The seriousness of the problem of work place stress and resultant costs to the individuals and organizations (Palmer et al., 2004), calls for identification of factors responsible for work stress. An assessment method based on the above factors is essential for the investigation of work stress. Such an empirical study demands a rigorous research methodology, with reliable and valid instruments (Ahire et al., 1996). This can be achieved only by measuring the perceptions of the employees in
Chapter 3

the industries. A survey using questionnaire is most cost effective especially suitable for studies involving large samples (Kultar Singh, 2007). The study using such instrument is non-biased and easy to analyze by using computer softwares.

3.1 Factors Responsible for Work Stress

The following seven factors are identified from literature survey and through discussion with safety professionals and safety managers in various industrial units in Kerala. These factors are

1. Demand
2. Control
3. Manager support
4. Peer support
5. Relationship
6. Role
7. Change

These factors can be treated as independent variables influencing the work stress in an organization. A detailed discussion about these factors is given below.

3.1.1 Demand

This includes issues such as work load, work patterns and work environment. Work load is one of the first aspects of work to receive attention. It has been found that both work overload and work under load can be problematic (Cox et al., 2000). There are two types of work load - qualitative and quantitative and both are associated with work stress. (Edwards and Rothbord, 2005; Cox et al., 2000). There is a strong
evidence that they pose a threat to both physical and psychological health (Teasdale et al., 2006; Handi et al., 1995). Some of the other researchers have extended this line of argument by suggesting work load as a function of quality, quantity and time (Cox et al., 2000; Handy et al., 1995). Stress related illness were more reported with “working deadlines” and having “too much of work” than general working population. It is also to be noted that unrealistic expectations from the employees, particularly during the time of reorganizations can lead to unhealthy and unreasonable pressure on the employees (Cox et al., 2000).

The two main issues that relate to the effects of work scheduling on health are shift working and long working hours. Research work shows that shift work often develops fatigue among workers and increases the risk of cardiovascular disease (Takeyama et al., 2005). Increased smoking and alcoholic consumption were found among the employees working in continuous shifts (Caruso et al., 2004). Research reveals that the extended shifts, beyond the normal 8 hour shift (9th to 12th hours of works) were associated with feelings of increased fatigue, lower cognitive function, decline in vigilance on task measures and increased injuries (Caruso et al., 2004). Over time and extended shifts were associated with increased odds for unhealthy weight gain in men (Suwazono et al., 2008; Caruso et al., 2004).

It is observed that expansion of technology coupled with downsizing has increased the expectation about productivity, speed and efficiency which resulted in increased pressure on the employees (Conti et al., 2006; Vahtera et al., 2004; NIOSH, 2002). Increased work load and long working hours can leave the employees physically and emotionally drained. The
states to be achieved in this connection are (Mackay et al., 2004; Cox et al., 2000).

i. Organization provides employees with adequate and achievable demands in relation to the agreed hours of work

ii. People skills and abilities are matched to the job demands

iii. Jobs are designed to be within the capabilities of the employees

iv. Employees should be provided with good work environment.

### 3.1.2 Control

Control and decision latitude are important issues in job design and work organization. This indicates “how much say the person has the way they do the work”. This is the extent to which employees’ participation in decision making process related to the work. It has been found that low control at work has been repeatedly associated with stress (Bond and Bunce, 2005) and leads to anxiety, apathy and increased incidence of cardiovascular symptoms (Wieclaw et al., 2008; Malinauskiene et al., 2004).

Researchers indicate that workers should be empowered to plan their work and control their workloads and make decisions about how that work should be completed and how problems should be tackled (Cox et al., 2000). Earlier research indicates that when there are greater opportunities for participating in decision making, greater satisfaction and higher feeling of self esteem are reported (Love et al., 2007; Bauer, 2004). Non-participation appears related to work stress and overall poor physical health (Cox et al., 2000). It has been found that lack of participation shows a strong correlation to job satisfaction (Bhardwaj and Srivastava, 2008; French and Caplan, 1973). The states to be achieved, in this connection are (Mackay et al., 2004; Cox et al., 2000).
Factors Identified for the Evaluation of Work Stress

i. Where ever possible, employees may have control over their pace of work

ii. Employees are encouraged to use their skills and take initiatives to do their work

iii. Employees can be encouraged to develop new skills to help them undertake new and challenging pieces of work

iv. Organizations may encourage employees to develop their skills

v. Employees should have freedom to take breaks, whenever required

vi. Employees are consulted over their work patterns.

3.1.3. Manager support

It includes encouragement, sponsorship and resources provided by the organization and time management. This is another factor that can buffer the effect of workplace stress (Ben, 2007) that an individual experiences. Managers and supervisors check the quality of work and are responsible for operational management at the work site. Superiors and managers often have to cope with lots of pressure, from the management as well as pleasing the customer and managing workers. The pressure that managers experience from their superiors and from the host companies is transferred to further down the line towards the workers on the lowest level of hierarchy. It has been found that superiors sometimes behave as authoritarian and unfair, with little respect for the team, encouraging favoritism and giving rise to distrust between workers. Earlier research work indicates that, manager support/superior support are one of the important predictors of both psychological ill health and job dissatisfaction (Noblet, 2003), and leads to musculoskeletal complaints (Kjellberg and Wadman, 2007). The states to be achieved in this connection are (Mackay et al., 2004; Cox et al., 2000).
i. The organization has policies and procedures to adequately support employees

ii. Systems are in place to enable and encourage managers to support their staff

3.1.4 Peer support

This includes encouragement, sponsorship and resources provided by the colleagues at work. Many times it is found that employees are unable to get support from the colleagues. The earlier research work points out that due to high intensity at work (as a consequence of time pressure, frequent staff shortage etc.), workers do not have possibility to get help from their colleagues to complete the work in time (Cox et al., 2000). Many workers report that support from others will not be available to complete the work, if the time of completion of the work is limited. This may result in high absence rate which in turn, may lead to tension between colleagues as the employees present will have to take over the job of absenting workers (Unden, 1996). Earlier research work reveals that low peer support leads to physical ill health problems like coronary heart diseases (Bacquer et al., 2005) and low job satisfaction (Cox et al., 2000). The states to be achieved in this connection are (Mackay et al., 2004; Cox et al., 2000).

i. Systems are in place to enable and encourage employees to support their colleagues.

ii. Employees should be aware – what support is available and how and when to access it.

iii. Employees should know, how to access the required resources to do their job.
iv. All the employees should receive regular and constructive feedback.

### 3.1.5 Relationship

This includes promoting positive working to avoid conflict and dealing with unacceptable behavior. Selye (1976) suggested that having to live with other people is one of the most stressful aspects of life. This is also true in the case of working relationships. For being ‘at work’ typically means significant interaction with other people, like colleagues, bosses or subordinates. These relationships can be a major source of both stress and support (Mackay et al., 2004; Cooper et al., 2001; Arnold, et al., 1998). Poor relationships are defined as those having a lack of trust, little support, and low interest in listening and attempting to tackle workplace problems. It has been found that good relationship among employees and members of the work group are essential for individual and organizational health (Hoel et al., 2010). Workplace bullying and workplace violence are associated variables in connection with relationship factor, which result in work stress (Hoel et al., 2010; Vartia, 1996).

There are several studies that indicate a correlation between relationships and health outcome (Hoel et al., 2010). It is observed that “stress cases” that have been presented to the courts typically include some relationship difficulties underpinning the basic compliant. Mayhew and Chappel (2003) argue that bullying and violence have both personnel and organizational costs; specifically they draw on supporting evidence that around 40% of the victims do not turn to any one at all for support, but as the bullying continues victims reduce their commitment and then leave the organization. Three important sets of relationship identified by the researchers (Cox et al., 2000) are relationship with superiors, relationship
with subordinates and relationship with colleagues, and the strained relationship in any one of the above may lead to work stress. The states to be achieved in this connection are (Mackay et al., 2004; Cox et al., 2000).

i. Organization to promote positive behavior at work to avoid conflict and ensure fairness

ii. Employees may share information relevant to their work

iii. The organization has agreed policies and procedures to prevent or resolve unacceptable behavior

iv. Systems are in place to enable and encourage employees to report unacceptable behavior

3.1.6 Role

This indicates whether people understand their role within the organization and whether the organization ensures that person does not have conflicting roles. The role can be explained with the help of three important aspects; role ambiguity, role conflict and role insufficiency.

Role ambiguity occurs when a worker has inadequate information about his/her work. Role ambiguity manifests itself a general confusion about objectives, lack of clarity among expectations and general uncertainty about the scope and responsibility of the job (Bliese and Castro, 2000). It has been found that workers suffering from role ambiguity are more likely to experience low job satisfaction and wide range of physical health problems (Colligan et al., 2005).

Role conflict occurs when the individual is required to play a role which conflicts with their values (Cox et al., 2000). Role conflict is defined as two or more set of incompatible demands concerning a work when
Factors Identified for the Evaluation of Work Stress

placed on a worker by the concerned parties or interface between two or more roles of the same person (Cooper et al., 2001). Researchers have shown that greater role conflict leads to low job satisfaction and greater work related stress (Cuhadar, 2008).

Role insufficiency refers to failure of the organization to make full use of the individual abilities and training. Such insufficiency leads to work stress and greater amounts of psychological strain (Cox et al., 2000). The states to be achieved in this connection are (Mackay et al., 2004; Cox et al., 2000).

i. The organization to ensure that, as far as possible, the different requirements it places upon the employees are clear and compatible.

ii. The organization provides information to enable employees to understand their role and responsibilities.

iii. The organization ensures that, as far as possible, the requirements placed upon the employees are clear.

iv. Systems are in place to enable employees to raise concerns about any uncertainties or conflicts about their role and responsibilities.

3.1.7 Change

Work is essentially an economic activity, and industries are established in order to manufacture products or provide services for the market. In order to survive in the market, organizations are constantly striving for more functional and cost efficient production and service concepts (Cox et al., 2000). Such renewals occur both in the public and private sector as well as in the industrial and service organizations. It is found that logic of work activities (eg: technological systems, division of
labour) make the organization layered and more complex. Different concepts require different capabilities, management and expert methods and production learning systems (Launis and Pihlaja, 2007). Many times transformations are not correctly understood from the perspective of either organizations or individuals. These recurrent changes increase time pressure, stress, health complaints and safety problems of individuals. The states to be achieved are

i. The organization provides employees with timely information to enable them to understand reasons for proposed changes

ii. The organizations ensure adequate employee consultation on changes and provides opportunities for employees to influence the proposals

iii. Employees are aware of the probable impact of any changes in their jobs and if necessary, employees are given training to support the changes in their jobs

iv. Employees are aware of time table for changes

v. Employees have access to get relevant support during changes

3.2 Research methodology

The primary objective of the study was to identify the factors responsible for the work stress. An instrument was developed using these factors and the validity and reliability of the measuring instruments was tested, so that it can be effectively used by the practitioners. Confirmatory factor analysis is conducted for all the seven factors developed for checking the convergent validity, and unidimensionality. All the above analysis were carried out by means of soft wares SPSS-15 and AMOS-7.
3.3 Development of instrument for the measurement of work stress

An instrument was developed for the study using data obtained through exhaustive literature survey, discussion with safety professionals and experts in India, in the absence of a well-defined measurement tool for the purpose. Moreover, little study is made in this direction in India. Initially, a pilot study was made before the main research in order to check the feasibility of the instrument and to improve the design of the questionnaire. Two industries were selected for this purpose.

The questionnaire initially developed for this study had 52 items which covered all the areas namely demand, control, manager support, peer support, relationship, role, and change. The content validity and face validity of the questionnaire was analyzed. As these were found satisfactory, a pilot survey was made among 75 employees in the selected industrial units in Kerala to check the clarity and suitability of the items mentioned in the questionnaire. Based on the comments and suggestion received during the pilot study particularly from the workers in these industries, it was decided to delete some of the complex usages from the questionnaire and decided to prepare the questionnaire in two versions in English and in the local language (given in Appendix). A very constructive feedback was received from the engineers and supervisors of these industries. Based on their suggestions some of the questions were removed, as they were repetitive in nature.

The final draft of the questionnaire had 35 items and seven subscales namely demand, control, manager support, peer support, relationship, role, and change. All the questions were of Likert type with five fixed
alternatives (always, often, sometimes, rarely, never). The items of the questionnaire were in the sequential order of demand (8 items), control (6 items), manager support (5 items), peer support (4 items), relationship (4 items), role (5 items), change (3 items). In addition to this, the questionnaire contained 10 demographic questions related to the name of the industry, type of the industry, name of employee, designation, department, age, experience, gender specification - male/female and educational qualification. The respondents were requested to indicate the choice of preference in the questionnaire.

3.4 Subjects and methods

Five profit making public sector industries were selected for the study. As per government records there were only 11 profit making manufacturing industries in the public sector, during the year 2006-2007 (Official web site of department of industries Govt. of Kerala; http://www.kerala.industry.org; The Hindu Daily dated 15 May 2010). The total sample size selected for the study thus consists of 45% of the population (the profit making manufacturing units in the public sector in Kerala state). Then these industries were divided in two categories namely, chemical and heavy engineering based on their work environment. Out of the five industries selected, three were in the chemical sector and two in the heavy engineering sector.

The chemical industries so selected are large scale type which are engaged in the production of caustic soda, titanium dioxide, white cement and allied products. The physical work environment in chemical industries is different from that in the heavy engineering industries. In chemical industries excessive airborne concentrations, vapours, gases or fumes
increases the work stress in addition to the hazard of inhalation (Wyman, 2000). It has been noted that many employees particularly at the worker level, may not be aware of the chemical used as the raw material and the nature of products manufactured and by products.

The heavy engineering industries selected are engaged in the design and manufacture of high voltage transformers and steel forgings. It has been noted that these industries are of product type where manufacture of the product depends on the market demand. Larger demand often raises the stress level of the employees (Melchior et al., 2007).

Initially permission was obtained from the authorities of the industries for collecting data in connection with the proposed research work. All the industries were of large scale type and running profitably for the last 5 consecutive years and have employee strength of 300-1300. All the industries are in public sector, located in the state of Kerala, India. All the companies work on shifts of 8 hour duration each. Most of the employees in this organization are permanent and are aged between 20 and 55 yrs. The population of women employees are much lower compared to men. Only blue collar employees were selected for the study and the subjects belonged to 3 different categories namely engineers, supervisors and workers.

Before administering the questionnaire, the subjects were briefed about the aim of the study and the methodology of answering the question was explained to them. At the initial stage a few employees were selected for the study by stratified proportional sampling, but this attempt turned out be a failure, because many of the employees raised concern about the confidentiality of the duly filled in questionnaire. As a result only few
employees returned the questionnaire, even though the researcher had assured the confidentiality of the results. Therefore, it was decided to distribute the questionnaire to all the eligible employees and they were assured that the result would be strictly anonymous. Hence the sample size of the participants turned out to be large. The details of the participants are given in Table 3.1.

<table>
<thead>
<tr>
<th>Designation</th>
<th>Chemical</th>
<th>Heavy Engineering</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Industry</td>
<td>Industry</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Engineers</td>
<td>6</td>
<td>18</td>
<td>24</td>
</tr>
<tr>
<td>Supervisors</td>
<td>10</td>
<td>26</td>
<td>41</td>
</tr>
<tr>
<td>Workers</td>
<td>117</td>
<td>120</td>
<td>192</td>
</tr>
</tbody>
</table>

The questionnaire was made in two versions in English as well as in the local language. While preparing the questionnaire it was made sure that content validity is not changed. English version was mainly given to the engineers and supervisors and the local language version was given to the workers. It has been ensured that the different categories of employees namely engineers, supervisors and workers have the requisite educational qualification in their discipline.

The total number of participants selected initially for the study was 1020, but only 830 participants returned the questionnaire. The filled up schedules are then carefully edited for completeness, consistency and accuracy etc and the details of the participants for the study are given in the Table 3.1. The response rate was 81.37%.
The total number of engineers selected for the study are 67 Nos which constitute about 8.1% of the total sample selected for the study, and supervisors and workers were 106 and 657 respectively, which constitute about 12.77% and 79.16% of the total sample size. The number of engineers and supervisors are very less compared to the workers in these organizations. It is learned that no fresh recruitment has been made in these companies for the last five years to replace the retired personnel. Further the number of engineers, supervisors and workers in the chemical industries are 48,77, and 429 respectively and in the heavy engineering industries are 19,29 and 228 respectively.

3.5 Scale refinement and validation

Validity is the most critical feature of an instrument (questionnaire) and indicates the degree to which the instrument measures what it is supposed to measure (Ahire et al., 1996; Cook and Campbell, 1979; Cronbach and Meehl, 1955). Validating the measuring instrument is necessary for reducing the error in the measurement. Validity requires that an instrument is reliable, but an instrument can be reliable without being valid. Only statistically reliable and valid instruments are used for research studies (Ahire et al., 1996). The major forms of validity are content validity, construct validity and face validity.

3.6 Different approaches to scale refinement and validation

The major approaches used by researchers for scale validation and refinement are exploratory factor analysis (EFA) approach, and confirmatory factor analysis (CFA) approach (Ahire et al., 1996). EFA approach is a conventional approach to scale refinement and it consists the
following steps (i) identifying the items relevant to the particular domain from literature (ii) designing a survey instrument to measure these items (iii) conducting a field survey (d) performing exploratory factor analysis (often with varimax rotation) on the item responses to identify the major factors according to the item factor loading and (iv) refining the scales using Cronbach’s scale reliability coefficient alpha (Cronbach and Meehl, 1955). The major disadvantage of pure exploratory factor analysis lies in the difficulty involved in interpreting the factors.

To overcome the inherent limitations of EFA approach, the scale refinement and validation were done using the alternative approach. This approach uses confirmatory factor analysis in various stages of scale refinement and validation. CFA is similar to EFA except that the hypothesis that form constraints are embedded in the analysis. Research in social sciences and marketing disciplines prefers CFA approach due to its conceptual strength (Ahire et al., 1996).

3.7 Confirmatory factor analysis

Confirmatory factor analysis (CFA) is a type of structural equation modelling (SEM), which deals specifically with measurement models (Harrington, 2009; Brown, 2006), and indicate the relationship between observed measures or indicators (e.g., Test items, test scores etc.) and latent variables or factors. A fundamental feature of CFA is its hypothesis-driven nature. In CFA, the researcher specifies the number of factors and the pattern of indicator factor loading in advance. Thus the researcher must have a firm a prior sense, based on past evidence and theory of the factors that exist in the data. CFA is used for four major purposes (i) psychometric evaluation of measures (questionnaires) (ii) construct validation (iii) testing
method effects and (iv) testing measurement in variance (across groups or population) (Brown, 2006).

In social research, researchers need to have measures (instruments) with good reliability and validity that are appropriate for use across diverse populations (Kendell and Jablensky, 2003; Natemeyer et al., 2003; Devellis, 2003). Development of psychometrically sound measure is an expensive and time consuming process. It has found that CFA can be effectively used for the development of measures because researchers often do not have the time or resources to develop a new measure, and many times they depend on the existing measures (Brown, 2006). By using the existing measures considerable amount of cost and time can be saved and more over this helps the researcher to compare the results, when same instrument is used for more than one study. However, when using existing measure, it is important to examine whether the measure is appropriate for the population included in the current study. In these circumstances, CFA can be used to examine whether the original structure of the measure works well in the new population.

3.8 Software for conducting confirmatory factor analysis

There are several very good software packages available for conducting confirmatory factor analysis, AMOS.7 (Arbuckle, 2006) was used in this research work. AMOS.7 was chosen because of its ease of use, particularly getting started with its graphics interface (Byrne, 2001). Other software packages are LISREL (see http://www.ssicentral.com/lisrel/index.html), Mplus (see http://www.statmodel.com), EQS (see http://www.mvsoft.com/index.htm), or SASCALIS (see http://v8doc.sas.com/sashtml/statml/stat/chap19/sect1.htm).
3.9 Content validity

Content validity is a non statistical type of validity that involves “systematic examination of the test content to determine whether it covers a representative sample of the behavior domain to be measured” (Anastasi and Urbina, 1997) or it is the extent to which a measuring instrument provides adequate coverage of the topic under study (Devellis, 2003). If the instrument contains a representative sample of the universe, the content validity is good. Its determination is primarily judgmental and intuitive. It can also be determined by using a panel of persons who shall judge how well the measuring instruments meet the standard, but there is no numerical way to express it (Cooper and Schinder, 2003). Accordingly the researcher consulted various safety experts and academic professionals in this field for this purpose and hence ensured that the questionnaire so prepared for the evaluation of work stress has sufficient content validity.

3.10 Face validity

This criterion is an assessment of whether a measure appears, on the face of it, to measure the concept it is intended to measure. Face validity is close to content validity, while the content validity concerns the extent which a measure adequately represent all facets of a concept. This is a very minimum assessment. If a measure cannot satisfy this criterion, then the other criteria are inconsequential. It can be assessed by an amateur (Devellis, 2003).

The present questionnaire had 52 items initially and it was given to six safety professionals from industries and five academicians, working as professors in the department of safety and statistics. They have been asked
to examine the questionnaire for the consistency, coverage, clarity, and comprehensiveness. Based on their suggestions 17 items were removed and 35 items were retained in the questionnaire for study. Both content validity and face validity have been assured before finalizing the draft of the questionnaire.

3.11 Convergent validity

It is one of the approaches to the construct validity. Convergent validity refers to the degree to which a measure is correlated with other measures that are theoretically predicted. In other words convergent validity is gauged by comparing it with measure of the same concept developed through other methods to assess how well the items are together (Ahire et al., 1996). This involves empirical and theoretical support for the interpretation of the construct. Each item in the scale is treated as different approach to measure the construct (Devellis, 2003). Accordingly by using confirmatory factor analysis each item in the scale namely, demand, control, manager support, peer support, relationship, change is checked with the help of coefficient called Bentler-Bonett fit index (NNFI or TLI). A scale with TLI values of 0.9 or above is an indication of strong convergent validity (Bentler and Bonnet, 1980). It has been observed that the TLI values of each construct as well as overall TLI values are more than 0.90, and this indicate strong convergent validity of the instrument (Table-3.2).
3.12 Unidimensionality analysis

Unidimensionality is a necessary condition for reliability analysis and construct validation (Natemeyer et al., 2003; Ahire et al., 1996). Items in a unidimensional scale estimate one single construct. In the absence of unidimensionality a single member cannot be used to represent the value of the scale. One can reduce the problems associated with unidimensionality by carefully selecting the items in the scales. This may warrant removing those items from the scales that reduce the extent of unidimensionality. Confirmatory factor analysis (CFA), can be used to access the unidimensionality of the scale. To use CFA a measurement model is specified for each construct. In this model, individual items constituting the construct are examined to see how closely they represent the same item. Comparative Fit Index (CFI) of 0.90 or higher for the model suggests that there is no evidence of lack of unidimensionality (Ahire et al., 1996). The CFI for all the seven constructs are computed by using AMOS software version-7 and the results are given in the Table 3.2. It has been observed that all the CFI values for the individual constructs are well above 0.90 and moreover the overall CFI value is 0.934, which indicates strong unidimensionality.

3.13 Reliability

Once Unidimensionality of the scales is established, an assessment of the statistical reliability is necessary before any further validation analysis. Reliability refers to degree of dependability, consistency or stability of a scale (Devellis, 2003). Unreliable scale will lack consistency of measuring the same item (Natemeyer et al., 2003). There are four good methods of measuring reliability: Test-retest technique, multiple forms,
Factors Identified for the Evaluation of Work Stress

inter-rater, and Split half reliability. Nowadays, particularly for field survey, internal consistency is estimated by using Cronbach’s $\alpha$ (Cronbach and Meehl, 1955). An alpha value of 0.70 or above is considered to be criterion for demonstrating strong internal consistency, alpha value of 0.60 or above is considered to be significant (Ahide et al., 1996).

Table 3.2 Validity and Reliability of the Instrument

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Variables/Factors</th>
<th>No. of items</th>
<th>CFI</th>
<th>TLI</th>
<th>Cronbach alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Demand</td>
<td>7</td>
<td>0.901</td>
<td>0.900</td>
<td>0.713</td>
</tr>
<tr>
<td>2</td>
<td>Control</td>
<td>4</td>
<td>0.980</td>
<td>0.976</td>
<td>0.797</td>
</tr>
<tr>
<td>3</td>
<td>Manager support</td>
<td>4</td>
<td>0.942</td>
<td>0.930</td>
<td>0.794</td>
</tr>
<tr>
<td>4</td>
<td>Peer support</td>
<td>4</td>
<td>0.916</td>
<td>0.900</td>
<td>0.806</td>
</tr>
<tr>
<td>5</td>
<td>Relationship</td>
<td>4</td>
<td>0.900</td>
<td>0.900</td>
<td>0.771</td>
</tr>
<tr>
<td>6</td>
<td>Role</td>
<td>5</td>
<td>0.901</td>
<td>0.901</td>
<td>0.676</td>
</tr>
<tr>
<td>7</td>
<td>Change</td>
<td>2</td>
<td>0.998</td>
<td>0.987</td>
<td>0.640</td>
</tr>
<tr>
<td>Total</td>
<td>-----------</td>
<td>30</td>
<td>0.934</td>
<td>0.928</td>
<td>0.742</td>
</tr>
</tbody>
</table>

For the present study, Cronbach’s $\alpha$ is calculated for all the seven variables and the results are given in Table 3.2. The evaluation has resulted in the removal of the items numbers 5, 9, 14, 17, and 35 from the questionnaire. The content validity of the questionnaire is not changed by removing these items. Values of cronbach’s $\alpha$ show that the refined scale consisting of 30 items is more reliable.
Overall CFI and TLI values are 0.934 and 0.928 respectively, which ensures that the refined scale has unidimensionality and convergent validity in addition to reliability. The scale thus developed can be used for measuring work stress in any organization effectively. There is enough scope for further development of scale depending on the industry.

### 3.14 Relationship between the factors

It has found from the literature review that, a number of factors were responsible for work stress in the organization. In the present research work seven factors or variables have been developed, which can be effectively used for the evaluation of work stress in any organization. To analyze the relation between the factors/variable correlation analysis was performed. The results are summarized in the Table-3.3.

**Table 3.3 Correlation matrix**

<table>
<thead>
<tr>
<th>Variables/Factors</th>
<th>Demand</th>
<th>Control</th>
<th>Manager Support</th>
<th>Peer Support</th>
<th>Relationship</th>
<th>Role</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand</td>
<td>1</td>
<td>0.354</td>
<td>0.249</td>
<td>0.240</td>
<td>0.310</td>
<td>0.214</td>
<td>0.196</td>
</tr>
<tr>
<td>Control</td>
<td>0.354</td>
<td>1</td>
<td>0.279</td>
<td>0.227</td>
<td>0.310</td>
<td>0.168</td>
<td>0.251</td>
</tr>
<tr>
<td>Manager support</td>
<td>0.249</td>
<td>0.279</td>
<td>1</td>
<td>0.426</td>
<td>0.319</td>
<td>0.313</td>
<td>0.357</td>
</tr>
<tr>
<td>Peer support</td>
<td>0.240</td>
<td>0.227</td>
<td>0.426</td>
<td>1</td>
<td>0.498</td>
<td>0.313</td>
<td>0.461</td>
</tr>
<tr>
<td>Relationship</td>
<td>0.310</td>
<td>0.310</td>
<td>0.319</td>
<td>0.498</td>
<td>1</td>
<td>0.440</td>
<td>0.474</td>
</tr>
<tr>
<td>Role</td>
<td>0.214</td>
<td>0.168</td>
<td>0.313</td>
<td>0.313</td>
<td>0.440</td>
<td>1</td>
<td>0.353</td>
</tr>
<tr>
<td>Change</td>
<td>0.196</td>
<td>0.251</td>
<td>0.357</td>
<td>0.461</td>
<td>0.474</td>
<td>0.353</td>
<td>1</td>
</tr>
</tbody>
</table>
The above analysis was carried out with the help of software SPSS-15. It has been noted that all the correlations were positive, but no significant correlation was found between the variables/factors (< 0.5), Therefore the variables selected for the study can be treated as independent variables for the purpose of research.

3.15 Summary of findings

As only little work has so far been done in the area of work stress in India, an attempt is made to develop an instrument for the evaluation of work stress. With the available information, the factors which are responsible for the work stress is identified, and correlation between the variables were analyzed. Further validation and reliability of the instrument is made based on the data collected from the five selected industries in Kerala, India, out of which three are in the chemical sector and two in the heavy engineering sector. The result of the present study can be summarized as follows

- Initially seven factors / variables responsible for work stress is identified from the literature review, and these factors are demand, control, manager support, peer support, relationship, role and change.

- A measuring instrument to evaluate work stress among the employees is developed in the absence of a well defined measure to evaluate work related stress in India.
Empirical validation of the above measuring instrument is done, so that it can be effectively used by the safety managers and professionals working in this area, particularly in India, where only little research is done in this field.