ecology and environment, inc.
CLOVERLEAF BUILDING 3, 6405 METCALF, OVERLAND PARK, KANSAS 66202, TEL. 913/432-9961
International Specialists in the Environment

Site: Rockwool Inds
ID #
Break: 1.2
Other: SYC
3-08-90

TO: Paul Doherty, EPA/DPO

FROM: Lynn Parman, E & E/TATM

THRU: Joe Chandler, E & E/TATL

DATE: February 28, 1990

SUBJECT: Rockwool Industries, Inc. Technical Assistance
Cameron, Missouri
TDD#: T07-9001-029
PAN#: TM00852TAA

40273972
Superfund

INTRODUCTION:

The Ecology and Environment Technical Assistance Team (E & E/TAT) was tasked through TDD# T07-9901-029 to conduct a background information search associated with a report of buried hazardous materials at Rockwool Industries, Inc., Cameron, Missouri. This now dormant company produced rock wool thermal insulation which complied with Federal Specification HH-I-1030A (see attachment).

These specific tasks included a review of technical literature on rock wool insulation manufacturing, to become knowledgeable of the complete process and any potentially derived wastes. In addition, a preliminary search for a potentially responsible party (PRP) was requested. This PRP investigation will be continued while site assessment activities are being carried out under TDD# T07-9001-028.

BACKGROUND ON ROCK WOOL MANUFACTURING TECHNIQUES:

Rock wool insulation, sometimes referred to as mineral wool, is manufactured from molten slag, rock, or glass (or from a combination of these), by fabricating it into fine fibers. A water repellent, bonding substance consisting of phenol-formaldehyde resin is subsequently added to the rock wool fibers by various methods. In one process, the resin is diluted to 10-15% solids and sprayed onto the fibers as they are being steam-blown from a molten state. Excess water evaporates, and the fibers collect at the bottom of the blow chamber where they are carried on a belt through an oven to cure. In another process, chopped fibers are mixed with powdered resin in a chamber, and the material collected in the bottom is cured in a similar fashion.

For low-temperature insulation where a degree of strength is desired (such as cold-storage rooms), blocks or boards are produced which are bonded with asphalt or synthetic resins. Flexible or semirigid blankets are manufactured for use in refrigerated cars and trucks, household refrigerators, and low-temperature food-storage containers.

Pipe insulation is produced in preformed sections, or as blankets which are suitable for wrapping. Loose or granulated rock wool is also produced for applications where a fill insulation is desired.

The phenolic resins used in the manufacturing process may be liquid or solid, and may be modified with fillers or polymeric compounds. The product may also be delivered to the user in a thermoplastic form, to which a hardener, hexamethylenetetramine, is added. Common trademarks of available phenol-formaldehyde resins are Bakelite (alkaline-catalyzed) and Novalak (acid-catalyzed).

Curing of the phenolic resins may result in the formation of byproducts, particular to which form of resin is being utilized. Curing of alkaline-catalyzed phenol-formaldehyde resins may produce an excess of formaldehyde or methylene ethers (which may also decompose to form formaldehyde). The curing of novalak resins (acid-catalyzed) in the presence of hexamethylenetetramine results in the release of ammonia. Cured phenolic resins have a high resistance to temperatures up to 500°F.

In summary, chemical wastes potentially derived from the manufacture of rock wool insulation include the following: phenol and formaldehyde (which may be in the form of phenol-formaldehyde resin), hexamethylenetetramine, methylene ethers, and ammonia. Phenol and formaldehyde both present considerable carcinogenic hazards to humans, as well as being deleterious to the environment (phenol: LD50 in rats = 87 mg/kg, formaldehyde: LD50 in rabbits = 180 mg/kg). Cured phenolic resins, however, are considered nontoxic. Hexamethylenetetramine presents minimal toxicological hazard (LD50 in rabbits = 9200 mg/kg), although formaldehyde may be liberated upon its decomposition. Methylene ethers likewise present few health hazards initially (TDLo in rats = 4608 mg/kg), however they may also decompose to form formaldehyde. Adverse health effects of ammonia are well established (LD50 in rats = 350 mg/kg), coupled with several chemical incompatibilities.

POTENTIALLY RESPONSIBLE PARTY (PRP) INFORMATION:

Rockwool Industries, Inc. was incorporated on May 3, 1973, establishing a rock wool manufacturing plant which operated at a site approximately three miles west of Cameron, Missouri, on County Road A (SW1/4, Sec.21, T.57N., R.30W.). The company employed 139 indivuals in 1980, at which time Mr. Jerel D. Jester was serving as Plant Manager. Although the facility has not been in operation the past few years, the Missouri Corporation Commission has no record of dissolution of the corporation.

When in business, Rockwool Industries, Inc. was a subsidiary of The Susquehanna Corporation. However, 1989-1990 directories of corporate affiliations do not list the company as a present subsidiary of The Susquehanna Corporation (see attachment). Rockwool Industries, Inc. is also not listed in Dun and Bradstreet's 1989 publication - America's Leading Public and Private Companies. The current financial status of The Susquehanna Corporation (D-U-N-S# 00-896-4561) is presented on an enclosed form.

No articles concerning Rockwool Industries, Inc. have been published in the Kansas City Star/Times since June 1983. A computer search utilizing the ABI/INFORM database (consisting of abstracts and indexing to business articles from over 800 business and management journals) also found no published articles concerning either company.

On February 19, 1990, Lynn Parman (E & E/TAT) visited the vicinity of the abandoned Rockwool plant to question nearby residents of any observed burial activity at the site, or associated activities. The following residents were questioned of the reported incident (see site vicinity map for locations):

Mrs. Harry Hahn
Mr. John P. O'Connell
Mr. Harry Hahn Jr.
Mrs. Elmer Lee Groebe

Of those questioned, only Mr. O'Connell stated that he had observed the burial of any material at the site. He stated that approximately 8-10 years ago (during the final period of plant operations), a trench was excavated with a bulldozer southwest of the Rockwool plant, in an open area north of the perimeter fence. No containers (such as drums) were observed. Mr. O'Connell also stated that many truckloads of a waste product were hauled off-site by Fleming Trucking Company, and dumped in a quarry west of Cameron (now abandoned - see site map), adjacent to Grindstone Creek. He recalled that this dumping was investigated by the Department of Conservation to determine if a fish kill had resulted from the release of this material to the environment. No such material was readily visible upon a subsequent visit to the quarry by TATM Parman.

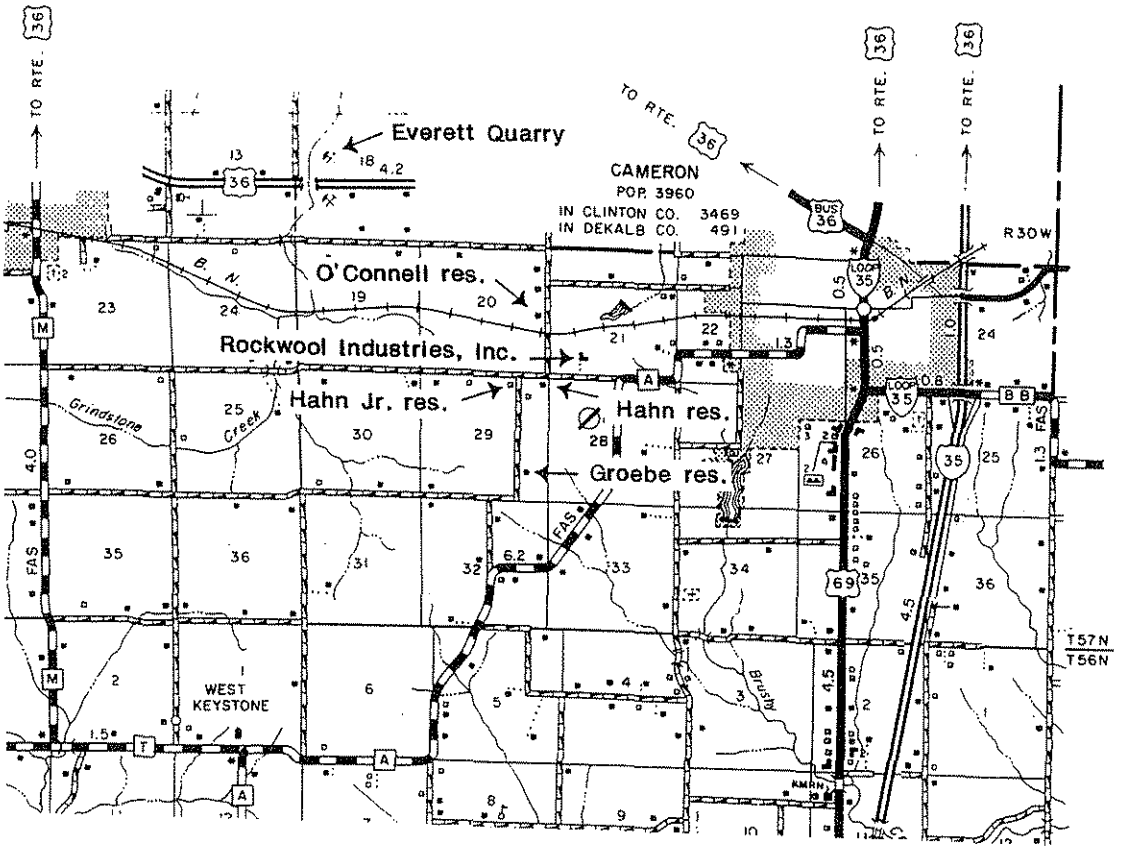
Mr. Stephen Eder, Fisheries District Supervisor, Missouri Department of Conservation, stated that an aquatic study of Grindstone Creek revealed no discernable fish kill, and the material was considered to pose minimal threat to the environment. Mr. Eder described the material as a dark, cinder-like substance, which several individuals had purchased for use as "cheap gravel". This material was likely to be residual, cured phenol-formaldehyde resin used in the insulation manufacturing process (see background section). He had no knowledge of this material being buried on-site.

A phone call was received by Mr. Elmer Lee Groebe on February 28, 1990, who stated that he also observed the burial of unknown materials southwest of the plant. He stated that at the time of the excavation, it was rumered that the debris to be buried consisted of materials damaged in a fire at the Rockwool plant.

A PRP search will be continued under TDD# T07-9001-028, including an investigation of the property's title history, and an in-depth study of waste disposal practices undertaken by Rockwool Industries, Inc.

Attachments:
Site Vicinity Map
Federal Specification for Thermal Insulation (HH-I-1030B, superseding HH-I-1030A)
Listing of The Susquehanna Corp. Financial Resources (1989)
LIsting of The Susquehanna Corp. Subsidiaries (1990)

SITE VICINITY MAP



ROCKWOOL INDUSTRIES, INC.

CAMERON, MISSOURI

SCALE

1 0 1 2 3 4 MILES

POLYCONIC PROJECTION

N

PAN#: TMO0852TAA TDD#: T07-9001-029

SPECIFICATION

1981 APR - 8

LINDA HALL LIBRARY

HH-I-1030B
August 12, 1980
SUPERSEDING
Fed. Spec. HH-I-1030A
February 23, 1973

FEDERAL SPECIFICATION

INSULATION, THERMAL (MINERAL FIBER, FOR PNEUMATIC OR POURED APPLICATION)

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This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers loose fill mineral fiber thermal insulation for use in attics or enclosed spaces in housing and other framed buildings at ambient temperatures, by pneumatic or pouring application. While products that comply with this specification may be used in various constructions they are adaptable primarily, but not exclusively, to wood joist, rafters and stud construction.

1.2 Classification. Insulation shall be of the following types and classes, as specified (see 6.2).

Type I - Pneumatic application.
- Class A - Loss on ignition, 1 percent or less.
- Class B - Loss on ignition, 12 percent or less.

Type II - Poured application.
- Class A - Loss on ignition, 1 percent or less.
- Class B - Loss on ignition, 12 percent or less.

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issues in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

Federal Specifications:

UU-S-48 - Sacks, Bags, Shipping, Paper, Plastic.
HH-I-558 - Insulation Blocks, Boards, Blankets, Felts, Sleeving (Pipe and Tube Covering) and Pipe Fitting Covering, Thermal (Mineral Fiber Industrial Type).

Federal Standards:

Fed. Std. No. 123 - Marking for Shipment (Civil Agencies).

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

(Single copies of this specification and other Federal Specifications required by activities outside the Federal Government for bidding purposes are available without charge from Business Service Centers at the General Services Administration Regional Offices in Boston, New York, Philadelphia, Washington, DC, Atlanta, Chicago, Kansas City, MO, Fort Worth, Houston, Denver, San Francisco, Los Angeles, and Seattle, WA.

(Federal Government activities may obtain copies of Federal Specifications, Standards and Handbooks and the Index of Federal Specifications and Standards from established distribution points in their agencies.)

Military Standards:

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-129 - Marking for Shipment and Storage.

(Copies of Military Specifications and Standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply.

American Society for Testing and Materials (ASTM) Standards:

C 177 - Steady-State Thermal Transmission Properties by Means of the Guarded Hot Plate.
C 553 - Mineral Fiber Blanket and Felt Insulation (Industrial Type).
C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter.
C 236 - Thermal-Conductance and Transmittance of Built-Up Sections by Means of the Guarded Hot Box.
C 519 - Standard Test Method for Density of Fibrous Loose Fill Building Insulation.
C 687 - Determination of the Thermal Resistance of Low-Density Fibrous Loose Fill-Type Building Insulation

National Motor Freight Traffic Association, Inc., Agent:

National Motor Freight Classification.

(Application for copies should be addressed to the American Trucking Associations, Inc., Traffic Department, 1616 P Street, N.W., Washington, DC 20036.)

Uniform Classification Committee, Agent:

Uniform Freight Classification.

(Application for copies should be addressed to the Uniform Classification Committee, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606.)

3. REQUIREMENTS

3.1 Material. Mineral fiber insulation shall be made from mineral substances such as rock, slag, or glass processed from a molten state into an incombustible fibrous form. The insulation shall be mechanically processed to produce a mineral fiber suitable for pneumatic or poured application.

3.1.1 Thermal resistance. The standard thermal resistance values normally recommended for open application are 11, 19, 22, 30, 38, and are expressed in Deg. F-h-ft^2/BTU (M^2.k/w). The thermal resistance value, R, measured shall not average more than 5 percent below the R value specified for a minimum of four specimens tested in accordance with 4.4.2.

3.1.2 Moisture adsorption. When tested in accordance with 4.4.3, the moisture adsorption of the insulation shall be a maximum of 5 percent by weight.

3.1.3 Odor emission. A detectable odor that is classified as objectionable and as either strong or very strong by more than two members of the panel shall be cause for rejection of the insulation when tested in accordance with 4.4.4.

3.1.4 Corrosiveness. When tested in accordance with 4.4.5, the steel test plate in contact with the insulation shall show no greater corrosion than the steel plate in contact with sterile cotton which is used for comparison.

3.1.5 Fungi resistance. The insulation shall show no greater growth of fungi than the comparative items when tested in accordance with 4.4.6.

3.1.6 Loss on ignition. When tested in accordance with 4.4.7, the loss on ignition for class A material shall be 1 percent or less and for class B material shall be 12 percent or less.

3.1.7 Critical radiant flux. When tested in accordance with 4.4.8, the critical radiant flux of each of the three specimens shall be equal to or greater than 0.12 w/cm^2.

3.1.8 Smoldering combustion. When tested in accordance with 4.4.9, the insulation shall have a maximum weight loss of 15 percent of initial weight and there shall be no evidence of flaming combustion.

3.2 Marking. Each bag of insulation shall be marked to include the following:

(a) Name of manufacturer.
(b) Type and class of insulation.
(c) Net weight of insulation per bag.
(d) The manufacturer recommends that the insulation be installed at these minimum thickness, maximum coverages, to provide the levels of insulation thermal resistance (R values) shown,
(e) Filled-in coverage chart shall be based on the density determined in 4.4.1, and shall contain the following:

TABLE I. Coverage Chart

R value at 75° mean temp.	Maximum net coverage		Minimum thickness	Minimum weight per sq. ft.
To obtain an insulation resistance (R) of:	Bags per 1000 sq. ft.	Maximum sq. ft. coverage per bag	Installed insulation should not be less than:	The weight per sq. ft. of installed insulation should be not less than:
Attic:				
R-38	....bags/MSF	....square feet	....inches thick	....lbs/sq. ft.
R-30	....bags/MSF	....square feet	....inches thick	....lbs/sq. ft.
R-22	....bags/MSF	....square feet	....inches thick	....lbs/sq. ft.
R-19	....bags/MSF	....square feet	....inches thick	....lbs/sq. ft.
R-11	....bags/MSF	....square feet	....inches thick	....lbs/sq. ft.
Sidewalls: 1/				
R -	....bags/MSF	....square feet	....inches thick	....lbs/sq. ft.

1/ Optional information for products intended for sidewall application.

(f) Certification. "This insulation has been installed in conformance with the above recommendations to provide a value of R-_____using_____ bags of this insulation to cover_____ square feet of area."
(g) Place for builder's signature, company name, and date.
(h) Note: Requirements (f) and (i) may be satisfied by a separate attic card containing the same information.
(i) Place for applicator's signature, company, name, and date.
(j) Where material is intended for blowing or pouring application, the bag shall have a separate coverage chart for each type of application.

3.3 Workmanship. Insulation shall be dry and free of extraneous foreign materials.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government.

4.2 Sampling. Each unit of product selected in 4.2.1 and 4.2.2 shall be one filled bag of loose fill insulation.

4.2.1 Sampling for examination. Sampling for examination shall be in accordance with level S-4 of MIL-STD-105.

4.2.2 Sampling for tests. Sampling for tests shall be in accordance with level S-1 of MIL-STD-105.

4.3 Examination.

4.3.1 End item. Samples selected in accordance with 4.2.1 shall be examined for defects listed in Table II. The acceptable quality levels (AQL's) for defects shall be 2.5 percent defective.

TABLE II. End Item Defects

Type and class not as specified.
Extraneous materials in the insulation.
Damp insulation.
Bags not marked.

4.3.2 Inspection of preparation for delivery. An examination shall be made to determine compliance with section 5. The sample unit shall be one shipping container fully prepared for delivery. Sampling shall be in accordance with MIL-STD-105. The inspection level shall be S-2 and the AQL shall be 4.0 expressed in terms of percent defective.

4.4 Test methods.

4.4.1 Density. Samples shall be prepared and densities determined in accordance with ASTM C519. Samples to be used in the thermal resistance, critical radiant flux, and smoldering combustion tests shall be prepared at the density so determined.

4.4.2 Thermal resistance. Using samples prepared as per 4.4.1, the thermal conductivity or thermal conductance shall be determined in accordance with ASTM C518. The mean temperature shall be 75°F (23.9°C) and the temperature difference shall be a minimum of 40°F (22°C). The thermal resistance shall then be calculated from the conductivity or conductance values using ASTM C687.

4.4.2.1 Calibration. The ASTM C518 apparatus shall be calibrated using standard reference materials or transfer standard materials available from the Office of Standard Reference Materials, National Bureau of Standards, Washington, D.C. 20234.

4.4.3 Moisture adsorption. Determination of moisture adsorption shall be in accordance with ASTM C553, section 15 (see 3.1.2).

4.4.4 Odor emission.

4.4.4.1 Apparatus. Containers shall be either of all stainless steel or of glass with metal lids. Containers must produce no discernable odor of their own. Capacity of containers shall be such that they will hold a minimum of 50 g of the material to be tested.

4.4.4.2 Conditioning. Condition samples for at least 24 hours at 50 ± 5 percent relative humidity and 23 ± 1.1°C (73 ± 2°F).

4.4.4.3 Procedure. Insert a sample (50 g minimum) into a test container and firmly replace the lid. Subject each closed container to a temperature of 65°C (150°F) for a period of 30 minutes. Test containers shall then be opened and examined for odor by a panel of five persons. Panel members should be persons who have demonstrated an ability to detect odors accurately and consistently. Panel members shall answer the following questions regarding the sample examined:

(a) Was a perceptible odor present?
(b) If so, was the odor objectionable, pleasant, or neutral?
(c) Was the odor weak, strong, or very strong? (See 3.1.3)

4.4.5 Corrosiveness. Determination of corrosion shall be in accordance with the following test procedure (see 3.1.4):

Corrosiveness - Test specimen--Two specimens shall be used, each measuring 1-1/2 inches by 4-1/2 inches by approximately 1/2 inch thick when compressed against the metal test plates under the conditions of this test. Apparatus--Two steel test plates 1 inch wide, 4 inches long and 0.020 inch thick. They shall be bright No. 2 finish, cold rolled strip steel, quarter hard, temper No. 3. Four pieces, 1-1/2 inches by 4-1/2 inches, type 304 stainless steel woven wire screen, 7/16 inch open square grid, .063 inch wire. Four No. 12 rubber bands. Clean humidity test chamber. Procedure--The steel test plates shall be cleaned until completely free of water breaks by a five minute vapor degreasing followed by a 15 minute hot caustic bath (15 percent KOH solution), rinsed thoroughly in distilled water and immediately dried. One piece of cold rolled steel shall be placed between two insulation specimens. This assembly is then compressed between two pieces of woven wire cloth and secured at each end with a No. 12 rubber band. The compressed thickness of this assembly shall measure 1 inch ± 1/8 inch. The other piece of cold rolled steel is placed between two 1-1/2 inch by 4-1/2 pieces of sterile cotton which have been solvent extracted in ACS reagent grade acetone for 48 hours and vacuum dried at low heat. The cotton is secured against the metal test plate in the same manner as the insulation specimen. The test specimen and extracted sterile cotton covered plate shall be suspended vertically in an atmosphere free of contaminants having a relative humidity of 95 percent ± 3 percent and a temperature of 120 degrees ± 3 degrees F, for 7 days, and then be examined for corrosion.

4.4.6 Fungi resistance.

Apparatus. The apparatus required to conduct this test consists of chambers or cabinets together with auxiliary instrumentation capable of maintaining the specified conditions of temperature and humidity. Provisions shall be made to prevent condensation from dripping on the test item. There shall be free circulation of air around the test item, and the surface area of fixtures supporting the test item shall be kept to a minimum.

Procedure. Preparation of mineral-salts solution. The solution shall contain the following:

Potassium dihydrogen orthophosphate (KH_2PO_4)	0.7g
Potassium monohydrogen orthophosphate (K_2HPO_4)	0.7g
Magnesium sulfate ($MgSO_4 \cdot 7H_2O$)	0.7g
Ammonium nitrate (NH_4NO_3)	1.0g
Sodium chloride (NaCl)	0.005g
Ferrous sulfate ($FeSO_4 \cdot 7H_2O$)	0.002g
Zinc sulfate ($ZnSO_4 \cdot 7H_2O$)	0.002g
Manganous sulfate ($MnSO_4 \cdot 7H_2O$)	0.001g
Distilled water	1000ml

Sterilize the mineral salts solution by autoclaving at 121°C (250°F) for 20 minutes. Adjust the pH of the solution by the addition of 0.01 normal solution of NaOH so that after sterilization the pH is between 6.0 and 6.5. Prepare sufficient salts solution for the required tests.

Reagent grade chemicals shall be used in all tests. Unless otherwise specified, it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available.

Unless otherwise specified, references to water shall be understood to mean distilled water or water of equal purity.

Preparation of mixed spore suspension. The following test fungi shall be used:

Fungi	ATCC 1/	NLABS 2/
Aspergillus niger	9642	386
Aspergillus flavus	9643	380
Aspergillus versicolor	11730	432
Penicillium funiculosum	11797	474
Chaetomium globosum	6205	459

1/ American Type Culture Collection, 12301 Parklawn Drive, Rockville, Maryland 20852.
2/ Pioneering Research Division, U.S. Army Natick Laboratories, Natick, Massachusetts 01760.

Maintain cultures of these fungi separately on an appropriate medium such as potato dextrose agar. However, the culture of Chaetomium globosum shall be cultured in strips of filter paper on the surface of mineral salts agar. (Mineral salts agar is identical to the mineral salts solution described above, but contains in addition 15.0g of agar per liter.) The stock culture may be kept for not more than 4 months at 6° ± 4°C (43° ± 7°F) at which time subcultures shall be made, and new stocks shall be selected from the subcultures. If genetic or physiological changes occur, obtain new cultures as specified above. Subcultures used for preparing new stock cultures or the spore suspension shall be incubated at 30°C (86°F) for 9 days or longer. Prepare a spore suspension of each of the five fungi by pouring into one subculture of each fungus a 10 ml portion of a sterile solution containing 0.05g per liter of a nontoxic wetting agent such as sodium dioctyl sulfosuccinate or sodium lauryl sulfate. Use a sterile platinum or nichrome inoculating wire to scrape gently the surface growth from the culture of the test organism. Pour the spore charge into a sterile 125 ml glass-stoppered Erlenmeyer flask containing 45 ml of sterile water and 50 to 75 solid glass beads, 5 mm in diameter. Shake the flask vigorously to liberate the spores from the fruiting bodies and to break the spore clumps. Filter the dispersed fungal spore suspension through a 6 mm layer of glass wool contained in a glass funnel, into a sterile flask. This process is intended to remove large mycelial fragments and clumps of agar which could interfere with the spraying process. Centrifuge the filtered spore suspension aseptically, and discard the supernatant liquid. Resuspend the residue in 50 ml of sterile water and centrifuge. Wash the spores obtained from each of the fungi in this manner three times. Dilute the final washed residue with sterile mineral-salts solution in such a manner that the resultant spore suspension shall contain 1,000,000 ± 200,000 spores per ml as determined with a counting chamber. Repeat the operation for each organism used in the test and blend equal volumes of the resultant spore suspensions to obtain the final mixed spore suspension. The spore suspension may be prepared fresh each day or may be held at 6° ± 4°C (43° ± 7°F) for not more than 7 days.

Viability of inoculum control. With each daily group of tests, place each of three pieces of sterilized filter paper. 1-inch square, on hardened mineral salts agar in separate Petri dishes. Inoculate these with the spore suspension by spraying the suspension from a sterilized atomizer 1/ until initiation of droplet coalesence. Incubate these at 30°C (86°F) at a relative humidity of not less than 85 percent and examine them after 7 days of such incubation. There should be copious growth on all three of the filter paper control specimens. Absence of such growth requires repetition of the test.

1/ An atomizer capable of providing 15,000 ± 3,000 spores per square centimeter.

Control items. In addition to the viability of inoculum control, known susceptible substrates shall be inoculated along with the test item to insure that proper conditions are present in the incubation chamber to promote fungus growth. The control items shall consist of cotton duck 8.25-ounce strips that are 1.25 inches wide: that have been dipped into a solution containing 10 percent glycerol, 0.1 percent potassium dihydrogen orthophosphate (KH_2PO_4), 0.1 percent ammonium nitrate (NH_4NO_3), 0.025 percent magnesium sulfate ($MgSO_4 \cdot 7H_2O$), and 0.05 percent yeast extract (pH 5.3); and from which the excess liquid has been removed. The strips should be hung to air dry before being inoculated and placed into the chamber.

Comparative items. Sections of southern pine approximately 3 inches wide by 6 inches long shall be employed as comparative items to determine the relative rate of growth on items being tested.

Inoculation of test, comparative, and control items. Mount the test, comparative, and control items on suitable fixtures or suspend from hangers as is applicable. Precondition the chamber and its contents at 29°C (84°F) and 95 percent relative humidity for at least 4 hours. Inoculate the test, comparative, and control items with the mixed fungus spore suspension by spraying it on and into these items in the form of a fine mist from a previously sterilized atomizer or nebulizer. In spraying the test, comparative, and control items, care should be taken to spray all surfaces. (For loose-fill materials, thorough spraying of the top surface will suffice.) If surfaces are nonwetting, spray until initiation of droplet coalesence. Incubation is to be started immediately following the inoculation.

Incubation. Maintain the test chamber at 29°C (84°F) and at a relative humidity of 95 percent minimum during the life of the test. Keep the test chamber closed during the incubation period except during inspection. After 14 days, inspect the control items. If control items do not show an abundant growth at this time, the entire test shall be repeated. If sufficient growth is present on the control items, continue the test for a period of 28 days from the time of incubation.

Inspection. At the end of the incubation period, the test and comparative items shall be removed from the test chamber and examined at 40X magnification. Test items which have growth greater than that on the comparative items shall be considered to have failed. Test items on which the growth is not greater than that on the comparative items shall be considered to have passed (see 3.1.5).

4.4.7 Loss on ignition. Remove moisture by heating in an oven at 220°F for 30 minutes. Place a 10 gram specimen in a porcelain crucible, then place the crucible in a cool muffle furnance, and expose to a temperature of 800°F for a period of 2 hours. Remove the crucible from the furnance, cool to room temperature, and weigh the crucible. Deduct the weight of the crucible and then calculate the loss in weight as a percent of the original specimen weight (see 3.1.6).

4.4.8 Critical radiant flux. Critical radiant flux shall be determined in accordance with the following test procedures: Standard Method of Test for Critical Radiant Flux of Exposed Attic Floor Insulation using a radiant heat energy source.

APPARATUS

The basic elements of the test chamber are: (1) an air-gas fueled radiant heat energy panel inclined at 30° and directed at (2) a horizontally mounted attic floor insulation specimen. The radiant panel generates a radiant energy flux distribution ranging along the 100-cm length of the test specimen from a nominal maximum of 1.0 watts/cm^2 to a minimum of 0.1 watts/cm^2. The test is initiated by open flame ignition from a pilot burner. The distance burned to flame-out is converted to watts/cm^2 from the flux profile graph (figure 6) and reported as critical radiant flux, watts/cm^2.

The Radiant Panel Test Chamber shall be Constructed and Instrumentated as follows:

The radiant panel test chamber employed for this test shall be located in a draft-protected laboratory. The radiant panel test chamber, figures 1 and 2, shall consist of an enclosure 140 cm (55 inches) long by 50 cm (19-1/2 inches) deep by 71 cm (28 inches) above the test specimen. The sides, ends, and top shall be of 1.3 cm (1/2 inch) calcium silicate board, such as Marinite I (46 lbs./ft^3), nominal density, with a thermal conductivity @ 200°F pf 0.96 cal (g)/hr cm^2 deg C per cm [0.77 Btu/(hr) (ft^2) (deg F per in)]. One side shall be provided with an approximately 10 cm x 110 cm (4 x 44 inches) draft tight fire resistance glass window so that the entire length of the test specimen may be observed from outside the fire test chamber. On the same side and below the observation window is a door which, when open, allows the specimen platform to be moved out for mounting or removal of test specimens. A draft tight fire resistant observation window may be installed at the low flux end of the chamber. The bottom of the test chamber shall consist of a sliding steel platform which has provisions for rigidly securing the test specimen holder in a fixed and level position. The free, or air access, area around the platform shall be in the range of 1950-3550 cm^2 (300-500 square inches). The top of the chamber shall have an exhaust stack with interior dimensions of 12.5 cm (5 inches) wide by 38 cm (15 inches) deep by 30 cm (12 inches) high at the opposite end of the chamber from the radiant energy source. The radiant heat energy source shall be a panel of porous refractory material mounted in a cast iron frame, with a radiation surface of 30.5 x 45.7 cm (12 by 18 inches). It shall be capable of operating at temperatures up to 816°C (1500°F). The panel fuel system shall consist of a venturi-type aspirator for mixing gas and air at approximately atmospheric pressure, a clean dry air supply capable of providing 28.3 NTP m^3 per hr (1000 Standard Cubic Feet per Hour) at 7.6 cm (3.0 inches) of water, and suitable instrumentation for monitoring and controlling the flow of fuel to the panel.

The radiant heat energy panel shall be mounted in the chamber at 30° to the horizontal specimen plane. The horizontal distance from the 0 mark on the specimen fixture to the bottom edge (projected) of the radiating surface of the panel is 8.9 cm (3-1/2 inches). The panel to specimen vertical distance is 14 cm (5-1/2 inches) (see figure 1). The angle and dimensions given above are critical in order to obtain the required radiant flux. The radiation pyrometer for standardizing the thermal output of the panel shall be suitable for viewing a circular area 25.4 cm (10 inches) in diameter at a range of about 1.37 m (54 inches). It shall be calibrated over the black body temperature range of 490-510°C (914-950°F) in accordance with the procedure described in Appendix A. A high impedance potentiometer voltmeter with a suitable millivolt range shall be used to monitor the output of the radiation pyrometer described.

The dummy holder (see figure 3) shall be constructed from heat-resistance stainless steel (AISI Type 300 (UNA-N08330)) or equivalent, thickness 0.198 cm (0.078 inches), having overall dimensions of 115 cm (45 inches) by 32 cm (12-3/4 inches) with a specimen opening of 20 cm (7.9 inches) by 100 cm (40 inches). Six slots are cut in the flange on either side of the holder to reduce warping. The holder is fastened to the platform with two stud bolts at each end.

The specimen tray (see figure 4) shall be constructed from heat-resistant stainless steel (AISI Type 300 (UNA-N08330) or equivalent, thickness 0.198 cm (0.078 inches), having overall dimensions of 110 cm (43.3 inches) by 27.3 cm (10.8 inches); the depth of the tray is 5 cm (2 inches). The flanges of the specimen tray are drilled to accommodate two stud bolts at each end; the bottom surface of the flange is 2.1 cm (0.83 inches) below the top edge of the specimen tray.

The pilot burner, used to ignite the specimen shall be a propane venturi torch with an axially symmetric burner tip having a propane supply tube with an orifice diameter of 0.0076 cm (0.003 inches). In operation, the propane flow is adjusted to give a pencil flame blue inner cone length of 1.3 cm (1/2 inch). The pilot burner is positioned so that the flame generated will impinge on the centerline of the specimen at the 0 distance burned point at right angles to the specimen length (see figures 1 and 2). The burner shall be capable of being swung out of the ignition position so that the flame is horizontal and at least 5 cm (2 inches) above the specimen plane.

Two 3.2 cm (1/8 inch) stainless steel sheathed grounded junction chromel alumel thermocouples are located in the Flooring Radiant Panel Test Chamber (see figures 1 and 2). Thermocouples shall be kept clean to insure accuracy of readout. The chamber thermocouple is located in the longitudinal central vertical plane of the chamber 2.5 cm (1 inch) down from the top and 10 cm (4 inches) back from the inside of the exhaust stack. The exhaust stack thermocouple is centrally located 15.2 cm (6 inches) from the top. An indicating potentiometer with a range of 100-500°C (212-932°F) may be used to determine the chamber temperature prior to a test.

An exhaust duct with a capacity of 23.3-85 NTP m^3 per minute (1000-3000 SCFM) decoupled from the chamber stack by at least 7.6 cm (3 inches) on all sides and with an effective area of the canopy slightly larger than the plane area of the chamber with the specimen platform in the out position shall be used to remove combustion products from the chamber. With the panel turned on and dummy specimens in place, there shall be no measurable difference in air flow through the chamber stack with the exhaust on or off.

The dummy specimen which is used in the flux profile determination shall be made of 1.9 cm (3/4 inch) inogranic 0.58 g/cm^3 (36 lbs/ft^3) nominal density calcium silicate board, such as Marinite I (see Figure 3). It is 25 cm (10 inches) wide by 107 cm (42 inches) long with 2.7 cm (1-1/16 inches) diameter holes centered on and along the centerline at the 10, 20, 30, 40, 50, 60, 70, 80, 90 cm locations, measured from the maximum flux end of the specimen. The total heat flux transducer used to determine the flux profile of the chamber in conjunction with the dummy specimen should be of the Schmidt-Boelter type, have a range of 0-1/5 watts/ cm^2 (0-1/32 Btu/ft^2s), and shall be calibrated over the operating flux level range of 0.10 to 1.5 watts/cm^2 in accordance with the procedure outlined in Appendix A. A source of 15-25°C cooling water shall be provided for this instrument. A high impedance or potentiometric voltmeter with a range of 0-10 m.v. and reading to 0.01 m.v. shall be used to measure the output of the total heat flux transducer during the flux profile determination. A timer shall be used for measuring preheat and pilot contact time.

SAFETY PROCEDURES

The possibility of a gas-air fuel explosion in the test chamber should be recognized. Suitable safeguards consistent with sound engineering practice should be installed in the panel fuel supply system. These may include one or more of the following: (1) a gas feed cut-off activated when the air supply fails, (2) a fire sensor directed at the panel suface that stops fuel flow when the panel flame goes out, (3) a commercial gas water heater or gas-fired furnance pilot burner control thermostatic shut-off which is activated when the gas supply fails or other suitable and approved device. Manual reset is a requirement of any safeguard system used. In view of the potential hazard from products of combustion, the exhaust system must be so designed and operated that the laboratory environment is protected from smoke and gas. The operator should be instructed to minimize his exposure to combustion products by following sound safety practice, e.g., insure exhaust system is working properly, wear appropriate clothing including gloves, et al.

TEST SPECIMENS

The test specimen shall be attic floor insulation of sufficient size to fill the specimen tray to a depth of 5 cm (2 inches). Insofar as possible, the attic floor insulation specimen should simulate actual installation practice. Typical examples follow: Loose-fill insulation blown in to fill the tray, then carefully remove excess to provide a uniform depth of 5 cm in the tray. Loose-fill insulation poured in to fill the tray, then carefully remove excess to provide a depth of 5 cm in the tray. A minimum of three specimens per sample shall be tested.

Radiant Heat Energy Flux Profile Standardization

Mount the dummy specimen in the mounting frame and attach the assembly to the sliding platform. With the sliding platform out of the chamber, ignite the radiant panel. Allow the unit to heat for 1 hour. The pilot burner is off during this determination. Adjust the fuel mixture to give an air-rich flame. Make fuel flow settings to bring the panel to an apparent black body temperature as measured by the radiation pyrometer, of about 500°C (932°F), and the chamber temperature to about 180°C (356°F). When equilibrium has been established, move the specimen platform into the chamber. Allow 0.5 hour for the closed chamber to equilibrate.

Measure the radiant heat energy flux level at the 40 cm point with the total flux meter instrumentation. This is done by inserting the flux meter in the opening so that its detecting plane is 0.16-0.32 cm (1/16-1/8 inch) above and parallel to the plane of the dummy specimen and reading its output after 30 ± 10 seconds. If the level is within the limits specified, the flux profile determination is started. If it is not, make the necessary adjustments in panel fuel flow. A suggested flux profile data log format is shown in figure 5.

The test shall be run under chamber operating conditions which give a flux profile as shown in figure 6. The radiant heat energy incident on the dummy specimen shall be between 0.87 and 0.95 W/cm^2 (0.77 and 0.83 Btu/ft^2 sec) at the 20 cm point, between 0.48 and 0.52 W/cm^2 (0.42 and 0.46 Btu/ft^2 sec) at the 40 cm point and between 0.22 and 0.26 W/cm^2 (0.19 and 0.23 Btu/ft^2 sec) at the 60 cm point. Insert the flux meter in the 10 cm opening following the procedure given above. Read the M.V. output at 30 ± 10 seconds and proceed to the 20 cm point. Repeat the 10 cm procedure. The 30 - 90 cm flux levels are determined in the same manner. Following the 90 cm measurement, make a check reading at 40 cm. If this is within the limits set forth, the test chamber is in calibration and the profile determination is completed. If not, carefully adjust fuel flow, allow 0.5 hour for equilibrium and repeat the procedure. Plot the radiant heat energy flux data as a function of distance along the specimen plane on rectangular coordinate graph paper. Carefully draw the best smooth curve through the data points. This curve will hereafter be referred to as the flux profile curve.

Determine the open chamber apparent black body and chamber temperatures that are identified with the standard flux profile by opening the door and moving the specimen platform out. Allow 0.5 hour for the chamber to equilibrate. Read the radiation pyrometer output and record the apparent black body temperature in °C. This is the temperature setting that can be used in subsequent test work in lieu of measuring the radiant flux at 20 cm, 40 cm, and 60 cm using the dummy specimen. The chamber temperature also shall be determined again after 0.5 hour and is an added check on operating conditions.

CONDITIONING

Test specimens shall be conditioned to equilibrium or a minimum of 48 hours, whichever is greater, at 21 ± 3°C (69.8 ± 5.4°F) and a relative humidity of 50 ± 5 percent immediately prior to testing.

TEST PROCEDURES

With the sliding platform out of the chamber, ignite the radiant panel. Allow the unit to heat for 1 hour. It is recommended that a sheet of inorganic millboard be used to cover the opening when the hinged portion of the front panel is open and the specimen platform is moved out of the chamber. The millboard is used to prevent heating of the specimen and to protect the operator. Read the panel apparent black body temperature and the chamber temperature. If these temperatures are in agreement to within ± 5°C with those determined previously, as above, the chamber is ready for use.

Mount the specimen tray with insulation on the sliding platform and position with stud bolts (see figure 7). Ignite the pilot burner, move the specimen into the chamber, and close the door. Start the timer. After 2 minutes preheat, with the pilot burner on and set so that the flame is horizontal and 5 cm above the specimen, bring the pilot burner flame into contact with the center of the specimen at the 0 cm mark. Leave the pilot burner flame in contact with the specimen for 5 minutes, then remove to a position 5 cm above the specimen and leave burning until the test is terminated.

If the specimen does not ignite within 5 minutes following pilot burner flame application, the test is terminated by extinguishing the pilot burner flame. For specimens that do ignite, the test is continued until the flame goes out. When the test is completed, the door is opened, the specimen platform is pulled out.

Measure the distance burned, i.e., the point of farthest advance of the flame front, to the nearest 0.1 cm. From the flux profile curve, convert the distance to watts/cm^2 critical radiant heat flux at flame out. Read to two significant figures. A suggested data log format is shown in figure 8. Remove the specimen tray from the moveable platform. The suceeding test can begin as soon as the panel apparent black body temperature and chamber temperature are verified. The specimen tray should be at room temperature prior to insertion of the next specimen.

4.4.9 Smoldering combustion. Smoldering combustion shall be determined in accordance with the following test procedure: Standard Method of Test for Smoldering Combustion Characteristics of Materials Used for Thermal Insulation (see 3.1.8).

APPARATUS

The specimen holder shall be an open-top 20 ± 0.2 cm square box, 10 ± 0.2 cm in height, fabricated from a single piece of 0.61 ± 0.08 mm thick (24 U.S. Standard gauge) stainless steel sheet with the vertical edges of the box overlapped, not to exceed to 7 mm in seam with, and soldered so as to be watertight. The specimen holder during test use shall rest upon a pad of glass fiberboard having dimensions equal to or greater than those of the bottom of the specimen holder. The glass fiberboard shall be approximately 2.5 cm thick with a density of 40 ± 8 kg/m^3 (Note 1). NOTE 1: Glass fiberboard which meets Federal Specification HH-I-558B (Form A, Class 1, plain faced) is suitable for this purpose.

Ignition source. The ignition source shall be a cigarette without filter tip made from natural tobacco, 85 ± 2 mm long with a tobacco packing density of 0.270 ± 0.020 g/cm^3 and a total weight of 1.1 ± 0.1 gm.

Balance. A balance of 1 kg capacity, accurate at least to 0.1 g, and provided with a suitable scale pan is required.

Test area. The test area shall be draft-protected and equipped with a suitable system for exhausting smoke and/or noxious gases produced by testing. Air velocities as measured by a hot wire anemometor in the vicinity of the surface of the sample shall not exceed 0.5 m/sec. The test area shall be maintained at 21 ± 3°C (69.8 ± 5.4°F) and 50 ± 5 percent relative humidity.

TEST PROCEDURE

Samples and cigarettes shall be conditioned in air at a temperature of 21 ± 3°C (69.8 ± 5.4°F) and a relative humidity of 50 ± 5 percent for at least 12 hours prior to test. Samples and cigarettes shall be removed from any packaging and exposed in a suitable manner to permit free movement of air around them during conditioning.

Calculate the weight of material required to fill the holder at the density determined in 4.4.1. This weight weight of material shall be loaded uniformly into each specimen holder and leveled flush to the top edge of the holder. The weight of each filled holder shall be determined to the nearest 0.2g or less and recorded.

With the sample in the holder and placed on the insulated pad, a rod of 8 mm diameter with a pointed end shall be inserted vertically into the approximate center of the material being tested and withdrawn to form an appropriate cavity for the ignition source, such that the cigarette fits snugly and maintains uniform contact with the specimen. A well lit cigarette, burned out more than 8 mm (0.3 inch), shall be inserted using tweezers in the formed cavity, with the lit end upward and flush with the sample surface. Burning of the cigarette and specimen shall be allowed to proceed undistured in the test area for at least 2 hours or until the smoldering is no longer progressing.

After completion of burning and after the holder has cooled down to 25°C, the specimen holder with its material residue shall be weighed, at least to the nearest 0.2g, and the percent weight loss of the original specimen calculated. The weight of the cigarette residue is ignored in this calculation.

4.5 Certification. A certificate of compliance shall be acceptable as proof that the product being offered meets the requirements of section 3.1 provided that the contractor shall have available, for inspection upon request, actual test results, acceptable to the contracting officer, which indicate that tests have been performed to substantiate the certification. Supportive test data shall be not more than 3 years old at the date of the invitation for bids. The certificate shall state that the tests on which the data is furnished have been performed on products manufactured from the same materials and using the same manufacturing processes as the items being offered. It shall also state that any changes in materials or processes

that affect the performance of the product will be reported to the contracting officer. The Government reserves the right to require additional testing and certification by the contractor when such changes are made or when otherwise deemed necessary.

5. PREPARATION FOR DELIVERY

5.1 Packing. The packing shall be level A, B, or commercial as specified (see 6.2).

5.1.1 Level A and B. Insulation shall be packed in bags conforming to UU-S-48 6-6x (1) or a polyethylene bag of equal moistureproof and bursting strength. The gross weight shall not exceed 45 pounds.

5.1.2 Commercial. The insulation shall be packed in accordance with normal commercial practice and packed to assure acceptance by common carrier and provide product protection against loss and damage during multiple shipments, handling and storage. The shipping containers shall be in accordance with the National Motor Freight Classification and Uniform Freight Classification.

5.2 Marking.

5.2.1 Civil agencies. Marking shall be in accordance with Federal Standard No. 123.

5.2.2 Military agencies. Interior packages and shipping containers shall be marked in accordance with MIL-STD-129.

5.3 Marking. Marking shall be as specified in the contract or order.

6. NOTES

6.1 Intended use. The loose-fill insulation covered by this specification is intended for use as thermal insulation in housing and buildings.

6.2 Ordering data. Purchasers should select the preferred options permitted herein, and include the following information in procurement documents:

(a) Title, number, and date of this specification.
(b) Type, class (see 1.2).
(c) Level of packing required (see 5.1).
(d) Thermal resistance (R) value required shall be specified (see Table I).

MILITARY CUSTODIANS:

Navy - YD
Air Force - 84

Review Activities:

Navy - YD
Air Force - 84

User Activities:

Army - ME
Navy - YD
Air Force - 84

Military Coordinating Activity:

Army - ME

Preparing Activity:

GSA - FSS

Civil Agency Coordinating Activities:

COMMERCE - NBS
GSA - FSS, PCD
HUD-TCS
DOE
CPSC
FTC

009337-000

THE SUSQUEHANNA CORPORATION

7400 S. Alton Court #204
Englewood, CO 80112

Mailing Address:
P.O. Box 5170
Denver, CO 80217
303-779-0777

Stock Exchange(s): ASE Bo
Ticker Symbol: SQN
Cusip Number: 869104109

Sales: $78,000,000 (12-31-87)
Earnings: $3,810,000
Assets: $62,261,000
Liabilities: $16,373,000
Net Worth: $45,888,000
Assets of Pension/Profit Sharing Fund Portfolio: $7,000,000
Employees: 709 (Total)

S.I.C. Code(s): 3088

Description of Business: Plastic Fittings Valves

Officers:
Fred L. Pundsack, Chm. Bd., Pres. & Chief Exec. Officer, 303-779-0777
R. L. Rasmussen, V.P., Chief Fin. Officer, Controller, Treas. & Sec., 303-779-0777

Area of Responsibility	*Manager*	*Telephone*
Cash Management	R. L. Rasmussen, V.P., Chief Fin. Officer, Controller, Treas. & Sec.	303-779-0777
Employee Benefits	R. L. Rasmussen, V.P., Chief Fin. Officer, Controller, Treas. & Sec.	303-779-0777
Human Resources	Peter Sage, Personnel Dir.	303-779-0777
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Risk Management	R. L. Rasmussen, V.P., Chief Fin. Officer, Controller, Treas. & Sec.	303-779-0777

Outside service firms providing financial services:

Legal Counsel(s)	Roth & Brega	Denver, CO
Major Banking Relationship(s)	United Bank of Denver	Denver, CO
Medical Insurance Carrier(s)	Metropolitan Life Insurance Co.	New York, NY

* The Corporate Finance Bluebook, National Register Publishing Company, 1989, p.1345.

21646-001

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Englewood, CO 80112
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Tel.: 303-779-0777 DE
SQN—(ASE Bo)
Assets: $62,261,000
Earnings: $3,810,000
Liabilities: $16,373,000
Net Worth: $45,888,000
Approx. Sls.: $78,000,000
Emp: 709
Fiscal Year-end: 12/31/88
Plastic Fittings Valves
S.I.C.: 3088
Fred L. Pundsack *(Chm. Bd., Pres. & Chief Exec. Officer)*
T. A. Jones *(V.P.)*
R. L. Rasmussen *(V.P., Chief Fin. Officer, Controller, Treas. & Sec.)*
Peter Sage *(Personnel Dir.)*
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21646-005
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7660 N. Clybourn Ave.
Sun Valley, CA 91352 (DE)
Tel.: 818-767-4726 (100%)
Approx. Sls.: $74,064,000
Emp: 666
Producer of Plastic Pipe Fittings & Valves
S.I.C.: 3088
N. M. Dye *(Pres.)*
Clark Clifford *(Pur. Dir.)*

Plants:

21646-007
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2010 Norris Rd.
Bakersfield, CA 93308
Tel.: 805-393-3250
Emp: 39
Mfg. Plastic Pipe, Fittings & Valves
S.I.C.: 3088
J. Perry *(Plant Mgr.)*

21646-008
R & G Sloane Mfg. Co., Inc. (2)
6100 Hillcrest Dr.
Cleveland, OH 44125
Tel.: 216-524-8600
Emp: 144
Mfg. Plastic Pipe, Valves & Fittings
S.I.C.: 3088

* Directory of Corporate Affiliations, National Register Publishing Company, 1990, p.1009.