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Pre-Qualification Of Contractors For High-Rise Building Projects In Philippines: A Selection Method In Construction Management Using Analytic Hierarchy Process (AHP) As A Tool In Decision Making

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Abstract: The construction of high-rise buildings, one of the fastest growing in the country, experienced a boom in the first quarter of 2014, generating jobs and enhancing growth of the industry. In order to sustain steady growth of Philippine construction industry there is a need to evaluate and manage projects in terms of quality, schedule and costs. The role of construction management is necessary to eliminate the risks of project failure due to poor contractor's performance. Therefore, the evaluation of prospective contractor's capability in a pre-qualification process is one of the important decisions to be made before executing the project. Instead of the existing industry practice in contractor selection which is based on lowest offer, another set of pre-qualification criteria should be measured. This criterion is not easy to establish and to measure. A range of decision making tools that rely on multi-attribute ranking are available for solving the problem. In this research paper the use of Analytic Hierarchy Process (AHP) is suggested in determining criteria weights and contractor's selection during pre-qualification process. Six criteria are evaluated for the primary objectives using a questionnaire. Comparisons are made by ranking the score of each contractor and the highest is considered the best. The used of this decision making tool as selection method for construction management in pre-qualification activities of high-rise construction project in Philippines is proposed. The results show that there is chance to make possible the objectives and rationalize the decisions during pre-qualification process in selecting contractors for high-rise building projects.

Key Words: pre-qualification process; construction management; contractor selection; high-rise building; analytical hierarchy process

1. INTRODUCTION

Management of high-rise construction project is carrying out in control: have a hold over quality, schedule and costs. The significance of contractor's pre-qualification process in construction management of high-rise buildings cannot be set aside. From the initial step of the building process to turn over ceremony, construction contractors plays a vital role. Failure to properly select a competent contractor can lead to problems for the entire project. The proper selection of contractors increases chances of project delivery within cost, time and quality.

The pre-qualification of contractors for high-rise building projects in the Philippines are very often conducted during pre-construction stage in the form of bidding or tendering. During tendering the potential contractors are selected based on their reputation or a set of pre-qualification criteria and with lowest proposals as shown in Table 1. In years, most owners of high-rise building projects made use of such method. As a result the lowest bidders often have problems in completing the project within cost, time and quality.

Table 1. Example Prequalification Evaluation Result

Description	%wt	Contractor Rating (%)			
		A	B	C	D
Methodology	13	7.65	3.85	9.46	8.69
Schedule	10	7.78	1.11	6.67	6.67
Quality	10	10.00	5.00	10.00	10.00
Safety	10	8.57	8.57	10.00	10.00
Manpower	4	3.33	0.00	4.00	2.67
Equipment	5	2.00	0.00	3.75	3.75
Organization	8	6.67	5.33	7.33	7.33
Personnel	10	4.17	0.00	5.00	6.67
Financial	30	20.93	10.80	24.09	23.70
Total Points	100	71.10	34.66	80.30	79.48

Several researchers (Holt *et al*, 1994; Russell *et al*, 1992; Ng, 1992) have identified different criteria in use for contractor selection. In a recent study, Hatush and Skitmore (1996a) found that all clients use what are implicitly the same type of criteria, but vary in the way they quantify the criteria, with most having to resort to a very subjective assessment based on information provided by the contractors. Also many techniques are proposed and applied as a solution (Hatush and Skitmore, 1998; Cheng and Heng, 2004; Plebankiewicz, 2009; Jaskowski et al., 2010). Because of its wide application in construction project management Analytical Hierarchy Process AHP is, as decision making method, widely used for multiple criteria decision-making (MCDM) in construction project management. (Saaty, 1990; Kamal et al., 2001; Chun-Chang Lin et al., 2008; Jaskowski et al., 2010). Some areas of construction project management where AHP method is used are contractor selection (Kamal et al., 2001; Jaskowski et al., 2010; Abudayyeh et al., 2007), technology selection (Skibniewski and Chao, 1992), equipment selection(Shapiraand Goldenberg, 2005), analysis of causes of disputes in the construction industry (Cakmak and Cakmak, 2013). AHP based contractor selection procedure for highway infrastructure projects in serbia (Petronijević et al., 2015).

The objective of this research paper is to introduce the application of Analytical Hierarchy Process (AHP) on the contractor pre-qualification process. The paper will briefly review the concepts and application of AHP's implementation steps, and demonstrate AHP application on the contractor selection problem. It is hoped that this will encourage its application in construction management of high-rise building projects in Philippines.

2. METHODOLOGY

In this research paper AHP was used in contractor pre-qualification process. Interviews and survey questionnaires were used to gather data and distributed to individuals experts in the field of contractor evaluation. Table 2 shows the types of questions used for data collection. The AHP was formulated based from the questionnaire responses.

Table 2. Types of questions used for data collection

No.	Question	Answer
1	How much more important do you think Financial Capability is than Past Performance in selection criteria of construction contractors?	Rating (1 to 9)
2	How much more important do You think Past Performance is than Resources in selection criteria of construction contractors?	

The Analytical Hierarchy Process (AHP) is a decision-aiding method developed by Saaty (Saaty, 1980). It aims at quantifying relative priorities for a given set of alternatives on a ratio scale, based on the judgment of the decision-maker, and stresses the importance of the intuitive judgments of a decision-maker as well as the consistency of the comparison of alternatives in the decision-making process (Saaty, 1985). Since a decision-maker bases judgments on knowledge and experience, then makes decisions accordingly, the AHP approach agrees well with the behavior of a decision-maker. The strength of this approach is that it organizes tangible and intangible factors in a systematic way, and provides a structured yet relatively simple solution to the decision-making problems (Skibniewski and Chao, 1992). In addition, by breaking a problem down in a logical fashion from the large, descending in gradual steps, to the smaller and smaller, one is able to connect, through simple paired comparison judgments, the small to the large (Al-Subhi and Al-Harbi, 1999). AHP is MCDM method where the process factors are hierarchically organized. Vertically, objective is on the highest level, with criteria, subcriteria and alternatives on lower levels, respectively, as it is showed on the hierarchical structure on Figure 1 (Marija et al., 2015).

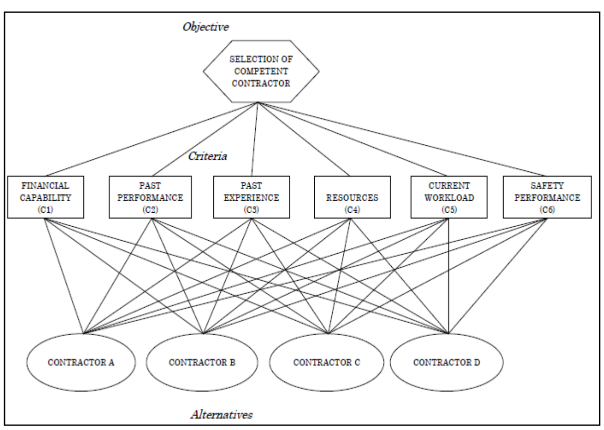

Fig.1, Hierarchical structure for AHP model

For each level – the criteria, subcriteria and alternatives, elements are compared in pairs. It means that one unfamiliar with the methodology of AHP can compare two elements from the same level according to verbal description scale. Fundamental scale used to compare the elements consists of verbal judgments ranging from equal to extreme (equal, moderately more, strongly more, very strongly more, extremely more) (Marija et al., 2015). Corresponding to the verbal judgments are the numerical values (1, 3, 5, 7, 9) and intermediate values (2, 6, 8). (Saaty, 1990) Saaty's scale is given in Table 3.

Table 3. Pair-wise comparison scale for AHP

Numerical rating	Verbal judgments of preferences
9	Extremely preferred
8	Very strongly to extremely
7	Very strongly preferred
6	Strongly to very strongly
5	Strongly preferred
4	Moderately to strongly
3	Moderately preferred
2	Equally to moderately
1	Equally preferred

Comparison results of n elements belonging to Saaty's scale and AHP hierarchical structure levels are comparison matrices. These matrices ensue vectors priority or $\omega = (\omega 1, \omega 2,\ldots \omega n)^T$, ω is the eigenvector of corresponding matrix. Vector priority involves normalized values which determine importance of the elements – weights of the elements which are compared. This is the method for determination of the priority vector of criteria, the priority vector of alternatives, and as the final result the priority vector of the objective. The priority vector of objective ranks alternatives respect to the importance of the criteria. Judgment consistency ratio (CR) of $CI = (\lambda_{max} - n)/ (n - 1)$, n is the matrix size with the appropriate value in Table 4. If CR is more than 0.10, the judgment matrix is inconsistent (Saaty, 1990).

Table 4. Random consistency index (RI)

n	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49

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3. RESULTS AND DISCUSSION

The AHP method was used in decision making process in selecting the best contractor for the construction of high-rise building project. The AHP model consist of four alternatives and six criteria as follows:

Criteria
C1 – Financial Capability
C2 – Past Performance
C3 – Past Experience
C4 - Resources
C5 - Current Workload
C6 - Safety Performance
Alternatives
Contractor - A
Contractor -B
Contractor – C
Contractor – D

These six criteria were evaluated with respect to the primary objective, to select the best and capable contractor for the project. Scores were evaluated from the interviews and survey questions distributed to experts in the field of construction management and area of contractor's pre-qualification.

Table 1 is an example of set of prequalification criteria used during bidding for the construction of a high-rise building for which contractors A, B, C and D were the prospective bidders refer to Appendix 1 for company description. Appendix 2 presents a sample evaluation for each contractor. As discussed with the lead construction project manager during an interview, the names and information have been withheld due to confidentiality reasons. The example was used to demonstrate the result applying the six criteria from the AHP model.

Table 5 shows the scores for the six criteria based on interviews and survey questions distributed to experts in the field of construction management and area of contractor's pre-qualification. Appendix 3 presents a sample data from survey questionnaire.

Table 5. Pair-wise comparision matrix for six criteria

	C1	C2	C3	C4	C5	C6
C1	1	6	7	4	5	5
C2	1/6	1	6	3	4	1
C3	1/7	1/6	1	1	1	1
C4	1/4	1/3	1	1	1	2
C5	1/5	1/4	1	1	1	1
C6	1/5	1	1	1/2	1	1

Table 6 shows the normalized relative weight, priority vector and consistency ratio. The weight of each element was calculated by dividing each score by the sum of its column in the comparison matrix to form a new matrix and the average of each row was calculated to determine the priority vector. After all pair wise comparisons are made consistency ratio was calculated by multiplying the weight column by the Level-1 matrix in Table 5 obtain a new matrix. The sum of each row was calculated and the sum column was divided by the weight column to find the average of the column (λ_{max}). The consistency ratio was calculated by dividing the consistency index by corresponding (RI) given in Table 4. The calculated consistency ratio does not exceed 10%, the judgement matrix is acceptable and consistent.

Table 6. Normalized matrix for six criteria

	C1	C2	C3	C4	C5	C6	Priority vector
C1	0.510	0.686	0.412	0.381	0.384	0.455	0.471
C2	0.085	0.114	0.353	0.286	0.308	0.091	0.206
C3	0.073	0.019	0.059	0.095	0.077	0.091	0.069
C4	0.128	0.038	0.059	0.095	0.077	0.182	0.096
C5	0.102	0.029	0.059	0.095	0.077	0.091	0.075
C6	0.102	0.114	0.059	0.048	0.077	0.091	0.082
						Σ =	1.00

λ_{max}= 6.551, CI= 0.11, RI=1.24, CR= 0.089 < 0.10 OK.

Values for the pair-wise comparison, normalization matrices and consistency ratio for each criterion "alternatives" were calculated using the same procedure as shown in Table 7 and Table 8. The calculated consistency ratio for each criterion does not exceed 10%, therefore the judgement matrices are acceptable and consistent.

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Table 7. Pair-wise comparision matrix "alternatives"

C1		A	B	C	D
	A	1	3	1/2	1/2
	B	1/3	1	1/4	1/4
	C	2	4	1	1
	D	2	4	1	1
C2		**A**	**B**	**C**	**D**
	A	1	5	1/2	1
	B	1/5	1	1/5	1/4
	C	2	5	1	2
	D	1	4	1/2	1
C3		**A**	**B**	**C**	**D**
	A	1	4	1/2	1/3
	B	1/4	1	1/5	1/6
	C	2	5	1	1/2
	D	1/0.333	1/0.167	2	1
C4		**A**	**B**	**C**	**D**
	A	1	6	1/3	1/2
	B	1/6	1	1/8	1/7
	C	1/0.333	8	1	1
	D	2	1/0.143	1/2	1
C5		**A**	**B**	**C**	**D**
	A	1	2	1/2	1/2
	B	1/2	1	1/2	1/3
	C	2	2	1	1
	D	2	1/0.333	1	1
C6		**A**	**B**	**C**	**D**
	A	1	1	1/2	1/2
	B	1	1	1/3	1/2
	C	2	1/0.333	1	1
	D	2	2	1	1

Table 8. Normalized matrix " alternatives"

C1		A	B	C	D	ω
	A	0.188	0.25	0.182	0.182	0.200
	B	0.063	0.083	0.091	0.091	0.082
	C	0.375	0.333	0.364	0.364	0.359
	D	0.375	0.333	0.364	0.364	0.359
					Σ =	1.00

λ_{max}= 4.021, CI= 0.007, RI=0.9, CR= 0.008 < 0.10 OK.

C2		A	B	C	D	ω
	A	0.238	0.333	0.227	0.235	0.258
	B	0.048	0.067	0.091	0.059	0.066
	C	0.476	0.333	0.455	0.471	0.434
	D	0.238	0.267	0.227	0.235	0.242
					Σ =	1.00

λ_{max}= 4.047, CI= 0.016, RI=0.9, CR= 0.018 < 0.10 OK.

C3		A	B	C	D	ω
	A	0.160	0.250	0.135	0.167	0.178
	B	0.040	0.063	0.054	0.083	0.060
	C	0.320	0.313	0.270	0.250	0.288
	D	0.480	0.375	0.541	0.500	0.474
					Σ =	1.00

λ_{max}= 4.067, CI= 0.022, RI=0.9, CR= 0.025 < 0.10 OK.

C4		A	B	C	D	ω
	A	0.162	0.272	0.170	0.137	0.186
	B	0.027	0.045	0.064	0.039	0.044
	C	0.486	0.364	0.511	0.549	0.477
	D	0.324	0.318	0.255	0.275	0.293
					Σ =	1.00

λ_{max}= 4.086, CI= 0.029, RI=0.9, CR= 0.032 < 0.10 OK.

C5		A	B	C	D	ω
	A	0.182	0.250	0.167	0.176	0.194
	B	0.091	0.125	0.167	0.118	0.125
	C	0.364	0.250	0.333	0.353	0.325
	D	0.364	0.375	0.333	0.353	0.356
					Σ =	1.00

λ_{max}= 4.046, CI= 0.015, RI=0.9, CR= 0.017 < 0.10 OK.

C6		A	B	C	D	ω
	A	0.167	0.143	0.176	0.167	0.163
	B	0.167	0.143	0.118	0.167	0.148
	C	0.333	0.429	0.353	0.333	0.362
	D	0.333	0.286	0.353	0.333	0.326
					Σ =	1.00

λ_{max}= 4.021, CI= 0.007, RI=0.9, CR= 0.008 < 0.10 OK.

Table 9 shows the overall priority vector. The priority vectors of the six criteria were multiplied by the priorities of the four alternative decisions for each objective.. In Table 7 judgments of the elements and comparison were provided by the independent experts. The experts assigned contractor C and D first on the ranking list in Table 9 considering criterion with highest importance C1 – financial capability as shown in Table 6. Also, considering the criteria which follows the financial capability on the criteria weights list, contractor C

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has better characteristics than contractor D, A and B as presented in Table 8. Lastly, Table 9 ranked contractors according to their overall priorities as follows: C, D, A, and B, which signify Contractor C as the best capable to execute the project.

Table 9. Priority matrix

	A	B	C	D
C1(0.471)	0.200	0.082	0.359	0.359
C2(0.206)	0.258	0.066	0.434	0.242
C3(0.069)	0.178	0.060	0.288	0.474
C4(0.096)	0.186	0.044	0.477	0.293
C5(0.075)	0.194	0.125	0.325	0.356
C6(0.082)	0.163	0.148	0.362	0.326
Overall priority vector	0.205	0.082	0.378	0.333

4. CONCLUSIONS

The paper has presented AHP as a decision-making tool in determining the order of each criteria used to select the best alternative. AHP allows options for owner and construction managers in the selection of the best contractor for high-rise building project in Philippines. This selection method avoids many risks which may result to problems if the project was awarded to less capable contractor.

Managing complex projects involves complex decision making abilities. Project failures not only result to poor selection of contractors but who made the selection process. The method can also be used in selecting who will be the best capable construction project manager.

5. ACKNOWLEDGMENTS

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APPENDICES

APPENDIX 1. Company Description

Contractor A	Contractor B	Contractor C	Contractor D
Is recognized as one of the leading construction companies in the Philippines, known for the quality of its work and the excellence of its workforce. It has the broadest range of construction and engineering services, with expertise in the construction of large-scale heavy and light industrial projects, infrastructure, and property development projects all over the world. Over the years, Contractor A has built several power plants, refineries, petrochemical plants, cement plants, mining facilities, industrial plants, buildings, schools, hospitals, roads, bridges, seaports, airports, railways, water distribution stations, flood control systems, steel structures and modular assemblies. As such, it is a preferred contractor of global Engineering, Procurement and Construction Companies.	Started as a modest sub-contractor and gradually worked their way to become an AAA Contractor. In a span of only twelve (12) years from its inception.As service oriented organization, contractor B give utmost importance to client satisfaction by continually improving the means of delivering projects, in the **safest way** possible, of **highest quality** attainable, shortest time achievable, at a **reasonable cost**.	Established in 1975, is a leading international construction company. Headquartered in Hong Kong, contractor C delivers a portfolio of high-profile infrastructure projects throughout Asia. As a proven leader in the delivery of complex tunnel, rail and road networks, contractor C also delivers turn-key renewable energy infrastructure including utility-scale wind, geothermal energy and waste-to-power installations. Its building projects range from schools, embassies and luxury high-rise residential towers, to large scale leisure complexes, a growing number of which are built to international green building and energy efficiency standards. Contractor C currently operates in Hong Kong, Indonesia, India, Macau, Malaysia, Philippines, Singapore, Thailand and Iraq.	Over the years has left its mark on a multitude building projects and structures in the Philippines and abroad. Built its legacy and solid reputation on enduring values of excellence, high standards of quality and completed projects on or ahead of schedule. Continues to undertake new construction techniques and using new products and processes. With more than 5 decades of solid track record, contractor D build world-class expertise and extensive portfolio in high-rise and commercial building construction.

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APPENDIX 2. Sample Prequalification Evaluation

	DESCRIPTION		CONTRACTOR C PARAMETERS	CHECKLIST	REMARKS	ASSESSMENT	PS	CP	RS
1.00	Construction Methodology	10%	(1) With program for mobilization at site, including procedure for turn-over of Excavation Works	(1) Included in submittal.	(1) With submittals in proposal for: a. Temporary MEPS Layout for Temfacil b. Procedure on Turn-over of Site/Joint Survey with Excavation Contractor	a. Proposal is acceptable. b. Clarify if in cost offer soil bear test is included as it is identified in method statement.	1	1	
			(2) Proposed work schedule should be validated by a pre-established calculations, with specific work flow-sequence	(2) Included in submittal.	(2) With proposal for: a. Basis of Calculation of Projected Milestones	(2) Conflict in schedule is identified in MEPF/ Equipment Works; should be rechecked.	1	0	
			(3) Construction Procedures and Method Statements to be included (but not limited to):	(3) Included in submittal.	(3) General Method Statements given as:	(3) Schematics on methods shown and detailed-out particularly on concrete pour works, which is tailored-fit with the project			
			(a) Mobilization		a. Noted		1	1	
			(b) Site Preparation; Temfacil,including equipment		b. Noted		1	1	
			(c) Formworks		c. Noted; with illustrations	c. Use of FUVI for formworks for better qu	1	1	
			(d) Concrete Works		d. Noted; with illustrations		1	1	
			(e) Basic Architectural Works and MEPF Works (including interface works)		e. Noted; with illustrations		1	1	
			(f) Curtain Wall Works		f. Noted; with illustrations		1	1	
			(g) Project Close-out and Demobilization		g. Noted.		1	1	
			(4) Interfacing with and Attendance to other Work Packages	(4) Included in submittal.	(4) Noted in proposal.		1	1	
			(5) Submittal Schedule	(5) See remarks.	(5) Not included in proposal.	(5) Clarify Submittal-Schedule preparation.	1	1	
			(6) Preparation of CSDs	(6) See remarks.	(6) Not clearly defined in proposal.	(6) Clarify attendance for CSDs preparation.	1	0	
			(7) Compliance to Drawings and Specifications	(7) See remarks.	(7) Noted in proposal.		1	1	
							13	11	8.46
2.00	Temporary Facility Layout	3%	(1) At least one (1) established control point for egress and ingress at site	(1) Identified in submittal.	(1) With two (2) egress/ingress points.	(1) Two egress/ingress points with identified and security at site	1	1	
			(2) Orientation of temfacil should consider the actual location of VMU which will have a direct effect on the layout	(2) Identified in submittal.	(2) VMU location indicated not as per actual conditions.	(2) Check if ocular visit was conducted. Temfa layout may be revised accordingly.	1	0	
			(3) A proposed floor layout of the offices should be defined and presented, including the contractor's laydown area, storage areas, waste disposal unit(s), etc.	(3) See remarks.	(3) With defined layout/floor plan for PM's Site Office and Gencon's Office, etc.	(3) Confirm location of waste disposal units	1	0	
			(4) Accesway to the building from the temfacil/offices to the construction site should be properly identified, including the the equipment to be used during operations/construction	(4) See remarks.	(4) Accessway to activity area/site and Alimak clearly defined and identified in layout.	(4) Access layout is acceptable as identified in proposal.	1	0	
			(5) Office requirement for the Owner/Owner's Rep. should be at least 270sqm, with Conference Room (cap. Min. 20 people)	(5) See remarks.	(5) Noted. Included in proposal.	(5) Complying with requirements (with floor la including MEP plans).	1	1	
			(6) Office layout of Gencon should be presented, identifying the proposed location and layout of each departments in line w/ the proposed organization chart/manpower requirements.	(6) See remarks.	(6) Noted. Included in proposal.	(6) Complying with requirements (with floor la including MEP plans).	1	0	
							6	2	1.00
3.00	Construction Schedule	10%	(1) Project Schedule should cover a maximum 24-month timeline	(1) Stipulated in submittal.	(1) Noted. With 24-month project timeline.	(1) With diagrams and illustrations on sequen works, only, conflict with MEPF/Equipment Schedule should be refined with main works.	1	1	1
			(2) Set on a minimum of +/-200sqm per day of concrete works, shell of the building should be about on a 3 to 3.5 floors/month or about 10 to 12 months for the superstructure and relatively 5 to 6-months duration for the substructure (was based on completed similar projects)	(2) See remarks.	(2) Noted. Target daily or weekly accomplishment not specifically detailed-out and presented. (2) Structural is set at 17-months to top-off, 12 mos. for superstructure and 5.0 mos. for substructure.	(2) Proposal is set at 2.83 floors ave. per mont superstructure which is within the expected timeline; substructure is still within expected timeline.	1	1	1
			(3) Established timeline for CWU is 3 to 4 floors/month, or about Eight (8) to Nine (9) months duration, with building seal-off set at 6 months before project hand-over	(3) See remarks.	(3) CWU is at 3F/mo; 11mos to complete, from October 2010 to August 2011.	(3) Within anticipated target of 3-4 floors per month. However, there is conflict with presented schedule vs. illustration (i.e. CWU works in reference with Concrete Works)	1	0	0
			(4) Project Schedule Calculations & Parameters were based on:	(4) See remarks.	(4) Noted.	(4) Proprosed schedule subject for presentation.			
			(a) Target Site Hand-over to Gencon - mid November 2009			(a) Within the parameter set.	1	1	
			(b) Gencon's Day 1 at Site - 3rd Week November 2009			(b) Within the parameter set.	1	1	
			(c) Top-off - April 2011		(c) Expected top-off by March 2011.	(c) Within te parameter set.	1	1	
			(d) Building Seal-off - Mid-year 2011		(d) Expected to seal-off by August 2011.	(d) Water tightness of bldg. is inconsistent w CWU completion and removal of Alimak.	1	0	
			(e) Testing and Commissioning by September 2011			(e) Review Equipment Schedule Installations Confirm early procurement-installation sched.	1	0	
			(5) Primavera Project Planner (and S-curve) or equivalent with Monthly Projected Accomplishments	(5) See remarks.	(4) Noted included in proposal.	(4) Proprosed schedule subject for presentati	1	1	1
							9	6	6.67
4.00	Quality Policy & Procedure	10%	(1) With written Quality Policies, which will include the company's Quality Plan, Quality Control and Quality Assurance	(1) Included in submittal.	(1) Noted in proposal.	(1) With established Quaity Program and Polic	1	1	
			(2) With established Quality Systems which is ISO 9001:2000 Certified	(2) See remarks	(2) Noted.	(2) With certification.	1	1	
							2	2	10.00
5.00	Safety Policy and Manual	10%	(1) With written Environment, Health and Safety Plan covering the following (but not limited to):	(1) Included in submittal.	(1) Noted in proposal.	(1) With established Safety Program and Polic	1	1	
			(a) Company EHS Policies and Program			(a) Included.	1	1	
			(b) Housekeeping			(b) Included.	1	1	
			(c) Accident, Emergency and Fire Prevention/Control Plan			(c) Included.	1	1	
			(d) Environment Management			(d) Included.	1	1	
			(e) Site and Building Security Measure and Program			(e) Included.	1	1	
			(2) With established Safety Manual which is ISO 14001 Certified and DOLE Accredited	(2) See remarks.	(2) Noted.	(2) With certification.	1	1	
							7	7	10.00
6.00	Manpower Loading	4%	(1) Use of Approximation to Manpower Loading to check Validity of proposal:	(1) Included in submittal.	(1) Noted; with illustrations.		1	1	
			(a) The maximum manpower at site is 160% of the average manpower site		(a) Max. manpower alloted is 745.	(a) As per calculations, max. manpower shou 745 (at peak), hence, acceptable.	1	1	
			(b) The maximum manpower at site first occurs after 40% of the total manpower requirement has been expended.		(b) Max. manpower alloted is at 7th month.	(b) As per calculations, max. manpower is at n 10 also, hence, acceptable.	1	1	
			(c) The period of maximum manpower at site accounts for 40% of the Total Manpower Requirement		(c) Max. manpower alloted is at 5,272 from month 7 to month 14	(c) As per calculation max. manpower is at 47 during the peak period, hence, acceptable.	1	1	
			(d) The maximum manpower at site first occurs when 50% of the project time has elapsed.		(d) Max. manpower alloted is at 12th month	(d) As per calculation max. manpower is at mo 12 also, hence, acceptable.	1	1	
			(e) The period of maximum manpower at site occurs for 25% of the project time.		(e) Max. manpower alloted is in 8 months, from month 7 to month 14.	(e) As per calculation max. manpower is abou 33.33%, hence, acceptable.	1	1	
							6	6	4.00

APPENDIX 3. Sample Survey Data

NAME: JONATHAN BIONA
COMPANY: DESIGN COORDINATES, INC.
POSITION: QCMD HEAD

Instruction: Put a "x" mark on the box provided for your answers. Choose only one (1) answer for every question.

		1	2	3	4	5	6	7	8	9
No.	Question	Equally preferred	Equally to moderately	Moderately preferred	Moderately to strongly	Strongly preferred	Strongly to very strongly	strongly preferred	strongly to	Extremely preferred
1	How much more important do you think Financial Capability is than Past Performance in selection criteria of Construction Contractor?						X			
2	How much more important do you think Financial Capability is than Past Experience in selection criteria of Construction Contractor?							X		
3	How much more important do you think Financial Capability is than Resources in selection criteria of Construction Contractor?				X					
4	How much more important do you think Financial Capability is than Current Workload in selection criteria of Construction Contractor?					X				
5	How much more important do you think Financial Capability is than Safety performance in selection criteria of Construction Contractor?					X				
6	How much more important do you think Past Performance is than Past Experience in selection criteria of Construction Contractor?						X			
7	How much more important do you think Past Performance is than Resources in selection criteria of Construction Contractor?			X						
8	How much more important do you think Past Performance is than Current Workload in selection criteria of Construction Contractor?				X					
9	How much more important do you think Past Performance is than Safety Performance in selection criteria of Construction Contractor?	X								
10	How much more important do you think Past Experience is than Resources in selection criteria of Construction Contractor?	X								
11	How much more important do you think Past Experience is than Current Workload in selection criteria of Construction Contractor?	X								
12	How much more important do you think Past Experience is than Safety Performance in selection criteria of Construction Contractor?	X								
13	How much more important do you think Resources is than Current Workload in selection criteria of Construction Contractor?	X								
14	How much more important do you think Resources is than Safety Performance in selection criteria of Construction Contractor?		X							
15	How much more important do you think Current Workload is than Safety Performance in selection criteria of Construction Contractor?	X								