

## **GUIDELINES FOR THE PREPARATION AND SUBMISSION OF WORK SCHEDULE FOR CONSTRUCTION PROJECT**

Rosli Mohamad Zin<sup>\*</sup>, Mohamad Ibrahim Mohamad,  
Shaiful Amri Mansur, Donald Chan Bing Tee

*Construction Technology Management Research Centre (CTMC)  
<sup>1</sup>Universiti Teknologi Malaysia, 81310 UTM Skudai, Malaysia*

*\*Corresponding author: [roslizin@utm.my](mailto:roslizin@utm.my)*

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**ABSTRACT:** The lack of standardised guidelines for the preparation and submission of work schedule has contributed to several problems in construction project especially the extra efforts that have to be put in before parties involved in the project accept the work plan. This paper explores the current practice in project scheduling in the Malaysian construction industry and proposes guidelines that will alleviate the current problems in project scheduling. The methodology adopted was through interviews and questionnaire survey. The questionnaire survey findings form a basis for the formulation of the proposed guidelines. It consists of four main aspects of project scheduling which are process of acceptance of work schedule, responsibilities of the contracting parties, application of work schedule, and implications of work schedule. With the establishment of the guidelines a standardised approach for the preparation and submission of work schedule can be achieved thus minimising some of the problems that are currently hinder the full application of project scheduling. The proposed guidelines will pave the way for the inclusion of work schedule as part of the contract document.

**Keywords:** Work Schedule, Guideline, Construction Contract

### **1.0 Introduction**

Effective use of project scheduling can ensure the smooth running of construction project. The main scheduling techniques, which are used widely especially in big and medium size projects are the Bar Chart and Network techniques that incorporate the use of computer software such as Microsoft Project and Primavera Project Planner. The requirement for the preparation and submission of work schedule varies between contracts. The conditions of contract under the Public Work Department 203 Forms (JKR, 1988) do not specifically state the requirement for preparation and submission of work schedule. However, several clauses in other standard forms address this subject

(Sundra Rajoo, 2000; Harban Singh, 2004). These clauses are Sub-clause 3.4 to 3.6: PAM'98 Forms (with and without quantity), Clause 5: CIDB Form, and Clause 7: IEM Condition of contract for Mechanical and Electrical contract works.

In general there are no detail guidelines that can be used for the purpose of preparing and submitting the work schedule. However the clauses stated above provide some general information on this matter. For example under Clause 5.1(a): CIDB Form (CIDB, 2000), it is stated that:

*The contractor shall no later than Date of Commencement submit for the approval of the Superintending officer a work programme related to the Time for Completion, clearly identifying the sequence, logic and critical path in which he proposes to carry out the works, including the various work activities and milestones to be achieved...*

Likewise, under Clause 7.1: IEM.ME 1/94 Form (IEM, 1994), it is stated that:

*The contractor shall submit to the engineer for his approval the Programme which include the sequence and timing in which the contractor proposes to carry out the works (including the design, manufacture, delivery to site, erection, testing and commissioning, The times when submission and approval of the contractor's drawing are required, and the times by which the contractor requires the employer:*

- 1. to furnish any drawings or information*
- 2. to provide access to site*
- 3. to have completed any necessary civil engineering or building work, to be provided by the employer*
- 4. to have obtained any way leaves, consents and approvals necessary for the construction of the works*

Based on these clauses it can be said any work schedule submitted by the contractor should contain the main activities, sequence of activities, timing of activities, critical activities and critical path, and important milestones (Harban Singh, 2004). Since there are no clear guidelines for the application of project scheduling in project management the current practice is entirely depending on the experience of the project manager. This has resulted in a lot of time wasting effort before parties involved in the project accept any work schedule. As such it is timely that scheduling guidelines be introduced in the local construction industry. This study is carried out with the objective of formulating standardised guidelines for the preparation and submission of work schedule that can be adopted by participants of the construction projects.

## 2.0 Methodology

The study was carried out in two main stages. The initial stage involved interviews to experienced individuals that have sound knowledge in planning. The next stage involved questionnaire survey to active players in the construction industry. The respondents were selected randomly that represent the clients, consultants, contractors, subcontractors and academicians who have at least several years of experience in the construction industry.

### 2.1. Design of Questionnaire and Analysis of Data

The final questionnaire was developed after a series of initial interviews and information gathered from literature. Recommendations solicited through these initial queries formed the base for refining the final questionnaire. The questionnaire comprised five parts; the first part consisted of general question such as the current practice of project scheduling and the common problems that occurs. The second part consisted of questions related to the acceptance of work schedule as a formal contract document. The third part consisted of questions related to responsibilities of the client and contractor once work schedule has been prepared. The fourth part dealt with the level of application of work schedule in project implementation. The last part consisted questions related to the right of each parties involved in the project. A Likert type scale comprising five points (Strongly Disagree to Strongly Agree) was provided against each question for the respondents to evaluate.

The data collected from the questionnaire survey exercise were analysed using the frequency analysis and Relativity Index. The Relativity Index can be calculated by using the following equation:

$$R.I = \frac{N_1(1) + N_2(2) + N_3(3) + N_4(4) + N_5(5)}{N(5)} \tag{1}$$

Where,

- R.I. = Relativity Index
- N<sub>1</sub> = Number of respondents choosing 1 (strongly disagree)
- N<sub>2</sub> = Number of respondents choosing 2 (disagree)
- N<sub>3</sub> = Number of respondents choosing 3 (neutral)
- N<sub>4</sub> = Number of respondents choosing 4 (agree)
- N<sub>5</sub> = Number of respondents choosing 5 (strongly agree)
- N = Total number of respondents

### 3.0 Results and Discussion

During the initial stage of the study, five respondents participated in the interview sessions. Two of the respondents at the time of the interviews were working with Class A contractor and have more than 20 years of experience. The other three individuals were a lecturer and two senior engineers. Based on the preliminary interviews it was found that scheduling has been an important element of project planning. The most common scheduling techniques used in project planning and scheduling are the Bar Chart and Critical Path Method. The purpose of having work schedule is for monitoring work progress, cost, materials and work sequence. It seems that the current practice in project scheduling have been found to be quite effective. Nevertheless there are still weaknesses in term of formal guidelines for the preparation and submission of work schedule.

In the questionnaire survey exercise the respondents were mainly targeted to those based in Kuala Lumpur, Perak, Sarawak, and Johor. There were four critical areas that had been investigated with respect to the preparation and submission of work schedule namely process of acceptance, responsibilities of contracting parties, application of work schedule, and implications of work schedule.

#### 3.1 Process of Acceptance

Table 1 shows the response to the question related to preparation of work schedule. It can be seen that majority of respondents agreed work schedule should be prepared and updated continuously before the final schedule is accepted by the client and contractor. The contractor should take the responsibility to prepare the work schedule while the client will do the final checking. Work schedule has to be prepared by someone with vast knowledge and experience in planning and scheduling. This will minimize error during the early stage of the schedule development.

In term of the legality of work schedule, the result of the survey as shown in Table 2 shows that work schedule should be considered as part of the contract document. The scope of project scheduling should include the as-planned and as-build schedules while network technique should be adopted. It is also agreed that the work schedule produced through the usage of planning software is preferable by the respondents (refer to Table 3). The survey also confirmed that Bar Chart should only be limited to representation of main work activities.

In response to the question of who should bear the cost of preparing work schedule, it was found that majority of respondents agreed that preparing and maintaining of work schedule should be part of items in the bill of quantity thus the contractor is required to price this item (refer to Table 4). The client on the other hand needs to review the adequacy of the cost of preparing and updating the work schedule.

Table 1: Preparation of work schedule

<b>Questions:</b>	<b>Agree (%)</b>	<b>Neutral (%)</b>	<b>Disagree (%)</b>
<i>Work Schedule should be:</i>			
Prepared and updated until the contracting parties agree	91.3	4.4	4.3
Reviewed by client	87.0	8.7	4.3
Part of contractor's responsibility	69.6	26.1	4.3
Prepared by someone qualified	65.2	26.1	8.7

Table 2: Work schedule and the contract

<b>Question:</b>	<b>Agree (%)</b>	<b>Neutral (%)</b>	<b>Disagree (%)</b>
<i>Work Schedule should be:</i>			
Part of contract document	52.2	26.1	21.7
In a separate agreement	21.7	54.6	21.7

Table 3: Form of work schedule

<b>Questions:</b>	<b>Agree (%)</b>	<b>Neutral (%)</b>	<b>Disagree (%)</b>
<i>Work schedule should be in the form of:</i>			
As-planned and as-built	73.9	26.1	0.0
Network type	69.6	26.1	4.3
Computer generated schedule	78.3	14.3	17.4
Bar Chart (for showing main activities only)	43.5	21.7	34.8

Table 4: Cost of preparation

<b>Question:</b>	<b>Agree (%)</b>	<b>Neutral (%)</b>	<b>Disagree (%)</b>
<i>Cost of preparing work schedule should be:</i>			
Included in the tender price	78.3	13.0	8.7
Reviewed by the client	56.5	26.1	17.4

### 3.2 Responsibilities of the Contracting Parties

Table 5 shows the opinion of the respondents on the responsibilities of the client for successful implementation of project scheduling. It can be seen that majority of the respondents agreed that the client should keep a copy of an updated schedule and must ensure that the contractor update the schedule. The client needs to review and approve changes made to the schedule and monitor its implication. When there is request for extension of time, work schedule should be used as main source of information for evaluating the request. The client should also make progress payment based on schedule's progress. It is also noted the client should provide all necessary information to the contractor for preparation of work schedule.

On the questions related to responsibilities of the contractor, the results of the survey are shown in Table 6. A high percentage of the respondents agreed that the contractor should prepare and submit work schedule prior to the start of project which is in line with the requirements under the CIDB or PAM contract. The contractor is also required to report to the client of any changes to work schedule, record and inform all delays, validate the delays, submit updated work schedule with progress report during site meeting, and submit all updated and finalised as-built schedules.

### 3.3 Application of Work Schedule

The results of the analysis on the application of work schedule are as shown in Table 7 to 10. Table 7 shows the application of work schedule in resource management. A high majority of the respondents agreed that work schedule must be used for resource planning. Slightly above half of respondents were in the view that the contractor must state clearly the resources used and updating of resources must be supported with proof of records.

For the application of work schedule in progress monitoring the results are shown in Table 8. It can be seen that all project monitoring must be based on no other than the work schedule where baseline schedule should be the reference point. The results also

show that the contractor should update the work schedule daily and submit to the client on a monthly basis.

As for the application of work schedule in progress payment and claims for extension of time the results of the survey are shown in Table 9 and 10. The findings show that work schedule should be used as a reference for progress payment evaluation. Thus, progress payment claim made by the contractor should be based entirely on the work schedule. The work schedule should also be referred to when request for extension of time is made. The result of the study shows that more than 50% of the respondents agreed on this matter. It is also agreed that only as-built schedule based on network technique should be submitted when applying for extension of time.

Table 5: The client’s responsibilities

Questions	Agree (%)	Neutral (%)	Disagree (%)
<i>The client’s responsibilities for successful implementation of project scheduling are:</i>			
Monitor work schedule	96.6	13.4	0.0
Review and approve changes made to the work schedule	93.1	16.9	0.0
Prepare all information needed for preparation of schedule by contractors	86.2	13.8	0.0
Making sure contractors update work schedule	86.2	13.8	0.0
Request a copy of the updated work schedule as record	69.0	17.2	13.8
Issue progress payment based on schedule’s progress	51.7	38.0	10.3
Use work schedule as main reference when dealing with extension of time	65.6	17.2	17.2

Table 6: The contractor's responsibilities

<b>Questions</b>	<b>Agree (%)</b>	<b>Neutral (%)</b>	<b>Disagree (%)</b>
<i>The contractor's responsibilities for successful implementation of project scheduling are:</i>			
Prepare and submit work schedule	96.6	3.4	0.0
Report any work changes to the client	96.6	3.4	0.0
Report all delay causes in work schedule	100.0	0.0	0.0
Validate delays with client	100.0	0.0	0.0
Submit updated work schedule that include progress report during site meeting	93.1	3.5	3.4
Submit all updated and finalized as-built schedules to the client	93.1	3.5	3.4
Use work schedule as main reference when dealing with extension of time	86.2	10.4	3.4

Table 7: Application of work schedule in resource management

<b>Questions</b>	<b>Agree (%)</b>	<b>Neutral (%)</b>	<b>Disagree (%)</b>
Work schedule must be used in resource planning	82.6	17.4	0.0
The contractor must state resources used in the work schedule	56.5	39.2	4.3
Updating of work schedule must be made with proof of resource records	56.5	34.8	8.7
Resource based schedule should be submitted to the client	43.5	43.5	13.0

Table 8: Application of work schedule in progress monitoring

<b>Questions</b>	<b>Agree (%)</b>	<b>Neutral (%)</b>	<b>Disagree (%)</b>
Monitoring must be based on project schedule	86.8	13.2	0.0
Work schedule must include baseline to show progress	72.4	27.6	0.0
Work schedule should be updated by the contractor daily and submitted to the client monthly	62.1	27.6	10.3

Table 9: Application of work schedule in progress payment

<b>Questions</b>	<b>Agree (%)</b>	<b>Neutral (%)</b>	<b>Disagree (%)</b>
Work schedule should be used as reference for progress payment evaluation	62.1	24.9	13.0
Claims should be based on resource and progress schedules	58.6	20.7	20.7

Table 10: Application of work schedule in claims for extension of time

<b>Questions</b>	<b>Agree (%)</b>	<b>Neutral (%)</b>	<b>Disagree (%)</b>
Work schedule should be included in request for extension of time	75.0	14.7	10.3
Claims for extension of time should only be based on network type of schedule	62.1	24.1	13.8

Table 11: Client's rights

Questions	Agree (%)	Neutral (%)	Disagree (%)
The client is the prominent owner of project schedule	82.8	17.2	0.0
The client has the right to access all information	75.9	17.2	6.9
Any changes to the work schedule must get the consent of the client	72.4	20.3	6.9
The client has the right to use the work schedule for other purposes	44.8	44.9	10.3
The client needs to inform other parties when work schedule is used for other purposes	34.5	39.7	27.6

Table 12: Consultant's rights

Questions	Agree (%)	Neutral (%)	Disagree (%)
The consultant only use work schedule for monitoring and evaluation	65.5	27.6	6.9
The consultant has full authority of work schedule with consent of the client	48.3	48.3	3.4
The consultant has to request for changes to the work schedule	65.5	24.2	10.3
The consultant has right to use the work schedule for other purposes with consent of the client	27.6	37.9	34.5

Table 13: Contractor's rights

Questions	Agree (%)	Neutral (%)	Disagree (%)
The contractor has full authority to use schedule for project purposes	76.0	20.6	3.4
The contractor has right to use the work schedule for other purposes with consent of the client	31.0	44.9	24.1

### 3.4 Implications of Work Schedule

Tables 11 to 13 highlight the results of the survey on the right of the client, consultant and contractor respectively. The respondents were in the opinion that the client should have the right to access all information in the work schedule, and give consent for any changes to the schedule. The consultant on the other hand should have the right to request for changes to the schedule when there is need to do so and may be given authority over the schedule when needed. Similarly the respondents also agreed that the contractor should have the right to request for changes to be made to the work schedule and be given authority over the schedule subject to approval of the client. Less than majority of respondents agreed that work schedule can be used for other purposes even with prior notice to the other parties in the project.

### 3.5 The Guidelines for the Preparation and Submission of Work Schedule

In general the survey exercise has revealed that currently in the local construction industry there is no standardised guidelines that can be followed for the preparation and submission of work schedule. The relevant clauses in the standard forms of contract such as PAM 98 Form, CIDB Form Edition 2000, and IEM forms basically give some general rules related to this matter. Thus in this study a standardised guidelines is proposed (refer to Appendix), which is based on the results obtained from the questionnaire survey. The guidelines consist of four main aspects of project scheduling, which are process of acceptance of work schedule, responsibilities of the contracting parties, application of work schedule, and implication of work schedule in term of rights of the project participants. With the establishment of this guidelines together with the relevant clauses on work programme in the standard forms of contract a standardised approach for the preparation of work schedule can achieved. It is hoped that the proposed guidelines will paved the way for the inclusion of work schedule as part of the contract document.

#### 4.0 Conclusions

The study described in this paper focused on the development of standardised guidelines that can be used for the preparation and submission of work schedule. The development of the guidelines is based on the outcome of questionnaire survey to project participants. The guidelines consists of four main aspects of project scheduling which are process of acceptance of work schedule, responsibilities of the contracting parties, application of work schedule, and implications of work schedule. Altogether there are 43 items that have been included in the checklist where 9 items are under process of acceptance of work schedule, 12 items under the responsibilities of the contracting parties, 13 items under the application of work schedule, and 9 items under the implication of work schedule. These are the checklist items that need to be complied with in order to ensure standardisation of the preparation and submission of work schedule is achieved.

#### References

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## Appendix

### Guidelines for the Preparation and Submission of Work Schedule

#### Introduction

The following guidelines highlight the steps for preparation and submission of work schedule.

Part 1	Process of Acceptance of Work Schedule
Part 2	Responsibilities of Contracting Parties
Part 3	Application of Work Schedule
Part 4	Implications of Work Schedule

#### PART 1

##### Process of Acceptance of Work Schedule

##### Preparation of Work Schedule

- The main Contractor shall bear the responsibilities of preparing the work schedule.
- The work schedule must be prepared by the Contractor personnel that have undergone a proper training.
- Upon completing of preparing the work schedule, it must be reviewed and approved by the Client or his representatives.

##### Agreement

- An agreement must be signed by both the Client and Contractor when work schedule has been prepared and work awarded to the contractor
- Work Schedule must be considered as part of the contract document.

##### Forms of Work Schedule

- At least 2 types of schedule should be prepared, the as-planned as well as as-built schedules.
- Detailed work schedule should be prepared using the Network Modeling techniques i.e. Critical Path Method (CPM) and Program Evaluation Review Technique (PERT).
- All schedules must be computer generated. The uses of scheduling software like Primavera Project Planner and Microsoft Project should be given priority.

##### Cost of Preparation

- All costs of preparation should be included in the tender price and to be reviewed by the Client.

#### PART 2

##### *Responsibilities of Contracting Parties*

##### Responsibilities of Client

- The Client must monitor the usage of work schedule by the Contractor
- All major changes to the work schedule should be reviewed and approved by the Client before it is implemented.
- The Client must ensure that all necessary information needed by the Contractor is provided for.
- The Client must at all times make sure that the work schedule is updated by the Contractor.
- The Client should make the progress payment based upon the schedule's progress

- Whenever there is dispute in request for extension of time, the Client should make the work schedule as the primary source of information.

#### Responsibilities of Contractor

- The Contractor must prepare and submit the work schedule prior to the start of the project.
- The Contractor is responsible to report any changes in the schedule to the Client or his representatives.
- All causes of delays or changes to the schedule must be recorded properly by the Contractor and validated by the Client or his representatives.
- Updating of the work schedule should be done by the Contractor or his representative on a regular basis.
- The Contractor must submit a copy of the updated work schedule to the Client and the Consultant along with the progress reports during site meeting.
- At the completion of the project, the Contractor must submit the finalised as-built detailed work schedule to the Client.

### **PART 3**

#### ***Application of Work Schedule***

#### Planning of Project Resources

- The work schedule shall be utilised as a tool to plan the resources to be used in the project.
- Work schedule must include resource usage such as manpower, machineries, and materials.
- Updating of the resources is a must and must be accompanied by proof of records such as invoice, labour records and etc.
- Once the project is completed, the resource-based work schedule should be submitted to the Client.

#### Monitoring of Project Progress

- All monitoring work shall be based on the work schedule.
- Work schedule should have baseline schedule to clearly show the planned and actual work done.
- Work schedule should be updated daily by the Contractor and submitted every month to the Client together with other reports.

#### Evaluation of Progress Payment

- Evaluation of progress payment by the Quantity Surveyor should be done by referring to the work schedule.
- Progress claims must be submitted based on the work schedule.
- Contractor's claims should be validated by the Quantity Surveyor prior to being approved by the Client.

#### Evaluation of Claims for Extension of Time

- In the case of project delay, the request for extension of time must be accompanied with the work schedule.
- The reasons of delays must be indicated clearly in the work schedule.
- The schedule used to support request for extension of time must be as-built schedule, created through the network modeling.

**PART 4**  
***Implications of Work Schedule***

**Client's Rights**

- The prominent owner of the work schedule is the Client.
- The Client reserves the right to access all the information in the work schedule.
- No changes shall be made without the approval of the Contractor and the Client.
- The Client reserves the right to use the work schedule for other purposes after informing the contractor about the use of the work schedule.

**Consultant's Rights**

- The Consultant has the right to the work schedule for monitoring and evaluation purposes only.
- Full access to the project shall be granted when authorised by the Client.
- The Consultant can request for changes to the work schedule either from the Client or Contractor.

**Contractor's Rights**

- The Contractor reserves the right to fully use and update the work schedule for the purpose of the project alone.
- Any other uses of the work schedule should be done after seeking the approval of the Client.