April 12, 1935

MEMORANDUM TO MR. SCHAEFER AND MR. STECKER

(Original attached to Memorandum to Mr. Webb.)

Specific Hazards in Relation to Various Processes

I. Raw Materials

The unloading and handling of the pigs of lead and bars of sodium have to date resulted in no occupational disease, the principal hazard apparently being that of injury from accident in handling. The same has been true of the molten sodium and lead systems. In the case of the last it is to be borne in mind that at the temperature at which the lead is stored and delivered, fumes and oxide dust are a potential source of danger if the system is opened at any time.

The Ethyl Chloride Manufacturing Plant has given rise to no difficulty although there has been varying slight exposure to HCl, EtOH, $ZnCl_2$ and EtCl. The danger of fire is a constant one, chemical injury from HCl as a result of interruption of delivery line or repair in tower is an occasional possibility.

II. Preparation of Alloy

(a) Pot process. Men charging kettles are working on the same level and close to other kettles which may be hot. In any case all kettles should be cool before opening and those in operation be hooded as they now are. The loading and transfer of the pots to the cooling chamber may introduce oxide dust into the air. Men working in this level should wear at least a filter mask while any operation, including the ensuing, is carried out. A cone respirator and goggles should

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be worn by the men engaged in dumping and grinding the alloy. The loading of the hoppers with ground alloy is the greatest potential hazard up to this point in the operation, the exposure being to dust. The exhaust system, loading technique and precautions now observed should be continued. This entire operation has been well controlled and safeguarded.

(b) The continuous process gives rise to a new hazard - viz., diphenyl but there has been no evidence of illness from exposure to it up to now. The grinding and cooling system for the alloy as well as the storage and delivery systems for molten alloy must be kept free from leakage. While this system has not been in complete operation for a sufficiently long period of time to evaluate the dangers as they exist, satisfactory functioning of the unit should effect a further reduction in exposure to men in the alloy operation.

III. Autoclave Charging

Men engaged on the fifth floor have two constant sources of minimal exposure. The first is from alloy which remains on improperly cleaned hopper tops, the second from droppage of alloy from the slide valve parts of the hopper following disconnection from the autoclave inlet. Both of the above are conditions which may or may not be corrected by improved equipment, certainly they can be by constant vigilance in housekeeping. A third, discontinuous exposure to these men is from dust arising in the recovery building as a result of furnace puffs, and possible, in part at least, from expulsion of larger quantities of dust than usual from the one exhaust stack which is not provided with a precipitator (D Building). In general, this operation can be considered the safest of those that follow.

IV. Autoclave Operation

Under normal operating conditions the exposure of autoclave operation is small and is limited principally to that associated with the taking of pressure readings and in sampling, and is due to fluid adhering to the rod of the sampling apparatus and to the rubber gaskets.

V. Distillation

The men working on the still floor have had the greatest continuous exposure of any group, the chief source being leaks at the packing around the agitator shafts and at the manhole covers. As in other places there are in addition occasional sources of exposure from tear-downs, these being fairly frequent, however, on this floor, in changing condensers and inserting new packings. Where new construction might permit sufficient change in design, thought should be given to the enclosure of at least such portions of the stills as give rise to these difficulties. A further improvement can be made in the ventilating arrangement on this floor, whereby the incoming air is delivered along the center ceiling and collected along the floors at the walls, assuring a constant sweep of air across the stills and floor away from the main corridor.

VI. Separation and Handling

This, as an operation is one of minimal exposure, such danger to the men as is encountered being mainly due to fumes from filter bag changing and tear-down work on lines. The filter bags should be so situated as to be handled conveniently and without undue exposure or spillage. They can best be located in a separate adequately ventilated room. A frequent source of exposure has been the steam jets into the stills, stoppage of which necessitates their removal and cleaning or replacement. The cleaning of spills is of especial importance to men on the first floor, any fluid allowed to remain in the drainage ditches may be volatilized by exhaust steam discharged into them.

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VII. Blending

Present methods of control of hazards are adequate for ordinary operating conditions. While the present sumps under the drum washing and filling equipment are adequate, they can be improved upon by giving them a decided slope with a large sewer outlet, so that cleaning can be easily affected by means of a stream of water. The history of the present blending tanks insofar as leaks are concerned should be considered when contemplating the construction of new tanks. A further improvement in the barrel filling equipment can be brought about by adequate lateral ventilation to include the adjacent valves and sight glass.

VIII. Storage and Loading

Unit ventilation about each of the Lewis pumps should be provided to prevent escape of vapor while the pump is operating. Filter bags are best housed in a separate, ventilated room apart from the space where the weighing is done and the loading controlled.

IX. Recovery

(a) EtCl. Exposure is slight. Non-condensible gases should be vented a safe distance fromthe air intakes or into the main vent stack.

(b) Pb. Ample provision for draining and handling of sludge should be made to eliminate the furnace puffs. These are a hazard not only to the operators in the furnace building but to the entire area as well. Dust from this source may lie in the areaways or be taken in through the air inlets into the buildings. If it is necessary to add waste alloy, floor sweepings from the alloy building, etc., directly to the furnace, special precautions should be taken.

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X. Waste

The slag pit or dump is best placed at some distance from the buildings, not between them where spilled material can be tracked or carried into the building by normal traffic. In general liquid wastes may form the greatest problem. As the sludge pit water contains on the average 0.5% of lead by volume and each unit contributes about 1300 gals. per 8 hour cycle, some means of disposal other than directly into fresh water streams is necessary. (See attached appendix)

XII. Labor and Hours

Lacking knowledge of labor laws and practices in Germany, one cannot recommend a specific plan. However, adequate provision should be made to avoid the consequences of too exacting and too prolonged hours of employment. The workmen in such a plant need to be regarded as expert mechanics after their training and they should be given every incentive to work skillfully and carefully. A strenuous schedule of hours will defeat such a result.

XIII. Medical Supervision

Should be provided and should include in its program periodic examination of all men employed in the area after the plant is in operation. Laboratory facilities as an adjunct to the medical work and to carry out such routine analyses on the men as are indicated, should be provided. Air analyses as a control measure would be best carried out by this laboratory, working with the Medical Department.

In order to put these matters on a basis which will enable estimates of cost to be made, it should be pointed out that at the outset the men will have to be carefully examined and the findings recorded. In addition urinalysis, erythrocyte counts and hemaglobin determinations should be made on each man. Blood films for the count of stippled erythro-

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content of the excreta of a representative group of not less than three men from each operation should be carried out.

Examinations should be repeated weekly during the preliminary period of operation, and at intervals of not less than three weeks subsequently. These examinations should include questioning, physical examination, weight, haemoglobin determination and urinalysis. Blood films should be examined at intervals of not less than 1 month as a routine.

Lead analyses of the excreta should be made every two months for the first six months, and afterward at not less than quarterly intervals. Air analysis should cover the entire plant at least twice a month for the first few months until the bad points have been found and eliminated, if such occurs.

These routine procedures will require the full time services of a good physician during the preliminary period, and for some time thereafter. At least one laboratory worker will be required in addition. Facilities for the analysis of the excreta must be found either at the plant or elsewhere. The precise nature of the arrangement will depend upon circumstances.

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