 100% permanently bonded to inside; baked-on colored converted epoxy coating on outside, specify the description of head, insulation thickness and color of outside coating.



PURCHASE DESCRIPTIONS (CONT'D)

Code Nos.	Description
J5	Jacket, <u>sheet</u> , <u>aluminum alloy</u> Type 3003-H14 or 5005-H14, 1-1/4-inch corrugated; colored converted epoxy, colored polyethylene, or 50-pound polyethylene-kraft paper moisture barrier 100% permanently bonded to inside; free of burrs and sharp edges, baked-on colored converted epoxy coating on outside; specify the thickness of metal, width and length of jacket, and color of outside coating.
J6	Jacket, <u>roll</u> , <u>aluminum alloy</u> Type 3003-H14 or 5005-H14, 3/16-inch cross corrugated, free of burrs and sharp edges; colored converted epoxy, colored polyethylene, or 50-pound polyethylene-kraft paper moisture barrier 100% permanently bonded to inside; baked-on colored converted epoxy coating on outside, specify the thickness, width, and length of jacket and color of outside coating.
J11	Jacket, <u>felt</u> , asphalt-saturated rag, specify number of rolls, 55 pounds per square, <u>36 inches wide</u> , 108 square feet per roll, weather resistant, 0 to 200°F temperature limits (continuous service), 2 perms maximum water vapor permeance.
J13	Jacket, <u>sheet</u> , <u>electrogalvanized steel</u> , 0.010-inch minimum metal thickness, 1-1/4-inch corrugated, free of burrs and sharp edges, 50-pound polyethylene-kraft paper moisture barrier on inside, baked-on vinyl enamel or vinyl organosol coating outside that is chemical and weather resistant; specify the width and length of jacket and color of outside coating.
J14	Jacket, <u>prefabricated head</u> , <u>electrogalvanized steel</u> , gore type with overlapping, beaded joints and stainless steel screws on centers not to exceed 6 inches, 0.010-inch minimum metal thickness, smooth surface material, 6-inch minimum flange length, free of burrs and sharp edges, 50-pound polyethylene-kraft paper moisture barrier on inside, baked vinyl enamel or vinyl organosol chemical and weather-resistant outside coating, specify the description of head, insulation thickness, and color of outside coating.
J15	Jacket, <u>roll</u> , <u>electrogalvanized steel</u> , 0.010-inch metal thickness, 3/16-inch cross corrugated, free of burrs and sharp edges; 50-pound polyethylene-kraft paper moisture barrier on inside, baked-on vinyl enamel or vinyl organosol chemical and weather-resistant outside coating, specify the width and length of jacket and color of outside coating.

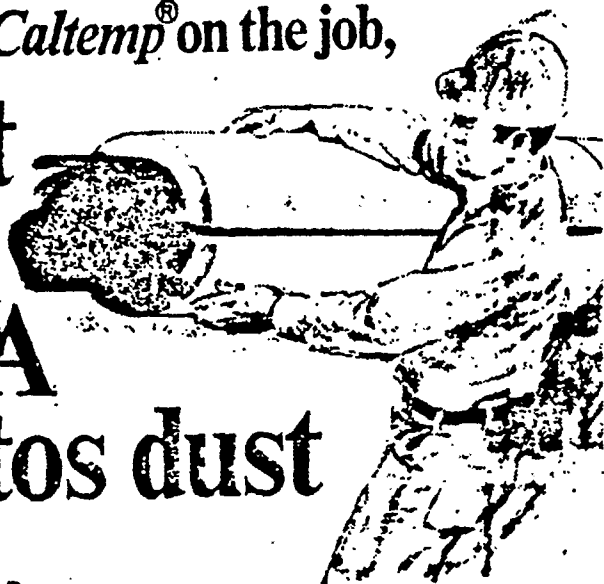
18-0000785

PURCHASE DESCRIPTIONS (CONT'D)

Code Nos.	Description
J16	Jacket, <u>insulated fitting</u> , smooth electrogalvanized steel, 0.010-inch minimum metal thickness, 2-inch minimum extension on both ends of weld ells, joints designed to effectively and permanently shed water, free of burrs and sharp edges, vapor barrier continuously bonded to inside surface, baked vinyl enamel or vinyl organosol chemical and weather-resistant outside coating, specify the following: Type of fitting (if ell, specify long or short radius and degree of direction change), type ends (if flanged, give rating), NPS, NIT, and color of outside coating.
J17	Mastic, <u>weatherproofing</u> for high-temperature insulation, containing no asbestos, <u>breathing type</u> , vinyl acrylic or polyvinyl acetate, nonflammables in noncured state, flame spread less than 20 when cured, not less than 180°F constant service temperature limit, specify color and specify trowel, spray or brush grade.
J19	Mastic, <u>fireproofing</u> , <u>breathing type</u> , containing no asbestos, nonflammable with a flame spread index of four or less, specify color. (Vimasco WC-1FR)
J20	Mastic, <u>sealer/flashng</u> for high-temperature insulation, containing no asbestos, nonshrinking, permanently flexible, less than one perm water vapor permeable for 1/16-inch thickness, not less than 400°F constant service temperature limit, specify color. (Childers' Chf-Joint CP-70)

With *Super Caltemp*® on the job,

Forget about OSHA asbestos dust limits.



If you are thinking about using asbestos-bearing insulation material for process control or conservation of energy, you should know about the OSHA asbestos dust control regulations and protective measures required. They're tough!

You should also know about Super Caltemp by Pabco. The first asbestos-free high temperature calcium silicate insulation on the market.

OSHA Regulations

In accordance with stringent new regulations of the Occupational Safety and Health Administration, you are responsible for monitoring asbestos dust levels and maintaining rigid control of allowable concentration. Where engineering methods of control are not feasible, you must provide protective respirators and train employees to use them. You are also required to provide periodic medical exams for any employee exposed to asbestos dust in excess of specified limits. Records of personal and environmental monitoring must be kept for at least 20 years.

Pretty grim prospect, isn't it?

There is an alternative. And it costs no more.

Other calcium silicate insulation manufacturers use asbestos fiber for reinforcement. Pabco, makers of Super Caltemp, offers a specially reinforced superior product that is absolutely asbestos free. And that's

not all. Only Super Caltemp offers these combined advantages:

1. Stainless Steel Corrosion Protection.

Austenitic stainless steel equipment is widely used in petro-chemical, petroleum refining, power generation and related fields. Super Caltemp is an inhibited product which does not contribute to stress corrosion cracking of austenitic stainless steel.

2. 1200°F Use Temperature.

3. Patented "Precision Molded" Process assures uniform fit.

Other process calcium silicates are "cast" in half-round sections; the legs are then trimmed in an attempt to achieve a true half-circumference pipe covering. Pabco's patented process yields full round "pipes," which are then split in half. Two half sections will match perfectly even if each section was made years apart, assuring a uniform fit every time, with minimum time lost in trimming and wiring.

Super Caltemp is available in pipe covering, blocks, pre-formed elbows and cements.

Pabco Super Caltemp: A full line of asbestos-free industrial insulation, available now. For the name of your local independent Pabco Contractor/Distributor, write:



PABCO

Division of Fibreboard Corp.
P.O. Box 8801
Emeryville, Ca. 94608

Super Caltemp...

The first asbestos-free calcium
silicate insulation on the market.

002207

18-0000787

2201