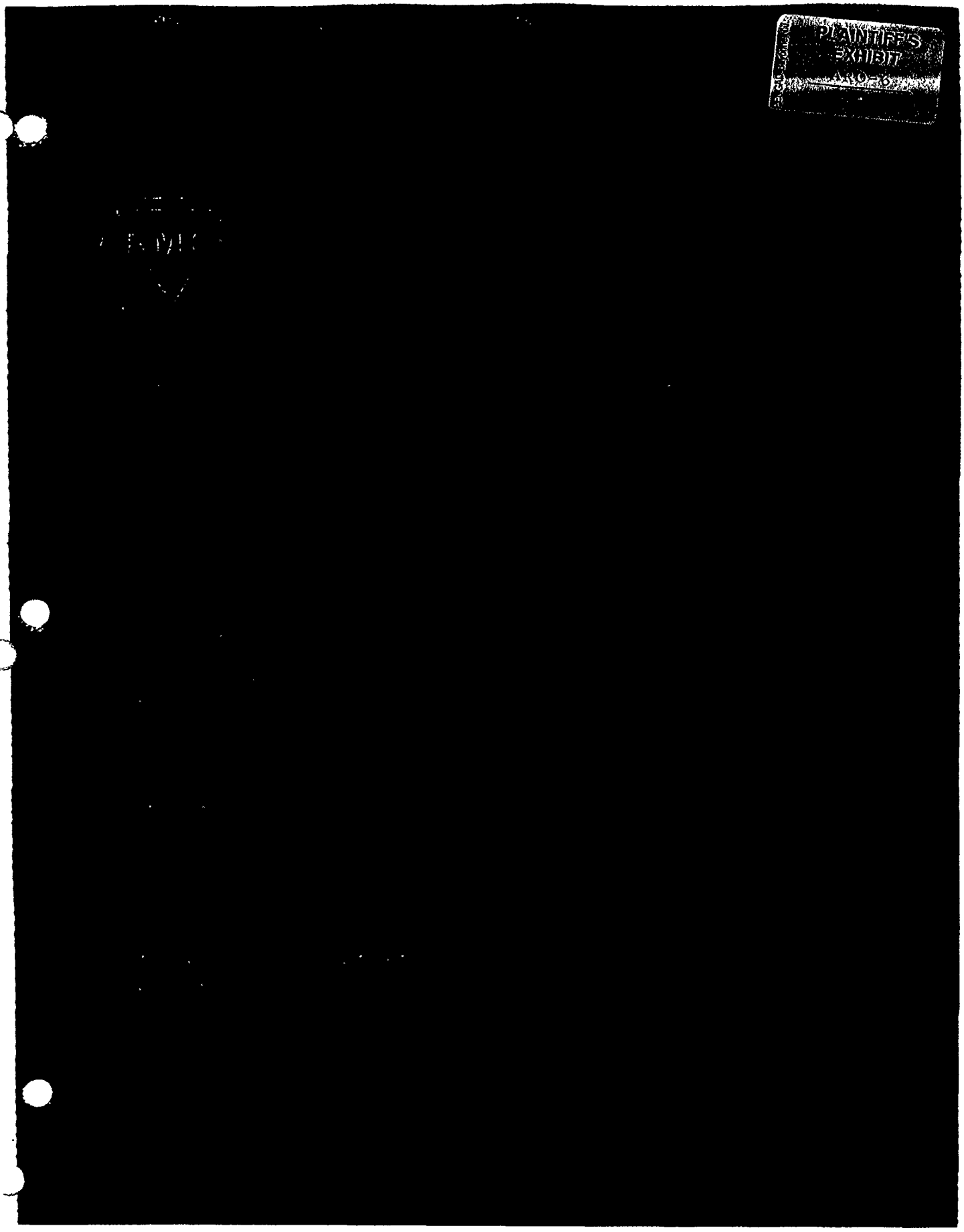
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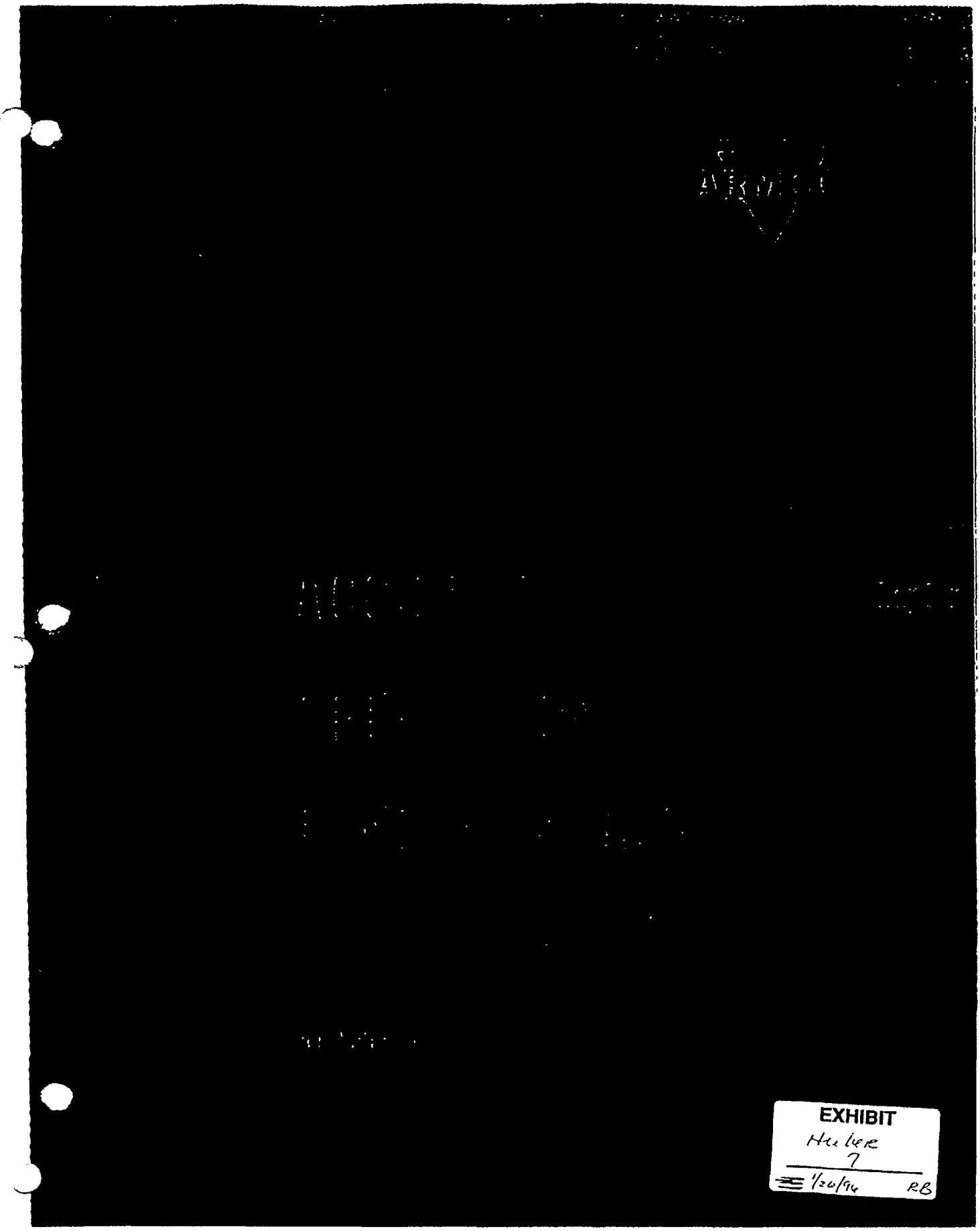
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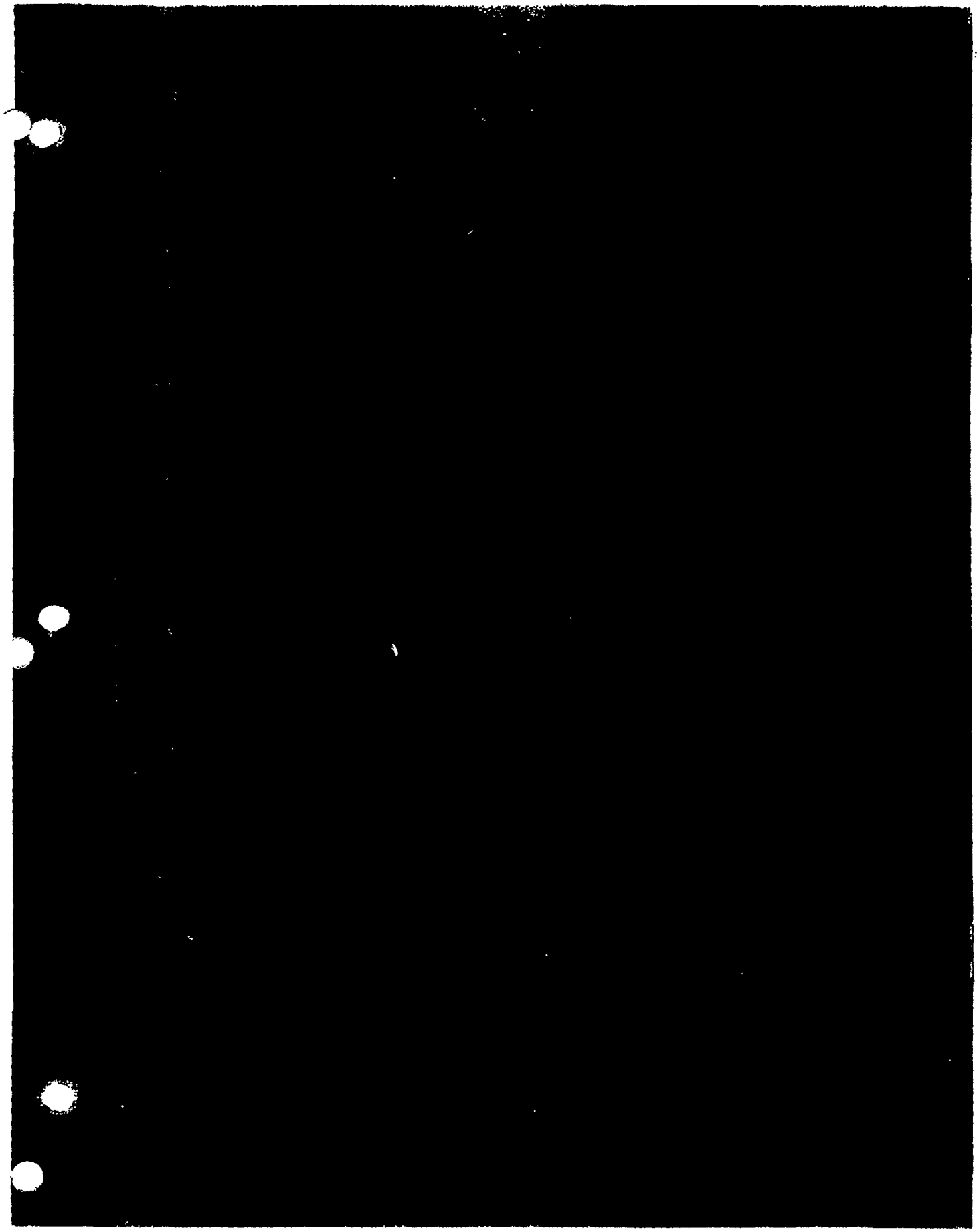

Introduction to Job Safety Analysis

SOME INTRODUCTORY IDEAS

A DEFINITION OF A JOB #104

The term, job, is commonly used in two ways. Sometimes it is used to refer to the position or occupational title that a man holds, e.g. carpenter, welder, electrician, crane operator, or millwright. Other times it is used to refer to specific assignments or activities that such positions are required to do, e.g. erecting a scaffold, welding a floor plate, installing a control switch, unloading a railroad car, or replacing a crane cable. *In this course, we will use the term, job, only in the latter way.*

By our definition, a job is a sequence of definite steps or separate activities that together accomplish a work goal. Hooking up a crane lift is a job. So is unloading a truck, machining a part, lubricating a vehicle, scarfing a steel slab, operating a punch press, and purging a gas line. Even replacing a flourescent light tube is a job. They all have in common the fact that they involve a sequence of separate steps of work, and when the last step is completed a work goal has been accomplished, e.g. the truck is loaded, the part has been machined, the vehicle has been lubricated, and so on.

It is important that you do not confuse the idea of a job with the idea of a position. Job safety analysis is a tool that applies to jobs, not to positions.

MAKING A JOB SAFE TO WORK 105

Let's see what has to be done in principle to make a hazardous job safe to do. But first, let's analyze the idea of a job further.

Figure 1 shows a diagram of a five step job. It is not like any diagram you have ever seen before. It gives a picture of the potential accidents associated with each step of the job.

The sequence of S's represent the five steps of the job. The H's represent specific hazards or potential causes of accidents. The A's represent the potential accidents associated with the job. Notice first that some job steps have more hazards, and therefore more potential accidents associated with them than do others. That's the way it is with most jobs. *Not all job steps have an equal number of hazards.* Notice secondly that some of the H's and A's are bigger than others. That's a diagramatic way of saying not all hazards are equal. *Some hazards are more hazardous than others.*

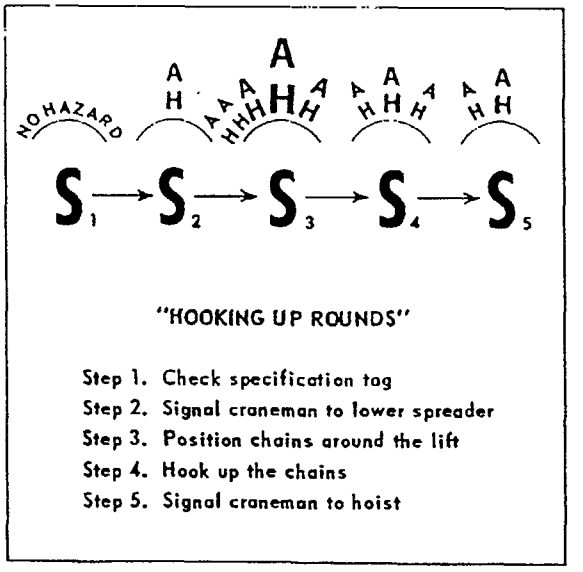

FIG. 1. SCHEMATIC DIAGRAM OF A HAZARDOUS JOB. The sequence of S's represent a five step job. H's are hazards associated with job steps. A's represent the potential accidents associated with each job step. Notice that not all job steps are equally hazardous.

The diagram in Figure 1 represents the way you should think about a job. You should think of each step as having possibly one or more hazards, and therefore one or more potential accidents associated with it. And you should think of some of the hazards of having a greater accident and injury potential than others.

With that background, we can now raise the question, "What must be done to make a job safe to work?" The answer is implied in Figure 1. Basically, two things have to be done:

1. ***The hazards and potential accidents associated with each job step must be identified.*** Obviously, if you don't know the hazards and potential accidents associated with a job, you can't do anything about them in order to make the job safe to work. Therefore, the first thing that must be done to make a job safe is to identify and understand the hazards and potential accidents connected with each job step.

2. ***Solutions must be developed for each identified hazard or potential accident that will eliminate or nullify the hazard.*** A solution may take the form of an environmental change. For example, a guard may be placed over an exposed, moving part of a machine. A solution may also take the form of a prescribed safe way to avoid the hazard. For example, a specific safe way of piling a material may be prescribed to prevent piles from toppling over. The key point is this: *For every known hazard associated with a job step, there must be a solution* that nullifies the hazard.

THE JOB SAFETY ANALYSIS #106

A job safety analysis is a way of studying a job in order to (1) identify the hazards or potential accidents associated with each step of the job, and (2) develop solutions that will eliminate, nullify, or prevent such hazards. That makes a job safety analysis a special tool for making jobs safe to work. You may recall from Chapter 3 that two of the basic principles of accident prevention are (1) Spot potential accident causes, and (2) Eliminate potential accident causes. A job safety analysis is designed to do exactly that.

The quickest way to understand the idea of a job safety analysis is to look at the end product. Figure 2 shows part of a completed job safety analysis. The left-hand column describes the basic steps of the job in the order of their occurrence. The center column identifies the potential accidents associated with each job step. The right-hand column tells what safe procedures or precautions should be followed to avoid the potential accidents listed in the center column.

It is common to refer to a job safety analysis as a JSA (Jay-ess-ay). For convenience, the abbreviation will be used in the discussions that follow. To do a JSA means to do the analysis of a job that gives an end product like that shown in Figure 2. To use a JSA means to make use of the end product.

BASIC STEPS OF A JOB SAFETY ANALYSIS #107

There are four basic steps to doing a job safety analysis. They are:

1. *Select the job to be analyzed.*
2. *Break the job down into steps.*
3. *Identify the hazards or potential accidents.*
4. *Develop solutions for the potential accidents.*

Let's discuss each step generally.

SELECTING THE JOB TO BE ANALYZED #108

Most supervisors have a fairly large number of different jobs done regularly by their men. That is so because any given position under a supervisor's direction may require the position-holder to do several, and sometimes, many, different jobs. Furthermore, the supervisor usually has a number of different position titles under his supervision. That brings us to some practical questions. What determines which jobs should be analyzed? And, of those that should be so analyzed, what determines the order in which they are selected for analysis?

ARMCO JOB SAFETY ANALYSIS TRAINING GUIDE

PLANT BUTLER | JOB BENDING COLD PIPE IN THE FIELD
DEPARTMENT MAINTENANCE
SECTION PIPEFITTERS
OCCUPATIONS PIPEFITTER AND HELPER

APPROVED J.B. 8-27-63
REVIEWED JSC 7-7-64
REVIEWED
REVIEWED

REQUIRED AND/OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT ➡ HARD HAT, SIDESHIELD SAFETY GLASSES, METATARSAL GUARD SAFETY SHOES, HAND PROTECTION

SEQUENCE OF BASIC JOB STEPS	POTENTIAL ACCIDENTS OR HAZARDS	RECOMMENDED SAFE JOB PROCEDURE	ACCIDENTS
1. LOAD EQUIPMENT BOX ON TRUCK	1. SO - awkward lift 2. SB - dropped box 3. CB - box bottom & truck bed.	1. Always lift the box with help. Keep back straight and lift with legs. 2. Take a firm grip. Do not lift until the other man is ready. 3. Keep fingers in the clear when lowering box to the truck bed. Lower in unison.	//
2. TRANSPORTING EQUIPMENT TO THE JOB SITE	1. Accidental contact with pedestrians, vehicles, and mobile equipment.	1. Don't take short cuts. Use only authorized roads and aisles. Keep within plant speed limits. Sound horn and slow down or stop at crossings and blind spots. Keep well clear of pedestrian traffic.	/
3. UNLOAD EQUIPMENT BOX FROM TRUCK	1. SB - dropped box 2. CB - floor & box	1. Always bring down the box with help. Coordinate the lift down. 2. Keep feet in clear when setting box down.	///
4. SET UP BENDING EQUIPMENT	1. SB - equipment	1. Select a level area free from debris and holes. Handle and position the equipment securely. Post signs and rope off the area to keep traffic away.	
5. INSERT PIPE; PUMP HYDRAULIC JACK TO MAKE THE BEND	1. SB - broken equipment parts 2. SB - foreign body in eye 3. CB - pipe & equipment	1. Inspect the bender for defects before inserting pipe. 2. Wear eye protection. 3. Keep fingers and hands clear of pinchpoints.	///

FIG. 2. AN EXAMPLE OF A JOB SAFETY ANALYSIS. Job steps are listed in the first column. Hazards or potential accidents associated with each job step are identified in the second column. The abbreviations represent types of accidents. Safe procedures and precautions are described in the third column. The last column is used to record accidents that have occurred since the JSA has been issued.

The considerations that should influence which jobs are selected for analysis, and the order in which they are analyzed are as follows:

1. ***Past accident frequency.*** All jobs that have a history of many accidents are good candidates for a job safety analysis. It is a safe assumption that a job that has produced a lot of accidents over the past five or more years will go on producing a lot of accidents in the future *unless it gets some special attention.* Naturally, the greater the number of accidents associated with a given job, the greater is the job's claim for a JSA.

2. ***Past injury severity.*** Those jobs that produced disabling injuries are also good candidates for a JSA. They should be given a priority over jobs that have produced only minor injuries because they have proven their potential for producing severe injuries. Naturally, the more disabling injury accidents in a job's history, the more the job deserves to be the subject of a JSA. A lot of disabling injury accidents means there is probably something basically wrong with the job environment or how the job is done.

3. ***Potential injury severity.*** Some jobs may have no history of disabling injuries, and yet they may have considerable *potential for crippling injury or death.* Such jobs are also good candidates for a JSA. Certainly it makes no sense to exclude such jobs from a JSA until they do produce a serious injury accident.

FACTS: 3 | 1 | 2 | 4
1. FREQ. - H_F | H_F | L_F | L_F
2 SEVERITY - L_S | H_S | H_S | L_S

4. *Newly established jobs.* Changes in tools, equipment, and machinery create new jobs from time to time. Naturally, such jobs have no local history of accidents. Nor is their potential for accidents always fully appreciated because supervisors lack experience with them. Such newly created jobs are also good candidates for a JSA. The analysis establishes the hazards and safe procedures for working the new job *before anyone has had an accident.* It provides an excellent basis for training men how to handle the new jobs safely.

The above considerations should be always applied when developing a list of jobs that warrant a JSA. The order in which jobs appear on such a list should indicate the order in which they should be analyzed.

BREAKING THE JOB DOWN INTO STEPS #109

The first step of a JSA is to break down the job to be analyzed into its basic steps. The major reason for doing a job step breakdown is so each step of the job can be examined critically for hazards and potential accidents. Another reason is that it permits the analysis to be done systematically, that is, one job step at a time in the order that the job steps occur. The end result is a better job safety analysis.

The job selected for analysis is broken down in such a way that the steps describe *what is done, and in what order.* Here is an example of a step by step breakdown of a very common backyard job, "planting a tree":

Step 1. *Select the site.*

Step 2. *Bring tools and equipment to site.*

Step 3. *Dig the hole.*

Step 4. *Prepare the hole.*

Step 5. *Position the tree in the hole.*

Step 6. *Backfill, tamp, and water.*

Step 7. *Brace the tree.*

Step 8. *Return tools and equipment to storage.*

Notice first that each step tells generally what must be done. The details of how it is to be done are omitted. Notice secondly that no hazards are mentioned and no safety precautions are prescribed. That comes later. Notice thirdly that the job steps are described in their normal order of occurrence. And notice lastly that each step is described by starting with a *do* word: select, bring, dig, prepare, etc. It usually takes only three or four words to write out a job step.

Two errors are very often made when attempting to break a job down into steps. The first is to make the job steps too "fine", too minute. This results in an unnecessarily large number of job steps. The second is to make the job steps too "broad", too all-inclusive. This results in a breakdown that fails to recognize important job steps.

Here is an example of a breakdown that is too fine. The job is "planting a tree" so that you can compare the "too fine" breakdown with the one above:

Step 1. *Pick up the shovel.*

Step 2. *Position the shovel so it points down.*

Step 3. *Put one foot on top of shovel blade.*

Step 4. *Press the shovel into the ground.*

Step 5. *ETC.*

Clearly, the above breakdown slices things too fine. The steps sound unnatural, even silly, because they are excessively minute slices of action. The correct job step breakdown usually sounds natural.

Now, here is an example of a breakdown that is too broad. It leaves out too much.

Step 1. *Dig the hole.*

Step 2. *Plant the tree.*

The steps sound natural, but they don't tell the whole story. The second step is much too general. It omits steps that should be recognized. When that happens in a JSA, it means potential accidents that are associated with the missing job steps are usually overlooked, and the entire JSA is weakened.

All that has been said above applies also to breaking down industrial jobs. Any job, no matter how complex, can be broken down into a series of basic steps. Some jobs may involve only two or three steps. Others may include

more than a dozen. The majority of one-man industrial jobs can be broken down into less than 10 steps for JSA purposes.

IDENTIFYING POTENTIAL ACCIDENTS

Once the job being analyzed has been broken down into basic steps, each step is studied for hazards and potential accidents. The idea is to identify *all* hazards, whether they be of the man's own doing or part of the job's surroundings. All hazards are recorded as potential accidents, that is, accidents that might occur when a man does the job step in question.

There are several ways for identifying hazards and potential accidents. One of the best ways is to observe the job step being done and to look for specific accident possibilities. Thus, the job step is observed with a specific question in mind, like "Can he be struck by or contacted by anything while doing this job step?" Potential accidents that are so identified are recorded on a JSA work sheet. Other questions that the observer should raise while observing are: Can he strike against or make injurious contact with anything? Can he be caught in, on, or between anything? Can he fall in any way? Can he strain or over-exert himself? Can he be exposed to any injurious condition, like gas, heat, fumes, etc.?

No attempt should be made to develop solutions for the potential accidents during this part of the job safety analysis. That comes later. The idea is to concentrate on identifying the accidents that might reasonably be expected to occur unless special precautions are taken.

DEVELOPING SOLUTIONS FOR POTENTIAL ACCIDENTS

Once all of the potential accidents have been identified and recorded for each step of the job, the next step of the JSA is to develop a solution for each potential accident. A solution may take any one of the following forms:

1. ***A job procedure solution.*** This kind of solution is one that spells out exactly what a man should do or not do to avoid a specific potential accident. It is a precaution that the man must take to protect himself against a particular accident. For example, the job step may require the job doer to make a machine adjustment. The potential accident associated with the job step may be getting one's hands caught between two moving machine parts. The safe job procedure solution would be to shut down the machine before attempting to make the adjustment.

2. ***A job environment solution.*** This kind of solution changes some aspect of the job environment in order to avoid accidents. The changes may concern such things as tools, equipment, machines, materials, work-area layouts, illumination, atmospheric conditions – in short, anything that is part of the workman's physical surroundings. For example, a job step may require the doer to assume a position very close to an exposed moving part of a machine, thus creating a potential caught between accident. An obvious environment solution would be to put a guard over the exposed moving part.

Environment solutions that result from a JSA do not show up on a final version of a JSA such as that shown in Figure 2. They are offered as recommendations to a higher level of supervision that has the authority to initiate the changes involved. Upon approval, the recommended changes are installed.

3. ***A radical solution.*** This type of solution is usually a combination procedure and environment solution that radically changes the way the entire job is done. It generally results in an improved way of doing a job from several angles - safety, time, effort, and cost. The following example illustrates the idea. The old way of doing a particular job was to remove a powdery type of waste material from a pit by shoveling the material into buckets and hoisting the buckets out of the pit. The method was laborious, time consuming, and hazardous. The new method that resulted from a JSA made use of a special type vacuum-cleaner that sucked up the waste materials and disposed of it into special containers. The new method was safer, and quickly paid for its cost of installation.

Radical solutions are not too common. One reason is that those who do JSA's often fail to look for radical solutions. No JSA should ever be completed without asking, "Is there an entirely different and better way of doing this job?"

4. ***A reduced frequency solution.*** This type of solution is so-called because it reduces the number of times a repair or ser-

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vice job must be done in a given period of time. Many hazardous repair or service jobs need to be done because a faulty or otherwise undesirable condition develops that requires correction. For example, something wears out and must be replaced, or something accumulates and must be cleaned out, or something gets out of adjustment and needs to be readjusted. The reduced frequency solution directs itself at the *cause* of the condition that requires repair or service, and seeks to reduce the frequency of the condition's occurrence. The basic idea is illustrated by the following example: Some production equipment had to be disassembled regularly about once a month to clean out a sediment that accumulated. The job was messy, production-delaying, and hazardous because of the corrosive nature of the sediment. In the course of doing a JSA, someone got an idea which greatly reduced the amount of sediment that accumulated. The idea was approved and installed. Thereafter, the equipment required clean-out only every third month instead of every month. That meant a two-thirds reduction in the exposure of men to the hazards of the clean-out job.

Reduced frequency solutions are a gain for both safety and cost-reduction. The less frequently a hazardous job must be done, the less men are exposed to the hazards and potential accidents. The ideal solution is one that eliminates the necessity for doing the hazardous job entirely. No JSA on a regularly recurring repair or service job should ever be completed without asking, "Can the life of this job be increased in any way? Can the causes of the condition which requires this job to be done every so often be eliminated or controlled in some way?"

The above four kinds of solutions for specific potential accident problems should make it clear that a JSA *is a tool for reducing production and maintenance costs as well as for preventing accidents.*

5. PROTECTIVE EQUIPMENT RECOMMENDATIONS

COMBINING COST REDUCTION WITH JSA #112

In the preceding section, two ways of reducing job costs simultaneously with increasing safety were introduced. The first was the radical solution. That amounted to finding an entirely different way to do a job. The second was the reduced frequency solution. That amounted to increasing the life of a job so it did not have to be done so often.

There's a third way to combine cost reduction with job safety analysis. It's called *methods improvement.* It can be applied to a completed JSA or it can be applied during the development of a JSA. Here's how it works.

DETERMINE THE MATERIALS, EQUIPMENT, TOOLS, AND PERSONNEL REQUIRED

Once you have broken the job down into its basic steps, determine the materials, tools, equipment and personnel required for *each* job step. Jot the information down under the job step listed in the first column of the JSA work sheet. Jot down just a word or two to minimize the writing. If you are not too familiar with the job, either observe the job being done or discuss with experienced men exactly what materials, tools, equipment and personnel are needed for each job step.

QUESTION THE MATERIALS, EQUIPMENT, TOOLS, AND PERSONNEL REQUIRED

The next step is to question critically the materials, tools, equipment, methods, and personnel associated with each job step. Question everything about each job step. That's the secret of the methods improvement. Never make the mistake of accepting the way things are currently being done just because that's the way they have always been done. Take the opposite viewpoint. The longer something has been done in a given way, the more suspicious you should be of it.

Below are some key questions that should be checked out on every job step. Asking the questions does *not* guarantee a solution but it certainly increases your chances of finding cost reduction ideas.

MATERIALS

* Can a less costly material be substituted and still do the job?
* Can materials be substituted that will last longer, e.g. resist corrosion, wear, shock, abrasion, heat, and other sources of material deterioration?

* Are there materials that can do the job easier and quicker, thereby reducing the job cost?

* Can materials be purchased for less with a better purchasing arrangement?

* Can material wastage or loss during the job be cut down? How?

* Is there a more efficient way to transport materials to and from the job site?

* Is there a more efficient way to handle the materials at the job site?

* Would it be more economical to store the materials in quantity at the job site?

* Are there any salvageable parts or materials that result from the job? Does anything have scrap value that is now not recognized?

* Are materials being damaged at the job site or in transit? Is there any way to prevent such damage?

* Question the amount of materials needed at the job site. If there are often excess materials, can you take steps to insure the right amount will go to the job site?

TOOLS AND EQUIPMENT

* Can other tools or equipment be used that will do the job more safely and efficiently?

* Are tools and equipment now used often subject to breaking or breakdowns. Can they be replaced by more dependable items?

* Can tools and equipment be moved to the job site more efficiently or at less cost?

* Does the job tie up costly equipment unnecessarily? Can less costly equipment be substituted?

* Is it more efficient to tailor-make tools or equipment for the job than to use standard tools or equipment?

* Does it pay to have tool and equipment replacements on hand to avoid costly delays in the event of equipment failure?

* Can a power actuated tool economically replace a non-power tool or the converse?

PERSONNEL

* Are any personnel idle for sizeable periods on the job? Can their idle time be used to salvage materials, clean up the area, return tools and equipment, get ready for the next job step, etc?

* Are highly skilled men doing too much non-skilled work? Can anything be done?

* Are there too many or too few men for the job or job step from the standpoint of efficiency?

* When the job or job step is done, is there anything else that should be done? For example, should something be inspected, cleaned, or otherwise serviced while something is open?

* Can the time required to get personnel to and from the job site be reduced?

* Are the right kind of personnel assigned to do the job?

* Are there any particular employees that should be assigned to the job because of special skills and know-how?

JOB METHODS

* Can the job step be eliminated by any change in job method?

* If there is a particularly slow or difficult job step, can a method change speed-up or simplify the job step?

* Should the job step be done at the job site or can it better be done at another location and brought to the job site.

* Will pre-job planning and organizing benefit a particular job step?

*. Can the job step be done quicker by changing from "muscle" to special equipment?

* What is the most efficient way of laying out tools, equipment, and materials?
* Are there any hazards that increase the time required to do the job? Can these be eliminated or temporarily nullified?
* Are there any environmental conditions like heat, cold, steam, or dust that increase job time? Can these be controlled?

The above list of cost-reduction leads is certainly not complete. You can use it as a starter to develop a longer list of questions. Whenever you develop or hear of a job cost reduction idea, convert the idea to a question that can be added to the list. For example, one man found it was less costly to staple than to nail. That suggests the useful lead question, "Is there a less costly way to *fasten* items?"

USING THE JOB SAFETY ANALYSIS #113

A completed JSA should be written up as shown in Figure 2. Some plants reproduce copies of completed JSA's and distribute them to the supervisors whose men do the jobs. Others prefer to file copies of completed JSA's in locations where the supervisors have access to them. The best alternative is to give each supervisor his own set of JSA's. That way, they will be readily accessible. He will be more likely to study them, to use them for his safety contacts.

The maximum benefits of a JSA are obtained *only when the finished product is used.* To be sure, many benefits are gained during the developing of a JSA. Supervisors invariably learn more about the jobs they supervise as a result of doing JSA's. The safety attitudes of workmen improve when they are asked to help develop a JSA. Ideas about improving safe working conditions are frequently generated. Cost-reducing improvements are often suggested by the JSA. All these things are real benefits of the JSA. However, the major safety benefits are those that come from *using the completed JSA.*

You can make good use of the JSA in these important ways:

1. *Initial job safety training.*
2. *Planned safety contacts.*
3. *Planned safety observations.*
4. *Pre-job safety instructions.*
5. *Cost-reduction studies.*

Let's discuss each idea generally. The details of how to use JSA's for training and instruction purposes will be discussed in Chapter 9.

JOB SAFETY TRAINING FOR NEW MEN

When new men are assigned to do hazardous jobs, common sense dictates that they should be first trained to do the jobs safely. The JSA is excellent for such purposes. A completed JSA is well-organized training material. Each step of the job is described and listed in the order of occurrence. The major hazards associated with each step are described. How each step should be done in order to avoid accidents is spelled out. Any supervisor should be able to do a competent job of instructing a new man if he has a good JSA to guide his instruction. He can cover the points in an orderly fashion. He is not likely to omit important details. He can even delegate the "break-in" training to someone else with more confidence when he can give that person a JSA to follow.

Chapter 9 discusses the details of how to use the JSA for training a new man on a job.

CONDUCTING PLANNED SAFETY CONTACTS

One way a supervisor can keep his men safety-minded and knowledgeable about job safety is by means of planned personal and group safety contacts. Supervisors who are asked to make such safety contacts often complain that they run out of safety subjects to instruct or discuss with their men. This is much less of a problem where JSA's have been developed and are available for use. The best safety topics are those that are closely related to the work men must do. Most men are not interested in listening to safety topics unrelated to their work. That's one reason why JSA's are a good source of safety topics.

Chapter 9 discusses the details of how to use the JSA for planned personal and group safety contacts.

CONDUCTING SAFETY OBSERVATIONS

Deliberate, planned safety observations by a supervisor are one of the best ways to detect unsafe practices and to develop safety minded employees. The JSA is very helpful in guiding such observations. By reviewing the JSA in

advance of making such observations, the supervisor will be in a position to observe to see if his men are following the JSA. If they are not, he can show them how the JSA calls for working in specified safe ways.

Chapter 6 discusses the details of planned safety observations more fully. It shows how to plan such observations around the JSA.

GIVING PRE-JOB SAFETY INSTRUCTIONS

Some hazardous repair or service jobs occur infrequently or irregularly. The men assigned to do them may not necessarily be the same men who did the jobs the last time. When such jobs are assigned, pre-job safety instructions are advisable to remind men about the hazards and precautions. JSA's are excellent for that purpose. When a supervisor knows he has a hazardous job to assign, he can check the JSA to remind himself of what to stress when giving pre-job safety instructions. He can either go over the JSA with the men assigned to the job, or he can give the JSA to the man and ask him to check it over before leaving for the job. A few minutes so spent is an excellent way to prepare men for an exceptionally hazardous job.

Chapter 9 discusses pre-job safety instructions more fully.

GETTING COST REDUCTION IDEAS

A completed JSA can also be an important source of cost reduction ideas. Since it provides a step by step account of how a job is done, it is an excellent ready-made basis for questioning the current method, tools, equipment, or materials used to do the job. Supervisors trained in principles of cost reduction through methods improvement will arrive at dollar-saving ideas a lot quicker when they have a JSA to start from. A well-written JSA will even generate cost-reduction ideas in supervisors who are not closely familiar with the job.

* * * * * * *

There are still other ways supervisors can make good use of completed JSA's. They will be discussed in subsequent chapters after the groundwork for understanding them has been developed.

CHECK YOURSELF ON THESE QUESTIONS

1. What is the difference between a job and a position? Can you give some examples of each based on the work you supervise?
2. What is a job step? Are some job steps more hazardous than others? Explain!
3. What two things, basically, must be done to make a job safe to work?
4. If someone asked you what a job safety analysis is, what would you tell him?
5. What are the 4 basic steps for doing a JSA?
6. Should all jobs be covered by a JSA? What are the main considerations that should influence which jobs are selected for analysis?
7. Can you explain to someone how to break a job down into steps? Try it on your wife, and see if she understands.
8. What is a good way to identify the potential accidents that may be associated with a particular step of a job?
9. Explain each of the following: (1) procedure solution. (2) environment solution. (3) radical solution. (4) reduced frequency solution.
10. Explain how a completed JSA may be used for each of the following: (1) breaking in a new man. (2) making regular safety contacts. (3) giving pre-job safety instructions. (4) getting cost-reduction ideas.

Doing a Job Safety Analysis

METHODS OF DOING A JOB SAFETY ANALYSIS

In Section 13, four basic steps for doing a JSA were described. The last three of those four steps, namely (1) breaking the job down into job steps, (2) identifying the potential accidents associated with each job step, and (3) developing solutions for each potential accident, can be done by any one of three different methods. They are:

1. *The observation method.*
2. *The group discussion method.*
3. *The recall and check method.*

You should be familiar with each method, and the advantages and disadvantages of each, so you can choose the method that best suits your situation, or a combination.

THE OBSERVATION METHOD 114

The observation method is so called because the supervisor doing the analysis actually observes the job being done. First, he establishes the job step breakdown by observing the job. Next, he gets his ideas about the potential accidents associated with each job step by further observation. Finally, he gets his ideas about solutions for preventing potential accidents by still more observation. Altogether, he may observe the job being done as much as half a dozen times before he completes the JSA. Moreover, he may observe different men do the same job to establish variations in doing the job.

Here are the advantages and benefits of the observation method.

1. ***Observation stimulates ideas.*** Seeing the job being done stimulates recognition of hazards and potential accidents more effectively than relying upon memory of how the job is done. It also stimulates better solutions for preventing accidents. The end result is usually a better JSA because important hazards and solutions are less likely to have been overlooked.

2. ***Observation promotes learning.*** A supervisor is more likely to learn new things about a job when he observes the job in order to do a JSA than when he relies upon memory. Memory can only tell him what he already knows. Observation opens the way to noticing things that he has never noticed before.

3. ***Observation encourages interaction with the job doer.*** The men who do a job regularly are a rich source of information about near-accidents and accidents that have been associated with the job. Correctly approached, these men can be a real help in doing a JSA. Observing the job affords the supervisor an excellent opportunity to exchange ideas about hazards, potential accidents, and safety precautions with his men.

A limitation of the observation method is that it can not be readily applied to jobs that are done very infrequently. Several observations are usually necessary. Therefore, applying the observation method to a job that is done only once every two or three months would mean considerable delay before a second observation could be made. Another limitation of the method occurs when the jobs to be observed are located a considerable distance from where the supervisor normally locates. It may be impractical,

for example, for a maintenance supervisor to make many field trips in order to observe how a regular job is done in the field. Sometimes, of course, such trips are essential.

THE GROUP DISCUSSION METHOD

The discussion method is so called because the JSA is accomplished by recall and discussion of how the job is done rather than by observation. The discussion groups may consist of several supervisors who are experienced with the job or of a supervisor and several employees who normally work the job. One person acts as the discussion leader. Under his guidance, the basic steps of the jobs are agreed upon. Then, the potential accidents associated with each step are established thru the participants drawing on their experience. Finally, the group tries to agree on what solutions should be adopted for each potential accident.

The discussion method requires a skilled discussion leader who can keep the discussion on the topic and bring out the ideas of the participants. It also requires a procedure for recording ideas as the JSA unfolds. Nevertheless, there are some worthwhile advantages in favor of this method:

1. ***Discussion taps broad experience.*** The JSA developed by discussion between experienced men draws on the experience and ideas of more than one man. Individual ideas can be tested against the experience of other men. Also, what may be overlooked by one man is caught by another.

2. ***Discussion trains "silently".*** When a group of men do a JSA by discussion, they not only complete a JSA, they learn the details as they go along. The sharing of experience by discussion means that the men usually know a lot more about the safety aspects of a job than they did before.

3. ***Discussion promotes acceptance.*** When one supervisor does a JSA, there is the problem of acquainting other supervisors with the end product and gaining their acceptance. The same problem occurs in terms of those who must do the job. This problem is greatly reduced by the discussion method because the JSA is the product of the group rather than any one individual. Differences of opinion can be resolved during the course of developing the JSA under guidance.

4. ***Discussion avoids limitations of observation.*** Unlike the observation method, the discussion method proceeds independently of when a job is done. It is suitable for infrequently done jobs, and for jobs that are impractical to observe repeatedly because of distance or other factors.

The principal disadvantage of the group discussion method of doing a JSA is that it is not always possible or practical to convene a group of men for such a purpose. The alert supervisor will use the group discussion when there is a downtime period on production equipment or when there is a slack period in a work schedule. At such times, otherwise idle men can be used to develop part, if not all, of a JSA.

Another possibility for using the group discussion method is in a monthly safety meeting. Where supervisors regularly conduct such meetings with their men, either all or part of a meeting can now and then be devoted to doing a JSA. The group, however, should be small (twelve men or less) and knowledgeable about the job to be analyzed. It is difficult and inefficient to do a JSA with a group of twenty, thirty, or more men, many of whom are inexperienced with the job to be analyzed.

Still another possibility is to use the group discussion method in a group of supervisors all of whom are familiar with the job to be analyzed. Where a large number of supervisors convene for a monthly departmental safety meeting, the supervisors can be broken into a number of small discussion groups after the meeting has covered general agenda items. Each group of supervisors should have a definite job to analyze by discussion. It may even be desirable to allow the sub-groups to leave so they can observe and discuss the jobs to be analyzed at the job sites.

THE RECALL AND CHECK METHOD

The recall and check method is so-called because the individual supervisor does the JSA on the basis of recall rather than observation of the job. Working from memory and recall, he breaks the job down into basic steps, identifies the potential accidents associated with each step, and develops his own solutions for each such accident. The result is a *preliminary* version of a JSA. He then checks his preliminary version by either discussing it individually with other supervisors (or employees who do the job) or by observing the steps of the job about

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which he has doubts. The finished JSA is the improved version that results from such checking.

This method's main advantage is flexibility. It can be applied to jobs that occur too infrequently for the observation method. It can be used where it is not practical to use the group discussion method. Even so, it is the least preferred of the three methods. The supervisor must be thoroughly experienced with the details of the job. Preferably, he should have experience in doing the job himself.

The recall and check method works best when several supervisors are assigned the same job to analyze *independently*. The individual versions can then be checked against each other, and a "pooled" version can be developed.

NON-SUPERVISORY EMPLOYEE PARTICIPATION

Whatever the method used to do a JSA, some degree of non-supervisory employee participation should be encouraged. The men who do the jobs represent collectively a lot of job experience. They are the ones who have experienced accidents and near-accidents. They know from direct experience the hazards involved. Many have developed their own special ways of protecting themselves. It makes sense to try to tap some of that experience and know-how.

There is yet another reason for encouraging their participation in the development of a JSA. *They are the ones for whom the JSA's are intended.* They will be expected to do the jobs in accordance with the procedures recommended by the JSA's. *They are less likely to resist changes in job methods if they have participated in the development of the JSA's.* Checking with such employees, asking their opinions, listening to their ideas - these things are likely to leave them with a feeling that they have been consulted. In turn, they are more likely to accept the end-product.

Incidentally, employee participation does not mean that workmen dictate the JSA. Responsibility for the contents of a job safety analysis always rests with supervision.

DOING A JSA BY THE OBSERVATION METHOD

Let's now discuss the details of how to do a JSA by the observation method. Keep in mind, what follows is *one* version of the observation method. Details can always be changed to fit your own situation.

HOW TO BREAK THE JOB DOWN INTO BASIC STEPS BY THE OBSERVATION METHOD

The key points to remember are as follows:

1. *Select the right man to observe.* When you have more than one man doing the job you plan to analyze, think over which man you will observe. He should be experienced at the job, cooperative, and generally one of your better men. Select the man who will be able to help you most with the JSA. It is also a good idea to observe more than one man.

2. *Explain what you intend to do.* Before you observe the man, explain the idea of a JSA, and how you intend to proceed. The easiest way to explain a JSA is to show the man a completed one, and review it briefly with him. Reassure him that you selected him because he is experienced and capable. Emphasize that you intend to observe him in order to study the job, not him. Let him know that you will discuss the job with him as the JSA develops.

3. *Observe to get the job step breakdown.* Stand well away from the man and, if possible, out of his line of vision. Observe to get an idea of basic job steps. What does he do first? What does he do next? What does he do after that? Keep in mind that you are observing to identify the *basic* steps. Don't slice things too fine. Don't omit any basic steps.

   If the job is a lengthy one, develop a preliminary job step breakdown on the basis of recall. Check your breakdown with the

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ARMCO JOB SAFETY ANALYSIS WORKSHEET

JOB Loading Bar Products on Trucks
OCCUPATION(S) Crane Hooker(CH), Car Blocker(CB) Crane Operator(CO)
DEPARTMENT Shipping SECTION Bar Storage

ANALYSIS BY John Doe, T.F.
REVIEWED BY H Smith, G.F.
APPROVED BY B. Jones, Supt.

REQUIRED AND/OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT ➡

SEQUENCE OF BASIC JOB STEPS	POTENTIAL ACCIDENTS OR HAZARDS	RECOMMENDED SAFE JOB PROCEDURE
Break the job down into basic steps that tell what is done first, what is done next, and so on. You can do this by (1) observing the job, (2) discussing it with the operator, (3) drawing on your knowledge of the job, or (4) a combination of all three. Record the job steps in their normal order of occurrence. Describe what is done, not the details of how it is done. Usually three or four words are sufficient to describe each job step. For example: The job of "replacing a light bulb" may break down into basic steps as follows: 1. Bring and set-up ladder 2. Ascend ladder 3. Remove light globe 4. Replace light bulb 5. Replace light globe 6. Descend ladder 7. Remove and store ladder Make the job steps neither too fine nor too broad. They should sound natural. Most jobs can be broken down into 12 or fewer steps. Sometimes the job step may be a major safety precaution, e.g. "Check for gas before entry".	Ask yourself for each job step what accidents could occur to the man doing the job step. Get your answers by either (1) observing the job, (2) discussing it with others, (3) recalling past accidents, or (4) a combination of all three. Ask: Can he be struck by or contacted by anything? Can he strike against or contact anything? Can he be caught in, on, or between anything? Can he fall? Can he strain or overexert himself? Can he be exposed to gas, fumes, radiation, etc ? Record potential accidents by combining one of the accident type abbreviations below with the agent of contact. For example, "struck by a crane hook" is recorded "SB-crane hook". Number each potential accident. SB - Struck by CO - Caught on CB - Contacted by CB - Caught between SA - Struck against F - Fall CW - Contact with SO - Strain-overexertion CI - Caught in E - Exposure If you prefer, explain hazards and potential accidents more fully. Draw a line to indicate where the entries for one job step end and the next begin.	For each potential accident, ask yourself what exactly should the man do or not do to avoid the accident. Get your answers by either (1) observing the job for leads, (2) discussing the job with others who are experienced therein, (3) drawing on your own experience, or (4) a combination of all three Describe specific precautions in concrete detail. Give each recommended precaution the same number as was given the potential accident (center column) to which it applies. Avoid generalities like "Be alert", "Be careful", and "Take caution". Use simple do or don't statements, e.g. "Lock out main power switch", "Stand clear of lift before signalling", or "Check wrench grip before exerting full force". If necessary, explain how as well as what to do. Amount of detail is a matter of judgment. Also, question the basic job method. Is there an entirely different way to do the job that is better and safer? If a repair or service job, can anything be done to increase the life of the job. Try to develop some cost reduction ideas. Question the materials, e.g. better materials, less costly materials, easier to work materials? Question the equipment, e.g. more efficient tools, power tools, tools less subject to damage? Question the personnel required, e.g. too many, too few, different type personnel? If it is a repetitive maintenance repair job, can anything be done to reduce the frequency with which the job has to be done?
1.(CH) CHECK CONDITION OF	1. SB-Lift Wrong Size	1. Check Spreader and Chains for
EQUIPMENT (Crane, Spreader,	Spreader or Chains, or	defects and proper size. Be sure
Chains (Hyd.), Slings, &	defects in equipment	these are adequate Chains for
Chain Hook.)	may cause lift to drop	Quoted load
2.(CH) INSPECT BAR RACK	1. SB-Bars	1 & 2. Make certain bars are
	2. SB-Bars and rack	properly Blocked and stacked in
	3. CB-Lift and other	storage rack. Unsafely stored
	objects	Bars may move unexpectedly
		3. Make certain there is
		ample room to take a safe
		position when lifting made
		to avoid being CB 3 swinging

(Continue on Reverse Side)

FIG. 3. THE JOB SAFETY ANALYSIS WORKSHEET. Abbreviated directions are included on the worksheet. An incompleted JSA is shown recorded on the worksheet. Notice that the JSA also specifies required and recommended personal protective equipment that are to be worn when the job is done.

workman. If he agrees, there is no need to observe. If there is disagreement, concentrate your observation on *that* part of the job where there is disagreement.

4. ***Check your job step breakdown with the man.*** When you complete your observation for the job step breakdown, check your breakdown with the man observed. You might say, *"Joe, here's the way I broke the job down. Listen to this, and see if you agree. Step 1: Set up equipment. Step 2: Disengage the power. Step 3: Remove the guard rails ....."*.

Get agreement on *what is done, and in what order, not on how it is done.* Don't discuss hazards, potential accidents, or precautions at this stage. Be sure to thank the man for his help when you are through.

5. ***Record the job step breakdown.*** Figure 3 shows a JSA worksheet. It is used to record the JSA as it is developed. Abbreviated instructions for recording JSA information are part of the worksheet.

After you have checked your job step breakdown with the man, record the job steps as shown in Figure 3. Record the steps in the order of their occurrence. Use a short three or four word sentence to describe *what is done*. Start each sentence with a "do" word, e.g. replace, remove, set up, position, open, etc. End the

sentence by describing what is to be done, e.g. replace *what?*, remove *what?*, set up *what?*, and so on. Record the job steps in the lefthand column. Number the steps consecutively as you record them.

HOW TO IDENTIFY POTENTIAL ACCIDENTS BY OBSERVATION METHOD

The key points to follow are:

1. ***Explain what you are going to do.*** Again, explain to the man selected for observation what you intend to do. Tell him you are going to observe him to get ideas about all the possible accidents that *could occur* to a man doing the job. Reassure him that you are not checking him for unsafe practices. Let him know you will check with him later for his ideas on what kinds of accidents could occur on the job in question.

2. ***Observe for specific types of accidents.*** Again, stand a reasonable distance from the man, and preferably out of his line of vision. Don't observe for potential accidents in general. Instead, observe for specific types of potential accidents. Focus your observation by asking yourself these six questions for each job step:

   1. *Can he be struck by or contacted by anything?*
   2. *Can he strike against or make injurious contact with anything?*
   3. *Can he be caught in, on, or between anything?*
   4. *Can he slip or trip on anything? Can he fall to below in any way?*
   5. *Can he strain or over-exert himself?*
   6. *Is he subject to any "invisible" hazard exposure, such as gas, fumes, radiation, heat, etc.?*

   The idea is to put those six questions to each job step as you observe. In practice, however, you will find that the nature of the job step and the surrounding circumstances will automatically eliminate the need to raise some of those questions. There's no point, for example, in mentally raising the questions about exposure to gases, fumes, or radiation when you know there aren't any such hazards in the area.

   While observing for ideas about what could happen, don't think about how to prevent such possibilities. That comes later. Concentrate entirely on spotting hazards and potential accidents.

3. ***Record the potential accidents.*** Don't rely on your memory to recall what potential accidents you have identified in connection with each job step. Make a record of the potential accidents *while you are observing* unless the situation makes that entirely impractical.

   Use the JSA worksheet shown in Fig. 3 to record the potential accidents. You can make the worksheet convenient to use if you fold the two end columns back behind the center column, and then fold the top of the form along the dotted line back behind the center column. The end product will be about the size of a small pad that can easily be used in the palm of your hand.

   Here is a simple way to record potential accidents. Describe (1) the type of accident and (2) the agent of contact. For example, suppose the potential accident is that the man can be struck by a sledge hammer while holding a bar for a sledge-wielding second man. All you need to record is: SB-hammer. *Knowing the job, that should be sufficient for you to recall the details of the potential accident.* For each basic type of accident, there is a standard abbreviation. The abbreviations are listed on the worksheet. Use them to record the potential accidents. Number the potential accidents consecutively as you record them. Separate those associated with one job step from those associated with the next job step by drawing a line between them. See Figure 3.

4. ***Check the potential accidents with the man observed.*** When you have identified and recorded the accidents that you think

could occur to someone doing the job, check your list with the man observed. Ask him if you have overlooked any possibilities. You might say, for example, *"Joe, I have tried to list the different accidents that could happen if someone did not do the job as safely as you just did. See if you agree with my list. If you think I missed anything, say so."* With that introduction, go over the potential accidents on your list, explaining each briefly. End by asking the man if he ever experienced any "close calls" that are not on your list.

You don't have to limit checking your list to the man observed. You can also check with other men who have experience with the job. Always ask them if they had any accidents or near-accidents on the job. Be sure they understand why you want to know before you ask them, lest they misunderstand your intentions.

HOW TO DEVELOP ACCIDENT SOLUTIONS BY THE OBSERVATION METHOD

Once you have developed a list of the accidents that might occur, the next step is to develop solutions that will prevent their occurrence. This is a matter of observing the job and thinking of each accident possibility on your list as a special problem. Be guided by the following key points:

1. *Always try for a radical solution.* Try for the radical solution before you develop a large number of specific solutions for the potential accidents on your list. Look for an entirely different way of doing the job. Start by identifying the *goal* of the job. What is the job supposed to accomplish? Once you identify the goal, explore new ways of getting it accomplished. Consider the use of new tools, materials, equipment and methods. Try for cost reduction as well as greater safety.

Here's an example of a radical solution. One job required a group of employes to transfer chunks of ore from a box car to a pit about 10 yards away with wheelbarrows. Upset wheelbarrows and over-exertion injuries were common. The radical solution was to use a roller conveyor arrangement that could be easily assembled for the job. The large chunks of ore were conveyed to the pit by gravity. The small amount of remaining "fines" were shoveled up and transferred with a wheelbarrow as before.

2. *Try for a procedure solution next.* If no radical solution presents itself, focus on each potential accident. Take one at a time, and try to establish a practical procedure solution. Do this by asking yourself, *"What exactly should the man do or not do in order to avoid this particular accident?"* When appropriate, also ask, *"How should he do it?"*

Record each procedure solution in an abbreviated way in the right-hand column of the JSA worksheet. Number the solution so that it corresponds with the potential accident recorded in the center column to which it refers. If you think the procedure solution offers only partial protection against the accident, mark it in some way that will remind you to give it more thought later. One way to mark it is to circle the number that you gave the solution.

A procedure solution must be a specific, concrete instruction that tells the man what to do to avoid the accident. Don't record such vague and generalized precautions as "Be alert", "Use caution", or "Be careful". Such expressions do not specifically tell a man what to do or how to do it. They should never appear in a JSA. Also, avoid statements that seem to be specific but really are not. Below are two statements describing a precaution. One seems to say something specific, but actually does not. The other is a good example of how a procedure solution should be written in its final form. Which of the two statements do you think is the better?

"Make certain the wrench does not slip. Guard against loss of balance if the wrench does slip."

"Set the wrench securely. Exert a check pressure on the wrench to check the grip. Position feet wide apart before exerting full force so balance will not be lost if wrench slips."

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When you jot down procedure solutions, jot down just enough to remember the idea. The final write-up can be done some other time. It should never be attempted while observing the job. The second of the above two statements, for example, could have been jotted down as follows: "Set secure, check grip, open stance." That would have been sufficient to hold on to the idea. With practice, you can reduce the majority of procedure solutions to a few words and abbreviations.

3. ***Try environment solutions where procedure solutions are weak.*** If the procedure solution for any potential accident seems weak, try to develop an environment solution. Ask yourself, *"What changes are necessary to prevent this accident?"* Consider changes in tools, materials, equipment, work area, and any other aspect of the man's environment that will eliminate the hazard. Observing the job is a good way to get ideas about what changes are needed.

Commonly occurring environment solutions are machine guards, safety devices, barriers, warning systems, safer tools, safer work area lay-outs, better illumination, and improved ventilation. However, any physical change in the workman's environment that reduces the likelihood of an accident is an environment.solution.

When you get an idea of a suitable environment solution for a particular accident, jot down only the core of the idea. Think about the details later. Then, discuss it with higher supervision. Be prepared to convince higher supervision that the change is necessary.

4. ***Consider reduced frequency solutions where applicable.*** When you do a JSA of a repetitive repair or service job, always check the possibility of a solution that will increase the "life" of the job. Such a solution will reduce the number of times that the job has to be done, and thereby the number of times men are exposed to the hazards of the job. The end result is a gain for safety.

Determine the causes of the condition that the job seeks to correct. Can they be eliminated or minimized? For example, if abrasion causes frequent replacement of an equipment part, can the abrasion be eliminated or reduced? Also study the condition that needs correction. Can it be prevented or retarded by using something that is more resistant to the cause of the condition? For example, if abrasion can not be eliminated, can some more abrasion-resistant material be used to increase the life of the job?

Here are some examples of reduced frequency solutions: Elimination of excessive vibration increased the life of a part, thereby reducing the number of times the part had to be replaced. Improved filtration required fewer clean-outs. A longer lasting lubricant cut down on the frequency of hand lubrication. A wider sheave wheel increased the life of a cable.

5. ***Check your solutions with others.*** Procedure solutions can be checked by reobserving part of the job and by discussing them with the men who do the job. If practical, get together a group of the men who do the job. Check your proposed procedure solutions against their experience. They may be able to show you where an idea is impractical, or they may be able to suggest an even better procedure. When you can't get a group together check your solutions with a few experienced individuals. Always check with the man you observed. You might also consult with other supervisors or other men who do the job.

DOING A JSA BY THE DISCUSSION METHOD #115

When doing a JSA by the discussion method, the participants may be either supervisors or employees experienced at doing the job. In either case, the discussion leader is usually a supervisor. What follows is directed at would-be discussion leaders. It assumes the participants are generally familiar with doing a JSA by group discussion.

FACILITIES FOR RECORDING THE JSA

With the discussion method, the JSA is recorded as it is developed so that it is visible to the group. The best equipment for recording purposes is a set of three easels with pads of 36" x 30" conference paper. For greater rigidity, the three pads can be evenly spaced on a single plywood panel in the manner shown in Fig. 4.

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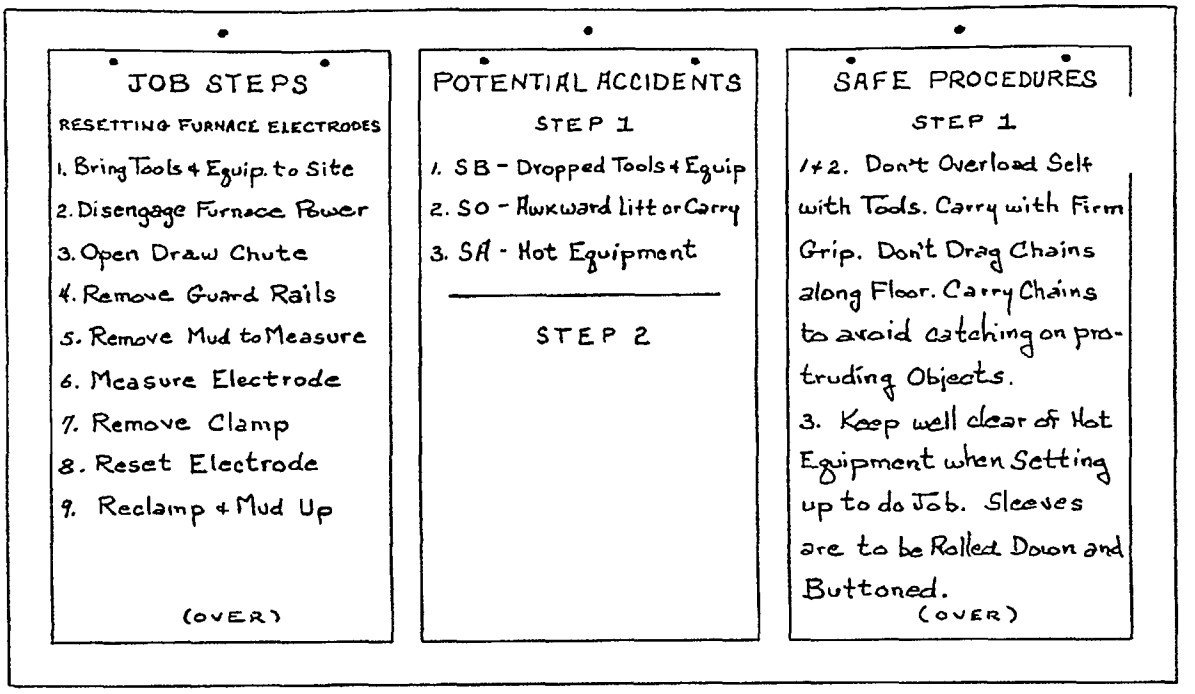

FIG. 4. CHART PAPER PANEL ARRANGEMENT FOR DOING JSA's BY THE DISCUSSION METHOD. Pads of chart paper are fixed to a large plywood panel as shown. The arrangement may be wall-hung or positioned on legs. If wall-hung, the panel should be bracketed off the wall to permit chart paper to be flipped over the top.

The left panel is used for recording the job step breakdown. The center panel is used for recording the potential accidents associated with each job step. The right panel is used for recording the main idea of suggested procedure solutions. No attempt is made to record the JSA as it will appear in its final form. The discussion leader records in any abbreviated form that will be sufficient to retain the basic ideas, and that will enable the group to follow the progress of the JSA. A heavy black marking crayon is used to record.

HOW TO BREAK DOWN THE JOB BY THE DISCUSSION METHOD

Identify the job to be analyzed by writing a short descriptive phrase at the top of the left panel, after the example of the model shown in Fig. 4. Explain why the job has been selected for analysis. Your explanation should usually be in terms of the history of accidents and near-accidents associated with the job. If you can cite some serious accidents, so much the better. The idea is to convince the group that the job does warrant the JSA treatment.

Briefly refresh the group's understanding of breaking a job down into basic steps. You can do this quickly by showing them an example of a step by step breakdown of another job. This can be omitted if the group has considerable experience at doing JSA's.

Establish the first job step. Ask the group, *"How is the job started? What's the first step?"* When you get an answer, check for agreement. If the majority agrees, record the job step and go on. Let those who disagree know that you will reopen the issue later. Establish the second job step. You might ask, *"What's the next step? What has to be done next to move the job along?"* Again, get your answer, check for agreement, and record the job step on the left panel underneath the first job step. Try to resolve any disagreement, but if it does not resolve itself quickly, move on. Indicate you will return to the point of disagreement later.

Always be ready to provide an answer if the group gets stuck. Do it by prompting the group with a question. For example, *"Is this the time when the guard rails are removed? Isn't that a job step?"* Avoid *telling* the group the answer. Bring the answers out of them with leading questions.

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Continue as described above until all job steps are listed. Keep the group on the task. Don't let them go too far astray in recalling past accidents. That tends to happen. When all of the job steps have been recorded, review the whole sequence. Iron out differences of opinion until the job step breakdown has majority approval. Ideally, the agreement should be 100%.

HOW TO IDENTIFY POTENTIAL ACCIDENTS BY THE DISCUSSION METHOD

Focus the group's attention on the first job step. Explain that you want to identify all accidents that reasonably could happen to a man doing the job step who did not take all required precautions. Emphasize that when there is doubt, the potential accident should be included.

Then, proceed to ask one by one the six orienting questions, applying them to each job step:

1. *Can he be struck by or contacted by anything?*
2. *Can he strike against or contact anything injurious?*
3. *Can he get himself caught in, on, or between anything?*
4. *Can he fall in any way?*
5. *Can he strain or over-exert himself?*
6. *Can he be exposed to gases, fumes, or any other harmful condition?*

When you raise the above questions, help them along with other questions that will guide the group. For example, "*Can he be struck by anything? Is there anything moving in the area? Can anything unexpectedly let go? Can anything be dropped on him?*" After each such set of questions, give the group time to think. Record suggested potential accidents suggested by the group on the center panel in the same abbreviated way described earlier. Thus, struck by a crane hook is recorded "SB – crane hook". Number the potential accidents consecutively for each job step. When the group appears to be running dry of ideas, go on to the next job step. Draw a bold line underneath the potential accidents recorded for each job step. Record those for the next job step beneath that line, after placing the number of the next job step below the center of the line. See Figure 4.

When a suggested potential accident is not clear, allow some discussion. Bring out clearly how the accident could happen. One word of caution: Don't argue that anyone's suggestion is farfetched. If you think it is, refer it back to the group. Simply ask, "How about that? Should we include that?" If the group thinks it should be included, include it. A discussion leader who argues with participants will soon find he has no participants.

HOW TO DEVELOP SOLUTIONS BY THE DISCUSSION METHOD

Make sure the group understands the different kinds of solutions, e.g. radical solutions, procedure solutions, environment solutions, and reduced frequency solutions. If necessary, explain each with an example.

You can not expect to develop radical solutions in a discussion although sometimes they will develop spontaneously. Therefore, ask the group members to volunteer a radical solution *at any time the idea strikes them.* Urge them to suggest such ideas even though they have not thought through the details. The idea that is made public is something everyone else can think about.

Concentrate on developing procedure solutions as follows: Focus the group's attention on a recorded potential accident. Then ask, "*What should the man do or not do in order to avoid this accident?*" If necessary, ask further, "*How exactly should he do it?*" Develop group agreement on the best precaution he should take. Record the precaution on the right panel in any abbreviated way that retains the idea. Precede the recorded precaution with the same number that was given to the potential accident in the center panel to which it refers.

If a procedure solution is weak, ask the group to think in terms of what environmental changes could be made to provide further protection. Make sure the group understands that authority for acting on such recommendations rests with higher supervision when that is the case.

Develop procedure solutions for each potential accident in the same manner. Don't permit the group to discuss solutions for more than one potential accident at a time. If you do, confusion will reign. Proceed systematically from one potential accident to the next, from one job step to the next.

Make a line through each potential accident on the center panel whenever a procedure solution has been recorded for it on the right panel. Sometimes one such solution will prevent several potential accidents.

Lastly, if it is a repetitive service job, focus the group's attention on what can be done to increase the life of the completed job. Examine the causes of the condition that requires correction by the job. Can they be eliminated wholly or partially? Can any materials, supplies, or parts be used that will be more resistant to the causes that bring about the condition that needs correction?

HOW MANY GROUP SESSIONS WILL BE REQUIRED TO COMPLETE A JSA?

The number of group sessions that will be required to complete a JSA will depend on the nature of the job, the skill of the discussion leader in keeping the group concentrated on the JSA, and the experience of the group in doing JSA's. A one or two hour session is usually sufficient to complete a JSA when the discussion leader is skilled and the group experienced in how to proceed. Complex jobs may require a second or even a third session.

CHECK YOURSELF ON THESE QUESTIONS

1. What is the observation method of doing a JSA? What are its advantages and limitations?
2. What is the discussion method of doing a JSA? What are its advantages and limitations?
3. What is the recall and check method of doing a JSA? What is the main advantage of this method?
4. Should non-supervisory employees be encouraged to participate in the development of JSA's? Why or why not?
5. When breaking a job down into its step via the observation method, what kind of man would you select to observe? Should you explain to him what you intend to do? Should you check your job breakdown with him? How are the job steps recorded on the JSA worksheet?
6. When you try to identify potential accidents by the observation method, should you explain what you are doing to the man you observe? What questions should you ask yourself in order to spot potential accidents?
7. How are potential accidents best recorded on the JSA worksheet? With whom do you check your list of potential accidents?
8. When developing solutions for potential accidents by the observation method, why is it advisable to try for a radical solution first? How should a procedure solution be written up on the JSA worksheet? What kind of solution should be tried when a procedure solution is weak?

Managing a Job Safety Analysis Program

THE JOB SAFETY ANALYSIS PROGRAM

A JSA program is a continuing, systematic effort to analyze one hazardous job after another until all such jobs are covered by a *standard safe job procedure.* Once established, such standard procedures are expected to be followed by all employees for the sake of both safety and efficiency.

A continuing JSA program has no end. JSA's are periodically revised to bring them in line with changes in job procedures, equipment, and materials. Moreover, when disabling or near-disabling injury accidents occur, the appropriate JSA's are modified, if necessary, to fit the circumstances of the accidents. Lastly, when new jobs are created by technological changes, they are covered by a JSA. (There is no sense in waiting for a newly created job to develop an accident history before establishing a standard safe job procedure.

Although a JSA program is a continuing effort, the heavy effort comes during the first two or three years. It is during this period that recognized hazardous jobs are analyzed for the first time. Considerable sustained effort is required. No one should be fooled into thinking that developing JSA's is easy. Once the development phase is completed, however, the major effort is done. Thereafter, it is primarily a matter of periodic reviews and revisions as needed.

The end purpose of a JSA program is not to accumulate a lot of standard safe job procedures on paper. The real purpose is to provide supervisors with training guides to be used for both initial and reminder training of employees. There is little value in a JSA program that never gets off the paper. If foremen don't use the completed JSA's, then a lot of time and effort has been wasted.

The Department Superintendent is the key man in a JSA program. It is true that foremen develop and use the JSA's. However, experience has proven that a departmental JSA program is effective or ineffective depending upon how well the superintendent *manages* the program. He is the person who must plan, organize, lead, and control the operation of the program. If he manages it badly by poor planning and organizing, by lack of stimulating leadership, and by inadequate controlling, then his supervisors will be inclined to go through the motions of a JSA program. The development of JSA's will drag. They will be of poor quality. Moreover, once done, they won't be used.

What follows is a guide for department superintendents in how to install and manage an effective JSA program. It embodies many of the principles of Armco's PROFESSION OF MANAGEMENT program.

PLANNING AND ORGANIZING A JSA PROGRAM 122

Long before the first job is analyzed, the JSA program must be planned and organized. The basic steps are as follows:

1. *Establish the objectives.*
2. *Determine what jobs to analyze.*
3. *Develop a program procedure.*
4. *Establish a minimum requirement.*
5. *Schedule the JSA activities.*

A discussion of each step follows:

ESTABLISHING THE OBJECTIVES

The plant manager, assisted by his superintendents, should develop a suitable statement of the objectives of the program. A well-prepared and publicized statement of objectives has several benefits. It lets lower levels of supervision know the plant manager is behind the program. It clarifies the purposes of the program to non-supervisory employees who may misinterpret the JSA as a disguised way to change their responsibilities and duties. It tells all levels of supervision why the program is being installed.

The following objectives should be considered for communication:

1. *To establish safe job procedures for jobs known to require special emphasis on safety.*
2. *To establish safe job procedures for jobs newly created as a result of changes in production facilities and equipment.*
3. *To revise established job procedures in the light of new accident facts.*
4. *To train employees in the details of standard safe job procedures for their own protection.*
5. *To develop safer and more efficient methods of doing jobs.*

Plans should be made on how to communicate the program's what, why, and how to employees. Several communication media should be considered. Newsletters, safety meetings, posters, personal contacts by supervisors - all are suitable methods of telling the story.

DETERMINING WHAT JOBS TO ANALYZE

A JSA program should not analyze jobs willy-nilly. The program should concentrate on those jobs that have proven themselves to be especially hazardous. It is therefore necessary to determine in advance what jobs to analyze.

The idea is to develop a master list of the jobs associated with each position title or occupation in the department. The list should include the jobs that have (1) a history of many accidents, regardless of injury severity, (2) a history of serious injury accidents, or (3) a potential for serious injury accidents even though such accidents have not yet occurred.

Once developed, the list has several uses: (1) It determines what jobs will be analyzed. (2) It provides a basis for establishing a priority order of analysis. (3) It provides a basis for making and scheduling JSA assignments.

The details of how to develop such a master list of jobs are described in Chapter 6. Your responsibility as a department head is to see that the master list of hazardous jobs gets developed.

After you have studied Chapter 6, Section 16, convene a meeting of your supervisors to explain what you want and why. Distribute the worksheet shown in Figure 1 of Chapter 6. Instruct the supervisors what to do with the worksheet. Let them start to identify hazardous jobs right then and there. Make sure all understand what is wanted. Then, get the foremen to agree on a target date by which they will have identified the hazardous jobs associated with the positions under their supervision.

After the first versions of the job lists have been submitted, general foremen should be required to review, edit, and consolidate the lists. The final version should be approved by the department head.

Maintenance and repair jobs are a special problem. The jobs done by maintenance personnel that should be listed are those that are (1) repetitive maintenance jobs, such as changing a crane cable, and (2) basic tool and equipment usage, such as using a cutting torch. Normally, there is no advantage to listing rarely done repair jobs, unless they are extremely hazardous. See Chapter 6 for further details.

DEVELOPING A PROGRAM PROCEDURE

The basic procedure of the program should be established while the foremen are developing the lists of hazardous jobs, or before. The overall JSA program procedure should include the following:

1. *A procedure for scheduling and controlling assignments.* A schedule is simply a device for stating who will do what by what date. There are many ways you can

Delete

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schedule and control JSA assignments. The form shown in Figure 5 is recommended because it is both a schedule and a control chart.

2. *A procedure for checking JSA progress.* It is a mistake to wait until a JSA is due before contacting the doer on his progress. For every person assigned to develop a JSA, there should be a person assigned to check the JSA's progress. Ordinarily, the immediate supervisor of the person assigned to develop a JSA should be given the responsibility of checking progress.

A mid-point check should be the minimum. It discourages supervisors from waiting until the last few days before the due date to do the JSA. It provides a check on the quality of what is being done. It gives an opportunity for personal guidance and instruction.

3. *A procedure for reviewing, integrating, and editing first darfts.* It is a rare JSA that is turned in ready for duplication and distribution to the users. The completed assignment should be regarded as a first draft. It needs to be reviewed and edited. Where several foremen have independently analyzed the same job, the separate versions must be integrated into one standard version. Normally, the JSA should be reviewed by the immediate supervisor of the person doing the JSA. However, that is not always possible or desirable.

The JSA should be reviewed for *content.* Are the job steps correctly identified? Are they in the correct order? Are the major hazards identified? Are the recommended safe procedures practical? Are they likely to be effective if followed?

The JSA should be reviewed for *style of writing.* Sentences should be short and complete. Spelling should be correct. Generalities should be eliminated. Useless repetition should be eliminated. The recommended safe procedures should be specific and concrete.

If it is clear that a supervisor has submitted a poor quality JSA, he should be required to redo it. The reviewer should not be burdened with the impossible task of trying to revise a poorly done JSA.

4. *A procedure for distributing and storing copies of the approved JSA.* Ideally, each supervisor should have a set of JSA's for the jobs done under his supervision. At the minimum, copies should be distributed and located so they are readily available to all supervisors. The more difficult it is for supervisors to get access to stored copies, the less likely will they use them. It is silly to spend vast amounts of supervisory time in the development of JSA's only to end up with a single typed copy in some inaccessable file. Each supervisor or group of turn supervisors should be given a binder in which to file the JSA's.

As superintendent, it is your job to establish the above procedures before the actual work of the JSA program gets underway. You will have to communicate the procedures to all concerned, and later make sure that they are followed.

SCHEDULING THE JSA ASSIGNMENTS

JSA assignments should be scheduled at least six months in advance. The form shown in Figure 5 is useful for scheduling and controlling JSA's. The advantage of scheduling JSA's well in advance is that all concerned know what JSA'S they will be required to develop. That gives them plenty of time to think about and observe the jobs they have been assigned to analyze.

Here are some tips about scheduling JSA assignments:

1. *Schedule a minimum of two supervisors to analyze the same job.* They can proceed either independently to get the benefit of different viewpoints or collaborate to develop a single version.

2. *Schedule the most hazardous jobs first.* You will get the greatest return for your effort if you proceed from the most to the least hazardous job.

3. *Assign supervisors to jobs with which they have experience.* Better JSA's will result. An exception can be made where you want to use the JSA assignment to provide more experience with a particular job. Do not allow supervisors to decide what jobs they will analyze. Why not?

A SUPERVISOR WHO IS NOT EXPERIENCED CAN LEARN MORE ABOUT A JOB.

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JSA ASSIGNMENT SCHEDULE AND CONTROL CHART FOR OPEN HEARTH

INSTRUCTIONS: Record names of supervisors who will be assigned to do JSA's in left column. Record month in which due at the top of columns headed Due End Of. Indicate the JSA assignment by recording the position and job title code in the appropriate space. For example: a "Open Hearth First Helper" is 29 and "Lighting up a Furnace" is 8, record 29-8. Mark an x in the appropriate space after the assignment is completed.

SUPERVISOR ASSIGNED	DUE END OF JAN.		DUE END OF FEB.		DUE END OF MAR.		DUE END OF APR.		DUE END OF MAY		DUE END OF JUNE	
MELTING & STEEL POURING	—		—		—		—		—		—	
Adams, H.	29-8	X										
Brown, G.	29-4											
Angelo, P.	29-4	X										
Macusi, W.	29-8	X										
Wenrich, J.	38-1											
Karl, T	38-1	X										
Fetter, J.	29-4	X										
Hudak, M.	—		→ 30-1									
Sander, E.	29-8	X										
O'Leary, M.	—		→ 30-1									
Murchison, W.	38-3	X										
Pulaski, R.	—		→ 30-1									
Plazza, F.	38-3	X										
Cotrell, C.	N.A.											
Henry, J.	N.A.											

FIG. 5. JSA SCHEDULE AND CONTROL CHART. (See instructions on chart)

4. ***Pair less capable supervisors with more capable ones.*** Not all supervisors have equal capability for doing JSA's. By combining those who are weak in doing JSA's with those who do well, the former may be helped to do a better job.

5. ***Give supervisors a reasonable amount of time to complete assignments.*** Don't expect too much too quickly. It is better to give the supervisor two months to do a good quality JSA than to get a superficial JSA at the end of one month. But don't make the mistake of giving too much time. Remember, work expands to fill the time assigned to do it.

6. ***Insist that target dates be met.*** Make yourself clear on this point. Once supervisors get the idea that target dates are not firm, they stop trying to meet them. Target dates should be met with a JSA that reflects proper effort.

LEADING AND CONTROLLING A JSA PROGRAM

Leading a program is largely a matter of initiating, communicating, and motivating. Controlling means setting standards, checking progress, evaluating results, and taking action where standards are not being met. The following steps are applicable to leading and controlling a JSA program.

1. *Communicate objectives and procedures.*
2. *Communicate JSA assignments.*
3. *Control assignment schedules.*
4. *Control quality of JSA's.*
5. *Stimulate use of JSA's as training guides.*

6. *Require periodic JSA reviews.*

7. *Order JSA's checked against accident facts.*

Let's discuss each point briefly.

COMMUNICATING OBJECTIVES AND PROCEDURES

Use one or more group meetings to explain to both supervisory and non-supervisory employees what you regard as the objectives of the program. Don't delegate this task to anyone in your department; do it yourself. It is one way of letting everyone else know you are behind the program.

Use a regular safety meeting with your supervisors to explain how the program will proceed in your department. Explain how assignments are made, and how you intend to control them. Explain the importance of meeting target dates. You may also want to indicate a place where the assignment chart will be posted.

Explain how those responsible, e.g. general foremen and other second-line supervisors should check progress during the time of JSA development, and review, edit, and consolidate preliminary drafts of JSA's. (See earlier discussion.)

Explain the plan to distribute and store copies of JSA's. Emphasize that you expect the JSA's to be used as training guides. (See Chapter 9.) Invite the supervisors to make suggestions for the improvement of the program. Let them know the program procedure will be evaluated after it has been given a fair try.

COMMUNICATING JSA ASSIGNMENTS

At the same or a subsequent safety meeting, let each supervisor know what job he has been assigned to study and the date he is expected to turn in the completed JSA. Tell them the balance of their assignments will be indicated on a posted JSA schedule. Never make verbal assignments only. A posted schedule eliminates misunderstandings.

Use these meetings to emphasize again that you expect quality JSA's turned in on time. Explain what you mean by a good JSA.

CONTROLLING ASSIGNMENT SCHEDULES

Use the regular monthly safety meeting with supervisors to control the assignment schedule. Determine whether target dates were met. If not, find out why not. Where it is reasonable extend a target date. Where you believe a target date was not met because a supervisor did not exert himself, deal with his supervisor. Hold the controlling supervisors accountable when their foremen do not meet target dates.

By demonstrating your control of assignment schedules in the supervisor safety meeting, you will be impressing all concerned with your personal interest in the JSA program. *Keep the program moving forward on schedule, but don't sacrifice quality for quantity.*

CONTROLLING QUALITY OF JSA'S

There are several things you can do to get good quality JSA's.

1. *Communicate standards of acceptable JSA's.* Include such points as good job step breakdown, satisfactory identification of potential accidents, absence of empty generalities, concrete descriptions of precautions, and simple written language.

2. *Insist that general supervisors work at improving quality.* If you get too many poor JSA's, bear down on the general supervisors responsible. Point out what is wrong, and how to get improvement.

3. *Give final approval to JSA's.* Review and approve final versions of JSA'S. If you can't review and approve *all*, then review and approve *some*. Return those that are not up to standard for revision. *Compliment the supervisors who turn in good JSA's.*

4. *Request safety department audits.* Now and then, ask the safety department to give you the benefit of a JSA audit. Invite a critical review of a sample of recent JSA's. Ask for a report at one of your regular safety meetings.

STIMULATING USE OF JSA's

Don't forget the end purpose of the JSA is to train employees to follow standard safe procedures. Chapter 9 discusses the training uses to which the completed JSA's can be put. It also describes how you, as department head, can control proper use of JSA's.

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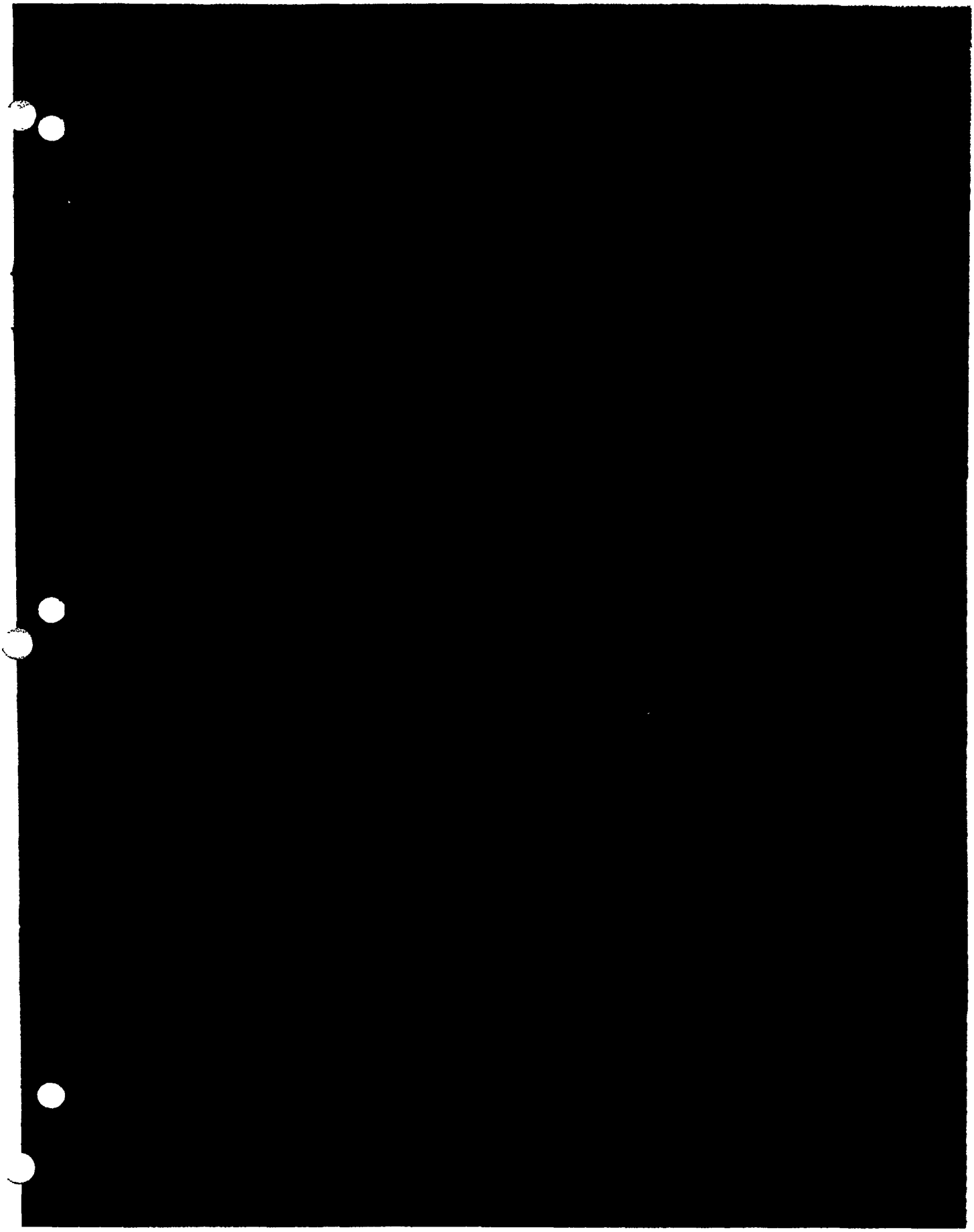

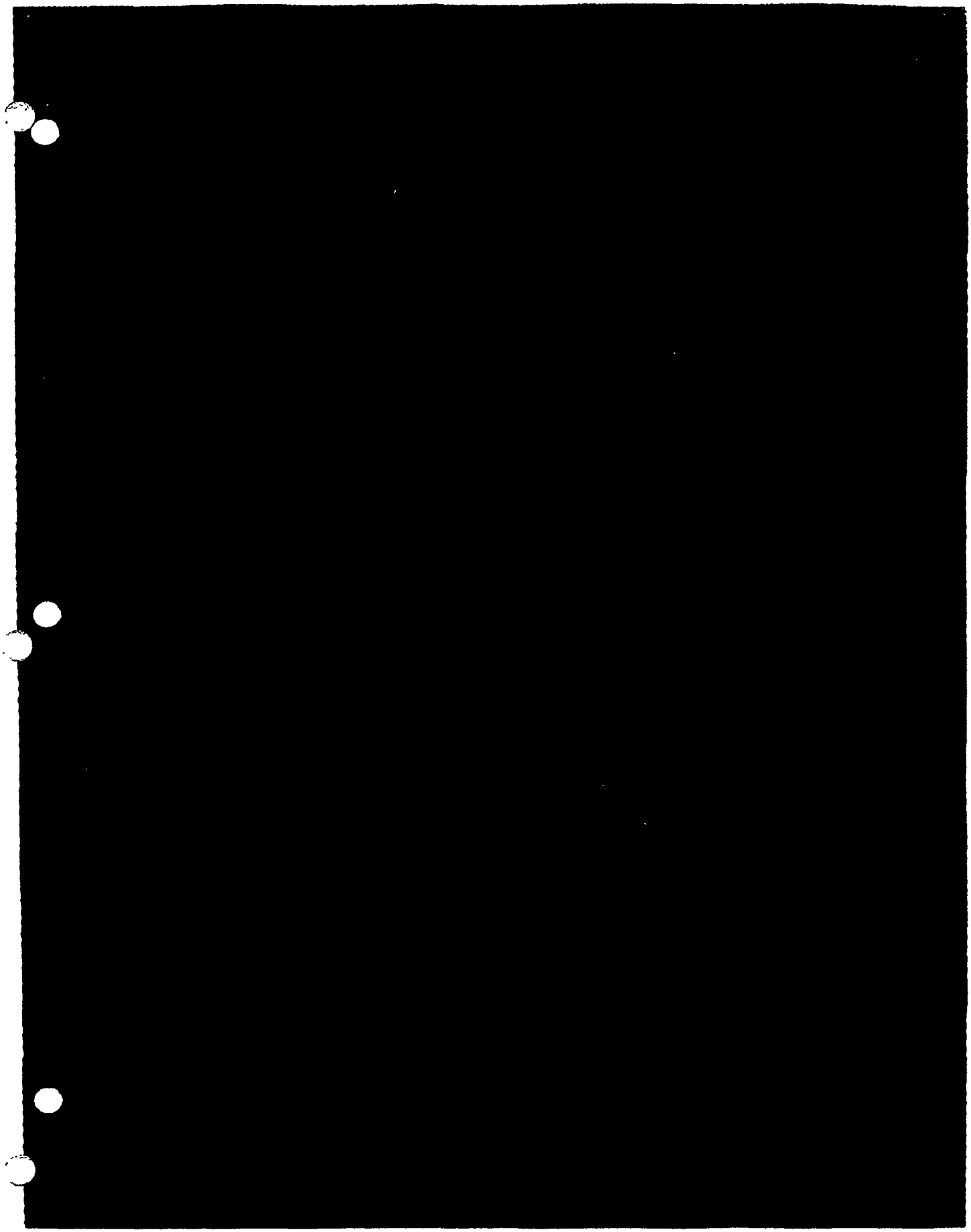

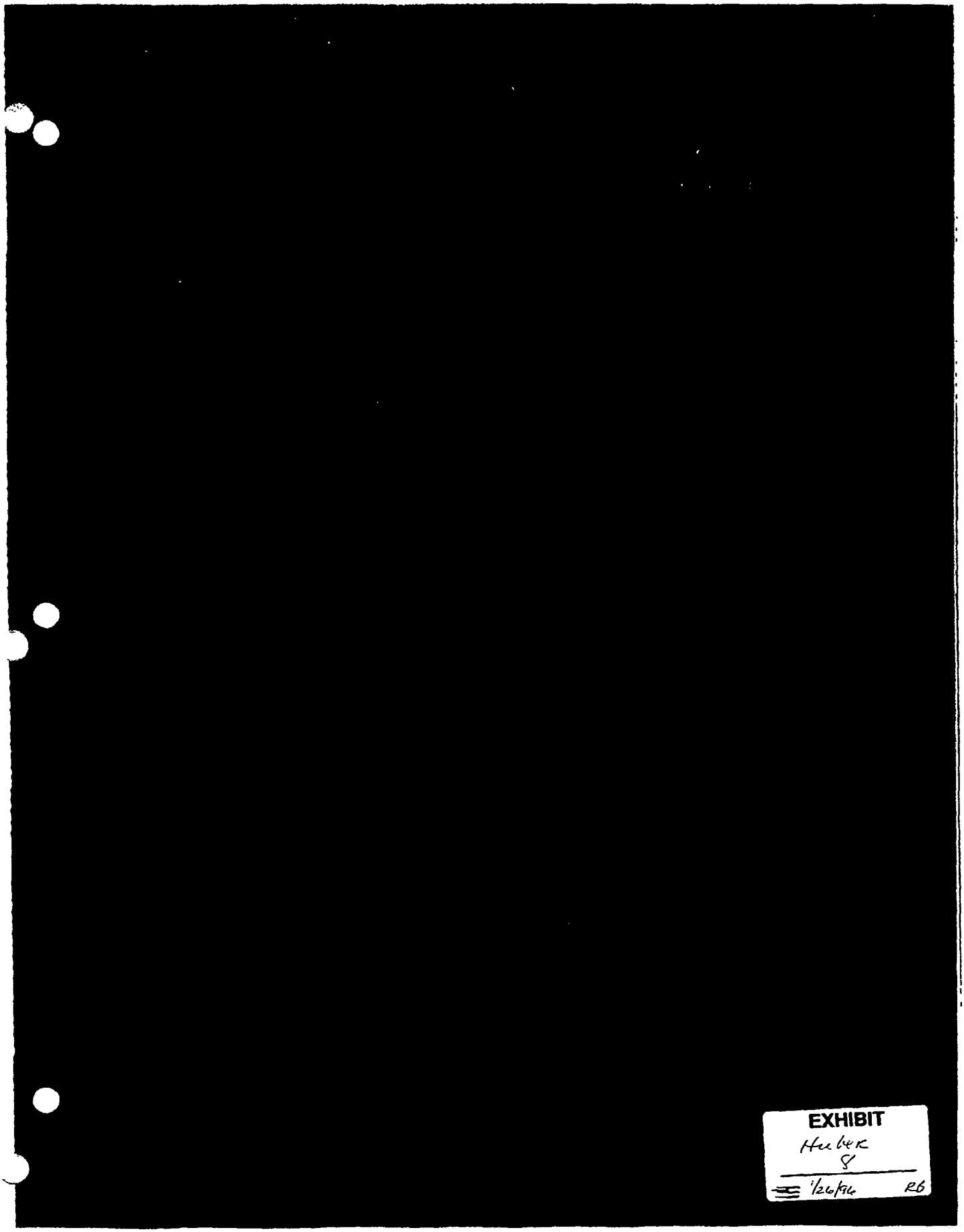
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