SYSTEMATIC ANALYSIS OF OCCUPATIONAL ACCIDENTS IN CIVIL CONSTRUCTION INDUSTRY IN BRAZIL (Case-Study in Building Sites Belonging to a Medium-Size Civil Construction / Edifications Industry)

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1. INTRODUCTION

As in many other countries, Brazilian Civil Construction is considered a rather unsafe activity. The estimates pointed out that thirteen people die per day due to occupational accidents, five of them were in the Civil Construction. In view of these facts, there is a growing awareness of the need to adopt more reliable analysis criteria that may identify the specific accident problems and factors in building sites. The Study enables to formulate a more effective accident control and preventive measures in the construction industry.

2. METHOD OF ANALYSIS

A new proposed criterion for measuring safety performance the analysis of accidents without injury-incidents as compared to traditional analyses carried out by the analysis of accidents with lost days is adopted in this Study. Research[1] shows that incidents statistically represent a higher relative frequency, in comparison with other types of accidents.The result based on examination of accident problems in building sites "BEFORE THE FACT", instead of "AFTER THE FACT" in terms of outcome:injury, damages/losses of human, material or financial resources supported this. The analysis were carried out from a case-study of six building sites belonging to a medium-size industry during 1989. The method of analysis was based on records and/or reports of accidents with lost days and incidents.

3. A NEW PROPOSED SYSTEMATIC ANALYSIS

In this Study, there were 82 cases of accidents with lost days and 3714 cases of incidents, revealing a 1:45 ratio (refer Fig.1). The solution to this problem need to consider its cause to prevent the materialization of all accidents in long run.

In the first stage of analysis comparisons are made between the potentiality and representativity of information on accident problems among the accident categories. The identified problems were classified under: individual unsafe mistakes, unsafe acts and conditions.Based on this classification, 96 and 388 different potential problem types were revealed according to the analysis of accidents with lost days and incidents, respectively. The findings showed that there was a tremendous exposure to potentially harmful accidents as a result of countless repetitions of mistakes and unsafe situations detected by the analysis of incidents.

By using the epidemiological analysis on both types of accidents, the result showed that different symptoms of the involvement of each conditioning factor in the materialization of accidents, either potential or real injury can be effectively diagnosed. The conditioning factors used in this analysis were month and day of the week of occurrence, professional category, involved object, type of contact and

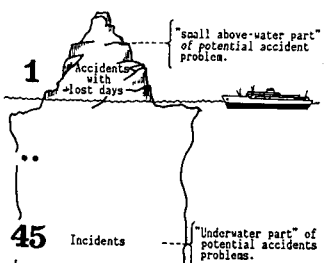
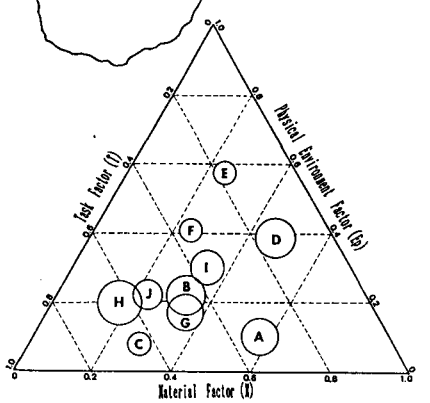


Figure 1. Unsafety Iceberg



TYPES OF CONTACT
A : Friction when handling non-vibrating object
B : Impact of falling object
C : Excessive effort/posture
D : Friction when stepping on object
E : Squeezing
F : Person falling on the same level
G : Friction when handling vibrating object
H : Person falling from different level
I : Impact of person against
J : Others

Figure 2. The Triangular Diagrams of Contributing Factors Frequency.

affected part of the body, and assumed nature of injury.

The next stage involves the understanding of the process of occurrence of accident[2] by identifying the related factors namely Individual (I), Task (T), Material(M), Physical environment (Ep), Social environment (Es). These factors were evidenced by the potential problems surveyed in the analysis of incidents, marked by a " direct thought" analysis mechanism.

Based on these classification of factors,the result were as follows:1)the distribution of frequency rates of contributing factors indicated that T and M were the highest. 2) the triangular diagrams of contributing factors frequency using different professional categories and types of contacts in accidents showed that different degree of influence factors (refer Fig.2). 3) the matrices of transition analysis showed that the interrelation of factors T-T, Ep-Ep, T-M and M-I contributed significantly to the process of occurrence of accidents with injury,either real or potential(refer Table3).

The following stage involved the determination of priority actions by ranking the reported incidents as to their maximum potentiality for results -injury degrees- Maximum potentiality Incident (MPI) and as to their probability of occurrence (PO), adopting four priority categories: I,II,III,IV, (refer Fig.4).

Table 3.Matrix of Transition Analysis.(For all sample)

		SUBSEQUENT FACTOR				
		I	T	M	E_p	E_s
PREVIOUS FACTOR	I	0.08	0.43	0.33	0.14	0.02
	T	0.31	0.09	0.38	0.21	0.01
	M	0.37	0.19	0.15	0.28	0.01
	E_p	0.17	0.27	0.13	0.42	0.01
	E_s	0.14	0.37	0.16	0.31	0.02

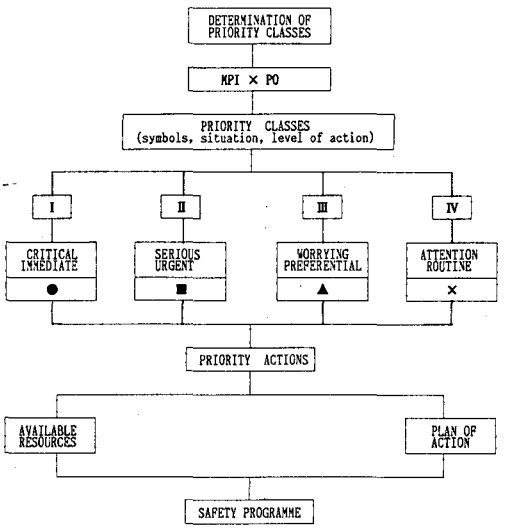


Figure 4. Determination of Priority Actions for the Prevention and Control of Potential Accident Problems.

In the final stage, guidelines were presented for a pilot-programme as summarized in Figure 5. In the development of the programme, analytical and technical-administrative procedures in the treatment of potential accident problems are used. It starts from a multidiscipline framework, designating for each level, function and area responsibilities and attributions aiming the good performance of the programme.

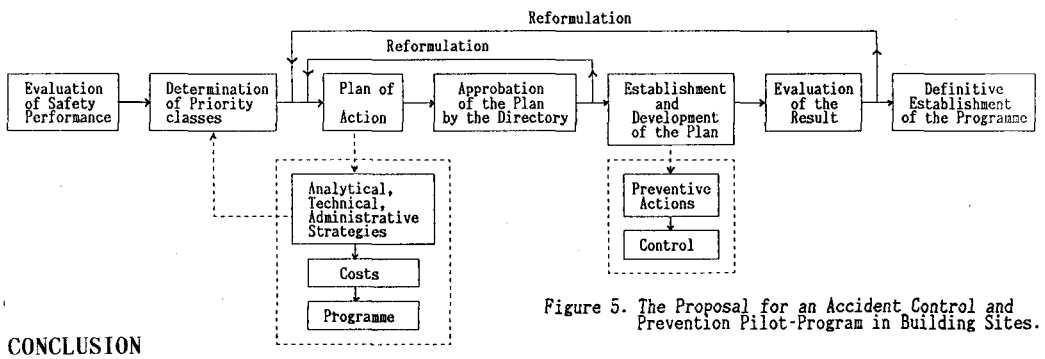


Figure 5. The Proposal for an Accident Control and Prevention Pilot-Program in Building Sites.

4. CONCLUSION

The system of analysis developed from data on incidents allows the broadening the scope of the preventive actions. Through the collection of more representative information on the real conditions of the system and evaluating all factors involved, it will allow a more effective ranking of preventive and control actions.

REFERENCES

(1) Tarrants,William E.: The Measurement of Safety Performance 1980, pp.301-323.
(2) Suzuki, Yoshimi.: "Analysis on Processes of Labour Accidents - Case Study of the Joetsu-Shinkansen Construction Work", RIIS-RR-85(1985).