

SECTION 4.0

CONTAINER STORAGE INFORMATION

4.1 INTRODUCTION

This section discusses specific process information for the storage of containers at GLOBALFOUNDRIES. Containers of nonflammable wastes are stored in Building 974 Chemical Distribution Center (CDC) waste storage room. Flammable wastes are stored in spill-containment pallets or tubs in the CDC flammable waste storage room. See Figure D-2-E for the layout of the CDC, including the waste storage and flammable waste storage rooms. Containers holding hazardous waste are kept closed during storage, except when it is necessary to add or remove wastes. Containers may be equipped with pressure relief valves for safety purposes (during normal operations, the valves remain closed).

The primary storage containers for wastes will be 30- or 55-gallon drums. In addition, wastes may be stored in cardboard cartons, fiber packs, power packs, lab packs, original containers, and other containers that are compatible with the wastes stored. A determination of the exact container that will be used to accumulate and store the wastes is made during the waste characterization and handling review process described in Section 3.2.1.

Containers shall be:

- A. Approved new or reconditioned Department of Transportation (DOT) containers, or
- B. Containers that originally contained the material, or
- C. DOT approved packaging for the particular waste being stored, or
- D. Lined in some manner with material compatible with the waste being stored, or
- E. Accumulated in uncovered containment tubs prior to shipment in lab pack containers (with an electronic inventory list itemizing the contents of each tub,) or
- F. Safety cans or equivalent.

A summary of the wastes that may be generated at the site and stored in the CDC is provided in Table 3-1.

Containers holding hazardous waste will not be stored in the permitted storage facility for more than 1 year. All containers are labeled with hazardous waste labels to identify the contents. In addition, polychlorinated biphenyl (PCB) containers have the standard PCB label, as required by 40 CFR 761.40 and .45.

4.2 CONTAINER MANAGEMENT PRACTICES

Containers are filled at waste-generating locations throughout the main site manufacturing buildings and off-site buildings. Once the containers are full, they are moved within 3 days to the CDC or to a designated short-term hazardous waste storage area. If the containers are taken to a designated short-term storage area, they are then transferred by truck within 90 days to the CDC building. At the CDC, a forklift truck transfers the nonflammable containers to the CDC waste storage room receiving area. Flammable wastes are taken directly to the flammable waste storage room after being weighed. Forklift trucks are rated as Double E (explosion proof - no sources of ignition).

The CDC waste storage room receiving area is provided to allow operations staff to weigh the container, place the container into the inventory, and log the appropriate containers out during shipment to off-site reclamation/treatment/disposal companies. Containers of nonflammable material may occasionally remain in the receiving area for more than 3 days (for example, if the container is received on a weekend or during a holiday); however, containers normally flow through the area in one work shift. Containers that have been in the receiving area for more than 3 days will be processed as soon as practicable during the next non-holiday and/or non-weekend work shift.

A GLOBALFOUNDRIES coded number and all pertinent data concerning the container is placed in an inventory system prior to transferring the container into storage. The inventory system allows CDC personnel to track storage volumes in each storage room and maintain the inventory within applicable storage limitations.

Containers may be transferred to the staging area in the CDC waste storage room if the contents of the containers need to be verified prior to being placed into storage. The containers will remain in the staging area until a determination has been made as to the applicability of the hazardous waste regulations. Containers placed into staging are not considered to be part of the inventory system. Wastes that are staged will be handled according to the results of the analytical testing or from knowledge gained from review of the waste stream.

4.2.1 CDC Waste Storage Room

Containers of nonflammable wastes are received, staged, accumulated, and stored in a 5,325-square-foot room in the CDC building. See Figure D-1-1 for details of the waste storage room. There are 1,498 square feet dedicated to container storage. Containers may be stacked three-high on pallets. The maximum storage capacity for the CDC waste storage room for nonflammable liquid, solid, and gaseous wastes is 60,720 gallons, equivalent to a total volume of 1,104 55-gallon containers. The maximum number of organic liquid wastes that will be stored in this room is 29,975 gallons, equivalent to 545 55-gallon drums. Two-foot-wide drum inspection aisles are provided between rows. Forklift truck aisles account for 1,260 square feet. The remainder of the space is devoted to a cooler, chemical waste staging and accumulation of specific wastes, and lab pack materials. To ensure worker safety, air in the waste room is exhausted at the rate of six air changes per hour and can be increased to twelve in the event of an emergency.

4.2.2 CDC Flammable Waste Storage Room

All flammable wastes are kept in the flammable waste storage room, which has been designed for flammable material storage. See Figure D-1-2 for a drawing of the flammable waste storage room. The containers are stored on spill-contained pallets in steel pallet racks four levels high. The maximum volume of flammable liquid waste stored in the flammable waste storage room at one time is 5,280 gallons, equivalent to 96 55-gallon drums. The rest of the room stores production (virgin) chemicals. The flammable waste storage room has the same exhaust air changes as the waste storage room.

4.2.3 CDC Transfer Room

GLOBALFOUNDRIES uses the transfer room within the CDC to consolidate compatible wastes for bulk shipments or biological treatment. The transfer room consists of one dump sink tied to the General Solvent #4 Waste Tank system, one sink tied to the Biological Waste Treatment Plant (Dilute Organic Waste (DOW)) system, and one sink is a spare sink (currently tied to a non-hazardous bulk waste tank). An aspiration system is also present at the CDC as part of the transfer station operations to allow for the discharge of drummed waste to the Biological Waste Treatment Plant system through the DOW dump sink. Compatibility determinations are made during the waste characterization and handling review process (Section 3.0).

4.2.4 Containers of Solid Wastes

Solid wastes are stored in DOT-approved 55-gallon drums, 30-gallon drums, cardboard cartons, fiber packs, power packs, lab packs, and other containers that are compatible with the wastes stored. These wastes may be stored in the same rows as liquid and gaseous wastes in the same compatibility class. Other miscellaneous wastes such as dry neutralized acid spills, clean-up rags, and broken glass contaminated with arsenic are collected on occasion and stored as solid wastes. There are no free liquids in these containers.

4.2.5 Containers of Gaseous Wastes

Gaseous wastes are stored in the original manufacturer's container or other containers that are compatible with the wastes stored. These wastes are stored in either the waste storage room or the flammable waste storage room depending upon whether the gas is considered flammable. These wastes may be stored in the same rows as liquid and solid wastes in the same compatibility class.

4.2.6 Small Quantity and Laboratory Wastes

When small containers of lab pack wastes are brought to the CDC, they are segregated by compatibility into open (uncovered) tubs until sufficient volumes have been accumulated for shipment. This avoids double-handling of the individual lab pack wastes when the disposal vendor packs the wastes for shipment, and allows GLOBALFOUNDRIES to (visually) ensure that no waste is leaking from any of the small containers. A hazardous waste label is located on the outside

of the tub in lieu of placing a hazardous waste label on every individual lab pack waste. An electronic inventory list of the lab pack wastes in each tub is maintained.

In preparation for off-site shipment, waste chemicals will be packaged in containers meeting DOT specifications. In addition, the packaging will be compatible with the selected treatment or disposal method approved for the wastes. An inventory of the contents of each drum will be prepared as wastes are packaged. After packaging, all containers will be securely closed, and proper labels that meet EPA, Vermont, and DOT requirements will be applied to each container.

4.3 SECONDARY CONTAINMENT FOR CONTAINERS

4.3.1 CDC Waste Storage Room Secondary Containment Systems

There are two secondary containment systems for containerized waste stored in the CDC waste storage room. These systems are described below.

4.3.1.1 CDC Waste Storage Room Organic Liquid Containment

The floor of the waste storage room is constructed of 4,000-pounds-per-square-inch (psi) reinforced concrete 6 inches thick with a design load of 500 pounds per square foot (see Attachment 4-1). The base is compacted gravel. The floor is protected with three coats of Tennant No. 4700 chemical-resistant urethane coating (see Attachment 4-2), last applied in November 1995. The concrete block walls, the door trenches, and the floor slope to prevent liquids from escaping the room. The floor is sufficiently impervious to contain leaks and spills until they can be removed or directed to the CDC container storage secondary containment tank.

The floor of the CDC waste storage room is sloped from the walls to two floor drains at the center of the room. (See Figures D-1-1 and D-1-3 for details of the floor slope and drains.) The floor drains discharge through a double-walled piping system to a 3,000-gallon vaulted tank located in the empty-drum storage room (see Figure D-2-C). The tank has a capacity of more than 10 percent of the maximum volume of organic liquid stored in the waste storage room, as required by 40 CFR Part 264.175. The inner pipe is a 3-inch Schedule 40 carbon steel pipe. The outer pipe is a 6-inch Schedule 10 carbon steel pipe. The tank vault is also made of carbon steel. All connections are welded and have been tested through use of x-ray and water-tightness testing. The tank is monitored by a level indicator/leak detection device that activates an alarm in Building 974. Information on the tank and operation is provided in Section 5.4.

No containers are stored in direct contact with the floor. Containers are stored on pallets, the room is enclosed with a roof and walls, and the floor is sloped to drain to ensure that containers do not sit in contact with spills or rain water. The floor drains and pipes described above prevent accumulation of liquid on the floor.

4.3.1.2 CDC Waste Storage Room Containment Pallets or Tubs

Secondary containment for liquid acids, liquid caustics, poisons, and PCB containers is provided through the use of steel or plastic containment pallets or tubs (described in Section 4.3.4).

4.3.2 CDC Flammable Waste Storage Room Secondary Containment

Spill-containment pallets and tubs (described in Section 4.3.4) provide secondary containment within the flammable waste storage room.

4.3.3 CDC Loading/Unloading Area Secondary Containment

Spills occurring in the CDC loading/unloading area will be contained in the trench system as shown on Figure D-2-D. When trucks are present in the loading dock area, the valve in the pipe leading from the trench will be closed. When trucks are not in the area, the valve will remain open to remove stormwater from the area.

4.3.4 Spill Containment Pallets and Tubs

The flammable wastes stored in the flammable waste storage room and the liquid acids, liquid caustics, poisons, and PCBs stored in the CDC waste storage room are placed in spill-containment pallets that provide approximately 93 gallons of storage or in spill-containment tubs that provide 62 gallons of storage.

The spill-containment volume provided by the pallets is calculated as follows:

Volume of the Containment Pallet

$$4 \text{ ft} \times 4 \text{ ft} \times 1.89 \text{ ft} = 30.24 \text{ ft}^3$$

$$1 \text{ ft}^3 = 7.48 \text{ gallons}$$

$$30.24 \text{ ft}^3 \times 7.48 \text{ gallons/ft}^3 = 226 \text{ gallons}$$

Volume of the Drums

$$(1 \text{ ft})^2 \times \pi \times 1.89 \text{ ft} \times 3 \text{ drums} = 17.81 \text{ ft}^3$$

$$1 \text{ ft}^3 = 7.48 \text{ gallons}$$

$$17.81 \text{ ft}^3 \times 7.48 \text{ gallons} = 133.22 \text{ gallons}$$

Total Volume Contained

$$\text{Volume of Pallet-Volume Drums} = \text{Volume Contained}$$

$$226 \text{ gallons} - 133.22 \text{ gallons} = 92.78 \text{ gallons}$$

The pallets hold 55-gallon drums; thus the spill-contained pallet provides 168 percent of the volume of a drum.

The spill-containment volume provided by the tubs is calculated as follows:

$$\begin{aligned} &\text{Volume of the Containment Tub} \\ &2.85 \text{ ft} \times 2.19 \text{ ft} \times 1.33 \text{ ft} = 8.30 \text{ ft}^3 \\ &1 \text{ ft}^3 = 7.48 \text{ gallons} \\ &8.30 \text{ ft}^3 \times 7.48 \text{ gallons/ft}^3 = 62.08 \text{ gallons} \end{aligned}$$

The tubs hold a single 55-gallon drum; thus the spill-contained tub provides approximately 113 percent of the volume of a drum.

The pallet and tub trays are made of materials designed to be compatible with the waste being contained. The pallets are also designed to elevate the containers within the spill containment to allow any leakage to be witnessed readily during inspections.

4.3.5 Control of Run-on

The CDC waste storage room and flammable waste storage room are indoors and totally enclosed, with the floors at least one foot above grade. In addition, the ground slopes away from the building. Run-on, therefore, cannot occur in these two storage rooms.

4.3.6 Removal of Liquids from Existing Containment Systems

In the event of an organic liquid chemical spill in the CDC waste storage room, the spilled liquid would flow to a floor drain and then to the containment tank. As described in Section 5.0, the CDC container storage secondary containment tank has a level sensor set to report liquid accumulation. The level-indicating panel is monitored daily, so personnel in the area would be notified of the spill. If a spill was detected, personnel would go to the room to find and stop the leak. The CDC container storage secondary containment tank would be evaluated and disposition of the material would depend on the results of that evaluation and would follow all regulations. An air-operated pump would be attached to the tank draw-off line and the contents would be pumped out for waste storage or shipment.

In the event of a chemical spill in the flammable waste storage room or in the containment pallets associated with acid, caustic, PCB, or poison storage within the waste storage room, the spill would be contained by the spill-containment pallets or tubs. The nature of the spilled material would be evaluated and the disposition of the material would be determined based on that evaluation.

The containment pallets and tubs are monitored at least weekly as part of the normal inspection routine, and spills would be noticed at that time. Spilled material would be removed in the safest manner possible, containers would be re-packed as necessary, and the pallet would be decontaminated. At no time shall released hazardous waste remain in the spill-containment pallets or tubs for more than 3 days after discovery.

ATTACHMENT 4-1

CDC WASTE STORAGE ROOM FLOOR CAPACITY

KNIGHT CONSULTING ENGINEERS, INC.

P.O. Box 29
WILLISTON, VERMONT 05495

STEPHEN C. KNIGHT, JR., P.E.

ROGER W. DORWART, P.E.
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MARTIN W. HAIN, P.E.

TEL: 802-879-6343

FAX: 802-879-6376

November 18, 1991

Mr. Raymond McIntosh
International Business Machines Corporation
Department 723, Building 615-2
Essex Junction, Vermont 05452

Re: Building 974 Waste Storage Floor Capacity

Dear Roy:

In accordance with your request I have reviewed the safe floor load capacity for the waste storage room. The following observations are made:

1. The Hazardous Waste Permit dated November 1, 1990 and submitted to the Agency of Natural Resources stated in Section 4.3.1 that the waste storage room slab is constructed of 3000 psi reinforced concrete 6 inches thick with a design load of 250 pounds per square foot.
2. A review of the original drawings confirm's that the slab is 6 inches thick with 6x6 W2.9 x W2.9 welded were fabric. All construction joints are dowelled with 3/4" diameter smooth dowels x 1'-3, spaced at 1'-0 o.c. Below the slab is an 8" layer of crushed stone (capillary barrier) and 2'-3' of compacted sand. All sand is compacted to a minimum of 95% optimum modified density. (ASTM D1557).
3. A review of the actual field test reports for this project and a discussion with our personnel who did the quality control testing indicates that all subbase materials were compacted properly and all concrete strength were greater than 4000 psi compressive strength. (See attached field test reports).
4. A visual inspection of the slab in the waste storage area reveals that the slab is in good condition with no signs of excessive cracking or deflections.

Page 2

November 18, 1991

Re: Building 974 Waste Storage Floor Capacity

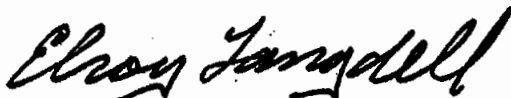
5. The floor of the waste room is arranged such that there are 2'-6"± isles between rows of pallets. 4'-0" square pallets are loaded with 4-55 gal. drums and stacked 3 pallets high. The heaviest material stored appears to be contaminated earth which weights about 800 lb/barrel. Because of the isle space between rows of pallets we can conservatively assume that the pallet load is distributed over a 20 square foot area. This loading will result in about a 480 pound per square foot equivalent slab loading.

As a result of these observations the following conclusions and recommendations are made:

1. This floor slab is adequate for 500 pound per square foot floor loading in my opinion.
2. It is recommended that the posting in this room be changed to 500 pound per square foot.

Enclosed are field test reports for the subbase soil material, compaction tests and concrete test results for the slab placed in the waste storage room. Please call if you have questions concerning this report.

Very truly yours,



Elroy L. Langdell, P.E.

Vice President

KNIGHT CONSULTING ENGINEERS, INC.

ELL/kdb

File: 91253-14-4



PROJECT TRM CHEMICAL DIST.

Date 6-20-80

FOR G. LETTER

By MO

MOISTURE - DENSITY CURVE

LABORATORY COMPACTION TEST

Standard (ASTM D 698)

Modified (ASTM D 1557)

SAMPLE: MEDIUM BROWN SAND - SAMPLED AT SITE

LAB NUMBER:

DATE TESTED:

OPTIMUM: 129.4 pcf @ 7.5 %

Dry Density (lbs./cu. ft.)

130

125

120

3

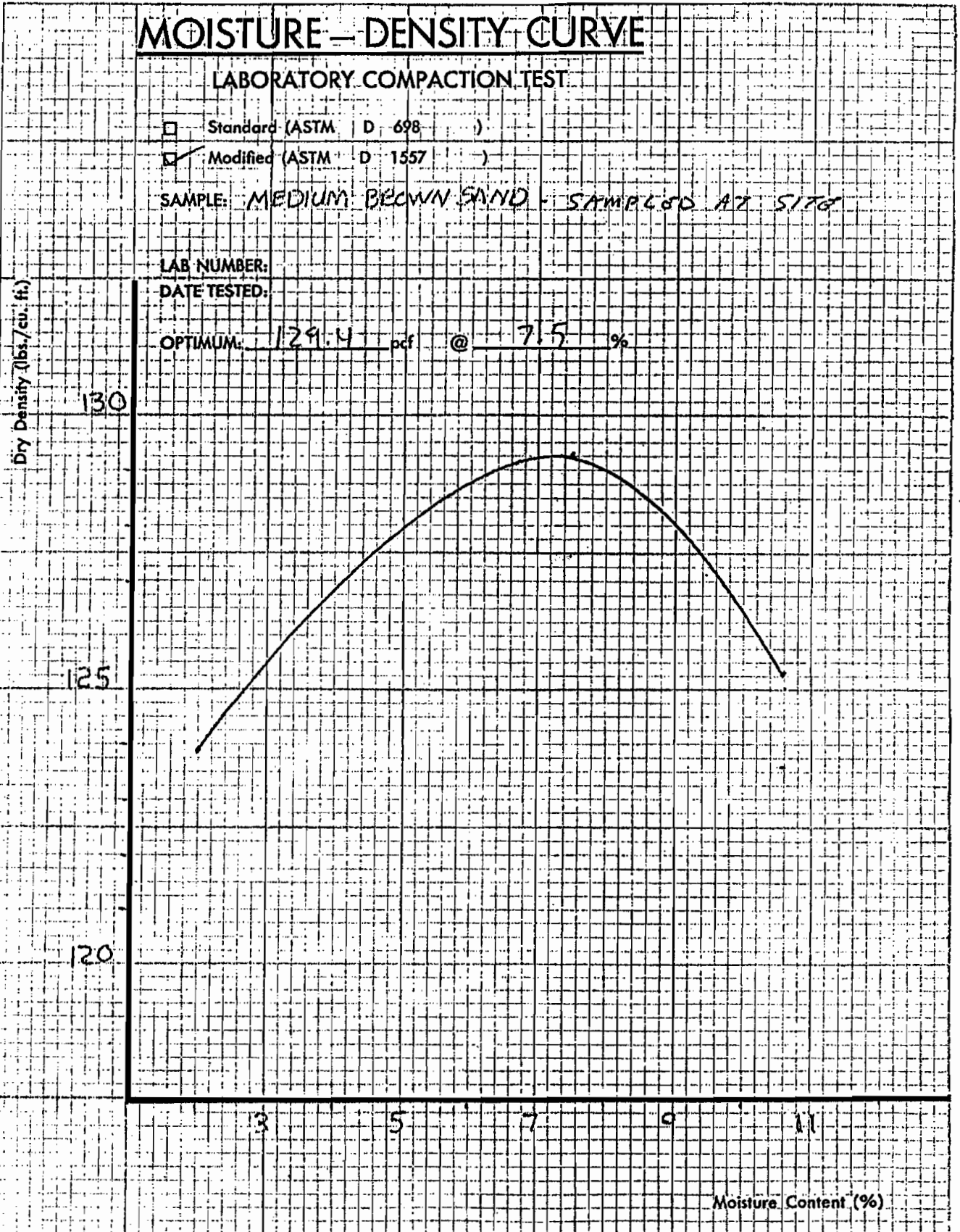
5

7

9

11

Moisture Content (%)



PROJECT IBM CDC BLDG.

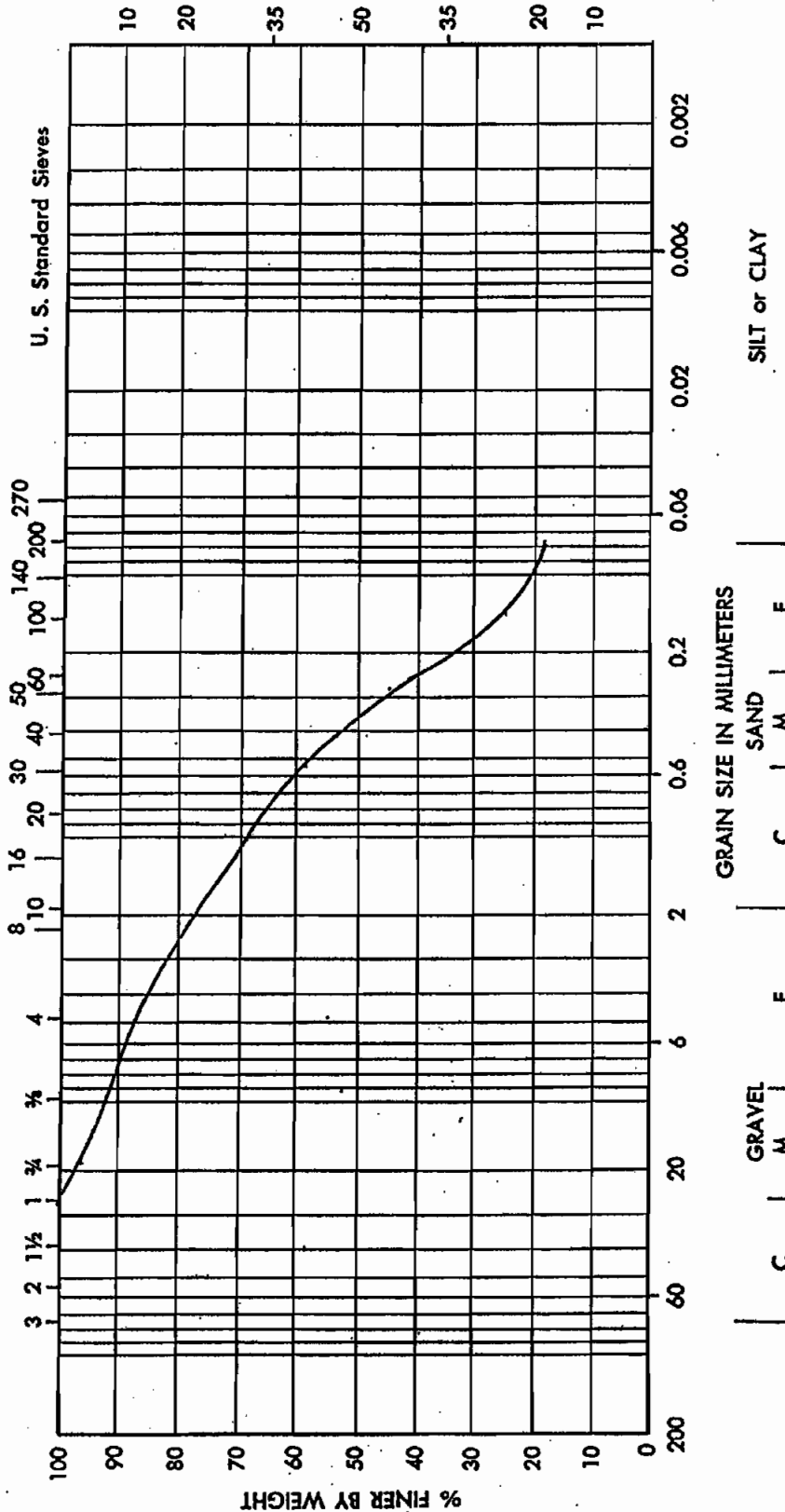
Sheet No. 8 of 8

FOR: G. GOTTBER ASSOCIATES

Date 6-20-80

GRAIN SIZE DISTRIBUTION CURVE

By JRS



| Sieve Size | % Finer | Sieve Size | % Finer | Soil Classification |
|-------------------------------|---------|------------|---------|--------------------------------------|
| 1" | 100 | #8 | 79.6 | MEDIUM BROWN SAND SAMPLED AT SITE |
| 3/4" | 96.3 | #16 | 70.8 | |
| 1/2" | 94.4 | #30 | 58.6 | |
| 3/8" | 92.6 | #60 | 35.0 | |
| #4 | 86.9 | #100 | 24.9 | |
| | | #200 | 19.4 | |
| CLASSIFICATION - SILTY GRAVEL | | | | |

PROJECT IBM CDC BLDG

Date 6-20-80

FOR G. EATON ASSOCIATES

By FPS

MOISTURE - DENSITY CURVE

LABORATORY COMPACTION TEST

Standard (ASTM D-698)

Modified (ASTM D-1557)

SAMPLE: COARSE BROWN SAND

SAMPLED 3' BELOW GROUND - BORROW AREA

LAB NUMBER:

DATE TESTED: 6-16-80

OPTIMUM: 1230 pcf @ 8.8 %

Dry Density (lb./cu. ft.)

126

124

122

120

118

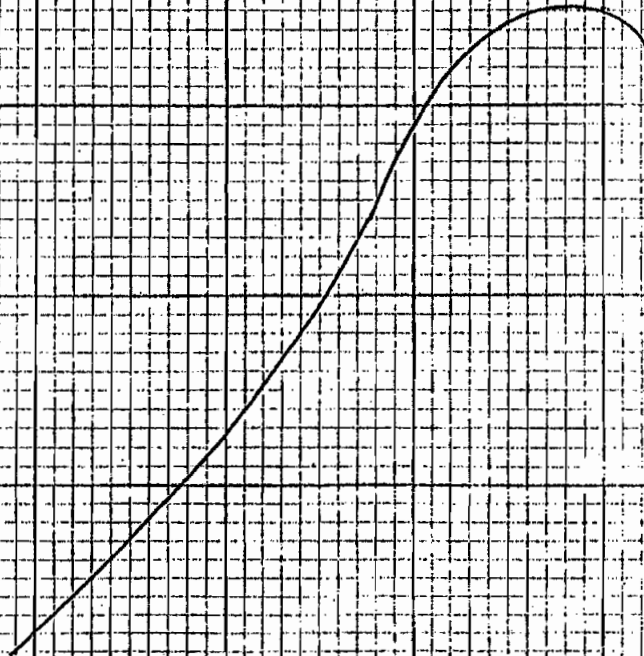
6

7

8

9

Moisture Content (%)



PROJECT IBM CDC B206

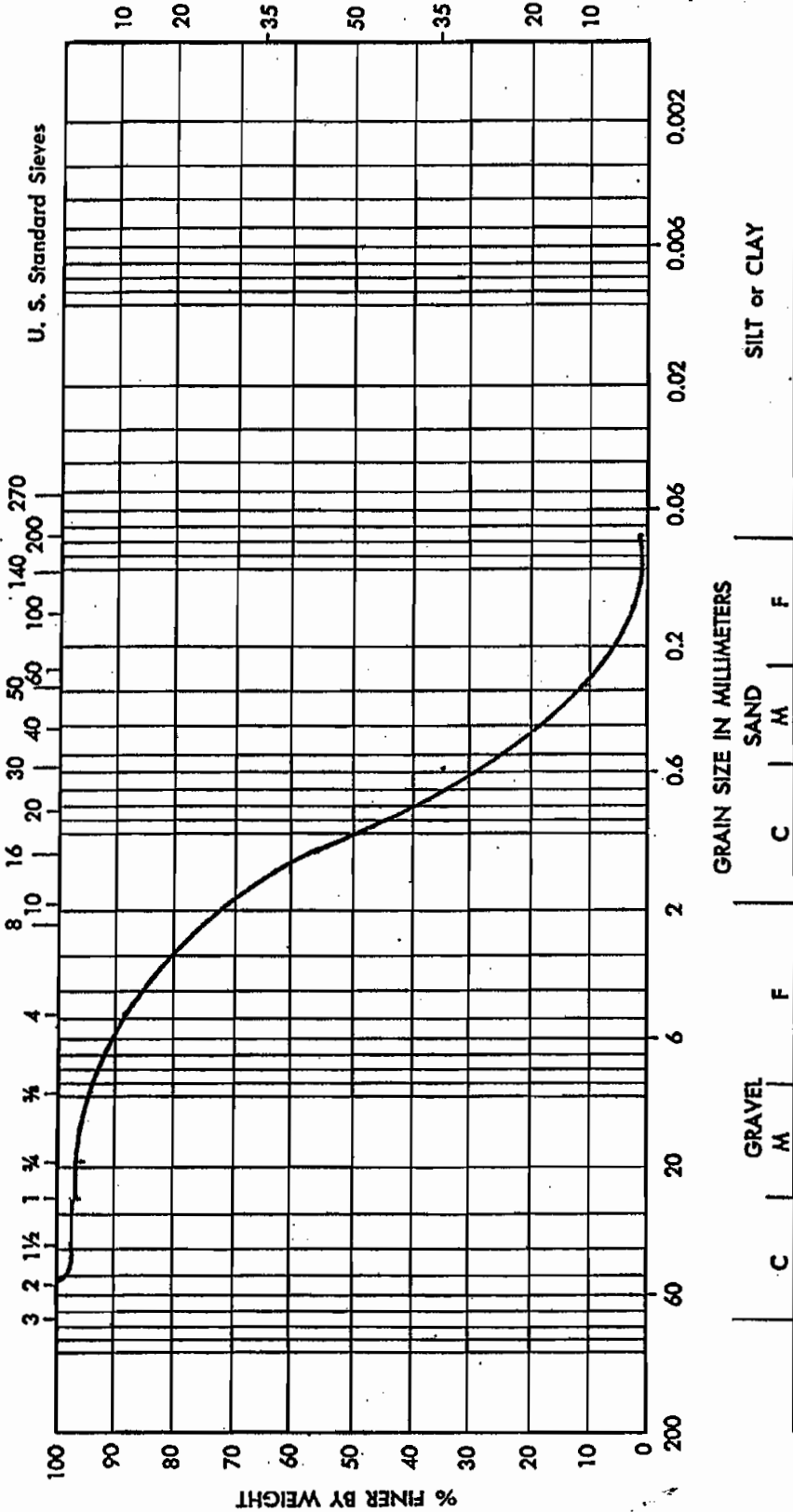
FOR: G. GOTTOR ASSOCIATES

GRAIN SIZE DISTRIBUTION CURVE

Sheet No. 6 of 9

Date 6-20-80

By MO'c



| SAMPLE (T.) | 576.10 | CUM.WT.R. | CUM.WT.R. | SIEVE # | 576.10 | CUM.WT.R. | CUM.WT.R. |
|-------------|--------|-----------|-----------|---------|--------|-----------|-----------|
| (Sieve #) | | | | | | | |
| 2.000 | .00 | 00.00 | 100.00 | 8.000 | 139.80 | 24.26 | 75.73 |
| 1.000 | 19.50 | 3.38 | 96.61 | 16.000 | 244.50 | 42.44 | 57.55 |
| .750 | 25.50 | 4242 | 95.57 | 30.000 | 377.50 | 65.52 | 34.47 |
| .500 | 32.60 | 5265 | 94.34 | 50.000 | 516.20 | 89.60 | 10.39 |
| .375 | 32.60 | 5.65 | 94.34 | 100.000 | 560.30 | 97.25 | 2.74 |
| 4.000 | 64.60 | 11.21 | 88.78 | 200.000 | 567.90 | 98.57 | 1.42 |

SAMPLE WT. 576.10

COARSE BROWN SAND - SAMPLED 5' BELOW GRADE
- BOTTOMS AREA

CLASSIFICATION - GRAYELLY SAND

NOTE - ACCEPTED FOR BUILDING FILL

KNIGHT CONSULTING ENGINEERS, INC.
 BOX 2304
 SO. BURLINGTON, VERMONT

FIELD COMPACTION REPORT

FOR Gustav Getter Associates, P.C.

PROJECT CDC Building - Phase III

| | | | | |
|-------------------------------------|------------------------------------------------|-------------------------------|--------------------------------|--------------------------------|
| TEST NUMBER | 192 | 193 | 194 | 195 |
| DATE TESTED | 1-27-81 | 1-27-81 | 1-27-81 | 1-27-81 |
| SOIL DESCRIPTION | ----- SITE MATERIAL ----- | | | |
| LOCATION | ----- BETWEEN COLUMN LINES ----- | | | |
| | 10a to 11/ B ₁ to D ₁ | 8 to 9/D ₁ to E | 7 to 8/ D ₁ to E | 6 to 7/ D ₁ to E |
| ELEVATION | ----- FINISH SUB-GRADE ----- | | | |
| IN-PLACE DRY DENSITY (pcf) | 114 | 120 | 123.5 | 122.5 |
| MOISTURE CONTENT (%) | 7 | 7.5 | 7.5 | 8.5 |
| OPTIMUM DRY DENSITY (pcf) | 123 | 123 | 123 | 123 |
| OPTIMUM MOISTURE CONTENT (%) | 8.8 | 8.8 | 8.8 | 8.8 |
| PERCENT OPTIMUM DENSITY ACHIEVED | 92.5 * | 97.5 | 100 | 99.5 |

Distribution: 1 copy each - Getter, IBM-RECD, Mr. Casile

REMARKS:

* Contractor instructed to recompact area.

Submitted by: Patricia J. Reed

rrb

KNIGHT CONSULT ENGINEERS, INC.
 P. O. BOX 2304
 BURLINGTON, VERMONT

For: Gustav Getter Associates, P.C. SO. BURLINGTON, VERMONT

Concrete Supplier: S.T.Griswold

Project: CDC Bldg. - Phase III

CONCRETE CONTROL REPORT

| Date Placed | Truck No. | Location | Time | Weather | Cylinders | Slump | Conc. Temp. | Density (pcf) | Air | Compr. Strength (psi) | | |
|------------------------------------------------|-----------|-----------------------------------------------|-------|-------------------------|------------------------------|--------|-------------|--------------------------|-------|-----------------------|--------------|--------------|
| | | | | | | | | | | 7 day | 14 day | 28 day |
| 2-17-81 | 60 | Utility Corridor | 10:45 | Fair | - | 3 1/2" | 67 | 149 | 4 1/2 | 3380 | | |
| | 65 | Slab at Road Crossing | 11:30 | Lt. Wind 52 deg. | 81A *** 81B 81C 81D | 3 1/2" | 64 | 149 151 | 4 | 3460 | 3840 | 4090 |
| | 65 | Utility Connector | 1:00 | Fair | 82A | 3" | 70 | 148 | 5 | 3220 | | |
| | | Grade Beams Lines 22, 23 from DD+10 to GG | 2:10 | Lt. Wind 55 deg. | 82B 82C 82D | | | 148 148 148 | | 3430 | 4080 3940 | |
| 2-18-81 | 64 | Slab Over Pipe Corridor Bldg. lines D to D+8' | 11:00 | Cloudy Lt. Wind 50 deg. | 83A *** 83B 83C 83D | 3 1/2" | 67 | 149 149 147 148 | 5 1/2 | 3360 3290 | | 3980 3690 |
| | 61 | Interior floor slabs | 8:05 | Fair, Lt. wind, 50-60° | -- | 4 | -- | -- | -- | -- | | |
| | | Col. Lines 5 to 6/C+7' | 8:30 | Enclosed area | -- | 4 | 74 | 149 148 | 4 | 4210 4160 | | 4530 4260 |
| | 63 | B ₁ +5' to C/1b+6' | 10:00 | | 84A 84B 84C 84D | 4 1/2" | 75 | 150 149 | 4 | | | |
| B ₁ +5' to C/1b+6'; 6 to D+10' to E | | 7/11:00 | | -- | 3 1/2" | 73 | | 4 | | | | |

Remarks: *** ANTI-HYDRO CONCRETE

DISTRIBUTION: 1 copy each- Mr. Kniffin, Mr. Casile, Mr. Vossler, S.T.Griswold Co.



KNIGHT CONSULTING ENGINEERS, INC.
 P. O. Box 2304
 For: Gustav Getter Associates, P.C. SO. BURLINGTON, VERMONT

Project: CDC Bldg. - Phase III

Concrete Supplier: S.T.Griswold

CONCRETE CONTROL REPORT

| Date Placed | Truck No. | Location | Time | Weather | Cylinders | Slump | Conc. Temp. | Density (pcf) | Air | Compr. Strength (psi) | | |
|-------------|-----------|---------------------------------------------------|-------|--------------------------|-----------|--------|-------------|---------------|------|-----------------------|--------|--------|
| | | | | | | | | | | 7 day | 14 day | 28 day |
| 2-16-81 | 60 | Interior Floor slabs | 8:50 | Enclosed Area 30-40 deg. | - | 4 | 68 | 148 | 4 | 4050 | 4740 | |
| | 64 | Col. lines | 9:10 | | 77A | 4 | 68 | | 3890 | | | |
| | 60 | 8 to 10/D ₁ to E | 9:35 | | 77C | 3 3/4" | 70 | | 4740 | | | |
| | 64 | 4 to 5/D ₁ to E & 5 to 6/E to F | 10:00 | | 77D | 3 1/2" | 69 | | 4930 | | | |
| 2-16-81 | 60 | " | 11:20 | " | - | 4 | 73 | 148 | 4 | 3910 | 4490 | |
| | 64 | | | | 78A | 4 | 73 | | 3820 | | | |
| | 60 | | | | 78B | | | | | | | |
| | 64 | | | | 78C | | | | | | | |
| 2-16-81 | 60 | | 12:00 | " | - | 4 | 73 | 148 | 4 | 3860 | 4780 | |
| | 60 | | 12:40 | | - | 3 | 72 | | 3930 | | | |
| | 61 | Wall at Line 11+8' from D to D+9' | 2:30 | | 79A | 3 | 65 | | 4780 | | | |
| | 61 | | | | 79B | | | | 4470 | | | |
| 2-17-81 | 63 | Interior Floor slabs | 10:10 | Enclosed Area 50 deg. | - | 4 1/2" | 73 | 149 | 4 | 4070 | 4860 | |
| | 61 | col. lines | 11:50 | | 80A | 3" | 72 | | 4160 | | | |
| | 61 | B to B+5' / 8a+10' to 10+4; 7 to 8/ C+7; to D+15' | 12:50 | | 80B | | | | | | | |
| | 64 | | | | 80C | | | | | | | |

Remarks: Distribution: 1 copy each- Mr. Kniffin, Mr. Casile, Mr. Vossler, S.T.Griswold Co.



Concrete

Supplier: S. T. Griswold

CONCRETE CONTROL REPORT

| Date Placed | Truck No. | Location | Time | Weather | Cylinders | Slump | Conc. Temp. | Density (pcf) | Air | Compr. Strength (psi) | | |
|-------------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------------------------------|--------------------------|-------|-------------|--------------------------|-------|-----------------------|--------|--------------|
| | | | | | | | | | | 7 day | 14 day | 28 day |
| 2-19-81 | 64 | Spill re-tention structure Tank support piers west side, northern 1/4 | 10:00 | Cloudy, mod. wind, 50±° | -- | 3 1/2 | 68 | | 5 | | | |
| 2-20-81 | 63 | Interior floor slab from Col. Lines D +12' to E +4' / S to 6 and Misc. Column box outs & interior wall section at Line 3/E ₂ +16' to F | 10:00 | Rain, Lt. wind, 50's Enclosed area | 88A 88B 88C 88D | 3 | 72 | 149 149 147 147 | 4 | 3660 3750 | | 4790 4700 |
| 2-20-81 | 65 | Utility connector grade beams - Lines 22 & 23 from JJ to MM+10' | 11:30 | Rain, Lt. wind 57° | 89A 89B 89C 89D | 3 3/4 | 67 | 148 147 148 148 | 4 1/2 | 3410 3500 | | 4260 4420 |
| | 68 | | 1:00 | | -- | 3 3/4 | 68 | | 4 1/2 | | | |

Remarks:

DISTRIBUTION: 1 copy each - Mr. Kniffin, Mr. Casile, Mr. Vossler, S. T. Griswold & Co., Inc.



KNIGHT CONSTRUCTION ENGINEERS, INC.
P. O. BOX 2304

For: Gustav Getter Associates, P.C. SO. BURLINGTON, VERMONT

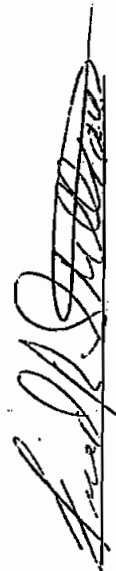
Project: CDC Bldg. Phase III

Concrete Supplier:

CONCRETE CONTROL REPORT

| Date Placed | Truck No. | Location | Time | Weather | Cylinders | Slump | Conc. Temp. | Density (pcf) | Air | Compr. Strength (psi) | | |
|-------------|----------------|----------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------------|-----------|--------|-------------|---------------|-------|-----------------------|--------|--------------|
| | | | | | | | | | | 7 day | 14 day | 28 day |
| 3-2-81 | 65 | Utility Connector slab on ground from S to T & No. tower Section | 10:30 11:50 | Enclosed Area 40+deg. | 101A | 3" | 66 | 149 | 4% | 3270 | 3290 | 4320 4560 |
| | | | | | 101B | | | 149 | | | | |
| | | | | | 101C | | | 149 | | | | |
| | | | | | 101D | | | 150 | | | | |
| 3-3-81 | 60 | Interior Floor slabs col. lines 4a to 5/E to F 2a to 4/D to E & 2a+5' to 4/D+12' to D 3 & 11:30 wall extend-1:30 ed at line D/11 | 10:00 | Enclosed Area 20+deg. | 102A | 4 | 59 | 149 | 4 | 3630 | 3780 | 5160 5220 |
| | | | | | 102B | | | 150 | | | | |
| | | | | | 102C | | | 151 | | | | |
| | | | | | 102D | | | 151 | | | | |
| | | | | | 102E* | | | 150 | | | | |
| | | | | | 102F | | | 150 | | | | |
| 3-3-81 | 61 64 65 | Utility Connector Grade beams Lines 22&23 From MM+10' to QQ+10' | 1:30 | Fair Lt. Wind 25-30 deg. | 103A | 4 1/4" | 64 | 148 | 4 1/2 | 2780 | 2650 | 3820 3730 |
| | | | | | 103B | | | 148 | | | | |
| | | | | | 103C | | | 149 | | | | |
| | | | | | 103D | | | 149 | | | | |
| 3-3-81 | 64 | From MM+10' to QQ+10' | 2:15 | | 103E | 4" | 66 | 148 | | 2780 | 2650 | 3820 3730 |
| | | | | | 103F | | | 149 | | | | |

Remarks: Distribution: 1 copy each-G.Getter Assoc. Mr. Vossler, Mr. Casile & S.T.Griswold
*E&F to be field cured.
** Appears to be frozen.



ATTACHMENT 4-2
TENNANT FLOOR COATING



INSTRUCTION BULLETIN

TENNANT® 4700 CHEMICAL RESISTANT URETHANE

SECTION I - GUIDELINES FOR SAFETY

Read and follow all precautions on labels.

FIRE AND STORAGE SAFETY PRECAUTIONS

SMOKING: Do not allow smoking or the use of matches in the area where material is being applied or curing.

STORAGE: Keep heat, sparks, and open flames (electrical equipment, pilot lights, etc.) away from container storage and application sites. Post appropriate warning signs around application area. Use only with adequate forced air ventilation to maintain solvent vapor concentrations below prescribed O.S.H.A. standards for L.E.L. and P.E.L. In case of fire, use foam, dry chemical or CO₂ extinguishers.

Place solvent-soaked items, such as used applicators, in metal containers outside of building.

Keep containers tightly closed when not in use. Store in a cool, dry place.

SPILLAGE: In case of spillage, absorb and then dispose of material in accordance with applicable local, state, and federal regulations.

PERSONNEL SAFETY PRECAUTIONS

VAPORS: Avoid breathing organic vapors. Wear a vapor/particulate respirator (U.S. Bureau of Mines BE-23, NIOSH 23C, 3M 8709 or equivalent) during application and until the work area has been exhausted of all vapors.

NOTE: Pregnant women and individuals with chronic respiratory problems or prior respiratory reaction to Isocyanates must not be exposed to vapors during urethane application. Individuals that wear contact lenses or have allergies also should avoid exposure. Individuals with a heart condition or poor health must not be exposed to vapors during TENNANT® 510 removal procedure.

TRACTION: When removing old coatings (using TENNANT® 510), curing membranes (using TENNANT® 528 or 531), or treating concrete (using TENNANT® 409), the floor becomes very slippery. Use caution when walking on the floor during these procedures, and post appropriate warning signs around the application area.

PROTECTIVE CLOTHING: Avoid contact with eyes, skin, and clothing. Wear safety goggles designed to protect against splash of liquids. Wear protective gloves, protective clothing, and shoes or boots which will not absorb materials.

INGESTION: Do not swallow materials.

FIRST AID

INHALATION: Remove person to fresh air. If breathing difficulty persists, consult a physician and have label information available.

EYE CONTACT: Flush immediately with plenty of water for 15 minutes. Call a physician.

SKIN CONTACT: Wash thoroughly with soap and water.

INGESTION: Call a physician immediately. Do not induce vomiting unless the material safety data sheet instructs you to do so.

OTHER PRECAUTIONS

NON SLIP GRIT: Tennant Company coatings provide a smooth, non-porous surface. Conditions of liquid spillage on such surfaces can create a slippery condition. Use Tennant Company safe walk grit in slip hazard areas.

ODOR CONTAMINATION: To protect against possible odor contamination, remove any odor-sensitive material such as foods or fibers from the area while applying any products containing solvent and until no vapors remain in the air.

SPILLAGE: If TENNANT® 409 is accidentally spilled on metal surfaces, it should be removed immediately to prevent pitting of the metal.

If TENNANT® 510 is accidentally spilled on painted surfaces, rubber or plastic materials, other than those desired, it should be removed immediately in order to prevent material damage.

SECTION II - WHERE TO USE TENNANT® 4700

TENNANT® 4700 chemical resistant urethane was designed for use as a concrete floor coating in chemically harsh environments. These areas include battery charging rooms, aircraft maintenance hangars, food storage lockers.

4700 is a three-coat CRU which is applied over clean, dry, sound concrete.

SECTION III - CONCRETE FLOOR PREPARATION

REMOVE ALL DIRT, OIL, GREASE, CURING MEMBRANES, OR EXISTING COATINGS.

Remove dirt, oil, grease, membranes, and coatings from the floor to expose a clean, bare concrete surface.

COMPACTED DIRT: First, remove compacted dirt with a TENNANT® K-4 machine equipped with a REVO®-Tool or wire brush, or with a spud bar. THEN proceed as follows.

SURFACE DIRT, GREASE OR OIL: Scrub with Tennant Company cleaners in a mechanized scrubber. If using a TENNANT® SRS® machine, use a cleaner recommended for that machine.

MIX: Mix the appropriate concentration of cleaner by using the dilution chart on the cleaner label.

APPLY: Use maximum solution flow of cleaner to the floor with the vacuum off, squeegee up, and maximum brush down pressure.

SOAK: Allow solution to remain on the floor for about 10 - 15 minutes.

REPEAT: Make a second pass using reduced solution flow, with same brush pressure, vacuum off and squeegee up.

REPEAT: The final pass should be made with the vacuum on, squeegee down and 1/2 solution flow.

SCRUB AND RINSE: Scrub and rinse with clear water as above.

CHECK FLOOR: Use Test Kit to ensure the floor is free of any contamination. (See Test Kit Procedure.)

GO TO 409 PRE-KOTE CLEANER STEPS.

HEAVY GREASE OR PENETRATED OIL: Remove heavy grease or penetrated oil using TENNANT® 528 Cleaner and Remover or 531 Curling Membrane Remover.

VENTILATION: Provide good ventilation and air movement while using 528 or 531.

MIX: Use 531 as supplied or mix 528 with petroleum solvent (140° F flash point or above...mineral spirits, Shell Cyclo-Sol 63 or equal) at one part 528 to nine parts solvent.

APPLY: Apply 531 or mixed 528 liberally to the floor surface with a mop, broom, or low pressure spray at 100 square feet per gallon.

SOAK: Allow to soak, keeping floor wet 30 minutes or more.

AGITATE: Agitate solution with a Tennant Company scrubber or disc machine equipped with an abrasive bristle brush.

FLOOD SURFACE: Flood surface with Tennant Company detergent (600 or 653) solution at three ounces per gallon of water.

REAGITATE: Reagitate as above and PICK UP residue with scrubber or wet vacuum.

SCRUB AND RINSE: Scrub and rinse with clear water and pick up residue as above.

CHECK FLOOR: Use Test Kit to ensure the floor is free of any contamination. (See Test Kit Procedure.)

GO TO 409 PRE-KOTE CLEANER STEPS.

CURING MEMBRANES: Remove curing membranes using TENNANT® 528 Cleaner and Remover or 531 Curing Membrane Remover.

VENTILATE: Provide good ventilation and air movement while using 528 or 531.

CAUTION: Curing membranes become very slippery as they dissolve from the floor surface. Wear shoes or boots and use caution when walking on the floor during this procedure.

MIX: Use 531 as supplied or mix 528 with a high flash (140° F or above), high solvency (90KB or above) aromatic hydrocarbon solvent (such as Shell Cyclo-Sol 63 or equal) at one part 528 to nine parts solvent.

APPLY: Apply 531 or mixed 528 liberally to the floor surface with a mop, broom, or low pressure spray at the rate of 100 square feet per gallon.

SOAK: Allow to soak, keeping floor wet 30 minutes or more.

AGITATE: Agitate solution with a Tennant Company scrubber or disc machine equipped with an abrasive bristle brush.

FLOOD SURFACE: Flood TENNANT® detergent (600 or 653) at three ounces per gallon of water.

INSTRUCTION BULLETIN TENNANT® 4700 (CON'T)

SCRUB AND RINSE: Scrub and rinse with clear water and pick up as above.

CHECK FLOOR: Use Test Kit to ensure the floor is free of above contamination. (See Test Kit Procedure.)

GO TO 409 PRE-KOTE CLEANER STEPS.

EXISTING COATINGS: Existing coatings are removed with either TENNANT® 510 Remover, or by sanding to expose clean, bare concrete surface.

510 PROCEDURE

VENTILATION: Provide good ventilation and air movement while using TENNANT® 510 Remover.

CAUTION: Floor coatings become very slippery as they dissolve from the floor surface. Wear protective shoes and boots and use caution when walking on the floor during this procedure.

HEAVY BUILDUP: For heavy buildup of floor coatings, sand the floor with a buffer using #3-1/2 open-coat sandpaper.

APPLY: Spread 510 liberally and evenly with a lamb's-wool applicator at approximately 50 ft² per gallon. WET AREA which can be easily picked up in 20 - 30 minutes. DO NOT REWORK 510 once it has been applied.

SOAK: Let soak 20 - 30 minutes until coating has lifted or it is well softened. If 510 begins to dry out, apply more.

SCRAPE: Scrape off the 510 residue with masonry scrapers. Scoop the waste into containers for proper disposal.

FLOOD SURFACE: While the floor is still wet, flood the surface with TENNANT® detergent (600 or 653) solution at three ounces per gallon of water.

AGITATE: Agitate with a scrubber equipped with an abrasive bristle brush.

REAGITATE: Reagitate as above and PICK UP residue with a scrubber or wet vacuum.

MULTIPLE COATS: Multiple coats of finish may require reapplication of 510. Repeat above procedure until finish is removed.

SCRUB AND RINSE: Scrub and rinse with clear water and pick up residue as above.

SOLVENT: Flood the floor with TENNANT® 528 or 531 solution at 100 square feet per gallon.

AGITATE: Agitate with an abrasive brush or scrubbing brush. Solvent should remain on the floor for 15 minutes.

CLEANER: While the floor is still wet, flood the surface with TENNANT® 600 cleaner at four ounces per gallon of water.

AGITATE: Agitate with an abrasive brush or scrubbing brush.

REMOVE: Use a neoprene blade squeegee on an automatic scrubber or wet vacuum to remove floor waste residue.

SCRUB: Repeat cleaner scrub and removal.

CHECK FLOOR: Use Test Kit to ensure the floor is free of above contamination. (See Test Kit Procedure.)

GO TO 409 PRE-KOTE CLEANER STEPS.

SANDING PROCEDURE:

SAND: Use #3 closed-coat sandpaper. For tough to remove coatings, it may be necessary to start with #3-1/2 open-coat sandpaper to remove most of the coating. Follow this with #3 closed-coat sandpaper.

CHECK FLOOR: Use Test Kit to ensure the floor is free of contamination. (See Test Kit Procedure.)

GO TO 409 PRE-KOTE CLEANER STEPS.

TREAT THE FLOOR WITH 409 PRE-KOTE CLEANER to remove concrete dust. Treat the floor to remove concrete dust or free calcium deposits and open the floor for better adhesion of the coating.

MIX: Mix 409 concentrate with water in a clean container at a ratio of one part 409 to nine parts of water. For dense machine trowelled concrete, mix one part 409 to seven parts water. For chemically hardened floors, mix one part 409 to five parts of water.

APPLY: Apply mixed solution to floor liberally and uniformly over the area at 100 square feet per gallon with a low-pressure spray, a garden-type sprinkling can, or by mop from a container.

SOAK: Allow solution to work for 2 - 3 minutes, but do not let floor dry out.

SCRUB: Scrub floor with a Tennant® scrubber or disc machine equipped with an abrasive bristle brush. Keep floor wet with additional water as necessary.

FLOOD SURFACE: Flood surface with TENNANT® detergent (1.00 or 653) solution at three ounces per gallon of water.

REAGITATE: Reagitate as above and PICK UP residue with scrubber or wet vacuum.

SCRUB AND RINSE: Scrub and rinse with clear water and pick up residue as above.

REPEAT: Repeat scrub and rinse to ensure removal of all residue. White residue upon drying shows inadequate rinse.

CHECK FLOOR: Texture of floor should feel like fine sandpaper. If surface is still smooth and glossy, repeat above 409 procedure.

DRY: Let floor dry completely (preferably overnight). Forced air ventilation will accelerate drying.

BEFORE COATING FLOOR, CHECK FLOOR MOISTURE CONTENT USING TEST KIT INSTRUCTIONS. RESIDUAL MOISTURE IN THE CONCRETE WILL PREVENT GOOD ADHESION OF THE COATING.

SECTION IV - COATING THE FLOOR

CHECK FLOOR: Floor temperatures must be 60°F or above during the CRU application.

COAT: Five gallon units of CRU contain both Parts A and B. Two coats of CRU are necessary to achieve maximum chemical resistance.

MIX: Mix only enough of parts A and B for use within a three-hour period.

REMOVE THE UPPER INSERT (Part B) from the pail.

PREMIX PART A by using a slow speed drill (500 rpm or less) with a paint mixing paddle or Jiffy Mixer (Tennant Company part number 08643-5).

POUR CONTENTS from the insert into Part A.

MIX 4700 CONTINUOUSLY for five minutes by using a slow speed drill as above.

ALLOW THE BLENDED MATERIAL to stand for ten minutes prior to using.

VENTILATION: Provide sufficient forced air ventilation during application and until the area has been exhausted of all vapors (usually until coating is dry).

APPLY FIRST COAT: Apply the first coat of 4700 by pouring blended material into an applicator tray and applying at the rate of 300 to 350 square feet per gallon. Use a paint roller with a medium nap cover for application.

Dip roller into coating and lightly roll out excess on screen in tray. Then apply an 8 to 10 foot long path on the concrete, making one forward and one backward stroke. Redip roller and make a second pass adjacent to the first. Repeat with third pass.

Wipe out ridges and level the coating with one cross pass. Avoid overworking the material.

DRY: Let the first coat dry 16-24 hours until the coating is hard. If recoat time exceeds 48 hours, dry buff the surface to remove the gloss before applying the next coat. To buff, use a TENNANT® K-4 machine with abrasive bristle brush or a disc buffer with an 80-100 mesh sanding screen. Sweep the surface thoroughly. Then tack rag the surface with a lightly dampened, lint-free cloth to remove fine dust.

APPLY SECOND COAT: Apply a second coat of 4700 in the same manner as described above at a coverage rate of 300 to 350 square feet per gallon.

DRY: Let the second coat dry 6 - 8 hours until the coating is hard.

APPLY THIRD COAT: Apply a third coat of 4700 in the same manner as previously described at a coverage rate of 300 to 350 square feet per gallon.

DRY: Allow the coating to dry a minimum of 24 hours before opening to foot traffic. Maximum chemical resistance is achieved after two weeks cure time.

OPTIONS

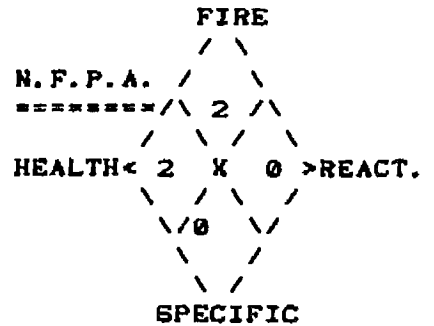
TRACTION GRIT: To improve traction in potential slip hazard areas, TENNANT® 292 aluminum oxide grit may be added to the second to last coat of 4700.

TENNANT
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MATERIAL SAFETY DATA SHEET
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Issue Date: 12/13/88

TENNANT COMPANY
701 NORTH LILAC DRIVE
MINNEAPOLIS, MN 55440



EMERGENCY PHONE NUMBER:

Chemtec: 800-424-9300(24 hrs.)
(District of Columbia) 483-7616(24 hrs.)
Tennant Company: 612-540-1381(days)
612-544-5163(nights)
612-738-9734(nights)
CANADA: CANUTEC 613-996-6666(24hrs.)

I. IDENTIFICATION

PRODUCT NAME/NUMBER: 4700-CHEMICAL RESISTANT TILE-LIKE GLAZE COATING PART A
PART NUMBER: 08569

MATERIAL USE: Two-Component Urethane for Concrete Floors

CHEMICAL FAMILY: Polyester

DEPARTMENT OF TRANSPORTATION

U.N. #: NA1993 HAZARD CLASSIFICATION: Combustible Liquid
SHIPPING NAME: Combustible Liquid N.O.S.

II. PHYSICAL DATA

| | |
|------------------------------------------------|---------------------------------------|
| BOILING POINT: 295F. / 146C. | FREEZE POINT: N.A. /N.A. |
| DENSITY: 1.0 g/ml | % VOLATILE: 69% by wt |
| SOLUBILITY IN WATER: Not Soluble | VAPOR PRESSURE: 3.7 mm Hg @ 20 Deg.C. |
| ODOR THRESHOLD: N/A | pH: N.A. |
| PHYSICAL FORM: Liquid | VAPOR DENSITY: Heavier , THAN AIR |
| APPEARANCE AND ODOR: Clear/Ester-like | |
| COEFFICIENT OF H2O/OIL DISTRIBUTION: N.L. | |
| EVAPORATION RATE: Slower, THAN n-BUTYL ACETATE | |
| MECHANICAL IMPACT: N.A. | STATIC DISCHARGE: N.A. |

NOTE - N.A. or N/A denotes Not Available or Not Applicable

III. INGREDIENTS

| ITEM (CAS#) | WT. % | OSHA PEL | TLVs | | LD/50 mg/kg | LC/50 |
|---------------------------------------------------------------|-------|-------------|--------|--------|---------------------------------------------|-------|
| | | | TWA | STEL | | |
| Propylene Glycol Monomethyl Ether Acetate (108-65-6) | 60-70 | N. A. | N. A. | N. A. | 5000 (skin rabbit) 8532 (oral rat) | N. A. |
| Hydroxyl Terminated Polyester (25322-69-4) | 25-35 | N. A. | N. A. | N. A. | N. A. | N. A. |
| Xylene (1330-20-7) | 1-5 | 100ppm | 100ppm | 150ppm | 5000 (oral rat) | N. A. |

NOTE - N. A. or N/A denotes Not Available or Not Applicable

N. E. - Not Established

IV. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: 108F./ 42C. (SETA FLASH) FLAMMABLE LIMITS: L.E.L. 1.0% U.E.L. 7.0%

AUTOIGNITION TEMPERATURE: N.A.

EXTINGUISHING MEDIA:

Use National Fire Protection Association (N.F.P.A.) Class B extinguishers (Carbon dioxide, dry chemical or foam).

SPECIAL FIRE FIGHTING PROCEDURES:

Water may be ineffective, but may be used to cool closed containers to prevent pressure buildup or possible autoignition when exposed to extreme heat (fog nozzles preferred). Wear self-contained breathing apparatus.

UNUSUAL FIRE AND EXPLOSION HAZARDS:

Keep containers tightly closed. Isolate from heat, electrical equipment, sparks and open flame. Closed containers may explode when exposed to extreme heat. Do not apply to hot surfaces.

V. REACTIVITY DATA

STABILITY: Stable

HAZARDOUS POLYMERIZATION: Will Not Occur

CONDITIONS TO AVOID:

N.A.

INCOMPATIBILITY (Materials to avoid):

Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS:

Carbon dioxide, carbon monoxide and nitrogen oxides in varying quantities.

VI. HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: See Section II for individual ingredients.

EFFECTS OF OVEREXPOSURE: PRIMARY ROUTE(S) OF ENTRY: Inhalation & Skin Contact &

SKIN CONTACT AND ABSORPTION:

Contains materials which may cause skin irritation.

EYE CONTACT:

Contains materials which may cause eye irritation and eye injury.

NOTE - N.A. or N/A denotes Not Available or Not Applicable

PRODUCT #4700-CHEMICAL RESISTANT TILE-LIKE GLAZE COATING PART A

INGESTION (Swallowing):

Contains materials which can cause a burning sensation, vomiting, diarrhea, drowsiness and tissue damage. Aspiration of material into lungs can cause chemical pneumonitis which can be fatal.

INHALATION (Breathing):

Repeated exposures may cause irritation to the upper respiratory tract and liver or kidney effects.

CARCINOGENICITY:

No specific information available.

CHRONIC EFFECTS OF OVEREXPOSURE:

No specific information available.

EMERGENCY AND FIRST AID PROCEDURES

SKIN CONTACT:

Wash thoroughly with soap and water.

EYE CONTACT:

Flush immediately with water for 15 minutes; CALL A PHYSICIAN.

INGESTION (Swallowing):

CALL A PHYSICIAN or POISON CONTROL CENTER. DO NOT attempt to induce vomiting and have this document available.

INHALATION (Breathing):

Remove to fresh air. Restore breathing if required. If breathing difficulty persists or occurs later, consult a physician and have this document available.

NOTE - N.A. or N/A denotes Not Available or Not Applicable

VII. SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

Remove all sources of ignition (flames, hot surfaces and electrical, static or frictional sparks). Avoid breathing vapors. Ventilate area. Remove with inert absorbent/scrub with soap and water.

WASTE DISPOSAL METHOD:

Dispose of in accordance with federal, state and local regulations.

VIII. SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (specify type):

Wear a chemical respirator approved for organic vapors (NIOSH 23C or equivalent) during the application and until the work area has been exhausted of all vapors.

VENTILATION:

Provide local exhaust ventilation to keep vapor concentrations below TLV (see Section II).

PROTECTIVE GLOVES:

Impervious gloves; i.e., rubber

EYE PROTECTION:

Chemical splash goggles

SKIN PROTECTION:

Impervious gloves; i.e., rubber

IX. SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:

Store in a cool dry place. Store large quantities in buildings designed and protected for storage of NFPA Class II Combustible Liquids.

OTHER PRECAUTIONS:

Do not take internally. Avoid prolonged contact with skin; contaminated clothing should be removed immediately. Avoid free fall of liquid in excess of a few inches.

This Material Safety Data Sheet (MSDS) has been prepared in compliance with the Federal OSHA Hazard Communication Standard 29 CFR 1910.1200.

The information and recommendations contained herein are based upon data believed to be correct. However, no guaranty or warranty of any kind expressed or implied is made with respect to the information contained herein.

For further information contact:

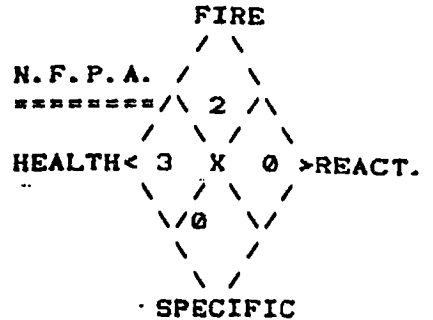
Tennant Company
Attn: Norman W. Gill
Technical Service Department
701 North Lilec Drive
Minneapolis, MN 55440

TENNANT
=====

MATERIAL SAFETY DATA SHEET
=====

Issue Date: 12/13/88

TENNANT COMPANY
701 NORTH LILAC DRIVE
MINNEAPOLIS, MN 55440



EMERGENCY PHONE NUMBER:

Chemtec: 800-424-9300(24 hrs.)
(District of Columbia) 483-7616(24 hrs.)
Tennant Company: 612-540-1381(days)
612-544-5163(nights)
612-738-9734(nights)
CANADA: CANUTEC 613-996-6666(24hrs.)

I. IDENTIFICATION

PRODUCT NAME/NUMBER: 4700-CRU TILE-LIKE GLAZE COATING PART B

PART NUMBER: 08569

MATERIAL USE: Two-Component Urethane for Concrete Floors

CHEMICAL FAMILY: Urethane Prepolymer

DEPARTMENT OF TRANSPORTATION

U. N. #: NA1993

HAZARD CLASSIFICATION: Combustible Liquid
SHIPPING NAME: Combustible Liquid N.O.S.

II. PHYSICAL DATA

BOILING POINT: 295F. / 146C.

FREEZE POINT: N.A. /N.A.

DENSITY: 1.0 g/ml

% VOLATILE: 46% by wt

SOLUBILITY IN WATER: Not Soluble

VAPOR PRESSURE: 3.7 mm Hg @ 20 Deg.C.

ODOR THRESHOLD: N/A

pH: N.A.

PHYSICAL FORM: Liquid

VAPOR DENSITY: Heavier , THAN AIR

APPEARANCE AND ODOR: Clear/Ester-like

COEFFICIENT OF H2O/OIL DISTRIBUTION: N.A.

EVAPORATION RATE: Slower, THAN n-BUTYL ACETATE

MECHANICAL IMPACT: N.A.

STATIC DISCHARGE: N.A.

NOTE - N.A. or N/A denotes Not Available or Not Applicable

III. INGREDIENTS

| ITEM (CAS#) | WT. % | OSHA TLVs | | | LD/50 mg/kg | LC/50 |
|------------------------------------------------------------------|-------|-----------|--------|--------|--------------------------------------------------|--------------------------------|
| | | PEL | TWA | STEL | | |
| Propylene Glycol Monomethyl Ether Acetate (108-65-6) | 35-45 | N. A. | N. A. | N. A. | 5000 (skin rabbit) 8532 (oral rat) | N. A. |
| Xylene (1330-20-7) | 5-10 | 100ppm | 100ppm | 150ppm | 5000 (oral rat) | N. A. |
| 1,6-Hexamethylene Diisocyanate Based Adduct (4035-89-6) | 50-60 | N. A. | N. A. | N. A. | 710000 (oral rat) 75000 (dermal rabbit) | 137-1150 mg/m3 (INH rat) |

NOTE - N. A. or N/A denotes Not Available or Not Applicable

N. E. - Not Established

IV. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: 108F. / 42C. (SETA FLASH) FLAMMABLE LIMITS: L.E.L. 1.0% U.E.L. 7.0

AUTOIGNITION TEMPERATURE: N.A.

EXTINGUISHING MEDIA:

Use National Fire Protection Association (N.F.P.A.) Class B extinguishers (Carbon dioxide, dry chemical or foam).

SPECIAL FIRE FIGHTING PROCEDURES:

Water may be ineffective, but may be used to cool closed containers to prevent pressure buildup or possible autoignition when exposed to extreme heat (fog nozzles preferred). Wear self-contained breathing apparatus.

UNUSUAL FIRE AND EXPLOSION HAZARDS:

Keep containers tightly closed. Isolate from heat, electrical equipment, sparks and open flame. Closed containers may explode when exposed to extreme heat. Do not apply to hot surfaces.

V. REACTIVITY DATA

STABILITY: Stable

HAZARDOUS POLYMERIZATION: Will Not Occur

CONDITIONS TO AVOID:

N.A.

INCOMPATIBILITY (Materials to avoid):

Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS:

Carbon dioxide, carbon monoxide and nitrogen oxides in varying quantities.

VI. HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: See Section II for individual ingredients.

EFFECTS OF OVEREXPOSURE: PRIMARY ROUTE(S) OF ENTRY: Inhalation X Skin Contact X

SKIN CONTACT AND ABSORPTION:

Contains materials which may cause skin irritation.

EYE CONTACT:

Contains materials which may cause eye irritation and eye injury.

NOTE - N.A. or N/A denotes Not Available or Not Applicable

PRODUCT #4700-CRU TILE-LIKE GLAZE COATING PART B

INGESTION (Swallowing):

Contains materials which can cause a burning sensation, vomiting, diarrhea, drowsiness and tissue damage. Aspiration of material into lungs can cause chemical pneumonitis which can be fatal.

INHALATION (Breathing):

Repeated exposures may cause irritation to the upper respiratory tract and liver or kidney effects.

CARCINOGENICITY:

No specific information available.

CHRONIC EFFECTS OF OVEREXPOSURE:

No specific information available.

EMERGENCY AND FIRST AID PROCEDURES

SKIN CONTACT:

Wash thoroughly with soap and water.

EYE CONTACT:

Flush immediately with water for 15 minutes; CALL A PHYSICIAN.

INGESTION (Swallowing):

CALL A PHYSICIAN or POISON CONTROL CENTER. DO NOT attempt to induce vomiting and have this document available.

INHALATION (Breathing):

Remove to fresh air. Restore breathing if required. If breathing difficulty persists or occurs later, consult a physician and have this document available.

NOTE - N.A. or N/A denotes Not Available or Not Applicable

VII. SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

Remove all sources of ignition (flames, hot surfaces and electrical, static or frictional sparks). Avoid breathing vapors. Ventilate area. Remove with inert absorbent/scrub with soap and water.

WASTE DISPOSAL METHOD:

Dispose of in accordance with federal, state and local regulations.

VIII. SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (specify type):

Wear a chemical respirator approved for organic vapors (NIOSH 23C or equivalent) during the application and until the work area has been exhausted of all vapors.

VENTILATION:

Provide local exhaust ventilation to keep vapor concentrations below TLV (see Section II).

PROTECTIVE GLOVES:

Impervious gloves; i.e., rubber

EYE PROTECTION:

Chemical splash goggles

SKIN PROTECTION:

Impervious gloves; i.e., rubber

IX. SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:-

Store in a cool dry place. Store large quantities in buildings designed and protected for storage of NFPA Class II Combustible Liquids.

OTHER PRECAUTIONS:

Do not take internally. Avoid prolonged contact with skin; contaminated clothing should be removed immediately. Avoid free fall of liquid in excess of a few inches.

This Material Safety Data Sheet (MSDS) has been prepared in compliance with the Federal OSHA Hazard Communication Standard 29 CFR 1910.1200.

The information and recommendations contained herein are based upon data believed to be correct. However, no guaranty or warranty of any kind expressed or implied is made with respect to the information contained herein.

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