#### CS-209

A Study on Project Management System for International Construction Project:

# A COST CONTROL AND MONITORING SYSTEM "COSMOS"

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#### 1. INTRODUCTION

To perform an international construction project is different from that of a domestic one. Working condition, ability and the way of thinking of foreign staff is also greatly different, not to mention material, equipment, specification. However the most significant one is the right and responsibility of contractor (conditions of contract). PMS (\*1) is a manual that specifies procedures for field office works, clearly defines the right and responsibility, and therefore, reduces time for adjusting individual difference of staff in the way of thinking and working, and let them be able to work with their true ability. The use this PMS leads to better cost-effectiveness. This report describes COSMOS (\*2), a cost control and monitoring system that is regarded as a core of PMS.

### 2. COST CONTROL WITH COSMOS

COSMOS consists of 7 independent sub-systems and 1 main system as shown in Tab-1.

① Account system (AC) covers all accounting cost data. ② Sub-contract system (SB) utilizes unit price that were sub-contracted and relative monthly progress to obtain cost data. ③ Material (MA), ④ Labor

(MR), ⑤ Equipment (EQ), ⑥ Plant (PL) systems, by summing up Working Daily Report, obtain quantity of material, worker, equipment and plant production (concrete, asphalt concrete, crushed stone, etc.) and calculate cost by multiplying unit price set in advance. ⑦ BQ system (BQ) utilizes unit price contracted with the Client and monthly progress quantities to calculate progress payment receivable. ⑧ Cost Analysis system (CA) is the main system and receives all cost data calculated by

SY:	STEM	PRINT OUT
1	AC	Balance Sheet / General Ledger / Payment List by Vender
2	SB	Contract Master List / Contract Control Report
3	MA	Journal List / Material Costing List
4	MR	Histogram of Number of Workers / Labor Costing List
5	EQ	Master List / Equipment Costing List
6	PL	Production Cost Report / Plant Costing List
7	BQ	BQ (Bill of Quantities) Progress Payment
8	CA	Balance Sheet: Target Budget vs Construction Cost / Balance
		Sheet: BQ Progress vs Cost to Date / Construction Productivity

Tab-1: Sub-systems and their major prints out

								CXXXXXXX									
							1998/04	/01 - 199	8/04/30	)							
BLOCK	(1 ) : DIRECT WORK																
SECTION	(E1) : Bridge Const	ructi	ion													tum	.10001
PAGE	(10): 4Each-6m Spa	n Bri	dge												AP	OUNT = >	(1000)
		data.		WET HIS	APP		ST TO DA	nege (COSCO)	HADE	TA BOUR	LETTON	CARCAL	TEA COM	or west		BALANCE	AGE
	COST ITEM																
CODE	DESCRIPTION	URT		ERNIVALE	NT IYEN		<b>EQUIVALE</b>	NT (YEA)		<b>CONTRACT</b>	R3 (YER)	Q' TY	ECHIVALE	#1 (YE#)	Q' TY	EQUIVALE	er in
CODE		UNT	Q' TY	EQUITYALI U/P	AMOUNT	Ø, 1.1	EQUIVALE U/P	AT (YEAR)	Q'TY	LQUIYALI U/P	ANOUNT	Q' TY	EQUIYALE U/P	AMOUNT	Q'TY (M)≈	EQUIYALE U/P	AMOU!
	DESCRIPTION		Q' TY (A)	E88 [YAL] U/P (B)=C/A	AMOUNT (C)	(D)	1081YALI U/P (E)=F/D	AT (YEA) AMOUNT (F)	Q'TY (G)	10VIYALI U/P (H)=1/G	AMOUNT	Q, IA (7)	0/P (K)=L/J	AMOUNT (L)=F+1	Q'TY (M)≈	EQUIYALI U/P (N)=8-K	HT LYE AMOU! (O)≕C
1 F1100010	DESCRIPTION  Bridge Excavation	C.M	Q' TY (A) 56,000	E00 (YAL) U/P (B)=C/A 265	MT (YEM) AMOUNT (C) 14,837	Q' TY (D) 5,500	1081YAL( U/P (E)=F/D 120	AMOUNT (F) 660	Q' TY (G) 50,500	19¥1YAL1 U/P (H)≈1/G 265	ANOUNT (1) 13,380	Q'TY (J) 56,000	EQUIYALE U/P (K)=L/J 251	#1 (YE#) AMOUNT (L)=F+1 14,040	0' TY (M)= A-J 0	EQUIYALE U/P	AMOU!
1 E1100010 1 E1100020	DESCRIPTION  Bridge Excavation Structural Backfill	C.M C.M	Q'TY (A) 56,000 50,000	EQUIVAL U/P (B)=C/A 265 889	MT (YEM) AMOUNT (C) 14,837 44,435	Q' TY (D) 5,500 0	EQUIVALU U/P (E)=F/D 120 0	AT (YEA) AMOUNT (F) 660 0	Q' TY (G) 50,500 50,000	10v1YAL1 U/P (H)=1/G 265 889	#1 (1EN) AMOUNT (1) 13,380 44,435	Q'TY (J) 56,000 50,000	EGNIYALI U/P (K)≈L/J 251 889	#1 (YER) AMOUNT (L)=F+1 14,040 44,435	0' TY (M)≈ <u>A-J</u> 0	EQUIYALI U/P (N)=B-K 14	11 IYE AMOU! (0)=0 7
1 E1100010 1 E1100020 1 E1100030	DESCRIPTION  Bridge Excavation Structural Backfill 350 x 350 Precast	C.M C.M	Q' TY (A) 56,000	EQUIVAL U/P (B)=C/A 265 889	MT (YEM) AMOUNT (C) 14,837	Q' TY (D) 5,500 0	1081YAL( U/P (E)=F/D 120	AT (YEA) AMOUNT (F) 660 0	Q' TY (G) 50,500	10v1YAL1 U/P (H)=1/G 265 889	ANOUNT (1) 13,380	Q'TY (J) 56,000 50,000	EGNIYALI U/P (K)≈L/J 251 889	#1 (YE#) AMOUNT (L)=F+1 14,040	0' TY (M)≈ <u>A-J</u> 0	EQUIYALI U/P (N)=B-K 14	AT IYE AMOU! (O)=C 7
1 E1100010 1 E1100020 1 E1100030	DESCRIPTION  Bridge Excavation Structural Backfill	C.M C.M	Q'TY (A) 56,000 50,000	EQUIVAL U/P (B)=C/A 265 889	MT (YEM) AMOUNT (C) 14,837 44,435	Q' TY (D) 5,500 0	EQUIVALU U/P (E)=F/D 120 0	AT (YEA) AMOUNT (F) 660 0	Q' TY (G) 50,500 50,000	10v1YAL1 U/P (H)=1/G 265 889	#1 (1EN) AMOUNT (1) 13,380 44,435	Q'TY (J) 56,000 50,000	EGNIYALI U/P (K)≈L/J 251 889	#1 (YER) AMOUNT (L)=F+1 14,040 44,435	0' TY (M)≈ <u>A-J</u> 0	EQUIYALI U/P (N)=B-K 14	11 IYE AMOU! (0)=0 7

Keyword: Project management system, International construction project, Cost control system, Estimating system, Work

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Fig-2: Balance Sheet: BQ Progress vs Construction Cost to Date

								xxxxxxxxx 1998/04/0	XXXXXX	PROJ	ECT		T TO DA				
	BQ ITEM		CUR			BQ PROGRES						CONSTRU	CTION COST			PAGE BALANCE	
CODE	DES- CRIPTION	UNT		Q' TY	U/PRICE		EQUIVAL U/PRICE	AMOUNT	COST I			ORIGINAL U/PRICE	AMOUNT	EQUIVAL U/PRICE	AMOUNT	EQUIVAL U/PRICE	ANOUNT
0E0111 E	Bridge Excavation		YEN US\$ VD	(A) 5,500	0.00	(C)=A*B 539,000 0.00 42,476,500	- 1	(E) 963,765	1 E110 0010		5,500		6,600.00	(I) 120.00	(J) 660,000	(K)≓D-1 55.23	( <u>L</u> )≑E-J 303,76
	Structural Backfill	C.M	YEN US\$ VD		149.00 0.00 11,762.00		266.62		1 E110 0020		0					266.62	
0070	350 x 350 Prect Conc Piles		YEN US\$ VD YEN US\$	55	1,823.00 0.00			179,725	1 E110 0030		55	30,000.00 0.00 0.00	0,00		1,650,000	-26,732.27	1,470,27

other sub-systems, sums up and analyses them and makes prints out. Figure-1 and Figure-2 shows two of its prints out.

On the other hand, cost for remaining work (Cost to Completion) can be obtained by multiplying remaining work quantity to the applicable unit price that can be adjusted with reference to both unit price of Budget and that of work done. The sum of Cost to Date and to Completion, i.e. Forecasted Construction Cost, will be then compared with the Budget to find out all expenditures which exceed the Budget. To study its cause and where the responsibility lies leads us to determine what method of construction must be improved, or as to Variation or Out of Scope works, evidence could be collected and kept for negotiation coming in the future.

# 3. USE OF FIELD DATA

The essence of estimation is how to determine appropriate unit price and work productivity. To analyze Field Data collected by COSMOS and to utilize it in the estimation process leads to a more theoretical and more competitive bid amount. These Data also help us to qualify the reasonability of the price offered by a Sub-contractor.

The procedure to use Field Data in an estimation process is as follow:

- (1) Examination of Data: To analyze and examine its reasonability. **COSMOS** provides its background data in basic format, i.e. material, labor, equipment, expenses, etc., so it is easy to do this work.
- (2) Averaging of Data: In general, Field Data is very detailed and particular because it is used not only by COSMOS but also by many other purposes such as Store Control, Schedule Control or Contract Management. Contrary to this, Estimation requires averaged data over the whole work. Data should be summed up and averaged to a level that Estimation system needs.
- (3) <u>Data Transfer:</u> Field Data, after being averaged, will be transferred to the database of Estimation system. The Data can also be transferred and utilized for the purpose of Contract administration as the evidence that shows the fact of construction cost.

# 4. CONCLUSION

For further development of COSMOS, improvement in its software and more training of staff is indispensable. To link Cost Control System with Estimation System enables an effective use of Field Data and leads to an competitive Bid amount.

We believe that collection and utilization of Field Data makes a great contribution to the participation in the international construction market that is considered to be growing up more and more.

- \*1) Project Management System, "Proceedings of the 48th Annual Conference of the JSCE", VI 249
- \*2) Cost Control & Monitoring System, "Proceedings of the 50th Annual Conference of the JSCE", VI 178