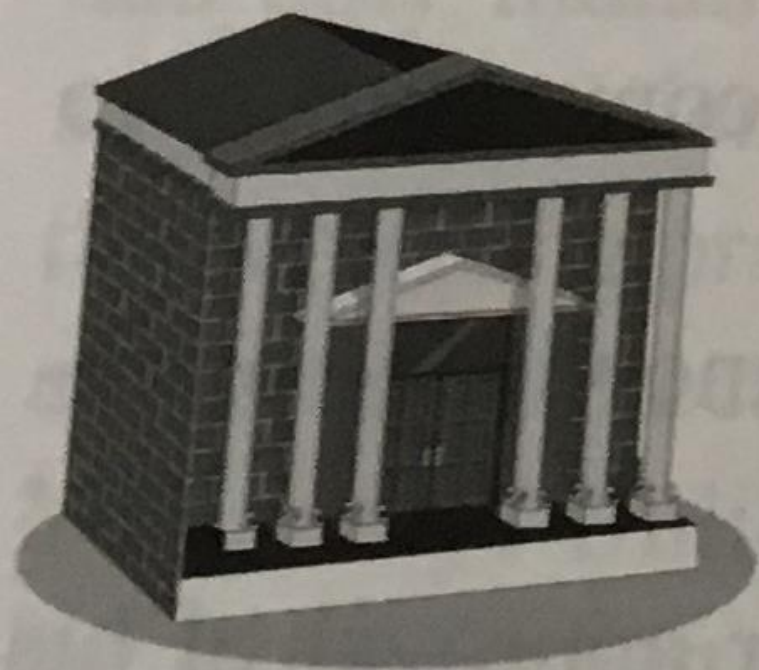
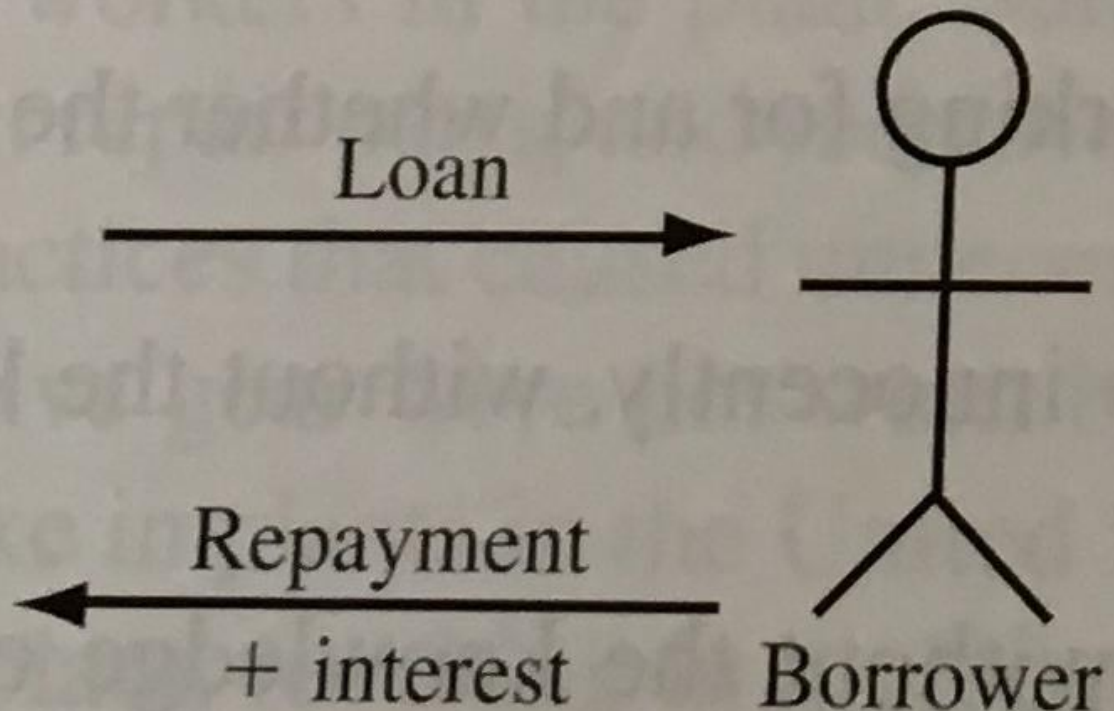


IA EIM 611
March 14th, 2020

Financial Aspect



Bank



Present Worth/Future Worth

I. Single Payment

▶ 2. Uniform Series

▶ 3. Arithmetic Gradient



Present and Future Worth

► Single Payment

ฝากเงินกับธนาคารแห่งหนึ่งเมื่อต้นปี **2550** เป็นเงิน **200,000** บาท ธนาคารให้ดอกเบี้ยร้อยละ **5** ต่อปี เมื่อถึงสิ้นปีที่ **10** (สิ้นปี พ.ศ. **2559**) จะมีเงินรวมเท่าไร ให้คิดวิธีการฝากแบบดอกเบี้ยทบต้น

► Uniform Series

ฝากเงินกับธนาคารแห่งเดียวกันตั้งแต่ต้นปี **2550** ปีละเท่าๆกันเป็นจำนวน **20,000** บาทต่อปี เป็นเวลา **10** ปี เมื่อสิ้นปีพ.ศ. **2559** จะมีเงินรวมทั้งสิ้นเท่าไร ธนาคารให้ดอกเบี้ยร้อยละ **5** ต่อปี



5% **TABLE 10** Discrete Cash Flow: Compound Interest Factors 5%

n	Single Payments		Uniform Series Payments				Arithmetic Gradients	
	Compound Amount F/P	Present Worth P/F	Sinking Fund A/F	Compound Amount F/A	Capital Recovery A/P	Present Worth P/A	Gradient Present Worth P/G	Gradient Uniform Series A/G
1	1.0500	0.9524	1.00000	1.0000	1.05000	0.9524		
2	1.1025	0.9070	0.48780	2.0500	0.53780	1.8594	0.9070	0.4878
3	1.1576	0.8638	0.31721	3.1525	0.36721	2.7232	2.6347	0.9675
4	1.2155	0.8227	0.23201	4.3101	0.28201	3.5460	5.1028	1.4391
5	1.2763	0.7835	0.18097	5.5256	0.23097	4.3295	8.2369	1.9025
6	1.3401	0.7462	0.14702	6.8019	0.19702	5.0757	11.9680	2.3579
7	1.4071	0.7107	0.12282	8.1420	0.17282	5.7864	16.2321	2.8052
8	1.4775	0.6768	0.10472	9.5491	0.15472	6.4632	20.9700	3.2445
9	1.5513	0.6446	0.09069	11.0266	0.14069	7.1078	26.1268	3.6758
10	1.6289	0.6139	0.07950	12.5779	0.12950	7.7217	31.6520	4.0991
11	1.7103	0.5847	0.07039	14.2068	0.12039	8.3064	37.4988	4.5144
12	1.7959	0.5568	0.06283	15.9171	0.11283	8.8633	43.6241	4.9219
13	1.8856	0.5303	0.05646	17.7130	0.10646	9.3936	49.9879	5.3215
14	1.9799	0.5051	0.05102	19.5986	0.10102	9.8986	56.5538	5.7133
15	2.0789	0.4810	0.04634	21.5786	0.09634	10.3797	63.2880	6.0973
16	2.1829	0.4581	0.04227	23.6575	0.09227	10.8378	70.1597	6.4736
17	2.2920	0.4363	0.03870	25.8404	0.08870	11.2741	77.1405	6.8423
18	2.4066	0.4155	0.03555	28.1324	0.08555	11.6896	84.2043	7.2034
19	2.5270	0.3957	0.03275	30.5390	0.08275	12.0853	91.3275	7.5569
20	2.6533	0.3769	0.03024	33.0660	0.08024	12.4622	98.4884	7.9030
21	2.7860	0.3589	0.02800	35.7193	0.07800	12.8212	105.6673	8.2416
22	2.9253	0.3418	0.02597	38.5052	0.07597	13.1630	112.8461	8.5730
23	3.0715	0.3256	0.02414	41.4305	0.07414	13.4886	120.0087	8.8971
24	3.2251	0.3101	0.02247	44.5020	0.07247	13.7986	127.1402	9.2140
25	3.3864	0.2953	0.02095	47.7271	0.07095	14.0939	134.2275	9.5238
26	3.5557	0.2812	0.01956	51.1135	0.06956	14.3752	141.2585	9.8266
27	3.7335	0.2678	0.01829	54.6691	0.06829	14.6430	148.2226	10.1224
28	3.9201	0.2551	0.01712	58.4026	0.06712	14.8981	155.1101	10.4114
29	4.1161	0.2429	0.01605	62.3227	0.06605	15.1411	161.9126	10.6936
30	4.3219	0.2314	0.01505	66.4388	0.06505	15.3725	168.6226	10.9691
31	4.5380	0.2204	0.01413	70.7608	0.06413	15.5928	175.2333	11.2381
32	4.7649	0.2099	0.01328	75.2988	0.06328	15.8027	181.7392	11.5005
33	5.0032	0.1999	0.01249	80.0638	0.06249	16.0025	188.1351	11.7566
34	5.2533	0.1904	0.01176	85.0670	0.06176	16.1929	194.4168	12.0063
35	5.5160	0.1813	0.01107	90.3203	0.06107	16.3742	200.5807	12.2498
40	7.0400	0.1420	0.00828	120.7998	0.05828	17.1591	229.5452	13.3775
45	8.9850	0.1113	0.00626	159.7002	0.05626	17.7741	255.3145	14.3644
50	11.4674	0.0872	0.00478	209.3480	0.05478	18.2559	277.9148	15.2233
55	14.6356	0.0683	0.00367	272.7126	0.05367	18.6335	297.5104	15.9664
60	18.6792	0.0535	0.00283	353.5837	0.05283	18.9293	314.3432	16.6062
65	23.8399	0.0419	0.00219	456.7980	0.05219	19.1611	328.6910	17.1541
70	30.4264	0.0329	0.00170	588.5285	0.05170	19.3427	340.8409	17.6212
75	38.8327	0.0258	0.00132	756.6537	0.05132	19.4850	351.0721	18.0176
80	49.5614	0.0202	0.00103	971.2288	0.05103	19.5965	359.6460	18.3526
85	63.2544	0.0158	0.00080	1245.09	0.05080	19.6838	366.8007	18.6346
90	80.7304	0.0124	0.00063	1594.61	0.05063	19.7523	372.7488	18.8712
95	103.0347	0.0097	0.00049	2040.69	0.05049	19.8059	377.6774	19.0689
96	108.1864	0.0092	0.00047	2143.73	0.05047	19.8151	378.5555	19.1044
98	119.2755	0.0084	0.00042	2365.51	0.05042	19.8323	380.2139	19.1714
100	131.5013	0.0076	0.00038	2610.03	0.05038	19.8479	381.7492	19.2337

8%

TABLE 13 Discrete Cash Flow: Compound Interest Factors

8%

n	Single Payments		Uniform Series Payments				Arithmetic Gradients	
	Compound Amount F/P	Present Worth P/F	Sinking Fund A/F	Compound Amount F/A	Capital Recovery A/P	Present Worth P/A	Gradient Present Worth P/G	Gradient Uniform Series A/G
1	1.0800	0.9259	1.00000	1.0000	1.08000	0.9259		
2	1.1664	0.8573	0.48077	2.0800	0.56077	1.7833	0.8573	0.4808
3	1.2597	0.7938	0.30803	3.2464	0.38803	2.5771	2.4450	0.9487
4	1.3605	0.7350	0.22192	4.5061	0.30192	3.3121	4.6501	1.4040
5	1.4693	0.6806	0.17046	5.8666	0.25046	3.9927	7.3724	1.8465
6	1.5869	0.6302	0.13632	7.3359	0.21632	4.6229	10.5233	2.2763
7	1.7138	0.5835	0.11207	8.9228	0.19207	5.2064	14.0242	2.6937
8	1.8509	0.5403	0.09401	10.6366	0.17401	5.7466	17.8061	3.0985
9	1.9990	0.5002	0.08008	12.4876	0.16008	6.2469	21.8081	3.4910
10	2.1589	0.4632	0.06903	14.4866	0.14903	6.7101	25.9768	3.8713
11	2.3316	0.4289	0.06008	16.6455	0.14008	7.1390	30.2657	4.2395
12	2.5182	0.3971	0.05270	18.9771	0.13270	7.5361	34.6339	4.5957
13	2.7196	0.3677	0.04652	21.4953	0.12652	7.9038	39.0463	4.9402
14	2.9372	0.3405	0.04130	24.2149	0.12130	8.2442	43.4723	5.2731
15	3.1722	0.3152	0.03683	27.1521	0.11683	8.5595	47.8857	5.5945
16	3.4259	0.2919	0.03298	30.3243	0.11298	8.8514	52.2640	5.9046
17	3.7000	0.2703	0.02963	33.7502	0.10963	9.1216	56.5883	6.2037
18	3.9960	0.2502	0.02670	37.4502	0.10670	9.3719	60.8426	6.4920
19	4.3157	0.2317	0.02413	41.4463	0.10413	9.6036	65.0134	6.7697
20	4.6610	0.2145	0.02185	45.7620	0.10185	9.8181	69.0898	7.0369
21	5.0338	0.1987	0.01983	50.4229	0.09983	10.0168	73.0629	7.2940
22	5.4365	0.1839	0.01803	55.4568	0.09803	10.2007	76.9257	7.5412
23	5.8715	0.1703	0.01642	60.8933	0.09642	10.3711	80.6726	7.7786
24	6.3412	0.1577	0.01498	66.7648	0.09498	10.5288	84.2997	8.0066
25	6.8485	0.1460	0.01368	73.1059	0.09368	10.6748	87.8041	8.2254
26	7.3964	0.1352	0.01251	79.9544	0.09251	10.8100	91.1842	8.4352
27	7.9881	0.1252	0.01145	87.3508	0.09145	10.9352	94.4390	8.6363
28	8.6271	0.1159	0.01049	95.3388	0.09049	11.0511	97.5687	8.8289
29	9.3173	0.1073	0.00962	103.9659	0.08962	11.1584	100.5738	9.0133
30	10.0627	0.0994	0.00883	113.2832	0.08883	11.2578	103.4558	9.1897
31	10.8677	0.0920	0.00811	123.3459	0.08811	11.3498	106.2163	9.3584
32	11.7371	0.0852	0.00745	134.2135	0.08745	11.4350	108.8575	9.5197
33	12.6760	0.0789	0.00685	145.9506	0.08685	11.5139	111.3819	9.6737
34	13.6901	0.0730	0.00630	158.6267	0.08630	11.5869	113.7924	9.8208
35	14.7853	0.0676	0.00580	172.3168	0.08580	11.6546	116.0920	9.9611
40	21.7245	0.0460	0.00386	259.0565	0.08386	11.9246	126.0422	10.5699
45	31.9204	0.0313	0.00259	386.5056	0.08259	12.1084	133.7331	11.0447
50	46.9016	0.0213	0.00174	573.7702	0.08174	12.2335	139.5928	11.4107
55	68.9139	0.0145	0.00118	848.9232	0.08118	12.3186	144.0065	11.6902
60	101.2571	0.0099	0.00080	1253.21	0.08080	12.3766	147.3000	11.9015
65	148.7798	0.0067	0.00054	1847.25	0.08054	12.4160	149.7387	12.0602
70	218.6064	0.0046	0.00037	2720.08	0.08037	12.4428	151.5326	12.1783
75	321.2045	0.0031	0.00025	4002.56	0.08025	12.4611	152.8448	12.2658
80	471.9548	0.0021	0.00017	5886.94	0.08017	12.4735	153.8001	12.3301
85	693.4565	0.0014	0.00012	8655.71	0.08012	12.4820	154.4925	12.3772
90	1018.92	0.0010	0.00008	12724	0.08008	12.4877	154.9925	12.4116
95	1497.12	0.0007	0.00005	18702	0.08005	12.4917	155.3524	12.4365
96	1616.89	0.0006	0.00005	20199	0.08005	12.4923	155.4112	12.4406
98	1885.94	0.0005	0.00004	23562	0.08004	12.4934	155.5176	12.4480
100	2199.76	0.0005	0.00004	27485	0.08004	12.4943	155.6107	12.4545

Single Payment Factors [F/P and P/F] [F= Future P =Present]

The most fundamental factor in engineering economy is the one that determines the amount of money F accumulated after n years , from a single present worth P , with interest compounded one time per year.

Recall that compound interest refers to interest paid on top of interest. Therefore, if an amount P is invested at time $t=0$, the amount F1 accumulated 1 year hence at an interest rate of i percent per year will be :

$$F_1 = P + Pi$$

$$= P[1 + i]$$

$$F_2 = P(1+i)^2$$

From the above mentioned 1 year , it is evident by mathematical induction that the formula can be generalized for n years to

$$F = P[1+i]^n$$

ถ้าเงื่อนไขเหมือนเดิมจาก slideที่แล้ว แต่ขยายเวลาเป็น 20 ปี จะมีเงินสุดท้ายเท่าไรหลังจาก 20 ปีผ่านไป

1. Single Payment 200,000 บาท

$$F = P(1 + i)^n$$

2. Uniform Series ปีละ 10,000 บาท

$$A = P \left[\frac{i(1 + i)^n}{(1 + i)^n - 1} \right]$$

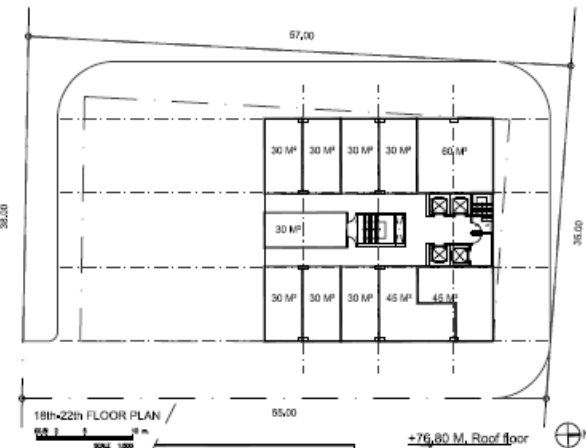
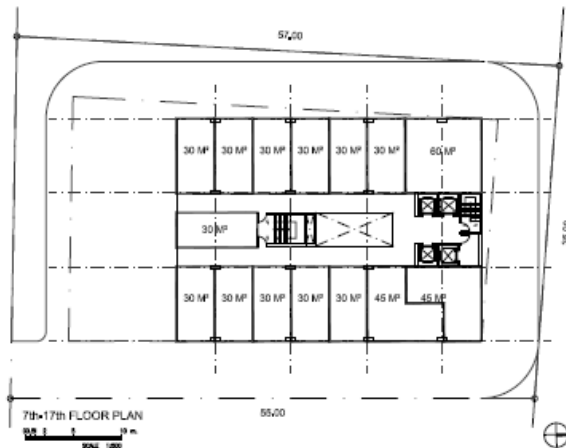
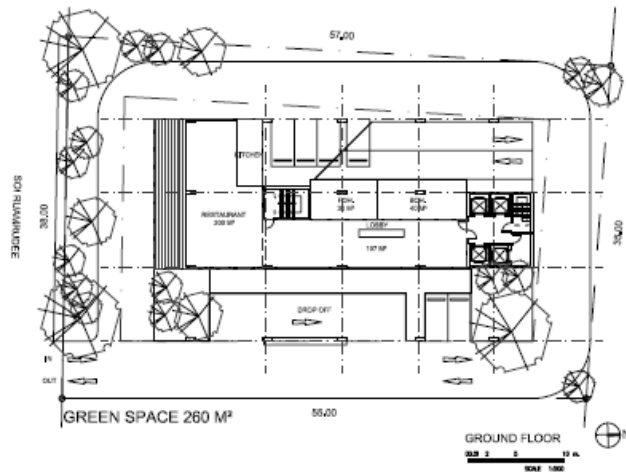


Example of Hotel Project

March 14th, 2020

- ▶ **Assumption and Projection**





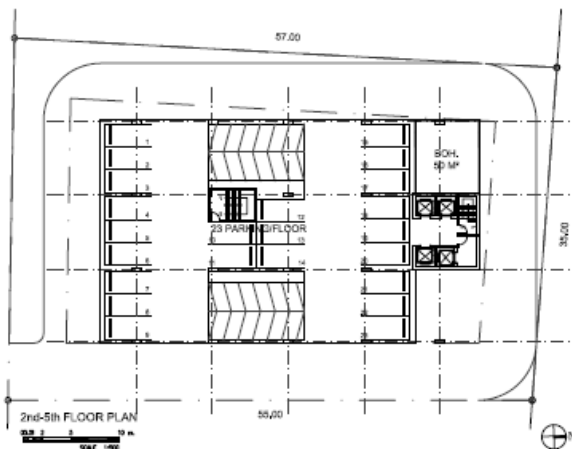
LAND AREA	=	2,000	M²
FAR 1 : 10	=	20,000	M²
GFA,	=	15,120	M²
RFA,	=	7,560	M²
RTL,	=	300	M²
EEF	=	51.98	%

TOWER ZONE			
FLOOR AREA 7th-17th	=	720	M²
RES.FLOOR	=	11	FLOOR
FLOOR AREA 18th-23th	=	567	M²
RES.FLOOR	=	5	FLOOR
TOTAL UNIT	=	220	UNITS

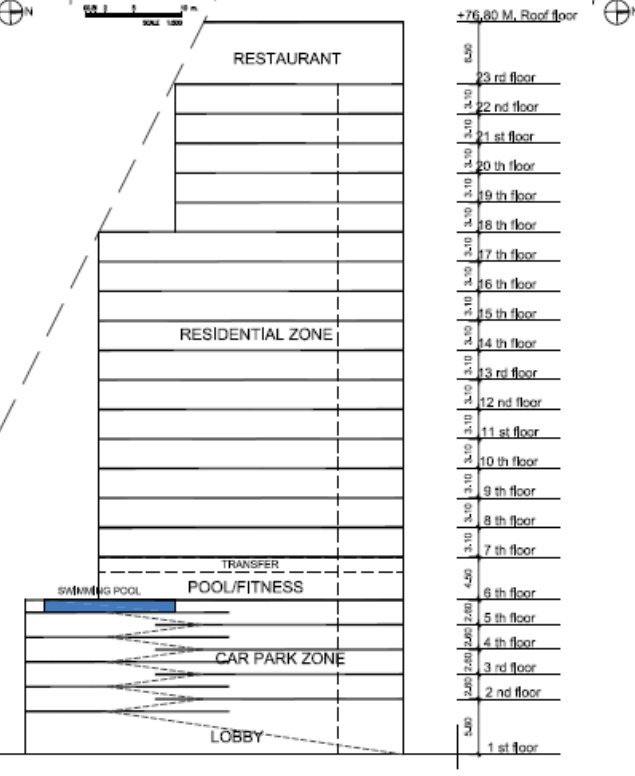
PODIUM ZONE			
FLOOR AREA	=	825	M²
PARKING FLOOR	=	4	FLOOR
TOTAL CAR PARK	=	100	CARS
BMA NEED	=	98	CARS

GROUND FLOOR AREA	=	445	M²
RESIDENTIAL AREA	=	10,775	M²
CAR PARKING AREA	=	3,300	M²
RESTAURANT AREA	=	300	M²
FACILITY AREA (1 FLR.)	=	300	M²

TOTAL FLOOR = 23 FLOOR



TYPE	AREA	QTY	TOTAL	MIX
STUDIO	30 M²	172	5,160 M²	78.18%
1 BED	45 M²	32	1,440 M²	14.54%
2 BED	60 M²	16	960 M²	7.27%
		220	7,560 M²	



Cost Estimates

▶ Project Development Expenses

▶ Construction hard cost

- ▶ Building construction
- ▶ Interior Decoration
- ▶ Furniture, fixtures and equipment (FF&E)
- ▶ Operating equipment & supply (OE&S)

▶ Construction soft cost

- ▶ Consulting fees
- ▶ Operator technical fees
- ▶ Permits, Public facilities connecting fees
- ▶ Pre-opening budget (POP)
- ▶ Marketing expenses
- ▶ Financial fees & interest



Project X

20 Sep 07

Based on SODA drawing dated 3rd Sep 2007

Development Budget

Room Ratio	Percentage	Size,m2	Keys	Remarks
Studio	84%	33	110	Studio 33m2 49
1-Bedroom	11%	49	14	Studio 34m2 35
2-Bedroom	5%	66	7	Studio 35m2 19
Total			131	Studio 36m2 7

Area Summary	
GFA	8,380.00
Guest Room Area	4,494.00
Dining & Kitchen	175.00
Retail Area	-
Common Area	1,813.00
FOH&BOH	Incl.
Service Area	Incl.
Parking	1,898.00

Item	Description	Unit Rate Bht./m2	Total Cost Bht.	Proposed Cost Bht.	Cost/Key Bht.	Cost/m2 Bht.
Project Cost Summary						
A	Piling Works		6,729,463	6,700,000	51,145.04	799.52
B	Building Works		115,547,630	115,600,000	882,442.75	13,794.75
C	Interior Works		60,523,500	60,900,000	464,885.50	7,267.30
D	Landscape Works		2,000,000	2,000,000	15,267.18	238.66
E	M&E Systems		60,391,218	60,200,000	459,541.98	7,183.77
F	Lift Works		4,089,440	4,100,000	31,297.71	489.26
G	Miscellaneous		1,257,000	1,000,000	7,633.59	119.33
H	Sub Total for Construction & Interior		250,538,251	250,500,000	1,912,213.74	29,892.60
I	Allow for Contingencies 3%	3.00%	7,516,148	7,515,000	57,366.41	896.78
J	Sub Total		258,054,398	258,015,000	1,969,580.15	30,789.38
K	Furniture, Fixtures & Equipments		16,010,000	16,400,000	125,190.84	1,957.04
L	Operating Equipments & Supplies		16,010,000	16,400,000	125,190.84	1,957.04
M	Sub Total		290,074,398	290,815,000	2,219,961.83	34,703.46
N	Soft Cost		39,707,264	39,000,000	297,709.92	4,653.94
O	Sub Total		329,781,662	329,815,000	2,517,671.76	39,357.40
Q	Grand Total		329,781,662	329,815,000	2,517,671.76	39,357.40



Assumptions:

- Roomrate 3,000 Bht./day for 3 years increase 10% maintain – years
- Soft opening 6 months for 1,500 Bht. Per day occupancy 50%
- After grand opening , occupancy rate 80% every year
- Operating expenses 1,500,000 Bht. Per months [interest payment included]















คำถามเพิ่มเติม

1. Pay Back Period
2. Return on investment
3. Rate of return
4. Additional Expenses [Salary increase, Utility Bill, Maintenance etc.]
5. Land Acquisition / Land Lease



Pay Back Period



Return on Investment



Rate of Return

