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Employees' Willingness to Use Mindful Safety Practices at Norwegian Petroleum Installations. Replication Study.

Work Report. HSE Petroleum:
Change – Organization – Technology.

Institute for Energy Technology

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Abstract

This report documents the outcome of a replication study. During 2004 a study, which in the following will be referred to as the *original study*, was performed to explore what type of contextual factors that might affect employees' willingness to use *mindful safety practices* at Norwegian petroleum installations (Skjerve, 2005). The term *mindful safety practice* was defined as a discrete general safety-promoting work practice that might prevent the initiation of unwanted but not explicitly predefined event sequences and/or interrupt such sequences. The replication study was performed to assess the extent to which the results obtained in the original study could be replicated, and thus to contribute to validate the suggestions made in terms of safety management practices. Both the original and the replication studies were based on data obtained in questionnaire surveys performed by the Petroleum Safety Authority Norway as part of two large-scale studies to assess the risk-level at the Norwegian Shelf. The replication study reproduced the major part of the results obtained in the original study. Taken together the studies suggest that management initiatives to increase employees' willingness to use mindful safety practices will be most efficient if directed at the local work environment of the employees, rather than at the employees' individually or at the employees that work on the installation in general. They further suggest that the use of mindful safety practices should be monitored with particular care when employees are transferred to a new local work environment, and when modifications are introduced in their present local work environment.

Keywords: human factors, petroleum installations, safety practices, work-place safety

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Executive Summary

In 2004 a study was performed within the framework of the *HSE Petroleum project* to *explore* what type of contextual factors that might affect employees' willingness to use *mindful safety practices* at Norwegian petroleum installations (Skjerve, 2005). The term *mindful safety practices* was defined as discrete, but general safety-promoting work practices that might prevent the initiation of unwanted but not explicitly predefined event sequences and/or interrupt such sequences. The results obtained should contribute to the knowledge base for development of safety management practices at the installations, i.e. to determine what type of organizational initiatives that facilitate employees' willingness to use mindful safety practices. The present study was performed to assess the extent to which the results obtained in the former study could be replicated, and thus to contribute to validate the suggestions made in terms of safety management practices. In the following, the former study will be referred to as the *original study*, and the present study will be referred to as the *replication study*.

The original study and the replication study were both based on data obtained in questionnaire surveys performed by the Norwegian Petroleum Directorate / Petroleum Safety Authority Norway[1] as part of two large-scale studies to assess the risk-level at the Norwegian Shelf. The original study was based on data obtained in December 10-21, 2001, and the replication study on data obtained in December 1, 2003 - January 18, 2004. Except for one questionnaire item, all items that were used in the original study from the 2001 survey were also contained in the 2003/2004-survey.

In the original study, a set of indexes and single items representing contextual factors that might impact employees' willingness to use mindful safety practices was composed. The factors were structured into three analytical levels: The *individual level*, i.e. person-related factors comprising: Age, time in job position offshore, overall health state, and perceived personal capability to deal with safety-related issues; the *group level*, i.e. factors related to the local work environment comprising: Task performance environment, managers' attitude to Health Safety and Environment (HSE), psychological work environment, and colleagues use of mindful safety practices; and the *organizational level*, i.e. factors associated with the overall work environment at the installation comprising: Overall work environment, perceived risk level, physical work environment, and spare-time and rest facilities. Except for one index, which turned out not to be reliable in the replication study, all indexes and single items that had been applied in the original study were also applied in the replication study.

The outcomes of the *original* study lead to three suggestions concerning the influence of contextual factors on employees' *willingness* to use mindful safety practices:

[1] The original study was based on data obtained by the *Norwegian Petroleum Directorate* in the 2001-survey. In January 2003, the Norwegian Petroleum Directorate was split into two separate organizations. The part of the former Norwegian Petroleum Directorate that had been responsible for the questionnaire survey in 2001 was now moved to the organization *Petroleum Safety Authority Norway*.

- The factors that influence employees' willingness to use mindful safety practices may differ depending on whether the *object* of a practice is the employee him or herself or other persons.

- Employees' willingness to use mindful safety practices is generally more affected by factors at the *group level*, i.e. factors in the local work environment, than by factors at the individual and organizational level.

- The results indicate that higher levels of *familiarity with the local work environment* might promote the use of mindful safety practices - *at Norwegian petroleum installations*.

Based on these results, a set of recommendations for safety management practices were suggested:

1. Management initiatives to increase employees' willingness to use mindful safety practices will be most efficient if directed at the local work environment of the employees, rather than at the employees' individually or at the employees that work on the installation in general.

   Employees' willingness to use mindful safety practices might potentially change in two situations, and should be particularly monitored when these occur:

   → Situations where employees are transferred to a new local work environment.

   → Situations where changes are introduced in the present local work environment of the employees.

   It was further suggested that a specific measure, which taps on the contextual factors that influence employees' willingness to use mindful safety practices, should be develop. This measure should serve as a *safety indicator* in surveys directed at assessing the overall safety level at petroleum installations.

2. It was further suggested that employees' willingness to use mindful safety practices *at Norwegian petroleum installations* might possibly be influenced by their level of familiarity with the local work environment: Employees, who hold a higher level of familiarity with the local work environment, seem to be more willing to use mindful safety practices, than employees, who hold a lower level of familiarity with the above.

The replication study reproduced the results that served as basis for the suggestions made in point 1 above, whereas the results that served as basis for the suggestion made in point 2 were *not* reproduced. Since, the results that served as basis for the suggestion made in point 2 only constituted a very limited part of the overall results, it is reasonable to say that the replication study, overall, reproduced the results obtained in the original study. Assuming that the interpretation of the results obtained in the original study in terms of safety management practices is reasonable, the outcomes of the replication study thus suggest that the recommendations made in terms of safety management practices in point 1 above is upheld, whereas the suggestions made in point 2 might not be valid.

1 Purpose and Research Question

Research directed at humans' contributions to safety in high-risk industry tends to focus on humans' roles as elements in *safety barriers*. Safety barriers can be defined as means that have been implemented in a production system, as, e.g. a petroleum installation, to prevent a set of *predefined "unwarranted events"* from occurring and/or to reduce their consequences (Petroleum Safety Authority Norway, Management Regulations §1, 2001). At Norwegian petroleum installations, safety barriers are implemented to protect against a set of predefined events, which are jointly referred to as *defined danger and accident situations*. These comprise, e.g., hydrocarbon releases, fires and explosions, helicopter crashes and ship collisions into the platforms (Norwegian Petroleum Directorate, 2002).

Petroleum installation employees may act as elements in safety barriers. In this role they will typically be requested to interact with physical and/or technical devices/equipment. Since the danger events that safety barriers are implemented to protect against are explicitly defined, the physical and/or technical devices that a safety barrier contains will typically be designed to function in particular ways. A technical safety system may, e.g., be designed to monitor pre-defined parameters, and to alarm when particular thresholds are reached. When the physical and/or technical devices contained in safety barriers are design to work in particular ways the requirements to the human barrier element can often be clearly defined because they are determined with reference to the activity of these devices. Thus, if a safety barrier contains a safety system, as the one sketched above, the human barrier element may e.g. be allocated the tasks of monitoring for specific alarms and for taking particular actions if these events occur (such as, activating technical safety systems, and making safety announcements). For this reason, the tasks that are allocated to humans, who serve as elements in safety barriers, are *often* proceduralised, i.e. they can be performed with reference to unambiguous rules, regardless of whether these are documented in the form of instructions or not. The cognitive activity required from employees thus tends to be *rule-based*: Employees' activity will be carried out with reference to (external or internalized) *rules*, it will be *goal-directed* and *structured by feed-forward* (Rasmussen, 1986). Employees' contribution to safety barriers in high-risk industry are often critical for the safety systems to fulfil their goals, and research directed at improving the capability of employees to contribute positively to the safety barriers are thus of key importance for improving system safety.

High-risk industries, such as the petroleum industry, constitute complex socio-technical systems. The possibilities for interactions within and between the human, technical and organizational components of a system are innumerable - and the same is thus true for the number of events that may arise (Perrow, 1984). For this reason, it is not possible to explicitly predict and protect against all the possible danger events that may occur in high-risk industries. A practical consequence of this is that, employees are *also* required to contribute to protect against danger events that have not been explicitly anticipated.

Petroleum installation employees may contribute to protect against dangers that have not been explicitly anticipated by applying *mindful safety practices* (Skjerve, 2005; Skjerve and Lauridsen, 2006; Skjerve, Rosness, Aase, Bye, 2003, Skjerve, Rosness,

Aase, Hauge, and Hovden, 2004, Aase, Skjerve, and Rosness, 2005).[2] A mindful safety practice is a *discrete general safety-promoting work practice that may prevent the initiation of and/or interrupt unwanted but not explicitly predefined event sequences* (Skjerve and Lauridsen, 2006). Mindful safety practices can constitute either formal or informal performance guidance. They are based on the recognition that the work processes of the *employees* are associated with various types of generic risks. The risks may refer directly to the activities of the employees (e.g., unsafe handling of a tool) or to factors in the work environment (e.g., unsafe storage of materials). The specific form of a risk (e.g., how and when a tool is handled unsafely or how and when materials are stored unsafely) cannot be foreseen exactly, but at a general level it can be foreseen that this type of risk may come to occur from time to time. To take another example: It is easy to foresee that an employee at some point in time *may* come to neglect information that could hold safety implications, but difficult to foresee exactly when and how this will happen - since this risk potentially is present through out the work periods of the employees. Mindful safety practices can thus be perceived as *performance guides*, which are introduced to guard against *generalized risks* associated with the employees' work processes - in the sense discussed above.

A subset of the mindful safety practices that are applied at Norwegian petroleum installations is outlined below:

- If you observe a person in danger, you should warn the person.
- An employee may be allocated the role as watchman ("Hawk's eye"), i.e. to warn his or her colleagues about any potential dangers that may come to inflict their task performance process.
- When faced with safety-critical or potentially safety-critical situations you should "Take Two" (minutes) to think through the situation *before* acting.
- If you realize that your performance may have safety-critical consequences for you or your colleagues, you should stop.

These safety practices are characterised as *mindful* because they serve to increase the employees' awareness of possible – but not explicitly defined - danger sources. They encourage employees to review situations from different perspectives (e.g. by making them aware that their colleagues may not have noted all dangerous aspects in a situation), and to be open to the possible relevance of new information and/or to the need for reinterpretation old information (e.g., to review the current danger level in a situation). These elements are all attributes of the concept *mindfulness* as suggested by Langer (1989).

When using mindful safety practices, the employees' activity *tend* to be *less procedurally guided* than when they serve as elements in safety barriers. A mindful safety practice will in general *not* specify the exact danger(s) that the employees should guard against, nor what action(s) the employees should take to reduce the

[2] The activity covered by the concept *mindful safety practice* was previously referred to using the concept *safety mechanism* (see Skjerve et al., 2003).

danger level. Using mindful safety practices, the employees will thus have to rely more heavily on their *subjective, real-time evaluation* of the danger associated with the *situation at hand*. The cognitive activity involved will thus contain more *knowledge-based* components, as compared to when they serve as elements in safety barriers (Rasmussen, 1986).

Mindful safety practices may be *formally* or *informally* defined. On one installation, a particular mindful safety practice may be applied informally based on the employees' understandings of the risks associated with their work processes, while the exact same mindful safety practice on another installation may be a formally defined part of the safety defences. When mindful safety practices are formally defined they tend to be perceived as elements in safety barriers: An instruction may, e.g., state that the employee should serve as a "Hawk's eye" (see above) when a particular type of danger situation arises. This does, however, *not* imply that the cognitive activity associated with use of this mindful safety practice will be largely rule-based. Rather, it implies that a certain part of the employees' role as elements in the safety barriers will require larger amount of knowledge-based reasoning, as compared to what is generally the case (Skjerve 2005).

Mindful safety practices can also be distinguished from improvisation (Skjerve, Rosness, Aase, Hauge, and Hovden, 2004). Improvisation can be defined as the activity of fabricating out of what is conveniently on hand (Merriam Webster's Collegiate Dictionary, 1993). Improvisation will in principle be needed *only* when situations occur that deviate radically from what the organization has anticipated.[3] In these situations, the employees may have to improvise approaches for how to deal with the situation at hand in real time.

The use of mindful safety practices may also involve elements of improvisation, e.g., with respect to how an employee decides to issue a warning to a colleague in danger. However, the key function of mindful safety practices is to increase the employees' sensitivity (attention) to *particular* but not explicitly predefined types of danger situations. Mindful safety practices will typically concern a clearly delineated situation and require a short time period only (i.e. the time it takes to observe a danger and to warn against it), where improvised plans may refer to fully unknown situations and involve longer time periods. The improvisation involved in mindful safety practices will thus tend to be markedly less resource demanding than improvisation directed at developing action plans for unknown situations.

The three types of human contribution to system safety are depicted in figure 1.

[3] This corresponds to what is sometimes referred to as 'beyond design basis' occurrences.

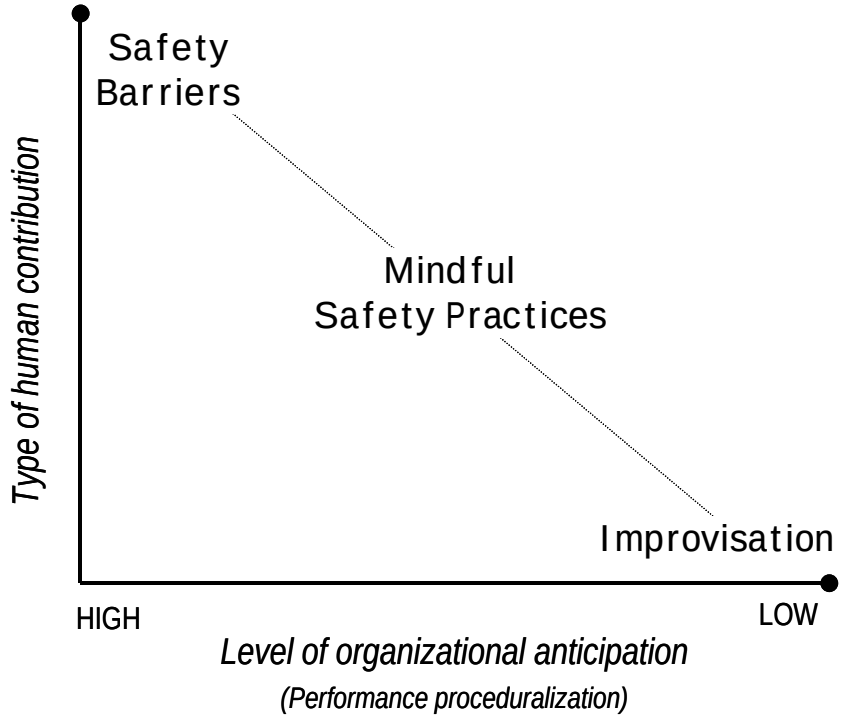

Figure 1. Three ways in which employees may contribute to system safety. The contribution types are depicted with reference to their associated level of organizational anticipation - and thus their level of performance proceduralization (Skjerve and Lauridsen, 2006).

Safety management practices at the installations may benefit from knowledge about the factors that influence employees' performance in all three roles, as the organizational initiatives required to facilitate human performance in each role can be assumed to be partly different.

Efficient use of mindful safety practices can be defined as the use of mindful safety practices in situations where danger is present and not excessively in situations where no danger is present. To use mindful safety practices efficiently, the employees must be able to correctly identify and warn against dangers in various types of situations. To do so, the employees must have received adequate *education and training* to that they possess the needed competence. In practice, however, at least two additional factors will also impact the employees' use of mindful safety practices: (1) the employees' *possibilities* for applying mindful safety practices, and (2) the employees' *willingness* to apply mindful safety practices. Employees' possibility for using mindful safety practices will depend on, e.g., the physical layout of the installation (how easy it is for the employees to monitor each other's activity), and on the operational procedures applied (e.g. how much time the employees have available to monitor each other's activity). The employees' willingness to apply mindful safety practices, i.e. the extent to which they actually *will* apply these practices when they have the opportunity, may depend on a variety of attitudinal and motivational factors. These may be associated with the characteristics of the employee, characteristics of local work environment, and/or characteristics of the overall organization.

Employees, who serve as elements in safety barriers will generally be required to perform predefined activities in a predefined sequence, as discussed above. For this reason, *instructions* (possibly instructions learned by heart) will be *one* factor that

facilitates the employees' ability to serve as elements in safety barriers. Education and training is further required to ensure that the employees master the different parts of the specific tasks they have been allocated as safety barrier element. The type of support required by employees who must engage in improvisation is more difficult to determine. The type of situations in which improvisation will be required cannot be clearly predicted, and this implies that neither the knowledge nor tools required to facilitate improvisation can be explicitly predefined. For this reason, it is reasonably to assume that as much knowledge about the installation - how it works technically and administratively - and about the tasks of the different roles/jobs at the installation, will be *one* critical factor that supports improvisation-based task performance.

The safety management practices may thus contribute to ensure that the relationship between the ways in which employees are expected to contribute to system safety, the preparation they get, and the tools they have available, will be well balanced.

In 2004, a study was performed to explore what type of contextual factors that may affect employees' willingness to use *mindful safety practices*[4] at Norwegian petroleum installations (Skjerve, 2005). This study assumed that a higher number of unwarranted events would be prevented if employees intervened in situations where they *judged* that the safety level of the installation and/or of one or more employees was reduced due to the presence of some kind of risk, than if employees did not intervene in these situations. It thus assumed that the use of mindful safety practices is a factor that will contribute to reduce the likelihood for *Defined Accident and Danger situations*, such as hydrocarbon releases, fires and explosions, and helicopter crashes into the platforms,[5] and for accidents involving individual employees. The results obtained were intended to contribute to the knowledge base for development safety management practices at the installations, i.e. more to determine what type of organizational initiatives that facilitate employees' willingness to use mindful safety practices. The purpose of the present study was to assess the extent to which the results obtained in the former study could be replicated, to contribute to validate the suggestions made in terms of safety management practices. In the following, the former study will be referred to as the *original study*, and the present study as the *replication study*.

The outcomes of the *original* study lead to three suggestions concerning the influence of contextual factors on employees' *willingness* to use mindful safety practices:

- The factors that influence employees' willingness to use mindful safety practices may differ depending on whether the *object* of a practice is the employee him or herself or other persons.

- Employees' willingness to use mindful safety practices is generally more affected by factors at the *group level*, i.e. factors in the local work environment, than by factors at the individual and organizational level.

[4] The term *mindful safety practice* was defined as a discrete general safety-promoting work practice that might prevent the initiation of unwanted, but not explicitly predefined, event sequences and/or interrupt such sequences.

[5] See, e.g., Oljedirektoratet (2002, 14-16) for the complete lists of *Defined Accident and Danger situations*.

- The results indicate that higher levels of *familiarity with the local work environment* might promote the use of mindful safety practices - *at Norwegian petroleum installations*.

Based on these results, a set of recommendations for safety management practices were suggested:

1. Management initiatives to increase employees' willingness to use mindful safety practices will be most efficient if directed at the local work environment of the employees rather than at the employees' individually or at the employees that work on the installation in general.

   Employees' willingness to use mindful safety practices might potentially change in two situations, and should be particularly monitored when these occur:

   → Situations where employees are transferred to a new local work environment.

   → Situations where changes are introduced in the present local work environment of the employees.

   It was further suggested that a specific measure, which taps on the contextual factors that influence employees' willingness to use mindful safety practices, should be develop. This measure should serve as a *safety indicator* in surveys directed at assessing the overall safety level at petroleum installations.

2. It was further suggested that employees' willingness to use mindful safety practices *at Norwegian petroleum installations* might possibly be influenced by their level of familiarity with the local work environment: Employees, who hold a higher level of familiarity with the local work environment, seem to be more willing to use mindful safety practices, than employees, who hold a lower level of familiarity with the above. [6]

The original study and the replication study were both based on data obtained in questionnaire surveys performed by the Norwegian Petroleum Directorate / Petroleum Safety Authority Norway[7] as part of two large-scale studies to assess the risk-level at the Norwegian Shelf. The original study was based on data obtained in December 10-21, 2001, and the replication study on data obtained in December 1, 2003 - January 18, 2004. Except for one questionnaire item, all items that were used from the 2001 survey in the original study were also contained in the 2003/2004-survey.

[6] It should be clearly stressed that the present study does not consider the based-rate risk level associated with the different work areas at petroleum installations. For this reason, differences in mindful safety practice use between work areas cannot – necessarily - be assumed to be reflected in different safety records.

[7] The original study was based on data obtained by the *Norwegian Petroleum Directorate* in the 2001-survey. In January 2003, the Norwegian Petroleum Directorate was split into two separate organizations. The part of the former Norwegian Petroleum Directorate that had been responsible for the questionnaire survey in 2001 was now moved to the organization *Petroleum Safety Authority Norway*.

The time difference between the two questionnaire surveys was approximately two years. It is reasonable to assume that a range of changes may have taken place at the installations during this time-interval. For this reason, it cannot be concluded that lack of replicability of the results obtained in the original study will imply that they hold no value, as the reason might simply be an effect of changes that have been introduced in the intermediate period. Still, the original study addressed patterns of results, rather than responses on individual items, and since no overall dramatic changes can be said to have occurred for petroleum installation employees in general within the two year period, it is expected that the patterns of results will be relatively similar in the two studies. For this reason, the present study is conceived as a *replication* study.

Except for this brief introduction, the report will provide no further details on the basis for the original study. More details can be found in Skjerve (2005).

2 Method

2.1 The Dataset

The replication study was based on data obtained in a questionnaire survey performed by the Petroleum Safety Authority Norway in year 2003-2004 as part of a large-scale study to assess the risk-level at the Norwegian Shelf (Petroleumstilsynet, 2004).

As in the survey on which the original study was based (Husebø *et al.*, 2002), the population was defined as all offshore employees, i.e. both managers and regular employees. In the replication study, the sample population constituted employees travelling offshore in the period 1, December 2003 to 18, January 2004 (Petroleumstilsynet, 2004). The questionnaire was administered to the respondents during their helicopter travel to the installations. The respondents were encouraged to fill in the questionnaire during their work period offshore, and to deliver the completed questionnaire to nurses at the installations in a sealed envelope.

Similarly to the questionnaire on which the original study was based, the questionnaire on which the replication study was based contained five major parts: Part 1 addressed demographic data. Part 2 requested the respondents to evaluate 48 items related to work-place safety, and contained four items that directly concerned the use of mindful safety practices. These items were formulated very generally to ensure that they would be equally applicable to employees from all work areas at petroleum installations. Three of the 48 items on work-place safety referred to the respondent's use of mindful safety practices:

- Item 25: I stop working if I find that continuing could imply a danger to myself or to others
- Item 33: I ask my colleagues to stop working, if I find that they perform their activities in a manner that threatens safety.
- Item 36: If I observe dangerous situations, I report on these

A fourth item referred to the respondent's evaluation of his or her colleagues' application of a particular mindful safety practices:

– Item 28: My colleagues will stop me if I work in a risky manner

For all items in part 2 of the questionnaire, a five-point rating scale with the following anchoring points was applied: Fully agree, partly agree, neither agree or disagree, partly disagree, and fully disagree. To reduce the risk of response bias, 20 of the 48 items were negatively formulated, i.e. addressing non-desirable safety states. Part 3 of the questionnaire requested the respondents to evaluate the risk for nine major accidents. Part 4 contained 33 items, which addressed the work environment and the recreational facilities offshore, and 9 items on sleep quality and working hours. Finally part 5 contained 19 items that addressed the respondents' state of health (ibid., 30).

The replication study was based on 7207 of the 8567 questionnaires returned (Petroleumstilsynet, 2004, 5). This selection contained all questionnaires in which the respondent had indicated what work area he or she belonged to, i.e. *process*, *drilling*, *well service*, *catering*, *construction/modification*, *maintenance* or *crane/deck*.[8] This selection strategy was applied to obtain more control over the organizational contexts of the individual respondents. The same selection strategy was used in the original study.[9] However, the number of respondents in the replication study was substantially higher, than the number of respondents included in the original study (n = 2928) due to the shorter administration period for the 2001-survey, i.e. 10-21 December 2001. For both surveys, the Petroleum Safety Authority Norway assessed that the response rates corresponded to approximately 50% of the sample population (Husebø *et al.*, 2002, Petroleumstilsynet, 2004).

2.2 The Adequacy of the Dataset vis-à-vis the Original Research Question

The report that documents the original study discusses the adequacy of the data set resulting from the 2001-survey in terms of the original research question (Skjerve, 2005). All of the issues discussed will have equal relevance for the 2003/2004-survey, given the very high-level of similarity of the questionnaires. Since these issues have implication for how the results are interpreted vis-à-vis the original research question, the main points in this discussions is summarized below:

1) The general or overall focus point of the items

It is not optimal that the focus points of three items on self-reported use of mindful safety practices are very general (see page 10). The problem is that the respondents' scores to some extent may be given in advance. It would, e.g. *not* be unreasonable to assume that almost all respondents would specify that they *in general* stopped working if they felt that their activities implied a danger to themselves or others,

[8] It should be noted that the work area *crane/deck* was not distinguished as a separate work area in the 2001-survey on which the original study was based. *Crane/Deck* had previously been recorded under the particular work area with reference to which the crane/deck jobs were performed, e.g., maintenance or construction/modification.

[9] The lower number of respondents in the original study was due to the shorter administration period for the 2001-survey, i.e. 10-21 December 2001.

etc., as both selection, training, and supervisory procedures should contribute to guard against the inclusion (and sustenance) of highly risk-taking employees in safety-critical job positions at Norwegian petroleum installations. For this reason, *the variation in the employees' scores can be expected to be quite low* - as was the case in the original study.

2) The response scale

All items in part two of the questionnaire used a five-point response-scale with the following response alternatives: Fully agree, partly agree, neither agree or disagree, partly disagree, and fully disagree. If employees at Norwegian petroleum installations as a starting point find that their work place is *more safe/appropriate* than *unsafe/inappropriate* - an assumption that is not unlikely given the various work place safety regulations and inspections – this can be expected to restrain the range of scores they will apply: If the work place is perceived to be 'more' safe than unsafe, it can be assumed that relatively few respondents would consider to apply the two response-scale points, which indicated the least optimal safety situation, and thus leaving the choice between the additional three response-scale points.

3) Self-reported use of mindful safety practices

The respondents' level of *self-reported* use of mindful safety practices might *not* necessarily reflect their *actual* use of these practices. The respondents' scores may most likely be biased by various heuristics,[10] in particular by the *availability heuristic* (Tversky and Kahneman, 1973). The availability heuristic implies that the frequency of an event is assessed by thinking of examples based on how quickly associated examples come to mind. Thus, it may be easier for respondents to recall instances where they have actually applied mindful safety practices, since these may have been experienced as more sensational or dramatic, than instances where no mindful safety practices have been applied, i.e. in more ordinary type of situations.

4) Perceived danger

The three items on self-reported use of mindful safety practices all refer to situations in which the employees as a starting point *perceive that danger is present* - either to themselves and/or to others, but the accuracy of the employees' perception cannot be assessed based on the data contained in the questionnaire. In addition, perceived danger is a matter of degree. A critical question in terms of assessing the practical implications of self-reported use of mindful safety practices is thus *how much danger* the employees presume when they provide their answer to the three items. How respondents assess what level of danger that is required to intervene with mindful safety practices can be assumed to relate to the general safety *standards on the particular installation*. Thus, for this reason high self-reported use of mindful safety practices on an installation with high a safety standard and high self-reported use of mindful safety practices on an installation with a lower safety standard may have different practical implications.

[10] A heuristic is a rule of thumbs that can be applied to a variety of problems, and which usually (but not always) will yield a correct solution.

With the above key limitations in mind, *the data obtained via the questionnaire may still provide a unique opportunity for assessing the extent to which the employees' perception of contextual factors affect their willingness to use mindful safety practices, due to its comprehensiveness and wide distribution.* The second administration of the questionnaire further provided a unique opportunity for the performance of a replication study.

2.3 Analysis Approach

The analysis approach applied in the replication study was similar to the analysis approach that was applied in the original study.

The data analyses were performed using Statistica (Statsoft, 2001). Initially, the key characteristics of the respondents were documented. This included their distribution in terms of gender, age, time in position offshore, and work area. Then an *item analysis* was performed on the 48 items contained in part 2 of the questionnaire (see section 2.1). Prior to this analysis, the responses provided on the *positively formulated* items were inverted, to ensure that a higher score always implied the less risky or more safety-oriented option.

The assessment of the employees' willingness to use mindful safety practices was based on the respondents' scores on the items on mindful safety practices. This implies, that the respondents' self-reported use of mindful safety practices were interpreted to reflect the extent to which the respondents' actually used the practices, when they were in a situation where they had determined there could be a need for doing so (see discussion on the limitations of this approach in section 2.2).

The indexes applied in the original study to represent *contextual factors* were recreated in the replication study (see Table 6, page 22). As in the original study, all indexes were tested for inter-item reliability prior to the initiation of the analyses. An index was seen as sufficiently reliable if it demonstrated a *Cronbach's alpha value of 0.7 or more*, as is the conventionally accepted minimum for rating scales (Murphy and Davidshofer, 2001). If the index demonstrated a lower Cronbach' alpha value, it was excluded from the replication study. In addition, the individual items applied in the original study were identified, and included as variables.

The variables were organized into three analysis levels in an identical manner as in the original study: individual, group and organizational (see Table 6, page 22). Variables at the *individual* level were assumed to relate to person-specific characteristics, i.e. items where the respondent, as such, was the object. Variables at the *group* level were assumed to refer to the local work environment, i.e. items were the local work environment was the object. Finally, variables at the *organizational* level were assumed to refer to the overall work environment at the installation, i.e. items where the overall work environment was the object.

The analysis process proceeded in two overall steps: First, analyses were performed on the complete dataset (n = 7207). Initially, the three items that addressed the employees' self-reported use of mindful safety practices were correlated to explore whether the relationship would be relatively stronger between the two mindful safety practices that were directed at *other persons* than between these and the mindful safety practice that was directed at the respondent *him or her self* – as had been the case in the original study. Then these items were correlated with the variables that represented contextual factors to explore whether group-level factors would be relatively stronger associated with employees' willingness to use mindful safety practices than individual and organizational level factors, as in the original study. In addition, multiple regression analyses were applied to further test the above finding.

Second, the data obtained were categorised based on the work-area that the respondent belonged to: *Process, drilling, well service, maintenance, construction/modification, catering*, and *crane/deck*. Analyses were performed on the separate data sets to assess the same issues that were earlier explored with reference to the complete data set. Following this, analyses were performed to assess whether a stronger relationship could be demonstrated between employees' willingness to use mindful safety practices in work areas in which the staff in general could be expected to hold a higher level of familiarity with their local work environment, than in work areas in which staff generally contain a lower level of familiarity - as had been suggested based on the outcome of the original study. These analyses were performed using non-parametric tests as in the original study.[11] The *Mann-Whitney U* test was applied as a non-parametric alternative to the *t* Tests for independent samples.[12] The *Kruskal-Wallis One-Way ANOVA by Ranks test* (Howell, 2002, 719) - in combination with the *Median test*[13] - was applied as alternative to One-Way Analysis of Variance.

Test-retest reliability concerns the extent to which a measurement instrument will yield the same result on repeated trial (Carmines and Zeller, 1979). The second administration of the questionnaire, i.e. the administration in 2003/2004, *might* be conceived as a re-test. The highly similar results obtained in the 2001-survey and the 2003/2004-survey (see 3.2.1) could thus be taken as an indication on adequate test-retest reliability. The questionnaire administration procedure (see section 2.1) have most likely introduced a certain level of noise in the dataset, in the form of responses that are based on a misunderstanding of what the items refer to, etc. This will contribute to reduce the reliability of the results obtained. Another aspect of reliability

[11] This solution was originally chosen for three reasons (Skjerve, 2005): (1) The scores on the indexes and items applied were not normally distributed (the distributions were skewed to the left). (2) Levene's test revealed that the requirement for homogeneity between the groups was not always fulfilled. (3) The datasets from the seven work areas were of *different* sizes.

[12] The *Mann-Whitney U* test is computed based on rank sums (Howell, 2002, 713), whereas the *t* Test is based on means, but the interpretation of the outcomes of the two tests is essentially the same (Statsoft, 2001). The null hypothesis, which is tested with the *Mann-Whitney U* test, is that there is *no* difference in the scores of the populations from which the two samples are selected (Hinkle, Wiersma, and Jurs, 1988). Because the samples are larger than 20, the sampling distribution of the U statistic rapidly approaches the normal distribution, and hence U statistic (adjusted for ties) are accompanied by a z value, and the respective *p*-value in Statistica.

[13] This test calculates (counts) the number of cases in each sample that falls above or below the common median, and computes the Chi-square. If the null hypothesis is true, it is expected that approximately 50% of all cases would fall above/below the median.

is the internal-consistency (stability) of the scores obtained (Pedhazur and Schmelkin, 1991). To assess the internal-stability of the scores, an inter-item reliability test was performed on the 48 items contained in part 2 of the questionnaire on the subset of data applied in the present analysis concerned with work place safety. This test revealed that the part 2 of the questionnaire was reliable.[14]

Internal validity concerns the possibility for making conclusions about causality, or more generally about the likelihood that the data obtained provide an accurate and truthful account of the phenomenon it was intended to address (Carmines and Zeller, 1979). To obtain internal validity it is necessary that no potentially effective variables are allowed to co-vary simultaneously (Shaughnessy and Zechmeister, 1994). With respect to the present study, internal validity cannot be claimed. The items contained in the questionnaire were quite general and different respondents might interpret some of them differently. In addition, the questionnaire items naturally constrained the possibility for defining contextual factors. This implies that the contextual factors used were less specific, precise and comprehensive, and the possibility that potential effective variables have co-varied cannot be excluded. External validity concerns the generalizability of the results, i.e. whether the results can be generalized to different populations, settings and conditions (Carmines and Zeller, 1979). The large number of respondents supports generalization of the results to Norwegian petroleum installations. However, approximately 50% of the sample population did not reply, and it cannot be excluded that there might be systematic differences between those who responded and those who did not. With respect to the data on which the original study was based, Husebø *et al.* (2002) compared the characteristics of the respondents with the characteristics of the respondents in a similar survey performed by Lie and Ringstad (1988) to assess whether the respondents' characteristics systematically differed from other employees. A high level of correspondence where found between the characteristics of the two groups of respondents in terms of age, sex and work area (Husebø *et al.*, 2002, 27). Qualitatively comparing a set of main characteristics of the respondents (age, time in position off-shore and work area) from the 2001-survey and the 2003/2004-survey does not suggest that the two groups of respondents differ markedly from one another.[15] This suggests that the respondents did not systematically differ from employees that did not respond, but the risk for systematic differences cannot be excluded.

3 Results

3.1 Main Characteristics of the Respondents

The main characteristics of the respondents in the replication study in terms of *age*, *time in a job position offshore*, and *work area membership* (see below) did not vary markedly from the profiles of the respondents in the original study (see Skjerve, 2005, section 3.1). The only exception was that *crane/deck* had not been distinguished as a separate work area in 2001-survey on which the original study was based.

[14] Detailed results: Valid N = 6110; Mean = 190.67; Standard deviation = 22.30; Cronbach alpha = .92; Standardized alpha = .92; Average inter-item correlation = .20.

[15] Compare the results reported in section 3.1 in the present report, with the results reported in section 3.1 in Skjerve (2005).

The respondents largely consisted of males. Of the 7207 respondents 6528 where males, 609 were females and 70 did not respond on this item. The age distribution of the respondents is depicted in Table 1. Excluding missing responses, the distribution showed that around 66% of the respondents were between 31 and 50 years old, while the younger group counted for around 11%, and the older group for around 23%.

Table 1. Age Distribution.

Age Distribution	**Count**	**Percent of all**
20 years old or less	73	1.0
21-30	739	10.3
31-40	2272	31.5
41-50	2459	34.1
51-60	1550	21.5
61 years old or more	85	1.2
Missing	29	0.4

The distribution of the respondents' time in a job position (full time or part time) offshore is depicted in Table 2. Excluding missing responses, around 56% of the respondents reported to have worked offshore between 11 and more than 20 years, around 24% between 2 and 10 years, and around 5% between 0 and 1 year.

Table 2. Distribution of time in job position (full time or part time) offshore.

Time in a job position offshore	**Count**	**Percent of all**
0-1 year	328	4.6
2-5 years	1350	18.7
6-10 years	1479	20.5
11-20 years	2342	32.5
More than 20 years	1651	22.9
Missing	57	0.8

The respondents' distribution in terms of work area is depicted in Table 3. Most respondents came from the work areas *maintenance*, *drilling* and *process*, and least from the work areas *crane/deck*, *construction/modification*, and *well service*.

Table 3. Distribution of respondents in terms of their area of work.

Work Area	**Count**	**Percent of all**
Process	1108	15.4
Drilling	1480	20.5
Well service	589	8.2
Catering	733	10.2
Construction / Modification	542	7.5
Maintenance	2272	31.5
Crane/Deck	483	6.7

Overall, the characteristics of the respondents in the 2003/2004-survey correspond well with the characteristics of the respondents in the 2001-survey.

3.2 Preparatory Analyses

3.2.1 Overall Characteristics of the Dataset

3.2.1.1 Item Analysis

Part 2 of the questionnaire was designed to capture the respondents' evaluation of work place safety. As in the original study, an item analysis was performed on the items contained in part 2 of the questionnaire. For each item, the number of valid responses, the mean score, the minimum and maximum scores applied, and the standard deviation, was reported (see Table 4).

Table 4. Description of the scores obtained on items in part 2 of the questionnaire, across the complete dataset. (R) = Reverse coding.[16]

Item number and content	Valid N	Mean	Mini-mum	Maxi-mum	Std.Dev.
1. High-risk work operations are always carefully gone through before they are initiated. (R)	7126	4.57	1	5	0.68
2. Some times I feel under pressure to work in a manner that threatens safety.	7109	4.22	1	5	1.12
3. My lack of familiarity with new technology may sometimes contribute to increase the risk for accidents.	7097	3.99	1	5	1.17
4. Sometimes I work even if I am actually too tired.	7118	3.18	1	5	1.40
5. The staffing level is sufficient to ensure that HSE is dealt with in a good manner. (R)	7108	3.60	1	5	1.26
6. I have the necessary competence to perform my job safely. (R)	7139	4.54	1	5	0.77
7. I have easy access to the necessary personal protection equipment. (R)	7150	4.73	1	5	0.65
8. Suggestions and comments from the safety delegates are being seriously dealt with by the management. (R)	7113	4.05	1	5	0.95
9. My work place is often untidy.	7118	3.86	1	5	1.09

[16] Item 47 and item 48 were new, as compared to the 2001-questionnaire. The formulation the item that corresponded to the present item 27 was somewhat revised: In the 2001-questionnaire it was formulated as "I have received sufficient safety education and training." In the 2003-2004-questionnaire it was formulated as "I have received sufficient HSE education and training." Item 6 in the 2001-questionnaire "Bonuses associated with few accidents improve safety" was *not* included in the 2003 questionnaire. The sequence, in which the items were presented in the two questionnaires, furthermore differed somewhat.

Item number and content	Valid N	Mean	Mini-mum	Maxi-mum	Std.Dev.
10. I find it unpleasant to call attention to breaches in the safety regulations.	7118	3.61	1	5	1.33
11. The work permit system is always adhered to. (R)	7057	4.07	1	5	1.02
12. I can influence the HSE state at my work place. (R)	7132	4.30	1	5	0.86
13. It does happen that I breach the safety regulations to get a job done fast	7141	3.95	1	5	1.23
14. A work place with good HSE conditions means a lot to me. (R)	7141	4.79	1	5	0.57
15. You can easily be perceived as quarrelsome if you call attention to dangerous conditions.	7132	3.29	1	5	1.38
16. In practice, considerations for production are prioritised over considerations for HSE.	7136	3.08	1	5	1.30
17. Information about unwanted events is used efficiently to prevent recurrences. (R)	7142	4.07	1	5	0.95
18. I use the required personal protection equipment. (R)	7155	4.83	1	5	0.50
19. I do not participate actively in the safety meetings.	7128	3.88	1	5	1.26
20. From the perspective of personal career, it is a disadvantage to be too concerned with HSE.	7143	3.92	1	5	1.20
21. Communication between me and my colleagues often fails in such a manner that dangerous situations may arise.	7160	4.48	1	5	0.85
22. The laws and regulations associated with HSE are inadequate.	7130	3.58	1	5	1.16
23. Preferably, I do not discuss issues related to HSE with my immediate leader.	7161	4.40	1	5	0.93
24. Insufficient maintenance has lead to poorer safety.	7130	2.86	1	5	1.37
25. I stop working if I find that continuing could imply a danger to myself or to others. (R)	7145	4.71	1	5	0.75
26. My leader appreciates that I call attention to issues of importance to HSE. (R)	7152	4.38	1	5	0.86
27. I have received sufficient HSE education and training. (R)	7148	4.09	1	5	0.92
28. My colleagues will stop me if I work in a risky manner. (R)	7142	4.21	1	5	0.85

Item number and content	Valid N	Mean	Mini-mum	Maxi-mum	Std.Dev.
29. I doubt if I will be able to perform my emergency tasks in a crisis situation.	7054	4.15	1	5	1.00
30. Often parallel work operations lead to dangerous situations.	7104	3.43	1	5	1.21
31. The emergency preparedness is good. (R)	7124	1.97	1	5	0.97
32. Reports about accidents or dangerous situations often become "trimmed"/"touched up."	7112	3.33	1	5	1.27
33. I ask my colleagues to stop working, if I find that they perform their activities in a manner that threatens safety. (R)	7119	4.51	1	5	0.74
34. The company in which I work takes HSE seriously. (R)	7134	4.49	1	5	0.80
35. Insufficient co-operation between operator[17] and contracting firms often leads to dangerous situations.	7087	3.55	1	5	1.22
36. If I observe dangerous situations, I report on these. (R)	7133	4.68	1	5	0.60
37. Safety has first priority when I perform my job. (R)	7124	4.67	1	5	0.58
38. My leader is engaged in the HSE work at the installation. (R)	7123	4.29	1	5	0.89
39. It is easy to report to the nurse/company health service about afflictions and illnesses that might be associated with the job. (R)	7117	4.26	1	5	1.00
40. My colleagues are very engaged in HSE. (R)	7119	4.10	1	5	0.79
41. I am uncertain about my role in the emergency management organization.	7032	4.33	1	5	1.07
42. The safety delegates do a good job. (R)	7106	4.08	1	5	0.87
43. I think it is easy to find my way in regulating documents (requirements and procedures). (R)	7123	3.00	1	5	1.25
44. I always know whom in the organization that I shall report to. (R)	7134	4.18	1	5	1.07
45. The HSE procedures adequately cover my tasks. (R)	7119	4.12	1	5	0.90
46. Different procedures and different routines at the different installations can be a threat to safety.	7101	2.15	1	5	1.13

[17] In the present context, the concept 'operator' refers to the company that owns/runs the installation.

Item number and content	Valid N	Mean	Mini-mum	Maxi-mum	Std.Dev.
47. I feel sufficiently rested when I am at work (R)	7101	2.15	1	5	1.13
48. The equipment I need to work safely is easily accessible (R)	7128	3.83	1	5	1.11
AVERAGE	**7122**	**3.93**			**1.00**

The average *mean score* on the 48 items was 3.93. This indicated that the employees in general assessed safety conditions at the individual work place to be more favourable than unfavourable. Item 18 "I use the required personal protection equipment" achieved the highest mean score, i.e. 4.83, and held the lowest standard deviation in the dataset, i.e. 0.5, implying that almost all the respondents had provided the score, "Fully agree" to this statement. The same was true in the original study. The lowest mean score, i.e. 1.97 was obtained on item 31. "The emergency preparedness is good." In the original study, this item held a mean score on 3.93, whereas the lowest mean score was obtained in relation to the items that had been excluded from the 2003/2004 questionnaire: "Bonuses associated with few accidents improve safety." The extreme anchoring points of the response scales were applied with reference to all items. The *overall standard deviation* was 1.00, as compared to 1.13 in the original study. The lowest standard deviation was held by item 18 (as discussed above), and the highest, i.e. 1.4, by item 4: "Sometimes I work even if I am actually too tired." In the original study the highest standard deviation, i.e. 1.65, was held by the present item 41 "I am uncertain about my role in the emergency organization." The average mean score associated with the four items that directly referred to the use of mindful safety practices (items 25, 28, 33, and 36) was 4.53, and thus higher than in the overall dataset, and the average standard deviation was 0.74, which was lower than in the overall dataset. In the original study, the figures were 4.44, and 0.78, respectively.

The item analysis thus indicated that the dataset obtained in the 2003/2004-survey, was highly similar to the dataset obtained in the 2001-survey.

3.2.1.2 Discussion of the Characteristics of the Dataset

As was the case in the original study, the item analysis revealed that the amount of variation contained in the dataset based on part 2 of the questionnaire was very *limited*, and thus that the homogeneity of the scores provided by the respondents was high. This result *could* be seen as surprising given the high number of respondents, the distribution of the respondents across seven different work areas, and the variety of job positions held by the respondents. On the other hand, it could also be seen as a natural consequence of the general formulations applied and the design of the response scale (as discussed in section 2.2). A similar high level of homogeneity was found in the original study, and the effect will most likely be similar: The correlation coefficients obtained may be low (Hinkle, Wiersma, and Jurs, 1988) – which will have implications for the outcome of all analyses that involve correlations - and the strength of the relationships between variables may not necessarily be representative: Stronger relationships might have been obtained if the items/response scales had more efficiently *differentiated* between the respondents' assessments.

As in the original study, the item analysis further showed that the respondents treated the negatively and positively formulated items differently: both the means and standard deviations between these item groups differed substantially (see Table 5).

Table 5. Means and standard deviations for the negatively and positively formulated items.

	Mean	**Standard Deviation**
Negative items	3.66	1.18
Positive items	4.19	0.86

The different treatment of the negatively and positively formulated items was to some extent further reflected in the distribution of the scores in the two item groups. The distribution of scores obtained on the positively formulated items was generally skewed to the left, whereas the distribution of scores obtained on the negatively formulated items tended to demonstrate a some what bimodal distribution - even though most of these scores overall also were skewed to the left following inversion of the response scale (see page 13).

Various explanations may account for the above findings. Skjerve (2005) suggested that the differences between the negatively and positively formulated items could be a consequence of different framing of these items by the respondents. The manner in which a judgement is framed - e.g. whether it is framed in terms of 'the possibility for gains' or 'the risk for losses' - have been demonstrated to impact the outcome of a person's judgment (Kahneman and Tversky, 2002).[18] Responding to the questionnaire (in both surveys), the respondents' might simply have focused more on the negative aspects in when the items were negatively framed, i.e. thought in terms of occurrences and states that endangered safety - and vice versa.[19] Husebø *et al.* (2002, 29) suggested that the respondents' different approach to negatively and positively formulated items could indicate that the majority of the respondents systematically had applied the left (in the present study this equals the *right*) end of the response scales to try to convey a positive view of the safety state at the installations without paying sufficiently attention to how the items were formulated. This interpretation could be detrimental to the validity of the entire data set, as the argument might easily be turned around: It cannot be ruled-out that it was actually only the negatively formulated items that the respondents' carefully read and responded to. Based on uncertainties associated with determining the reason for the differences in the scores obtained in the two item groups, the original study applied the combined dataset while attending to possible effects of the differences. The same approach will be applied in the present study.

[18] Example: A person who frames a decision in terms of gains, e.g., "I will *save time* if I don't get the safety helmet," will be more likely to choose the risky option, than a person who frames the decision in terms of losses, e.g., "I *might be harmed* by a falling object if I don't wear the safety helmet."

[19] The most marked consequence was that the indexes created representing contextual factors either contained only positively or only negatively formulated items. The different approaches to scoring most likely have restrained the possibility for creating valid contextual-factor indexes.

3.2.2 Defining Contextual Factors to be applied in the Study

3.2.2.1 Contextual Factors

The contextual factor indexes and single items applied in the original study were re-created in the present study. In the original study, the creation of indexes and the selection of individual items were based on general assumptions about the type of contextual factors that might affect the use of mindful safety practices. An index's score was calculated by taking the average of the scores obtained on the individual items it contained. Table 6 provides an overview of the indexes and their associated Cronbach's alpha value, and the individual items applied.

Table 6. Overview of the indexes and single items applied in the analysis. The Cronbach's alpha values obtained for the indexes in the original study are reported in the parentheses.

Name	**Content of the items**	**Cron-bach's Alpha**
Individual Level		
Age	• Age? (Six response alternatives see section 3.1).	
Overall health state	• In general, how would you characterize your state of health?	
Perceived personal capability to deal with safety-related issues	*Index, composed of the following items:* • Some times I feel under pressure to work in a manner that threatens safety. • From the perspective of personal career, it is a disadvantage to be too concerned with HSE. • Communication between me and my colleagues often fails in such a manner that dangerous situations may arise. • Preferably I do not discuss issues related to HSE with my immediate leader. • I doubt if I will be able to perform my emergency tasks in a crisis situation. • I am uncertain about my role in the emergency management organization.	.67 [.91]
Time in job position offshore	• Time in job position whole or part time offshore (specify the number in years: six response alternatives see section 3.1).	
Group Level		
Task performance environment	*Index, composed of the following items:* • I have received sufficient HSE education and training. • The HSE procedures adequately cover my tasks. • Safety has first priority when I perform my job. • My colleagues are very engaged in HSE. • The safety delegates do a good job.	.69 [.71]
Managers' attitude to HSE	*Index, composed of the following items:* • Suggestions and comments from safety delegates are being seriously dealt with by the management. • My leader appreciates that I call attention to issues of importance to HSE • The company in which I work takes HSE seriously • My leader is engaged in the HSE work at the installation.	.77 [.77]

Name	Content of the items	Cron-bach's Alpha
Psychological work environment	This index was calculated based on a subset of the items contained in part 4 of the questionnaire. The items applied requested the employees to evaluate different several aspects of the work environment offshore: a) Possibility for planning own work, b) Possibility for gaining in professional skills, c) Relationship with colleagues, d) Relationship with the immediate leader, e) The manner in which the respondents work is appreciated, and f) The work environment in totality. NOTE: To make this variable readily comparably with the corresponding variable that were applied in the analysis based on the 2001-dataset, the two new items added to the questionnaire in the 2003/2004-survey "Climate for co-operation between different companies" and "Job-assurance" were *not* included	.82 [.82]
Colleagues' use of mindful safety practices	• My colleagues will stop me if I work in a risky manner.	
Organizational Level		
Overall Work Environment[20]	*Index, composed of the following items:* • You can easily be perceived as quarrelsome if you call attention to dangerous conditions. • In practice, considerations for production are prioritised over considerations for HSE. • Insufficient maintenance has lead to poorer safety. • Often parallel work operations lead to dangerous situations. • Insufficient co-operation between operator and contracting firms often leads to dangerous situations. • Reports about accidents or dangerous situations often become "trimmed"/"touched up."	.78 [.75]
Perceived risk level	This index was calculated based on part 3 of the questionnaire, which asked the respondents to rate the degree to which they felt personally endangered by different possible incident/accident events offshore. The events comprised: a) Helicopter crash into the platform, b) Gas leakages, c) Fire, d) Blow out, e) Releases of poisonous gasses/materials/chemicals, f) Collisions with skips or other objects in the sea, g) Sabotage/Terror, h) Breakdown in the installation's bearing constructions or loss of its ability to float, i) Other work accidents. NOTE: The formulation of item "i" was slightly changed from the 2001 version of the questionnaire. From "Serious work accidents" to the above.	.88 [.87]

[20] It should be noted that this variable, which was created analytically in the original study based on a classification of the individual items, naturally emerged as a factor in the overall exploratory factor analysis on the 48 items contained in part 2 of the RNNS questionnaire in the replication study.

Name	Content of the items	Cron-bach's Alpha
Physical work environment	This index was calculated based on a subset of the items contained in part 4 of the questionnaire. The items applied requested the employees to evaluate different several aspects of the work environment offshore: a) Noise, b) Temperature, c) Vibrations, d) Hygiene/cleaning/tidiness, e) Lightning conditions, f) Air quality, g) Protections against the weather, h) Handling of chemicals, i) Heavy lifts, j) Repetitive work, k) Work in inadequate positions, l) Workload, m) Work tempo, n) Shift-work schedule, o) Workplace design.	.88 [.89]
Spare-time and rest facilities	This index was calculated based on a subset of the items contained in part 4 of the questionnaire. The items applied requested the employees to evaluate different several aspects of the work environment offshore in terms of the quality of spare time and rest periods: a) Noise, b) Temperature, c) Vibrations, d) Hygiene/cleaning/tidiness, e) Lighting conditions, f) Air quality, g) Food/Drink quality, h) cabin standard, i) Training facilities, and j) Additional recreational possibilities.	.87[21] [.87]

In general, the indexes demonstrated quite similar levels of inter-item reliability, as compared to what had been found in the original study. The only exception was the index *Perceived personal capability to deal with safety-related issues*. This index demonstrated a markedly lower inter-item reliability in the replication study (.67) than in the original study (.91). The low level of inter-item reliability implied that the index was excluded from the additional parts of the replication study. The index *task performance environment* demonstrated an inter-item reliability level that was very close to the level obtained in the original study, but the value was immediately below the threshold value on .70. Still, as the result was very similar to the result obtained in the original study, and as the value obtained could not be closer to reach the threshold value with its Cronbach's alpha value on .694, and as it was decided to still maintain the index in the replication study. All the indexes applied in the replication study demonstrated, as in the original study, distributions that were skewed to the left.

3.2.2.2 The Relationships between the Contextual Factors

To assess the relationship between the indexes and items within and between the three analysis levels, a series of Pearson product-moment correlations were performed (see Table 7, page 26).

As in the original study, these correlations revealed that all variables within each of the three analysis levels correlated significantly with each other. However, as was the case in the original study, various significant correlations were also found across the three analysis levels. This could indicate that (1) that the locations of indexes/items were inadequate, (2) that the indexes/items could not explicitly be located at a specific analysis level, because they covered issues of importance for more than one level,

[21] This value is based on the *Petroleum Safety Authority of Norway's* report (Petroleumstilsynet, 2004, 44), as the author did not have access to the respondents' score on the individual items contained in this index.

and/or (3) that the results merely reflected the fact that the three analysis levels essentially are interrelated.

To obtain a better understanding of the reasons for the cross-correlations, an exploratory factor analysis was performed, similarly to what was done in the original study. The analysis again suggested the validity of the three factors: the *individual-level*, the *group-level*, and the *organizational-level* (see Appendix 1). As expected, the three group-level variables *task performance environment*, *managers' attitude to HSE*, and *colleagues' use of mindful safety practices* all loaded on the group-level factor. The group-level variable *psychological work environment* demonstrated cross-loadings between the group-level factor and the organizational-level factor. The individual-level variables *age* and *time in position offshore* loaded on the individual-level factor, while *overall health state* did not load on any of the three factors. These results were similar to what had been found in the original study. The organizational-level variables *the physical work environment* and *spare-time and rest facilities* loaded on the organizational-level factor, which were also similar to the result obtained in the original study. The organizational-level variable *perceived risk level* also loaded on the organizational-level factor, but with .60 only. In the original study, this variable loaded on the organisational-level factor with .67. The organizational-level variable *overall work environment* demonstrated a cross loading between the organizational-level factor and the group-level factor. In the original study, it had tended to load on the organisational-level factor, but with .55 only.

Still, as in the original study it was decided to maintain the variables at the predefined analytical levels to which they had originally been located in the replication study, and to pay particular attention potential consequences of the cross-loadings found and the complete lack of loading of the *overall health state* variable.

Table 7. Product-moment correlations between the contextual factors (N = 5523, casewise deletion of missing data).

	Age	Time in job position offshore	Overall health state	Task performance environment	Managers' attitude to HSE	The psychological work environment	Colleagues' use of mindful safety practices	Overall work environment	The physical work environment	Spare-time and rest facilities	Perceived risk level
Age		r = .68**	r = -.15**	r = .13**	r = .07***	r = -.01	r = .01	r = .08***	r = .04**	r = .05*	r = .04**
Time in job position offshore			r =- .15**	r = .08***	r = .02	r = -.03*	r = -.02	r = .03*	r = -.03*	r = -.06***	r = -.01
Overall health state				r = .17**	r = .16**	r = .25**	r = .11***	r = .16**	r = .25**	r = .20**	r = .12**
Task performance environment					r = .66**	r = .48**	r = .50**	r = .49**	r = .43**	r = .35**	r = .24**
Managers' attitude to HSE						r = .54**	r = .43**	r = .55**	r = .45**	r = .37**	r = .23**
The psychological work environment							r = .32**	r = .44**	r = .59**	r = .44**	r = .27**
Colleagues' use of mindful safety practices								r = .34**	r = .27**	r = .19**	r = .16**
Overall work environment									r = .49**	r = .41**	r = .36**
The physical work environment										r = .65**	r = .36**
Spare-time and rest facilities											r = .29**

*$p < .05$, **$p < .01$. ***$p < .001$

3.3 Analyses Based on the Overall Dataset

3.3.1 Employees' Use of Different Mindful Safety Practices

In the original study, a higher level of correlation was found between the two items that addressed the use of mindful safety practices *directed at other persons* (item 33 and item 36), than between any of these and the item that addressed the use of mindful safety practices *directed at the respondent him or her self* (item 25). This was interpreted to suggest that employees' willingness to use mindful safety practices directed at him or her self might – to some extent - be influenced by different factors than their willingness to apply mindful safety practices directed at other persons. To assess whether the above result could be replicated, the three items that referred to self-reported use of mindful safety practices were subjected to a Pearson product-moment correlation (see Table 8).[22]

Table 8. Product-moment correlations between the three items on self-reported use of mindful safety practices based on the complete dataset (N = 7062, casewise deletion of missing data).[23]

Items	**Item 33:** I ask my colleagues to stop working, if I find that they perform their activities in a manner that threatens safety.	**Item 36:** If I observe dangerous situations, I report on these.
Item 25: I stop working if I find that continuing could imply a danger to myself or to others.	r = .28***	r = .26***
Item 33: I ask my colleagues to stop working, if I find that they perform their activities in a manner that threatens safety.		r = .45***

****p* < .001

As in the original study, the replication study showed that significant correlations were found between all item pairs, and that the correlation coefficients in general were quite low. The correlation coefficients obtained in the correlations between items 33 and 36 and item 25 were markedly lower than the correlation coefficient obtained in the correlation between items 33 and 36. This also corresponded to the findings in the original study. For this reason, the interpretation of the results obtained in the original study cannot be dismissed.

[22] The three items on the use of mindful safety practices were all positively formulated, and the scores provided on the separate items were skewed to the left.

[23] Due to the high level of homogeneity in the dataset (as discussed in section 3.2.1.2), the coefficient of determination (r^2) was *not* reported in association with the correlation coefficients. The coefficient of determination expresses how large a proportion (in percentage) of the variation in one variable that is associated with the other.

3.3.2 The Relationship between the Use of Mindful Safety Practices and the Contextual Factors

In the original study, a stronger relationship was found between employees' willingness to use mindful safety practices and the contextual factors at the group level, than with the contextual factors at the individual and organizational levels.[24] To explore whether this result could be replicated, the three items on self-reported use of mindful safety practices were subjected to Pearson product-moment correlations with the contextual factors (see Table 9).

Table 9. Product-moment correlations between the three items on self-reported use of mindful safety practices and the defined contextual factors (N = 5506, casewise deletion of missing data).

	Item 25: I stop working if I find that continuing could imply a danger to myself or to others.	**Item 33:** I ask my colleagues to stop working, if I find that they perform their activities in a manner that threatens safety.	**Item 36:** If I observe dangerous situations, I report on these.
Individual Level			
Age	r = .05***	r = .08 ***	r = .11***
Overall health state	r = .06***	r = .07***	r = .11***
Time in job position offshore	r = .04**	r = .07***	r = .08***
Group Level			
Task performance environment	r = .25**	r = .39**	r = .44**
Managers' attitude to HSE	r = .26**	r = .31**	r = .36**
Psychological work environment	r = .15**	r = .21**	r = .24**
Colleagues' use of mindful safety practices	r = .26**	r = .35**	r = .34**
Organizational Level			
Overall work environment	r = .16**	r = .21**	r = .26**
Perceived risk level	r = .09***	r = .10***	r = .10***
Physical work environment	r = .12**	r = .16**	r = .20**
Spare time and rest facilities	r = .10***	r = .13**	r = .16**

*$p < .05$, **$p < .01$. ***$p < .001$

The results obtained were highly similar to the results obtained in the original study: The relationships between employees' willingness to use mindful safety practices and contextual factors at the *individual* and *organizational levels* were relatively low, whereas the relationship between contextual factors at the *group level* and employees' willingness to use mindful safety practices were, relatively, stronger. The results thus overall correspond well with the results obtained in the original study.

[24] Even though correlations say nothing about the direction of a relationship, i.e., about what is cause and what consequence, it seems reasonable in the present context to interpret the present results to suggest that factors at the group level more markedly affected employees' willingness to use mindful safety practices, than factors at the individual and organizational level.

It should, however, be noted that both in the original study and in the replication study, the index *psychological work environment* demonstrated a relatively lower level of correlation with the three items on mindful safety practice use, than the other variables at the group level. The reason is most likely that the index in both studies cross-loaded on the group-level and the organizational-level factors (see section 3.2.2.2 for the results associated with the present study). The index *overall work environment* demonstrated a much higher level of correlations with the three items on mindful safety practice use, than with the other variables at the organizational level. This was *not* the case in the original study. In addition, the variable demonstrated a cross-loading on both the group-level and the organizational-level factor (see section 3.2.2.2), whereas it did *not* load on any of the factors in the original study. The reason for this difference is undecided.

Similar results were obtained in the replication study, as compared to in the original study, with respect to the strength of the correlation coefficients in the replication study: The correlation coefficients obtained when contextual factors were correlated with item 33 and item 36, i.e. the two items that referred to use of mindful safety practices directed at other persons, were generally higher, than the correlation coefficients obtained in when contextual factors were correlated with item 25, the item that referred to use of mindful safety practices directed at one self.

3.3.2.1 Multiple Regression Analyses

Multiple regression analyses were used to explore whether contextual factors at the group level would contribute more to explain the use of mindful safety practices than factors at the individual and organization levels, as had been found in the original study. Separate multiple regression analyses were performed on the three items on self-reported use of mindful safety practices (see Table 10, Table 11, and Table 12).

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Table 10. Multiple regression analysis on item 25: "I stop working if I find that continuing could imply a danger to myself or to others."

Regression Summary for Dependent Variable: Item 25. N = 5520. R = .32. R^2= .10. Adjusted R^2= .10. F(11.5508)=56.047 p<0,0000 Std.Error of estimate: .70.						
	Beta	**Std.Err. of Beta**	**B**	**Std.Err. of B**	**t(5508)**	**p-level**
Intercept			2.90	0.11	26.47	0.000
Task performance environment	0.09	0.02	0.12	0.03	4.68	0.000
Managers' attitude to HSE	0.15	0.02	0.16	0.02	7.73	0.000
Colleagues' use of mindful safety practices	0.17	0.02	0.15	0.01	11.12	0.000

Table 11. Multiple regression analysis on item 33: "I ask my colleagues to stop working, if I find that they perform their activities in a manner that threatens safety."

Regression Summary for Dependent Variable: Item 33. N=5512. R= .44. R^2= .19. Adjusted R^2= .19. F(11.5500)=117.79 p<0,0000 Std.Error of estimate: .66.						
	Beta	**Std.Err. of Beta**	**B**	**Std.Err. of B**	**t(5500)**	**p-level**
Intercept			1.97	0.10	19.03	0.000
Time in job position offshore	0.04	0.02	0.03	0.01	2.57	0.010
Task performance environment	0.24	0.02	0.32	0.02	13.61	0.000
Managers' attitude to HSE	0.08	0.02	0.09	0.02	4.39	0.000
Colleagues' use of mindful safety practices	0.21	0.01	0.18	0.01	14.69	0.000

Table 12. Multiple regression analysis on item 36: "If I observe dangerous situations, I report on these."

Regression Summary for Dependent Variable: Item 36. N=5520. R= .47. R^2= .22. Adjusted R^2= .22. F(11.5508)=143.27 p<0,0000 Std.Error of estimate: .52.						
	Beta	**Std.Err. of Beta**	**B**	**Std.Err. of B**	**t(5508)**	**p-level**
Intercept			2.37	0.08	29.23	0.000
Age	0.05	0.02	0.03	0.01	3.06	0.002
Overall health state	0.04	0.01	0.04	0.01	3.47	0.001
Task performance environment	0.29	0.02	0.31	0.02	16.56	0.000
Managers' attitude to HSE	0.10	0.02	0.09	0.02	5.95	0.000
Colleagues' use of mindful safety practices	0.15	0.01	0.10	0.01	10.45	0.000

The levels of explained variation accounted for in the multiple regression analyses were low. For items 25, 33 and 36, the variation accounted for by the contextual factors was 10%, 19% and 22%, respectively. This was even lower than in the original study were the corresponding results were 11%, 24% and 23%, respectively. The reason for these differences might be related to the fact that the level of variation in the dataset overall was lower in the 2003/2004-survey, than in the 2001-survey. In accordance with the results obtained in the original study, all multiple regression analyses revealed that the variable *task performance environment* contributed most to explain the variation, *colleagues' use of mindful safety practices* the second most, and *managers' attitude to HSE* the third most. All of these factors were located at the group level.

Also in accordance with the results obtained in the original study, the amounts of variation explained was *relatively* higher with respect to employees' willingness to use mindful safety practices directed at other persons, than with respect to mindful safety practices directed at the person him or her self.

3.4 Analyses Based on the Data Obtained Within the Seven Work Areas

A set of comparisons between the work areas was performed to assess the extent to which the results obtained in the original study, with respect to work area differences, could be replicated. With respect to interpretations of the results, it should be clearly stressed that the original study did not consider the base-rate risk level associated with the different work areas at petroleum installations. For this reason, potential differences in the use of mindful safety practice between the seven work areas cannot be assumed to be directly reflected in the safety records.

3.4.1 Item Analyses

As in the original study, item analyses were performed on the items contained in part 2 of the questionnaire separately for the data obtained within the different work areas (see Appendix 2). In the original study, the purpose had been to assess the correspondence between the results obtained for the separate work areas and the results obtained based on the overall data set. For each of the seven work areas, the mean score, the mean standard deviations the items associated with the highest and lowest mean scores, and the items associated with the highest and lowest standard deviations were reported (see Table 13). The results obtained were largely similar to the results obtained in the original study, and corresponded to the outcome of the item analyses based on the overall data set (see section 3.2).

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Table 13. Overview of the results obtained in the separate items analyses for each of the seven work areas.

Work Area	Mean score	Mean std.	Highest mean score	Lowest mean score	Highest st. dev.	Lowest st. dev.
Process	3.98	0.97	4.83: A work place with good HSE conditions means a lot to me. (item 14)	1.90: The emergency preparedness is good. (item 31)	1.39: You can easily be perceived as quarrelsome if you call attention to dangerous conditions. (item 15)	0.48: I use the required personal protection equipment. (item 18)
Drilling	4.10	0.96	4.88: I use the required personal protection equipment. (item 18)	1.91: The emergency preparedness is good. (item 31)	1.42: Sometimes I work even if I am actually too tired. (item 4)	0.44: I use the required personal protection equipment. (item 18)
Well service	3.87	0.98	4.87: I use the required personal protection equipment. (item 18)	1.91: Different procedures and different routines at the different installations can be a threat to safety. (item 46)	1.44: Sometimes I work even if I am actually too tired. (item 4)	0.45: I use the required personal protection equipment. (item 18)
Catering	3.92	1.03	4.78: A work place with good HSE conditions means a lot to me. (item 14)	1.95: The emergency preparedness is good. (item 31)	1.39: I find it unpleasant to call attention to breaches in the safety regulations. (item 10)	0.56: I use the required personal protection equipment. (item 18)
Construction/ Modification	3.96	0.97	4.87: I use the required personal protection equipment. (item 18)	1.93: The emergency preparedness is good. (item 31)	1.35: You can easily be perceived as quarrelsome if you call attention to dangerous conditions. (item 15)	0.48: I use the required personal protection equipment. (item 18)
Maintenance	3.93	1.00	4.81: I use the required personal protection equipment. (item 18)	2.01: The emergency preparedness is good. (item 31)	1.38: You can easily be perceived as quarrelsome if you call attention to dangerous conditions. (item 15)	0.53: I use the required personal protection equipment. (item 18)

Work Area	Mean score	Mean std.	Highest mean score	Lowest mean score	Highest st. dev.	Lowest st. dev.
Crane/Deck	3.96	1.01	4.86: I use the required personal protection equipment. (item 18)	1.94: The emergency preparedness is good. (item 31)	1.43: You can easily be perceived as quarrelsome if you call attention to dangerous conditions. (item 15)	0.5: I use the required personal protection equipment. (item 18)

3.4.2 Employees' Use of Different Mindful Safety Practices

To explore whether differences could be found in the relationship between employees' willingness to use different mindful safety practices within the seven work areas, separate Pearson product-moment correlations of the three items on self-reported use of mindful safety practices were performed based on the data obtained within the seven work areas (see Table 14). The original study suggested that no major differences would be found.

Table 14. Product-moment correlations between the three items on the self-reported use of mindful safety practices for each of the seven work areas separately.

Items	**Work Area**	**Item 33:** I ask my colleagues to stop working, if I find that they perform their activities in a manner that threatens safety	**Item 36:** If I observe dangerous situations, I report on these
Item 25: I stop working if I find that continuing could imply a danger to myself or to others	**Process**[25]	r = .21**	r = .24***
	Drilling[26]	r = .32**	r = .26**
	Well Service[27]	r = .38**	r = .34***
	Catering[28]	r = .25***	r = .33**
	Construction/ Modification[29]	r = .29***	r = .18***
	Maintenance[30]	r = .25**	r = .22**
	Crane/Deck[31]	r = .39***	r = .50**
Item 33: I ask my colleagues to stop working, if I find that they perform their activities in a manner that threatens safety	**Process**		r = .39***
	Drilling		r = .53**
	Well Service		r = .48**
	Catering		r = .45**
	Construction/ Modification		r = .52**
	Maintenance		r = .43**
	Crane/Deck		r = .47**

**$p < .01$. ***$p < .001$

[25] N = 1083, casewise deletion of missing data.
[26] N = 1449, casewise deletion of missing data.
[27] N = 583, casewise deletion of missing data.
[28] N = 701, casewise deletion of missing data.
[29] N = 533, casewise deletion of missing data.
[30] N = 2235, casewise deletion of missing data
[31] N = 478, casewise deletion of missing data

As in the original study, the outcome of the analyses suggested that no major differences existed between the employees' willingness to use mindful safety practices within the seven work areas: The correlation coefficient obtained when correlating the two items that referred to mindful safety practices directed at other persons (item 33 and item 36), was higher than the correlation coefficients obtained when these items were correlated with the item on a mindful safety practice that only involved the respondent him or her self (item 25). In the original study, the work area *well service* had constituted an exception from this pattern of result in the sense that all three correlation coefficients were highly similar. In the replication study, the results obtained for the work area well service reflected the overall pattern. However, the work area *crane/deck*, which had not been distinguished as a separate work area in the original study, now constituted an exception: Within this work area, the highest correlation coefficient was obtained when item 25 was correlated with item 36. No obvious cause can be determined for the above deviations.

3.4.3 The Relationship between the Use of Mindful Safety Practices and the Contextual Factors

For each of the seven work-area datasets, the three items on self-reported use of mindful safety practices were correlated with the contextual-factor variables (see Appendix 3). The results obtained from the corresponding analyses in the original study had provided similar results to the results obtained based on the analyses of the overall data set. The replication study demonstrated highly similar findings: The correlation coefficients were markedly higher in correlations that involved group-level factors, than in correlations that involved individual-level and organizational-level factors. In addition, the correlation coefficients obtained with group-level factors were higher for the items that referred to mindful safety practices directed at other persons (item 33 and 36), than for the item that referred to the mindful safety practice directed at the respondent him or her self. The analyses performed based on data from the work areas *catering* and *crane/deck* constituted exceptions. Within these work areas, the correlation coefficients obtained between item 25 and the contextual factors at the group level – were of similar strength (not lower) to the correlation coefficients obtained in correlations between the contextual factors at the group level and items 33 and 36.

3.4.4 Comparisons between the Seven Work Areas

3.4.4.1 Comparisons of the Use of Mindful Safety Practices between the Seven Work Areas

The original study suggested that employees' willingness to use mindful safety practices might be higher in work areas where the staff in general could be assumed to hold a (comparatively) *higher level of familiarity with their local work environment*, such as e.g. *process* and *drilling*, as compared to work areas where staff in general could be assumed to hold a (comparatively) lower level of familiarity with their local work environment. The assumed general lower 'level of familiarity' was based on the fact that staff within these work areas (e.g. *well service*) would generally spend less continuous time on the same installation, than staff in other work areas (e.g. *drilling* and *process*). Separate *Kruskal-Wallis One-Way ANOVA by Ranks test* and the *Median test* were performed for each of the three items on self-reported use of

mindful safety practices (items 25, 33, and 36) across the seven work areas. Below the post-hoc comparisons of mean ranks of all pairs of groups are reported (see section 2.3).

Table 15. Comparison of respondents' self-reported use of the mindful safety practice "I stop working if I find that continuing could imply a danger to myself or to others" (item 25) between the seven work areas.

Multiple Comparisons of mean ranks for all groups, p values (2-tailed); Item 25. Kruskal-Wallis test: H (6, N= 7145) = 108.41 p = .000							
	Process R: 3622.7	**Drilling** R: 3606.0	**Well Service** R: 3362.9	**Catering** R: 3128.8	**Construction/ Modification** R: 3678.0	**Maintenance** R: 3659.4	**Crane/ Deck** R: 3754.9
Process		1.00	0.29	0.00*	1.00	1.00	1.00
Drilling			0.33	0.00*	1.00	1.00	1.00
Well Service				0.87	0.22	0.04*	0.04*
Catering					0.00*	0.00*	0.00*
Construction/ Modification						1.00	1.00
Maintenance							1.00

The analysis of item 25 showed that the mindful safety practice "I stop working if I find that continuing could imply a danger to myself or to others" was used significantly more in the work areas *process* and *drilling* than in the work area *catering*, and significantly less in the work area *well service* than in the work areas *maintenance* and *crane/deck.*

Table 16. Comparison of respondents' self-reported use of the mindful safety practice "I ask my colleagues to stop working, if I find that they perform their activities in a manner that threatens safety" (item 33) between the seven work areas.

Multiple Comparisons of mean ranks for all groups, p values (2-tailed); Item 33. Kruskal-Wallis test: H (6, N= 7119) = 78,53 p = .000							
	Process R: 3518	**Drilling** R: 3827.9	**Well Service** R: 3651.5	**Catering** R: 3119.1	**Construction/ Modification** R: 3591.3	**Maintenance** R: 3442.8	**Crane/ Deck** R: 3748.4
Process		0.00*	1.00	0.05	1.00	1.00	0.85
Drilling			1.00	0.00*	0.48	0.00*	1.00
Well Service				0.00*	1.00	0.60	1.00
Catering					0.03*	0.24	0.00*
Construction/ Modification						1.00	1.00
Maintenance							0.07

The analysis on item 33 showed that the mindful safety practice "I ask my colleagues to stop working, if I find that they perform their activities in a manner that threatens safety" was used significantly less in the work area *process* than in the work area *drilling*, and further significantly more in the work area *drilling* than in the work areas *catering* and *maintenance*. The practice was further used significantly more in the work area *well service* than in the work area *catering*, and significantly less in the work area *catering* than in the work areas *construction/modification* and *crane/deck.*

Table 17. Comparison of respondents' self-reported use of the mindful safety practice "If I observe dangerous situations, I report on these" (item 36) between the seven work areas.

Multiple Comparisons of mean ranks for all groups, p values (2-tailed); Item 36. Kruskal-Wallis test: H (5, N= 7133) = 50.50 p = .000							
	Process R: 3670.2	**Drilling** R: 3744.1	**Well Service** R: 3377.3	**Catering** R: 3585.6	**Construction/ Modification** R: 3443.6	**Maintenance** R: 3446	**Crane/ Deck** R: 3698.2
Process		1.00	0.11	1.00	0.77	0.07	1.00
Drilling			0.01*	1.00	0.08	0.00*	1.00
Well Service				1.00	1.00	1.00	0.24
Catering					1.00	1.00	1.00
Construction/ Modification						1.00	1.00
Maintenance							0.31

The analysis on item 36 showed that the mindful safety practice "If I observe dangerous situations, I report on these" was used significantly more in the work area *drilling* than in the work areas *well service* and *maintenance*. No other significant differences were found.

The above results do not replicate the finding in the original study. Except for the analysis of item 36, where the mindful safety practice "If I observe dangerous situations, I report on these" was reported to be used significantly more in the work area *drilling* than in the work areas *well service* no other significant differences were found between the work areas comprising staff with relatively higher levels of familiarity with their local work environment (e.g., process/drilling), and work areas comprising staff with relatively lower level of familiarity with their local work environment (e.g., well service). The analysis of item 33 even showed a significant difference in use of the mindful safety practice "I ask my colleagues to stop working, if I find that they perform their activities in a manner that threatens safety" *between* the work areas *process* and *drilling*: Mindful safety practices were reported to be used significantly more in the work area *drilling* than in the work area *process*.

3.4.4.2 Comparisons of Contextual Factors between the Seven Work Areas

As in the original study, the extent to which the contextual factors contributed to distinguish employees' willingness to use mindful safety practices within the seven work areas (see section 3.4.4.1) was assessed using *Kruskal-Wallis One-Way ANOVA by Ranks test* and the *Median Test* (see Table 18). If differences were found in the respondents' evaluation of the contextual factors between the work areas, as compared to the findings in the original study, this might further contribute to explain why the results related to familiarity (see the previous section) were not replicated.

Table 18. Summary of the outcomes of multiple comparisons of mean ranks for all groups, p values (2-tailed) between the seven work areas. Kruskal-Wallis test. Note: Only significant results are reported. ">" implies that the work area (as specified for the column) is significantly higher/better in terms of the particular index/item (as specified for the row) than the work area following the sign. Bold text implies that the result was similar to the result obtained in the original study (ref. Table 19 in Skjerve, 2005). Details can be found in Appendix 4.

Work Area: **Indexes/Items:**	**Process**	**Drilling**	**Well Service**	**Catering**	**Construction/ modification (Con/mod)**	**Maintenance**	**Crane/deck**
Individual level							
Age	**> Drilling** **> Well service**	**< Process** **> Well service** **< Catering** < Con./mod. **< Maintenance** < Crane/deck	**< Process** **< Drilling** **< Catering** **< Con./mod.** **< Maintenance** < Crane/deck	**> Drilling** **> Well service**	> Drilling **> Well service** < Crane/deck	**> Drilling** **> Well service**	> Drilling > Well service > Con./mod.
Time in job position offshore	**> Drilling** **> Well service** > Con./mod.	< Process **> Well service** < Crane/deck	**< Process** **< Drilling** < Catering **< Maintenance** < Crane/deck	**> Well service**	< Process < Crane/deck	**> Well service**	> Drilling > Well service > Con./mod.
Overall health State	No differences	> Maintenance > Crane/deck	No differences	No differences	No differences	> Drilling	> Drilling
Group level							
Task performance environment	< Drilling **> Well service**	> Process **> Well service** > Catering > Maintenance	**< Process** **< Drilling** < Con./mod. **< Maintenance** < Crane/deck	< Drilling	> Well service	< Drilling > Well service	> Well service

Work Area: **Indexes/Items:**	**Process**	**Drilling**	**Well Service**	**Catering**	**Construction/ modification (Con/mod)**	**Maintenance**	**Crane/deck**
The psychological work environment	**< Drilling** < Well service < Catering	**> Process** **> Maintenance** > Crane/deck	> Process > Maintenance	> Process > Maintenance		**< Drilling** < Well service < Catering	> Drilling
Managers' attitude to HSE	**< Drilling**	**> Process** **> Well service** **> Catering** **> Con./mod.** **> Maintenance** > Crane/deck	**< Drilling** **< Maintenance**	**< Drilling**	< Drilling	**< Drilling** **> Well service**	< Drilling
Colleagues' use of mindful safety practices	**< Drilling** < Crane/deck	**> Process** **> Catering** **> Con./mod.** **> Maintenance**	> Catering	**< Drilling** < Well service < Maintenance < Crane/deck	< Drilling < Crane/deck	**< Drilling** > Catering < Crane/deck	< Process > Catering > Con./mod. > Maintenance
Organizational level							
Overall work environment	< Drilling > Well service > Catering > Maintenance	> Process > Well service > Catering > Con./mod. > Maintenance	< Process < Drilling < Catering < Maintenance < Crane/deck	< Process < Drilling > Well service	< Process < Drilling	< Process < Drilling > Well service	< Drilling > Well service
The physical work environment	< Drilling **> Well service** **< Catering**	> Process **> Well service** > Maintenance	**< Process** **< Drilling** **< Catering** **< Con./mod.** < Crane/deck	**> Process** **> Well service** > Con./mod. **> Maintenance**	< Drilling < Catering	< Drilling **< Catering** < Crane/deck	> Well service > Maintenance

Work Area: **Indexes/Items:**	**Process**	**Drilling**	**Well Service**	**Catering**	**Construction/ modification (Con/mod)**	**Maintenance**	**Crane/deck**
Spare-time and rest facilities	**> Well service** **< Catering** **< Con./mod.**	**> Well service** **> Maintenance**	**< Process** **< Drilling** **< Catering** **< Con./mod.** < Maintenance < Crane/deck	**> Process** **> Well service** **> Maintenance** > Crane/deck	**> Process** **> Well service** > Maintenance	< Drilling **> Well service** < Catering < Con./mod.	> Well service < Catering
Perceived risk level	**< Drilling**	**> Process** **> Well service** **> Catering** > Con./mod. **> Maintenance**	**< Drilling**	**< Drilling**	< Drilling	**< Drilling**	

The outcomes of these analyses were in general highly similar to the outcomes of the original study: The results suggested that staff in the work area *drilling* in general provided significantly better scores in terms of the contextual factors at the group level and organizational level, as compared to the staff in the other work areas. The results also suggested that staff in the work area *well service*, generally (except for the group-level factor *psychological work environment*) tended provide lower scores on the above factors, as compared to the other work areas. Still, as compared to the original study, clear differences were found in the results referring to the organizational-level variable *overall work environment*: In the original study, no significant results had been obtained for this variable, but in the replication study various significant results were obtained. The reason for the increased sensitivity of this variable is undecided.

3.4.4.3 Implications of the Comparisons

The replication study did not reproduce the results obtained in the original study with respect to work area differences: Overall, no differences were found between the work areas comprising staff with relatively higher levels of familiarity with their local work environment, and work areas comprising staff with relatively lower level of familiarity with their local work environment (see section 3.4.4.1). No clear indications on why the outcome of the original study was not reproduced in this respect can, however, be found from the results.

There could be several reasons why the corresponding results obtained in the original study were no reproduced: The dataset on which the replication study was based might hold too limited variation for differences of this type/size of effect to be uncovered. In addition, potential changes within the work areas from 2001 to 2003/2004 in terms of e.g., educational approach or safety management practices could imply that employees' use mindful safety practices differently. Furthermore, staff working with crane/deck was only separate in a distinct work area in the 2003/2004-survey. Still, another explanation could be that the interpretations of the results obtained in the original study were wrong.

Table 19. The number of respondents in the original study and the replication study distributed across work areas.

Work Area	**Original Study**		**Replication Study**	
	N	**N%**	**N**	**N%**
Process	523	17.9	1108	15.4
Drilling	762	26	1480	20.5
Well service	205	7	589	8.2
Catering	319	10.9	733	10.2
Construction / Modification	215	7.3	542	7.5
Maintenance	904	30.9	2272	31.5
Crane/Deck			483	6.7

From Table 19 it can be seen that the *relative* number of respondents in the work area *drilling* was reduced by 5,5 % from the original to the replication study, whereas the relative number of respondents in the other work areas contained in the original study was quite similar. It might be that the introduction of *crane/deck* as a separate work area most markedly impacted the characteristics of the work area *drilling*. Unfortunately, it is not possible to test this suggestion, since it the author cannot reliably transfer the respondents in the *crane/deck* work area to the work areas in which they would have been included, if only the six original work areas had been applied in the 2003/2004-survey.

4 Discussion

The outcomes of the *original study* lead to three suggestions concerning the influence of contextual factors on employees' *willingness* to use mindful safety practices at Norwegian petroleum installations:

1. The factors that influence employees' willingness to use mindful safety practices may differ depending on whether the *object* of a practice is the employee him or herself or other persons.

2. Employees' willingness to use mindful safety practices is generally more affected by factors at the *group level,* i.e. factors in the local work environment, than by factors at the individual and organizational level.

3. The results indicated that higher levels of *familiarity with the local work environment* might promote the use of mindful safety practices - *at Norwegian petroleum installations*.

The results reported in *point 1 and point 2* were interpreted to suggest that safety management initiatives to increase employees' willingness to use mindful safety practices *overall* would be most efficient if directed at the local work environment of the employees, rather than at the employees' individually or at the employees that work at the installation in general. The term 'overall was applied since the results obtained indicated that this might be less the case with respect to the use of mindful safety practices directed at *their own activity* or at *the activities of other persons*. It was suggested that employees' willingness to use mindful safety practices directed at their own activity might be better accounted for by individual-level factors that were not covered in the study, such as e.g. risk acceptance and stress management capacity. The overall recommendation was, however, still seen as valid, because the multiple regression analyses had suggested that contextual factors at the group-level contributed most to explain the variation obtained – also with respect to the use of mindful safety practices directed at one's own activity. The replication study reproduced the results on which the two above suggestions were made: With respect to point 1, the results suggested that the contextual factors, which influenced employees' willingness to use mindful safety practices, to some extent differed, depending on whether the mindful safety practices were directed at *their own activity* or at *the activities of other persons*. With respect to point 2, the results indicated that employees' willingness to use mindful safety practices *overall* was more influenced

by factors at the group level, i.e., factors in the local work environment, rather than by factors at the individual and group level. The outcome of the correlations between the three items on self-reported use of mindful safety practices and the defined contextual factors demonstrated higher correlation coefficients for contextual factors at the group level, than with the contextual factors at the individual and organizational levels. This was true both in the analysis that was based on the overall data set, and in the analyses based on separate datasets from the seven work areas. In addition, the multiple regression analyses revealed that contextual factors at the group level contributed most to account for the variation obtained - both for mindful safety practices directed at the respondent's own activity and for mindful safety practices directed at the activity of other persons.

Based on the results obtained in point 1 and 2, the original study suggested two further implications for safety management practices by coupling the findings to research on group norms (Glendon and McKenna, 1995):[32]

→ Employee's willingness to use mindful safety practices might change when they are transferred to a different 'local work environment.'

→ Employee's willingness to use mindful safety practices might change when modifications are introduced in their 'local work environment.'

It was further suggested that a specific measure, which taps on the contextual factors that influence employees' willingness to use mindful safety practices, should be developed. This measure should serve as a *safety indicator* in surveys directed at assessing the overall safety level at petroleum installations. The above recommendations are maintained, following the replication study.

Based on the results reported in *point 3*, it was tentatively suggested that safety management practices should emphasise the need for employees' to get highly familiar with their local work environment. Even though the results obtained in the original study were not clear, it was seen as likely that high familiarity would facilitate the use of mindful safety practices, because the use of mindful safety practices involves large elements of knowledge-based reasoning (Skjerve, 2005).[33] The results that served as basis for the above recommendation in the original study were, however, *not* reproduced in the replication study. The implication is that the safety management practices suggested with respect to the level of work-area familiarity cannot be supported. Whether the suggestion should be dismissed altogether must depend on the outcomes of future studies.

Even though the replication study reproduced all main findings in the original study, the suggestions made based on the studies should still be considered with care. The reason is that the original study is associated with a set of constrains that may impact

[32] For further details see Skjerve (2005).

[33] It was further pointed out that employees, who held higher levels of familiarity with their local work environment, could be assumed to possess higher levels of inter-positional knowledge, i.e. knowledge about work roles other than their own (Cooke, Salas, Cannon-Bowers, and Stout, 2000). A higher level of inter-positional knowledge might contribute to increase employees' willingness to use mindful safety practices by increasing their confidence in their own ability to judge when and how these should be used.

the results, and that the replication study is associated with the same constrains: First, the response rate was around 50% (in both studies) and there is a risk that the respondents may systematically differ from employees that did not respond to the questionnaire. Second, the respondents' level of *self-reported* use of mindful safety practices might not necessarily reflect their *actual* use of mindful safety practices. The respondents' scores may most likely be biased by various heuristics, in particular by the *availability heuristic* (Tversky and Kahneman, 1973). Third, the contextual factors associated with the individual level were in most analyses covered by 1-item variables only, whereas factors at the group and organizational levels comprised more indexes. This may have reduced the possibility for uncovering relationships between the use of mindful safety practices and individual-level factors. Fourth, the identification and definition of the contextual factors contained was constrained by the items contained in the questionnaire, and the definition of the levels of familiarity associated with the work areas was based on the subjective judgments of the author. Other researchers might have identified different contextual factors and/or located the factors differently in terms of analysis level and/or outlined other work area characteristics, and could have implied that the results obtained would have been different and/or would have been interpreted differently. Still, overall the pattern of results obtained in the original study was reproduced in the replication study, and this contributes to validate the key suggestions made in the original study in terms the safety management practices. The results obtained furthermore seem plausible, as they demonstrate correspondence to the results obtained in earlier studies (see, e.g., Glendon and McKenna, 1995, Skjerve, 2005).

5 Conclusion

The purpose of the present study was to assess the extent to which the results obtained in an exploratory study, i.e., the original study, could be replicated. The purpose of the original study was to explore what type of contextual factors that might affect employees' *willingness* to use *mindful safety practice* at Norwegian petroleum installations. It was assumed that a higher number of unwarranted events would be prevented if employees intervened in situations where they *judged* that the safety level of the installation and/or of an individual employee was endangered, than if employees did not intervene in these situations. The study should contribute to the knowledge-base for development of safety management practices at the installations, i.e., to improve the basis for determining what kind of organizational initiatives that is required to facilitate the use of mindful safety practices. The replication study was performed to contribute to assess the validity of the practical suggestions with respect to safety management practices that were generated based on the results obtained in the original study.

The study replicated the main part of the results obtained in the original study. It contributed to the validation of the following recommendations made for safety management practices:

Management initiatives to increase employees' willingness to use mindful safety practices will be most efficient if directed at the local work environment of the employees rather than at the employees' individually or at the employees that work on the installation in general.

Employees' willingness to use mindful safety practices might potentially change in two situations, and should be particularly monitored when these occur:

- → Situations where employees are transferred to a new local work environment.
- → Situations where changes are introduced in the present local work environment of the employees.

It was further suggested that a specific measure, which taps on the contextual factors that influence employees' willingness to use mindful safety practices, should be develop. This measure should serve as a *safety indicator* in surveys directed at assessing the overall safety level at petroleum installations.

The results on which the tentative suggestion that safety management practices should emphasise the need for employees' to get highly familiar with their local work environment, were not replicated. Future studies will be needed to further assess the validity of this suggestion.

In conclusion it should be stressed that even though the present study overall replicate the results obtained in the original study, the methodological approach applied in both studies have limitations. For this reason, results from future studies will be needed to contribute to assess the validity of the suggestions may in terms of safety management practices at Norwegian Petroleum installations.

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8 Appendix

Appendix 1. Exploratory Factor Analysis on the Contextual Factor Variables.

Appendix 2. Separate Item Analyses for the Seven Work Areas (Part 2 of the questionnaires).

Appendix 3. Separately for the Six Work Areas: Correlations between the Three Items on Mindful Safety Practices and the Contextual Factors.

Appendix 4. Kruskal- Wallis Tests on the Contextual Factors for the Seven Work Areas

Appendix 1. Exploratory Factor Analysis on the Contextual Factor Variables

Factor Loadings (Varimax normalized) Extraction: Principal components			
	Organizational-Level Factor (Factor 1)	**Individual-Level Factor (Factor 2)**	**Group-Level Factor (Factor 3)**
Age	0.06	0.90*	0.04
Time in position offshore	-0.03	0.89*	0.03
Overall health state	0.40	-0.33	0.07
Task performance environment	0.28	0.09	0.80*
Managers' attitude to HSE	0.33	0.03	0.77*
The psychological work environment	0.59(!)	-0.06	0.48
Colleagues' use of mindful safety practices	-0,01	-0.06	0.80*
Overall work environment	0.51(*)	0.07	0.53
Perceived risk level	0.60(*)	0.05	0.08
The physical work environment	0.81*	-0.01	0.29
Spare-time and rest facilities	0.79*	-0.01	0.16
Expl.Var	2.58	1.73	2.50
Prp.Totl	0,24	0.16	0.23

Max. Factors allowed = 6.

* = loadings > .70.

(*) = tentative loadings.

'(!)' = Variables that tend to load on another factor that the one it was hypothesised to be associated with.

Eigenvalues (RNNS-2003-main.sta) Extraction: Principal components				
Factor Number	Eigenvalue	% Total	Cumulative	Cumulative
1	3.99	36.25	3.99	36.25
2	1.74	15.85	5.73	52.10
3	1.08	9.81	6.81	61.91

Appendix 2. Separate Item Analyses for the Seven Work Areas (Part 2 of the RNNS Questionnaires)

Work Area: Process

Item number and content	Valid N	Mean	Mini-mum	Maxi-mum	Std.Dev.
1. High-risk work operations are always carefully gone through before they are initiated. (R)	1099	4.60	1	5	0.63
2. Some times I feel under pressure to work in a manner that threatens safety.	1099	4.29	1	5	1.03
3. My lack of familiarity with new technology may sometimes contribute to increase the risk for accidents.	1093	3.88	1	5	1.19
4. Sometimes I work even if I am actually too tired.	1100	3.09	1	5	1.36
5. The staffing level is sufficient to ensure that HSE is dealt with in a good manner. (R)	1094	3.42	1	5	1.28
6. I have the necessary competence to perform my job safely. (R)	1103	4.41	1	5	0.77
7. I have easy access to the necessary personal protection equipment. (R)	1105	4.72	1	5	0.64
8. Suggestions and comments from the safety delegates are being seriously dealt with by the management. (R)	1098	4.01	1	5	0.95
9. My work place is often untidy.	1101	3.85	1	5	1.04
10. I find it unpleasant to call attention to breaches in the safety regulations.	1099	3.85	1	5	1.24
11. The work permit system is always adhered to. (R)	1102	3.97	1	5	1.04
12. I can influence the HSE state at my work place. (R)	1100	4.30	1	5	0.81
13. It does happen that I breach the safety regulations to get a job done fast	1100	4.01	1	5	1.16
14. A work place with good HSE conditions means a lot to me. (R)	1100	4.83	1	5	0.49
15. You can easily be perceived as quarrelsome if you call attention to dangerous conditions.	1101	3.32	1	5	1.39
16. In practice, considerations for production are prioritised over considerations for HSE.	1103	3.26	1	5	1.30
17. Information about unwanted events is used efficiently to prevent recurrences. (R)	1098	3.97	1	5	0.99
18. I use the required personal protection equipment. (R)	1099	4.80	1	5	0.48

Item number and content	Valid N	Mean	Mini-mum	Maxi-mum	Std.Dev.
19. I do not participate actively in the safety meetings.	1099	4.07	1	5	1.20
20. From the perspective of personal career, it is a disadvantage to be too concerned with HSE.	1096	3.86	1	5	1.22
21. Communication between me and my colleagues often fails in such a manner that dangerous situations may arise.	1100	4.47	1	5	0.79
22. The laws and regulations associated with HSE are inadequate.	1097	3.54	1	5	1.15
23. Preferably, I do not discuss issues related to HSE with my immediate leader.	1101	4.42	1	5	0.88
24. Insufficient maintenance has lead to poorer safety.	1098	2.91	1	5	1.31
25. I stop working if I find that continuing could imply a danger to myself or to others. (R)	1098	4.73	1	5	0.73
26. My leader appreciates that I call attention to issues of importance to HSE. (R)	1101	4.28	1	5	0.90
27. I have received sufficient HSE education and training. (R)	1100	4.03	1	5	0.89
28. My colleagues will stop me if I work in a risky manner. (R)	1096	4.16	1	5	0.83
29. I doubt if I will be able to perform my emergency tasks in a crisis situation.	1096	4.28	1	5	0.93
30. Often parallel work operations lead to dangerous situations.	1096	3.57	1	5	1.22
31. The emergency preparedness is good. (R)	1099	1.90	1	5	0.93
32. Reports about accidents or dangerous situations often become “trimmed”/”touched up.”	1094	3.51	1	5	1.26
33. I ask my colleagues to stop working, if I find that they perform their activities in a manner that threatens safety. (R)	1094	4.49	1	5	0.78
34. The company in which I work takes HSE seriously. (R)	1094	4.44	1	5	0.78
35. Insufficient co-operation between operator and contracting firms often leads to dangerous situations.	1094	3.64	1	5	1.17
36. If I observe dangerous situations, I report on these. (R)	1094	4.72	2	5	0.53
37. Safety has first priority when I perform my job. (R)	1093	4.71	1	5	0.53
38. My leader is engaged in the HSE work at the installation. (R)	1093	4.31	1	5	0.85

Item number and content	Valid N	Mean	Mini-mum	Maxi-mum	Std.Dev.
39. It is easy to report to the nurse/company health service about afflictions and illnesses that might be associated with the job. (R)	1094	4.32	1	5	0.97
40. My colleagues are very engaged in HSE. (R)	1093	4.22	1	5	0.74
41. I am uncertain about my role in the emergency management organization.	1091	4.55	1	5	0.92
42. The safety delegates do a good job. (R)	1093	4.15	1	5	0.88
43. I think it is easy to find my way in regulating documents (requirements and procedures). (R)	1097	2.83	1	5	1.31
44. I always know whom in the organization that I shall report to. (R)	1095	4.26	1	5	1.03
45. The HSE procedures adequately cover my tasks. (R)	1090	4.00	1	5	0.91
46. Different procedures and different routines at the different installations can be a threat to safety.	1091	2.23	1	5	1.10
47. I feel sufficiently rested when I am at work (R)	1093	3.79	1	5	1.06
48. The equipment I need to work safely is easily accessible (R)	1095	4.14	1	5	0.92
AVERAGE		**3.98**			**0.97**

Work Area: Drilling

Item number and content	Valid N	Mean	Mini-mum	Maxi-mum	Std.Dev.
1. High-risk work operations are always carefully gone through before they are initiated. (R)	1464	4.69	1	5	0.61
2. Some times I feel under pressure to work in a manner that threatens safety.	1467	4.38	1	5	1.03
3. My lack of familiarity with new technology may sometimes contribute to increase the risk for accidents.	1466	4.18	1	5	1.08
4. Sometimes I work even if I am actually too tired.	1458	3.17	1	5	1.42
5. The staffing level is sufficient to ensure that HSE is dealt with in a good manner. (R)	1465	3.89	1	5	1.18
6. I have the necessary competence to perform my job safely. (R)	1466	4.69	1	5	0.67

Item number and content	Valid N	Mean	Mini-mum	Maxi-mum	Std.Dev.
7. I have easy access to the necessary personal protection equipment. (R)	1469	4.77	1	5	0.61
8. Suggestions and comments from the safety delegates are being seriously dealt with by the management. (R)	1461	4.24	1	5	0.88
9. My work place is often untidy.	1462	3.86	1	5	1.14
10. I find it unpleasant to call attention to breaches in the safety regulations.	1465	3.79	1	5	1.28
11. The work permit system is always adhered to. (R)	1462	4.26	1	5	0.94
12. I can influence the HSE state at my work place. (R)	1467	4.44	1	5	0.83
13. It does happen that I breach the safety regulations to get a job done fast	1466	4.14	1	5	1.14
14. A work place with good HSE conditions means a lot to me. (R)	1463	4.79	1	5	0.55
15. You can easily be perceived as quarrelsome if you call attention to dangerous conditions.	1462	3.59	1	5	1.33
16. In practice, considerations for production are prioritised over considerations for HSE.	1463	3.40	1	5	1.28
17. Information about unwanted events is used efficiently to prevent recurrences. (R)	1467	4.24	1	5	0.88
18. I use the required personal protection equipment. (R)	1465	4.88	1	5	0.44
19. I do not participate actively in the safety meetings.	1465	3.95	1	5	1.24
20. From the perspective of personal career, it is a disadvantage to be too concerned with HSE.	1469	4.13	1	5	1.13
21. Communication between me and my colleagues often fails in such a manner that dangerous situations may arise.	1470	4.56	1	5	0.80
22. The laws and regulations associated with HSE are inadequate.	1466	3.65	1	5	1.16
23. Preferably, I do not discuss issues related to HSE with my immediate leader.	1468	4.50	1	5	0.86
24. Insufficient maintenance has lead to poorer safety.	1465	3.28	1	5	1.35
25. I stop working if I find that continuing could imply a danger to myself or to others. (R)	1462	4.72	1	5	0.74

Item number and content	Valid N	Mean	Mini-mum	Maxi-mum	Std.Dev.
26. My leader appreciates that I call attention to issues of importance to HSE. (R)	1465	4.52	1	5	0.80
27. I have received sufficient HSE education and training. (R)	1465	4.21	1	5	0.86
28. My colleagues will stop me if I work in a risky manner. (R)	1467	4.36	1	5	0.80
29. I doubt if I will be able to perform my emergency tasks in a crisis situation.	1453	4.31	1	5	0.94
30. Often parallel work operations lead to dangerous situations.	1468	3.63	1	5	1.23
31. The emergency preparedness is good. (R)	1463	1.91	1	5	0.96
32. Reports about accidents or dangerous situations often become “trimmed”/”touched up.”	1460	3.58	1	5	1.28
33. I ask my colleagues to stop working, if I find that they perform their activities in a manner that threatens safety. (R)	1460	4.61	1	5	0.69
34. The company in which I work takes HSE seriously. (R)	1465	4.68	1	5	0.66
35. Insufficient co-operation between operator and contracting firms often leads to dangerous situations.	1461	3.77	1	5	1.26
36. If I observe dangerous situations, I report on these. (R)	1469	4.74	1	5	0.53
37. Safety has first priority when I perform my job. (R)	1465	4.70	1	5	0.59
38. My leader is engaged in the HSE work at the installation. (R)	1464	4.36	1	5	0.90
39. It is easy to report to the nurse/company health service about afflictions and illnesses that might be associated with the job. (R)	1457	4.30	1	5	0.99
40. My colleagues are very engaged in HSE. (R)	1465	4.24	1	5	0.77
41. I am uncertain about my role in the emergency management organization.	1450	4.40	1	5	1.02
42. The safety delegates do a good job. (R)	1462	4.05	1	5	0.87
43. I think it is easy to find my way in regulating documents (requirements and procedures). (R)	1463	3.17	1	5	1.21
44. I always know whom in the organization that I shall report to. (R)	1464	4.37	1	5	0.97
45. The HSE procedures adequately cover my tasks. (R)	1464	4.22	1	5	0.86

Item number and content	Valid N	Mean	Mini-mum	Maxi-mum	Std.Dev.
46. Different procedures and different routines at the different installations can be a threat to safety.	1457	2.29	1	5	1.18
47. I feel sufficiently rested when I am at work (R)	1466	3.92	1	5	1.07
48. The equipment I need to work safely is easily accessible (R)	1465	4.33	1	5	0.83
AVERAGE		**4.10**			**0.96**

Work Area: Well Service

Item number and content	Valid N	Mean	Mini-mum	Maxi-mum	Std.Dev.
1. High-risk work operations are always carefully gone through before they are initiated. (R)	583	4.57	1	5	0.63
2. Some times I feel under pressure to work in a manner that threatens safety.	583	3.89	1	5	1.29
3. My lack of familiarity with new technology may sometimes contribute to increase the risk for accidents.	581	4.12	1	5	1.11
4. Sometimes I work even if I am actually too tired.	583	2.78	1	5	1.44
5. The staffing level is sufficient to ensure that HSE is dealt with in a good manner. (R)	580	3.63	1	5	1.16
6. I have the necessary competence to perform my job safely. (R)	584	4.65	1	5	0.65
7. I have easy access to the necessary personal protection equipment. (R)	584	4.65	1	5	0.70
8. Suggestions and comments from the safety delegates are being seriously dealt with by the management. (R)	579	3.93	1	5	0.93
9. My work place is often untidy.	579	3.74	1	5	1.10
10. I find it unpleasant to call attention to breaches in the safety regulations.	583	3.45	1	5	1.33
11. The work permit system is always adhered to. (R)	581	4.15	1	5	0.99
12. I can influence the HSE state at my work place. (R)	582	4.35	1	5	0.81
13. It does happen that I breach the safety regulations to get a job done fast	586	3.98	1	5	1.20
14. A work place with good HSE conditions means a lot to me. (R)	584	4.76	1	5	0.60

Item number and content	Valid N	Mean	Mini-mum	Maxi-mum	Std.Dev.
15. You can easily be perceived as quarrelsome if you call attention to dangerous conditions.	579	3.14	1	5	1.36
16. In practice. considerations for production are prioritised over considerations for HSE.	588	2.86	1	5	1.28
17. Information about unwanted events is used efficiently to prevent recurrences. (R)	583	3.95	1	5	0.94
18. I use the required personal protection equipment. (R)	587	4.87	1	5	0.45
19. I do not participate actively in the safety meetings.	587	3.81	1	5	1.22
20. From the perspective of personal career. it is a disadvantage to be too concerned with HSE.	587	3.92	1	5	1.19
21. Communication between me and my colleagues often fails in such a manner that dangerous situations may arise.	589	4.50	1	5	0.79
22. The laws and regulations associated with HSE are inadequate.	588	3.44	1	5	1.14
23. Preferably. I do not discuss issues related to HSE with my immediate leader.	587	4.43	1	5	0.87
24. Insufficient maintenance has lead to poorer safety.	583	2.88	1	5	1.31
25. I stop working if I find that continuing could imply a danger to myself or to others. (R)	587	4.65	1	5	0.74
26. My leader appreciates that I call attention to issues of importance to HSE. (R)	587	4.36	1	5	0.87
27. I have received sufficient HSE education and training. (R)	587	3.91	1	5	0.99
28. My colleagues will stop me if I work in a risky manner. (R)	589	4.25	1	5	0.82
29. I doubt if I will be able to perform my emergency tasks in a crisis situation.	574	4.00	1	5	0.99
30. Often parallel work operations lead to dangerous situations.	584	3.01	1	5	1.22
31. The emergency preparedness is good. (R)	585	2.14	1	5	0.94
32. Reports about accidents or dangerous situations often become “trimmed”/”touched up.”	585	2.79	1	5	1.27
33. I ask my colleagues to stop working. if I find that they perform their activities in a manner that threatens safety. (R)	588	4.56	1	5	0.68

Item number and content	Valid N	Mean	Mini-mum	Maxi-mum	Std.Dev.
34. The company in which I work takes HSE seriously. (R)	587	4.51	1	5	0.80
35. Insufficient co-operation between operator and contracting firms often leads to dangerous situations.	585	3.43	1	5	1.23
36. If I observe dangerous situations. I report on these. (R)	586	4.61	1	5	0.63
37. Safety has first priority when I perform my job. (R)	588	4.65	2	5	0.55
38. My leader is engaged in the HSE work at the installation. (R)	586	4.03	1	5	1.00
39. It is easy to report to the nurse/company health service about afflictions and illnesses that might be associated with the job. (R)	587	4.09	1	5	1.00
40. My colleagues are very engaged in HSE. (R)	586	4.02	1	5	0.78
41. I am uncertain about my role in the emergency management organization.	574	4.03	1	5	1.08
42. The safety delegates do a good job. (R)	583	3.91	1	5	0.82
43. I think it is easy to find my way in regulating documents (requirements and procedures). (R)	587	2.84	1	5	1.15
44. I always know whom in the organization that I shall report to. (R)	589	3.99	1	5	1.16
45. The HSE procedures adequately cover my tasks. (R)	589	4.04	1	5	0.86
46. Different procedures and different routines at the different installations can be a threat to safety.	586	1.91	1	5	1.08
47. I feel sufficiently rested when I am at work (R)	587	3.55	1	5	1.17
48. The equipment I need to work safely is easily accessible (R)	587	4.12	1	5	0.92
AVERAGE		**3.87**			**0.98**

Work Area: Catering

Item number and content	Valid N	Mean	Mini-mum	Maxi-mum	Std.Dev.
1. High-risk work operations are always carefully gone through before they are initiated. (R)	714	4.29	1	5	0.89

Item number and content	Valid N	Mean	Mini-mum	Maxi-mum	Std.Dev.
2. Some times I feel under pressure to work in a manner that threatens safety.	709	4.15	1	5	1.17
3. My lack of familiarity with new technology may sometimes contribute to increase the risk for accidents.	705	4.11	1	5	1.13
4. Sometimes I work even if I am actually too tired.	714	2.89	1	5	1.39
5. The staffing level is sufficient to ensure that HSE is dealt with in a good manner. (R)	717	3.50	1	5	1.29
6. I have the necessary competence to perform my job safely. (R)	724	4.66	1	5	0.73
7. I have easy access to the necessary personal protection equipment. (R)	728	4.72	1	5	0.72
8. Suggestions and comments from the safety delegates are being seriously dealt with by the management. (R)	724	4.04	1	5	1.00
9. My work place is often untidy.	717	4.00	1	5	1.17
10. I find it unpleasant to call attention to breaches in the safety regulations.	721	3.48	1	5	1.39
11. The work permit system is always adhered to. (R)	653	3.70	1	5	0.99
12. I can influence the HSE state at my work place. (R)	719	4.19	1	5	0.93
13. It does happen that I breach the safety regulations to get a job done fast	722	3.82	1	5	1.33
14. A work place with good HSE conditions means a lot to me. (R)	723	4.78	1	5	0.62
15. You can easily be perceived as quarrelsome if you call attention to dangerous conditions.	722	3.23	1	5	1.37
16. In practice. considerations for production are prioritised over considerations for HSE.	707	3.00	1	5	1.27
17. Information about unwanted events is used efficiently to prevent recurrences. (R)	719	4.17	1	5	0.95
18. I use the required personal protection equipment. (R)	726	4.75	1	5	0.56
19. I do not participate actively in the safety meetings.	718	3.85	1	5	1.35
20. From the perspective of personal career. it is a disadvantage to be too concerned with HSE.	714	4.00	1	5	1.18

Item number and content	Valid N	Mean	Mini-mum	Maxi-mum	Std.Dev.
21. Communication between me and my colleagues often fails in such a manner that dangerous situations may arise.	723	4.46	1	5	0.90
22. The laws and regulations associated with HSE are inadequate.	711	3.61	1	5	1.13
23. Preferably. I do not discuss issues related to HSE with my immediate leader.	724	4.30	1	5	1.02
24. Insufficient maintenance has lead to poorer safety.	714	3.03	1	5	1.31
25. I stop working if I find that continuing could imply a danger to myself or to others. (R)	718	4.49	1	5	0.94
26. My leader appreciates that I call attention to issues of importance to HSE. (R)	722	4.36	1	5	0.94
27. I have received sufficient HSE education and training. (R)	718	4.04	1	5	0.99
28. My colleagues will stop me if I work in a risky manner. (R)	715	3.99	1	5	1.00
29. I doubt if I will be able to perform my emergency tasks in a crisis situation.	716	3.99	1	5	1.10
30. Often parallel work operations lead to dangerous situations.	690	3.48	1	5	1.05
31. The emergency preparedness is good. (R)	710	1.95	1	5	1.00
32. Reports about accidents or dangerous situations often become “trimmed”/”touched up.”	708	3.34	1	5	1.19
33. I ask my colleagues to stop working. if I find that they perform their activities in a manner that threatens safety. (R)	712	4.36	1	5	0.84
34. The company in which I work takes HSE seriously. (R)	720	4.38	1	5	0.91
35. Insufficient co-operation between operator and contracting firms often leads to dangerous situations.	691	3.23	1	5	1.08
36. If I observe dangerous situations. I report on these. (R)	719	4.67	1	5	0.65
37. Safety has first priority when I perform my job. (R)	718	4.48	1	5	0.72
38. My leader is engaged in the HSE work at the installation. (R)	715	4.30	1	5	0.89
39. It is easy to report to the nurse/company health service about afflictions and illnesses that might be associated with the job. (R)	717	4.27	1	5	0.99

Item number and content	Valid N	Mean	Mini-mum	Maxi-mum	Std.Dev.
40. My colleagues are very engaged in HSE. (R)	714	3.92	1	5	0.84
41. I am uncertain about my role in the emergency management organization.	702	4.36	1	5	1.10
42. The safety delegates do a good job. (R)	712	4.01	1	5	0.90
43. I think it is easy to find my way in regulating documents (requirements and procedures). (R)	709	3.13	1	5	1.17
44. I always know whom in the organization that I shall report to. (R)	715	4.09	1	5	1.12
45. The HSE procedures adequately cover my tasks. (R)	711	4.21	1	5	0.88
46. Different procedures and different routines at the different installations can be a threat to safety.	704	2.24	1	5	1.13
47. I feel sufficiently rested when I am at work (R)	716	3.65	1	5	1.21
48. The equipment I need to work safely is easily accessible (R)	715	4.40	1	5	0.84
AVERAGE		**3.92**			**1.03**

Work Area: Construction/Modification

Item number and content	Valid N	Mean	Mini-mum	Maxi-mum	Std.Dev.
1. High-risk work operations are always carefully gone through before they are initiated. (R)	536	4.62	1	5	0.66
2. Some times I feel under pressure to work in a manner that threatens safety.	538	4.32	1	5	1.06
3. My lack of familiarity with new technology may sometimes contribute to increase the risk for accidents.	537	4.09	1	5	1.12
4. Sometimes I work even if I am actually too tired.	538	3.55	1	5	1.33
5. The staffing level is sufficient to ensure that HSE is dealt with in a good manner. (R)	536	3.82	1	5	1.20
6. I have the necessary competence to perform my job safely. (R)	537	4.58	1	5	0.74
7. I have easy access to the necessary personal protection equipment. (R)	538	4.65	1	5	0.72

Item number and content	Valid N	Mean	Mini-mum	Maxi-mum	Std.Dev.
8. Suggestions and comments from the safety delegates are being seriously dealt with by the management. (R)	536	4.04	1	5	0.95
9. My work place is often untidy.	536	3.94	1	5	0.96
10. I find it unpleasant to call attention to breaches in the safety regulations.	535	3.55	1	5	1.32
11. The work permit system is always adhered to. (R)	538	4.28	1	5	0.98
12. I can influence the HSE state at my work place. (R)	536	4.30	1	5	0.88
13. It does happen that I breach the safety regulations to get a job done fast	538	4.06	1	5	1.17
14. A work place with good HSE conditions means a lot to me. (R)	538	4.74	1	5	0.66
15. You can easily be perceived as quarrelsome if you call attention to dangerous conditions.	538	3.31	1	5	1.35
16. In practice. considerations for production are prioritised over considerations for HSE.	540	2.94	1	5	1.31
17. Information about unwanted events is used efficiently to prevent recurrences. (R)	539	4.03	1	5	0.96
18. I use the required personal protection equipment. (R)	540	4.87	1	5	0.48
19. I do not participate actively in the safety meetings.	537	3.70	1	5	1.25
20. From the perspective of personal career. it is a disadvantage to be too concerned with HSE.	540	3.93	1	5	1.17
21. Communication between me and my colleagues often fails in such a manner that dangerous situations may arise.	540	4.46	1	5	0.85
22. The laws and regulations associated with HSE are inadequate.	541	3.55	1	5	1.17
23. Preferably. I do not discuss issues related to HSE with my immediate leader.	541	4.42	1	5	0.85
24. Insufficient maintenance has lead to poorer safety.	538	2.34	1	5	1.24
25. I stop working if I find that continuing could imply a danger to myself or to others. (R)	541	4.78	1	5	0.62
26. My leader appreciates that I call attention to issues of importance to HSE. (R)	538	4.42	1	5	0.77

Item number and content	Valid N	Mean	Mini-mum	Maxi-mum	Std.Dev.
27. I have received sufficient HSE education and training. (R)	540	4.18	1	5	0.90
28. My colleagues will stop me if I work in a risky manner. (R)	539	4.13	1	5	0.86
29. I doubt if I will be able to perform my emergency tasks in a crisis situation.	524	3.97	1	5	0.99
30. Often parallel work operations lead to dangerous situations.	538	3.23	1	5	1.17
31. The emergency preparedness is good. (R)	540	1.93	1	5	0.93
32. Reports about accidents or dangerous situations often become “trimmed”/”touched up.”	538	3.22	1	5	1.22
33. I ask my colleagues to stop working. if I find that they perform their activities in a manner that threatens safety. (R)	536	4.56	1	5	0.64
34. The company in which I work takes HSE seriously. (R)	538	4.48	1	5	0.81
35. Insufficient co-operation between operator and contracting firms often leads to dangerous situations.	535	3.47	1	5	1.25
36. If I observe dangerous situations. I report on these. (R)	536	4.63	1	5	0.65
37. Safety has first priority when I perform my job. (R)	538	4.68	1	5	0.53
38. My leader is engaged in the HSE work at the installation. (R)	539	4.26	1	5	0.92
39. It is easy to report to the nurse/company health service about afflictions and illnesses that might be associated with the job. (R)	535	4.13	1	5	1.04
40. My colleagues are very engaged in HSE. (R)	538	4.01	1	5	0.78
41. I am uncertain about my role in the emergency management organization.	526	4.13	1	5	1.06
42. The safety delegates do a good job. (R)	537	4.04	1	5	0.90
43. I think it is easy to find my way in regulating documents (requirements and procedures). (R)	537	3.04	1	5	1.21
44. I always know whom in the organization that I shall report to. (R)	539	4.12	1	5	1.08
45. The HSE procedures adequately cover my tasks. (R)	537	4.17	1	5	0.91

Item number and content	Valid N	Mean	Mini-mum	Maxi-mum	Std.Dev.
46. Different procedures and different routines at the different installations can be a threat to safety.	538	1.93	1	5	1.10
47. I feel sufficiently rested when I am at work (R)	539	4.06	1	5	1.04
48. The equipment I need to work safely is easily accessible (R)	537	4.26	1	5	0.83
AVERAGE		**3.96**			**0.97**

Work Area: Maintenance

Item number and content	Valid N	Mean	Mini-mum	Maxi-mum	Std.Dev.
1. High-risk work operations are always carefully gone through before they are initiated. (R)	2251	4.57	1	5	0.67
2. Some times I feel under pressure to work in a manner that threatens safety.	2240	4.20	1	5	1.14
3. My lack of familiarity with new technology may sometimes contribute to increase the risk for accidents.	2238	3.82	1	5	1.22
4. Sometimes I work even if I am actually too tired.	2246	3.37	1	5	1.37
5. The staffing level is sufficient to ensure that HSE is dealt with in a good manner. (R)	2237	3.52	1	5	1.28
6. I have the necessary competence to perform my job safely. (R)	2245	4.44	1	5	0.85
7. I have easy access to the necessary personal protection equipment. (R)	2248	4.74	1	5	0.64
8. Suggestions and comments from the safety delegates are being seriously dealt with by the management. (R)	2237	4.02	1	5	0.96
9. My work place is often untidy.	2245	3.84	1	5	1.08
10. I find it unpleasant to call attention to breaches in the safety regulations.	2238	3.48	1	5	1.34
11. The work permit system is always adhered to. (R)	2246	4.04	1	5	1.06
12. I can influence the HSE state at my work place. (R)	2249	4.25	1	5	0.87
13. It does happen that I breach the safety regulations to get a job done fast	2247	3.83	1	5	1.27
14. A work place with good HSE conditions means a lot to me. (R)	2253	4.79	1	5	0.58

Item number and content	Valid N	Mean	Mini-mum	Maxi-mum	Std.Dev.
15. You can easily be perceived as quarrelsome if you call attention to dangerous conditions.	2251	3.19	1	5	1.38
16. In practice. considerations for production are prioritised over considerations for HSE.	2256	2.91	1	5	1.28
17. Information about unwanted events is used efficiently to prevent recurrences. (R)	2256	3.99	1	5	0.97
18. I use the required personal protection equipment. (R)	2259	4.81	1	5	0.53
19. I do not participate actively in the safety meetings.	2246	3.82	1	5	1.27
20. From the perspective of personal career. it is a disadvantage to be too concerned with HSE.	2258	3.82	1	5	1.20
21. Communication between me and my colleagues often fails in such a manner that dangerous situations may arise.	2258	4.47	1	5	0.88
22. The laws and regulations associated with HSE are inadequate.	2247	3.58	1	5	1.16
23. Preferably. I do not discuss issues related to HSE with my immediate leader.	2259	4.36	1	5	0.97
24. Insufficient maintenance has lead to poorer safety.	2252	2.60	1	5	1.36
25. I stop working if I find that continuing could imply a danger to myself or to others. (R)	2257	4.74	1	5	0.74
26. My leader appreciates that I call attention to issues of importance to HSE. (R)	2259	4.35	1	5	0.86
27. I have received sufficient HSE education and training. (R)	2257	4.07	1	5	0.92
28. My colleagues will stop me if I work in a risky manner. (R)	2256	4.19	1	5	0.84
29. I doubt if I will be able to perform my emergency tasks in a crisis situation.	2216	4.11	1	5	1.01
30. Often parallel work operations lead to dangerous situations.	2252	3.39	1	5	1.20
31. The emergency preparedness is good. (R)	2249	2.01	1	5	0.99
32. Reports about accidents or dangerous situations often become “trimmed”/”touched up.”	2248	3.24	1	5	1.25
33. I ask my colleagues to stop working. if I find that they perform their activities in a manner that threatens safety. (R)	2249	4.48	1	5	0.74

Item number and content	Valid N	Mean	Mini-mum	Maxi-mum	Std.Dev.
34. The company in which I work takes HSE seriously. (R)	2252	4.43	1	5	0.82
35. Insufficient co-operation between operator and contracting firms often leads to dangerous situations.	2243	3.50	1	5	1.21
36. If I observe dangerous situations. I report on these. (R)	2249	4.63	1	5	0.63
37. Safety has first priority when I perform my job. (R)	2243	4.67	1	5	0.56
38. My leader is engaged in the HSE work at the installation. (R)	2248	4.31	1	5	0.85
39. It is easy to report to the nurse/company health service about afflictions and illnesses that might be associated with the job. (R)	2248	4.27	1	5	0.99
40. My colleagues are very engaged in HSE. (R)	2247	4.05	1	5	0.79
41. I am uncertain about my role in the emergency management organization.	2210	4.27	1	5	1.11
42. The safety delegates do a good job. (R)	2239	4.15	1	5	0.84
43. I think it is easy to find my way in regulating documents (requirements and procedures). (R)	2251	2.93	1	5	1.28
44. I always know whom in the organization that I shall report to. (R)	2253	4.09	1	5	1.11
45. The HSE procedures adequately cover my tasks. (R)	2249	4.07	1	5	0.93
46. Different procedures and different routines at the different installations can be a threat to safety.	2245	2.12	1	5	1.12
47. I feel sufficiently rested when I am at work (R)	2250	3.88	1	5	1.11
48. The equipment I need to work safely is easily accessible (R)	2252	4.27	1	5	0.87
AVERAGE		**3.93**			**1.00**

Work Area: Crane/Deck

Item number and content	Valid N	Mean	Mini-mum	Maxi-mum	Std.Dev.
1. High-risk work operations are always carefully gone through before they are initiated. (R)	479	4.57	1	5	0.67
2. Some times I feel under pressure to work in a manner that threatens safety.	473	4.13	1	5	1.19
3. My lack of familiarity with new technology may sometimes contribute to increase the risk for accidents.	477	4.04	1	5	1.13
4. Sometimes I work even if I am actually too tired.	479	3.11	1	5	1.41
5. The staffing level is sufficient to ensure that HSE is dealt with in a good manner. (R)	479	3.31	1	5	1.30
6. I have the necessary competence to perform my job safely. (R)	480	4.56	1	5	0.80
7. I have easy access to the necessary personal protection equipment. (R)	478	4.81	1	5	0.56
8. Suggestions and comments from the safety delegates are being seriously dealt with by the management. (R)	478	3.83	1	5	0.99
9. My work place is often untidy.	478	3.85	1	5	1.15
10. I find it unpleasant to call attention to breaches in the safety regulations.	477	3.56	1	5	1.37
11. The work permit system is always adhered to. (R)	475	4.13	1	5	0.99
12. I can influence the HSE state at my work place. (R)	479	4.24	1	5	0.93
13. It does happen that I breach the safety regulations to get a job done fast	482	3.86	1	5	1.26
14. A work place with good HSE conditions means a lot to me. (R)	480	4.83	1	5	0.52
15. You can easily be perceived as quarrelsome if you call attention to dangerous conditions.	479	3.08	1	5	1.43
16. In practice. considerations for production are prioritised over considerations for HSE.	479	2.97	1	5	1.25
17. Information about unwanted events is used efficiently to prevent recurrences. (R)	480	4.13	1	5	0.94
18. I use the required personal protection equipment. (R)	479	4.86	1	5	0.50
19. I do not participate actively in the safety meetings.	476	3.86	1	5	1.33

Item number and content	Valid N	Mean	Mini-mum	Maxi-mum	Std.Dev.
20. From the perspective of personal career. it is a disadvantage to be too concerned with HSE.	479	3.76	1	5	1.28
21. Communication between me and my colleagues often fails in such a manner that dangerous situations may arise.	480	4.38	1	5	0.96
22. The laws and regulations associated with HSE are inadequate.	480	3.56	1	5	1.18
23. Preferably. I do not discuss issues related to HSE with my immediate leader.	481	4.36	1	5	0.99
24. Insufficient maintenance has lead to poorer safety.	480	3.06	1	5	1.39
25. I stop working if I find that continuing could imply a danger to myself or to others. (R)	482	4.78	1	5	0.67
26. My leader appreciates that I call attention to issues of importance to HSE. (R)	480	4.35	1	5	0.90
27. I have received sufficient HSE education and training. (R)	481	4.07	1	5	0.94
28. My colleagues will stop me if I work in a risky manner. (R)	480	4.36	1	5	0.85
29. I doubt if I will be able to perform my emergency tasks in a crisis situation.	475	4.21	1	5	1.03
30. Often parallel work operations lead to dangerous situations.	476	3.34	1	5	1.25
31. The emergency preparedness is good. (R)	478	1.94	1	5	0.95
32. Reports about accidents or dangerous situations often become “trimmed”/”touched up.”	479	3.30	1	5	1.29
33. I ask my colleagues to stop working. if I find that they perform their activities in a manner that threatens safety. (R)	480	4.57	1	5	0.76
34. The company in which I work takes HSE seriously. (R)	478	4.47	1	5	0.80
35. Insufficient co-operation between operator and contracting firms often leads to dangerous situations.	478	3.58	1	5	1.25
36. If I observe dangerous situations. I report on these. (R)	480	4.71	1	5	0.60
37. Safety has first priority when I perform my job. (R)	479	4.77	1	5	0.53
38. My leader is engaged in the HSE work at the installation. (R)	478	4.24	1	5	0.96

Item number and content	Valid N	Mean	Mini-mum	Maxi-mum	Std.Dev.
39. It is easy to report to the nurse/company health service about afflictions and illnesses that might be associated with the job. (R)	479	4.23	1	5	1.02
40. My colleagues are very engaged in HSE. (R)	476	4.12	1	5	0.81
41. I am uncertain about my role in the emergency management organization.	479	4.36	1	5	1.12
42. The safety delegates do a good job. (R)	480	4.01	1	5	0.95
43. I think it is easy to find my way in regulating documents (requirements and procedures). (R)	479	3.15	1	5	1.24
44. I always know whom in the organization that I shall report to. (R)	479	4.29	1	5	0.99
45. The HSE procedures adequately cover my tasks. (R)	479	4.24	1	5	0.84
46. Different procedures and different routines at the different installations can be a threat to safety.	480	2.12	1	5	1.13
47. I feel sufficiently rested when I am at work (R)	477	3.87	1	5	1.12
48. The equipment I need to work safely is easily accessible (R)	482	4.30	1	5	0.84
AVERAGE		**3.96**			**1.01**

Appendix 3. Separately for the Six Work Areas: Correlations between the Three Items on Mindful Safety Practices and the Contextual Factors.

Work area: Process (N = 850)

	Item 25: I stop working if I find that continuing could imply a danger to myself or to others.	**Item 33:** I ask my colleagues to stop working. if I find that they perform their activities in a manner that threatens safety.	**Item 36:** If I observe dangerous situations. I report on these.
Individual Level			
Age	r = .03	r = .07*	r = .11**
Overall health state	r = .08*	r = .07*	r = .12***
Time in job position offshore	r = .01	r = .03	r = .06
Group Level			
Task performance environment	r = .20***	r = .35**	r = .49**
Managers' attitude to HSE	r = .25***	r = .31**	r = .41
Psychological work environment	r = .12**	r = .21***	r = .28***
Colleagues' use of mindful safety practices	r = .24***	r = .28***	r = .31***
Organizational Level			
Overall work environment	r = .19***	r = .21***	r = .33**
Perceived risk level	r = .10**	r = .06	r = .12**
Physical work environment	r = .11**	r = .16***	r = .22***
Spare time and rest facilities	r = .12**	r = .11**	r = .21***

*$p < .05$, **$p < .01$. ***$p < .001$

Work area: Drilling (N = 1162)

	Item 25: I stop working if I find that continuing could imply a danger to myself or to others.	**Item 33:** I ask my colleagues to stop working. if I find that they perform their activities in a manner that threatens safety.	**Item 36:** If I observe dangerous situations. I report on these.
Individual Level			
Age	r = .06*	r = .15***	r = .15***
Overall health state	r = .04	r = .02	r = .06*
Time in job position offshore	r = .05	r = .17***	r = .16***
Group Level			
Task performance environment	r = .25***	r = .44**	r = .47**
Managers' attitude to HSE	r = .30**	r = .39**	r = .41**
Psychological work environment	r = .12***	r = .24***	r = .26**

	Item 25: I stop working if I find that continuing could imply a danger to myself or to others.	**Item 33:** I ask my colleagues to stop working. if I find that they perform their activities in a manner that threatens safety.	**Item 36:** If I observe dangerous situations. I report on these.
Colleagues' use of mindful safety practices	r = .29**	r = .40**	r = .38*
Organizational Level			
Overall work environment	r = .20***	r = .29**	r = .29**
Perceived risk level	r = .11***	r = .14***	r = .10***
Physical work environment	r = .12***	r = .18***	r = .18***
Spare time and rest facilities	r = .10**	r = .15***	r = .15***

*p < .05, **p < .01. ***p < .001

Work area: Well service (N = 464)

	Item 25: I stop working if I find that continuing could imply a danger to myself or to others.	**Item 33:** I ask my colleagues to stop working. if I find that they perform their activities in a manner that threatens safety.	**Item 36:** If I observe dangerous situations. I report on these.
Individual Level			
Age	r = .07	r = .06	r = .09*
Overall health state	r = .08	r = .03	r = .12*
Time in job position offshore	r = .15**	r = .09	r = .11*
Group Level			
Task performance environment	r = .27***	r = .43**	r = .48**
Managers' attitude to HSE	r = .31***	r = .38***	r = .42**
Psychological work environment	r = .17***	r = .17***	r = .22***
Colleagues' use of mindful safety practices	r = .28***	r = .37***	r = .36***
Organizational Level			
Overall work environment	r = .20***	r = .21***	r = .27***
Perceived risk level	r = .04	r = .05	r = .05
Physical work environment	r = .18***	r = .19***	r = .23***
Spare time and rest facilities	r = .15**	r = .18***	r = .15**

*p < .05, **p < .01. ***p < .001

Work area: Catering (N = 482)

	Item 25: I stop working if I find that continuing could imply a danger to myself or to others.	**Item 33:** I ask my colleagues to stop working. if I find that they perform their activities in a manner that threatens safety.	**Item 36:** If I observe dangerous situations. I report on these.
Individual Level			
Age	r = -.04	r = .05	r = .05
Overall health state	r = .19***	r = .11*	r = .18***
Time in job position offshore	r = -.07	r = .04	r = -.04
Group Level			
Task performance environment	r = .40**	r = .40**	r = .39**
Managers' attitude to HSE	r = .30***	r = .31***	r = .30***
Psychological work environment	r = .26***	r = .24***	r = .24***
Colleagues' use of mindful safety practices	r = .30***	r = .28***	r = .21***
Organizational Level			
Overall work environment	r = .22***	r = .20***	r = .26***
Perceived risk level	r = .12**	r = .01	r = .08
Physical work environment	r = .24***	r = .20***	r = .16**
Spare time and rest facilities	r = .19***	r = .20***	r = .14**

*$p < .05$, **$p < .01$. ***$p < .001$

Work area: Construction/Modification (N = 431)

	Item 25: I stop working if I find that continuing could imply a danger to myself or to others.	**Item 33:** I ask my colleagues to stop working. if I find that they perform their activities in a manner that threatens safety.	**Item 36:** If I observe dangerous situations. I report on these.
Individual Level			
Age	r = .09	r = .16**	r = .09
Overall health state	r = -.03	r = . 11*	r = .08
Time in job position offshore	r = .02	r = . 08	r = .08
Group Level			
Task performance environment	r = .26***	r = .38***	r = .41***
Managers' attitude to HSE	r = .23***	r = .30***	r = .35***
Psychological work environment	r = .20***	r = .18***	r = .20***
Colleagues' use of mindful safety practices	r = .21***	r = .39***	r = .42**
Organizational Level			
Overall work environment	r = .07	r = .14**	r = .16**
Perceived risk level	r = .07	r = .06	r = .05
Physical work environment	r = .16**	r = .18***	r = .20***
Spare time and rest facilities	r = .13**	r = .18***	r = .19***

*$p < .05$, **$p < .01$. ***$p < .001$

Work area: Maintenance (N = 1755)

	Item 25: I stop working if I find that continuing could imply a danger to myself or to others.	**Item 33:** I ask my colleagues to stop working. if I find that they perform their activities in a manner that threatens safety.	**Item 36:** If I observe dangerous situations. I report on these.
Individual Level			
Age	r = .05*	r = .10***	r = .12***
Overall health state	r = .01	r = .06*	r = .10***
Time in job position offshore	r = .04	r = .05	r = .06*
Group Level			
Task performance environment	r = .20***	r = .36**	r = .41**
Managers' attitude to HSE	r = .21***	r = .26**	r = .32**
Psychological work environment	r = .13***	r = .18***	r = .21**
Colleagues' use of mindful safety practices	r = .21***	r = .36**	r = .33**
Organizational Level			
Overall work environment	r = .11***	r = .18***	r = .23**
Perceived risk level	r = .06*	r = .10***	r = .11***
Physical work environment	r = .08**	r = .15***	r = .19***
Spare time and rest facilities	r = .05*	r = .11***	r = .13***

*$p < .05$, **$p < .01$. ***$p < .001$

Work area: Crane/Deck (N = 362)

	Item 25: I stop working if I find that continuing could imply a danger to myself or to others.	**Item 33:** I ask my colleagues to stop working. if I find that they perform their activities in a manner that threatens safety.	**Item 36:** If I observe dangerous situations. I report on these.
Individual Level			
Age	r = .07	r = .08	r = .05
Overall health state	r = .15**	r = .13*	r = .12*
Time in job position offshore	r = .03	r = .08	r = .01
Group Level			
Task performance environment	r = .35***	r = .38***	r = .46**
Managers' attitude to HSE	r = .32***	r = .28***	r = .37***
Psychological work environment	r = .23***	r = .21***	r = .24***
Colleagues' use of mindful safety practices	r = .38***	r = .31***	r = .38***
Organizational Level			
Overall work environment	r = .16**	r = .18***	r = .19***
Perceived risk level	r = .08	r = .10*	r = .08
Physical work environment	r = .17**	r = .15**	r = .23***
Spare time and rest facilities	r = .15**	r = .13*	r = .15**

*$p < .05$, **$p < .01$. ***$p < .001$

Appendix 4. Kruskal- Wallis Tests on the Contextual Factors for the Seven Work Areas

Age Multiple Comparisons p values (2-tailed); Kruskal-Wallis test: H (6. N= 7178) =295.3017 p =0.000							
	Process R: 3890.7	**Drilling R: 3175.9**	**Well service R: 2601.7**	**Catering R: 3703.0**	**Con./ Mod. R: 3592.2**	**Mainte-nance R: 3843.5**	**Crane/ Deck R: 4001.2**
Process		0.000*	0.000*	1.000	0.127	1.000	1.000
Drilling	0.000*		0.000*	0.000*	0.001*	0.000*	0.000*
Well service	0.000*	0.000*		0.000*	0.000*	0.000*	0.000*
Catering	1.000	0.000*	0.000*		1.000	1.000	0.302
Construction/ Modification	0.127	0.001*	0.000*	1.000		0.236	0.034*
Maintenance	1.000	0.000*	0.000*	1.000	0.236		1.000
Crane/ Deck	1.000	0.000*	0.000*	0.302	0.034*	1.000	

Time in job position offshore Multiple Comparisons p values (2-tailed); Kruskal-Wallis test: H (6. N= 7150) =77.88455 p =.0000							
	Process R: 3794.6	**Drilling R: 3498.0**	**Well service R: 3048.9**	**Catering R: 3613.6**	**Con./ Mod. R: 3349.0**	**Mainte-nance R: 3627.8**	**Crane/ Deck R: 3905.8**
Process		0.000*	0.000*	1.000	0.127	1.000	1.000
Drilling		0.007*	0.000*	1.000	0.001*	0.588	1.000
Well service	0.007*		0.000*	1.000	1.000	1.000	0.004*
Catering	0.000*	0.000*		0.000*	0.311	0.000*	0.000*
Construction/ Modification	1.000	1.000	0.000*		0.508	1.000	0.343
Maintenance	0.001*	1.000	0.311	0.508		0.101	0.000*
Crane/ Deck	0.588	1.000	0.000*	1.000	0.101		0.157

Overall health state Multiple Comparisons p values (2-tailed); Kruskal-Wallis test: H (6. N= 7115) =27.79284 p =.0001							
	Process R: 3510.8	**Drilling R: 3749.7**	**Well service R: 3603.8**	**Catering R: 3566.1**	**Con./ Mod. R: 3597.0**	**Mainte-nance R: 3467.4**	**Crane/ Deck R: 3396.2**
Process		0.076	1.000	1.000	1.000	1.000	1.000
Drilling	0.076		1.000	1.000	1.000	0.001*	0.023*
Well service	1.000	1.000		1.000	1.000	1.000	1.000
Catering	1.000	1.000	1.000		1.000	1.000	1.000
Construction/ Modification	1.000	1.000	1.000	1.000		1.000	1.000
Maintenance	1.000	0.001*	1.000	1.000	1.000		1.000
Crane/ Deck	1.000	0.023*	1.000	1.000	1.000	1.000	

Task performance environment Multiple Comparisons p values (2-tailed); Kruskal-Wallis test: H (6. N= 6990) =69.53580 p =.0000							
	Process R: 3516.0	**Drilling R: 3770.6**	**Well service R: 3036.2**	**Catering R: 3252.0**	**Con./ Mod. R: 3515.4**	**Mainte-nance R: 3472.7**	**Crane/ deck R: 3608.2**
Process		0.037*	0.000*	0.155	1.000	1.000	1.000
Drilling	0.037*		0.000*	0.000*	0.266	0.000*	1.000
Well service	0.000*	0.000*		1.000	0.002*	0.000*	0.000*
Catering	0.155	0.000*	1.000		0.499	0.257	0.066
Construction/ Modification	1.000	0.266	0.002*	0.499		1.000	1.000
Maintenance	1.000	0.000*	0.000*	0.257	1.000		1.000
Crane/ Deck	1.000	1.000	0.000*	0.066	1.000	1.000	

The psychological work environment Multiple Comparisons p values (2-tailed); Kruskal-Wallis test: H (6. N= 6986) =66.18237 p =.0000							
	Process R: 3278.2	**Drilling R: 3795.3**	**Well service R: 3618.2**	**Catering R: 3631.0**	**Con./ Mod. R: 3543.6**	**Mainte-nance R: 3330.4**	**Crane/ deck R: 3416.6**
Process		0.000*	0.023*	0.007*	0.273	1.000	1.000
Drilling	0.000*		1.000	1.000	0.294	0.000*	0.009*
Well service	0.023*	1.000		1.000	1.000	0.050*	1.000
Catering	0.007*	1.000	1.000		1.000	0.013*	1.000
Construction/ Modification	0.273	0.294	1.000	1.000		0.605	1.000
Maintenance	1.000	0.000*	0.050*	0.013*	0.605		1.000
Crane/ Deck	1.000	0.009*	1.000	1.000	1.000	1.000	

Managers' attitude of HSE Multiple Comparisons p values (2-tailed); Kruskal-Wallis test: H (6. N= 6996) =113.6226 p =0.000							
	Process R: 3380.5	**Drilling R: 3964.3**	**Well service R: 3117.3**	**Catering R: 3442**	**Con./ Mod. R: 3486.8**	**Mainte-nance R: 3422.5**	**Crane/ deck R: 3262.2**
Process		0.000*	0.246	1.000	1.000	1.000	1.000
Drilling	0.000*		0.000*	0.000*	0.000*	0.000*	0.000*
Well service	0.246	0.000*		0.090	0.051	0.027*	1.000
Catering	1.000	0.000*	0.090		1.000	1.000	1.000
Construction/ Modification	1.000	0.000*	0.051	1.000		1.000	1.000
Maintenance	1.000	0.000*	0.027*	1.000	1.000		1.000
Crane/ Deck	1.000	0.000*	1.000	1.000	1.000	1.000	

Colleagues' use of mindful safety practices Multiple Comparisons p values (2-tailed);Kruskal-Wallis test: H (6. N= 7142) =127.4038 p =0.000							
	Process R: 3417.7	**Drilling R: 3932.5**	**Well service R: 3629.9**	**Catering R: 3157.1**	**Con./ Mod. R: 3374.0**	**Mainte-nance R: 3486.7**	**Crane/ Deck R: 3985.1**
Process		0.000*	0.924	0.180	1.000	1.000	0.000*
Drilling	0.000*		0.055	0.000*	0.000*	0.000*	1.000
Well service	0.924	0.055		0.001*	0.784	1.000	0.107
Catering	0.180	0.000*	0.001*		1.000	0.004*	0.000*
Construction/ Modification	1.000	0.000*	0.784	1.000		1.000	0.000*
Maintenance	1.000	0.000*	1.000	0.004*	1.000		0.000*
Crane/ Deck	0.000*	1.000	0.107	0.000*	0.000*	0.000*	

Overall work environment Multiple Comparisons p values (2-tailed); Kruskal-Wallis test: H (6. N= 6889) =262.3257 p =0.000							
	Process R: 3694.0	**Drilling R: 4075.6**	**Well service R: 2898.8**	**Catering R: 3346.6**	**Con./ Mod. R: 3039.8**	**Mainte-nance R: 3189.7**	**Crane/ Deck R: 3403.5**
Process		0.000*	0.000*	0.009*	0.000*	0.000*	0.180
Drilling	0.000*		0.000*	0.000*	0.000*	0.000*	0.000*
Well service	0.000*	0.000*		0.002*	1.000	0.041*	0.001*
Catering	0.009*	0.000*	0.002*		0.179	1.000	1.000
Construction/ Modification	0.000*	0.000*	1.000	0.179		1.000	0.087
Maintenance	0.000*	0.000*	0.041*	1.000	1.000		0.744
Crane/ Deck	0.180	0.000*	0.001*	1.000	0.087	0.744	

The physical work environment Multiple Comparisons p values (2-tailed); Kruskal-Wallis test: H (6. N= 6403) =105.5840 p =0.000							
	Process R: 3146.4	**Drilling R: 3385.2**	**Well service R: 2757.9**	**Catering R: 3650.5**	**Con./ Mod. R: 3265.5**	**Mainte-nance R: 3029.4**	**Crane/ Deck R: 3434.1**
Process		0.044*	0.002*	0.000*	1.000	1.000	0.155
Drilling	0.044*		0.000*	0.072	1.000	0.000*	1.000
Well service	0.002*	0.000*		0.000*	0.000*	0.053	0.000*
Catering	0.000*	0.072	0.000*		0.013*	0.000*	1.000
Construction/ Modification	1.000	1.000	0.000*	0.013*		0.237	1.000
Maintenance	1.000	0.000*	0.053	0.000*	0.237		0.001*
Crane/ Deck	0.155	1.000	0.000*	1.000	1.000	0.001*	

Spare-time and rest facilities Multiple Comparisons p values (2-tailed); Kruskal-Wallis test: H (6. N= 7140) =102.0521 p =0.000							
	Process R: 3518	**Drilling R: 3707.8**	**Well service R: 2968.1**	**Catering 3949.0**	**Con./ Mod. R: 3904.3**	**Mainte-nance R: 3462.0**	**Crane/ Deck R: 3568.2**
Process		0.449	0.000*	0.000*	0.008*	1.000	1.000
Drilling	0.449		0.000*	0.210	1.000	0.008*	1.000
Well service	0.000*	0.000*		0.000*	0.000*	0.000*	0.000*
Catering	0.000*	0.210	0.000*		1.000	0.000*	0.036*
Construction/ Modification	0.008*	1.000	0.000*	1.000		0.000*	0.202
Maintenance	1.000	0.008*	0.000*	0.000*	0.000*		1.000
Crane/ Deck	1.000	1.000	0.000*	0.036*	0.202	1.000	

Perceived risk level Multiple Comparisons p values (2-tailed); Kruskal-Wallis test: H (6. N= 6480) =76.82148 p =.0000							
	Process R: 3130.7	**Drilling R: 3609.7**	**Well service R: 3051.2**	**Catering R: 3089.9**	**Con./ Mod. R: 3228.5**	**Mainte-nance R: 3118.4**	**Crane/ Deck R: 3381.9**
Process		0.000*	1.000	1.000	1.000	1.000	0.410
Drilling	0.000*		0.000*	0.000*	0.002*	0.000*	0.571
Well service	1.000	0.000*		1.000	1.000	1.000	0.132
Catering	1.000	0.000*	1.000		1.000	1.000	0.259
Construction/ Modification	1.000	0.002*	1.000	1.000		1.000	1.000
Maintenance	1.000	0.000*	1.000	1.000	1.000		0.161
Crane/ Deck	0.410	0.571	0.132	0.259	1.000	0.161	