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PRACTICAL SOLUTIONS TO SOME INDUSTRIAL HYGIENE CONCERNS

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Presented at the

NPRA
Midwest, Oklahoma-Texas and Gulf Coast
Fire & Accident Prevention Group Meeting

September 29-30, 1982
Dupont Plaza Hotel
Dallas, Texas

LAM 000408

DPMC-16120

**PRACTICAL SOLUTIONS TO SOME INDUSTRIAL
HYGIENE CONCERNS**

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LAM 000409

DPMC-16121

ABSTRACT

Sometimes the obvious is so obvious that the actual is overlooked. This paper discusses three "obvious" statements in connection with industrial hygiene concerns. It attempts to get beyond the "obvious" by outlining some practical "how to's" for people in the field with responsibility for protecting the health of their company's major resource - people.

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INTRODUCTION

Industrial hygiene is sometimes defined as the art and science devoted to recognizing, evaluating, controlling and anticipating those environmental factors or stresses, arising in and from the workplace which may cause sickness, impaired health and well being or significant discomfort and inefficiency among employees.

It has been my experience that recognition and evaluating are relatively easy compared with controlling and anticipating. For that reason, I'd like to discuss a potpourri of practical control measures which have been effective against some known stressors and also in helping control stressors that at the moment can only be considered anticipatory. What I mean by known stressors are substances for which threshold limit values (TLV's) have been established whereas anticipated stressors are those for which no TLV is established or more subtle effects such as on blood cytology, embryo fetus toxicity, reproductive hazards or combined exposures are still not well understood.

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DISCUSSION

One of the biggest opportunities for employee exposure is and has been vessel entry. Because of concern for explosive mixtures in petroleum processing, checking for hydrocarbons and "gas freeing" has been a practice for many, many years. As more information and awareness has been generated over the last decade, it has become necessary to be concerned with contaminant levels that may affect "long term" wellness rather than just "immediate" wellness.

I'd like to consider three "givens" when we talk about maximizing "long term wellness" of employees in maintenance and turn-around activities.

I. "Good ventilation will control known and anticipated stressors"

This statement is so much of a "given" you're probably thinking "tell us something we don't know." Sometimes the problem with the obvious is that it is so obvious we overlook the actual. I'd be willing to bet if you have not looked lately that in many cases you do not have good ventilation. Here are some suggestions for getting and maintaining "good ventilation":

A. Ventilator choices

1. Steam or air eductors have been the historic ventilator of choice because of availability of power source and simplicity of design. These units do a good job when used correctly - but it has been my experience that there are problems in the field.

Noisy

Air/steam pressure problems

Clogged nozzles (infrequently used steam lines rust)

Dripping condensate (burns/slippery surfaces)

Valves partially open

Difficult to visually check performance

2. Steam or air powered blowers have some of the same problems

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3. Electrically driven tank blowers, long used to ventilate storage tanks - can be effectively used on other vessels to improve ventilation.

These units effectively eliminate most of the disadvantages of the aspirators.

It's fairly easy to tell whether it's working or not since it's either on - or off - no in between.

Generally speaking, more air will be moved increasing contaminate removal.

- B. Air Flow - Sometimes this seems elementary. I've read an excellent article by Wm. Brief, published in 1963 with cautions about air flow. But the problem is in educating the responsible people. In many cases it is not possible to establish an air flow that will be adequate throughout the whole job. Gas freeing to eliminate explosion is different from personnel entry for work, i.e. H_2S , gasoline, benzene, welding fumes

Mounting locations should be decided ahead of time.

The type and progression of work needs to be considered.

Entry and exit from the vessel must be thought out.

Here are some things you will want to consider:

1. Ventilator mounting - make sure the flanges are flush so short circuiting doesn't take place. (Figure 1)
2. If your short on manways - consider a combination fan mount/entry spool piece. (Figure 2)
3. Welding cables, electrical cords, air hoses are always a problem. Consider a cable entry spool piece. (Figure 3)
4. Be prepared to move ventilators as the work progresses. One time we cut an opening in an overhead line to provide an air-inlet point to get the flow direction needed. We frequently move ventilators on columns and vessels as the work moves from tray to tray. Sometimes wooden bulkheads have been used to get the flow direction needed in large piping.

C. How do you know which air-mover to use? A nomograph (Figure 4) has been constructed as a ready reference for the volume of air needed for general ventilation. For our plant a chart shows the approximate flows of the various options (Figure 5). CAUTION - depending on the ventilator condition and the constraints, i.e. pressure drops thru the vessel or piping - these values may be overstated.

D. Wind Chill During Cold Weather Turnarounds

1. Figure 6 shows the effect of wind chill at various velocities. The major wind chill problem is at the manway entrance. This is physiologically crucial since the employee experiences the wind chill as he enters the vessel. Early this year, a make-up air preheater was used to take the chill off the ventilation air. By using a steam coil and blower and flex hose to feed warmed air to a plywood hut built around the entry manway, conditions inside the column were materially improved. You can imagine the employee acceptance this received. Temperature in the vessel was raised about 10 degrees. (Figure 7).

II. "Prethinking/planning is necessary to efficient and hence healthy work."

As mentioned, ventilation preplanning is required. Several other preplanning items are necessary in reaching for our goal of optimized long term "well being".

One thing we've done is consider the use of water whenever possible to suppress dust problems. This is a commonly used control for asbestos handling. Why not extend that control? Water spray has successfully kept down dust levels while chipping out old gannister inside lines and even during maintenance work in precipitators. Vessel decontamination does not have to take place just on initial bring down, but should be considered if maintenance work creates contaminated conditions, i.e. sandblasting, grinding. A fire hose can be used to effectively re-clean the vessel after dust generating maintenance operations.

Another thing to preplan is blocked out work schedules. If sandblasting has to be done or asbestos rip out - consider doing it on the off shift or weekend when other people/crafts will be at a minimum.

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Initial vessel/unit decontamination needs thorough preplanning. It takes effort, but thorough purging is necessary - washing, steaming, looking out for liquid trapped in lines. In some cases, longer steaming cycles are necessary so that when the unit is opened the work can proceed without over-exposure and the need to react after the exposure occurs trying to correct the situation.

Being prepared with funnels and hoses to direct liquid to a controlled location when a vessel is first opened is also useful.

Since it has not been possible to eliminate all shutdown exposures, preplanning has to include personal protective equipment. A table of respirators will be helpful in the field so the proper selection can be made. (Figure 8)

Don't forget hearing protection. Noise levels from chipping, grinding and arc gouging inside a vessel can far exceed the safe noise level. Even the noise of the aspirator can be a problem. Permits or other controls need to be used to communicate hearing protection requirements.

III. "Change comes slowly"

When we face this premise we have mixed emotions. Sometimes it seems things need to be changed sooner. Other times it seems things change too quickly. It depends on where you're coming from, what your personal involvement means, and what data you have to support the change.

I'm reminded of our attempts to get a 76 year old lead burner to wear his respirator (I don't know if he was quite that old) - trying to impress him with the health risks of something he had lived with all his life was almost impossible.

Recently, an estimate has been made that approximately 15% of people exposed to 100 ppm of benzene over a working lifetime will contract leukemia. In a democratic society the majority voting on "their" experience would probably defeat any law requiring a lowering of the exposure limit. In other words 85% of the people can't really relate to the problem. The excuses are legion

"We've always done it that way."

"The old way is the best way."

"That suggestion costs too much."

"It's not that bad."

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DISCUSSION

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By the same token, we often have failed to clearly articulate the risks and problems, instead using scare tactics and innuendos.

The practical solution is "perseverance" - persistence, understand the concerns of those whom you want to change.

Take asbestos - it is not all gone. It is a useful material. There really are some applications that it is more effective to control exposures than to substitute. Develop and enforce asbestos handling procedures.

Lead based paints - we've eliminated the use of a lot of primers containing lead. But there are still some paints, limited in use and limited in lead content, that are still being used.

Silica abrasive blasting - again substitutes have been found for the bulk of the blasting that's going on. Yet some silica blasting is still occurring in limited use under controlled conditions such as tube decoking.

Carbon monoxide from forklift exhausts in closed warehouses with limited ventilation has been minimized with catalytic convertors in place of mufflers.

These represent some of the practical, measurable solutions to improving workplace conditions that we have used.

I hope you'll be able to use some of these ideas.

You noticed the solutions are merely methods developed from three straight forward "givens". Yet much can be done with a little innovative thinking and perseverance to improve the long term "wellness" of your fellow employees.

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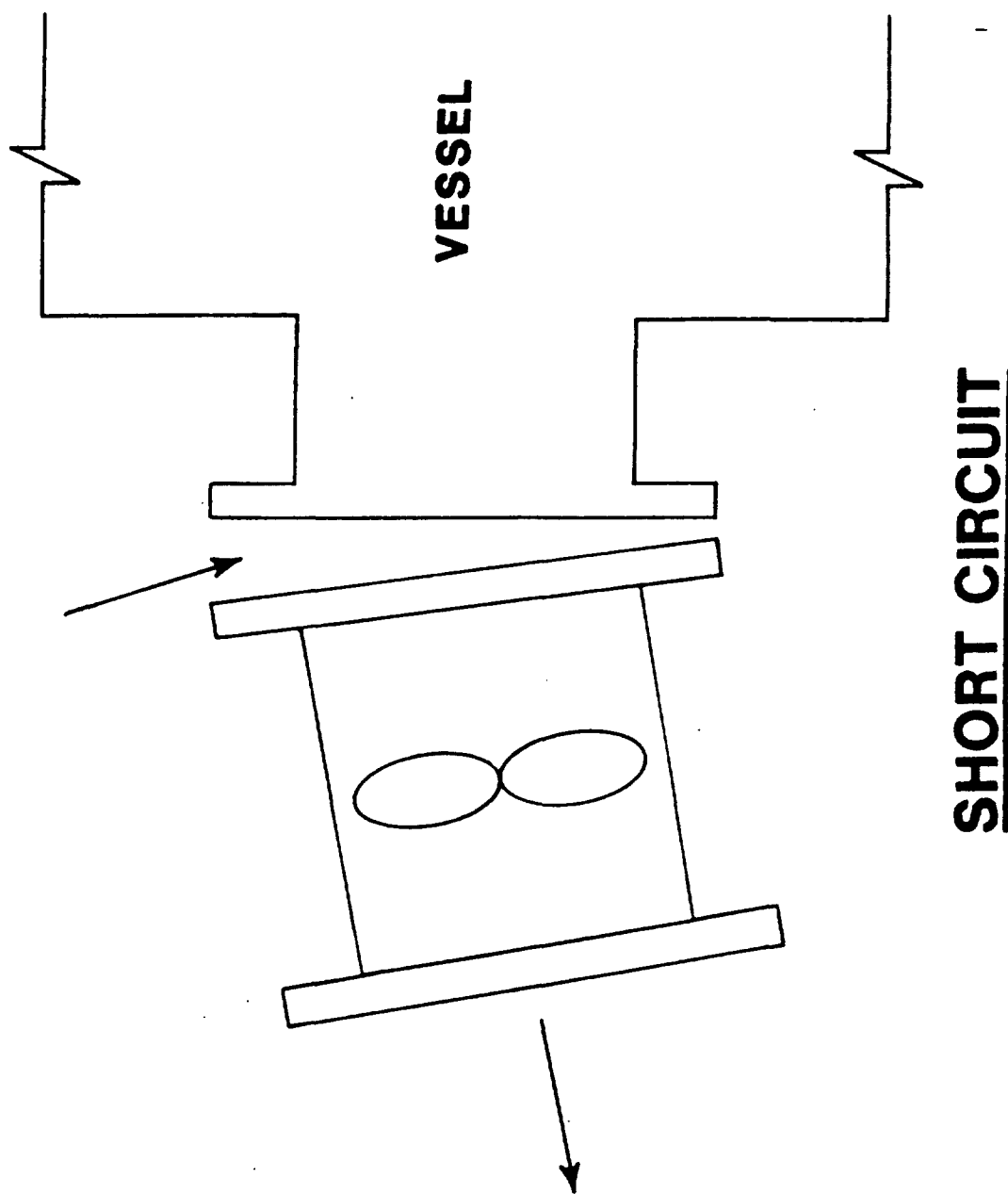
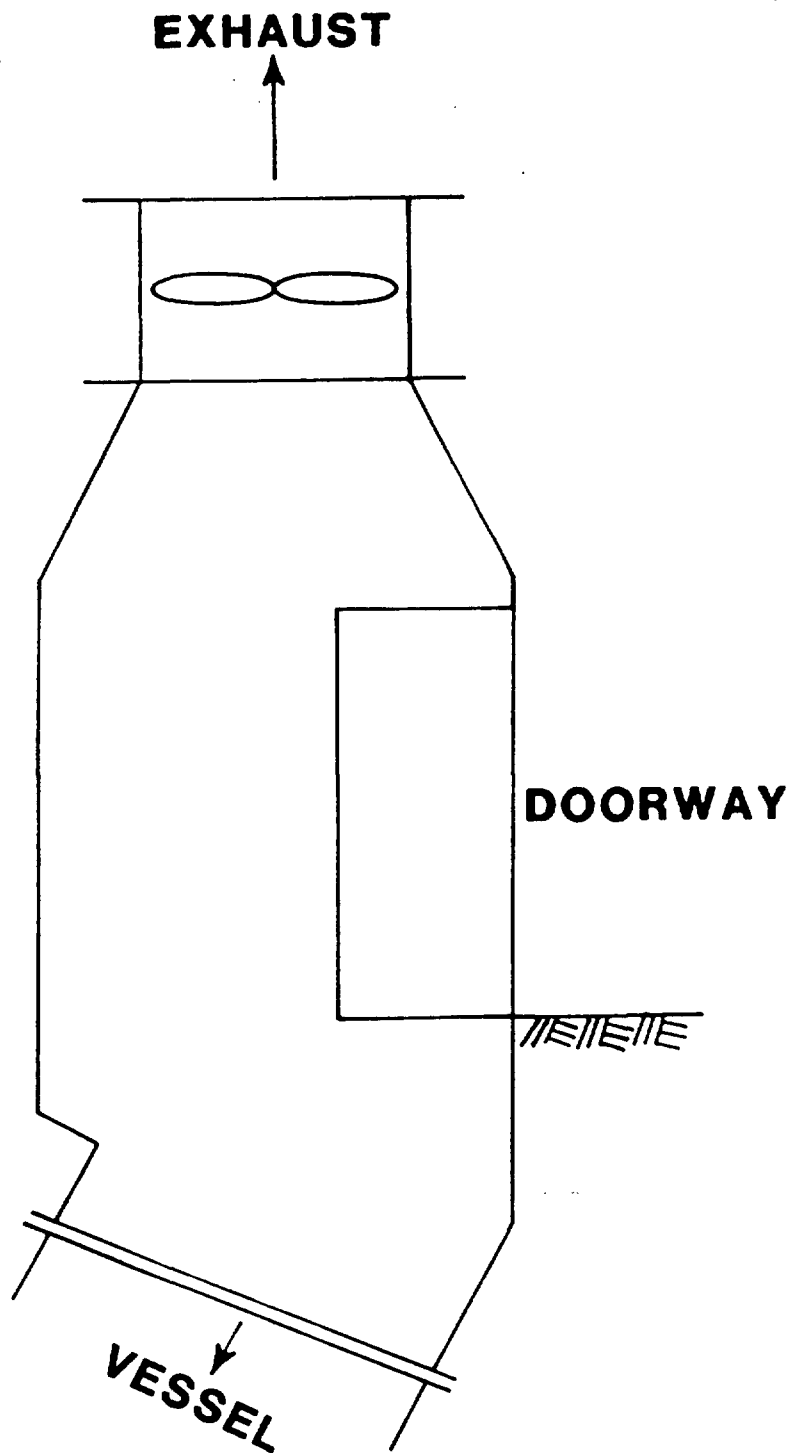


FIGURE 1

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COMBINATION MANWAY
FAN MOUNT

FIGURE 2

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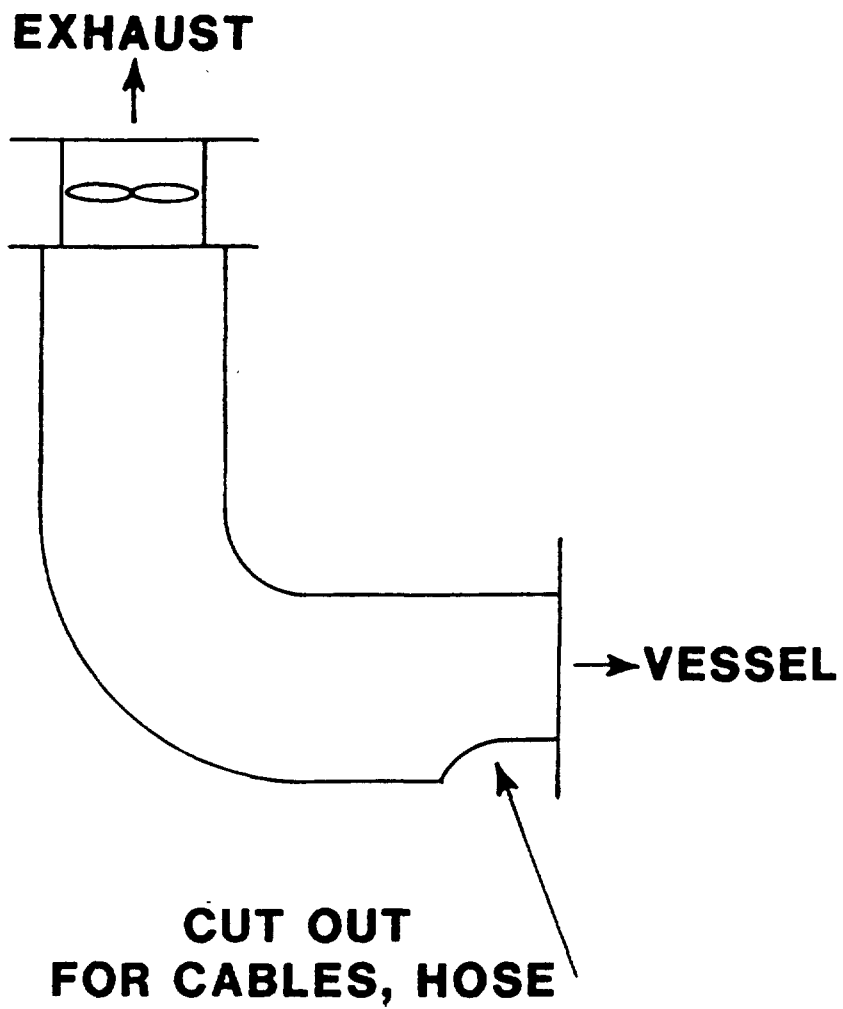
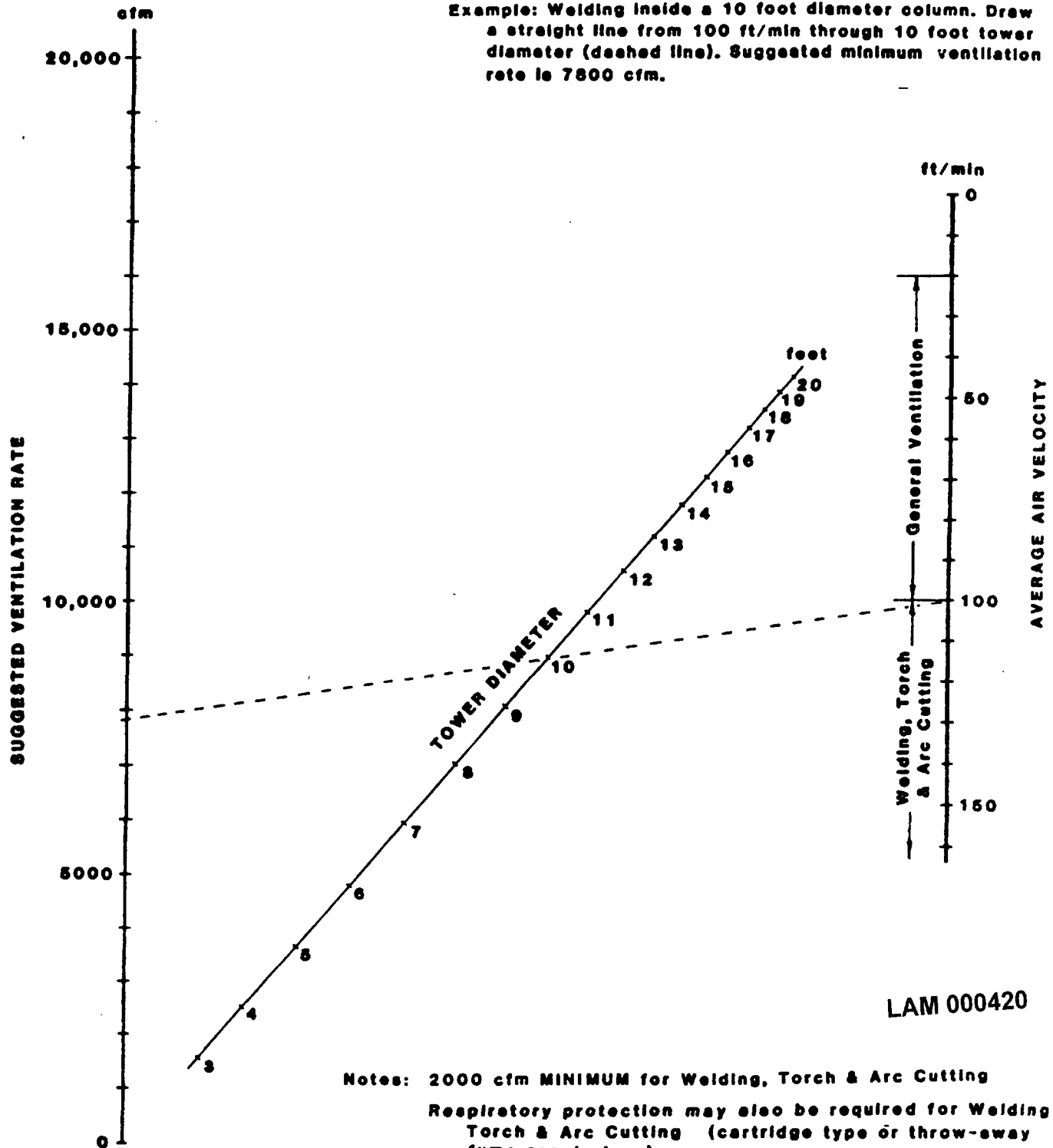


FIGURE 3

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Suggested Ventilation Rates for Work In Confined Spaces

Example: Welding inside a 10 foot diameter column. Draw a straight line from 100 ft/min through 10 foot tower diameter (dashed line). Suggested minimum ventilation rate is 7800 cfm.



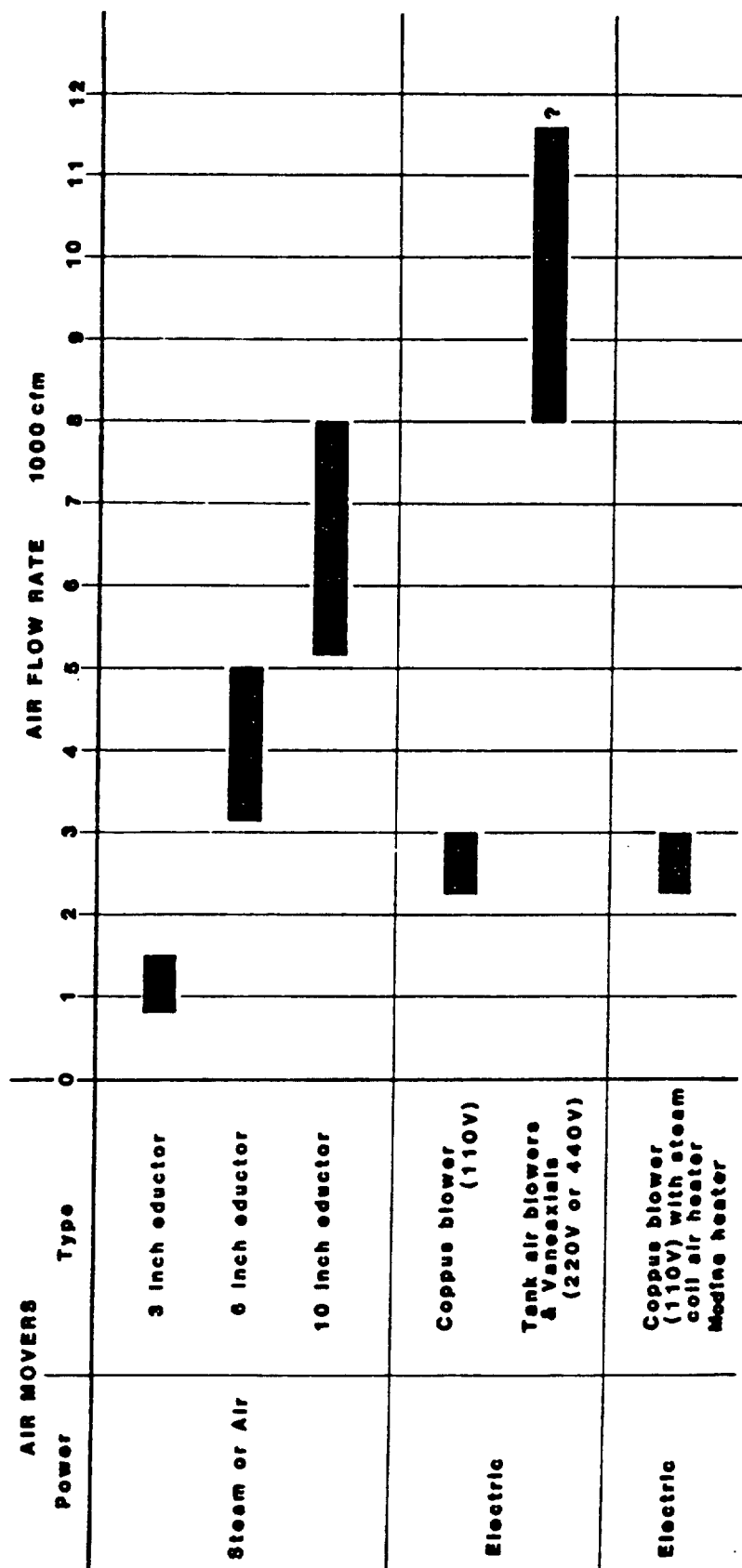
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Notes: 2000 cfm MINIMUM for Welding, Torch & Arc Cutting
Respiratory protection may also be required for Welding
Torch & Arc Cutting (cartridge type or throw-away
fume respirators)

Suggested ventilation rates good for restrictions of up
to 50% of tower area. Reduced rates and localized
ventilation should be considered for restrictions
greater than 50%.

FIGURE 4

Air Movers Available for Ventilation of Confined Spaces



Note: All flow rates are approximate. Rate depends on vessel restrictions (static pressure), condition of air mover, inlet steam or air pressure (eductors).

FIGURE 5

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WIND CHILL TEMPERATURES

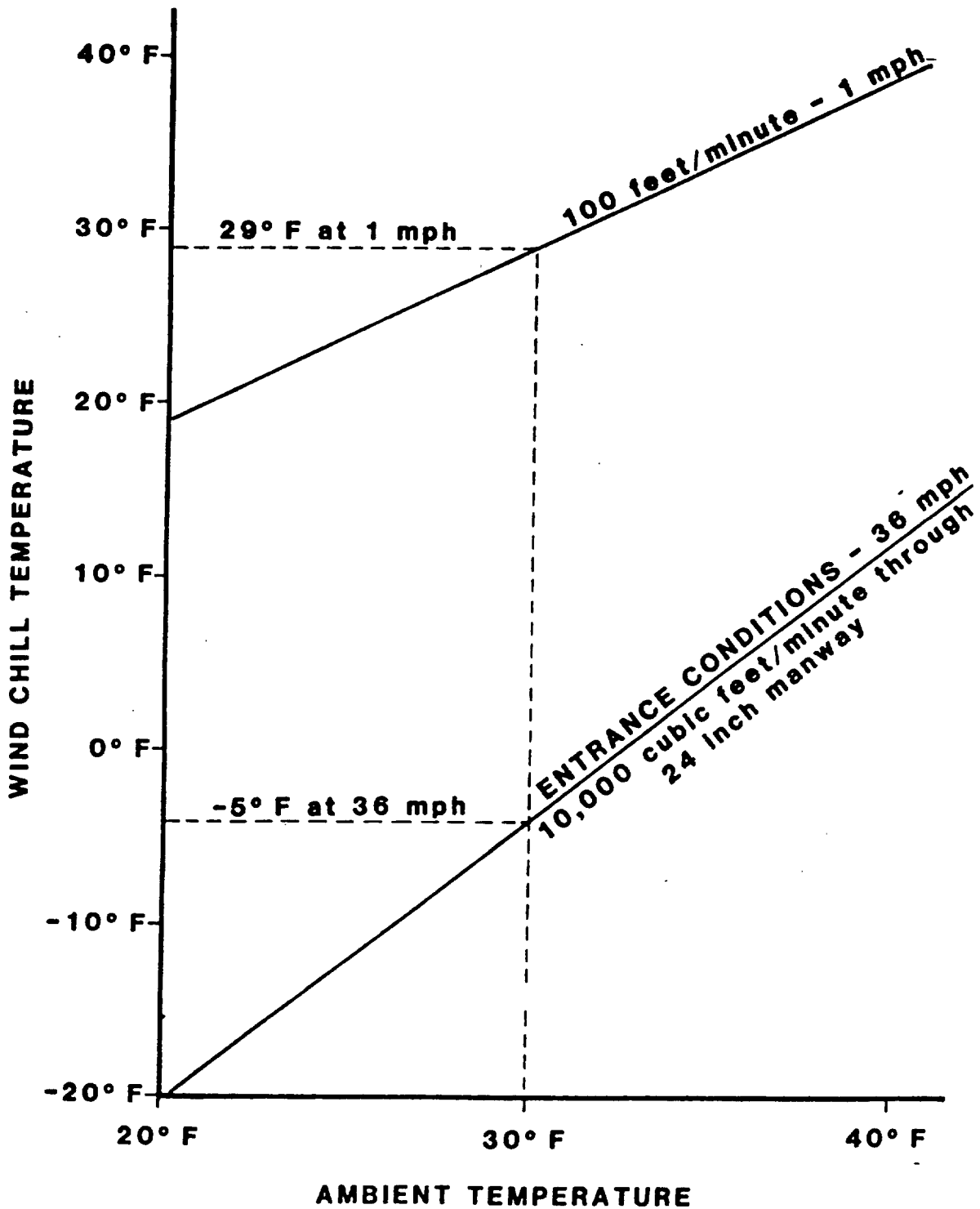


FIGURE 6

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VENTILATION AIR PREHEATER

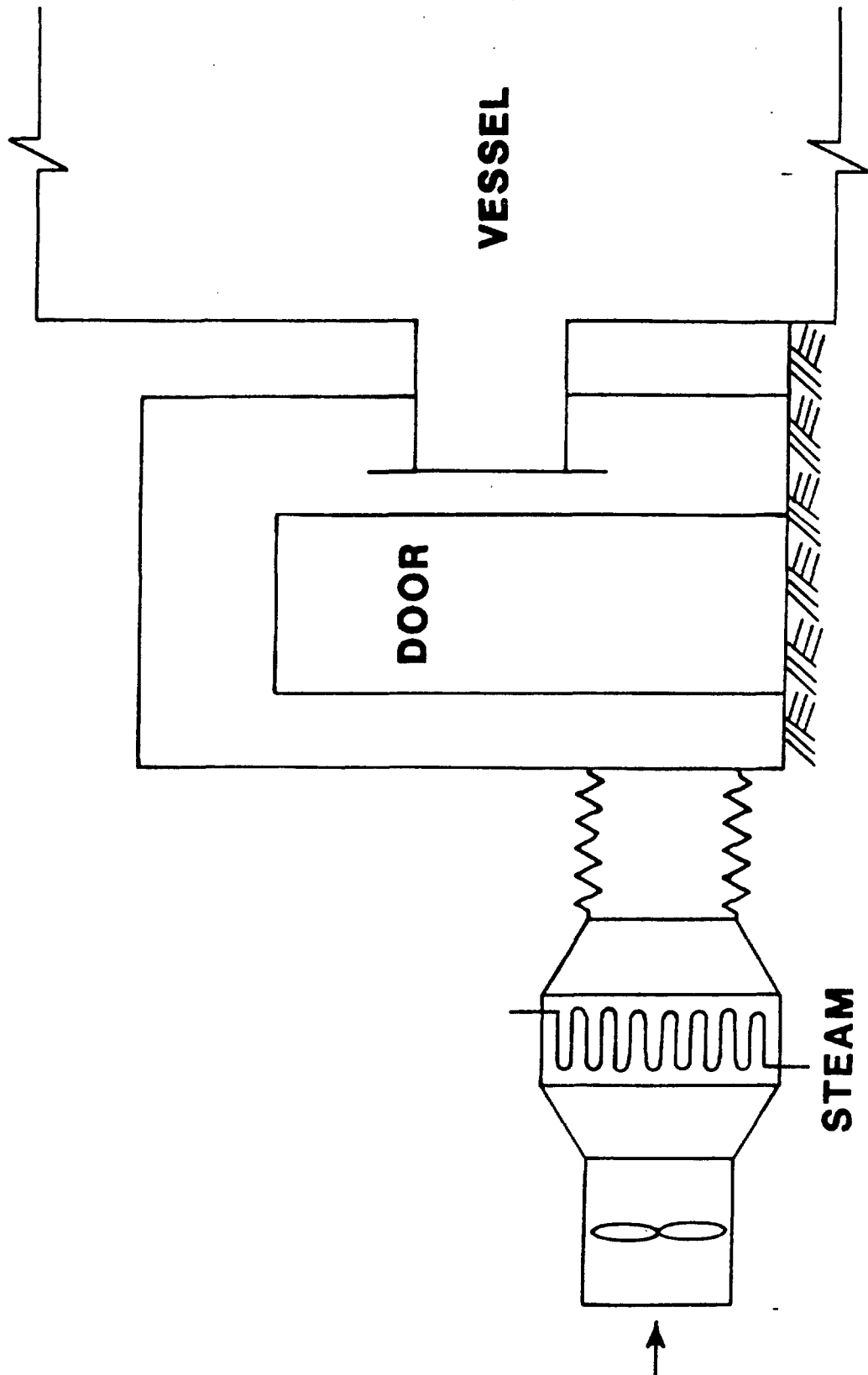


FIGURE 7

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RESPIRATOR SELECTION SHEET

1. AMERICAN OPTICAL R-1050 DUST MASK
- 2.
- 3.
- 4.

CONTAMINANT

NORMAL PROTECTION

INSULATION

A/O - R-1050

STAINLESS STEEL

A. IN CONFINED SPACES

WELDING

WELDERS - AIRLINE MASK

HELPERS - A/O R-5000

WITH R-57 CARTRIDGES

B. OPEN AREA

A/O - R-5000 W/R-57

CARTRIDGES

ETC.

ETC.

FIGURE 8

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