1/29/97

70-1257

SIEMENS

January 27, 1997
JBE:97:014

U.S. Nuclear Regulatory Commission
Attn.: Mr. Michael F. Weber
Licensing Branch
Division of Fuel Cycle Safety and Safeguards, NMSS
Washington DC

License No. SNM-1227
Docket No. 70-1257

Dear Mr. Weber:

Ref.: 1. Letter, K. J. Hardin to L. J. Maas, "Request for Additional Information, Low Level Radioactive Waste Shredding and Uranium Recovery", (TAC NO. L30896), dated December 10, 1996.

2. Letter, K. J. Hardin to L. J. Maas, "Request for Additional Information, Low Level Radioactive Waste Shredding and Uranium Recovery", (TAC NO. L30896), dated December 23, 1996.

Enclosed are Siemens Power Corporation's (SPC's) responses to the Staff's request for additional information in the referenced letters. We are scheduled to begin installation of equipment mid-March and begin operations by the end of April of this year.

If you have any questions or require further information, please call me on (509) 375-8663.

Very truly yours,

JBE

James B. Edgar
Staff Engineer, Licensing

pg

Enclosure

cc: C. A. Hooker, Region IV

NF04

TAC L30896, dated December 10, 1996

1. Process Description

1.1 Describe the equipment used for leaching, including vessel sizes, maximum quantity of the acid leaching fluid and feed in a batch, and a drawing or a schematic of the proposed layout of the equipment in relation to the module.

SPC Response

The leaching equipment layout is shown in Attachment 1. The leaching process is carried out in a stainless steel commercial washer/extractor manufactured by the Pellerin-Milnor Corporation of New Orleans, LA. The particular washer/extractor model is described in further detail in the vendor literature in Attachment 2. The washer drum holds a maximum of 130 U.S. gallons of leachant and will normally contain a maximum of approximately 300 pounds of feed material during wet waste processing. The normal maximum weight of the feed material during processing of HEPA and prefilter media will be on the order of 160 pounds. The washer/extractor drum is a horizontal cylinder that is 60 inches in diameter and 44 inches deep.

1.2 Describe precautions that will be taken, if any, to preclude contaminants that could react explosively with nitric acid from being introduced in the leaching process.

SPC Response

A complete process development effort has been undertaken to evaluate the reaction of each waste stream when placed in contact with dilute (3M) nitric acid at 75°C. During this effort, no adverse effects were observed under nominal operating conditions. Based on process knowledge regarding the wet waste, HEPA filter and prefilter inventories, there are no contaminants that will react explosively or violently with dilute nitric acid.

1.3 Where will nitric acid be stored and in what quantity? Will there be a dilution process on site, and if so, where? How will the diluted acid be transported to the leaching vessel?

SPC Response

The concentrated nitric acid is stored in the Raw Material/Storage Area in a stainless steel tote with a maximum capacity of 350 U.S. gallons. The nitric acid tote sits over a secondary containment pan which is designed to hold 100% of the contents of the tote. Concentrated nitric acid is transferred to the UNH Hold Tank (LE-TK-308) via the Nitric Acid Metering Pump (UT-PM-502) which is controlled by a flow totalizer (FIC-308) in the process area. The operator will initiate the dilution process by placing a specified quantity of water in the UNH Hold Tank. The totalizer is then set for the desired volume of concentrated acid and the UNH Hold Tank Agitator is energized. The acid is slowly

added to achieve the desired concentration of 3M for leaching. The diluted acid is transferred to the washer/extractor via the UNH Hold Tank Pump (LE-PM-315) when called for by the washer control system.

1.4 At what dilution will the acid be used? Will the acid and feed mixture be heated? If so, to what temperature? Describe the means of controlling the temperature.

SPC Response

The nitric acid leachant will be used at 3M (19% HNO_3). The dilute nitric acid is pre-heated in the UNH Hold Tank to approximately 60°C. This process is controlled by a thermocouple installed in the tank wall that provides a signal to a solenoid valve on the steam line. The nitric acid leachant in the washer is controlled to 75°C by a similar temperature feedback control mechanism using a thermocouple mounted in the bottom of the washer drum.

1.5 Where will the peroxide fluid used in the precipitation step be stored and in what quantity? How will it be transferred to the precipitation vessel?

SPC Response

30% H_2O_2 is transferred to the UNH Precipitation Tank (LE-TK-306) via the Hydrogen Peroxide Metering Pump (UT-PM-503) which is controlled by a flow totalizer (FIC-306) in the process area. The hydrogen peroxide is stored in a 55-gallon chemical drum located in the Raw Material/Storage Area. The operator will determine the amount of hydrogen peroxide that is required for precipitation. The totalizer is then set for the desired volume of hydrogen peroxide and the UNH Precipitation Tank Agitator is energized. The peroxide is slowly added to the desired concentration to effect uranium precipitation.

1.6 What solvent will be used in the solvent extraction part of the waste recovery in the ELO Building? Where will the solvent be stored and in what quantity?

SPC Response

Tributyl phosphate (TBP) and dodecane are the solvents used in the ELO solvent extraction process. A 55 gallon drum of each is stored on a spill container pallet outside the ELO Building.

2. Building Enclosure

2.1 Provide an estimate of the quantity (weight) of wood, plywood, and foam-board used in the construction of each module and an estimate of the fire load (Btu/sft of floor area).

SPC Response

The combustible material tables are provided as Attachment 3. These tables give the data on combustible materials that are present during each phase of waste recovery operation (i.e., wet waste, HEPA filters and prefilters). As shown in Attachment 3, the maximum fuel value for the MERF (73,000 BTU/ft^2) occurs during wet waste processing. The modules contain a total of approximately 5,800 pounds of plywood and approximately 2,500 pounds of foam board insulation.

The fire hazard analysis, to be completed by the end of January, will further discuss this issue.

2.2 List all doors or other openings providing thoroughfare between the modules and buildings, including ventilation openings. Alternatively, provide a detailed drawing showing such openings.

SPC Response

There are four doorways within the MERF facility that provide for normal thoroughfare between the modules. These include the personnel entry doorway (shown in detail on Attachment 4) and the interior personnel doorways (shown in detail on Attachment 5). The main personnel entry door (Attachment 4) employs a 2" thick metal door with a 2'x2' reinforced safety glass window. Because there is no fire area separation within the MERF, this door is not fire rated. The interior personnel doorways (Attachment 5), of which there are three within the facility, are open passageways with no doors. The openings are sealed with two-piece "plug-doors", one from inside and one from outside, for transportation and storage. Since all ventilation airflows are "hard piped" within the MERF, there are no "ventilation openings".

2.3 How are the chemicals storage room and the steam generator area separated from each other? Describe the construction of the separating wall, if any. Describe the steam generator, including its capacity and the method of heating.

SPC Response

There is no barrier wall in the Raw Material/Storage Area to separate the steam boiler from the chemical storage totes and drums. This was not considered necessary for basically two reasons. First, propane is not stored in bulk in the Raw Material/Storage Area but is piped from another facility approximately 150' away from the MERF. Thus, a boiler explosion or fire would not ignite a large volume of propane potentially endangering the integrity of the chemical storage containers. Second, the boiler is designed with an outer steel jacket that covers three (3) inches of castable refractory insulation. This material provides not only thermal insulation, but also reduces the potential for projectiles to result from a boiler failure. In essence, the boiler jacket acts as a separating wall from the remainder of the Raw Material/Storage Area. Detailed vendor information regarding

the boiler can be found in Attachment 6. The boiler generates 500,000 BTU/hr (15 BHP or 517 lbs/hr steam @ 150 psig) using propane gas.

2.4 List the materials, that would be stored in the raw materials/storage area. Very small quantities of chemicals in closed containers need not be listed. Provide copies of MSDS data sheets regarding the chemicals.

SPC Response

The only chemicals stored in the Raw Material/Storage Area are:

a) 57% HNO_3 - 350 U.S. gallons (UT-TK-502)
b) 50% NaOH - 200 U.S. gallons (UT-TK-506)
c) 30% H_2O_2 - 55 U.S. gallons (UT-TK-503)

The Material Safety Data Sheets (MSDS) for these chemicals are included as Attachments 7, 8 and 9.

2.5 What specific design features have been incorporated into the module/building complex to make it withstand a 100 mph gale? What will prevent its being uprooted by the gale force wind?

SPC Response

When the term "modular" is used in conjunction with a nuclear waste processing or recovery facility, the concept of mobile or modular home construction comes to mind. It should be clearly understood that the MERF does not employ the same building techniques or materials utilized in mobile or modular home or office construction. As opposed to typical mobile/modular construction, the MERF modules are constructed primarily of steel and are not designed to be installed above the ground with an under-pinning.

The modules incorporate minimal quantities of wood and are designed to sit at grade level on a series of grade beams and footings. This foundation design, which will be sealed at the bottom by tamping asphalt around the seam of the MERF and the waste storage pad at the SPC-ND site, precludes the infiltration of rainwater or wind underneath the structure. This abates the typical scenario of a mobile home being overturned due to wind forces generated underneath the structure. In addition, the four independent modules are physically bolted together at the interior door flanges and at the corners of each module. This creates a unitized structure with essentially four times the weight of a single module by itself.

During the design of the MERF, a structural analysis was done using 100 mph as the design basis wind velocity. Using a 40% stagnation pressure model (i.e., it is assumed that the stagnation pressure at 100 mph is integrated over 40% of the frontal surface), a

force sufficient to create a lift regime that could overturn the modules was not credible. There was however, a slight possibility that the modules could slide sideways under a sustained wind velocity of 100 mph. The foundation was therefore designed to resist lateral loads that might allow the modules to move sideways. The hold-down anchor design employed in the MERF foundation is the same one that is used by the shipping industry on Land/Sea containers for transoceanic passage.

3. MERF HVAC System

3.1 Does the HVAC duct system have any dampers, automatic or otherwise, to isolate a module or building from one another in the event of a fire? Does the system provide for exhaust of the air in a module in the event of a fire, and if it does, is the exhaust directed through the HEPA filter system?

SPC Response

Since the entire MERF is considered as a single fire area, there are no dampers to isolate the modules in the event of a fire. There are isolation dampers on the sorting glove box that close in the event of a fire. This serves to extinguish the fire and minimize the spreading of smoke and flames within the HVAC system. In the event of a fire, the HVAC supply fan will shut down and the exhaust fan will be throttled to half volume. All of the exhaust air under fire alarm conditions will continue to be routed through the HEPA filter system. Attachment 10 shows the panel arrangements for the Fire Alarm and HVAC Control Panels.

3.2 Is the fog deluge system protecting the final HEPA filters automatic in operation or manual?

SPC Response

The fog deluge in the non-scrubber HVAC train operates automatically using a temperature sensor in the ductwork.

4. Fire Protection

4.1 Will this project be incorporated in the Pre-Fire Plan of the facility? Will the Pre-Fire Plan be prepared in coordination with the City of Richland Fire Department?

SPC Response

MERF will be incorporated into the Pre-Fire Plan with input from the Richland Fire Department.

4.2 Provide a fire hazard analysis of the processes and the modules/buildings in which these will be implemented, and demonstrate that the probability of an accidental fire and the resultant release of radioactive material has been minimized to an acceptable level.

SPC Response

A fire hazard analysis is being prepared. We expect to provide a copy by the end of January.

TAC L 30896, dated December 23, 1996

1. Provide a detailed process description, including details of items important to safety (i.e., describe the controls used to ensure criticality safety).

SPC Response

The process description provided in the August 22, 1996 application remains accurate and is restated below.

Process Description

The first step in the recovery process is to sort and shred the material to put it into a physical form amenable to recovery. SPC will remove the frames from the HEPA filters and put the filter media in drums. The wet waste, prefilters, and HEPA filter media will be brought in drums to Recodyne'' sorting and shredding unit. In this unit Recodyne will empty and sort the contents of each drum. After sorting, some of the contents (e.g. HEPA filter media and plywood frames and plastic drums) will be shredded to facilitate either uranium recovery or incineration. Dilute nitric acid will be used to leach uranium out of the waste components designated for recovery. After leaching, these wastes will be water washed and the pH adjusted to at least 4.0 to facilitate the recovery of uranium from the washwater by peroxide precipitation. The leached and washed wastes will be compacted and assayed in preparation for either off-site disposal or on-site incineration. Uranium will be recovered directly from the acid liquor by chemical precipitation followed by filtration. The resulting filtrate represents the final effluent for discharge to SPC's lagoon system.

The controls used to ensure criticality safety are mass and enrichment. The waste material currently stored at SPC has been sorted and any uniquely identifiable pieces of uranium have been removed and NDA analysis to establish the ^{235}U content of the material has been done. As this material is brought into the LLRW process area, a second sorting of the waste material will be performed. After a batch of this waste material is processed, a complete cleanout of the process equipment is required. Independent inspections will assure that the equipment does not have any significant holdup of material prior to permitting another batch to be processed.

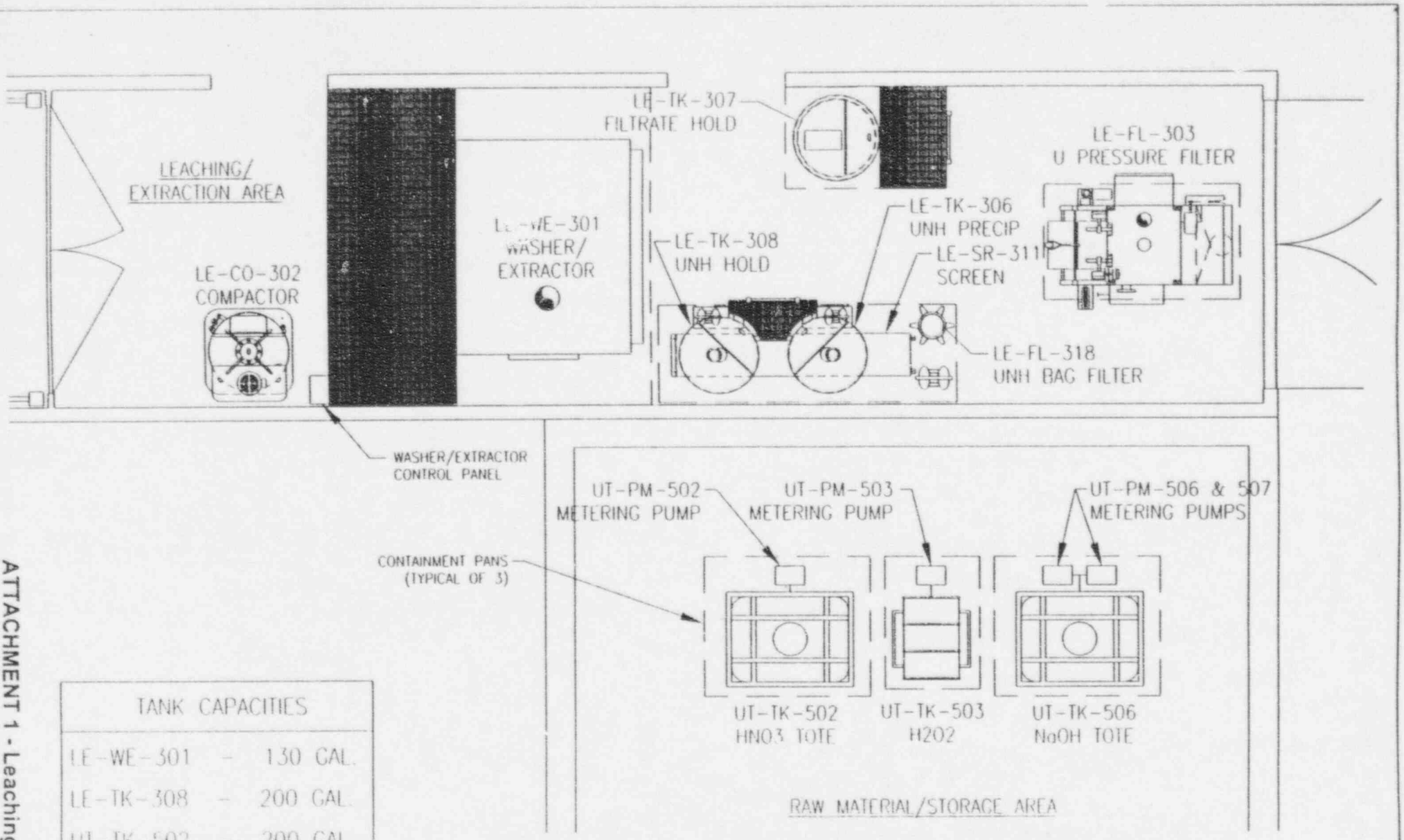
2. Provide a summary of the criticality safety analysis, including parameter safety limits and margins of safety and how they were derived.

SPC Response

As previously stated, the parameters controlled are mass and enrichment. The SPC facility is limited to an enrichment of 5 wt.% ^{235}U. Section 4.2.3.1 of the operating license establishes the minimum safety margin, when using mass control, at 45% of the minimum critical mass ("safe" mass) being

processed. This section also details the additional controls that must be used.

Table II.14.2 of the operating license provides the basis for critical and safe masses. For 5 wt.% enriched material the safe mass of UO_2 is 18.0 kg. This is equivalent to 15.8 kg U or 790 grams ^{235}U (the actual average enrichment of SPC's waste is approximately 3.5%). The process is controlled to 450 grams ^{235}U, thus ensuring that the process will conservatively remain well below the 790 gram ^{235}U safety limit, and the minimum critical mass of 1756 g^{235}U, when considering the random and systematic errors associated with the NDA of this material. The safety margin in terms of mass is approximately 3.9 (1756/450).



TANK CAPACITIES		
LE-WE-301	-	130 GAL.
LE-TK-308	-	200 GAL.
UT-TK-502	-	200 GAL.
UT-TK-503	-	55 GAL.
UT-TK-506	-	200 GAL.

ATTACHMENT 1 - Leaching Equip. Layout

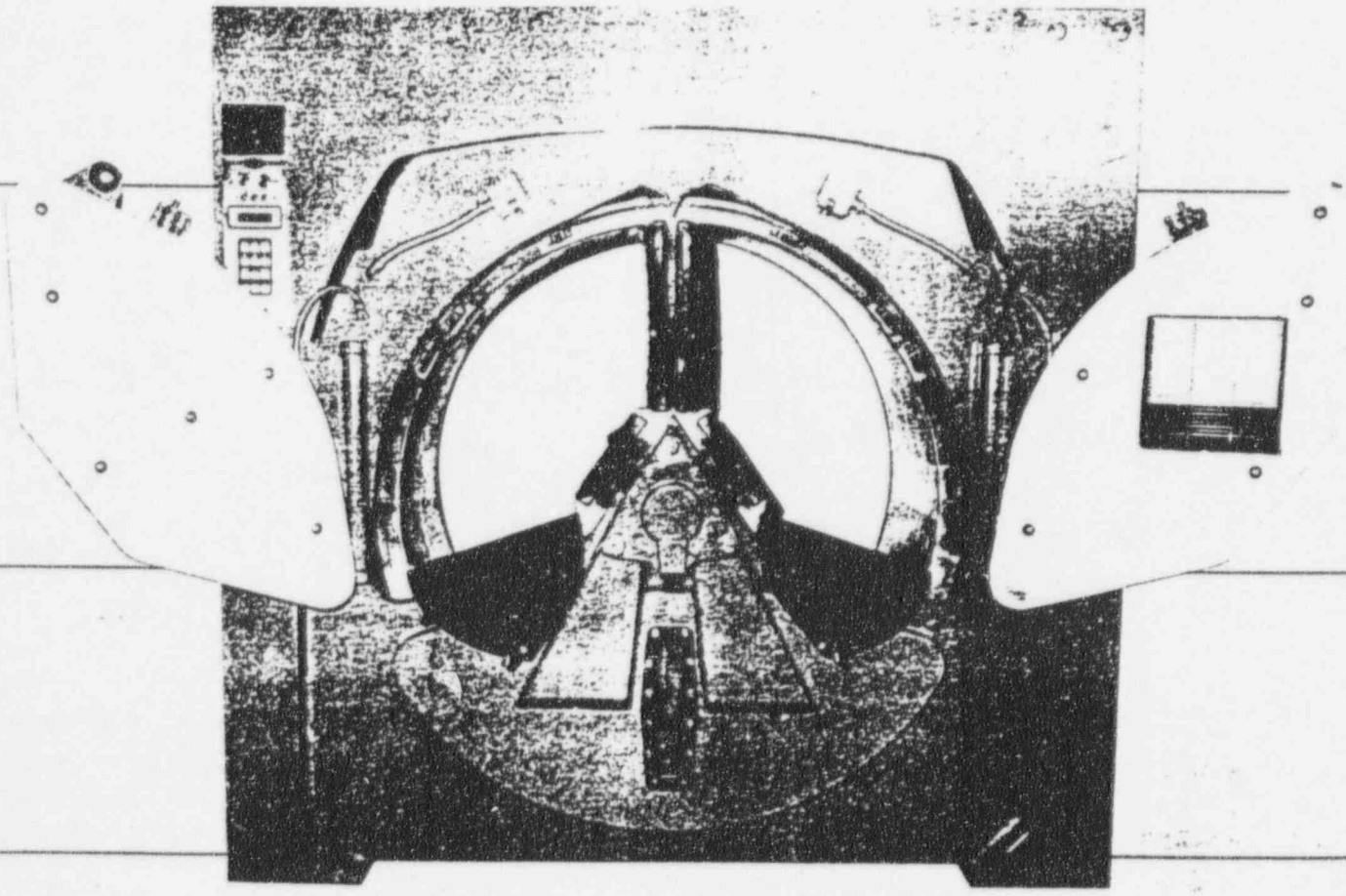
Recodyne
RECOVERY DYNAMICS CORPORATION
200 EAST MAIN STREET, 6th FLOOR
JOHNSON CITY, TENNESSEE 37604
(423) 975-5566

FILE: LEACH.DWG

MILNOR®

450-700 LB. DIVIDED CYLINDER WASHER-EXTRACTORS

60044 AND 72044 MODELS

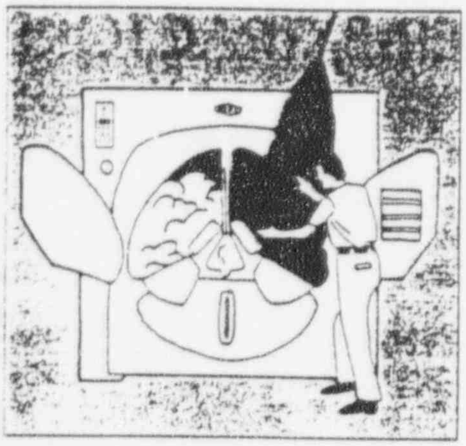


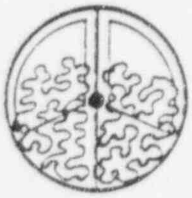
Two-pocket RAPID LOAD illustrated in loading position

WINK DAVIS EQUIPMENT
COMPANY, INCORPORATED
800 MIAMI CIR., N.E. SUITE 220
ATLANTA, GA 30324
404/266-2990

RAPID LOAD –
two pockets for fast, easy handling
and superior wash quality

Faster loading

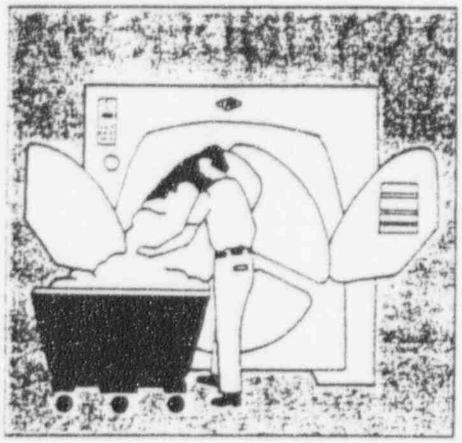


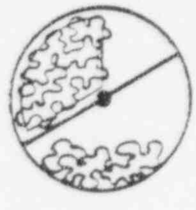


Both pockets are open at one time for loading. (No need to load one pocket, close the doors, inch the cylinder, and then open another set of doors to load the other pocket.)

Gravity makes sling loading easy. Plus, low doors facilitate manual loading. In large installations with several operators, two employees can load both pockets simultaneously to save even more time.

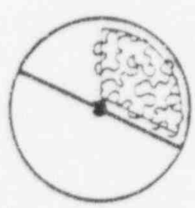
Faster unloading





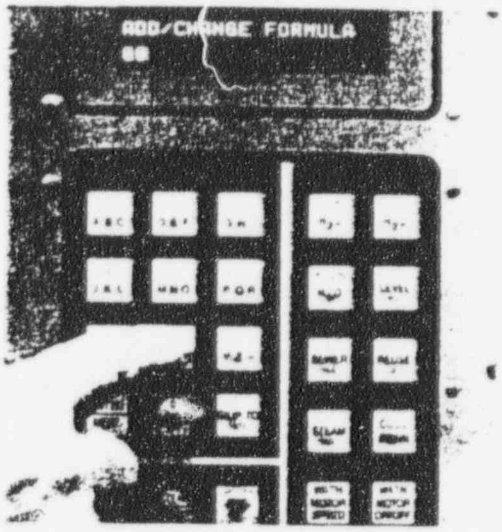
For easy removal of goods, the load is fluffed by a tumble cycle after extraction. Then the cylinder is rotated to locate the load directly in front of the door – about 18° below horizontal for unloading. With optional AUTOSPOT positioning is done automatically in seconds.

The machine's convenient door height makes unloading easy. Plus, the shelf-like inner door prevents the load from dropping between cylinder and shell.



The second pocket is unloaded just as easily by turning the cylinder to this position. AUTOSPOT does the job easily and accurately.

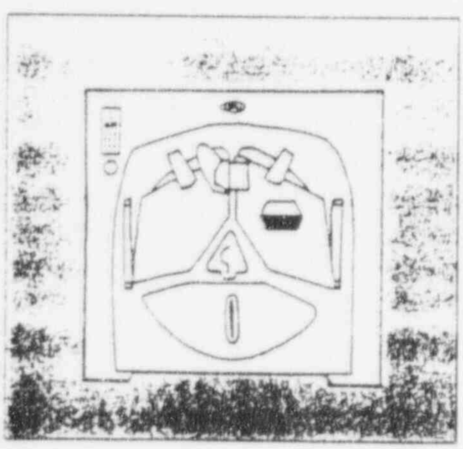
Microprocessor is simple, versatile.

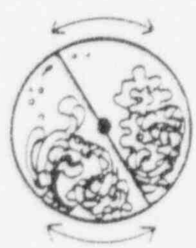


Microprocessor controller provides 100 formulas, 98 fully field-programmable. Two pre-programmed formulas get you started fast. Controller is user-friendly for both operator and programmer. Bright two-line alphanumeric display gives up-to-the-second operating information, plus prompts for each programming step. Help messages occur automatically or as requested. Microprocessor recognizes programming errors and requires appropriate action. Two-screen format lets the user view [illegible]. Formulas can be added, [illegible], deleted or modified in a single programming mode.

Any of the chemicals can be [illegible] into any bath, each at any of three starting points [illegible] pre-programmed [illegible]. Desired temperature can be digitally programmed into each formula step. Temperature control [illegible] calibrating for continued accuracy. Among other features: Formula downloading, production summaries, RS-232 port for printer, troubleshooting aids, key-switch protection, ability to operate manually while a formula is running, and interchangeability with control components from other Milnor machines.

Better washing action





RAPID LOAD's large 60-in. or 72-in. diameter cylinder – divided by only a single partition – provides greater dropping action for outstanding soil removal. Reversing action (note arrows) prevents tangling.

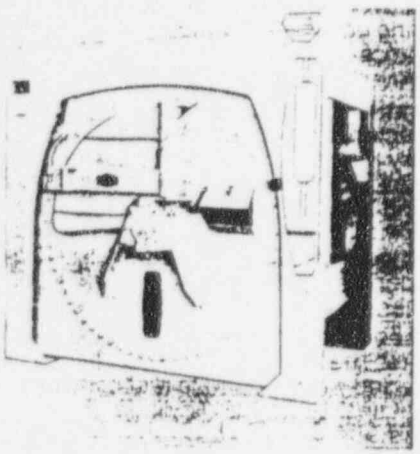
The big drop also fluffs the load at the end of the cycle, making it easier to remove from the machine.

Solid state temperature control for accuracy.

Desired temperature can be programmed digitally into each step of a formula – allowing infinite temperature settings. Temperature control is accurate and [illegible] that way because [illegible].

Automatic supply injection promotes consistency.

Automatically injects up to five supplies. Saves on labor and supplies, helps maintain steady quality. Before injection, supplies are diluted to prevent harm to the load. Uniform dispersion also helps improve quality. Optional central liquid supply injection is available, as are 10 extra supply signals and peristaltic pump connections.



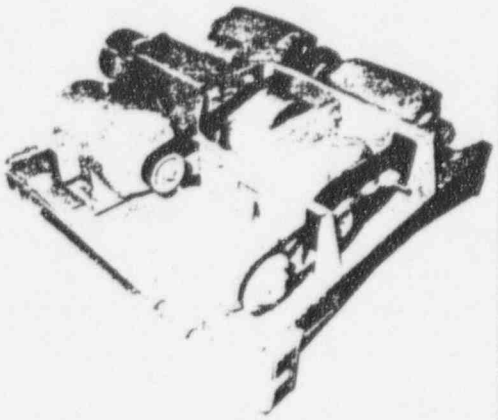
HYDRO-CUSHION® reduces objectionable vibration.

HYDRO-CUSHION® is a unique suspension system designed to minimize objectionable vibration. It includes a rugged steel frame and spring hydraulic units with heavy fluid damping. The machine is suspended within the frame from above its mass center, so it is stable for all directions of motion.

Provided a reasonable safety factor exists, the machine can be installed on any floor strong and rigid enough to support – without undue or objectionable deflections – the dead weight of the fully loaded machine, and the repeated forces transmitted to the floor by the rotating machinery. Consult manufacturer for full information.

Fast filling, draining accelerate production.

Fast filling and draining further reduce processing time. Ball-type water inlet valves have a faster flow rate than globe valves of equal size. Ball valves are also more trouble-free, and they help eliminate water hammer. Drain valves are sized to remove water rapidly.



Multiple-motor drive reduces power costs.

Separate motors are used for washing, load distribution/drain speed, low speed extraction, and final extraction. This reduces the peak load on each motor and allows use of smaller motors that require less electrical power.

Self-adjusting, self-aligning clutch requires no field adjustment. (Note: air pressure is needed to operate in machines.)

Large, low doors speed loading and unloading.

Loading and unloading doors are extra large and conveniently located for ease in handling. The doors on the big 700 lb. two-pocket model are only 36½" from the floor. For even easier handling, gravity performs a big share of the operation when loading two-pocket models.

Cylinder doors are constructed of stainless steel. Outer doors are completely interlocked to prevent opening while the machine is in operation.

AUTOSPOT (standard on Model 72044, optional on Model 60044) automatically locates the cylinder in precisely the right position each time for loading and unloading. This speeds turnaround time between loads by eliminating the guesswork usually required to position the cylinder.

Compact design saves space.

MILNOR washer-extractors occupy less space per pound of washing than other machines of like capacity. Compare the space-saving dimensions on the next page with those of competitive machines.

Ideal for poly-cottons and regular cottons.

Automatic cooldown (optional extra) helps keep wrinkles from setting in polyester-cottons, even at high temperatures. It gradually cools the load – automatically.

Precise temperature control is provided by MILNOR's solid state temperature control (standard). Infinite numbers of temperature settings can be digitally programmed for virtually any type of fabric. Accuracy is insured by automatic recalibration.

Low speed extraction helps keep wrinkles from setting in polyester-cottons.

Better engineering means greater reliability.

Large, high capacity roller bearings are grease-lubricated. Three seals shield bearings from the washing solution, and keep oil and grease from entering the shell. Rugged flange-type bearing mountings, with external boxed bracing, provided rigidity. Extraction forces are transmitted directly to front and rear shell heads, to minimize stress-strain deflection and vibration.

Throughout each machine, MILNOR employs rugged construction, continuous welding, and heavy materials for superior strength. Cylinders are fabricated entirely of high tensile stainless steel – including front and rear heads and compartment partitions. The machine's stainless steel shaft runs entirely through the cylinder for greater rigidity.

Other MILNOR models expand your alternatives.

MILNOR also manufactures many other types and sizes of commercial washing equipment. This equipment includes completely automated continuous batch washing systems (three batch sizes plus two types of extractors), and numerous open pocket washer-extractors. Available in sizes from 35 to 750 lbs., these washer-extractors span a full range of capabilities – from basic or pushbutton models to solid state controls, plus tilting models for faster turnaround and reduced labor. Dryers are available in several capacities, both as freestanding and automated systems machines.

Cylinder: Cylinder shall be fabricated entirely of 3/16" (.1875" thick) fully perforated low carbon Type 304L polished stainless steel. Continuous welding shall be used throughout; no spot or tack welds.

Shaft: 4⅜" schedule 40 stainless steel pipe on 60044 and 4¾" on 72044. Type 304L stainless steel, fully ground all over.

Cylinder doors: Shall be stainless steel, and shall project deeply into cylinder to prevent fabrics being caught between cylinder and door.

Shell: Shall be 10 ga. (.140"), low carbon Type 304 stainless steel, continuously welded.

Shell front and back: Shall be 1" thick, suitably machined, reinforced, and lined with low carbon Type 304 stainless steel.

Drain valve: Automatic air actuated drain valve in sizes shown in specification table below.

Drive: V-belts and helical gear drive. V-belts shall be easily changed in the field.

Clutch: Shall be air-operated, self-adjusting, self-aligning, expanding tire clutch.

Brake: Shall be self-adjusting and self-locking, with renewable lining.

Motors: Motors shall be single speed, of the horsepower shown in specification table. Motors shall be specifically designed and approved for their respective applications.

Overload protection: Motors shall be protected by thermal overload devices.

Safety switch: Vibration sensitive safety switch shall shut off machine, apply brake, and signal audibly in any case of excessive vibration.

Door interlock: An air actuated door latch shall prevent operator from opening door until cylinder has decelerated.

Bearings: Shall be self-aligning spherical roller bearings, grease lubricated.

Automatic solid state controls: Shall automatically fill, dump, rinse, extract, inject supplies, and signal at end of washing cycle and any other time required. During operation, two-line vacuum fluorescent display shall indicate names of both formula and operation underway. Control shall have capacity for up to 100 programs (98 fully programmable and two pre-programmed, one fixed, the other re-programmable). Display shall prompt operator while programming each step. Programming functions shall include the ability to copy (duplicate) complete formulas, and/or to add, delete or modify individual steps without need for re-programming subsequent steps. Control shall allow for full manual operation including manual output testing.

Machine shall be equipped with thermo-modulated hot and cold water valves (optional) plus a third water valve (optional) if specified. In addition to all hot, all cold, or both hot and cold full open, any other desired water temperature between 50°F (10°)C and 205°F (96°)C may be programmed in each bath.

Automatic supply injector: Shall automatically add proper supply at required time in cycle. Shall be mounted integrally on machine, and shall have two compartments for dry supplies and three for either dry or liquid supplies. Supplies shall be dissolved by water and flushed into machine. Supplies can be added in any order or at any point in the cycle.

Automatic cooldown: When specified, cooldown (optional) shall cause gradual, controlled cooling of polyester-cotton fabrics to prevent thermal shock, and shall provide for an infinite number of programmable setpoint temperatures. Adjustable valve shall limit rate of temperature decrease during cooldown. Operation shall be entirely automatic. During cooldown, formula time shall not advance until commanded temperature is achieved.

Vibration insulation system: The washer-extractor shall be supplied complete with a fully assembled vibration insulation mount. The suspension shall include four spring-hydraulic units with integral, heavy duty fluid damping means, and shall be designed so the washer-extractor is suspended from a point above its mass center.

Arrangement of loading/unloading doors: The washer-extractor shall be provided with a [illegible]rate and complete set of shell (outer) and cylinder (inner) doors.

RAPID LOAD models only: End-loading, two-pocket design permits loading of both pockets without repositioning the cylinder. Unloading shall be one pocket at a time, but with gravity assist facilitated by a divider slanted at approximately 20° below horizontal.

Maximum recommended capacity - lbs (kg)	Cylinder diameter x depth - inches (mm)	Number of cylinder compartments	Cylinder door area - Square inches	Height of loading doors above floor - inches (mm)	Wash motor - HP	Drain speed motor - HP	1st stage extraction motor - HP	2nd stage extraction motor - HP	Approx washing speed (reversing 4 times/minute) - RPM	Approx 1st stage extract speed - RPM	2nd stage extract Speed - RPM	Automatic drain valve - inches (mm)	Automatic inlet valves - inches (mm)	Overall width§ - inches (mm)	Overall depth§ - inches (mm)	Overall height§ - inches (mm)	Approximate net weight - lbs (kg)
450 (200)	60x44 (1524x1118)	2 or 3	1076* / 850 (6943*/ 5484)	34½* / 32½ (876*/ 826)	10	5	7½	20	21 / 27*	305	610 (317)	8 (203)	3** (76)	102⅝ (2607)	78¾ (1200)	94½ (2400)	11,994 (5452)
700 (315)	72x44 (1829x1118)	2 or 3	1700*/ 850 (5484*/ 10967)	36½* / 32½ (894*/ 826)	10	7½	15	20	22 / 26*	220	535 (292)	6x10 (254)	3** (76)	110¼ (2801)	86⅛ (2188)	105¼ (2673)	17,260 (7845)

*2-compartment models
**Equivalent flow rate
§With standard accessories
Capacity depends on density and soil content of goods.

Consult factory for acoustics data.

Specifications subject to change without notice.

Class 5-14 Brochure B22SL87010/94327 Printed in USA

Pellerin Milnor Corporation
P.O. Box 400
Kenner, Louisiana 70063
U.S.A. (Suburban New Orleans)
504/467-9591, Ext. 222
Fax: 504/468-9307

Wet Waste Processing Combustible Material Inventory for MERF Fire Hazard Analysis

Plastics - Piping/Duct	Weight(lb.)	BTU/lb.	Ref	BTUs	Notes
CPVC	324.8	7,717.1	Est	2,506,618	Piping Material, Estimated BTU/lb as PVC
PP	4.5	19,935.5	(1)	88,833	Piping Material
PVC	26.7	7,717.1	(1)	205,707	Piping Material
PVC Duct	2,300.0	7,717.1	(1)	17,749,330	Duct Work material
		Subtotal		20,550,488	BTUs

Glovebox Combustibles	Weight(lb.)	BTU/lb.	Ref	BTUs	Notes
Lexan - 1/4"	371.9	13,323.3	(1)	4,954,372	Glovebox Panels
55gal drum (HDPE) (1)	22.0	19,991.4	(1)	439,876	Estimated drum weight
Cotton Rags	140.0	8,770.4	(1)	1,227,856	High tendency for spontaneous heating if oily
Kerosene	1.3	19,948.4	(1)	24,975	Solvent Extraction Diluant
Nitrates	13.1	1,181.4	(2)	15,509	Absorbed in Wet Waste Matrix
Lubricating Oil	14.0	19,350.0	Est	270,900	Absorbed in Wet Waste, Estimated BTU/lb
Hydraulic Fluid	168.0	19,350.0	(3)	3,251,375	HEPA Punch,Drumdump,(4) Lift Tables
		Subtotal		10,184,862	BTUs

Chemicals	Weight(lb.)	BTU/lb.	Ref	BTUs	Notes
UO2 (Total)	33.0	1,729.9	(2)	57,086	Oxidant Value
Nitric Acid 57%	2,340.0	1,181.4	(2)	2,764,543	Oxidant Value - 200 gallons
Hydrogen Peroxide 35%	506.0	2,390.8	(2)	1,209,756	Oxidant Value - 55 gallons
Sodium Hydroxide 50%	2,560.0	4,588.2	(2)	11,745,792	Oxidant Value - 200 gallons
Propane - Gas	Negligible	21,646.6	(1)	Negligible	Piped into facility, not stored on site
Hydraulic Fluid	311.2	19,350.0	(3)	6,022,433	Compactor, Large Lift Table, Small Lift Table
		Subtotal		21,799,611	BTUs

Misc. Combustibles	Weight(lb.)	BTU/lb.	Ref	BTUs	Notes
Plywood - 1/2"	5,809.8	8,254.5	(1)	47,956,627	Wall Sheathing in Modules
Foam Insulation	2,525.4	17,067.9	(1)	43,103,141	Insulation in MERF Modules
PVC Coated Fabric	221.8	2,000.0	(4)	443,608	Weatherport Material
PP Tanks (2) 200 gal.	166.0	19,935.5	(1)	3,309,293	Process Equipment (LE-TK-307,MH-TK-210)
PP Tanks (1) 28 gal.	26.0	19,935.5	(1)	518,323	Process Equipment (HA-TK-425)
PP Tanks (1) 14 gal.	14.0	19,935.5	(1)	279,097	Process Equipment (ML-TK-224)
55gal drum (HDPE) (11)	242.0	19,991.4	(1)	4,838,633	Estimated drum weight
Bag Filters (PP) (2)	126.0	19,935.5	(1)	2,511,873	Process Equipment (ML-FL-216,LE-TK-318)
Wilden M1 Pump-PP(1)	9.3	19,935.5	(1)	184,403	Process Equipment (ML-PM-219)
Wilden M2 Pumps-PP(3)	54.0	19,935.5	(1)	1,076,517	Process Equip. (SS-PM-109,LE-PM-313,315)
Wilden M4 Pumps-PP(2)	76.0	19,935.5	(1)	1,515,098	Process Equipment (ML-PM-214,LE-PM-316)
Cotton Rags	1,540.0	8,770.4	(1)	13,506,416	High tendency for spontaneous heating if oily
Kerosene	13.8	19,948.4	(1)	274,729	Solvent Extraction Diluant
Nitrates	144.4	1,181.4	(2)	170,595	Absorbed in Wet Waste Matrix
Lubricating Oil	154.0	19,350.0	Est	2,979,900	Estimated BTU/lb as Hydraulic Fluid
		Subtotal		122,668,254	BTUs

Est - Estimated

Total	175,203,215	BTUs
Area	2,400	SqFt
Factor	73,001	BTU/SqFt

References:
1. Fire Protection Handbook (NFPA), Arthur E. Cote, P.E., Editor-in-Chief, Seventeenth Edition, 1992
2. Chemical Engineers Handbook, Robert H. Perry, Cecil H. Chilton, Fifth Edition, 1973
3. Mobile Oil Corporation
4. Hansen Weatherport Corporation

HEPA Processing Combustible Material Inventory for MERF Fire Hazard Analysis

Plastics - Piping/Duct	Weight(lb.)	BTU/lb.	Ref	BTUs	Notes
CPVC	324.8	7,717.1	Est	2,506,618	Piping Material, Estimated BTU/lb as PVC
PP	4.5	19,935.5	(1)	88,833	Piping Material
PVC	26.7	7,717.1	(1)	205,707	Piping Material
PVC Duct	2,300.0	7,717.1	(1)	17,749,330	Duct Work material
		Subtotal		20,550,488	BTUs

Glovebox Combustibles	Weight(lb.)	BTU/lb.	Ref	BTUs	Notes
Lexan - 1/4"	371.9	13,323.3	(1)	4,954,372	Glovebox Panels
HEPA Filter Wood (1)	16.0	8,254.5	(1)	132,039	3/4" Plywood Frames in Facility
Poly Bag (1)	0.3	19,991.4	(1)	4,998	Bin Liner
Hydraulic Fluid	168.0	19,350.0	(3)	3,251,375	HEPA Punch,Drumdump,(4) Lift Tables
		Subtotal		8,342,784	BTUs

Chemicals	Weight(lb.)	BTU/lb.	Ref	BTUs	Notes
UO2 (Total)	33.0	1,729.9	(2)	57,086	Oxidant Value
Nitric Acid 57%	2,340.0	1,181.4	(2)	2,764,543	Oxidant Value - 200 gallons
Hydrogen Peroxide 35%	506.0	2,390.8	(2)	1,209,756	Oxidant Value - 55 gallons
Sodium Hydroxide 50%	2,560.0	4,588.2	(2)	11,745,792	Oxidant Value - 200 gallons
Propane - Gas	Negligible	21,646.6	(1)	Negligible	Piped into facility, not stored on site
Hydraulic Fluid	311.2	19,350.0	(3)	6,022,433	Compactor, Large Lift Table, Small Lift Table
		Subtotal		21,799,611	BTUs

Misc. Combustibles	Weight(lb.)	BTU/lb.	Ref	BTUs	Notes
Plywood - 1/2"	5,809.8	8,254.5	(1)	47,956,627	Wall Sheathing in Modules
Foam Insulation	2,525.4	17,067.9	(1)	43,103,141	Insulation in MERF Modules
PVC Coated Fabric	221.8	2,000.0	(4)	443,608	Weatherport Material
PP Tanks (2) 200 gal.	166.0	19,935.5	(1)	3,309,293	Process Equipment (LE-TK-307,MH-TK-210)
PP Tanks (1) 28 gal.	26.0	19,935.5	(1)	518,323	Process Equipment (HA-TK-425)
PP Tanks (1) 14 gal.	14.0	19,935.5	(1)	279,097	Process Equipment (ML-TK-224)
Bag Filters (PP) (2)	126.0	19,935.5	(1)	2,511,873	Process Equipment (ML-FL-216,LE-TK-318)
Wilden M1 Pump-PP(1)	9.3	19,935.5	(1)	184,403	Process Equipment (ML-PM-219)
Wilden M2 Pumps-PP(3)	54.0	19,935.5	(1)	1,076,517	Process Equip. (SS-PM-109,LE-PM-313,315)
Wilden M4 Pumps-PP(2)	76.0	19,935.5	(1)	1,515,098	Process Equipment (ML-PM-214,LE-PM-316)
HEPA Filter Wood (23)	367.9	8,254.5	(1)	3,036,897	3/4" Plywood Frames in Facility
Cardboard Boxes (24)	48.0	8,000.0	(2)	384,000	Estimated Weight and BTU/lb
Poly Bag (23)	5.8	19,991.4	(1)	114,951	Bin Liner
		Subtotal		104,433,827	BTUs

Est - Estimated

Total	155,126,709	BTUs
Area	2,400	SqFt
Factor	64,636	BTU/SqFt

References: 1. Fire Protection Handbook (NFPA), Arthur E. Cote, P.E., Editor-in-Chief, Seventeenth Edition, 1992
2. Chemical Engineers Handbook, Robert H. Perry, Cecil H. Chilton, Fifth Edition, 1973
3. Mobile Oil Corporation
4. Hansen Weatherport Corporation

PreFilter Processing Combustible Material Inventory for MERF Fire Hazard Analysis

Plastics - Piping/Duct	Weight(lb.)	BTU/lb.	Ref	BTUs	Notes
CPVC	324.8	7,717.1	Est	2,506,618	Piping Material, Estimated BTU/lb as PVC
PP	4.5	19,935.5	(1)	88,833	Piping Material
PVC	26.7	7,717.1	(1)	205,707	Piping Material
PVC Duct	2,300.0	7,717.1	(1)	17,749,330	Duct Work material
		Subtotal		20,550,488	BTUs

Glovebox Combustibles	Weight(lb.)	BTU/lb.	Ref	BTUs	Notes
Lexan - 1/4"	371.9	13,323.3	(1)	4,954,372	Glovebox Panels
Pre-Filter Frames (24)	12.0	8,000.0	Est	96,000	Estimated BTU/lb
Poly Bag (24)	6.0	19,991.4	(1)	119,948	Bin Liner
Hydraulic Fluid	168.0	19,350.0	(3)	3,251,375	HEPA Punch,Drumdump,(4) Lift Tables
		Subtotal		8,421,695	BTUs

Chemicals	Weight(lb.)	BTU/lb.	Ref	BTUs	Notes
UO2 (Total)	33.0	1,729.9	(2)	57,086	Oxidant Value
Nitric Acid 57%	2,340.0	1,181.4	(2)	2,764,543	Oxidant Value - 200 gallons
Hydrogen Peroxide 35%	506.0	2,390.8	(2)	1,209,756	Oxidant Value - 55 gallons
Sodium Hydroxide 50%	2,560.0	4,588.2	(2)	11,745,792	Oxidant Value - 200 gallons
Propane - Gas	Negligible	21,646.6	(1)	Negligible	Piped into facility, not stored on site
Hydraulic Fluid	311.2	19,350.0	(3)	6,022,433	Compactor, Large Lift Table, Small Lift Table
		Subtotal		21,799,611	BTUs

Misc. Combustibles	Weight(lb.)	BTU/lb	Ref	BTUs	Notes
Plywood - 1/2"	5,809.8	8,254.5	(1)	47,956,627	Wall Sheathing in Modules
Foam Insulation	2,525.4	17,067.9	(1)	43,103,141	Insulation in MERF Modules
PVC Coated Fabric	221.8	2,000.0	(4)	443,608	Weatherport Material
PP Tanks (2) 200 gal.	166.0	19,935.5	(1)	3,309,293	Process Equipment (LE-TK-307,MH-TK-210)
PP Tanks (1) 28 gal.	26.0	19,935.5	(1)	518,323	Process Equipment (HA-TK-425)
PP Tanks (1) 14 gal.	14.0	19,935.5	(1)	279,097	Process Equipment (ML-TK-224)
55gal drum (HDPE) (11)	242.0	19,991.4	(1)	4,838,633	Estimated drum weight
Bag Filters (PP) (2)	126.0	19,935.5	(1)	2,511,873	Process Equipment (ML-FL-216,LE-TK-318)
Wilden M1 Pump-PP(1)	9.3	19,935.5	(1)	184,403	Process Equipment (ML-PM-219)
Wilden M2 Pumps-PP(3)	54.0	19,935.5	(1)	1,076,517	Process Equip. (SS-PM-109,LE-PM-313,315)
Wilden M4 Pumps-PP(2)	76.0	19,935.5	(1)	1,515,098	Process Equipment (ML-PM-214,LE-PM-316)
Pre-Filter Frames (24)	12.0	8,000.0	Est	96,000	Estimated BTU/lb
Poly Bag (11)	2.8	19,991.4	(1)	54,976	Drum Liner
		Subtotal		105,887,590	BTUs

Est - Estimated

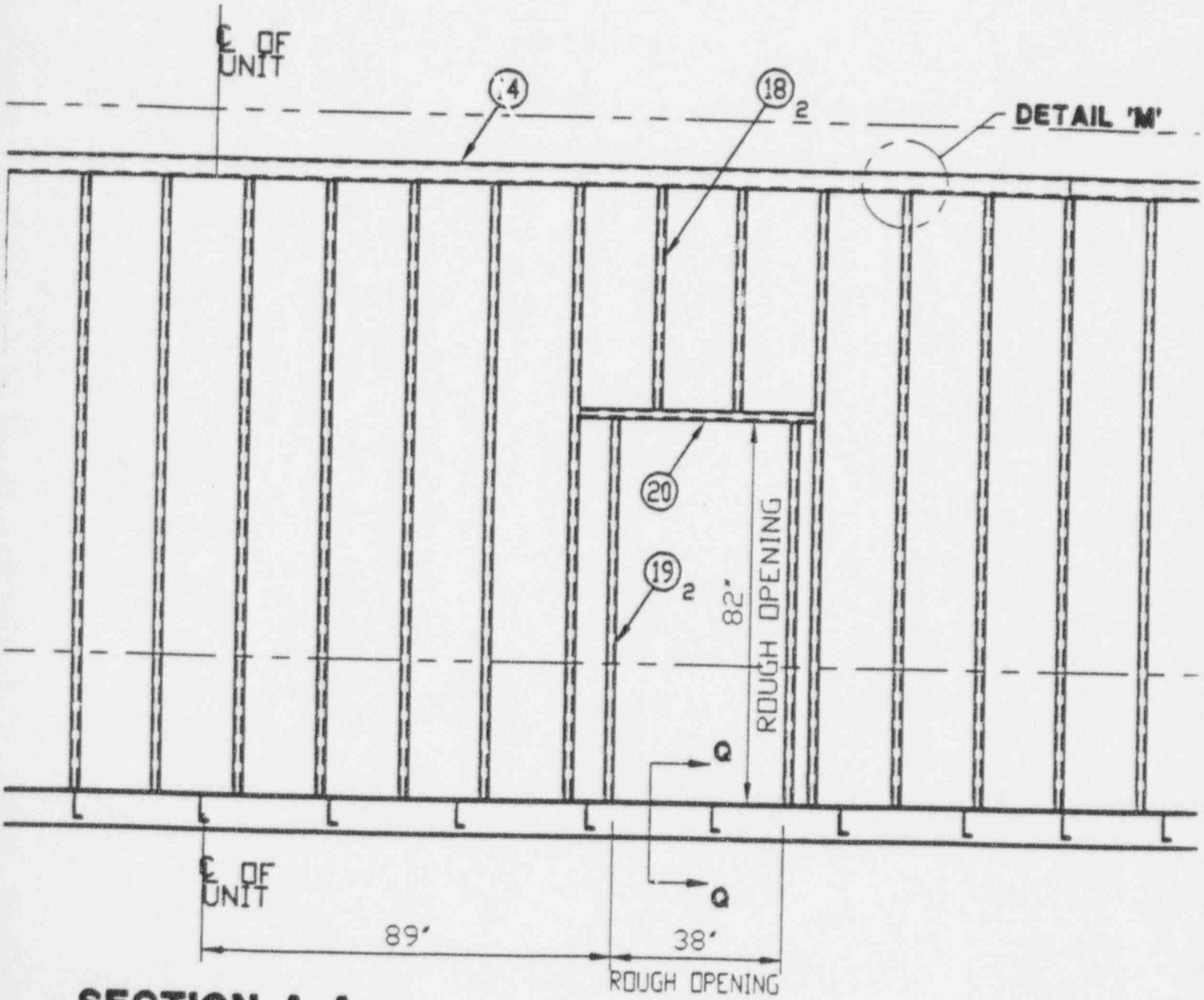
Total	156,659,384	BTUs
Area	2,400	SqFt
Factor	65,275	BTU/SqFt

References: 1. Fire Protection Handbook (NFPA), Arthur E. Cote, P.E., Editor-in-Chief, Seventeenth Edition, 1992
2. Chemical Engineers Handbook, Robert H. Perry, Cecil H. Chilton, Fifth Edition, 1973
3. Mobile Oil Corporation
4. Hansen Weatherport Corporation

600" ± 7/16
(OVERALL)

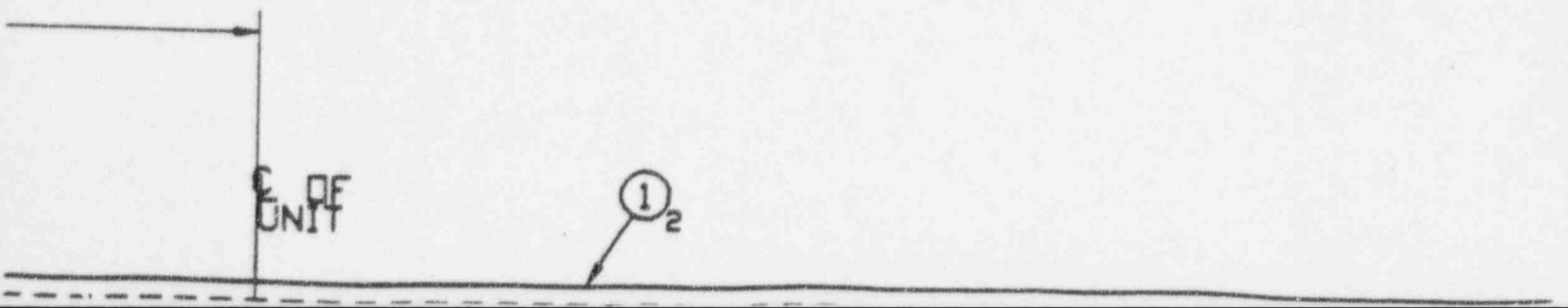
7/8" BETWEEN CORNER BLOCKS

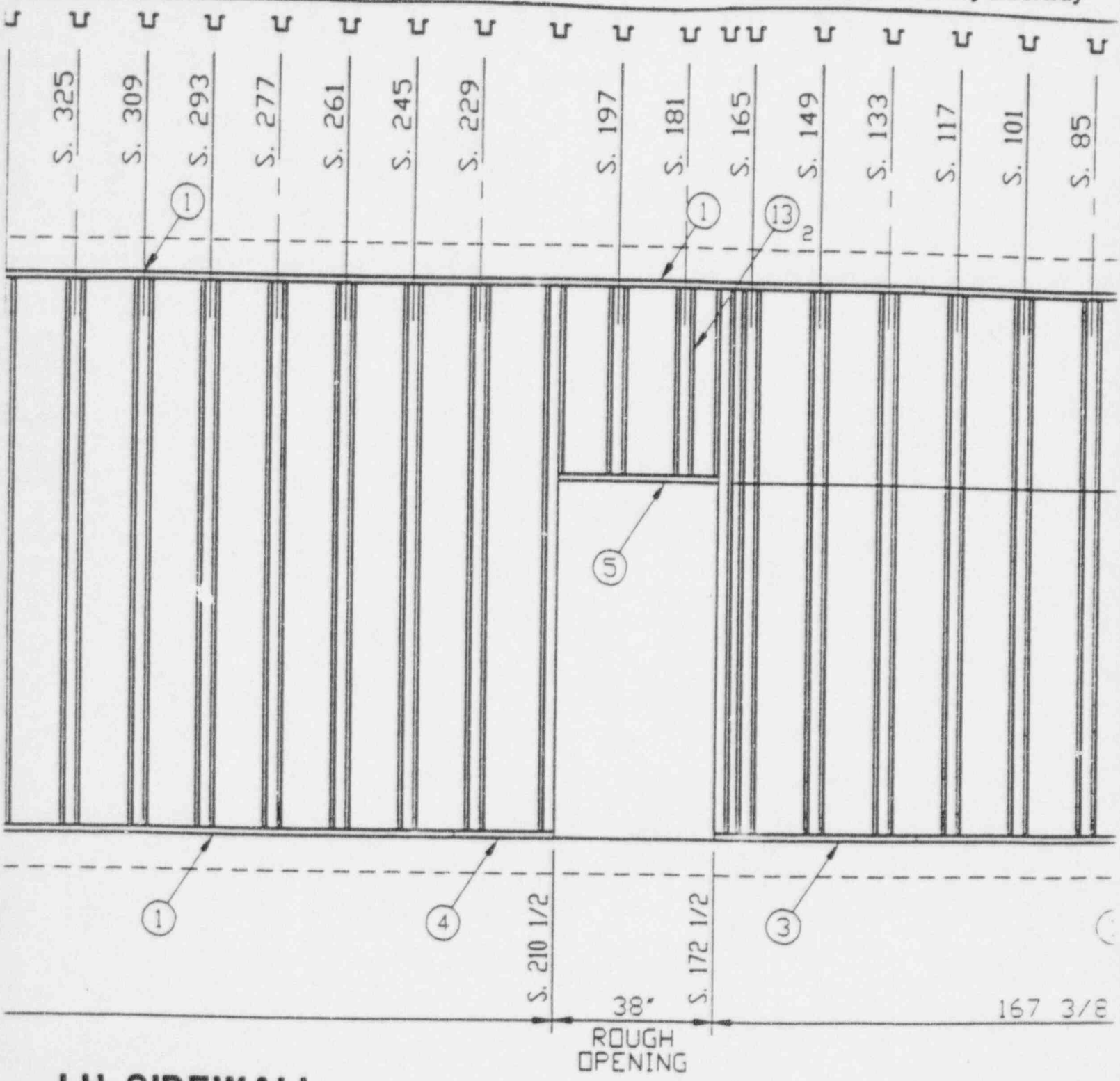
31) 18" SPACES = 558"



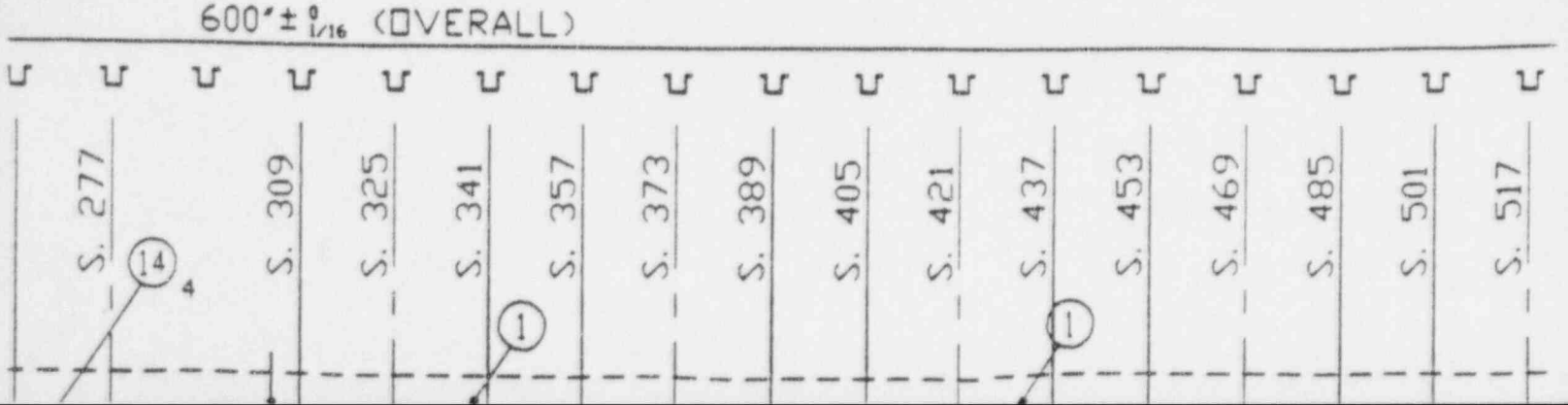
SECTION A-A

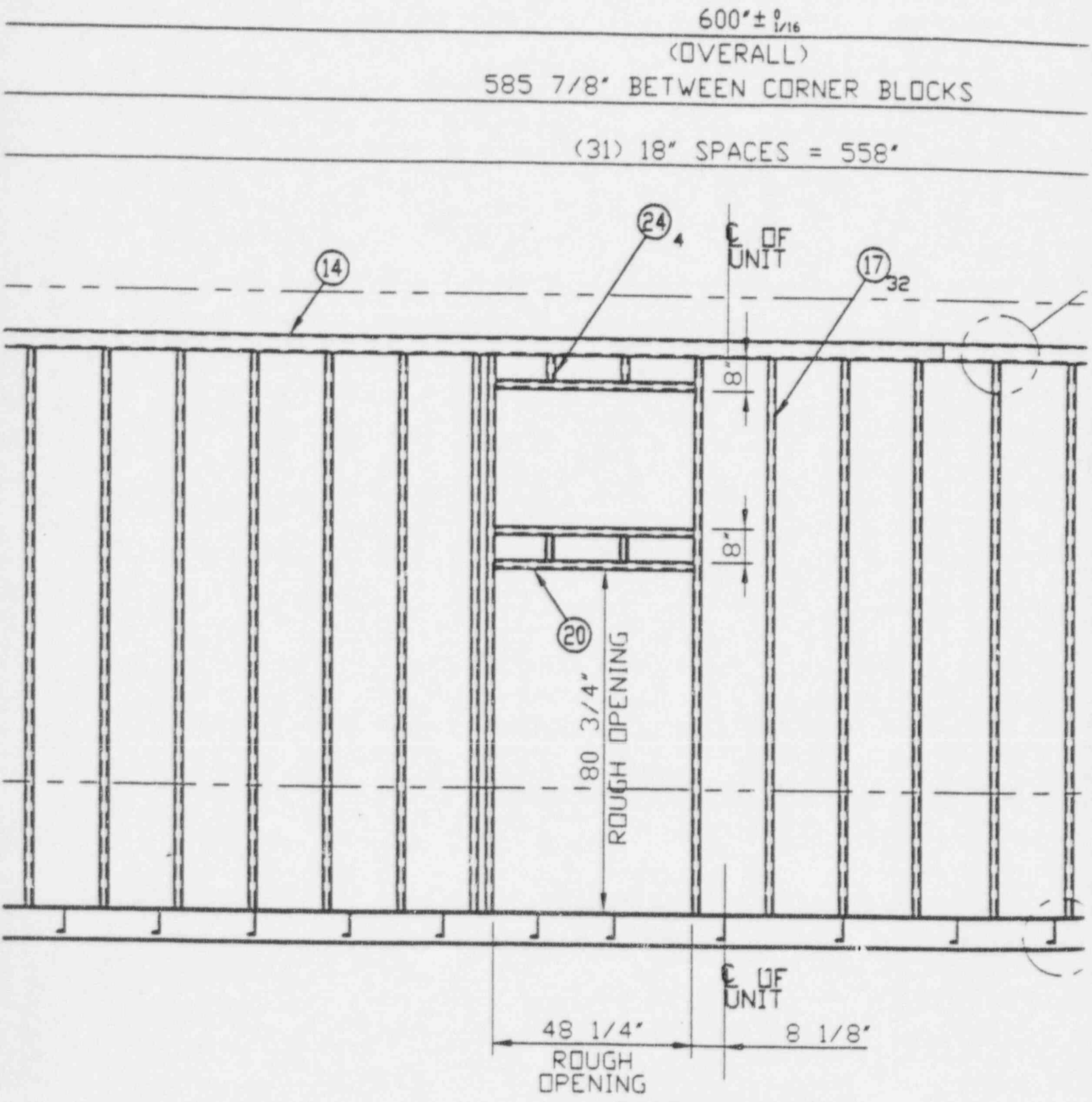
600" ± 0 1/16
(OVERALL)




600" ± 9/16 (OVERALL)
S. 325
S. 309
S. 293
S. 277
S. 261
S. 245
S. 229
S. 197
S. 181
S. 165
S. 149
S. 133
S. 117
S. 101
S. 85
1
1
13
2
5
1
4
3
S. 210 1/2
S. 172 1/2
38"
ROUGH OPENING
167 3/8

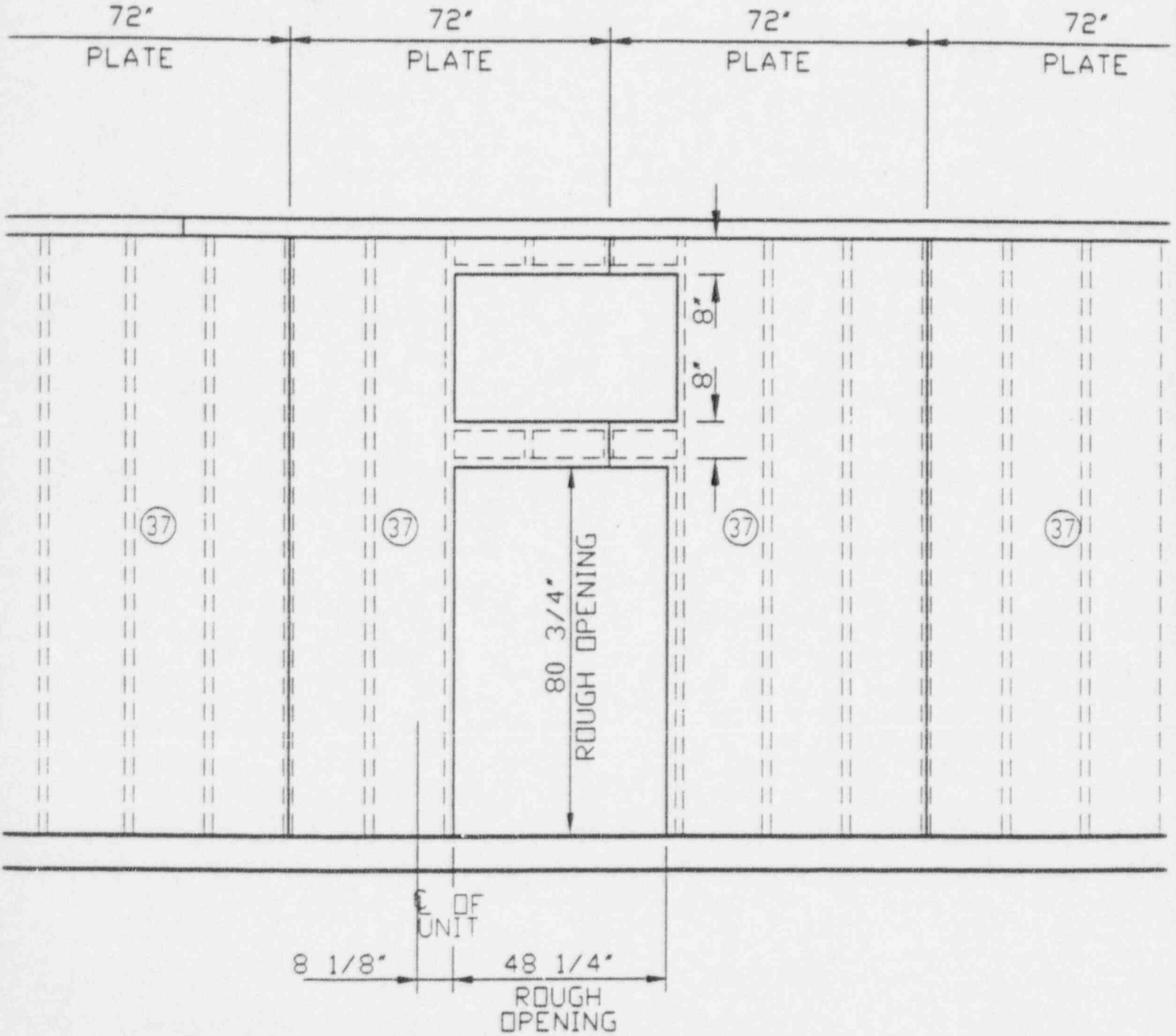
LH SIDEWALL


600" ± 9/16 (OVERALL)
S. 277
S. 309
S. 325
S. 341
S. 357
S. 373
S. 389
S. 405
S. 421
S. 437
S. 453
S. 469
S. 485
S. 501
S. 517
14
4
1
1


600" ± 0/16
(OVERALL)
585 7/8" BETWEEN CORNER BLOCKS
(31) 18" SPACES = 558"
24
4
℄ OF UNIT
14
17
32
8"
8"
20
80 3/4"
ROUGH OPENING
℄ OF UNIT
48 1/4"
ROUGH OPENING
8 1/8"
600" ± 0/16
(OVERALL)

SECTION C-C

600" ± 0/16
(OVERALL)
592" BETWEEN TS4x4 COLUMNS



EXTERIOR ELEVATION

COLUMBIA VERTICAL TUB

COLUMBIA CT SERIES BOILERS are used in...

- Dry Cleaning
- Sterilization
- Laminating
- Laundries
- Garment Manufacturing
- Candy Manufacturing
- Plating
- Dairies
- Food Processing
- Concrete Curing
- Bottle Washing
- Tire Recapping

and many other applications

Gas, Oil or Dual Fuel Fired

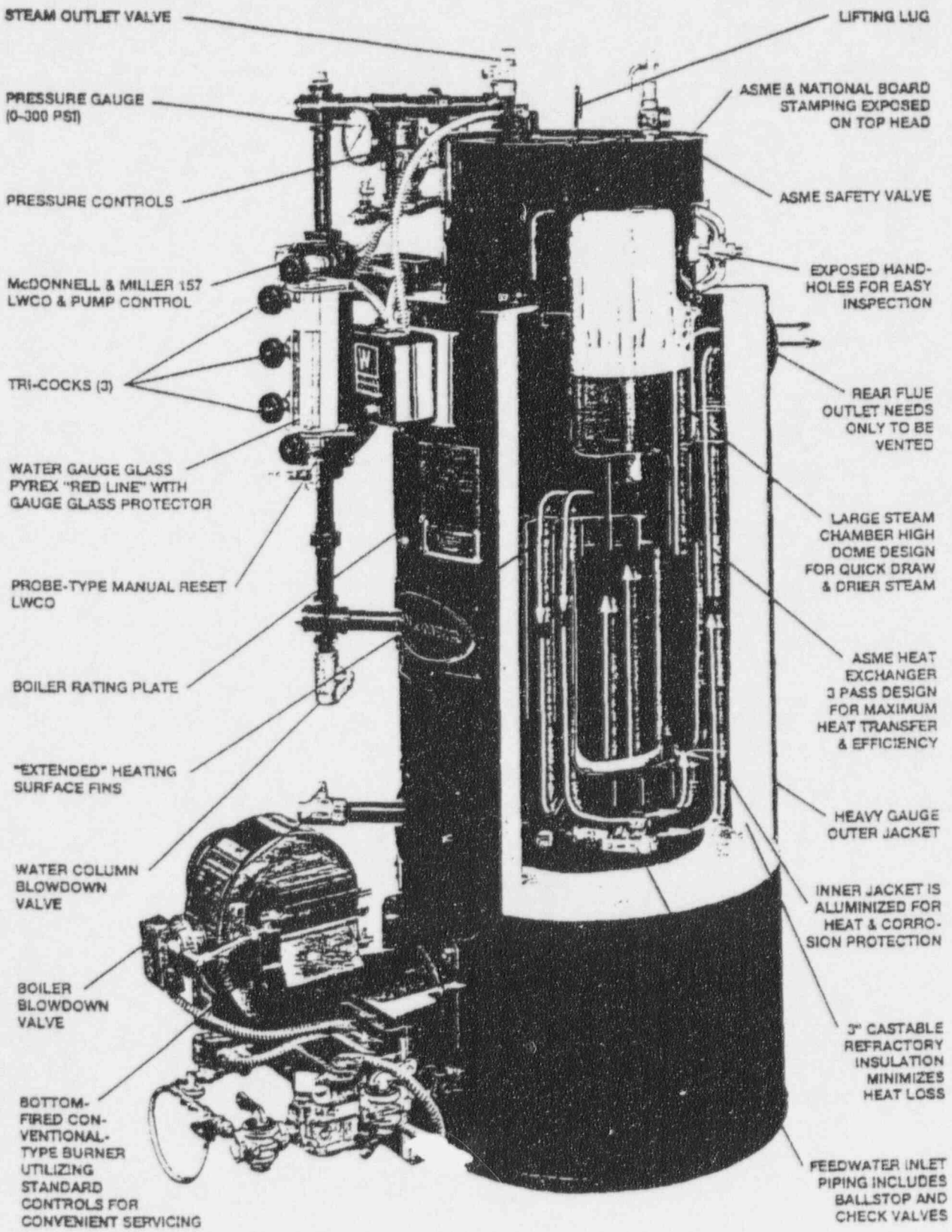
CT Features

CT 35

- Three-pass design for excellent heat transfer and high energy conservation.
- Pressure fired (need only to be vented).
- Very small floor space required, only 43" through 35 HP.
- 3200°F refractory combustion chamber ensures more complete combustion. (6-25 HP)
- Large steam chamber-High Dome Design for drier stream.
- Burner mounted in lower portion of boiler for easy accessibility.
- All boiler/burner parts and controls readily available.
- Gas and oil burners interchangeable.
- Power burners for high efficiency.
- Exposed hand holes provide easy access for cleaning and inspection.
- Completely packaged, test fired, skidded and crated at the factory.
- McDonnell Miller 157 float type low water cutoff and pump controller (standard).
- Secondary low water cutoff probe type with manual reset (standard).
- Additional manual reset pressure limit control (standard.)
- Gauge glass protector (standard).
- Standard heavy gauge steel outer jacket. Inner jacket is aluminized for heat and corrosion protection.
- Optional stainless steel jackets available.
- 3" castable refractory insulation minimizes heat loss.
- Range 6 to 35 horse power.
- UL listed packaged boiler. (6 to 35 HP)
- Design pressure 150 PSI.*(6 to 35 HP)
- Boiler shell and furnace welds are 100% X-ray inspected in accordance with Section I of the ASME Boiler and Pressure Vessel Code.
- Each CT Boiler is inspected by an independent inspection agency which is authorized by The National Board of Boiler and Pressure Vessel Inspectors.
- CSD-1 / FM / IRI requirements available.

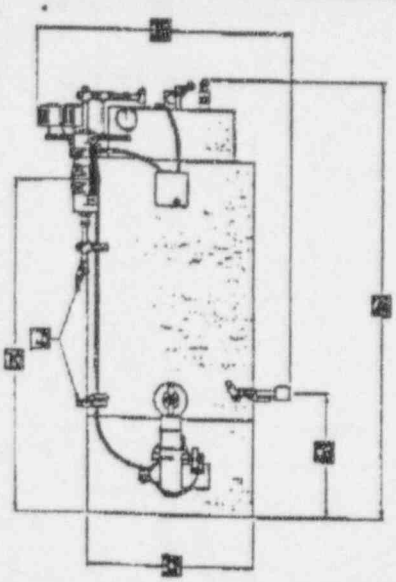
*Up to 250 PSI upon request.

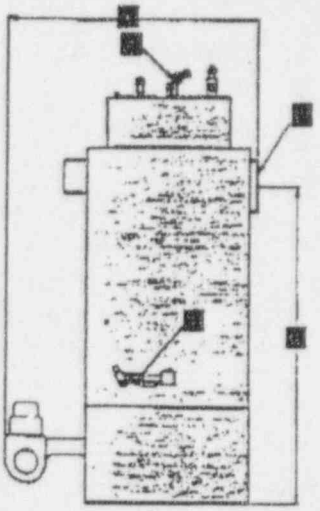
ELESS STEAM BOILERS



ATTACHMENT 6 - Steam Boiler (UT-SG-501)

SPECIFICATIONS AND DATA





MODEL NO:	VT-3	CT-6	CT-10	CT-15	CT-20	CT-25	CT-35
RATINGS:							
Horsepower	3	6	10	15	20	25	35
Gas Input (BTU per Hour)	126,000	252,000	420,000	630,000	840,000	1,050,000	1,470,000
Oil Input (Gals. per Hour)	0.90	2.00	3.00	4.50	6.00	7.50	10.50
Output (BTU per Hour)	100,800	201,600	336,000	504,000	672,000	840,000	1,176,000
Output (Lbs. Steam per Hour)	103	207	345	517	690	862	1207
Maximum Allowable Working Pressure	100	150	150	150	150	150	150
Water Capacity (Gals)	10	16	27	37	43	59	90
Hand Hole Sizes	N/A	(3) 3 x 4	(3) 3 x 3-3/4	(3) 3 x 3-3/4	(4) 3 x 3-3/4	(4) 3 x 3-3/4	(4) 3 x 3-3/4
BOILER DIMENSIONS:							
A Boiler Height (Includes Piping)	52-1/2"	70"	78"	84"	88"	92"	96"
B Boiler Diameter (Left to Right, packaged including MM)	28-1/8"	34"	36"	40"	41"	42"	43"
C Boiler Diameter (Left to Right, less Trim & Piping)	18-1/4"	27"	30"	34"	37"	40"	43"
D Burner to Flue Outlet (Ft. to Bk. approx)	36"	47"	48"	54"	58"	62"	71"
E Flue Outlet (Diameter)	6"	6"	8"	10"	10"	12"	12"
F Flue Outlet to Floor (Centerline)	54-1/2"	48-1/4"	55"	60"	63-1/2"	65-1/2"	69"
G Steam Outlet (IPS)	3/4"	3/4"	3/4"	1"	1"	1-1/4"	1-1/4"
H Feedwater Inlet (IPS)	1/2"	1/2"	1/2"	1/2"	3/4"	3/4"	3/4"
I Feedwater Inlet to Floor (Centerline)	29"	22-3/8"	24-3/8"	24-3/8"	27-3/8"	28-3/8"	13-1/2"
J Blowdown Outlet (IPS)	1"	1"	1"	1"	1"	1"	1"
K Normal Water Line to Floor	24"	46-3/4"	54-1/2"	60-1/2"	65"	69"	69-1/8"
Approx. Floor Space	3' x 5'	3' x 5'	3' x 5'	3-1/4' x 5'	3-1/2' x 5-1/2'	4' x 6'	5' x 8'
CRATED DIMENSIONS:							
Left to Right	42"	38"	41"	43"	44"	44"	45-1/2"
Front to Rear	48"	53"	56"	62"	66"	66"	77"
Height	59"	73"	81"	86"	95"	95"	95"
Approx. Shipping Wt. (Skidded & Crated)	700 lb	1580 lb	1900 lb	2450 lb	3075 lb	3400 lb	4650 lb

* Fire Tube Design-100 PSI-not UL approved-Miniature Code.

America's Most Trusted Name in Industrial, Commercial and Residential Boilers

COLUMBIA® BOILER COMPANY

P.O. Box 1070, Pottstown, PA 19464 • Phone (610) 323-2700 • FAX (610) 323-7292

CT 3/94 5M MB

PRINTED IN U.S.A.

ATTACHMENT 6 - Steam Boiler (UT-SG-501)

OHS/MDL Record Number : OHSLP100
MATERIAL SAFETY DATA SHEET

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MDL Information Systems, Inc.
14600 Catalina Street
San Leandro CA 94577
1-800-635-0064 (Toll Free) or
1-510-895-1313

FOR EMERGENCY SOURCE INFORMATION
CONTACT: 1-615-366-2000 in USA

SUBSTANCE: NITRIC ACID

TRADE NAME/SYNONYM(S): INV# 05753

CHEMICAL FAMILY: Mixture, aqueous; Inorganic acid

SUMMARY SHEET AVAILABLE: Y

CREATION DATE: 19910123 REVISED: 19960106 CHEM CHANGE DATE: 19951010

SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS

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1) Component Substance: NITRIC ACID
Component Percent: Range 52.3-67.2 %
CAS Registry Number: 7697-37-2
Component SARA 302 TPQ: 1000
Component SARA 304 RQ: 000001000
2) Component Substance: WATER
Component Percent: Range 33.0-48.0 %

SECTION 3 - HAZARDS IDENTIFICATION

NFPA Ratings (scale 0-4): Health=3 Fire=0 Reactivity=0

EMERGENCY OVERVIEW:

DESCRIPTION: Clear, colorless to light brown liquid with an acrid odor.
STATEMENT OF HAZARDS:
May be fatal if inhaled. Causes respiratory tract, skin, and eye burns and
severe burns to mucous membranes.
PRECAUTIONARY STATEMENTS:
Poison. Do not breathe vapor or mist. Do not get in eyes, on skin, or on clothing. Keep from contact with clothing and other combustible materials.
Store away from combustible materials. Keep container tightly closed. Wash
thoroughly after handling. Use only with adequate ventilation. Handle with
caution.
POTENTIAL HEALTH EFFECTS
INHALATION:
SHORT TERM EFFECTS: May be fatal if inhaled. May cause burns. Additional effects may include nausea, difficulty breathing, low blood pressure, headache, dizziness, bluish skin color and lung congestion.
LONG TERM EFFECTS: May cause effects as in short term exposure. Additional
effects may include tooth decay and digestive disorders.

ATTACHMENT 7 - 57% HNO_3 Material Safety Data Sheet

INGESTION:
SHORT TERM EFFECTS: May cause burns. Additional effects may include fever, nausea, vomiting, diarrhea, stomach pain, difficulty breathing, low blood pressure, kidney damage, convulsions, shock and coma.
LONG TERM EFFECTS: Same effects as short term exposure.

CARCINOGEN STATUS:
OSHA: N
NTP: N
IARC: N

SECTION 4 - FIRST AID MEASURES

INHALATION:
FIRST AID- Remove from exposure area to fresh air immediately. Perform artificial respiration if necessary. Maintain airway, blood pressure and respiration. Keep warm and at rest. Treat symptomatically and supportively. Get medical attention immediately. Qualified medical personnel should consider administering oxygen.
SKIN CONTACT:
FIRST AID- Remove contaminated clothing and shoes immediately. Wash with soap or mild detergent and large amounts of water until no evidence of chemical remains (at least 15-20 minutes). If burns occur, proceed with the following: Cover affected area securely with sterile, dry, loose-fitting dressing. Treat symptomatically and supportively. Get medical attention immediately.
EYE CONTACT:
FIRST AID- Wash eyes immediately with large amounts of water, occasionally lifting upper and lower lids, until no evidence of chemical remains (at least 15-20 minutes). Continue irrigating with normal saline until the pH has returned to normal (30-60 minutes). Cover with sterile bandages. Get medical attention immediately.
INGESTION:
FIRST AID- Do not use gastric lavage or emesis. Give large amounts of water or milk. Repeat if vomiting occurs. Ingested corrosive should be diluted approximately 100 times to render it harmless to tissues. (Dreisbach & Robertson; Handbook of Poisoning; 12th Ed.). Do not give anything by mouth to a person who is unconscious or otherwise unable to swallow. If vomiting occurs, keep head lower than hips to help prevent aspiration. Maintain airway and respiration. Treat symptomatically and supportively. Get medical attention immediately.

SECTION 5 - FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARD:
Negligible fire hazard when exposed to heat or flame.

Oxidizer: Oxidizers decompose, especially when heated, to yield oxygen or other gases which will increase the burning rate of combustible matter. Contact with easily oxidizable, organic, or other combustible materials may result in ignition, violent combustion or explosion.
EXTINGUISHING MEDIA:
Water, dry chemical or soda ash
(1993 Emergency Response Guidebook, RSPA P 5800.6).
For larger fires, flood area with water from a distance
(1993 Emergency Response Guidebook, RSPA P 5800.6).
FIREFIGHTING:
Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn (1993 Emergency Response Guidebook, RSPA P 5800.6. Guide Page 44).

Flood with water. Cool containers with flooding amounts of water applied from as far a distance as possible. Keep upwind. If fire is uncontrollable, evacutate to a radius of 2500 feet.

HAZARDOUS COMBUSTION PRODUCTS:
Thermal decomposition products may include toxic oxides of nitrogen.

Cool containers with flooding amounts of water from as far a distance as possible. Avoid breathing corrosive vapors or dusts. If fire is uncontrollable, evacuate for a radius of 2500 feet.

FLASH POINT: Not applicable

HAZARDOUS COMBUSTION PRODUCTS:
Thermal decomposition products may include oxygen.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

OCCUPATIONAL SPILL:
Keep combustibles (wood, paper, oil, etc.) Away from spilled material. Do not touch spilled material. Stop leak if you can do it without risk. Use water spray to reduce vapors. Do not get water inside container. For small dry spills, with clean shovel place material into clean, dry container and cover. Move containers from spill area. For small liquid spills, flush area with flooding amounts of water. For larger spills, dike far ahead of spill for later disposal. Keep unnecessary people away. Isolate hazard area and deny entry.
Reportable Quantity (RQ): The Superfund Amendments and Reauthorization Act (SARA) Section 304 requires that a release equal to or greater than the reportable quantity established for that substance be immediately reported to the local emergency planning committee and the state emergency response commission (40 CFR 355.40). If the release of this substance is reportable under CERCLA Section 103, the National Response Center must be notified immediately at (800) 424-8802 or (202) 426-2675 in the metropolitan Washington, D.C. area (40 CFR 302.6).

HYDROGEN PEROXIDE (Olin Corporation has reported the following): Remove all ignition sources. Do not place spilled materials back in their original containers.

SECTION 7 - HANDLING AND STORAGE

Observe all federal, state and local regulations when storing or disposing of this substance.

Consult NFPA publication 43A, Storage of Liquid and Solid Oxidizing Materials, for Storage Requirements.

Store in a cool, dry, well ventilated area.

Do not store near heat or flame.

Protect from light.

Shelf life is 12 months.

Store below 100 F.

Store away from incompatible substances.

SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:
HYDROGEN PEROXIDE:
1 ppm (1.4 mg/m3) OSHA TWA
1 ppm (1.4 mg/m3) ACGIH TWA
ACGIH A3-Animal Carcinogen (Proposed Addition 1995-96)
1 ppm (1.4 mg/m3) NIOSH recommended 10 hour TWA
1 ppm (1.4 mg/m3) DFG MAK TWA;
2 ppm (2.8 mg/m3) DFG MAK 5 minute peak, momentary value, 8 times/shift

HYDROGEN PEROXIDE (GREATER THAN 52%):
1000 pounds SARA Section 302 Threshold Planning Quantity
1 pound SARA Section 304 Reportable Quantity

7500 pounds OSHA Process Safety Management Threshold Quantity

VENTILATION:

Provide local exhaust ventilation system to meet published exposure limits.

EYE PROTECTION:

Employee must wear splash-proof or dust-resistant safety goggles with or without a faceshield to prevent contact with this substance. Emergency eye wash: Where there is any possibility that an employee's eyes may be exposed to this substance, the employer should provide an eye wash fountain within the immediate work area for emergency use. CLOTHING: Employee must wear appropriate protective (impervious) clothing and equipment to prevent repeated or prolonged skin contact with this substance. GLOVES: Employee must wear appropriate protective gloves to prevent contact with this substance.

RECOMMENDED MATERIAL TYPES:

Natural rubber

RESPIRATOR:

The following respirators and maximum use concentrations are recommendations by the U.S. Department of Health and Human Services, NIOSH Pocket Guide to Chemical Hazards; NIOSH criteria documents or by the U.S. Department of Labor, 29 CFR 1910 Subpart Z. The specific respirator selected must be based on contamination levels found in the work place, must not exceed the working limits of the respirator and be jointly approved by the National Institute for Occupational Safety and Health and the Mine Safety and Health Administration (NIOSH-MSHA).

HYDROGEN PEROXIDE:

10 ppm- Any supplied-air respirator.

25 ppm- Any supplied-air respirator operated in a continuous-flow mode.

50 ppm- Any self-contained breathing apparatus with a full facepiece.

Any supplied-air respirator with a full facepiece.

75 ppm- Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

Escape- Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against this compound. Any appropriate escape-type, self-contained breathing apparatus.

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode. Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

DESCRIPTION: Clear, colorless liquid.
PHYSICAL STATE (S,L,G): L
BOILING POINT: 223 F (106 C) (30% solution)
MELTING POINT: -15 F (-26 C)
SPECIFIC GRAVITY: 1.113 (30% solution)
pH: 3.3 (30% solution)
VAPOR PRESSURE: 25 mmHg @ 30 C
VOLATILITY: 100%
WATER SOLUBILITY: Complete

SECTION 10 - STABILITY AND REACTIVITY

REACTIVITY:

Stable under normal temperatures and pressures.

CONDITIONS TO AVOID:

May ignite other combustible materials (wood, paper, oil, etc.). Reaction with fuels may be violent. Flammable poisonous gases may accumulate in tanks and hopper cars. Runoff to sewer may create fire or explosion hazard.

INCOMPATIBILITIES:

HYDROGEN PEROXIDE (Olin Corporation has reported the following):
BACOC: May generate oxygen gas and high pressure.
COMBUSTIBLE MATERIALS: Incompatible.
METALS: May generate oxygen gas and high pressure.
ORGANIC MATERIALS: Incompatible.
OXIDIZABLE MATERIALS: Incompatible.
METAL SALTS: May generate oxygen gas and high pressure.
SOLVENTS: May generate oxygen gas and high pressure.

HYDROGEN PEROXIDE:
ACETALDEHYDE: Forms explosive compound.
ACETIC ACID: Forms explosive compound.
ACETONE: Explosion.
ALCOHOLS: May form explosive compounds.
BENZENESULFONIC ANHYDRIDE: Explosive decomposition.
CARBOXYLIC ACIDS: Form explosive peroxyacids.
CHLOROSULFONIC ACID: May form explosive compound.
CHLORINE + POTASSIUM HYDROXIDE: Reacts with red luminescence.
COMBUSTIBLE MATERIALS: May accelerate the burning rate, or cause ignition or
explosion on contact.
DIETHYL ETHER: Explosive mixture.
DIMETHYLPHENYLPHOSPHINE: Violent reaction on rapid mixing.
DIPHENYL DISELENIDE: May form explosive compound.
ETHANOL: Explosion.
GADOLINIUM HYDROXIDE: Forms explosive compound.
HYDROGEN SELENIDE: Rapid interaction.
KETENE: Forms explosive compound.
KETONES + NITRIC ACID: May form explosive compounds.
LITHIUM TETRAHYDROALUMINATE: Explosive mixuture.
METALS (+ ALLOYS): May catalyze violent, exothermic decomposition.
METAL OXIDES: Vigorous or violent reaction.
METAL SALTS: May catalyze violent, exothermic decomposition.
NITRIC ACID + THIOUREA: Formation of explosive compound.
NITRIC ACID: Unstable mixture when more than 50% acid is present.
NITROGENOUS BASES: Explosion hazard.
ORGANIC COMPOUNDS: Under certain circumstances, may ignite or form detonable
mixtures. The presence of a catalyst may increase the risk of a reaction.
OXYGENATED COMPOUNDS + WATER: May form detonable mixtures.
PHENYLSELENOKETONES: Strong, exothermic reaction.
PHOSPHOROUS: Violent reaction if heated.
PHOSPHOROUS(V) OXIDE: Extremely violent reaction.
POTASSIUM: Violent reaction.
POTASSIUM PERMANGANATE: Violent reaction.
REDUCING AGENTS: Fire and explosion hazard.
SODIUM: Violent reaction.
TETRAHYDROTHIOPENE: May form explosive compound.
SULFURIC ACID: Explosion hazard if heated to dryness.
TIN(II) CHLORIDE: Exothermic reaction.
WOOD: Possible ignition.

HAZARDOUS DECOMPOSITION:

Thermal decomposition products may include oxygen.

POLYMERIZATION:

Hazardous polymerization has not been reported to occur under normal temperatures and pressures.

SECTION 11 - TOXICOLOGICAL INFORMATION

(Olin Corporation has reported the following*):

nembranes, respiratory tract, tissues, and

rma and other respiratory diseases, skin or

osed to skin or eyes.*

ation-mouse LCLo;
gm/kg skin-pig
abbit LD50;
ogers MSDS);

DS).
rs MSDS).
S).
an LDLo; 1200 mg/kg
); mutagenic data

s data (RTECS).
oral-rat LD50 (Caledon

IARC Group-3). Oral
rcinomas of the

no tumor promoting

s, ingestion.
d ingestion; slightly toxic

ons with impaired pulmonary function

as reported the following):
cause irritation and inflammation of the nose, mouth,
a may develop and may cause shortness of breath,
nent of lung function. Effects may be delayed for several hours.
hing of the hair and impairment of

or Health.
ay cause severe irritation of the respiratory tract. 10% may
ess of breath; above 30% breathing may become labored.
lt in headache, dizziness, vomiting, diarrhea, tremors,
nbness, convulsions, unconsciousness, shock, and death.

SECTION 11 - TOXICOLOGICAL INFORMATION

HYDROGEN PEROXIDE (Olin Corporation has reported the following*):
CARCINOGEN STATUS: None.*
ACUTE TOXICITY LEVEL: No data available.
TARGET EFFECTS: Poisoning may affect the eyes, mucous membranes, respiratory tract, tissues, and lungs.*
AT INCREASED RISK FROM EXPOSURE: Persons with asthma and other respiratory diseases, skin or eye disorders.*
ADDITIONAL DATA: Harmful if inhaled, swallowed, and exposed to skin or eyes.*

HYDROGEN PEROXIDE:
TOXICITY DATA:
90%: 2 gm/m3/4 hours inhalation-rat LC50; 227 ppm inhalation-mouse LCLo; 500 mg/kg skin-rabbit LDLo; 4060 mg/kg skin-rat LD50; 2 gm/kg skin-pig LDLo; 2 gm/kg oral-mouse LD50; 15 gm/kg intravenous-rabbit LD50; >2000 ppm/8 hours inhalation-rat LC50 (Van Waters & Rogers MSDS); mutagenic data (RTECS); tumorigenic data (RTECS).
75%: 75 mg/kg oral-rat LD50 (Van Waters & Rogers MSDS).
70%: 9200 mg/kg skin-rabbit LD50 (Van Waters & Rogers MSDS).
35%: 2000 mg/m3/4 hours inhalation-rat LC50 (Cil MSDS).
30%: 1429 mg/kg oral-man LDLo; 2626 ug/kg oral-woman LDLo; 1200 mg/kg oral-woman TDLo; >50 gm/kg intravenous-mouse LD50; mutagenic data (RTECS); tumorigenic data (RTECS).
27-52%: 100 ppm inhalation-rat LCLo (GE MSDS).
8-20%: 1518 mg/kg oral-rat LD50; reproductive effects data (RTECS).
3%: 2000 mg/m3/4 hours inhalation-rat LC50; 2 g/kg oral-rat LD50 (Caledon MSDS).
CARCINOGEN STATUS: Animal Limited Evidence (IARC Group-3). Oral administration in mice resulted in adenomas and carcinomas of the duodenum.
Other studies indicated that hydrogen peroxide has no tumor promoting activity.
LOCAL EFFECTS: Corrosive- inhalation, skin, eyes, ingestion.
ACUTE TOXICITY LEVEL: Toxic by inhalation and ingestion; slightly toxic by dermal absorption.
TARGET EFFECTS: No data available.
AT INCREASED RISK FROM EXPOSURE: Persons with impaired pulmonary function or skin or eye disorders.

HEALTH EFFECTS
INHALATION:
HYDROGEN PEROXIDE (Olin Corporation has reported the following):
ACUTE EXPOSURE- Vapors and mist may cause irritation and inflammation of the nose, mouth, throat and respiratory tract. Pulmonary edema may develop and may cause shortness of breath, wheezing, choking, chest pain and impairment of lung function. Effects may be delayed for several hours.
CHRONIC EXPOSURE- May cause bleaching of the hair and impairment of lung function.

HYDROGEN PEROXIDE:
CORROSIVE/TOXIC.
75 ppm Immediately Dangerous to Life or Health.
ACUTE EXPOSURE- Vapor or mist may cause severe irritation of the respiratory tract. 10% may cause sore throat, coughing, and shortness of breath; above 30% breathing may become labored. Severe systemic poisoning may result in headache, dizziness, vomiting, diarrhea, tremors, irritability, insomnia, hyper-reflexia, numbness, convulsions, unconsciousness, shock, and death.

May ignite other combustible materials (wood, paper, oil, etc.). Reaction with fuels may be violent. Flammable poisonous gases may accumulate in tanks and hopper cars. Runoff to sewer may create fire or explosion hazard.

INCOMPATIBILITIES:

HYDROGEN PEROXIDE (Olin Corporation has reported the following):
BACOC: May generate oxygen gas and high pressure.
COMBUSTIBLE MATERIALS: Incompatible.
METALS: May generate oxygen gas and high pressure.
ORGANIC MATERIALS: Incompatible.
OXIDIZABLE MATERIALS: Incompatible.
METAL SALTS: May generate oxygen gas and high pressure.
SOLVENTS: May generate oxygen gas and high pressure.

HYDROGEN PEROXIDE:
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CHLORINE + POTASSIUM HYDROXIDE: Reacts with red luminescence.
COMBUSTIBLE MATERIALS: May accelerate the burning rate, or cause ignition or explosion on contact.
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DIMETHYLPHENYLPHOSPHINE: Violent reaction on rapid mixing.
DIPHENYL DISELENIDE: May form explosive compound.
ETHANOL: Explosion.
GADOLINIUM HYDROXIDE: Forms explosive compound.
HYDROGEN SELENIDE: Rapid interaction.
KETENE: Forms explosive compound.
KETONES + NITRIC ACID: May form explosive compounds.
LITHIUM TETRAHYDROALUMINATE: Explosive mixuture.
METALS (+ ALLOYS): May catalyze violent, exothermic decomposition.
METAL OXIDES: Vigorous or violent reaction.
METAL SALTS: May catalyze violent, exothermic decomposition.
NITRIC ACID + THIOUREA: Formation of explosive compound.
NITRIC ACID: Unstable mixture when more than 50% acid is present.
NITROGENOUS BASES: Explosion hazard.
ORGANIC COMPOUNDS: Under certain circumstances, may ignite or form detonable mixtures. The presence of a catalyst may increase the risk of a reaction.
OXYGENATED COMPOUNDS + WATER: May form detonable mixtures.
PHENYLSELENOKETONES: Strong, exothermic reaction.
PHOSPHOROUS: Violent reaction if heated.
PHOSPHOROUS(V) OXIDE: Extremely violent reaction.
POTASSIUM: Violent reaction.
POTASSIUM PERMANGANATE: Violent reaction.
REDUCING AGENTS: Fire and explosion hazard
SODIUM: Violent reaction.
TETRAHYDROTHIOPHENE: May form explosive compound.
SULFURIC ACID: Explosion hazard if heated to dryness.
TIN(II) CHLORIDE: Exothermic reaction.
WOOD: Possible ignition.

HAZARDOUS DECOMPOSITION:

Thermal decomposition products may include oxygen.

POLYMERIZATION:

Hazardous polymerization has not been reported to occur under normal temperatures and pressures.

Respiratory damage may range from mild bronchitis to pulmonary edema and effects may be delayed for several hours.

CHRONIC EXPOSURE- Dogs exposed to 7 ppm of 90% solution for 6 hours a day 5 days a week for 6 months showed no effects for the first 23 weeks. After week 23 they exhibited coughing, lacrimation, and bleached hair. Autopsy showed thickening of the skin with no hair follicle destruction, and irritation of the lungs. Rabbits exposed to 22 ppm for 3 months exhibited bleached hair and irritation around the nose.

SKIN CONTACT:

HYDROGEN PEROXIDE (Olin Corporation has reported the following):

ACUTE EXPOSURE- May cause severe irritation and/or burns characterized by a tingling sensation, redness, swelling, and whitening of the skin. Prolonged exposure may cause destruction of the dermis with ulceration.

CHRONIC EXPOSURE- Effects from chronic exposure would be similar to those from single exposure except for effects secondary to tissue destruction.

HYDROGEN PEROXIDE:

CORROSIVE.

ACUTE EXPOSURE- Vapor or mist may be irritating to the skin. A 6% solution is a weak irritant. Contact with low concentrations of the liquid may cause tingling and whitening of the skin. If not removed, erythema or vesicle formation may occur. High concentrations may cause severe burns with ulceration. There are inconclusive or unverified reports of human sensitization.

CHRONIC EXPOSURE- Effects depend on the concentration and duration of exposure. Repeated or prolonged contact with corrosive substances may cause dermatitis or effects similar to acute exposure.

EYE CONTACT:

HYDROGEN PEROXIDE (Olin Corporation has reported the following): May cause severe irritation and/or burns. Direct contact may cause impairment of vision and corneal damage.

HYDROGEN PEROXIDE:

CORROSIVE.

ACUTE EXPOSURE- Vapors may cause redness, stinging, tearing and blurred vision. The liquid may cause severe corneal or conjunctival ulceration, possibly resulting in blindness. Effects may be delayed. In rabbit eyes, 0.5% caused disturbances in the corneal epithelium which returned to normal in 24 hours; 5% caused severe corneal edema, flare in the aqueous, intense congestion of the iris and vascularization of the cornea with only partial improvement after 4-5 months; 5-30% caused corneal clouding which was persistent at concentrations >10%.

CHRONIC EXPOSURE- Effects depend on the concentration and duration of exposure. Repeated or prolonged exposure to corrosive substances may cause conjunctivitis or effects similar to acute exposure. Rabbits exposed to 7 ppm for 10 weeks exhibited no corneal damage.

INGESTION:

HYDROGEN PEROXIDE (Olin Corporation has reported the following):

ACUTE EXPOSURE- May cause irritation and/or burns to the entire gastrointestinal tract, including the stomach and intestines, characterized by nausea, vomiting, diarrhea, abdominal pain, bleeding, and/or tissue ulceration. May cause severe damage to the gastrointestinal tract with the potential to cause perforation.

CHRONIC EXPOSURE- Effects would be similar to those from a single exposure.

HYDROGEN PEROXIDE:

CORROSIVE/TOXIC/LIMITED ANIMAL CARCINOGEN.

ACUTE EXPOSURE- May cause severe irritation and injury to the mouth and throat, distention of the esophagus and stomach, and internal bleeding. 5 humans who ingested 50 ml of a 35% solution experienced stomach and chest pains, retention of breath, foaming at the mouth, and loss of consciousness. They later developed motor and sensory disorders, fever, microhemorrhages, and moderate leucocytosis; 1 developed pneumonia. All recovered in 2-3 weeks. The lethal dose reported in rats was 75 mg/kg of a 75% solution.

CHRONIC EXPOSURE- Growth retardation, induction of dental caries, and pathological changes in the periodontium were observed in young male rats receiving 1.5% hydrogen peroxide as their drinking fluid for 8 weeks. Treatment of mice for 35 weeks with 0.15% hydrogen peroxide resulted in hydropic degeneration of hepatic and renal tubular epithelial tissues, necrosis, inflammation, irregularities of tissue structure of the stomach wall and hypertrophy of the lymphatic tissue of the small intestine wall;

concentrations in excess of 1% resulted in a pronounced loss of body weight and death within 2 weeks. Repeated administration to mice and rats produced adenomas and carcinomas of the duodenum.

SECTION 12 - ECOLOGICAL INFORMATION

Ecological information is not yet available for this record

SECTION 13 - DISPOSAL CONSIDERATIONS

Observe all federal, state and local regulations when storing or disposing of this substance. Disposal must be in accordance with standards applicable to generators of hazardous waste, 40 CFR 262. EPA Hazardous Waste Number D001. 100 pound CERCLA Section 103 Reportable Quantity.

SECTION 14 - TRANSPORT INFORMATION

U S. DEPARTMENT OF TRANSPORTATION SHIPPING NAME-ID NUMBER, 49 CFR 172.101:
Hydrogen peroxide, aqueous solutions-UN 2014

U.S. DEPARTMENT OF TRANSPORTATION HAZARD CLASS OR DIVISION, 49 CFR 172.101:
5.1 - Oxidizer

U.S. DEPARTMENT OF TRANSPORTATION PACKING GROUP, 49 CFR 172.101:
PG II

U.S. DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS, 49 CFR 172.101 AND SUBPART E:
Oxidizer, corrosive

U.S. DEPARTMENT OF TRANSPORTATION PACKAGING AUTHORIZATIONS:
EXCEPTIONS: None
NON-BULK PACKAGING: 49 CFR 173.202
BULK PACKAGING: 49 CFR 173.243

U.S. DEPARTMENT OF TRANSPORTATION QUANTITY LIMITATIONS 49 CFR 172.101:
PASSENGER AIRCRAFT OR RAILCAR: Forbidden
CARGO AIRCRAFT ONLY: Forbidden

SECTION 15 - REGULATORY INFORMATION

TSCA Status	: Y
SARA Section 302 (40 CFR 355.30)	: Y TPQ
SARA Section 304 (40 CFR 355.40)	: Y RQ
SARA Section 313 (40 CFR 372.65)	: N
California Prop 65 Status	: N
SARA ACUTE Hazard	: Y
SARA CHRONIC Hazard	: Y
SARA FIRE Hazard	: Y
SARA REACTIVITY Hazard	: N
SARA SUDDEN RELEASE Hazard	: N

SECTION 16 - OTHER INFORMATION

No other information is currently available for this record

SECTION 6 - ACCIDENTAL RELEASE MEASURES

OCCUPATIONAL SPILL:

Keep combustibles (wood, paper, oil, etc.) Away from spilled material. Do not touch spilled material. Stop leak if you can do it without risk. Use water spray to reduce vapors. Do not get water inside container. For small spills, flush area with flooding amounts of water. For larger spills, dike far ahead of spill for later disposal. Keep unnecessary people away. Isolate hazard area and deny entry. Ventilate closed spaces before entering.

Reportable Quantity (RQ):

The Superfund Amendments and Reauthorization Act (SARA) Section 304 requires that a release equal to or greater than the reportable quantity established for that substance be immediately reported to the local emergency planning committee and the state emergency response commission (40 CFR 355.40). If the release of this substance is reportable under CERCLA Section 103, the National Response Center must be notified immediately at (800) 424-8802 or (202) 426-2675 in the metropolitan Washington, D.C. area (40 CFR 302.6).

SOIL SPILL:

Dig a holding area such as a pit, pond or lagoon to contain spill and dike surface flow using barrier of soil, sandbags, foamed polyurethane or foamed concrete. Absorb liquid mass with fly ash or cement powder.

Neutralize spill with slaked lime, sodium bicarbonate or crushed limestone.

AIR SPILL:

Apply water spray to knock down and reduce vapors. Knock-down water is corrosive and toxic and should be diked for containment and later disposal.

WATER SPILL:

Add suitable agent to neutralize spilled material to pH-7.

SECTION 7 - HANDLING AND STORAGE

Observe all federal, state and local regulations when storing or disposing of this substance.

Protect against physical damage. Separate from metallic powders, carbides, hydrogen sulfide, turpentine, organic acids, and all combustible, organic or other readily oxidizable materials. Provide good ventilation and avoid direct sunlight (NFPA 49, Hazardous Chemicals Data, 1975).

Store away from incompatible substances.

Threshold Planning Quantity (TPQ):

The Superfund Amendments and Reauthorization Act (SARA) Section 302 requires that each facility where any extremely hazardous substance is present in a quantity equal to or greater than the TPQ established for that substance notify the state emergency response commission for the state in which it is located. Section 303 of SARA requires these facilities to participate in local emergency response planning (40 CFR 355.30).

SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:

NITRIC ACID:

2 ppm (5 mg/m3) OSHA TWA;
4 ppm (10 mg/m3) OSHA STEL (vacated by 58 FR 35333, June 30, 1993)
2 ppm (5 mg/m3) ACGIH TWA; 4 ppm (10 mg/m3) ACGIH STEL
2 ppm (5 mg/m3) NIOSH recommended TWA;
4 ppm (10 mg/m3) NIOSH recommended STEL
10 ppm (25 mg/m3) DFG MAK TWA;

20 ppm (50 mg/m3) DFG MAK 5 minute peak, momentary value, 8 times/shift
Measurement method: Silica gel tube; sodium bicarbonate/sodium carbonate;
ion chromatography; (NIOSH Vol. III # 7903, Inorganic Acids).
1000 pounds SARA Section 302 Threshold Planning Quantity
1000 pounds SARA Section 304 Reportable Quantity
1000 pounds CERCLA Section 103 Reportable Quantity
500 pounds OSHA Process Safety Management Threshold Quantity
(94.5% by weight or greater)
Subject to SARA Section 313 Annual Toxic Chemical Release Reporting

VENTILATION:

Process enclosure ventilation recommended to meet published exposure limits.
Ventilation equipment must be explosion-proof.

EYE PROTECTION:

Employee must wear splash-proof or dust-resistant safety goggles and a faceshield to prevent contact with this substance. Emergency wash facilities: Where there is any possibility that an employee's eyes and/or skin may be exposed to this substance, the employer should provide an eye wash fountain and quick drench shower within the immediate work area for emergency use.

CLOTHING:

Employee must wear appropriate protective (impervious) clothing and equipment to prevent any possibility of skin contact with this substance.

GLOVES:

Employee must wear appropriate protective gloves to prevent contact with this substance.

RESPIRATOR:

The following respirators and maximum use concentrations are recommendations by the U.S. Department of Health and Human Services, NIOSH Pocket Guide to Chemical Hazards; NIOSH criteria documents or by the U.S. Department of Labor, 29 CFR 1910 Subpart Z. The specific respirator selected must be based on contamination levels found in the work place, must not exceed the working limits of the respirator and be jointly approved by the National Institute for Occupational Safety and Health and the Mine Safety and Health Administration (NIOSH-MSHA).

NITRIC ACID:

25 ppm- Any supplied-air respirator operated in a continuous-flow mode. Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against this compound. Only nonoxidizable sorbents are allowed (not chracoal). Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against this compound. Only nonoxidizable sorbents are allowed (not charcoal). Any self-contained breathing apparatus with a full facepiece. Any supplied-air respirator with a full facepiece. Escape- Any air-purifying, full facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against this compound. Only nonoxidizable sorbents are allowed (not charcoal). Any appropriate escape-type, self-contained breathing apparatus.

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode. Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

DESCRIPTION: Clear, colorless to light brown liquid with an acrid odor.
PHYSICAL STATE (S,L,G): L
BOILING POINT: Range 241-248 F (116-120 C)
MELTING POINT: Range -25 to -3 F (-32 to -19 C)
SPECIFIC GRAVITY: Range 1.33-1.40
pH: 1.0 (approx)
VAPOR PRESSURE: Range 8-11 mmHg @ 25 C
VAPOR DENSITY: 1.0

EVAPORATION RATE: 1.0 (butyl acetate=1) (approx)
WATER SOLUBILITY: 100%

SECTION 10 - STABILITY AND REACTIVITY

REACTIVITY:
Reactivity data is not available for this product; however, the following data apply to all the components which compose at least 1% of the product.

NITRIC-15N ACID:
Reacts exothermically with water.
INCOMPATIBILITIES:
NITRIC ACID:
CARBIDES: Incompatible.
CYANIDES: Incompatible.

NITRIC ACID:
ACETIC ACID: May react explosively.
ACETIC ANHYDRIDE: Explosive reaction by friction or impact.
ACETONE: May react explosively.
ACETONITRILE: Explosive mixture.
4-ACETOXY-3-METHOXYBENZALDEHYDE: Exothermic reaction.
ACROLEIN: Temperature and pressure increase in closed container.
ACRYLONITRILE: Explosive reaction at 90 C.
ACRYLONITRILE-METHACRYLATE COPOLYMER: Incompatible.
ALCOHOLS: Possible violent reaction or explosion; formation of explosive compound in the presence of heavy metals.
ALKANETHIOLS: Exothermic reaction with possible ignition.
2-ALKOXY-1,3-DITHIA-2-PHOSPHOLANE: Ignition reaction.
ALLYL ALCOHOL: Temperature and pressure increase in closed container.
ALLYL CHLORIDE: Temperature and pressure increase in closed container.
AMINES (ALIPHATIC OR AROMATIC): Possible ignition reaction.
2-AMINOETHANOL: Temperature and pressure increase in closed container.
2-AMINOTHIAZOLE: Explosive reaction.
AMMONIA (GAS): Burns in an atmosphere of nitric acid vapor.
AMMONIUM HYDROXIDE: Temperature and pressure increase in closed container.
AMMONIUM NITRATE: Forms explosive mixture.
ANILINE: Ignites on contact.
ANILINIUM NITRATE: Forms explosive solution.
ANION EXCHANGE RESINS: Possible violent exothermic reaction.
ANTIMONY: Violent reaction.
ARSINE: Explosive reaction.
ARSINE-BORON TRIBROMIDE: Violent oxidation.
BASES: Reacts.
BENZENE: Explosive reaction.
BENZIDINE: Spontaneous ignition.
BENZONITRILE: Possible explosion.
BENZOTHIOPHENE DERIVATIVES: Formation of possibly explosive compounds.
N-BENZYL-N-ETHYLANILINE: Vigorous decomposition.
1,4-BIS(METHOXYMETHYL)2,3,5,6-TETRAMETHYLBENZENE: Gas evolution.
BISMUTH: Intense exothermic reaction or explosion.
1,3-BIS(TRIFLUOROMETHYL)BENZENE: Possible explosion.
BORON: Violent reaction with incandescence.
BORON DECAHYDRIDE: Explosive reaction.
BORON PHOSPHIDE: Ignition reaction.
BROMINE PENTAFLUORIDE: Ignition reaction.
N-BUTYL MERCAPTAN: Ignition reaction.
N-BUTYRALDEHYDE: Temperature and pressure increase in closed container.
CADMIUM PHOSPHIDE: Explosive reaction.

CALCIUM HYPOPHOSPHITE: Ignition reaction.
CARBON (PULVERIZED): Violent reaction.
CELLULOSE: Forms easily combustible ester.
CHLORATES: Reacts.
CHLORINE: Incompatible.
CHLORINE TRIFLUORIDE: Violent reaction.
CHLOROBENZENE: Possible explosion.
4-CHLORO-2-NITROANILINE: Forms explosive compound.
CHLOROSULFONIC ACID: Temperature and pressure increase in closed container.
COAL: Explosive mixture.
COATINGS: Attacks.
CRESOL: Temperature and pressure increase in closed container.
CROTONALDEHYDE: Violent decomposition with ignition.
CUMENE: Temperature and pressure increase in closed container.
CUPRIC NITRIDE: Explosive reaction.
CUPROUS NITRIDE: Violent reaction.
CYANATES: Possible explosive reaction.
CYCLOHEXANONE: Violent reaction.
CYCLOHEXYLAMINE: Forms explosive compound.
CYCLOPENTADIENE: Explosive reaction.
1,2-DIAMINOETHANEBIS(TRIMETHYLGOLD): Explosive reaction.
DIBORANE: Spontaneous ignition.
DI-2-BUTOXYETHYL ETHER: Violent decomposition reaction.
2,6-DI-T-BUTYL PHENOL: Formation of explosive compound.
DICHLOROETHANE: Forms shock and heat sensitive mixture.
DICHLOROETHYLENE: Forms explosive compound.
DICHLOROMETHANE: Forms explosive solution.
DICYCLOPENTADIENE: Spontaneous ignition.
DIENES: Ignition reaction.
DIETHYLAMINO ETHANOL: Possible explosion.
DIETHYL ETHER: Possible explosion.
3,6-DIHYDRO-1,2,2H-OXAZINE: Explosive interaction.
DIISOPROPYL ETHER: Temperature and pressure increase in closed container.
DIMETHYLAMINOMETHYLFERROCENE: Violent decomposition if heated.
DIMETHYL ETHER: Forms explosive compound.
DIMETHYL HYDRAZINE: Ignites on contact.
DIMETHYL SULFOXIDE + 1,4-DIOXANE: Explosion.
DIMETHYL SULFOXIDE + <14% WATER: Explosive reaction.
DINITROBENZENE: Explosion hazard.
DINITROTOLUENE: Explosive reaction.
DIOXANE + PERCHLORIC ACID: Possible explosion.
DIPHENYL DISTIBENE: Explosive oxidation.
DIPHENYL MERCURY + CARBON DISULFIDE: Violent reaction.
DIPHENYL TIN: Ignition reaction.
DISODIUM PHENYL ORTHOPHOSPHATE: Violent explosion.
DIVINYL ETHER: Possible ignition reaction.
EPICHLOROHYDRIN: Temperature and pressure increase in closed container.
ETHANESULFONAMIDE: Explosive reaction.
ETHOXY-ETHYLENE DITHIOPHOSPHATE: Ignition on contact.
M-ETHYL ANILINE: Ignition reaction.
ETHYLENE DIAMINE: Temperature and pressure increase in closed container.
ETHYLENE GLYCOL: Forms shock and heat sensitive mixture.
ETHYLENEIMINE: Temperature and pressure increase in closed container.
5-ETHYL-2-METHYL PYRIDINE: Explosive reaction.
ETHYL PHOSPHINE: Ignition reaction.
5-ETHYL-2-PICOLINE: Forms explosive compounds.
FERROUS OXIDE (POWDERED): Intense exothermic reaction.
FLUORINE: Possible explosive reaction.
FORMIC ACID: Exothermic reaction with release of toxic gases.

2-FORMYLAMINO-1-PHENYL-1,3-PROPANEDIOL: Possible explosion.
FUEL OIL (BURNING): Explosion.
FULMINATES: Reacts.
FURFURYLIDENE KETONES: Ignites on contact.
GERMANIUM: Violent reaction.
GLYCEROL: Possible explosion.
GLYOXAL: Temperature and pressure increase in closed container.
HEXALITHIUM DISILICIDE: Explosive reaction.
HEXAMETHYLBENZENE: Possible explosion.
2,2,4,4,6,6-HEXAMETHYLTRITHIANE: Explosive oxidation.
HEXENAL: Explodes on heating.
HYDRAZINE: Violent reaction.
HYDRAZOIC ACID: Energetic reaction.
HYDROGEN IODIDE: Ignition reaction.
HYDROGEN PEROXIDE: Forms unstable mixture.
HYDROGEN PEROXIDE AND KETONES: Forms explosive products.
HYDROGEN PEROXIDE AND MERCURIC OXIDE: Forms explosive compounds.
HYDROGEN PEROXIDE AND THIOUREA: Forms explosive compounds.
HYDROGEN SELENIDE: Ignition reaction.
HYDROGEN SULFIDE: Incandescent reaction.
HYDROGEN TELLURIDE: Ignition and possible explosive reaction.
INDANE AND SULFURIC ACID: Explosive reaction.
ISOPRENE: Temperature and pressure increase in closed container.
KETONES (CYCLIC): Violent reaction.
LACTIC ACID + HYDROFLUORIC ACID: Explosive reaction.
LITHIUM: Ignition reaction.
LITHIUM SILICIDE: Incandescent reaction.
MAGNESIUM: Explosive reaction.
MAGNESIUM + 2-NITROANILINE: May ignite on contact.
MAGNESIUM PHOSPHIDE: Incandescent reaction.
MAGNESIUM SILICIDE: Violent reaction.
MAGNESIUM-TITANIUM ALLOY: Forms shock and heat sensitive mixture.
MANGANESE (POWDERED): Incandescence and possible explosion.
MESITYL OXIDE: Temperature and pressure increase in closed container.
MESITYLENE: Possible explosive reaction.
METALS: Violent reaction with explosion or ignition.
METAL ACETYLIDES: Violent or explosive reaction.
METAL CARBIDES: Violent or explosive reaction.
METAL CYANIDES: Explosive reactions.
METAL FERRICYANIDE OR FERROCYANIDE: Violent reaction.
METAL SALICYLATES: Forms explosive compounds.
METAL THIOCYANATES: Possible explosion.
2-METHYLBENZIMIDAZOLE + SULFURIC ACID: Possible explosive reaction.
4-METHYLCYCLOHEXANONE: Explosive reaction.
2-METHYL-5-ETHYLPYRIDINE: Temperature and pressure increase in closed container.
METHYL THIOPHENE: Ignition reaction.
NEODYMIUM PHOSPHIDE: Violent reaction.
NICKEL TETRAPHOSPHIDE: Ignition reaction.
NITRO AROMATIC HYDROCARBONS: Forms highly explosive products.
NITROBENZENE: Explosive reaction, especially in the presence of water.
NITROMETHANE: Explosive reaction.
NITRONAPHTHALENE: Explosion hazard.
NON-METAL OXIDES : Explosive reaction.
OLEUM: Temperature and pressure increase in closed container.
ORGANIC MATERIALS: Fire and explosion hazard.
ORGANIC SUBSTANCES: Possible explosion.
PERCHLORATES: Possible explosion.
PHENYL ACETYLENE + 1,1-DIMETHYLHYDRAZINE: Violent reaction.
PHENYL ORTHOPHOSPHORIC ACID DISODIUM SALT: Forms explosive products.

PHOSPHINE + OXYGEN: Spontaneous ignition.
PHOSPHONIUM IODIDE: Ignition reaction.
PHOSPHORUS (VAPOR): Ignites when heated.
PHOSPHOROUS HALIDES: Ignition reaction.
PHOSPHORUS TETRAIODIDE: Vigorous reaction.
PHOSPHORUS TRICHLORIDE: Explosive reaction.
PHTHALIC ACID: Possible explosive reaction.
PHTHALIC ANHYDRIDE: Exothermic reaction and forms explosive products.
PICRATES: Reacts.
PLASTICS: Attacks.
POLYALKENES: Intense reaction.
POLYDIBROMOSILANES: Explosive reaction.
POLY(ETHYLENE OXIDE) DERIVATIVES: Possible explosion.
POLYPROPYLENE: Temperature and pressure increase in a closed container.
POLY(SILYLENE): Ignition.
POLYURETHANE (FOAM): Vigorous reaction.
POTASSIUM HYPOPHOSPHITE: Explosive reaction.
POTASSIUM PHOSPHINATE: Explodes on evaporation.
B-PROPIOLACTONE: Temperature and pressure increase in closed container.
PROPIOPHENONE + SULFURIC ACID: Exothermic reaction above -5 C.
PROPYLENE GLYCOL + HYDROFLUORIC ACID + SILVER NITRATE: Explosive mixture.
PROPYLENE OXIDE: Temperature and pressure increase in closed container.
PYRIDINE: Temperature and pressure increase in closed container.
PYROCATECHOL: Ignites on contact.
REDUCING AGENTS: Possible explosive or ignition reaction.
RESORCINOL: Possible explosion.
RUBBER: Vigorous reaction, possible explosion.
SELENIUM: Vigorous reaction.
SELENIUM HYDRIDE: Ignition or incandescent reaction.
SELENIUM IODOPHOSPHIDE: Explosive reaction.
SILICON: Violent reaction.
SILICONE OIL: Possible explosion.
SILVER BUTEN-3-YNIDE: Explosion.
SODIUM: Spontaneous ignition.
SODIUM AZIDE: Exothermic reaction.
SODIUM HYDROXIDE: Temperature and pressure increase in a closed container.
STIBINE: Explosive reaction.
SUCROSE (SOLID): Vigorous reaction.
SULFAMIC ACID: Violent reaction with evolution of toxic nitrous oxide.
SULFIDES: Reacts.
SULFUR DIOXIDE: Explosive reaction.
SULFUR HALIDES: Violent reaction.
SULFURIC ACID: Possible explosion.
SULFURIC ACID + GLYCERIDES: Explosive reaction.
SULFURIC ACID + TEREPHTHALIC ACID: Violent reaction.
SURFACTANTS + PHOSPHORIC ACID: Explosion hazard.
TERPENES: Spontaneous ignition.
TETRABORANE: Explosive reaction.
TETRABORANE DECAHYDRIDE: Explosive reaction.
TETRAPHOSPHOROUS DIIODOTRISELENIDE: Explosive reaction.
TETRAPHOSPHOROUS IODIDE: Ignites on contact.
TETRAPHOSPHOROUS TETRAOXIDE TRISULFIDE: Violent reaction.
THIOALDEHYDES: Violent reaction.
THIOKETONES: Violent reaction.
THIOPHENES: Explosive reaction.
TITANIUM: Forms shock-sensitive compound.
TITANIUM ALLOYS: Possible explosive reaction.
TITANIUM-MAGNESIUM ALLOY: Possible explosion on impact.
TOLUENE: Violent reaction.

TOLUIDENE: Ignition reaction.
1,3,5-TRIACETYLHEXAHYDRO-1,3,5-TRIAZINE + TRIFLUOROACETIC ANHYDRIDE: Explosive reaction.
TRIAZINE: Violently explosive reaction.
TRICADMIUM DIPHOSPHIDE: Explosive reaction.
TRIETHYLGALLIUM MONOETHYL ETHER COMPLEX: Ignition reaction.
TRIMETHYLTRIOXANE: Intense reaction.
TRIS(IODOMERCURI)PHOSPHINE: Violent decomposition.
TRITHIOACETONE: Explosive reaction.
TURPENTINE: Explosive mixture.
UNSYMMETRICAL DIMETHYL HYDRAZINE: Spontaneous ignition.
URANIUM: Explosive reaction.
URANIUM ALLOY: Violent reaction.
URANIUM DISULFIDE: Violent reaction.
URANIUM-NEODYMIUM ALLOYS: Explosive reaction.
VINYL ACETATE: Temperature and pressure increase in closed container.
VINYLIDENE CHLORIDE: Temperature and pressure increase in closed container.
WOOD: Possible ignition.
P-XYLENE: Intense reaction in presence of sulfuric acid.
ZINC: Incandescent reaction.
ZINC ETHOXIDE: Possible explosion.
ZIRCONIUM-URANIUM ALLOYS: Explosive reaction.

HAZARDOUS DECOMPOSITION:
Thermal decomposition products may include toxic oxides of nitrogen.

POLYMERIZATION:
Hazardous polymerization has not been reported to occur under normal temperatures and pressures.

SECTION 11 - TOXICOLOGICAL INFORMATION

NITRIC ACID:
TOXICITY DATA:
ANHYDROUS: 49 ppm/4 hours inhalation-rat LC50 (Van Water & Rogers, Inc MSDS); 2500 ppm/1 hour inhalation-rat LC50 (Dupont MSDS);
1071 ug/m3/24 hours/84 days-continuous inhalation-rat TCLo; 430 mg/kg oral-human LDLo; 50-500 mg/kg oral-unspecified species LD50 (Dupont MSDS);
110 mg/kg unreported-man LDLo; reproductive effects data (RTECS).
MONOHYDRATE: No data available.
TRIHYDRATE: No data available.
CARCINOGEN STATUS: None.
LOCAL EFFECTS: Corrosive- inhalation, skin, eyes, ingestion.
ACUTE TOXICITY LEVEL: Highly toxic by inhalation.
TARGET EFFECTS: No data available.
AT INCREASED RISK FROM EXPOSURE: Persons with impaired pulmonary function,
pre-existing eye and skin disorders.

HEALTH EFFECTS
INHALATION:
NITRIC ACID:
CORROSIVE/HIGHLY TOXIC. 100 ppm Immediately Dangerous to Life or Health.
ACUTE EXPOSURE- Inhalation of acidic substances may cause severe respiratory irritation with coughing, choking, and possibly yellowish burns of the mucous membranes. Other initial symptoms may include dizziness, headache, nausea, and weakness. Pulmonary edema may be immediate in the most severe exposures, but more likely will occur after a latent period of 5-72 hours. The symptoms may include tightness in the chest, dyspnea, dizziness, frothy sputum, and cyanosis. Physical findings may include hypotension, weak, rapid pulse, moist rales.

and hemoconcentration. In non-fatal cases, complete recovery may occur within a few days or weeks or, convalescence may be prolonged with frequent relapses and continued dyspnea and other signs and symptoms of pulmonary insufficiency. In severe exposures, death due to anoxia may occur within a few hours after onset of the symptoms of pulmonary edema or following a relapse.

CHRONIC EXPOSURE- Depending on the concentration and duration of exposure, repeated or prolonged exposure to an acidic substance may cause erosion of the teeth, inflammatory and ulcerative changes in the mouth, and possibly jaw necrosis. Bronchial irritation with cough and frequent attacks of bronchial pneumonia may occur. Gastrointestinal disturbances are also possible.

SKIN CONTACT:

NITRIC ACID:

CORROSIVE.

ACUTE EXPOSURE- Direct contact with liquid or vapor may cause severe pain, burns and possibly yellowish stains. Burns may be deep with sharp edges and heal slowly with scar tissue formation. Dilute solutions of nitric acid may produce mild irritation and harden the epidermis without destroying it. Concentrated acid solutions applied to over 25% of the skin area in rats produced elevated methemoglobin and blood nitrate levels.

CHRONIC EXPOSURE- Effects depend on the concentration and duration of exposure. Repeated or prolonged contact with acidic substances may result in dermatitis or effects similar to acute exposure.

EYE CONTACT:

NITRIC ACID:

CORROSIVE.

ACUTE EXPOSURE- Direct contact with acidic substances may cause pain and lacrimation, photophobia, and burns, possibly severe. The degree of injury depends on the concentration and duration of contact. In mild burns, the epithelium regenerates rapidly and the eye recovers completely. In severe cases, the extent of injury may not be fully apparent for several weeks. Ultimately, the whole cornea may become deeply vascularized and opaque resulting in blindness. In the worst cases, the eye may be totally destroyed. Concentrated nitric acid may impart a yellow color to the eye upon contact.

CHRONIC EXPOSURE- Effects depend on the concentration and duration of exposure. Repeated or prolonged exposure to acidic substances may cause conjunctivitis or effects as in acute exposure.

INGESTION:

NITRIC ACID:

CORROSIVE.

ACUTE EXPOSURE- Acidic substances may cause circumoral burns with yellow discoloration and corrosion of the mucous membranes of the mouth, throat and esophagus. There may be immediate pain and difficulty or inability to swallow or speak. Epiglottal edema may result in respiratory distress and possibly asphyxia. Marked thirst, epigastric pain, nausea, vomiting and diarrhea may occur. Depending on the degree of espohageal and gastric corrosion, the vomitus may contain fresh or dark precipitated blood and large shreds of mucosa. Shock with marked hypotension, weak, rapid pulse, shallow respiration, and clammy skin may occur. Circulatory collapse may ensue and if uncorrected, lead to renal failure. In severe cases, gastric, and to a lesser degree, esophageal perforation and subsequent peritonitis may occur and be accompanied by fever and abdominal rigidity. Esophageal, gastric anc pyloric stricture may occur within a few weeks, but may be delayed for months or even years. Death may result within a short time from asphyxia, circulatory collapse or aspiration of even minute amounts. Later death may be due to peritonitis, severe nephritis or pneumonia. Coma and convulsions sometimes occur terminally.

CHRONIC EXPOSURE- Depending on the concentration, repeated ingestion of acidic substances may result in inflammatory and ulcerative changes in the mucous membranes of the mouth and other effects as in acute ingestion. Reproductive effects have been reported in animals.

SECTION 12 - ECOLOGICAL INFORMATION

Ecological information is not yet available for this record

SECTION 13 - DISPOSAL CONSIDERATIONS

Observe all federal, state and local regulations when storing or disposing of this substance.

Disposal must be in accordance with standards applicable to generators of hazardous waste, 40 CFR 262. EPA Hazardous Waste Number D002. 100 pound CERCLA Section 103 Reportable Quantity.

SECTION 14 - TRANSPORT INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION SHIPPING NAME-ID NUMBER, 49 CFR 172.101:
Nitric acid, red fuming, solution-UN 2032

U.S. DEPARTMENT OF TRANSPORTATION HAZARD CLASS OR DIVISION, 49 CFR 172.101: 8 - Corrosive material

U.S. DEPARTMENT OF TRANSPORTATION PACKING GROUP, 49 CFR 172.101: PG I

U.S. DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS, 49 CFR 172.101 AND SUBPART E:
Corrosive, oxidizer, poison
U.S. DEPARTMENT OF TRANSPORTATION PACKAGING AUTHORIZATIONS:
EXCEPTIONS: None
NON-BULK PACKAGING: 49 CFR 173.227
BULK PACKAGING: 49 CFR 173.244

U.S. DEPARTMENT OF TRANSPORTATION QUANTITY LIMITATIONS 49 CFR 172.101:
PASSENGER AIRCRAFT OR RAILCAR: Forbidden
CARGO AIRCRAFT ONLY: Forbidden

SECTION 15 - REGULATORY INFORMATION

TSCA Status : Y
SARA Section 302 (40 CFR 355.30) : Y TPQ
SARA Section 304 (40 CFR 355.40) : Y RQ
SARA Section 313 (40 CFR 372.65) : Y
California Prop 65 Status : N
SARA ACUTE Hazard : Y
SARA CHRONIC Hazard : N
SARA FIRE Hazard : Y
SARA REACTIVITY Hazard : Y
SARA SUDDEN RELEASE Hazard : N

SECTION 16 - OTHER INFORMATION

No other information is currently available for this record

OHS/MDL Record Number : OHS21300
MATERIAL SAFETY DATA SHEET

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MDL Information Systems, Inc.
14600 Catalina Street
San Leandro CA 94577
1-800-635-0064 (Toll Free) or
1-510-895-1313

FOR EMERGENCY SOURCE INFORMATION
CONTACT: 1-615-366-2000 in USA

CAS Registry Number: 1310-73-2
RTECS Number : WB4900000
UN Number : UN 1823

SUBSTANCE: SODIUM HYDROXIDE

TRADE NAME/SYNONYM(S): CAUSTIC SODA; SODA LYE; LYE; WHITE CAUSTIC; CAUSTIC SODA, BEAD; CAUSTIC SODA, DRY; CAUSTIC SODA, FLAKE; CAUSTIC SODA, GRANULAR; CAUSTIC SODA, SOLID; SODIUM HYDRATE; SODIUM HYDROXIDE (NA(OH)); SODIUM HYDROXIDE, FLAKE; SODIUM HYDROXIDE, DRY; SODIUM HYDROXIDE, SOLID; ASCARITE; SODIUM HYDROXIDE, DRY SOLID, FLAKE, BEAD, OR GRANULAR; FOTOFOIL-ETCHANT (MILLER DIAL); UN 1823; STCC 4935235; NaOH

CHEMICAL FAMILY: Inorganic base

SUMMARY SHEET AVAILABLE: Y

CREATION DATE: 19841217 REVISED: 19960123 CHEM CHANGE DATE: 19960123

SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS

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1) Component Substance: SODIUM HYDROXIDE
Component Percent: 100 %
CAS Registry Number: 1310-73-2

CONTAMINANTS: NONE

SECTION 3 - HAZARDS IDENTIFICATION

NFPA Ratings (scale 0-4): Health=3 Fire=0 Reactivity=1
EMERGENCY OVERVIEW:

DESCRIPTION: Odorless, white or off-white hygroscopic solid.
STATEMENT OF HAZARDS:
Harmful if swallowed. Causes respiratory tract, skin, and eye burns and severe burns to mucous membranes.
PRECAUTIONARY STATEMENTS:
Do not breathe dust. Do not get in eyes, on skin, or on clothing. Do not allow water to get in container. Keep container tightly closed. Wash thoroughly after handling. Use only with adequate ventilation. Handle with caution.
POTENTIAL HEALTH EFFECTS
INHALATION:
SHORT TERM EFFECTS: May cause irritation, possibly severe. Additional effects may include difficulty breathing, lung congestion and shock.
LONG TERM EFFECTS: May cause effects as in short term exposure. Additional effects may include diarrhea and lung effects.
SKIN CONTACT:
SHORT TERM EFFECTS: May cause burns.
LONG TERM EFFECTS: Same effects as short term exposure.

ATTACHMENT 8 - 50% NaOH Material Safety Data Sheet

EYE CONTACT:
SHORT TERM EFFECTS: May cause burns. Additional effects may include blindness.
LONG TERM EFFECTS: Same effects as short term exposure.
INGESTION:
SHORT TERM EFFECTS: May be harmful if swallowed. May cause burns. Additional effects may include diarrhea, stomach pain, bloody vomit, blood in the stool, shock, coma and heart failure.
LONG TERM EFFECTS: Same effects as short term exposure.

CARCINOGEN STATUS:
OSHA: N
NTP: N
IARC: N
Date: 19881020

SECTION 4 - FIRST AID MEASURES

INHALATION:
FIRST AID- Remove from exposure area to fresh air immediately. Perform artificial respiration if necessary. Maintain airway, blood pressure and respiration. Keep warm and at rest. Treat symptomatically and supportively. Get medical attention immediately. Qualified medical personnel should consider administering oxygen.
SKIN CONTACT:
FIRST AID- Remove contaminated clothing and shoes immediately. Wash with soap or mild detergent and large amounts of water until no evidence of chemical remains (at least 15-20 minutes). If burns occur, proceed with the following: Cover affected area securely with sterile, dry, loose-fitting dressing. Treat symptomatically and supportively. Get medical attention immediately.
EYE CONTACT:
FIRST AID- Wash eyes immediately with large amounts of water, occasionally lifting upper and lower lids, until no evidence of chemical remains (at least 15-20 minutes). Continue irrigating with normal saline until the pH has returned to normal (30-60 minutes). Cover with sterile bandages. Get medical attention immediately.
INGESTION:
FIRST AID- Do not use gastric lavage or emesis. Dilute the alkali by giving Water or milk to drink immediately and allowing vomiting to occur. As soon as possible, have qualified medical personnel do esophagoscopy and irrigate injured areas with 1% acetic acid until the alkali is completely neutralized. (Dreisbach, Handbook of Poisoning, 11th Edition). Get medical attention immediately.
NOTE TO PHYSICIAN
ANTIDOTE:
No specific antidote. Treat symptomatically and supportively.

SECTION 5 - FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARD:
Negligible fire hazard when exposed to heat or flame.
EXTINGUISHING MEDIA:
Dry chemical, carbon dioxide, water spray or regular foam (1993 Emergency Response Guidebook, RSPA P 5800.6).

For larger fires, use water spray, fog or regular foam (1993 Emergency Response Guidebook, RSPA P 5800.6).
FIREFIGHTING:
Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks (1993 Emergency Response Guidebook, RSPA P 5800.6, Guide Page 60).

Use agent suitable for type of fire. Use water in flooding quantities as fog.
Apply water from as far a distance as possible.

HAZARDOUS COMBUSTION PRODUCTS:
Thermal decomposition may release toxic fumes of sodium oxide.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

OCCUPATIONAL SPILL:

Do not touch spilled material. Stop leak if you can do it without risk. For small spills, take up with sand or other absorbent material and place into containers for later disposal. For small dry spills, with clean shovel place material into clean, dry container and cover. Move containers from spill area. For larger spills, dike far ahead of spill for later disposal. Keep unnecessary people away. Isolate hazard area and deny entry.

Reportable Quantity (RQ): 1000 pounds

The Superfund Amendments and Reauthorization Act (SARA) Section 304 requires that a release equal to or greater than the reportable quantity for this substance be immediately reported to the local emergency planning committee and the state emergency response commission (40 CFR 355.40). If the release of this substance is reportable under CERCLA Section 103, the National Response Center must be notified immediately at (800) 424-8802 or (202) 426-2675 in the metropolitan Washington, D.C. area (40 CFR 302.6).

SOIL SPILL:

Dig holding area such as lagoon, pond or pit for containment.

Use protective cover such as a plastic sheet to prevent material from dissolving in fire extinguishing water or rain.

WATER SPILL:

Add suitable agent to neutralize spilled material to pH-7.

SECTION 7 - HANDLING AND STORAGE

Observe all federal, state and local regulations when storing or disposing of this substance.

Store in a cool, dry, well-ventilated location. Separate from acids, water, metals. Immediately remove and properly dispose of any spilled material. (NFPA 49, Hazardous Chemicals Data, 1991)

Store away from incompatible substances.

SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:

SODIUM HYDROXIDE:

2 mg/m3 OSHA TWA
2 mg/m3 OSHA ceiling (vacated by 58 FR 35338, June 30, 1993)
2 mg/m3 ACGIH ceiling
2 mg/m3 NIOSH recommended ceiling
2 mg/m3 DFG MAK TWA (total dust);
4 mg/m3 DFG MAK 5 minute peak, momentary value, 8 times/shift
Measurement method: Particulate filter; hydrochloric acid; titration;
(NIOSH Vol. III # 7401, Alkaline Dusts).
1000 pounds CERCLA Section 103 Reportable Quantity

VENTILATION:

Provide local exhaust ventilation system to meet published exposure limits.

EYE PROTECTION:

Employee must wear splash-proof or dust-resistant safety goggles and a faceshield to prevent contact with this substance. Emergency wash facilities: Where there is any possibility that an employee's eyes and/or skin may be exposed to this substance, the employer should provide an eye wash fountain and quick drench shower within the immediate work area for emergency use.

CLOTHING:

Employee must wear appropriate protective (impervious) clothing and equipment to prevent any possibility of skin contact with this substance.

GLOVES:

Employee must wear appropriate protective gloves to prevent contact with this substance.

RESPIRATOR:

The following respirators and maximum use concentrations are recommendations by the U.S. Department of Health and Human Services, NIOSH Pocket Guide to Chemical Hazards; NIOSH criteria documents or by the U.S. Department of Labor, 29 CFR 1910 Subpart Z. The specific respirator selected must be based on contamination levels found in the work place, must not exceed the working limits of the respirator and be jointly approved by the National Institute for Occupational Safety and Health and the Mine Safety and Health Administration (NIOSH-MSHA).

SODIUM HYDROXIDE:

10 mg/m3- Any supplied-air respirator operated in a continuous flow mode. Any air-purifying full facepiece respirator with a high efficiency particulate filter. Any powered, air-purifying respirator with a dust and mist filter. Any self-contained breathing apparatus with a full facepiece. Any supplied-air respirator with a full facepiece. Escape- Any air-purifying, full facepiece respirator with a high efficiency particulate filter. Any appropriate escape-type, self-contained breathing apparatus.

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode. Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

DESCRIPTION: Odorless, white or off-white hygroscopic solid.
MOLECULAR WEIGHT: 40.00
MOLECULAR FORMULA: NA-O-H
PHYSICAL STATE (S,L,G): S
BOILING POINT: 2534 F (1390 C)
MELTING POINT: 604 F (318 C)
SPECIFIC GRAVITY: 2.130
pH: 14 @ 5% solution
VAPOR PRESSURE: 100 mmHg @ 1111 C
WATER SOLUBILITY: soluble
SOLVENT SOLUBILITY: Soluble in alcohol, glycerol; insoluble in acetone, ether.

SECTION 10 - STABILITY AND REACTIVITY

REACTIVITY:

Reacts exothermically with water.

CONDITIONS TO AVOID:

May burn but does not ignite readily. Flammable, poisonous gases may accumulate in tanks and hopper cars. May ignite combustibles (wood, paper, oil, etc.).

INCOMPATIBILITIES:

SODIUM HYDROXIDE:
ACETALDEHYDE: May result in violent polymerization.
ACETIC ACID: Mixing in closed container increases temperature and pressure.
ACETIC ANHYDRIDE: Mixing in a closed container increases temperature and pressure.
ACIDS: May react violently.
ACROLEIN: May result in an extremely violent polymerization.
ACRYLONITRILE: May cause violent polymerization.
ALLYL ALCOHOL + BENZENE SULFONYL CHLORIDE: Possible explosion hazard.
ALLYL CHLORIDE: Hydrolyzes.
ALUMINUM: Vigorous reaction.
ALUMINUM, ARSENIC TRIOXIDE, SODIUM ARSENATE: May generate flammable hydrogen gas.
AMMONIA + SILVER NITRATE: Precipitation of explosive silver nitride may occur.
AMMONIUM SALTS: May react violently evolving ammonia gas.
BENZENE-1,4-DIOL: Exothermic reaction.

N,N'-BIS(TRINITROETHYL)UREA: Formation of explosive compound.
BROMINE: Possible explosion if not stirred continously.
CHLORINE TRIFLUORIDE: May cause violent reaction.
CHLOROFORM + METHYL ALCOHOL: Exothermic reaction.
CHLOROHYDRIN: Mixing in a closed container causes an increase in temperature and pressure.
4-CHLORO-2-METHYLPHENOL: Possible ignition.
CHLORONITROTOLUENES: Possible explosion.
CHLOROPICRIN: May cause violent reaction.
CHLOROSULFONIC ACID: Mixing in a closed container causes an increase in temperature and pressure.
CINNAMALDEHYDE: Exothermic reaction.
COATINGS: May be attacked.
COPPER: Solutions may slowly corrode.
CYANOGEN AZIDE: May form sodium 5-azidotetrazolide, which is explosive if isolated.
2,2-DICHLORO-3,3-DIMETHYLBUTANE: Hazardous reaction.
1,2-DICHLOROETHYLENE: May form spontaneously flammable monochloroacetylene.
DIBORANE AND OCTANAL OXIME: Exothermic reaction.
ETHYLENE CYANOHYDRIN: Mixing in a closed container causes an increase in temperature and pressure.
FLAMMABLE LIQUIDS: Fire and explosion hazard.
GLYCOLS: May cause exothermic decomposition with evolution of hydrogen gas.
GLYOXAL: Mixing in a closed container increases temperature and pressure.
HALOGENATED HYDROCARBONS: Violent reaction.
HYDROCHLORIC ACID: Mixing in a closed container causes an increase in temperature and pressure.
HYDROFLUORIC ACID: Mixing in a closed container causes an increase in temperature and pressure.
HYDROQUINONE: Rapid decomposition of hydroquinone with evolution of heat.
IRON: Solutions may slowly corrode.
LEAD: May be attacked; flammable hydrogen gas may be liberated.
LEATHER: May be attacked.
MALEIC ANHYDRIDE: Explosive decomposition.
METALS: Corrodes metals, reacting to form flammable hydrogen gas.
4-METHYL-2-NITROPHENOL: Exothermic reaction.
NITRIC ACID: Mixing in closed container increases temperature and pressure.
NITROBENZENE: Possibly explosive reaction upon heating in presence of water.
NITROETHANE: Forms an explosive salt.
NITROMETHANE: Forms an explosive salt.
NITROPARAFFINS: The nitroparaffins, in the presence of water, form dry salts with organic bases. The dry salts are explosive.
NITROPROPANE: Forms an explosive salt.
O-NITROTOLUENE: Possible explosion.
OLEUM: Mixing in a closed container causes an increase in temperature and pressure.
ORGANIC PEROXIDES: Incompatible.
PENTOL (3-METHYL-2-PENTENE-4-YN-1-OL): Possible explosion.
PHOSPHORUS: May form mixed phosphines which may ignite spontaneously in air.
PHOSPHORUS PENTOXIDE: May react violently when heated.
PLASTICS: May be attacked.
B-PROPIOLACTONE: Mixing in a closed container causes an increase in temperature and pressure.
PROPYLENE OXIDE: Ignition or explosion may occur.
RUBBER: May be attacked.
SODIUM TETRAHYDROBORATE: Dry mixtures with sodium hydroxide containing 15-40% of tetrahydroborate liberate hydrogen explosively at 230-270 C.
SULFURIC ACID: Mixing in a closed container causes an increase in temperaure and pressure.
1,2,4,5-TETRACHLOROBENZENE: Violent reaction.
TETRACHLOROBENZENE + METHYL ALCOHOL: Possible explosion.
TETRACHLOROETHYLENE: Possible explosion.
TETRAHYDROFURAN: Serious explosions can occur.
TIN: Evolution of hydrogen gas which may form an explosive mixture.
1,1,1-TRICHLOROETHANOL: Explosion may occur.
TRICHLOROETHYLENE: Formation of explosive mixtures of dichloroacetylene.
TRICHLORONITROMETHANE + METHANOL: May cause violent reaction.
WOOL: May be attacked.

ZINC (DUST): Fire and explosion hazard.
ZIRCONIUM: May cause explosive reaction upon heating.
HAZARDOUS DECOMPOSITION:
Thermal decomposition may release toxic fumes of sodium oxide.
POLYMERIZATION:
Hazardous polymerization has not been reported to occur under normal temperatures and pressures.

SECTION 11 - TOXICOLOGICAL INFORMATION

SODIUM HYDROXIDE:
IRRITATION DATA: 500 mg/24 hours skin-rabbit severe; 1% eye-rabbit severe;
50 ug/24 hours eye-rabbit severe; 1 mg/24 hours eye-rabbit severe; 400 ug eye-rabbit mild; 1 mg/30 seconds rinsed eye-rabbit severe; 1%/24 hours eye-monkey severe.
TOXICITY DATA: 1350 mg/kg skin-rabbit LD50 (Van Waters & Rogers Inc. MSDS);
500 mg/kg oral-rabbit LDLo; 104-340 mg/kg oral-rat LD50 (Van Waters & Rogers
Inc. MSDS); 40 mg/kg intraperitoneal-mouse LD50; mutagenic data (RTECS).
CARCINOGEN STATUS: None.
LOCAL EFFECTS: Corrosive- inhalation, skin, eye, ingestion.
ACUTE TOXICITY LEVEL: Toxic by ingestion; moderately toxic by dermal absorption.
TARGET EFFECTS: No data available.
AT INCREASED RISK FROM EXPOSURE: Persons with pre-existing skin and eye conditions.

HEALTH EFFECTS
INHALATION:
SODIUM HYDROXIDE:
CORROSIVE. 10 mg/m3 Immediately Dangerous to Life or Health.
ACUTE EXPOSURE- Effects due to inhalation of dusts or mist may vary from mild irritation of the nose at 2 mg/m3 to severe pneumonitis depending on the severity of exposure. Low concentrations may cause mucous membrane irritation with sore throat, coughing, and dyspnea. Intense exposures may result in destruction of mucous membranes and delayed pulmonary edema or pneumonitis. Shock may occur.
CHRONIC EXPOSURE- Prolonged exposures to high concentrations of dusts or mists may cause discomfort and ulceration of the nasal passages. Repeated exposures of 5000 mg/L were harmless to rats, but 10,000 mg/L led to nervousness, sore eyes, diarrhea and retarded growth. Rats exposed 30 minutes/day to unmeasured concentrations of sodium hydroxide aerosols suffered pulmonary damage after 2-3 months. Death occurred in 2 of 10 rats exposed to an aerosol of 40% aqueous sodium hydroxide for 30 minutes, twice a week for 3 weeks. Histopathological examination showed mostly normal lung tissue with foci of enlarged alveolar septae, emphysema, bronchial ulceration, and enlarged lymph adenoidal tissues. An epidemiologic study of 291 workers chronically exposed to caustic dusts for 30 years or more found no significant increase in mortality in relation to duration or intensity of such exposures.
SKIN CONTACT:
SODIUM HYDROXIDE:
CORROSIVE.
ACUTE EXPOSURE- Upon contact with the skin, damage including redness, cutaneous burns, skin fissures and white eschars may occur without immediate pain. Exposure to solutions as weak as 0.03 N (0.12%) for 1 hour has caused injury to healthy skin. With solutions of 0.4-4%, irritation does not occur until after several hours. Solutions of 25-50% caused no sensation of irritation within 3 minutes in human subjects. Skin biopsies from human subjects having 1 N sodium hydroxide applied to their arms for 15 to 180 minutes showed progressive changes beginning with dissolution of the cells in the horny layer and progressing through edema to total destruction of the epidermis in 60 minutes. A 5% aqueous solution caused severe necrosis to the skin of rabbits when applied for 4 hours. Alkalies penetrate the skin slowly. The extent of injury depends on the duration of contact. If sodium hydroxide is not removed from the skin, severe burns with deep ulceration may occur. Exposure to the dust or mist may cause multiple small burns and temporary loss of hair. Pathologic findings due to alkalies may include gelatinous, necrotic areas at the site of contact.

CHRONIC EXPOSURE- Effects are dependent upon concentration and duration of exposure. Dermatitis or effects similar to those for acute exposure may occur.

EYE CONTACT:

SODIUM HYDROXIDE:

CORROSIVE.

ACUTE EXPOSURE- Contact may cause disintegration and sloughing of conjunctival and corneal epithelium, corneal opacification, marked edema and ulceration. After 7 to 13 days either gradual recovery begins or there is progression of ulceration and corneal opacification. Complications of severe eye burns are symblepharon with overgrowth of the cornea by a vascularized membrane, progressive or recurrent corneal ulceration and permanent corneal opacification. Blindness may occur.

CHRONIC EXPOSURE- Effects are dependent upon concentration and duration of exposure. Conjunctivitis or effects similar to those for acute exposure may occur.

INGESTION:

SODIUM HYDROXIDE:

CORROSIVE/TOXIC.

ACUTE EXPOSURE- The reported lethal dose in rats is 140-340 mg/kg. Ingestion may cause a burning sensation in the mouth, corrosion of the lips, mouth, tongue and pharynx, and severe esophageal and abdominal pain, vomiting of blood and large pieces of mucosa, and bloody diarrhea. Asphyxia can occur from swelling of the throat. Mediastinitis, alkalemia, pallor, weak, slow pulse, cardiovascular collapse, shock, coma and death may occur. Perforation of the alimentary tract and constrictive scarring may result. Esophageal stricture may occur weeks, months, or even years later to make swallowing difficult. The estimated fatal dose in man is 5 grams. Cases of squamous cell carcinoma of the esophagus have occurred with latent periods of 12 to 42 years after ingestion. These cancers were believed to be sequela of tissue destruction and possibly scar formation rather than the result of direct carcinogenic action of sodium hydroxide.

CHRONIC EXPOSURE- Depending on the concentration, repeated ingestion of alkaline substances may result in inflammatory and ulcerative effects on the oral mucous membranes and other effects as with acute ingestion.

SECTION 12 - ECOLOGICAL INFORMATION

Ecological information is not yet available for this record

SECTION 13 - DISPOSAL CONSIDERATIONS

Observe all federal, state and local regulations when storing or disposing of this substance.

Disposal must be in accordance with standards applicable to generators of hazardous waste, 40 CFR 262. EPA Hazardous Waste Number D002. 100 pound CERCLA Section 103 Reportable Quantity.

SECTION 14 - TRANSPORT INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION SHIPPING NAME-ID NUMBER, 49 CFR 172.101:
Sodium hydroxide, solid-UN 1823

U.S. DEPARTMENT OF TRANSPORTATION HAZARD CLASS OR DIVISION, 49 CFR 172.101:
8 - Corrosive material

U.S. DEPARTMENT OF TRANSPORTATION PACKING GROUP, 49 CFR 172.101:
PG II

U.S. DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS, 49 CFR 172.101 AND SUBPART E:
Corrosive

U.S. DEPARTMENT OF TRANSPORTATION PACKAGING AUTHORIZATIONS:
EXCEPTIONS: 49 CFR 173.154

NON-BULK PACKAGING: 49 CFR 173.212
BULK PACKAGING: 49 CFR 173.240
U.S. DEPARTMENT OF TRANSPORTATION QUANTITY LIMITATIONS 49 CFR 172.101:
PASSENGER AIRCRAFT OR RAILCAR: 15 kg
CARGO AIRCRAFT ONLY: 50 kg

SECTION 15 - REGULATORY INFORMATION

TSCA Status : Y
SARA Section 302 (40 CFR 355.30) : N TPQ
SARA Section 304 (40 CFR 355.40) : N RQ
SARA Section 313 (40 CFR 372.65) : N
California Prop 65 Status : N
SARA ACUTE Hazard : Y
SARA CHRONIC Hazard : N
SARA FIRE Hazard : N
SARA REACTIVITY Hazard : Y
SARA SUDDEN RELEASE Hazard : N

SECTION 16 - OTHER INFORMATION

No other information is currently available for this record

ATTACHMENT 8 - 50% NaOH Material Safety Data Sheet

OHS/MDL Record Number : OHSIA348
MATERIAL SAFETY DATA SHEET

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MDL Information Systems, Inc.
14600 Catalina Street
San Leandro CA 94577
1-800-635-0064 (Toll Free) or
1-510-895-1313

FOR EMERGENCY SOURCE INFORMATION
CONTACT: 1-615-366-2000 in USA

SUBSTANCE: HYDROGEN PEROXIDE

TRADE NAME/SYNONYM(S): DIHYDROGEN DIOXIDE (SOLUTION)

CHEMICAL FAMILY: Mixture

SUMMARY SHEET AVAILABLE: Y

CREATION DATE: 19931124 REVISED: 19960619 CHEM CHANGE DATE: 19960109

SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS

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1) Component Substance: HYDROGEN PEROXIDE, SOLUTIONS
Component Percent: Range 25-35 %
CAS Registry Number: 7722-84-1
Component SARA 302 TPQ: 1000
Component SARA 304 RQ: 000000001
2) Component Substance: WATER
Component Percent: Range 65-75 %

SECTION 3 - HAZARDS IDENTIFICATION

NFPA Ratings (scale 0-4): Health=2 Fire=0 Reactivity=0

EMERGENCY OVERVIEW:

DESCRIPTION: Clear, colorless liquid.
STATEMENT OF HAZARDS:
Harmful if inhaled or swallowed. Causes skin burns and severe burns to mucous membranes. Causes respiratory tract and eye irritation, possibly severe.
PRECAUTIONARY STATEMENTS:
Do not breathe vapor or mist. Do not get in eyes, on skin, or on clothing. Keep from contact with clothing and other combustible materials. Store away from combustible materials. Keep container tightly closed. Wash thoroughly after handling. Use only with adequate ventilation. Handle with caution.
POTENTIAL HEALTH EFFECTS
INHALATION:
SHORT TERM EFFECTS: May be harmful if inhaled. May cause irritation, possibly severe. Additional effects may include vomiting, diarrhea, chest pain, shortness of breath, wheezing, headache, dizziness, numbness, twitching, lung congestion, convulsions and shock.
LONG TERM EFFECTS: May cause effects as in short term exposure. Additional effects may include tearing.
SKIN CONTACT:
SHORT TERM EFFECTS: May cause irritation, possibly severe. Additional effects may include tingling sensation.
LONG TERM EFFECTS: May cause effects as reported in long term exposure. Same effects as short term exposure.
EYE CONTACT:

SHORT TERM EFFECTS: May cause irritation, possibly severe. Additional effects may include tearing and blindness.

LONG TERM EFFECTS: Same effects as short term exposure.

INGESTION:

SHORT TERM EFFECTS: May be harmful if swallowed. May cause burns. Additional effects may include fever, nausea, vomiting, diarrhea, stomach pain and chest pain.

LONG TERM EFFECTS: May cause effects as in short term exposure. Additional effects may include kidney damage. May also cause tumors.

CARCINOGEN STATUS:

OSHA: N
NTP: N
IARC: N

SECTION 4 - FIRST AID MEASURES

INHALATION:

FIRST AID- If person experiences nausea, headache or dizziness, person should stop work immediately and move to fresh air until these symptoms disappear If breathing is difficult, administer oxygen, keep the person warm and at rest. Call a physician. In event that an individual inhales enough product to lose consciousness, person should be moved to fresh air immediately. If breathing has stopped, artificial respiration should be given immediately. In all cases, ensure adequate ventilation and provide respiratory protection before the person returns to work.

SKIN CONTACT:

FIRST AID- Remove contaminated clothing and shoes immediately. Wash with soap or mild detergent and large amounts of water until no evidence of chemical remains (at least 15-20 minutes). If burns occur, proceed with the following: Cover affected area securely with sterile, dry, loose-fitting dressing. Treat symptomatically and supportively. Get medical attention immediately.

EYE CONTACT:

FIRST AID- Wash eyes immediately with large amounts of water, occasionally lifting upper and lower lids, until no evidence of chemical remains (at least 15-20 minutes). Continue irrigating with normal saline until the pH has returned to normal (30-60 minutes). Cover with sterile bandages. Get medical attention immediately.

INGESTION:

FIRST AID- If the person is conscious and not convulsing, give 2-4 glasses of water to dilute the chemical. Use gastric tube to relieve the pressure caused by evolved oxygen (Dreisbach, Handbook of Poisoning, 12th Ed.). Treat symptomatically and supportively. Intubation should be performed by qualified medical personnel. Get medical attention immediately.

SECTION 5 - FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARD:

Negligible fire hazard when exposed to heat or flame.

Oxidizer: Oxidizers decompose, especially when heated, to yield oxygen or other gases which will increase the burning rate of combustible matter. Contact with easily oxidizable, organic, or other combustible materials may result in ignition, violent combustion or explosion.

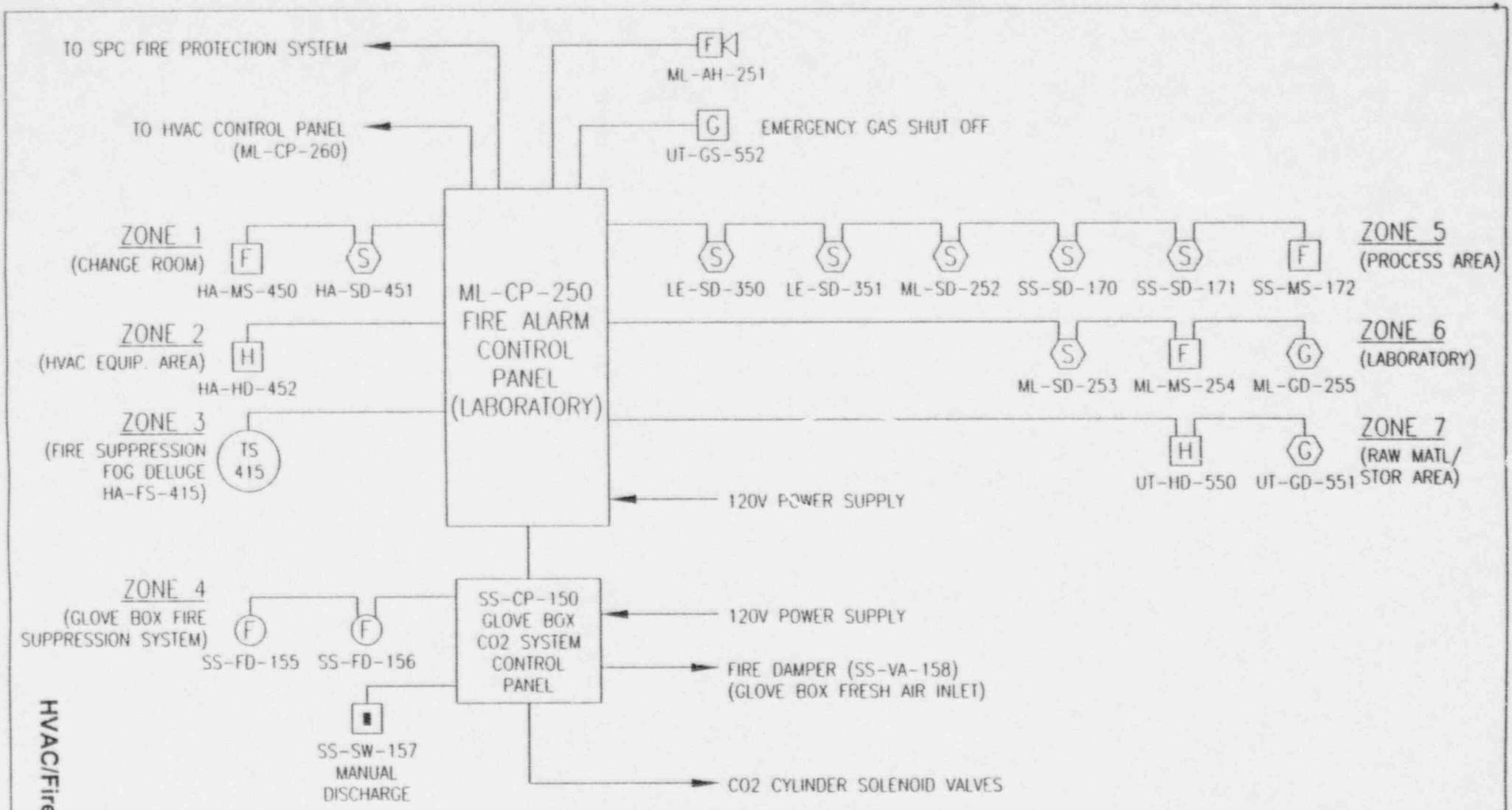
EXTINGUISHING MEDIA:

Water
Do not use dry chemical, carbon dioxide or halon.
(1993 Emergency Response Guidebook, RSPA P 5800.6).

For larger fires, flood area with water from a distance
(1993 Emergency Response Guidebook, RSPA P 5800.6).

FIREFIGHTING:

Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn (1993 Emergency Response Guidebook, RSPA P 5800.6, Guide Page 45). Flood with water.

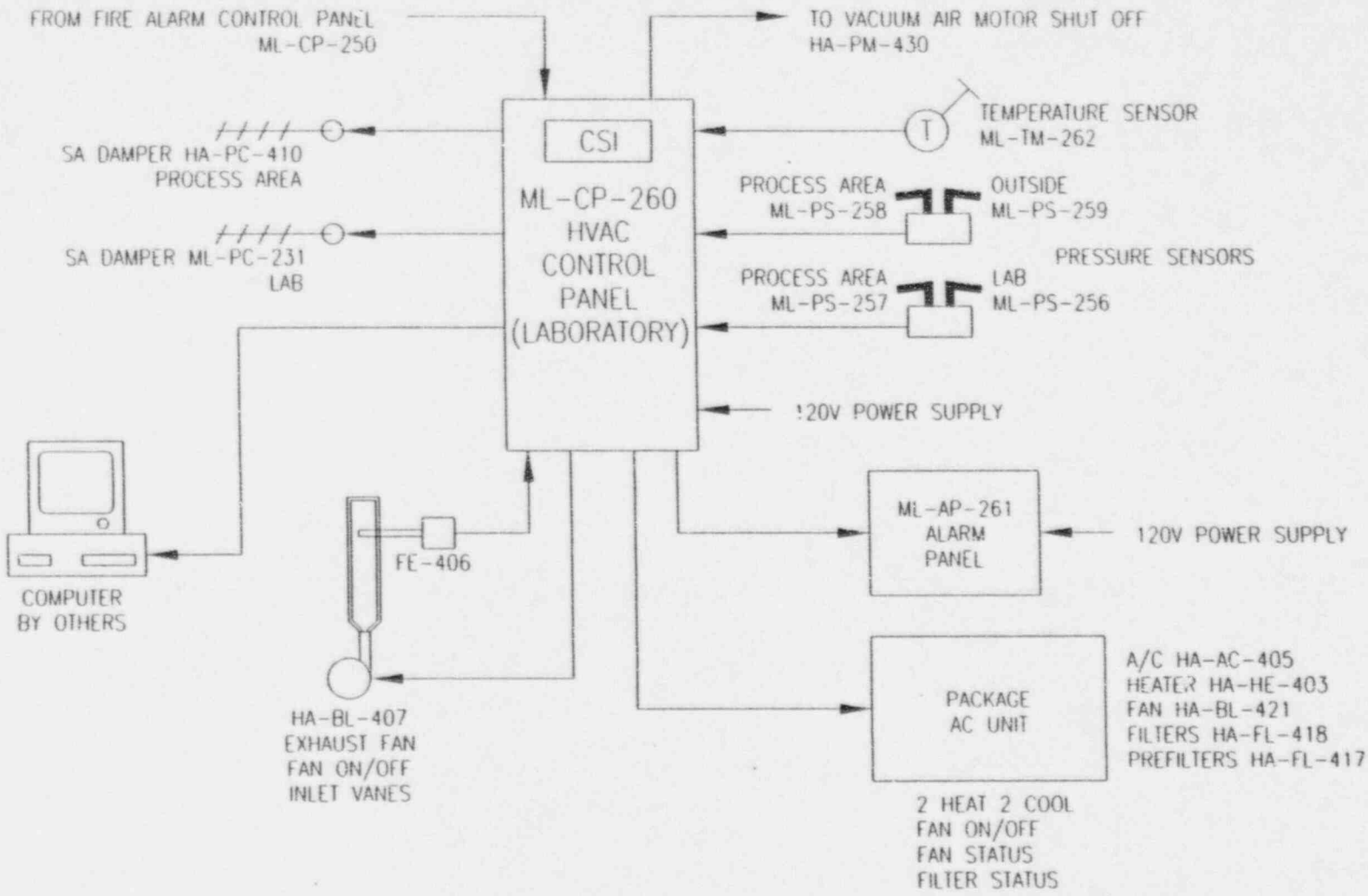


ATTACHMENT 10
HVAC/Fire Protection Controls

REFERENCE DWG G003 - SAFETY EQUIPMENT GENERAL ARRANGEMENT

Recodyne
RECOVERY DYNAMICS CORPORATION
200 EAST MAIN STREET, 6th FLOOR
JOHNSON CITY, TENNESSEE 37604
(423) 975-5566

FILE: FIRE.DWG



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200 EAST MAIN STREET, 6th FLOOR
JOHNSON CITY, TENNESSEE 37604
(423) 975-5566

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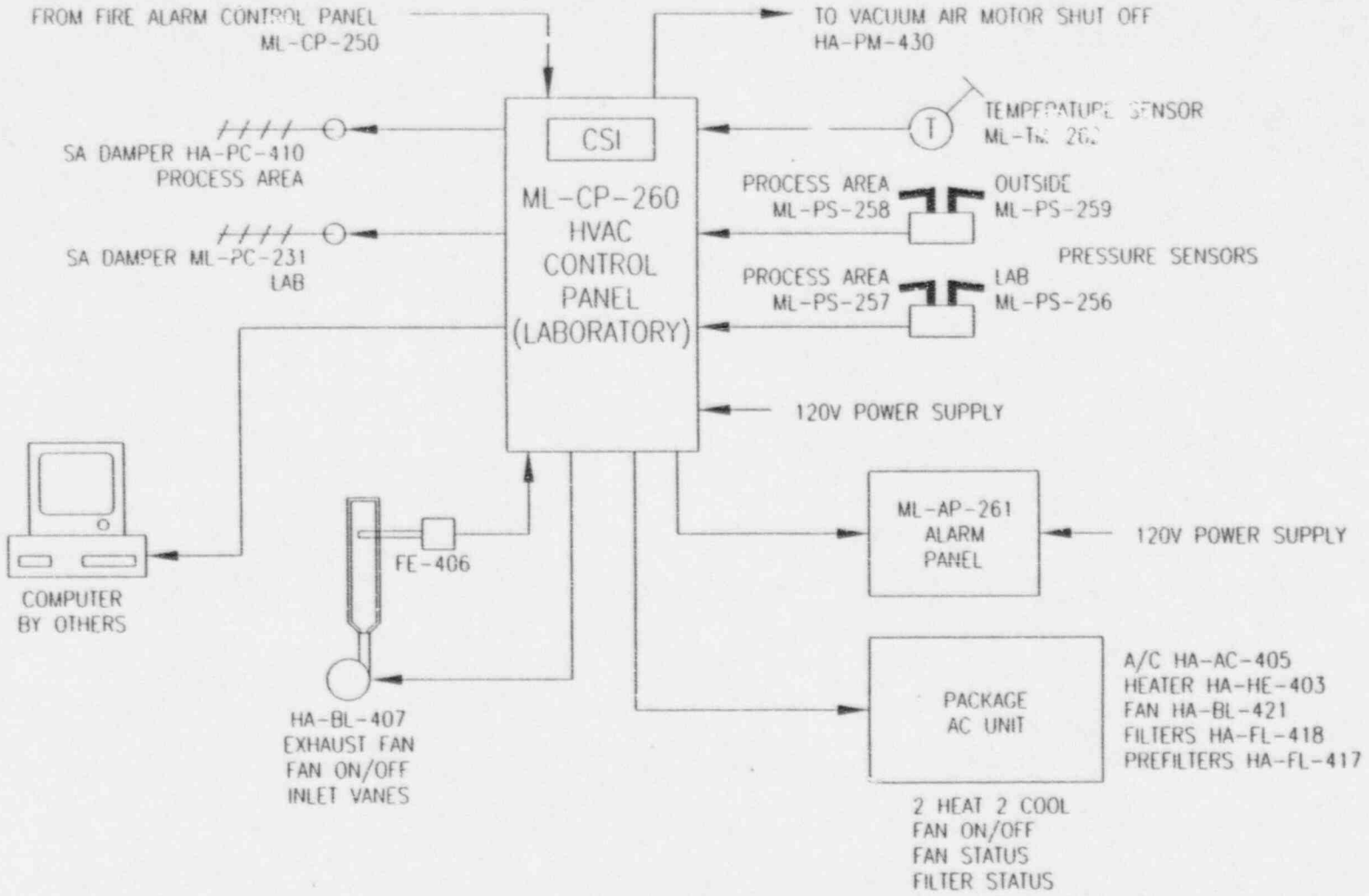

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