Use of a Supervisory Safety Checklist and Safety Meetings to Reduce and Prevent Hazardous Safety Conditions in an Automotive Plant

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USE OF A SUPERVISORY SAFETY CHECKLIST AND SAFETY MEETINGS TO REDUCE AND PREVENT HAZARDOUS SAFETY CONDITIONS IN AN AUTOMOTIVE PLANT

by

Todd Alan Brighton

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Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
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Western Michigan University
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USE OF A SUPERVISORY SAFETY CHECKLIST AND SAFETY MEETINGS TO REDUCE AND PREVENT HAZARDOUS SAFETY CONDITIONS IN AN AUTOMOTIVE PLANT

Todd Alan Brighton, M.A.
Western Michigan University, 1985

Hazardous safety conditions and incidents were operationally defined for an assembly division at an automotive plant. The conditions were observed and recorded on two different employee shifts for an 11 week period. The experimental design used had three distinct phases. In the first phase baseline data were recorded on the number of hazardous safety conditions by two safety observers. In the second phase two shift supervisors used the safety checklist to record hazardous safety conditions. In the last phase data were taken but the supervisory safety checklist was not used. The data from all observations were discussed in safety meetings near the end of each shift. Results indicated that the frequency of hazardous safety conditions declined 32% for the morning shift and 21% for the afternoon shift when comparing baseline figures to those recorded during the last phase. The results indicated that the use of a safety checklist in safety meetings may be effective in reducing unsafe working conditions.
ACKNOWLEDGEMENTS

I would like to express my sincere appreciation to my adviser, Dr. Dale Brethower, for his time, encouragement, and invaluable input throughout not only the course of this study, but my entire academic career at Western Michigan University. My appreciation also is extended to Dr. Norm Peterson and Dr. Paul Mountjoy for their time and constructive criticisms. My extreme thanks also to all concerned parties for their continued patience in this long term project. Finally, I would like to thank the employees and management of the General Motors plant in Lansing for allowing me to research my study at their facility.

Todd Alan Brighton
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CHAPTER I

INTRODUCTION

Industrial safety in the United States is of great importance to both public and private concerns. Injuries totaled 2,300,000 in 1979 and there were 13,200 deaths. Work related injuries resulted in 80,000 workers suffering permanent impairments and contributed to 245,000 work days lost (National Safety Council [N.S.C.], 1980). Over 12 billion dollars were paid in worker compensation; costs of lost wages, medical expenses, insurance administrative costs, property damage, and lost work time brought the total figure for losses to 27.3 billion dollars (U.S. Department of Commerce [D.O.C.], 1979). There was a death every 40 minutes and an injury every 14 seconds. The average cost for each worker was 280 dollars (N.S.C., 1980). The total amount of loss does not take into account lost production, new worker training, worker law suits or other considerations. Attempts to reduce these numbers for unsafe conditions and worker safety incidents have looked at various solutions to the problem. Possible solutions to the problem for the most part have focused on unsafe working conditions or unsafe employee behaviors.

The annual rate of accidental deaths has decreased 22% since 1968 (D.O.C., 1979). This decrease is believed to be largely due to public policy resulting from a greater awareness and new technology. A
recent trend that demonstrates an increase in accident figures indicates that while new engineering developments and advances in design and materials must continue, a greater level of concentration should be aimed towards identifying behavioral strategies (Sulzer-Azaroff, 1982).

Current researchers have explored many aspects of safety performance in the work setting. One approach examined the theories of accident causation (Hale and Hale, 1970; Torrie, 1983). The problem with this approach was the researchers could not be certain there was a direct relationship between the actual incident and any specific causal factor. Most studies use the correlation between an event such as the enactment of the Occupational Safety and Health Act and the figures resulting from the recent trends in the data (Komaki, Collins, and Penn, 1982). This is an example of a difficulty found in many areas of research on the prevention of occupational accidents. This researcher saw evidence of the problem in worker awareness of the safety program to be implemented at Oldsmobile.

Another difficulty is operationally defining what is and what is not safe behavior for the given situation (Cohen, Smith, and Anger, 1980). This involves interviewing safety experts, workers, and supervisors to clearly define both safe and unsafe practices for a given situation; examining accident reports and safety patterns; and also studying the physical arrangements of equipment, materials, and workers. Another area of concern is getting complete reports on the actual frequency of industrial accidents (O'Connel and Meyers, 1966; Rubinski and Smith, 1973). Each of these areas mentioned differed in
the approach, methods, and types of suggested intervention to be used but were similar in that their purpose was to reduce the frequency of safety accidents.

With more acceptance of behavioral principles in the business world, researchers have used behavioral modification techniques in the safety research area (Smith, Anger, and Uslan, 1978). Another area researchers have studied is the number of safety hazards present in a specific situation in comparison with what is normal for that particular industrial field (Sulzer-Azaroff and DeSantamaria, 1980). In a related study extensive comparisons were made on the safety efforts of high and low accident firms matched for type of industry, size and geographical location (Cohen, Smith, and Cohen, 1975). The last major area is the setting and following of safety requirements and regulations (Fiedler and Chemers, 1974). Komaki, Heinzmann, and Lawson, (1980) established that employee feedback in conjunction with establishing rules and regulations has been effective as a motivational strategy in four sections of a city vehicle maintenance division but problems occurred in sustaining performance gains if feedback was not available three times a week.

Safety performance and effective means of measuring it have been studied in a number of ways. Many of the early studies (Paul, Robertson and Herzberg, 1969) focused on employee factors such as accident proneness, job skills, attention span, psychological make-up, and personal goals. Industrial research began to apply incentives (e.g. extra privileges, time off, bonus points which could be exchanged for tangible items) for meeting or exceeding the required
norms. Management also started to supply workers with feedback on desired performance. This included the posting of graphs and posters and worker participation in the setting of safety goals (Komaki, Barwick, and Scott, 1979; Laner and Sell, 1960; Smith, Anger, and Uslan, 1978).

Two previous research studies are very important to this study. Their importance is that they laid the foundation for the present research. In many ways this study is a systematic replication of elements involved in one or both of the earlier studies. The first study was in 1978 titled, "Behavioral Ecology and Accident Prevention" (Sulzer-Azaroff, 1978). This research focused on the presentation of informational feedback concerning hazards and hazardous safety conditions in a collection of university research laboratories. Researchers investigated the effects of reinforcing or aversive contingencies on the pattern of safe actions by the subjects. The contingencies basically involved social acceptance or nonacceptance of subjects' actions concerning safety practices. This investigation was very similar to this researcher's in that the program could be incorporated with ease, little time was required for implementation, and the costs were relatively low. Sulzer-Azaroff's study was similar to this researcher's in that it also suggested that the use of a checklist to behaviorally define safe practices in combination with positively reinforcing the safe behavior is a viable approach to occupational accident reduction. Another feature the 1978 study shared with this researcher's was that the focus was not on behavior itself, but on the products of unsafe practices, i.e. on unsafe
conditions resulting from unsafe actions. The intervention (Sulzer-Azaroff, 1978) led to an overall decline in the number of hazardous safety conditions. The major difference between Sulzer-Azaroff's 1978 study and this study was the environment in which the intervention took place. Certainly, differences in occupational function, educational level, and other social factors existed.

The second study of the greatest significance to the research was "Industrial Safety Hazard Reduction Through Performance Feedback" (Sulzer-Azaroff and DeSantamaria, 1980). Here researchers implemented a "feedback package" to their supervisors which was designed to prevent occupational accidents. As with the present study, the supervisors were presented with observational data, congratulated on good performance, and were asked for their input. As with both the 1978 study by Sulzer-Azaroff and this study, the program of planned intervention could be instituted within the normal operating guidelines of plant activity. The 1980 Sulzer-Azaroff and DeSantamaria study had further similarities in that it focused on an area involved in production. As industrial management places its emphasis on production, both studies shared the necessary quality of not having an adverse action or reaction on assembly time. The present study and the Sulzer-Azaroff studies were also alike in that they resulted in a greater level of worker input on potential safety hazards and a neater, more organized production plant. The major dissimilarity between the 1980 Sulzer-Azaroff and DeSantamaria procedure and this researcher's was that Sulzer-Azaroff's was designed
to prevent workers from ascertaining exactly what was being recorded, while this researcher's study made explicit what was being recorded.

The effects that a safety checklist may have on the number of safety incidents and general safety conditions on the whole are worth further investigation. The potential benefits are numerous and may have a positive impact on all levels of the worker hierarchy. Safety is both a profit incentive and good public relations. It enhances worker interest and enriches job quality through worker awareness of employer's concern with their well being.

An effective safety program will also help reduce insurance and local government costs. This is achieved by having lower insurance premiums, cheaper tax appropriations, and overall less expenses that result directly in lower costs. (U.S. Labor Department, 1980)

The realization of a positive safety environment must not be looked at in terms of considering only what must be done from a legal standpoint. Research has shown that to have a successful safety program there must also be adequate operating procedures as well as proper equipment maintenance (Fine, 1974).

The purpose of this study was to investigate the effect of a supervisory safety checklist on the reduction of hazardous safety conditions. The safety checklist was researched for a number of reasons. Safety personnel at General Motors were concerned that the safety training that supervisors had completed as requirements of accepting their positions were being effective for only a very short period of time. In addition, the information they had been exposed to
was either forgotten or ignored. Evidence of the existing safety conditions as well as accident statistics supported this belief. These safety professionals believed that a checklist would serve as a needed reminder for the supervisors. Another major reason was that many situations that were potentially hazardous to worker safety existed that had been either missed or ignored during the supervisory safety training. The reason for this was that there was little updating of safety training for supervisors who had been on the job a number of years. (There was a regular meeting but it was usually just an update on new or revised federal regulations and laws; very little was accomplished for actual supervisors of specific line shifts during this time.) The last major reason that the safety researchers felt that a safety checklist might be helpful was that it may alert both supervisors and line personnel that a problem existed and that management was concerned in altering the situation to a more acceptable level.

One example of positive attributes resulting from managerial use of a safety checklist was supported in a study at General Motors where management was attempting to retrain workers who had been laid off. Workers felt that the program using a safety checklist was a renewed effort to insure safety for all workers (General Motors to Retrain Laid Off Workers, 1983). Another example of the use of a safety checklist was a study completed by conductors to insure a safe journey (Improving Conductor Safety Performance by Implementing a Duties Worklist, 1979). The use of a checklist to improve other areas of performance includes using one to improve both the quality and
quantity of cold calls by telemarketing professionals (Raising Sales by Verifying Daily Activities, 1979); another is the use of a job duties requirement list to assist in the training of new individuals (Harmon, 1981). The use of a daily checklist in the wide variety of settings mentioned above showed a wide range of settings in which a condition could be reduced or increased as researchers desired.
CHAPTER II

METHOD

Setting

This study was conducted in a large automotive plant located in Lansing, Michigan. The facility was involved in each and every phase of automotive assembly. Research was conducted in the east wing engine assembly department. It focused specifically on the parts assembly involved in the final product of constructing an automotive engine. The specific format followed in this study evolved from a recent safety program developed by Oldsmobile safety personnel titled "Safe Care." Upon hearing about this program this researcher approached the safety director to gain permission to make observations and to use this opportunity to investigate the use of a supervisory checklist. Approval was granted by the home office of General Motors Corporation with the understanding that certain rules and regulations would have to be observed.

Subjects

Subjects were the employees and two shift supervisors of two different shifts for the east engine assembly department. All employees were full time personnel: They worked eight hour
shifts, either from 8 a.m. to 4:30 p.m. or from 4:30 p.m. to 1 a.m. Each shift employed 154 people. On the morning shift there were 111 men and 43 women. Their ages ranged from 24 to 59 years. On the afternoon shift there were 102 men and 52 women. Ages ranged from 27 to 57 years. All employees on both shifts were included in the study.

Design

The purpose of this study was to investigate the effect of a supervisory safety checklist as an intervention technique to reduce the number of hazardous safety conditions at an automotive assembly plant. A checklist of 15 categories of possible safety condition hazards was produced by the organizational safety director and his assistant. A list of the categories is included in Appendix A. The checklist was designed for the immediate work area (East wing engine assembly) but also took into account some general safety rules mandated for the entire plant. The overall design of the study is shown in Table 1. During the baseline phase two safety observers, A and B, took baseline data using the checklist. The checklist was then used by the shift supervisors during checklist training to assure that supervisors were able to detect unsafe conditions. The two safety observers continued to take data which is represented on both graphs. During the final phase supervisors were instructed to
continue attending to safety considerations but were not required to use the safety checklists. The safety observers took data to determine whether safety hazards were lower during the final phase than they had been during baseline.

The meetings referred to in Table 1 were an important part of the study. They were attended by both safety observers, the safety director and the researcher during the baseline phase and were held to discuss the study, get agreement on definitions, etc. The union representatives, who had been informed of the study earlier (the union representatives occasionally used the checklist to make observations), began attending the meetings for the first time during checklist training. The safety meeting was held for 30 to 45 minutes towards the end of each shift. During the checklist training the supervisors took the place of the safety observers. In the last phase the safety observers replaced the shift supervisors for post training. Hazardous safety conditions data were reviewed during the meetings and possible solutions for hazardous conditions were discussed. Praise was also delivered by the safety director during the checklist training period to the shift supervisors for any reductions in hazardous safety conditions.

The design implemented in the study was implemented across shifts to measure the effectiveness of the supervisory safety checklist on the reduction of hazardous safety conditions. Baseline was recorded on both shifts for two weeks (ten working days).
<table>
<thead>
<tr>
<th>PERSON</th>
<th>BASELINE</th>
<th>CHECKLIST TRAINING</th>
<th>POST TRAINING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Observer A</td>
<td>Took data/Attended meetings</td>
<td>Observed/Took data</td>
<td>Took data/Attended meetings</td>
</tr>
<tr>
<td>Safety Observer B</td>
<td>Took data/Attended meetings</td>
<td>Observed/Took data</td>
<td>Took data/Attended meetings</td>
</tr>
<tr>
<td>Supervisor A</td>
<td>Normal work procedure</td>
<td>Took data.</td>
<td>Performed supervisory function without safety checklist.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Implemented checklist.</td>
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<tr>
<td></td>
<td></td>
<td>Attended meetings.</td>
<td></td>
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<tr>
<td>Supervisor B</td>
<td>Normal work procedure</td>
<td>Took data.</td>
<td>Performed supervisory function without safety checklist.</td>
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<td></td>
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<td>Implemented checklist.</td>
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<td></td>
<td></td>
<td>Attended meetings.</td>
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</tr>
<tr>
<td></td>
<td>Made occasional observations.</td>
<td>Attended meetings.</td>
<td>Attended meetings.</td>
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<td></td>
<td>Attended meetings.</td>
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<td>Delivered feedback.</td>
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<td>Reviewed data.</td>
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<td>Generated feedback comments.</td>
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<td>Reviewed data.</td>
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<td>Generated feedback comments.</td>
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<td></td>
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<td></td>
<td>Reviewed data.</td>
</tr>
<tr>
<td>Safety Researcher</td>
<td>Observed Gathering information</td>
<td>Observed</td>
<td>Attended meetings.</td>
</tr>
<tr>
<td></td>
<td>Attended meetings</td>
<td>Affordable</td>
<td>Gathered information.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Reviewed data.</td>
</tr>
</tbody>
</table>
Observation/Procedure

Upon finalization of the checklist, all aspects were discussed in detail by safety personnel to reduce any discrepancies that might have existed. Agreement between data takers was developed through the oral discussion of each item on the checklist as to an individual's interpretation of context and meaning in the period prior to baseline and supervisory checklist training. Supervisors and safety observers were required by the safety director to pass a verbal quiz to reduce possible discrepancies.

Research data were collected over a period of 11 weeks. In the first phase baseline data were recorded on the number of hazardous safety conditions by two safety observers. In the second phase the shift supervisors also used the safety checklist to record what they believed to be hazardous safety conditions. In the last phase data were again taken by both safety observers but this time the supervisory safety checklist was not used. Data were collected during the times that both shifts worked, Monday through Friday. No data were taken for overtime or for weekends as this would have required accounting for too many other variables (i.e., different workers, different conditions). The safety director would occasionally spend time observing during both shifts. The observation was completed at a randomly selected time and would last for approximately 30 minutes. On a few occasions the safety director was present in the plant at the time data were being recorded but no interaction between parties took
place. When a safety incident occurred, the conditions present were noted by the observers. A safety incident was defined as an action with potential for injury. The category on the checklist pertaining to the hazard in question would then be explored in-depth to during the meetings allow for all parties to understand why a particular action was or was not a hazard.

The recording materials used were accident investigation report sheets, a hazardous conditions definition sheet, and a safety checklist. These materials are located in Appendices A, B, and F. The safety observers became familiar with the use of the safety checklist by having trial runs and then verifying agreement prior to the taking of baseline data. The shift supervisors became familiar with the checklist during the one week phase labeled as checklist training. The safety observers performed trial runs with the safety director before baseline and with the supervisors at the onset of the second phase. On two occasions the safety director's assistant stood in due to a scheduling conflict but any possible impact this had was judged to be minimal.

All components which made up the checklist were operationally defined and discussed to determine if any discrepancies existed and to improve accuracy and agreement of the material. Both safety and supervisory observers were observing the safety conditions present; however, complete independence was not achieved because this experimenter, the safety director, safety observers, and supervisory observers occasionally inspected safety incidents and accidents simultaneously. This was done informally and by chance.
and no reliability data was computed during this time. This also enabled this experimenter to gain first hand experience into existing conditions. The observer reliability was performed randomly once a week throughout the study by the safety director. The director's observations were compared with the safety observer sheets for the day of the week on which he made reliability observation checks. The observation times varied for both shifts as to when reliability was checked. Reliability was calculated by using the percentage agreement between the observers and the safety director for each respective phase of the study. This was figured by dividing the total number of agreements by the total number of agreements and disagreements added together and multiplying by 100.

Frequency of Hazardous Safety Conditions

The frequency of hazardous safety conditions was the total number of hazardous conditions noted by observers on the checklist. Hazard inspections were carried out at random times once a week for each shift by the safety director to observe conditions present and to investigate the conditions present were those being reported by both safety observers and shift supervisors. The time was chosen by the draw of a playing card. The inspections were made with no attempt to conceal the intent of the inspectors. Any possible hazards not included on the checklist were noted but not included in the data taking. All comparisons represented herein were made based upon the observations of the two safety observers. The observations made by
the shift supervisors were used to insure that the supervisors were understanding the use of the checklist, to help them identify hazardous safety conditions, and to facilitate the study format.
CHAPTER III

RESULTS

Figures 1 and 2 indicate the total number of hazardous safety conditions existing for shifts one and two during the baseline, during checklist training, and after withdrawal of the supervisory safety checklist. During the baseline the number of hazardous conditions was noted by the safety observers. Shift one had a range of 7 to 16 hazardous safety conditions. Shift two had a range from 8 to 15. The mean for shift one was 12.2 while shift two had a mean of 11.8 during baseline. The mean for interobserver reliability for the length of the study was 93%. The reliability ranged from 73% to 100%.

During the one week training period the range for shift one was from 12 to 15. The mean for shift one was 13.2. During this same period the range for shift two was from 10 to 14. The mean was 12.6. The training period involved the shift supervisors' recording of hazardous safety conditions. This period differed from baseline in that the hazardous safety conditions were being noted by the shift supervisors and the safety observers but only the safety observers' data were used for comparative purposes.

After withdrawal of the supervisory safety checklist the mean for shift one dropped to 8.3. During the same period the average for shift two dropped to 9.3. The range for shift one after withdrawal was from 4 to 15. For shift two the range was also 4.
to 15. These figures represented a 32% drop for shift one and 21% drop for shift two. Results were similar for both departments in that mean frequency of hazardous safety conditions decreased after training, when compared with baseline levels. This phase represented the removal of the checklist. The data reported in the results indicated to this researcher that the hazardous safety checklist and the safety meetings using it contributed to the drop in the number of hazardous safety conditions present for both shifts. While the data were not conclusive, the use of the checklist was still seen as beneficial.
FIGURE ONE. Hazardous safety conditions
FIGURE TWO. Hazardous safety conditions
CHAPTER IV

DISCUSSION

The results of this research lend support to the original hypothesis formulated by the safety director at Oldsmobile. That is, safety meetings and training involving the use of a safety checklist by the immediate supervisor may result in a reduction of hazardous conditions that the workers must face. The safety professionals had originally made an assumption that a reduction in hazardous conditions would lead immediately to a reduction in the number of safety incidents (accidents, near misses, non-reported occurrences). This assumption was considered to be correct after management chose to continue the study following the recording of preliminary data for baseline and the training phase. The number of hazardous safety conditions was on the decline and the safety director believed the initial assumption concerning the relative merits of the safety checklist and corresponding meetings was correct; however, it is not clear that the data support this belief.

This research supported many other factors that have been researched in the past. It was recognized that the involvement of the supervisory personnel as well as financial support from top level management is a must if workers are to see the importance of safety
conditions. This was reflected in that the hourly workers were able to see that management had placed enough emphasis on the program to be personally involved. Research completed also indicated that safety may be improved by investigating work centered variables and their direct connection to safety. Most research recently completed has centered on employee related factors to the extent of placing work centered variables in the background. The cost of studying work centered factors was also much less than attempting to interview, train, retrain, hire or terminate employees would have been. However, some of the hazardous safety conditions were eventually very costly after management decided improvements had to be made (changing of certain machinery, down time while equipment was modified, and implementation of new safety devices). The equipment changes were all made after the conclusion of this study.

The resulting figures of a 32% drop for shift one and a 21% drop for shift two may have actually been due in part to factors other than the checklist. Once the program showed initial success people began to place more of an emphasis on safety aspects. This may have resulted in a decline in hazards due to an awareness and not specifically the checklist itself. The data indicated an increase in hazardous safety occurrences during the last two weeks of the study. The research staff attributed this to the workers becoming lackadaisical toward the study as a result of their knowledge that they would soon be changing shift hours and the study would end. Baseline data indicated a slight increase in hazardous conditions for both shifts employed in the study. Researchers attributed the increase in hazardous conditions
observed to anxiety by the data takers' feelings that they may not have been observing all of the hazardous conditions present. A second contributing factor may have been that the observers were gaining a better insight into what the checklist was developed to investigate and were thus noticing more safety hazards.

The direct cost of the checklist was relatively low. All supervisors at the plant had been trained on safety measures available to them and how to recognize potential hazards during their pre-supervisory training period. A major problem with this training however, is that very little time was actually spent in the shop. The use of safety videotapes, cassettes, workshops, and discussion groups had been helpful but may not have been enough.

The safety department was optimistic that the use of this supervisory checklist would help their supervisors recognize specifically what constituted an unsafe or hazardous working condition. Daily comments from workers, safety personnel and management as well as results documented herein would indicate this was indeed true. As was previously noted, no attempts were made to discourage employees from finding out what the program was about or what it was intended to do. This may be viewed as a limitation in the study as no figures could be obtained on how much bias may have existed due to employee awareness. Another limitation was that there were no visible consequences for completing the safety checklist carefully and as trained to do. This was compounded by the fact that the researchers were limited in what they could do with their
personnel due to union regulations. Still another limitation was that in my role as an observer and researcher there was a limit on the amount of information that was available to me as an outsider. Production and other data measured during the safety study may have provided some interesting information. This resulted in there being very little production information available to me on either shift, both before and after implementation. (Union people felt that information may have possibly reflected badly on one or more of the personnel involved; under union agreement many things are only open to certain personnel at yearly reviews, grievance hearings, or as evidence for termination.)

How much generalization this study had must be considered from a variety of positions. Each division at Oldsmobile has a different function and it is almost like many separate companies. There was evidence researchers felt generalization was feasible in that a follow-up plan was being developed to be applied to other divisions in the plant. The use of the safety hazard checklist can be generalized with only a few minor modifications to many different types of settings (both industrial and non-industrial). This researcher would recommend very highly the use of a training procedure implementing a checklist in place of completely retraining supervisors in all applicable situations.

Like all research, the safety research conducted by this author had some weaknesses and problems associated with it. A major problem was this researchers' study allowed limited generalization to larger or different populations (Grimaldi and Simonds, 1974). This was
evidenced by the presence of a work environment that was totally union, and had a constant work force. These two variables are often not present together in a work situation. Another problem existed in that data are sometimes accidently or intentionally omitted (Herman, 1979). This problem potentially existed due to environmental attributes of the study. The environmental problems included the chaotic work pace of the plant which could prove distracting as well as the loudness generated by the machinery which resulted in minor difficulties in communication. Another possible problem was that outside variables may not have been given due consideration as to their impact on the outcome of the study (i.e., time lag between recordings, worker maturity). Previous research that attempted to focus on how much affect feedback systems had for employees and supervisors showed significantly positive results but failed to completely convince researchers that their feedback systems were the determining reason for the positive results exhibited.

One concern this researcher had with the research was that the collection of data during the baseline period was not completely infallible as a few minor alterations were still being made to the checklist. One example was the further defining of existing terms applicable to the checklist. This concern was not severe enough to have had a large impact on the study or to have altered the opinion presented here that the plan was effective.

The dependent variable was the number of safety conditions defined as being hazardous. The safety people noted that as few
assumptions as possible should be made, but that due to many factors a few would have to be made. One such assumption was that if the number of hazardous conditions was reduced then a reduction in safety incidents would likely follow. No safety data were presented on the decline in accident frequency. As the purpose of this study involved the potential reduction of hazardous safety conditions and not the reduction in safety incidents the assumption was believed to be tenable.

This researcher concluded at least temporarily the supervisory safety checklist had much potential for improving safety programs for the entire plant. Safety personnel have made recommendations that a need exists for a study to be conducted using a safety checklist in the plant with foremen, line-leaders, and even specific areas with machinery that have proven to be a problem.

One clear benefit of the supervisory checklist is that it will help to teach a desired behavior in a given situation. Researchers can study the application of incentives, or the effect of aversive stimuli, but if a behavior has not been properly learned their efforts will be stifled (Sulzer-Azaroff, 1978). Another benefit is shown in that the supervisors are able to visualize what is safe behavior as the checklist assists in breaking employee actions down into manageable components. This will then result in more specific rather than general instructions, which will often result in greater compliance (Peterson, 1984). The use of a supervisory safety checklist also holds promise in the training of individuals new to the job. Individuals who learned their job initially without the benefit
of making errors are more likely to perform their duties correctly (Peterson, 1976). One area of safety research this researcher would like to see explored is what schedule of reinforcement is the best for improving safety performance. Another suggestion for future research is to study how safety consciousness can be built into supervisory styles. There is also a need for follow-up studies to be completed to maintain the positive attributes of a checklist.

The researchers attributed the decreases in hazardous safety conditions for both shifts to three major reasons. First, the greater awareness of plant workers that safety problems were present and that management was intent on reducing these hazards. This was solidified by the posting of safety records for each period on the workers' bulletin board. The second major reason for the decline in hazardous conditions was greater awareness of existing conditions on the part of the supervisors involved in the study. This was reinforced by praise and other positive reinforcers for correct actions. The last major reason was the actual checklist itself. Evidence of this is reflected in the planned implementation of a second study using a safety checklist in either a different section of the plant or to assist in worker training at specific job functions.

The experimental design used was believed to have been an effective tool with which to implement the safety checklist but a few problems did exist with the format. One such problem was the relatively short time allowed for the taking of data in the training phase. There seemed to be some confusion as to the best way to familiarize the supervisors with the planned format. A second
problem was that due to the design used, there was some concern over whether the results obtained were as a result of the presentation of the checklist or as a result of removal.
APPENDIX A

SUPERVISORY SAFETY CHECKLIST CATEGORIES

1. Lighting
2. Ventilation
3. Materials
4. Liquids
5. Electrical
6. Equipment
7. Apparel
8. Hydraulics
9. Housekeeping
10. Hazardous Materials
11. Machinery Guards
12. Work Area
13. General Machinery
14. Fire Safety Equipment
15. Personal Safety Devices
APPENDIX B

DEFINITIONS OF HAZARDOUS SAFETY CONDITIONS

1. Bulbs or lamps burned out. Incorrect wattage in work areas.
2. Improper exposure to paints, fumes, smells, or gasses. Lack or inadequate use of heating or cooling controls.
3. Improperly stored in work areas, aisles, or fire exit lanes.
4. Leakage from machinery or equipment not cleaned up or overflowing.
5. Circuit overload, pull conduits, or exposed wires present. Solenoid covers missing, loose, or leaking. Ungrounded outlets, defective wiring, or improper drop cords. Lack of explosion proof switches or improper clearance for disconnects.
6. Stools or benches damaged or unsafe. Hand tools improperly used, stored, defective, damaged, or not properly grounded.
7. Improper footwear or loose clothing being worn in prohibited areas. Wearing of rings or other jewelry.
8. Air tools exceeding p.s.i. limits. Inadequate use or testing of pressure released valves.
10. Improper use, mixture or storage. Usage in restricted areas. Gasses and liquids under improper pressure.
11. Damaged, bent, missing, or out of place. Power guard locks not oiled or greased.
12. Production stock out of place. Hoses, bands, or grates exposed. Aisle lines not observed. Gondolas, baskets, or pallets not properly stacked. Personal items out of place.
13. In need of oil, cleaning, grease, or routine maintenance.
14. Exits not properly marked. Smoking in no smoking sections. Blocked or locked fire exits. Fire extinguishers missing, low on pressure, or improperly mounted.
15. Not provided, not used, inoperable, damaged, or disconnected. Safety locks not used in required areas.
APPENDIX C

REPORT OF NON-INJURY ACCIDENT

OLDSMOBILE-DIVISION
GENERAL MOTORS CORPORATION

1. WHO WAS INVOLVED: Name
   Date Present
   Case No.

2. TIME AND PLACE OF ACCIDENT: Date
   Hour A.M. P.M.
   Dist.
   Brk.
   Floor

3. WITNESSES TO ACCIDENT:
   1. Name
      Class Number
   2. Name
      Class Number

4. REPORT OF ACCIDENT:

5. WHAT HAS BEEN DONE TO PREVENT SIMILAR ACCIDENTS?

Subsriber
Date

General Subscriber
Date

Check by
Safety Department

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### GENERAL MOTORS CORPORATION

**OCCUPATIONAL INJURY - ILLNESS REPORT AND CAUSE ANALYSIS**

<table>
<thead>
<tr>
<th>Division/Plant</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Security No.</td>
<td>Date injured reported to Medical</td>
</tr>
<tr>
<td>Male ☐ Female ☐</td>
<td>Date of accident</td>
</tr>
<tr>
<td>Age</td>
<td>How long had injured been working on day of accident?</td>
</tr>
<tr>
<td>Department</td>
<td>How long regularly employed on this operation</td>
</tr>
<tr>
<td>Exact place of accident</td>
<td>Length of service</td>
</tr>
<tr>
<td>Name &amp; No. of machine or part causing accident</td>
<td>Date disability ended</td>
</tr>
<tr>
<td>Nature and extent of injury</td>
<td>Date returned to work</td>
</tr>
<tr>
<td>Treating Doctor (Dr.)</td>
<td>Total days lost</td>
</tr>
<tr>
<td>Address of Physician</td>
<td>Total days charged</td>
</tr>
<tr>
<td>Name &amp; Address of Hospital</td>
<td></td>
</tr>
</tbody>
</table>

**IMPORTANT:** If injury required amputation, have doctor designate point of amputation on diagram of Form GM-212-A and attach. Include below a description of the events leading to the accident, the employee actions, relevant conditions or circumstances, and conclusions based on investigation.

**DESCRIPTION OF ACCIDENT**

---

**Did Employee Die:** Yes ☐ No ☐

What steps would you recommend be taken to prevent future accidents of this kind?

---

**Date of Report:** 19

**Prepared by:**

**Approved by Safety Department:**

**Title:**

---

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### Appendix E

#### I. Type of Injury or Occupational Disease:

<table>
<thead>
<tr>
<th>#</th>
<th>Disease</th>
<th>#</th>
<th>Disease</th>
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</thead>
<tbody>
<tr>
<td>11</td>
<td>Abdominal</td>
<td>12</td>
<td>Acute disease</td>
</tr>
<tr>
<td>13</td>
<td>Appendicitis</td>
<td>14</td>
<td>Aneurysm</td>
</tr>
<tr>
<td>15</td>
<td>Asthma</td>
<td>16</td>
<td>Basal cell carcinoma</td>
</tr>
<tr>
<td>17</td>
<td>Bladder disease</td>
<td>18</td>
<td>Basomucous</td>
</tr>
<tr>
<td>19</td>
<td>Bronchitis</td>
<td>20</td>
<td>Basomucous</td>
</tr>
<tr>
<td>21</td>
<td>Carcinoma</td>
<td>22</td>
<td>Basomucous</td>
</tr>
<tr>
<td>23</td>
<td>Cancer</td>
<td>24</td>
<td>Basomucous</td>
</tr>
<tr>
<td>25</td>
<td>Cerebral arteriosclerosis</td>
<td>26</td>
<td>Basomucous</td>
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<tr>
<td>27</td>
<td>Cerebral vascular accidents</td>
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<td>Basomucous</td>
</tr>
<tr>
<td>29</td>
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<td>30</td>
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<tr>
<td>31</td>
<td>Cerebral vascular accidents</td>
<td>32</td>
<td>Basomucous</td>
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#### II. Area of Body Involved:

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<thead>
<tr>
<th>#</th>
<th>Part of Body</th>
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<tbody>
<tr>
<td>11</td>
<td>Left</td>
</tr>
<tr>
<td>12</td>
<td>Right</td>
</tr>
</tbody>
</table>

#### III. Type of Accident:

<table>
<thead>
<tr>
<th>#</th>
<th>Type of Accident</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Caught in, on, or between</td>
</tr>
<tr>
<td>12</td>
<td>Electronic</td>
</tr>
<tr>
<td>13</td>
<td>Exposure</td>
</tr>
<tr>
<td>14</td>
<td>Exposure temperatures</td>
</tr>
</tbody>
</table>

#### IV. Agency/Device or Substance Most Closely Related to the Injury:

<table>
<thead>
<tr>
<th>#</th>
<th>Devices or Substances</th>
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<td>12</td>
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<td>15</td>
<td>Devices or Substances</td>
</tr>
<tr>
<td>16</td>
<td>Devices or Substances</td>
</tr>
</tbody>
</table>

#### V. Cause of Accident:

<table>
<thead>
<tr>
<th>#</th>
<th>Cause of Accident</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Injury caused by another person</td>
</tr>
<tr>
<td>12</td>
<td>Injury caused by another person</td>
</tr>
<tr>
<td>13</td>
<td>Injury caused by another person</td>
</tr>
<tr>
<td>14</td>
<td>Injury caused by another person</td>
</tr>
<tr>
<td>15</td>
<td>Injury caused by another person</td>
</tr>
<tr>
<td>16</td>
<td>Injury caused by another person</td>
</tr>
</tbody>
</table>

### Classification of Injury:

<table>
<thead>
<tr>
<th>#</th>
<th>Classification of Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Permanent partial disability</td>
</tr>
<tr>
<td>12</td>
<td>Permanent total disability</td>
</tr>
<tr>
<td>13</td>
<td>Temporary partial disability</td>
</tr>
<tr>
<td>14</td>
<td>Temporary total disability</td>
</tr>
<tr>
<td>15</td>
<td>Death</td>
</tr>
<tr>
<td>16</td>
<td>Hospitalization</td>
</tr>
</tbody>
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---

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# Supervisory Safety Checklist

<table>
<thead>
<tr>
<th>Category</th>
<th>Meets Code</th>
<th>Specific Problem Area</th>
<th>Action Taken/Required</th>
<th>Follow-up Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Lighting</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Ventilation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Materials</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>4. Liquids</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Electrical</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Apparel</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Hydraulics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Category</td>
<td>Meets Code</td>
<td>Specific Problem Area</td>
<td>Action Taken/Required</td>
<td>Follow-up Date</td>
</tr>
<tr>
<td>------------------------</td>
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</tr>
<tr>
<td>9. Housekeeping</td>
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<tr>
<td>10. Hazardous Materials</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Machinery Guards</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Work Area</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. General Machinery</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Fire Safety Equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Personal Safety Devices</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>


IMPROVING CONDUCTOR SAFETY PERFORMANCE BY IMPLEMENTING A DUTIES WORKLIST. (1979) Railway Age, 33-42.

