Tradesmen Involvement in Health and Safety

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Abstract: Craftsmen performing construction work are in the best position to determine how a job should be performed safely. They should be involved in planning the safe execution of the work. Involvement will be a function of opportunity, capability, and motivation. A survey of contractor management personnel and craftsmen was conducted to assess their perceptions of these variables. A simulated planning exercise was conducted to assess craftsmen's capabilities, in terms of knowledge, of construction tasks and risks. Craftsmen were found to be capable, but inexperienced in reducing their knowledge to writing. Questioning uncovered the depth of their knowledge. Craftsmen perceive themselves as capable and motivated and seek the opportunity to be involved in planning for health and safety.

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Introduction

Managing health and safety on construction sites has historically been a top-down, externally imposed process. A firm's safety director develops the health and safety program and, with consultation with contractor officials and the project's management staff, implements it. This staff-developed, one-program-fits-all, approach has had mixed results.

Significant improvement in health and safety performance in construction requires a different approach. The Japanese have developed the phrase "Gemba Kaizen" where Gemba means, the real place where the action takes place, and kaizen means to continuously improve in all facets of life (Masaaki 1997). Thus, the way to improve performance, of any kind, is to involve the people who perform the work. This is not a new idea. Writers in the management field have, for years, alleged that improved performance is obtained when the tradesmen performing the work are involved in improving it (Shearn 2004; Bell and Phelps 2001; Alder et al. 2000; Ochsner and Grunberg 1998). The focus of this paper is tradesmen involvement as opposed to contractor officials, who are probably involved in health and safety planning, and execution as part of their normal job. Management facilitate tradesmen involvement by creating opportunities for it. Tradesmen are currently the only group without an opportunity to participate in the health and safety planning process, and they are the ones, most likely, to be impacted by safety failures.

Involvement Paradigm

Involvement is a behavior about which people make a conscious choice. A person can decide to be involved or choose not to be involved. In understanding that decision, the critical issues are: (1) the factors that influence a person's decision as to whether or not to become involved; and (2) how these factors influence that decision. These issues can be examined in the context of the following relationship:

$$\text{Involvement} = f\ (\text{Opportunity, Capability, Motivation}) \quad (1)$$

Involvement is a behavior characterized by taking part in a process that includes activities, such as evaluating a situation, analyzing alternatives, selecting a preferred alternative, providing feedback, etc. In terms of the Tannenbaum and Schmidt continuum (adapted), there is no involvement by tradesmen, in the decision making process, at the extreme left end of the continuum (Tannenbaum and Schmidt 1973). The manager exercises his/her authority, makes the decision, and conveys the decision to employees who are charged with implementing it. As one moves from the left end toward the right end, the degree of employee involvement increases and the expectation for the employees is to move from a reactive to a proactive perspective. Instead of being asked to react to a proposed managerial decision, tradesmen are asked to formulate their own proposal. Except at the extreme left end of the continuum, tradesmen are presented with two questions:

- Do I get involved?
- If I do, to what degree do I get involved? See Fig. 1.

In answering these questions, a person must address the factors of opportunity, capability, and motivation. The relationship between these factors is presented in Fig. 2. To decide whether to get involved in something, an employee will ask the questions presented in the figure.

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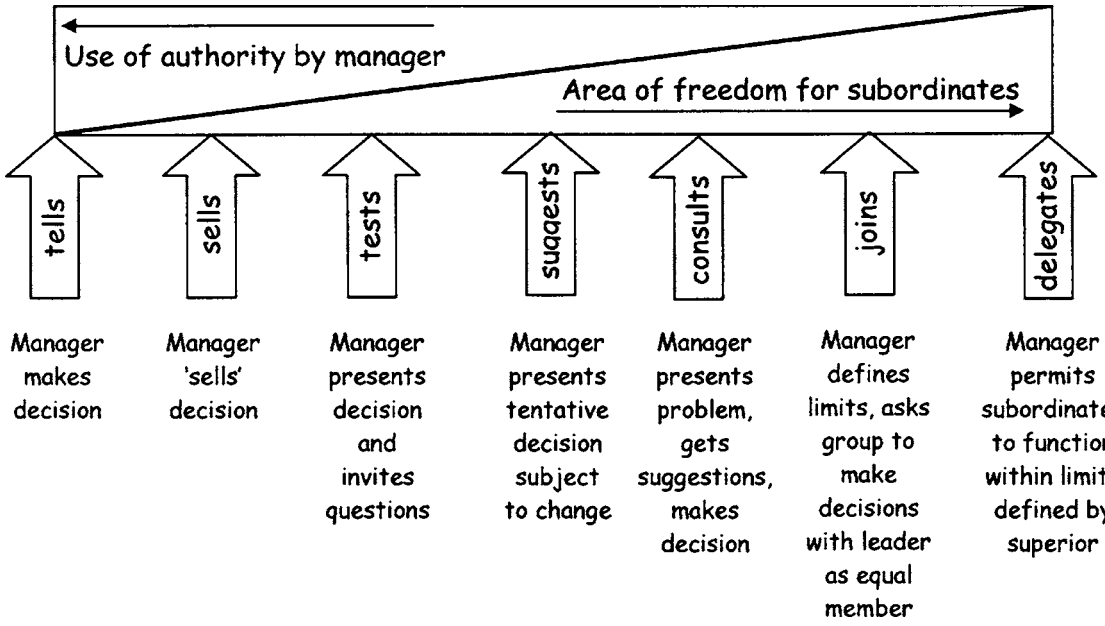

Fig. 1. Tradesmen involvement continuum. (Reprinted by permission of *Harvard Business Review*. Exhibit 1 from "How to Choose a Leadership Pattern" by Robert Tannenbaum and Warren H. Schmidt, May/June, 1973. Copyright 1973 by the Harvard Business School Publishing Corporation. All rights reserved).

Opportunity

To be involved, tradesmen must be given the opportunity. Only management can create that opportunity. Management's creation of opportunity is a function of management's beliefs in: (1) the role of management and who should make decisions; (2) the capability of tradesmen to make a serious contribution to the matter at hand; and (3) the desire of tradesmen to be involved. For management to create involvement opportunities, they must believe that they should not unilaterally make decisions; That tradesmen, who potentially would be involved, have the qualifications in terms of education, training, and experience to be effective and make a serious contribution to the decision making process and, the desire to be involved. Only then will involvement opportunities be created. Thus, it is management's beliefs and perceptions that create involvement opportunities.

Although management's creation of opportunities is necessary for tradesmen involvement, it is not sufficient, in and of itself, to initiate involvement. It is crucial that the tradesmen perceive that there is the opportunity for involvement. Tradesmen are too intelligent to be fooled for very long and are very good at detecting hypocrisy. A manager who solicits involvement, and then completely disregards any information provided, is not serious about involvement but simply creates the illusion of involvement. This is analogous to the suggestion box with no bottom so that any suggestions submitted drop directly into the trash basket below. A person's perceptions of a situation determine that person's behavior in that situation. Unless tradesmen perceive that management is serious about obtaining tradesmen involvement, the tradesmen will not elect to get involved.

Capability

Just as with opportunity, capability must be addressed, in terms of the perceptions of the manager, considering the creation of involvement opportunities and the perceptions of the tradesmen

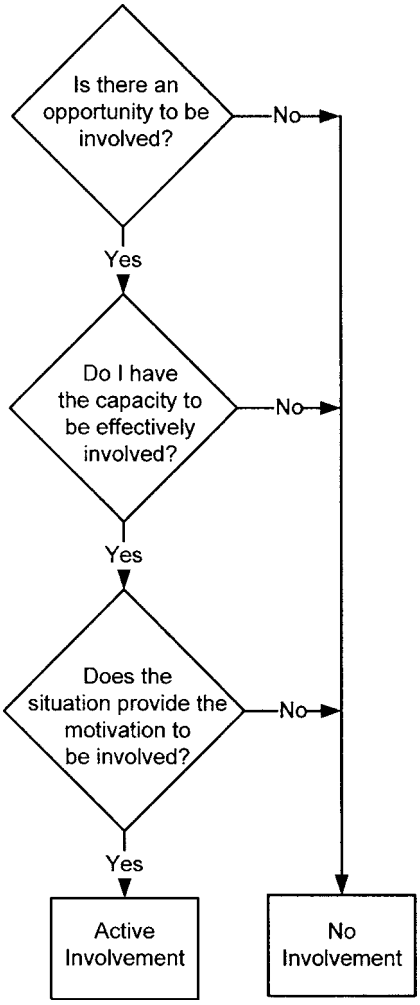

Fig. 2. Involvement decision process

considering whether to become involved. Capability refers to a person's possession of the knowledge, skills, and abilities pertinent to a specific task. For example, a manager evaluating the purchase of a new welding machine that would be used by welders to fabricate pipe supports, would like to obtain an evaluation by tradesmen who would use the machine. He goes into the shop and the only tradesmen present are the ones who would install the pipe supports, not fabricate them. None of these tradesmen are welders. The manager would, most likely, perceive that the available tradesmen do not have the necessary capabilities to provide a serious evaluation of the proposed machine. Therefore, he would not create the involvement opportunity. His perception of the tradesmen's capabilities, relative to the issue, causes him to forego the creation of an involvement opportunity.

Similarly, the tradesmen's perceptions of their own capabilities, relative to the issue, will influence their decision to get involved. If people do not believe that they have the capabilities that are pertinent to an issue, they will not want to get involved with that issue. A potential safety problem encountered by electricians is connecting new electrical circuits into an existing electrical grid. A group of carpenters, when approached by a contractor and asked their opinion as to how to minimize this problem, will, most likely, decline because they do not have the necessary capabilities. Conversely, the response, when asking a group of electricians, will be very different. Thus, the tradesmen's perceptions of their capabilities, relative to the issue, influence their decision whether to get involved.

Capability is developed through observation, formal and informal training, education, and experience. It can be assessed by reviewing certificates obtained through the completion of training courses or programs—programs, such as the journeyman certification, or upgrades in the United States or Construction Skills Certification Scheme in the United Kingdom, and formal assessment. Managerial perceptions of capability are based upon external assessments, such as these and observation and interaction. Tradesmen perceptions are based upon their assessment of the issue and their knowledge, skills, and abilities.

Motivation

Motivation must be considered in relation to a behavior because it addresses the desire or willingness to engage in that behavior. The question "Motivated to do what?" must always be considered. Because motivation is intangible, we must look for evidence of motivation and the best evidence of motivation is effort. The expenditure of mental and physical effort is the evidence of motivation. The greater the effort expended, the greater the motivation. Motivation is a function of the tradesmen' belief in what he will accomplish by expending the effort, and the result of the effort. A runner may be motivated to run because he/she perceives that he/she burns calories and gets in shape while running, and wins medals as a result of running.

As with opportunity and capability, perception is critical. A manager will only create an involvement opportunity if he perceives that tradesmen will be motivated to be involved. Similarly, tradesmen will not want to be involved unless they perceive that there is something in it for them. If they perceive that they will get something during or as a result of their involvement, they will be motivated to be involved. This is a crucial issue.

What can a tradesman believe he will get as a consequence of his involvement? There are many things; Beginning simply with the interaction with the others involved and the knowledge that can be gained. They can also gain respect from their peers and managers, which could lead to enhanced employment opportunities. These are all positive consequences. Are there potentially negative consequences to involvement?

The compensation scheme through which tradesmen are paid creates potentially negative consequences. Payment based upon the number of units completed is a system designed to maximize earnings by motivating tradesmen to increase their productivity. Payment of a fixed sum, for completion of a specified scope of work, also serves to motivate tradesmen to increase productivity in order to shorten duration. The sooner the specified scope of work can be completed, the sooner the tradesmen can move onto another work package and, thereby, earn more money. Involvement requires that the tradesman divert his time from producing to being involved. This results in a loss of income and creates a disincentive to involvement. For tradesmen to be motivated to be involved, they must perceive that the benefits to being involved are greater than the costs of involvement.

A factor that will influence motivation is the subordinates' role perception. Some tradesmen believe that there is a management role and a tradesman role: It is the manager's role to make decisions, and the tradesmen's role to comply and execute the commands. Individuals with this role perception will not be interested in being involved. The decision to become involved comes down to perceptions:

- If a manager perceives that his subordinates have a role to play in the consideration of an issue, that they have the capability to make a contribution, and have the desire to be involved, he will create an opportunity for them to be involved.
- If the tradesman perceives that there is an opportunity to be involved in the consideration of an issue, that he has the capability to evaluate and make a contribution on the issue, and that he gains something from his involvement, he will elect to be involved.

Study Objectives

The objectives of the study were to assess the perceived capability, opportunity, and motivation of tradesmen to become involved in the management of health and safety. The study was conducted on three projects in Great Britain; one in Edinburgh, Scotland, and the others in London, England.

Construction health and safety in the United Kingdom is regulated by the Construction (Design and Management) Regulations of 1994 HSE (2001). An element of the regulations is hazard analysis and risk assessment for each process to be utilized on a project. This is done by the preparation of a Task Method Statement (TSM), which contains

1. Scope of work: Provide a clearly defined description of the work to be undertaken.
   - List each activity to be performed in the order in which it is to be performed;
   - Identify the location at which the activity is to be performed;
   - Identify the plant and equipment required for each activity; and
   - Identify the tools required for each activity.
2. Hazard Identification: Clearly identify the hazards that will result from the performance of the work. For each activity, identify the hazard(s) that arise from the performance of the work.

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Table 1. Work Processes and Risks

Risk		Work process: Bricklaying for three-story building	Work process: Scabbling	Work process: Groundwork–excavation and installation of storm water line
Health	Cement dermatitis	X	X	
	Hand arm vibration syndrome	X	X	X
	Noise exposure	X	X	X
	Musculo-skeletal injury	X	X	X
Safety	Fall from heights	X	X	
	Struck by moving vehicle	X		X
	Struck by moving, including flying/falling, object	X	X	X
	Trapped by something collapsing, overturning	X	X	X
	Slips, trips, or falls from same level	X	X	X
	Injured while handling, lifting, or carrying	X	X	X
	Contact with moving machinery	X		X
	Strike against something fixed or stationary	X		X

3. Health and Safety Risks and Controls: For each of the hazards identified, clearly identify:
   - The key risks to health and safety associated with each hazard;
   - For each risk, the probability of an accident occurring and, if an accident did occur, the severity of the accident (use a scale of 1–5 with 1 being the lowest); and
   - The key safety control measures and precautions to be implemented to control the health and safety risks.
4. Access/Egress
   - Clearly identify the safe means of access and egress to the workplace; and
   - Will general access/egress routes be blocked as a result of the work? If so, what special measures will be taken?
5. Hazardous Materials and Substances: Clearly identify
   - any materials/substances to be used, which are "hazardous" to health;
   - the key risk(s) to health associated with each material/substance; and
   - the key control measures and precautions to be implemented to control the risks to health.
6. Special Control Measures: Identify any work activities that will require special control measures (i.e., permit to work systems, specialist training, specialist equipment, etc.) to be implemented to ensure the adequate protection of employees and/or others against risk of injury.

The Task Method Statements are typically prepared by the contractor's staff or safety director, and become part of the construction phase health and safety plan required, prior to the start of construction.

Evaluation of Tradesmen Capability

To assess the relative capability or competence of tradesmen relative to management, three work processes were identified. The processes were selected to match priorities of the U.K. Health and Safety Executive and are shown in Table 1 with their attendant risks.

Assessment

The research approach was to utilize an actual work process, and ask teams of tradesmen and teams of contractor officials, to prepare task method statements for a work process. The objective was to determine the extent to which tradesmen and contractor officials (none were safety officials) could actually prepare a complete and accurate task method statement. As discussed later, a survey was conducted of three groups to determine their perceptions of their capabilities, as well as their desire to be involved, in the preparation of task method statements. For each work process, a scenario was developed that required the participants, in a planning exercise, to prepare a task method statement. The three scenarios were:

1. A building is to be built that is 8 m high (2 stories), total perimeter length of 300 m. The walls are to be constructed of concrete block with a brick facade. Lintels for the doors and windows are to be stone.
2. A foundation wall is to be constructed. Each section is to be 10 m wide, 5 m high and 350 mm thick. The wall section sits on a 150 mm high kicker. One section of the wall has been placed. The existing wall section and kicker are to be prepared for the placement of the next wall section by scabbling (roughing the surface using a pneumatic hand tool) the exposed concrete surfaces that will be in contact with the next section.
3. 500 m of 600 mm concrete pipe are to be installed for storm water drainage, in a mild clay soil, with running bands of sand. The pipe is to be installed at a depth of 3.5 m with allowances for the slope required for drainage. A manhole is to be installed after 300 m and, a second manhole is to be installed after the next 200 m. 150 mm of pea gravel is to be placed as bedding in the trench, and another 150 mm of pea gravel is to be placed on top of the pipe. The soil excavated from the trench is to be used to backfill the trench and should be placed in 300 mm lifts and compacted with a vibrating plate. Excess soil is to be removed from the site.

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Exercise Format

The planning exercises were conducted using the following format:

- The principal (general) contractor identified the relevant trade contractor for the specified work process;
- The trade contractor was asked to provide two teams, each consisting of 2–3 personnel. One team was to be comprised of tradesmen and one of management personnel;
- Each team was briefed on the purpose of the exercise and the requirements;
- Each team was given two hours to complete the exercise, and
- There were three exercises, and two teams per exercise on each project.

For comparison purposes, a best practice document was created by the principal investigator and refined, during a series of reviews by contractor health and safety personnel. For each trade contractor, the planning exercise documents completed by its management personnel and tradesmen were compared against each other, as well as against the best practice statement.

Evaluation of Tradesmen Capability

An analysis of the comparisons leads to the following conclusions:

- The completion of a complete Task Method Statement is beyond the present capability of tradesmen to participate in health and safety planning. They are not accustomed to thinking, in terms, of detailed processes and putting their ideas down on paper. A comparison of the tradesmen statements versus those of the contractor personnel and the best practice statement reveals that many of the tradesmen's statements are very sketchy, potentially indicating a lack of knowledge of the subject. However, questioning of the tradesmen, during and after the exercise, found that many of them had the knowledge, but either did not think of it during the exercise, or did not know how to include it in the written requirements. Use of sequential questioning on the work process revealed that the tradesmen had the knowledge, but were not used to thinking, in terms, of the structure they were asked to use.
- The management personnel were more able to articulate their knowledge of the subject matter than the tradesmen. Their responses were more comprehensive and more in-depth. They were simply more familiar with the subject matter and thinking, in terms, of work processes and method statements.
- Tradesmen are very knowledgeable about how the work is to be done, but need more training in health and safety and method statements. The question becomes how to access the tradesmen' knowledge without overwhelming them with formalized procedures and paperwork.

Survey on Tradesmen Involvement

An objective of the study was to assess contractor and tradesmen attitudes on tradesmen involvement and consultation, in terms, of opportunity, capability, and motivation. This was done using a short questionnaire developed for this purpose that was administered to all contractor and trades personnel on the three projects by the principal contractor.

Demographic questions included:

- Age;
- Experience in the construction industry;
- Tradesman or management official;
- If a management official, did the respondent formerly work as a tradesman?
- Type of tradesman;
- If contractor official, did you complete university training?
- If so, what type of training?

Ten statements were presented to which the respondents were asked the extent of their agreement/disagreement on a 1 to 5 Likert scale with the following possible responses:

1–Strongly disagree
2–Disagree
3–Neither agree nor disagree
4–Agree
5–Strongly agree

Survey Responses

The survey was given to all construction management and trade contractor personnel on the three sites. The total number of potential respondents was approximately 1,100, of which 449 (or 40.8%) actually responded. The demographics of the respondents were as follows:

Position			
Tradesmen	258		
Contractor Official	177		
Missing	14		
Age—years	Mean	SD	
Tradesmen	35.8	11.1	
Contractor Official	38.3	10.4	$p < 0.05$
Experience—years	Mean	SD	
Tradesmen	15.6	11.3	
Contractor Official	18.4	11.1	$p < 0.01$

The differences in mean age and experience are significant at the levels indicated.

Of the 177 contractor officials responding, 95 (or 53.7%) reported working previously as tradesmen, and 67 (or 37.9%) reported completing university training. Of the respondents, 21 studied construction management and 35 studied engineering. Of the 258 tradesmen responding, 114 (or 44.2%) were general tradesmen (laborers in the United States), 16 (or 6.2%) were apprentice trade tradesmen, 106 (or 41.1%) were trade tradesmen, 19 (or 7.4%) were equipment operators.

The items and the means and standard deviations for the total set of respondents and the sets of tradesmen and contractor officials are presented in Table 2.

From the mean responses presented in the table, it is evident that both tradesmen and management officials believe tradesmen should be involved in the planning and development of method statements, with the contractor officials having a somewhat stronger belief in that involvement. For four of the eight common items, the difference between the means of the tradesmen and that of the management officials is statistically significant, although at different levels of significance.

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Table 2. Survey Responses

Item	All respondents		Tradesmen		Management officials	
	Mean	SD	Mean	SD	Mean	SD
1. Tradesmen should be involved in planning how work should be done and the development of method statements before project starts.	**3.61**	**1.12**	**3.64**	**1.17**	**3.59**	**1.05**
2. Tradesmen should be involved in reviewing the method statement prior to work identified in the method statement beginning.	**3.85**	**1.02**	**3.74**	**1.09**	**3.99**[b]	**0.90**
3. Tradesmen should be involved in modifying the method statement, if necessary, before the actual work begins.	**3.79**	**1.04**	**3.75**	**1.09**	**3.84**	**0.98**
4. Once the work begins, tradesmen should be involved in evaluating whether the method statement is producing desired outcomes.	**3.73**	**1.01**	**3.68**	**1.06**	**3.82**	**0.92**
5. If the method statement is not producing the desired outcomes, tradesmen should be involved in modifying the method statement so that desired outcomes are obtained.	**3.78**	**1.01**	**3.77**	**1.02**	**3.82**	**1.03**
6. After the work is completed, tradesmen should be involved in evaluating the method statement, and its outcomes and determining if modifications should be made in the method statement for future work.	**3.65**	**1.01**	**3.57**	**1.07**	**3.78**[a]	**0.90**
7. The average tradesman is qualified to be involved in work planning and the development of method statements.	**3.26**	**1.08**	**3.42**	**1.08**	**2.98**[c]	**1.01**
8. The average tradesman would like to be involved in work planning and the development of method statements.	**3.15**	**1.11**	**3.38**	**1.14**	**2.79**[c]	**0.95**

[a]Difference is significant at the 0.05 level.

[b]Difference is significant at the 0.01 level.

[c]Difference is significant at the 0.001 level.

- Item 2: *Tradesmen should be involved in reviewing the method statement prior to the work identified in the method statement beginning.*

Tradesmen mean	3.74	
Contractor official mean	3.99	$p < 0.005$

Given that a method statement has been prepared for the work to be performed, contractor officials believe, more strongly than the tradesmen, that tradesmen should be involved in reviewing the method statement prior to the start of work. Thus, the contractor officials believe that tradesmen need to familiarize themselves with the work to be performed, how it is to be performed, the hazards and risks associated with the work, and how those risks are to be controlled. This is a more proactive role than that perceived by the tradesmen.

- Item 6: *After the work is completed, tradesmen should be involved in evaluating the method statement, and its outcomes, and determining if modifications should be made in the method statement for future work.*

Tradesmen mean	3.57	
Contractor official mean	3.78	$p < 0.05$

This activity represents the feedback or continuous improvement effort to close the loop. It allows the contractor to address the question of what was learned in doing this work. The best people to participate in this activity are those who performed the work. The management officials believe more strongly than the tradesmen that this is an appropriate role for tradesmen.

- Item 7: *The average tradesman is qualified to be involved in work planning and the development of method statements.*

Tradesmen mean	3.42	
Management official mean	2.99	$p < 0.001$

- Item 8: *The average tradesman would like to be involved in work planning and the development of method statements.*

Tradesmen mean	3.38	
Contractor official mean	2.79	$p < 0.001$

The responses to Items 7 and 8 raise significant concern. In their responses to the first six items, the contractor official respondents indicate a strong belief that tradesmen should be involved in all aspects of work planning and work statement planning, development, implementation, and revision. However, they do not perceive that the average tradesman is either qualified to be involved in these activities or motivated to do so. Tradesmen have a much more positive perception of their fellow tradesmen than do the contractor officials.

When the responses for the contractor officials are dichotomized into those of contractor officials who were formerly tradesmen and those who were not, the mean responses for Item 7 were 3.09 and 2.88, while those for Item 8 were 2.99 and 2.56, respectively. The difference in the mean responses for Item 7 was not statistically significant; while that for Item 8 was statistically significant at the 0.005 level. Statistically speaking, there is no difference in the perceptions of contractor officials who used to work as tradesmen and those who did not, as to the qualifications of the average tradesmen to be involved in work planning and method statement development. They have reservations about these qualifications. The difference in the mean responses for the contractor officials who are former tradesmen and those who were not is significant. The former tradesmen perceive the average tradesmen as being more motivated to be involved.

In the presentation of the involvement paradigm above, the influence of a manager's perceptions of qualifications and motivation to be involved on the creation of involvement opportunities was discussed. Negative perceptions of these factors will cause a manager to limit involvement opportunities.

The responses to Items 7 and 8 were also analyzed by age and experience of the contractor officials. There was no difference in the responses. The tradesmen respondents perceive themselves the same as the average tradesmen, in that, the mean scores for the

tradesmen' responses to Items 7 and 9 are similar to those of Items 8 and 10.

Lastly, tradesmen were asked for their perceptions of their capability and motivation by Items 9 and 10. Item 9 stated "I am qualified to be involved in work planning and the development of method statements" and Item 10 was "I would like to be involved in work planning and the development of method statements." The means and standard deviations were 3.36 and 1.20 and 3.54 and 1.13, respectively. Tradesmen, in this sample, believe that they are motivated and qualified to prepare task method statements.

Conclusions

The construction industry operates with a command and control or top-down philosophy whereby the contractor develops the work plan and tradesmen implement or execute it. There is little, if any, involvement of tradesmen in the development of the work plan. There is some point between total control of work process planning and execution by management, and total control of that process by tradesmen at which the benefits of tradesmen involvement are maximized. Thus, tradesmen involvement represents the basis for a new approach to improving health and safety in construction.

The findings of this study provide the foundation for that new approach:

1. A three-phase model for the development, implementation, and improvement of a task method statement identifies three opportunities for tradesmen to become involved.
2. Interviews with tradesmen and contractor personnel reveal that tradesmen are rarely involved in this process and, that if they are, it is in the implementation phase as the work is about to begin. There is little or no tradesmen involvement in the development or improvement phases of the process.
3. Tradesmen believe that they are more capable of being involved in this process than do contractor personnel.
4. The results of the planning exercise reveal that tradesmen are
   - unfamiliar with and unaccustomed to preparing formal plans;
   - able to articulate their knowledge about the work and how it should be done when questioned;
   - knowledgeable about best practices for performing construction work; and
   - less familiar with health issues than they are with safety issues.
5. Tradesmen see themselves as being more motivated to be involved in the work planning process than do contractor personnel.

Framework

The Task Method Statement provides an excellent framework within which to develop a work plan. The ideal Task Method Statement (TMS) will

- Identify the activities to be performed;
- Identify any hazards that will be encountered in the performance of those activities;
- Identify the risks associated with each hazard;
- Present an assessment of each risk;
- Identify the methods to be used for control for each risk;
- Identify any hazardous materials and/or substances that will be encountered; and
- Identify any special control measures that will be employed.

For these issues to be addressed, a detailed examination of the task to be performed, and the work setting within which it is to be performed, must be conducted. Tradesmen involvement in this examination can be obtained through increased opportunity for involvement, enhanced capabilities, and improved motivation.

Increased Opportunity

The process model for the development, implementation, and improvement of task method statements consists of the following steps:

1. Development of a project specific task method statement in which a generic task method statement is adapted to fit the unique characteristics of an upcoming project. The TMS must be developed within the context of the specific project and work setting within which the work is to be performed. Each construction project has a unique set of hazards that should be identified in the pre-tender health and safety plan required under the CDM Regulations of 1994 (HSE 2001). For example, installing electrical conduit, pulling in wire, and making connections are construction tasks. Performing the task in the construction of a new facility presents one set of hazards, while performing the same task in the midst of an operating oil refinery presents a very different set of hazards. The TMS must be tailored to the specific nature of the project.

   This is performed prior to the start of work by the trade contractor responsible for the performance of the work. It may require a series of iterations as the trade contractor addresses concerns raised by the principal contractor. Once completed, the project specific task method statement is included in the construction phase health and safety plan as required by the CDM Regulations of 1994 HSE (2001).

   At this stage, the opportunity for involvement by the tradesmen who will perform the task is limited, because those tradesmen will be employed on other projects or will not have been employed yet by the trade contractor.
2. Review and modification of the project specific task method statement as work on the task is about to begin.

   Preparation of a project specific task method statement requires the use of a set of assumptions, about the work setting, within which the task is to be performed. A review of task method statements included in construction phase health and safety plans conducted by the author revealed that they tend to be generic, i.e., applicable to any project and work setting. Thus, the assumptions that were made in the development of the statements were minimal.

   On a project, the work setting within which a task is performed, may vary significantly. Factors such as work sequencing—which influences the physical environment in which the task will be performed, and scheduling—which influences:
   - The trade tradesmen and equipment that will be present in the work area; and
   - When the task is to be performed, which in turn influences the time of day the task is to be performed, and the weather that will be experienced when the task is to be performed.

   Preparation of the project specific task method statement requires that assumptions be made about these factors. However, it is unlikely that these assumptions will be valid when it is time to perform the task. There may be a very different

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set of hazards present when the work is actually performed, when compared to the hazards envisioned, when the project specific task method statement was developed.

Thus, it is critical that the tradesmen assigned to perform the task review the project specific task method statement including the assumptions upon which it is predicated prior to beginning the task. This review must include an examination of the expected and actual work settings to identify any differences in the hazards and risks expected to be present, and determine if changes need to be made in the risk control methods planned for the task. This review and evaluation must be continuous during the performance of the task.

In addition, once a plan has been developed for the work to be performed in a healthy and safe manner; Tradesmen must be involved in ensuring that the plan is actually followed.

To improve construction health and safety performance, tradesmen involvement is imperative at this stage. Individuals actually performing the work are in the best position to evaluate the work setting, and the work to be performed, to identify the hazards and risks present. They are also best suited to evaluate the effectiveness of risk control measures planned and/or available for use in the work.

Trade contractors must develop formal schemes to secure tradesmen involvement at this stage of the process. Tradesmen must take ownership of the work plan and responsibility for its safe execution.

3. Review performance of the task, in terms, of the adequacy and effectiveness of the task method statement and determine whether the generic task method statement should be modified.

   If construction is to become a healthier, safer industry, it is crucial that an attitude of continuous improvement be developed within the industry. There is an old cliché that the job is not done until the paperwork is completed. Continuous improvement requires the belief that the job is not done until performance has been evaluated to determine if there are things that should be done differently in the future to improve performance.

   An evaluation of the work performed by the tradesmen who performed it is critical to continuous improvement. Trade contractors must develop schemes by which tradesmen review and evaluate completed work to identify opportunities for improvement, not only in terms of health and safety, but also for productivity and cost.

Enhanced Capability

Construction is an industry whose work force is significantly under trained because of the reluctance of contractors to underwrite the costs of training and/or provide the time for training. More tradesmen must be trained not only in how to perform the work task, but also in how to perform it in a safe and healthy manner. It is crucial that this training not be perceived as a one-off function. Equipment, materials and tools are constantly changing. Consequently, the knowledge and skills of tradesmen must be continually upgraded to reflect these changes. Tradesmen must have the capability to address effectively each of these issues. This can only come through a combination of education, training, and work experience. It is incumbent upon contractors to provide the education and training.

In addition, tradesmen must be trained to evaluate work environments and settings to recognize hazards and risks. The planning exercises conducted in this study revealed that tradesmen are knowledgeable about hazards and risks, but are not experienced in addressing them within a formal framework. Therefore, it is evident that tradesmen need to be trained in a formalized approach to hazard and risk identification, risk assessment, and the identification of risk control measures.

Improved Motivation

Motivation must be addressed from several perspectives. First, contractors must increase the proportion of their work force that is directly hired. The use of agency or labor-only subcontractors, as well as self-employed tradesmen, reduces the motivation of tradesmen to be involved, because of the contractor's reduced ability to provide rewards associated with that involvement. Second, the use of productivity incentives or lump-sum payment for fixed scope of work packages also reduces the motivation of tradesmen to be involved. Motivation is a function of the rewards associated with a specific behavior. Rewarding one behavior, e.g., productivity, while hoping that a person engages in another, unrewarded, behavior, e.g., working in a safe manner, makes little sense (Kerr 1975).

Tradesmen that are directly hired are typically paid on an hourly basis. Thus, they are paid for the time spent at work. What they do during that time is up to the trade contractor. Thus, it is imperative that contractors establish involvement in health and safety as a behavior that is expected by all tradesmen employed. It must become part of the culture of the contractor's organization, i.e., "the way we do things around here."

Under the CDM regulations, designers are required to assess and address construction safety in their design. In a study of designers in Scotland, it was found that designers lack knowledge of their requirements under CDM, as well as work process safety requirements (Maloney 2004). If tradesmen are capable of preparing TMSs, they could provide valuable input to designers. The designer would be forced to hire workers on an ad hoc basis because no construction contracts have been left.

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