



**COMPASS**

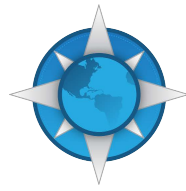
INTERNATIONAL INC.



**2021**

**International Construction  
Benchmark Yearbook**

**2<sup>ND</sup> EDITION**



# COMPASS

INTERNATIONAL INC.

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# What is Benchmarking & how can it help you with your future estimating / budgeting

*Construction Benchmarking utilizes historical engineering and construction cost data to distinguish targets and best practice routines, specific to the performance and project delivery of construction related projects. Benchmarking is in many ways the analysis of what you're up against, how to we measure up or compare to our competitor's business practices and execution practices, in order to enhance the performance of your organizations performance. Used correctly benchmarking can fundamentally improve construction related performance and enhance the return on investment for the organization. Most of the successful construction organizations consistently benchmark their historical & latest performance / execution practices in the effort to improve the organizations standing in their particular market sector.*

**S**o what is benchmarking as it applies to construction? Benchmarking is basically investigating & researching historical costs & performance, a benchmark was a master masons datum point or mark on a foundation, wall or building utilized as a specific location / height for determining future heights or lengths needed to successfully complete a future building. .

The benchmarking procedure encompasses the assessment of planned performance data versus actual performance / data achieved from comparable historical accomplished construction related projects.

Benchmarks require need to be validated by a well-defined and concise description of deviations between planned projected performance and the estimated benchmarking low and high ranges that are for the most part indicated in the following sections of this publication.

Compass International's five phase approach to benchmarking is detailed below.

**Phase 1:** Verify the project goals and established the major benchmark components to be analysed.

**Phase 2:** Document and compile a list of the major cost / performance drivers, key component and collect performance and specific historical cost data, this could include cost per square foot / square meter, cost of electrical systems compare to comparable projects.

**Phase 3:** Assemble relevant benchmark data by cooperation with internal team members, conferring with relevant stakeholders on their views and perspectives, contacting professional societies, industry experts, industry associations and data mining via the internet on comparable benchmark norms. This data is essential to accurate and beneficial benchmarking.

**Phase 4:** Confirm and validate initial benchmark cost and performance data.

**Step 5:** Finalize benchmark data cost and performance models, develop low and high cost / performance benchmarks and compile benchmark report on project being reviewed.

#	DESCRIPTION	MATERIAL COST	M-H'S	HOURLY RATE	LABOR COST	TOTAL COST
<b>CONTINUED</b>						
28	Field In-Directs					12,665,926
29	<b>ENGINEERING / EPC SERVICES</b>					
30	Detailed Design					3,476,005
31	PM / PC / Procurement					1,087,088
32	HO Support					563,860
33	Start Up / Commissioning					276,000
34	Engineering Fee					575,890
35	Misc. items					86,082
36	Engineering / EPC Services					6,064,925
36	Contingency / Mgmt. Reserve					3,000,000
36	<b>TOTAL PROJECT COST</b>					<b>81,302,865</b>

## Cost / Man-hour Model (7)

### 1.50 MILLION TON PER YEAR USA GULF COAST ETHYLENE FACILITY

#	COST CATEGORIES	QTY	UOM	MATERIAL	M-H'S	M-H RATE	LABOR COST	TOTAL
1	<b>MAJOR EQUIPMENT (M.E.)</b>							
2	Columns c/w trays	74	EA	411,083,852	43,475	44.90	1,951,952	413,035,803
3	Drums / Vessels	70	EA	23,248,825	36,650	44.90	1,645,523	24,894,348
4	Pumps	103	EA	20,507,850	18,837	44.90	845,744	21,353,594
5	Compressors / Fans / Blowers	26	EA	112,070,264	137,319	44.90	6,165,348	118,235,613
6	Heat Exchangers	96	EA	24,444,292	17,404	44.90	781,394	25,225,685
7	Tanks	7	EA	17,045,486	3,890	44.90	174,664	17,220,150
8	Material Handling	4	EA	19,115,295	4,914	44.90	220,629	19,335,924
9	Water Treatment	11	EA	5,889,824	2,594	44.90	116,443	6,006,267
10	Miscellaneous Equipment	20	EA	65,495,758	20,953	44.90	940,737	66,436,494
11	Electrical Equipment	30	EA	17,654,253	7,849	44.90	352,393	18,006,646
12	Instrumentation Devices (Tagged)	5,670	EA	20,703,120	176,085	44.90	7,905,864	28,608,984
13	Freight		ALLOW	22,718,782	-			22,718,782
14	Vendor Assistance		ALLOW	1,827,224	-			1,827,224
15	Total Major Equipment (M.E.)			761,804,823	469,970		21,100,691	782,905,514
16	Removals / Demolition		ALLOW	8,955,009	79,950	41.56	3,322,762	12,277,771
17	Site Earthmoving / Improvements	1,230,000	CY	35,175,206	799,500	41.56	33,227,620	68,402,826
18	Piling	6,150	LF	8,846,992	159,900	41.56	6,645,524	15,492,516
19	Buildings	61,500	SF	8,846,992	239,850	41.56	9,968,286	18,815,278
20	Concrete	86,100	CY	47,332,250	186,550	41.56	7,753,111	55,085,361
21	Refractory / Fireproofing	-	ALLOW	6,423,583	7,995	41.56	332,276	6,755,859
22	Structural Steel / Platforms	9,225	TON	38,829,629	319,800	41.56	13,291,048	52,120,677
23	Piping systems	799,500	LF	221,753,872	3,997,500	41.56	166,138,099	387,891,971
24	Insulation	-	ALLOW	53,220,460	63,960	41.56	2,658,210	55,878,670

## Cost / Man-hour Model (16)

AMMONIA / UREA FACILITY 450 TONS / DAY PRODUCTION

LOCATION MID-WEST USA UNION LABOR (26 MONTH CONSTRUCTION EFFORT)

2015 COST BASIS

#	CATEGORY	M-H'S	\$ TIC COST	\$ COST / HOUR
1	Engineering / Detailed Design	64,957	10,115,000	\$155.72
2	OH / Profit / CAD / Repro / Admin Staff		4,230,600	
3	Procurement incl Major Equipment		87,989,000	
4	Construction Direct Labor	539,674	36,056,776	\$66.81
5	Construction Bulks		57,776,090	
6	Construction In-Direct Labor	229,718	16,146,094	\$70.29
7	Construction Management	71,554	8,786,558	\$122.80
8	C M Travel / Per Diem / Site Trucks / Other		3,834,065	
9	Misc. items Demo / Removals		1,255,487	
10	Total EPCM Cost (450 Tons / Per Day)		\$226,189,670	
11	Cost per Ton (Millions \$)		\$502,644	
12	TYPICAL CAPEX COST RANGE PER TON / DAY	LOW	\$602,000	
13	TYPICAL CAPEX COST RANGE PER TON / DAY	HIGH	\$402,000	

## Cost / Man-hour Model (17)

140 MILLION CUBIC FEET PER DAY - DEEP CUT / TIGHT GAS - GAS GATHERING COMPRESSION FACILITY - FEED / FUNDING ESTIMATE 2016 COST BASIS: CANADA

PRELIMINARY BUDGET FUNDING AUTHORIZATION - CLASS (3) AACEI ESTIMATE

INSIDE BATTERY LIMITS (ISBL = 78% OUTSIDE BATTERY LIMITS OSBL = 22%) MERIT SHOP LABOR

#	DESCRIPTION	QTY	UOM	M-H'S	C\$ LABOR & S/C COST	C\$ MAT COST	C\$ TOTAL COST	% OF CD
1	Process Equipment (Long Lead Items) free issued to Contractor	137	EA	-	-	65,667,000	65,667,000	69.40%
2	Process Equipment Setting / alignment	137	EA	20,266	677,895	442,946	1,120,841	1.18%
3	Purchase & Set Pre-Assemblies - Modules - Field Erected Tanks (18 # Modules & 4 # F.E. tanks) - approx. 210 Tons	22	EA	25,240	844,269	1,401,037	2,245,306	2.37%
4	Temporary roads / Site Clearance	1	EA	469	15,690	24,292	39,982	0.04%
5	ISBL / OSBL Roads / Footpaths	2,356	SY	1,970	65,899	58,040	123,939	0.13%
6	Demolition of xtg catch pits / pads / minor structures / overhead lines	88	CY	761	25,457	1,270	26,728	0.03%
7	Site work / Fencing / Gatehouse	1	LS	3,863	129,216	115,904	245,120	0.26%

## Cost / Man-hour Model (21)

ONSHORE WIND FARM 42 # 2.4 TURBINES 101 MW MINNESOTA USA  
2012 COST - 280' - 85 M TOWER HEIGHT  
12 MONTH CONSTRUCTION. LOCATED ON 15,500 ACRES

#	DESCRIPTION	% SPLIT	TOTAL COST
1	Land clearance / Gravel roads	2.7	1,600,228
2	Piling	3.4	2,015,102
3	Concrete Foundations	8.2	4,859,951
4	Fence	0.8	474,142
5	Towers / Lift	65.2	38,642,540
6	Electric grid	6.9	4,089,471
7	Pre-Fabricated Control / Electrical Room	0.4	237,071
8	Detailed Design / Procurement	6.2	3,674,597
9	Project - Construction Mgmt.	4.2	2,489,243
10	Heavy Lift	1.6	948,283
11	Contractor Gen Conditions	0.4	237,071
12	<b>TOTAL</b>	<b>100.0</b>	<b>59,267,700</b>
13	<b>COST PER MW</b>	<b>101</b>	<b>586,809</b>
14	<b>LOW COST RANGE - 15%</b>		<b>498,788</b>
15	<b>HIGH COST RANGE +15%</b>		<b>678,830</b>

## Cost / Man-hour Model (22)

OVERLAND PIPELINE: NEW HAMPSHIRE USA  
2017 COST MODEL 32.3 MILES 18" DIA

#	DESCRIPTION	\$ MILLIONS	%
1	Logistics / Material Handling Bases (2 Locations)	0.91	1.4%
2	ROW / Survey / Clearing / Excavation / Backfill Activities	4.82	7.6%
3	Materials Pipe / Stone / Concrete	11.50	18.0%
4	Valves & Fittings	1.70	2.7%
5	Installation Labor (\$69 hour)	19.00	29.8%
6	Construction Equipment	6.70	10.5%
7	River Crossing including barge work	2.43	3.8%
8	Road / Railroad Crossings (7)	2.20	3.5%
9	Compressor Pumping Stations (2) 2,500 to 3,500 HP	5.10	8.0%
10	Miscellaneous Items / SCADA / Communications / Control Building	9.40	14.7%
11	<b>S/T</b>	<b>63.76</b>	<b>100.0%</b>
12	Detailed Design / Project Mgmt. - Control / Procurement Activities	5.34	8.4%
13	Construction Management / Inspection	2.82	4.4%
14	Fees / Profit	2.28	3.6%
15	<b>TOTAL COST</b>	<b>74.20</b>	
16	<b>COST PER MILE</b>	<b>2.30</b>	
17	<b>TYPICAL RANGE (LOW)</b>	<b>1.72</b>	
18	<b>TYPICAL RANGE (HIGH)</b>	<b>2.87</b>	

#	CONSTRUCTION CATEGORY	SF	\$ / SF	\$ TOTAL	MATERIAL %	LABOR %	TOTAL %
<b>CONTINUED</b>							
<b>37</b>	<b>OTHER COSTS</b>						
38	General Conditions			14,851,000			
39	Field Support Labor			9,345,990			
40	Construction Equipment			4,855,000			
41	Consumables / Small Tools			3,470,000			
42	Early Engineering Studies			2,362,700			
43	Detailed Design / PM / PC - Procurement			37,956,000			
44	Field Engineering Support (site based)			1,698,880			
45	Construction Management			17,698,000			
46	Temporary Field Offices / Warehouse (existing)			1,636,700			
47	Sales Tax (Partial Exemption)			16,445,000			
48	Commissioning			1,780,000			
49	Owner Engineering / Consultants / Admin			8,940,000			
50	Spare parts			4,570,000			
51	New Warehouse lay down area			572,450			
<b>52</b>	<b>OTHER COSTS TOTAL</b>			<b>126,181,720</b>			
<b>53</b>	<b>TOTAL \$ COST / SF / M2</b>			<b>\$583,152,185</b>	<b>\$2,205</b>	<b>\$23,723</b>	

### Cost / Man-hour Model (16)

**SUPER COMPUTER CENTER NORTH WEST USA**

**122,400 SF 11,375 M2 60' FFL TO UNDERSIDE OF ROOF**

**7,344,000 CUBIC FEET: 18,540 SF RAISED FLOOR: 3,560 SF MEZZANINE FLOOR:**

**14 ACRE GREEN FIELD FLAT WOODED SITE**

**START OF DETAILED DESIGN 3/2017**

**START OF CONSTRUCTION 7/2017 FINISH CONSTRUCTION 12/2018**

**PEAK CONSTRUCTION MAN-POWER 175**

**60 - 70 OPERATING STAFF**

DIVISION #	DESCRIPTION	\$ COST PER SF	%
1	General Requirements / Preliminaries	\$44.16	8.3
2	Site Construction (including roads, parking area, retention basin & fencing)	\$37.77	7.1
3	Concrete	\$40.43	7.6
4	Masonry	\$18.09	3.4
5	Metals	\$32.45	6.1
6	Wood & Plastics	\$44.69	8.4
7	Thermal & Moisture Protection	\$38.84	7.3
8	Doors & Windows	\$33.52	6.3
9	Finishes	\$54.80	10.3
10	Specialties	\$9.04	1.7
11	Equipment	\$11.70	2.2
12	Furnishings	\$9.04	1.7
13	Special Construction	\$5.85	1.1
14	Conveying Systems	\$9.58	1.8



## Cost / Man-hour Model (6)

**R&D LABORATORY 100,000 TO 200,000 SQUARE FOOT 2 - 3 STORY 14 FOOT HEIGHT BETWEEN FLOOR: AVERAGE OF UNION & NON-UNION CONSTRUCTION: BASED ON 2018 VALUES FROM PROJECTS IN PENNSYLVANIA, NEW JERSEY & DELAWARE USA REGION CONTRACTORS OVERHEAD / HOME OFFICE SUPPORT, FEES & PROFIT (RANGING FROM 12.5% TO 17.5%)**

#	R&D LABORATORY 100,000 TO 200,000 SQUARE FOOT 2 - 3 STORY 14 FOOT HEIGHT BETWEEN FLOORS	LOW SF \$	HIGH SF \$	LOW M2 \$	HIGH M2 \$	TYPICAL % SPLIT
1	Brick on metal frame	234	321	2,518	3,457	
2	Precast panels on metal frame	237	325	2,550	3,501	
3	Precast panel on reinforced concrete frame	239	328	2,572	3,531	
4	Curtain wall on reinforced concrete frame	242	332	2,604	3,575	
5	Curtain wall on metal frame	245	336	2,636	3,620	
6	Typical Work Breakdown					
7	Division 1 General Conditions / Requirements - Preliminaries					9%
8	Division 2 Site Work (includes work under building & 10 feet / 3 meters outside building, excludes demolition, major site clearance, parking lots & utility related structures).					6%
9	Division 3 Concrete					11%
10	Division 4 Masonry					4%
11	Division 5 Metals / Structural Steel					7%
12	Division 6 Carpentry					6%
13	Division 7 Thermal & Moisture Protection					5%
14	Division 8 Doors, Windows & Glass					8%
15	Division 9 Finishes					8%
16	Division 10 Specialties					3%
17	Division 11 Equipment					3%
18	Division 12 Furnishings					2%
19	Division 13 Special Construction					1%
20	Division 14 Conveying Systems					4%
21	Division 15 Mechanical - HVAC					14%
22	Division 16 Electrical Work					9%
<b>23</b>	<b>TOTAL %</b>					<b>100%</b>
24	Architectural / Engineering Activities & Fees as a % of construction cost	7.3	9.4	7.3	9.4	
25	Construction Management Activities & Fees as a % of construction cost	3.9	4.9	3.9	4.9	
	<b>TYPICAL ADD-ON</b>	<b>UOM</b>	<b>\$ LOW</b>	<b>\$ HIGH</b>		
26	CCTV 1 Camera & Monitor	1	2,100	2,600		
27	Security / Card swipe system	1	1,500	2,100		

#	FACILITY / BUILDING COSTS	COST MODEL SF BASIS	SF \$ LOW	SF \$ HIGH
<b>CONTINUED</b>				
32	Nanoscale Science Laboratory	98,500	347	446
33	Office 1 - 3 Story	37,370	154	199
34	Office 4 - 8 Story	157,800	150	189
35	Paper Production	106,000	130	166
36	Parking Garage 3 - 5 Floors	255,600	62	81
37	Refrigerated Warehouses	54,000	141	179
38	Research Laboratory (Basic Research) 2 Floors	62,000	225	288
39	Research Center Auto / Jet Engine Testing	64,000	209	267
40	Research Laboratory / OSD	71,700	474	604
41	Toner Production 2 Floors	98,800	130	167
42	University Research Medical Facility 9 Floors	345,400	828	1,062
43	University / Biomedical Genomics	237,500	483	621
44	University Dormitory 3 - 5 Floors	123,700	156	200
45	University Laboratory 1 - 2 Floors	79,500	182	232
46	Warehouse 80% / Office 20% / Distribution Center	84,000	82	103
47	Warehouse 90% / Office 10%	51,500	96	121

## Cost / Man-hour Model (8)

### MEXICO HOTELS & RESORTS 2019 COST BASIS:

#	TYPE OF FACILITY	\$ SF / LOW	\$ SF / HIGH	\$ M2 / LOW	\$ M2 / HIGH
1	Hotel 3-6 floors - Total SF 100,000 SF - 2 - 3 star	110	150	1,184	1,614
2	Resort Type Facility 5 - 10 floors - Total SF 250,000 3 - 4 star West Coast	124	173	1,334	1,861
3	Vacation / Resort Type Facility 3 - 6 floors Total SF 200,000 3 star East Coast	117	162	1,259	1,743
4	All-inclusive resort 3 floors Total SF 330,000 2 - 3 star	113	157	1,216	1,689
5	Residence 3,000 SF	111	145	1,194	1,560
6	Excludes: o/s pools, o/s dining areas, parking area, roads, landscaping, playground areas, all o/s features.				
7	Building / Facility Type: Hotel 5 -10 Floors				
8	<b>CSI DIVISION DESCRIPTION TYPICAL % RANGES OF COST</b>				
9	1 General Requirements 5.50 – 10.50 % Gen Conditions / Preliminaries / Site Establishment / Temp Offices				
10	2 Site Construction 8.50 – 12.50 %				
11	3 Concrete 6.00 – 8.50 %				
12	4 Masonry 3.50 – 5.50 %				
13	5 Metals 3.00 – 8.50 %				
14	6 Wood & Plastics 7.50 – 10.50 %				
15	7 Thermal & Moisture Protection 7.50 – 9.50 %				
16	8 Doors & Windows 5.50 – 8.50 %				
17	9 Finishes 11.50 – 13.50 %				
18	10 Specialties 0.50 – 2.00 %				
19	11 Minor Equipment 0.50 – 1.50 %				
20	12 Furnishings 0.50 – 5.50 %				
21	13 Special Construction 1.50 – 3.50 %				