



2.5 Average Historical Multiplier Factors – Liquids

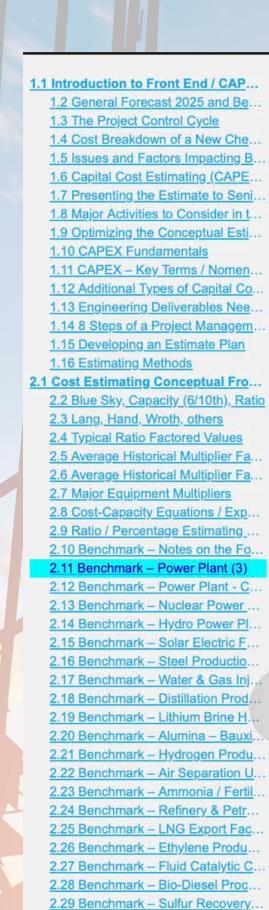
(2) Average Historical (Multiplier) Factors - Liquid Plants +/- 25% Accuracy (Chemicals / Fluids / Wet Process's type facilities, high percentage of pumps / piping) Assume Major Equipment cost is \$1.00 million delivered to site the following average percentages should be used as a starting point. Off sites (O.S.B.L.) are excluded from the following data values.

To establish a budget value for O.S.B.L. add between 5% and 70% of the above compiled values, typically the O.S.B.L. value will fall in the 10% to 25% range.

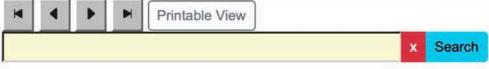
For revamp / upgrade / modernization projects calibrate the above values by the following:

- Minor revamps multiply by 1.05 -1.15
- Average revamp projects multiply by 1.15 to 1.25
- Major revamps multiply by 1.25 to 1.75

Ref	Direct Construction Costs	Typical % Of M.E.	% Bulk Materials	% Labor - S/C	Total	Remarks	
1	Major Equipment (M.E.)						
2	Freight (used 4%)						
3	Overseas Freight						
4	M.E. Setting (Millwright work)						
5	Site work / civil (excavation / roads)						
6	Concrete work						
7	Structural steel						
8	Facilities / Buildings (including services)						
9	Piping** (includes hangars & testing)						
10	Electrical						
11	Instrumentation / Controls						
12	Insulation						
13	Painting						
14	Safety / F P / Miscellaneous (A)						
	Total Direct Cost						
direct Pro	roject Costs						
15	Field Establishment Costs ***						
16	EPC Office H.O. range 20% - 30%						
17	Construction Management range 20%45% of line 16						
18	Owner Engineering & CM 5% - 15% of line 16 & 17						
19	Total Indirect Costs						
20	Total Cost Multiplier						
	"(A) = Start up costs, initial chemicals, expense items and other minor items. * 1.00 = Total value of Major Equipment / Assume 25 items (M.E.) ** 50% -						
	150% is based on using a 60 - 40 split of Carbon Steel and 304-316 SS, this value could in some situations exceed 150% in circumstances were exotic /						
	expensive pining materials are utilized i.e. Glass / Kynar / Teffon lined / Alloy						



2.30 Benchmark - Coker Unit 2.31 Benchmark - Refinery Equip...



2.11 Benchmark - Power Plant (3)

SIMPLE CYCLE - POWER PLANT

Cost Basis Mid-point of 2024 200 MW USA MIDWEST LOCATION EPC Duration 22 months

E & P = 9 months C = 17 months

#	DESCRIPTION	\$ Cost In Millions	%
1	Major Equipment - Combustion turbines, Compressors, Evaporators, Cooling Systems, Pumps, Tanks, Modules & other minor equipment		
2	Freight		
3	Site works / Clearance		
4	Civil Work / Foundations & Roads		
5	Structural Steel / Pipe Racks		
6	Pipe (Below & Above Ground)		
7	Elec / Instrumentation & Balance of Plant (Switchgear, MCC's, Transformers, SCADA etc.,)		
8	Insulation		
9	Paint / Coatings		
10	Admin - Control Building / Warehouse / Guard House		
11	Water / Nat Gas Pipelines & tie-ins 1.8 & 2.9 miles		
12	New Switchyard / Transmission Line 4.7 miles		
13	New sub stations		
14	Minor Costs - Fencing, Testing, Inspection Services		
15	Field In directs (Site trailers / offices, supervision, construction equipment-plant hire, scaffolding, small tools, site logistics)		
16	Sub Total Construction Activities		
17	HO Engineering / Detailed Design / Procurement & Project Control - Admin Support		
18	Project & Construction Management		
19	OCIP Insurance / Fees / Profit		
20	Initial Start Up Spare Parts		
21	Start Up / Commissioning		
22	Contingency / Management reserve		
23	Total Facility Cost of Facility		
24	Cost per MW (Based on 200 MW Facility)		
25	Low-Cost Range - 15% per MW		
26	High Cost per MW + 15% per MW		
	EXCLUDES: Owners staff /support costs Land purchase Overtime / shift work Operating spares Future escalation Demo / Relocation Costs		

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NEW INDUSTRIAL / COMMERCIAL SQUARE FOOT - M2 BUILDING COSTS 2025 COST BASIS

The general approach is to determine the number of floors, footprint of building / facility, calculate usable square foot area of facility / building, select building type / specification from list below and multiply by calculated square footage by the appropriate SF/ M2 cost value. Modify for location by selecting city location factor indicated in Section B - 5. The following Facility / Building costs are specified by cost model size in S.F. together with number of floors in U.S. dollars per square foot / M2 by Facility / Building for each category of building.

Specification A Facing with concrete block back-up

- Specification B Stucco on concrete block
- Specification C Ribbed concrete block
- Specification D Pre-Cast concrete panels
- Specification E Insulated metal panels
- Specification F Tilt-up concrete panels
- · Specification G R.C. frame cast on site
- Specification H Curtain wall / metal & glass panels
- Specification I EIFS / Dryvit wall panels

New Industrial / Commercial Sq. Ft. - M2 Building Costs

2025 COST BASIS: INCLUDE ALL MATERIAL, LABOR, PLANT, GENERAL CONDITIONS, PRELIMINARIES, OVERHEAD, AND PROFIT.

Facility / Building Costs	Cost Model SF	Cost Model M2	SF \$ Low	SF \$ High	Average \$ SF Cost	Average \$ M2 Cos
300 mm wafer manufacturing facility						
Advanced Chemical Weapons Laboratory						
Agricultural R&D Center						
Animal Research / Testing Facility 2 Floors						
Apartments 1 – 3 Floors (Spec A)						
Apartments 1 – 3 Floors (Spec B)						
Apartments 3 – 5 Floors (Spec C)						
Apartments 3 – 5 Floors (Spec A)						
Apartments 3 – 5 Floors (Spec D)						
Apartments 5 – 25 Floors (Spec D)						
Apartments 5 – 25 Floors (Spec A)						
API – Pharmaceutical Facility						
Auditorium 2 Story (Spec A)						
Auditorium 2 Story (Spec D)						
Auditorium 2 Story (Spec C)						
Automobile Production Facility						
Bakery						
Bank 1 Story (Spec A)						
Bank 1 Story (Spec B)						
Bank 1 Story (Spec C)						
Biological Manufacturing						
Bio – Medical / R&D Center 3 Floors						
Bleach Manufacturing Facility						



4.5 CSI DIV 3 & 4: Structural Elements / Walls / Floors / Steel Framing

CSI DIVISION 3, 4 & 5 STRUCTURAL ELEMENTS / WALLS / FLOORS STRUCTURAL STEEL FRAMING (100 – 1,000 TON)

	Description	Unit	Material	Labor	Total
	Offices 1 – 3 floors				
2	Factory / Manufacturing Facility				
l.	Hi-Rise Building 5 – 10 floors				
١	3" metal decking ribbed 20 g				
5	Ditto 18 g				
6	Ditto 16 g				
7	10" L B wall				
1	Ditto 12"				
	Ditto 14"				
0	Flat 4" thick (PCCWS)				
1	Ditto 6" (PCCWS)				
2	Ditto 8" (PCCWS)				
3	Exposed aggregate face 4" thick (PCCWS)				
1	Ditto 6" (PCCWS)				
5	Ditto 8" (PCCWS)				
6	Ribbed finish 4" thick (PCCWS)				
7	Ditto 6" (PCCWS)				
В	Ditto 8" (PCCWS)				
9	Concrete reinforced (Tilt up wall panels) 4" thick				
0	Ditto 6" thick				
1	Ribbed Concrete block wall in 1-3 Cement mortar 8" wide				
2	Ditto 10" wide				
3	6" thick				
4	8" thick				
5	Concrete Column, cast in place, round, 12" diameter				
6	Concrete Column, cast in place, round, 14" diameter				
7	Concrete Column, cast in place, round, 18" diameter				
3	Concrete Column, cast in place, square, 10"X10"				
9	Concrete Column, cast in place, square, 12"X12"				
0	Column, Pre cast concrete, 12"X12"				
1	Column, Pre cast concrete, 14"X14"				
2	Column, Pre cast concrete, 16"X16"				



4.24 Process Piping Systems Cost Data

Process Piping Systems

DATA TABLE

			40.00			
Diameter	\$ Material Cost Per LF	\$ M-H Cost Per LF	\$ Cost Per LF	\$ Material Cost Per M	\$ M-H Cost Per M	\$ Cost Per M
Alloy 20 schedule 40 Complicated / Intricate (ISBL - Inside	Facility) Piping - Numerous changes in dire	ction				
2" / 50 mm						
4" / 100 mm						
6" / 150 mm						
Add 4.5% - 7.5% to labor & material costs for hangars, bolts, g						
Alloy 20 schedule 40Staight run / OSBL Piping - Less Weld	ding					
2" / 50 mm						
4" / 100 mm						
6" / 150 mm						(1000)
Add 4.5% - 7.5% to labor & material costs for hangars, bolts, g	gaskets & testing					
Aluminum schedule 40 Complicated / Intricate (ISBL - Insi	ide Facility) Piping - Numerous changes in d	irection				
2" / 50 mm						
4" / 100 mm						
6" / 150 mm						
Add 4.5% - 7.5% to labor & material costs for hangars, bolts, g	gaskets & testing					
Aluminum schedule 40 Straight run / OSBL Piping - Less \	Welding					
2" / 50 mm						
4" / 100 mm						
6" / 150 mm						
Add 4.5% - 7.5% to labor & material costs for hangars, bolts, g	gaskets & testing					
Inconel schedule 40 Complicated / Intricate (ISBL - Inside	Facility) (Piping - Numerous changes in dire	ction)				
2" / 50 mm	100					
4" / 100 mm						
6" / 150 mm						
Add 4.5% - 7.5% to labor & material costs for hangars, bolts, g	gaskets & testing					
Inconel schedule 40 Straight run / OSBL Piping - Less We	lding					
2" / 50 mm	1981					
4" / 100 mm						
6" / 150 mm						

