COMPASS
INTERNATIONAL INC.

2019
Global Construction Costs Yearbook
19TH EDITION

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Compass International Consultants Inc.

Morrisville, Pennsylvania, USA

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PREFACE

The 2019 Global Construction Costs Yearbook is a practical reference handbook for construction professionals faced with the challenges of forecasting, estimating and controlling the costs of international construction CAPEX projects. This edition now provides data on 101 countries. It provides current and detailed answers to questions that are likely to arise when establishing construction budgets in an international context. The estimating process is in many ways similar for the various parties involved: owners, government agencies, architectural and engineering firms, construction managers, contractors, subcontractors, suppliers, vendors, and capital equipment providers-although on occasion there are elements of unique concern to one of those parties. This book will be of assistance to all construction professionals involved in estimating, either in North America or overseas. There would not be a need for this book if construction professionals had at their disposal a comprehensive international data source giving costs that reflect current market conditions. This book offers that data, together with a wealth of information on a variety of international construction topics that will allow the construction professional to compile accurate and timely estimates. This book covers all of the main categories of international construction, including:

- Process / Industrial / Manufacturing / Mining type projects.
- Civil-engineering construction / Roads / Bridges / Tunnel type projects.
- Commercial / Residential / Hotels / School type projects.
- Institutional / Governmental / Military type projects.
- Repair and upgrade work related type projects.

This book is divided into three sections. Section I provides a basic introduction to global construction. Section II gives in-depth reviews of construction cost-related subjects for 101 countries. Section III provides the reader with additional reference materials, as well as the benefits of international contracting problems of staffing overseas, international estimating, bidding, contracting methods and a listing of places of where to locate additional cost related data. It is Compass International's intent to continue to add to and improve this book in the coming years. We invite your comments and ask for observations and data that could be incorporated into future editions.

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Introduction to Global Construction

The global construction market is forecast to expand significantly in the next ten years. For the most part China, the USA and India will be the front runners of this growth. The prospect of a major trade war between China and the European Union and the USA is a distinct possibility in 2019. The Chinese economy is a very dependent on exports to the US; a trade war with the US could seriously impact construction activity in China. Canada and US reached a new trade deal to replace NAFTA on September 30, 2018. The cost impact of Hurricane Florence and Michael that hit the US Carolinas and Florida in September and October will likely cost between $25 and $50 billion and possibly more in construction and repair work. This repair effort could take more than a year to complete.

Now that the dust is beginning to settle after the recent global financial crisis, the # 1 economy ranking the USA has held for more than a century looks more and more under threat as we move into 2019 and beyond. They say that the 19th century was the British and French's century, the 20th century was the American century, well, it appears that the 21st century will be the Chinese and Indian century, with the USA still being a major player, but perhaps not as powerful as it use to be. Every day we see this possibility gaining more credence, the old adage go "west young man", should now read "go east or south young man or woman" (to be politically correct). City expansion or urban sprawl is the number one trend that will

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Table 11
GLOBAL A/E FEES

#	COUNTRY	1*	2*	3*	4*	5*	6*
1	Argentina	2.30-4.00	0.90-1.25	1.00-1.50	0.30-0.55	0.25-0.50	10%-50% of # 1
2	Australia	3.00-6.20	1.20-1.80	1.40-2.50	0.50-0.80	0.35-0.65	10%-50% of # 1
3	Belgium	3.00-6.15	1.25-1.75	1.30-2.30	0.50-0.85	0.35-0.70	10%-50% of # 1
4	Brazil	2.40-3.75	0.90-1.20	1.00-1.50	0.30-0.50	0.20-0.50	10%-50% of # 1
5	Canada	3.00-6.20	1.25-1.85	1.40-2.50	0.50-0.80	0.35-0.75	10%-50% of # 1
6	China (A)	1.25-2.75	0.50-0.80	0.50-0.90	0.20-0.30	0.15-0.30	10%-50% of # 1
7	Denmark	3.40-6.20	1.25-1.85	1.50-2.50	0.50-0.85	0.40-0.80	10%-50% of # 1
8	Egypt	2.00-3.00	0.80-1.00	0.70-1.00	0.20-0.40	0.15-0.40	10%-50% of # 1
9	France	3.00-6.10	1.20-1.70	1.40-2.50	0.50-0.80	0.30-0.70	10%-50% of # 1
10	Finland	3.20-6.15	1.25-1.85	1.50-2.50	0.40-0.85	0.25-0.75	10%-50% of # 1
11	Germany	3.15-6.20	1.25-1.80	1.40-2.50	0.50-0.85	0.30-0.75	10%-50% of # 1
12	Greece	2.20-4.00	0.80-1.00	1.00-1.30	0.30-0.65	0.25-0.50	10%-50% of # 1
13	India	1.40-3.00	0.70-1.00	0.60-0.85	0.15-0.30	0.10-0.30	10%-50% of # 1
14	Ireland	3.00-6.10	1.25-1.80	1.50-2.40	0.50-0.85	0.35-0.75	10%-50% of # 1
15	Italy	3.00-5.40	1.25-1.60	1.50-2.25	0.40-0.70	0.30-0.60	10%-50% of # 1
16	Israel	1.75-4.20	0.90-1.25	0.90-1.30	0.30-0.65	0.20-0.40	10%-50% of # 1
17	Japan	3.40-6.15	1.25-1.85	1.50-2.70	0.50-0.85	0.35-0.85	10%-50% of # 1
18	Mexico	2.00-4.00	0.75-1.00	0.70-1.00	0.30-0.40	0.15-0.35	10%-50% of # 1
19	Netherlands	3.40-6.10	1.15-1.80	1.40-2.50	0.50-0.85	0.35-0.75	10%-50% of # 1
20	New Zealand	3.15-5.95	1.25-1.80	1.40-2.50	0.50-0.85	0.30-0.70	10%-50% of # 1
21	Nigeria	2.10-4.00	0.90-1.20	0.85-1.30	0.30-0.55	0.25-0.60	10%-50% of # 1
22	Norway	3.50-6.50	1.25-1.90	1.40-2.75	0.50-0.90	0.45-0.85	10%-50% of # 1
23	Poland	2.40-4.10	0.85-1.25	0.75-1.40	0.20-0.50	0.15-0.35	10%-50% of # 1
24	Portugal	2.50-4.25	1.00-1.25	0.80-1.50	0.30-0.65	0.25-0.65	10%-50% of # 1
25	Romania	2.25-4.00	0.90-1.25	0.80-1.20	0.15-0.30	0.15-0.30	10%-50% of # 1
26	South Africa	2.50-4.10	1.00-1.25	0.90-1.50	0.30-0.65	0.25-0.55	10%-50% of # 1
27	Spain	3.35-5.40	1.15-1.60	1.30-2.30	0.50-0.80	0.30-0.75	10%-50% of # 1
28	Sweden	3.50-6.50	1.25-1.85	1.40-2.50	0.50-0.80	0.35-0.85	10%-50% of # 1
29	Switzerland	3.45-6.65	1.20-1.80	1.30-2.60	0.50-0.75	0.50-0.75	10%-50% of # 1
30	Turkey	2.00-3.30	0.75-1.10	0.60-1.20	0.30-0.40	0.20-0.35	10%-50% of # 1
31	UK	3.30-6.35	1.25-1.85	1.50-2.50	0.55-0.95	0.35-0.75	10%-50% of # 1
32	USA (N.E. USA)	3.25-6.00	1.15-1.70	1.30-2.20	0.50-0.75	0.30-0.60	10%-50% of # 1

**1. Architectural Fee as a % of the Total Installed Cost (Low – High range) includes fit-out work if applicable •*
**2. Structural Engineering Fee as a % of the Total Installed Cost (Low – High range)*
**3. Mechanical / Electrical / Plumbing (MEP) Fee as a % of the Total Installed Cost (Low – High range)*
**4. Cost Consultant / Quantity Surveyor Fees as a % of the Total Installed Cost (Low – High range)*
**5. Additional Design Consultants Fees as a % of the Total Installed Cost (soils, sound, traffic landscaping & others) (Low – High range)*
6. Clerk of the Works / CM services monitoring G.C.*

Notes:
• Assumes that A/E will compile (1 #) G.C. bid package and obtain 4-6 competitive bids and construction work will be completed by a single G.C. utilizing a number of specialized sub-contractors. Increase values by 10-40% for significant tenant fit-out work / complex owner requirements.
***If a CM approach is used for item (6) with multiple work / bid packages then this value could increase by as much as 50 – 100%.*
Note (A) China utilizes Design Institutes; these percentages were very low compared to other Western countries; however these percentages have been rising since 2006.

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B	MANUFACTURING FACILITY 50,000 TO 100,000 SQ FT 1-2 STORY (INCLUDES MEZZANINE FLOOR) 20-30 FT HEIGHT	LOW SF $	HIGH SF $	LOW M2 $	HIGH M2 $	TYPICAL % SPLIT
	CONTINUED					
20	Division 11 Equipment - excludes production / process equipment					1%
21	Division 12 Furnishings					4%
22	Division 13 Special Construction					2%
23	Division 14 Conveying Systems					5%
24	Division 15 Mechanical - HVAC					18%
25	Division 16 Electrical Work					9%
26	**TOTAL %**					**100%**
27	Architectural / Engineering Activities & Fees as a % of construction cost	6.8	9.2	6.8	9.2	
28	Construction Management Activities & Fees as a % of construction cost	3.9	4.8	3.9	4.8	
	TYPICAL ADD-ON	**UOM**		**$ LOW**		**$ HIGH**
29	CCTV 1 Camera & Monitor	1		2,100		2,600
30	Dock Levelers 15 Ton Capacity	1		7,500		10,750
31	Directory 60" x 48"	1		1,500		2,700
32	Flagpole	1		1,750		3,750
33	Furniture / Benches / Lunch Room Furniture / Shelves	1		17,500		35,000
34	Computer Terminal	1		1,000		2,200
35	Communications / Loud Speaker System	1		700		1,400
36	Front Reception Desk	1		7,500		12,500
37	Security / Card swipe system	1		1,500		2,100
38	Fire Alarm / Smoke Detector - Ceiling Type	1		210		290
39	Emergency Hallway Lighting 25 watt	1		370		570
40	Elevator 2,500 pound hydraulic (20 passenger) 1 stop	1		75,000		120,000
41	Elevator 5,000 pound electric goods 1 stop	1		85,000		155,000
42	Copy machines	1		750		950
43	Emergency Electric Power Supply - Diesel 50 kW	1		37,000		76,700

C	R&D LABORATORY 100,000 TO 200,000 SQ FT 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%

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Table 40

USA - INTERNATIONAL LNG EXPORT FACILITIES. 2018 COST BASIS

#	LOCATION	$ CAPEX COST PER TON PER ANNUM MINIMUM	$ CAPEX COST PER TONS PER ANNUM MAXIMUM	$ CAPEX COST PER TONS PER ANNUM AVERAGE
1	US Gulf Coast	890	1,550	1,220
2	US / Canada (West Coast)	950	1,850	1,400
3	Australia	1,375	3,650	2,513
4	West Africa	880	1,850	1,365
5	North Africa	845	1,950	1,398
6	S.E. Asia	935	2,050	1,493

#	TOTAL FACILITY BENCHMARKS	% SPLIT
1	Major Equipment	34.3
2	Bulk materials	14.2
3	Construction Labor	28.1
4	Indirects	11.3
5	Detailed Design / Project Mgmt + Fees	12.1
6	**TOTAL**	**100.0**

#	CONSTRUCTION BENCHMARKS	% SPLIT
1	Site Work / Civil	6.3
2	Concrete	9.4
3	Structural Steel	8.5
4	Equipment Setting	10.4
5	Piping	45.6
6	Electrical / InstrumentationI	17.7
7	Insulation	7.2
8	Paint	2.7
9	Offsite /Tank Farm / Loading Facilities	15.9
10	Construction In-Directs Field Supervision, Site Establishment, Construction Equipment, Scaffolding	48.2
11	**TOTAL**	**171.9**

#	SYSTEM BENCHMARKS	% SPLIT
1	Gas Pre-Treatment	21.2
2	Liquifaction / Refridgeration	37.1
3	Utilities	20.2
4	Offsites / LNG Storage / Loading	21.5
5	**TOTAL**	**100.0**

NOTES / REASONS FOR MAJOR COST VARIATIONS:

1 Differing escalation & currency rates.
2 Remote location, requiring pioneer camps, expensive logistic & ocean freight costs.
3 Need for offshore drilling & long distance pipelines, that were part of the AFE funding request (Facility costs could be reduced if pipeline / production wells are deducted from costs indicated above.
4 Significant CAPEX budget project overruns, due to ineffective execution methods
5 Some US facilities saved CAPEX costs by revamping / reutilization of mothballed or under utilized Gas Import Facilities

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Table 41

USA ETHYLENE PRODUCTION FACILITY: AVERAGE OF UNION / NON-UNION CONSTRUCTION: COST BASIS 2019

PRODUCTION CAPACITY (TONS PER ANNUM TPA)	NUMBER OF MAJOR EQUIPMENT ITEMS (M.E.)	NUMBER OF TAGGED INSTRUMENTATION EQUIPMENT ITEMS (M.E.)	TOTAL EPC AVERAGE COST PER TON ISBL	TOTAL EPC AVERAGE COST PER TON OSBL	TOTAL EPC AVERAGE COST PER TON ISBL & OSBL	ACCURACY OF DATA
500,000	145	1,760	$3,425	$381	$3,806	+/- 15%
750,000	215	2,645	$3,360	$415	$3,775	+/- 15%
1,000,000	323	3,510	$3,297	$450	$3,747	+/- 15%
1,250,000	345	4,388	$3,172	$516	$3,688	+/- 15%
1,500,000	427	5,260	$3,090	$545	$3,635	+/- 15%

NOTES:

- Typical Cost of Major Equipment Item = $1,575,000 to $1,675,000
- Typical Cost of Tagged Instrument Item = $8,700 to $9,250
- Costs exclude Feed Studies, Land Purchase, Owner Engineering & Construction Management.
- Furnaces Represent 53% of M.E. Engineering & Fees = 14.2% of EPC cost
- Typical Owner Costs (10 to 20 professionals) Project Manager, Deputy Project Manager, Mechanical, Chemical, Electrical and Civil Engineers, Purchasing, QA QC, Estimators, Planners, Construction Manager, Inspectors, Document Control, Secretary - 10 to 20 people x 24 months:

Typical Open Shop (Non Union) Skilled Worker

(PIPEFITTER, ELECTRICIAN ETC. ALL-IN HOURLY RATE BILL OUT RATE):

DESCRIPTION	% OF BASE RATE	$ COST
BASE SKILLED JOURNEYMAN RATE (2Q – 2019)		$29.25
PAYROLL TAXES & INSURANCES		
WORKERS COMPENSATION INSURANCE	17.3	$5.06
GENERAL LIABILITY INSURANCE	4.2	$1.23
FICA	14.3	$4.18
FUI / SUI	4.3	$1.26
BUILDERS ALL RISK INSURANCE	7.6	$2.22
FRINGE BENEFITS	21.2	$6.20
PREMIUM TIME	7.7	$2.25
FIELD OFFICE / TEMP FACILITIES	8.3	$2.43
FIELD OFFICE SUPPLIES / COMPUTERS / COPY MACHINES / COMMUNICATIONS	4.3	$1.26
SAFETY ITEMS / FIREWATCH	8.6	$2.52
SMALL TOOLS / CONSUMABLES	10.9	$3.19
FIELD STAFF / PROCUREMENT / MATERIAL LOGISTICS	22.8	$6.67
SCAFFOLDING	6.7	$1.96
EQUIPMENT RENTAL (EXCLUDES HEAVY LIFT CRANES)	18.5	$5.41
HOME OFFICE SUPPORT / COORDINATION	8.6	$2.52
PER DIEM	5.3	$1.55
PROFIT / CONTRACTOR FEE	15.5	$4.53
OTHER / MISCL ITEMS	9.5	$2.78
TOTAL ALL-IN FIELD WAGE RATE	195.6	$86.46

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Azerbaijan

DATA TABLE

1	Capital: Baku 2,000,000
2	Area: 86,500 sq km
3	Population: 9.60 million
4	GDP $42.7 billion
5	GDP per Head: $4,800
6	Inflation Rate: 5.0% - 6.0%
7	VAT / GST: 18%
8	Freight: 8.5 – 11.5 / 35 days
9	Exchange Rate: 1.71 New Manat
10	Import duties: Refer to website above on general notes page, note 10.
11	A/E Billing rate: $20 - $40
12	Skilled Worker rate: $9 - $14
13	Ditto # 12 offshore rate: $46 - $70*
14	Unskilled worker rate: $5 - $8
15	Local Engineering Productivity: 1.25 – 1.50
16	Worker Productivity: 1.50 – 1.85
17	Location Factor: 0.93 - 0.97
18	Local Bulk Material Factor: 0.85 – 0.90
19	SF / $ Unit Cost: $35 - $51
20	Construction Equipment / Rental Factor: 0.87 – 0.90

ADDITIONAL DATA:

1. Major Cities: Guyanda, Sumgait, Laki.
2. Time:+ 8 EST
3. Local freight: 2% - 3% of material / equipment purchase price.
4. Government website: http://www.azertag.com
5. Import duties: Refer to website mentioned above:
6. Electricity: 220 v – 50 Hz
7. Telephone code: 994
8. Major Sea Ports: Baku, Sumgait.

The GDP is forecast to be in the 3.1% - 3.3% range in 2018.

* Excludes Camp Establishment / Maintenance and de-mobilization ranges from $2.50 - $3.50 per direct hour. Excludes Food / Messing Costs- ranges between $1.00 and $1.50 per direct hour:

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Government Statistics Office: www.azstat.org

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Bosnia

DATA TABLE

1	Capital: Sarajevo 450,000
2	Area: 51,250 sq km
3	Population: 3.85 million
4	GDP $17.9 billion
5	GDP per Head: $6,300
6	Inflation Rate: 1.7% - 2.1%
7	VAT / GST: 17%
8	Freight: 8.5 – 11.5 / 25 days
9	Exchange Rate: 1.69 Marka
10	Import Duties: www.uino.gov.ba/b/Carina/ Refer to website above on general notes page, note 10.
11	A/E Billing rate: $25 - $40
12	Skilled Worker rate: $10.50 - $15.50
13	Ditto # 12 offshore rate: N/A
14	Unskilled worker rate: $6 - $10
15	Local Engineering Productivity: 1.20 – 1.35
16	Worker Productivity: 1.35 – 1.80
17	Location Factor: 0.90 - 0.95
18	Local Bulk Material Factor: 0.85 – 0.90
19	SF / $ Unit Cost: $38 - $60 $409 - $646 / M2
20	Construction Equipment / Rental Factor: 0.80 - 0.85

ADDITIONAL DATA:

1. Major Cities: Mostar, Banja Luka, Bihhac
2. Time: + 6 EST
3. Local freight: 2% - 3% of material / equipment purchase price.
4. Government website: www.fbihvlada.gov.ba
5. Electricity: 220 v – 50 Hz
6. Telephone code: 387
7. Major Sea Ports: Bosnia-Herzegovina is landlocked most goods are transported by road or rail via Croatia and other close by countries.

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China

FACTS IN BRIEF

Official name: People's Republic of China
Currency: Yuan (1 Yuan = 10 Jiao)
Population: 1.40 billion (est. 2019)
Import: $1,075 billion (2015)
Population growth: 0.6% per annum
Exports: $1,340 billion (2018)
Capital: Beijing
Weights/ measures: Metric
Languages: Standard Chinese or Mandarin, and hundreds of regional and local dialects
Chief products: Minerals, textiles, garments, electronics, petroleum, agricultural products, metals, consumer goods
Area: 9,597,000 km2
Highest elevation: Mount Everest, 8,848 m
Unemployment: 3.5% - 3.9% 2019
Type of government: Communist state
GDP: $12.85 trillion 2019
Life expectancy: Male 71.4, female 75.1 years

GENERAL BACKGROUND

LOCATION

China occupies the eastern part of Asia. It is located between India on the Southwest and Russia to the north.

LAND

China is the world's third largest country. Only Russia and Canada are larger. China is slightly larger than the U.S. in land mass; China's land is as varied as it is vast. The Tibetan highlands lie in southwestern China. The world's highest mountain, Mount Everest, is in this region. Eastern China is a region of low mountains and hills. The only flat area is the Xi Jiang (West River) delta. The area of the lower reaches of the Yellow and Yangtze Rivers consist of fertile plains. In the north of China is the Gobi Desert. China has a number of rivers that drain into the South and East China Seas.

CLIMATE

China's climate varies dramatically because of

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building. This could increase as much as 10% on hi-tech facilities.

The following rates are "all in" or selling rates for specific Chinese construction professionals and are suitable for 2019. They include salaries and fringe benefits, (Civil / social / community burdens) all statutory payments and contributions, and overhead, office establishment cost, and profit (10% - 20%). The rates are appropriate for all areas (smaller cities and rural areas) and are shown for qualified individuals with at least 10 years professional experience.

The following rates are appropriate for Beijing for individuals with 10-plus years experience.

SKILL	$ LOW	$ HIGH
Architect	22.00	46.00
Civil Engineer	22.00	46.00
Mechanical Engineer	22.00	46.00
Electrical Engineer	23.00	46.00
Cad Operator	13.00	31.00
Site Manager	18.00	42.50

Note: The above rates apply to Chinese Domestic Projects. For North American / Western European EPC firms operating in partnership with Chinese Design Institutes and claiming that they have full time engineering presence in China use an all in bill out rate of $37 to $57 per hour for engineering work, this includes office costs, support, CAD machines, computers, overhead and profit.

ENGINEERING PRODUCTIVITY / DESIGN WORK

The following figures show a range of productivity values: (1) Washington, DC (2) Houston Texas, and (3) Beijing (Peking) / Guangzhou, China. The productivity factors are compared against a U.S. basis of 1.00 – Washington DC, engineering labor working on producing the necessary design deliverables for a midsize petro-chemical / manufacturing facility (say $10 – $50 million).

REF. #	LOCATION	PRODUCTIVITY VALUE
1	Washington, DC	1.00
2	Houston, TX	0.95
3	Beijing (Peking) / Guangzhou, China.	1.10 – 1.25

CONSTRUCTION LABOR HOURLY RATES

The hourly indicated below are "all in" selling rates for skilled and unskilled construction workers. These rates include base wage rate and all related burdens, fringes, statutory payments and contributions, overhead and establishment charges,

Construction Labor Hourly Rates

"ALL IN" SELLING RATES FOR SKILLED AND UNSKILLED CONSTRUCTION WORKERS

LABOR MARK-UP CATEGORIES	AVERAGE
Civil / social / community burdens Social security/housing fund contributions. Urban maintenance tax	20% - 35%
Holidays / Vacation time	
Home office support (admin, payroll, procurement / buy-out assistance, management support, estimating, rent / utilities to maintain H.O.	
Field supervision / Timekeepers / Warehouse men / Safety / HSE issues	
Temporary facilities / trailers / porta johns / office supplies	
Small tools	
Consumables, gas, welding rods etc	
Construction equipment (excludes heavy lift cranes)	
Maintenance of CE / fuel oil / repairs to CE	
PROFIT	10% - 20%
TOTAL (ADJUSTED)	80% - 100%

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agement at the macro level will dampen inflationary pressures, thus leaving space for continued accommodative monetary policy to prolong the current cyclical upswing. The government goes after this aim through a tripartite (government, business, labor) body called the Alliance for Jobs. Understandings achieved in this advice-giving forum have been translated into multi-year wage agreements between employers and unions in several key industries involving modest wage increases. The success of this strategy is not assured, partly because monetary policy made by the European Central Bank must take account of conditions in all 19 member countries of the European Monetary Union, most of which are currently growing faster than Germany. More broadly, the German labor market faces a number of structural problems. Continuing widespread use of sector-wide wage bargaining agreements results in a high de facto minimum wage that prices lower skilled workers out of the market: In the meantime, generous unemployment benefits reduce the incentive to take those low-skilled jobs that are available. And despite 3.4 + percent unemployment, serious labor shortages exist in many high-skill fields. Germany is one of the major economic powers of the world. Both parts of Germany offer exceptional business opportunities to international EPC construction organizations. With a single European market in place (28 members that will soon be 27 once Britain invokes article 50 of the Lisbon Treaty) and political reform changing the landscape of Eastern Europe, Germany is at the center of one of the world's most exciting and dynamic marketplaces, an area with great growth potential for the coming decade. According to the European Community biding procedures, all construction projects located in Germany and other EC countries with a value exceeding 5 million European Currency Units (ECUs), must be published in the Supplement to the Official Publications of the EC. These publications can be obtained from Dept. of Official Publications of the EC, 2 Rue Mercier, L-2985 Luxembourg. The general consensus both in Germany and overseas is that the German government will continue to take the required path forward to speed up the reunification process and that within the next decade the eastern part of the country will enjoy both high levels of productivity and an impressive increase in its quality of life and basic standard of living. All this bodes well for EPC construction organizations looking to expand and prosper in this part of Europe. The German construction industry has earned a worldwide reputation for the quality of the finished product its designers and workers achieve. The education level of German EPC construction professionals and workers is one of the highest in the world. With the addition of the Poland and other Eastern European countries to the expanded E.U. 2019 will see a reduced amount of work for German EPC firms. Construction looks to be relatively stable as we transition into 2019.

Germany is at the center of one of the world's most exciting and dynamic marketplaces, an area with great growth potential for the coming decade.

Architects, engineers, and contractors executing construction work in Germany must conform to the German National Standards (Deutsches Institute für Normung). These DIN standards are considered by many to be the most detailed and demanding in the world. They have similarities with American Society of Mechanical Engineers (ASME) and American Society for Testing and Materials (ASTM) standards and British Standards (BS). Architects and engineers must be registered in the specific state they are performing work. Germany has a national building code. State and local building inspectors monitor compliance with this code. The Honoraria for Architects and Engineers (H.O.A.I.) regulates architects and engineers fees, which is basically the architects' and engineers' procedural manual.

The vast majority of construction organizations in Germany are "trade contractors." These organizations, as the name implies, are specialist in one or two specific types of work (e.g., painting and decorating, concrete work, or underground utilities). Many of

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The productivity factors are computed against of U.S. basis of 1.00, based on open-shop (i.e., nonunion) labor working at a midsize petrochemical facility on the Texas Gulf Coast.

PRODUCTIVITY RANGE

- **Good:** 1.00
- **Average:** 1.15
- **Poor:** 1.50 - 1.65

For example, if a task 2,000 man-hours to complete in the U.S. then, using the average value of 1.15, it would take 2,300 man-hours to accomplish in Ireland. Factors that contribute to good productivity include good access to the work area, an experience workforce, adequate supervision, moderate weather conditions, specifications and drawing details that are not overly complicated, and materials and equipment that are stored close by the work areas. Factors that can contribute to poor productivity include overcrowded or tight working conditions, limited skills or education of workers, limited use of construction equipment and power tools, extreme weather conditions, inadequate or poor supervision, complex work items, sophisticated specifications, fast track construction requirements, extensive overtime, materials and equipment not stored close to the work areas, double or triple handling of materials and equipment, and small or scattered element of work.

REGIONAL COST VARIATIONS

The percentages indicated below reflect price differentials between major cities. These percentages can be used to calculate the square-meter and square-foot cost values shown previously.

- **Athlon:** -4%
- **Cork:** -2%
- **Dublin:** 0%
- **Dundalk:** -4%
- **Galway:** -5%
- **Limerick:** -3%
- **Waterford:** -4%
- **Wexford:** -3%

INFLATION

The following are actual and forecasted annual increases in consumer prices.

- **2001:** 3.8%
- **2002:** 3.5%
- **2003:** 3.5%
- **2004:** 2.9%
- **2005:** 2.3%
- **2006:** 3.4%
- **2007:** 3.1%
- **2008:** 3.3%
- **2009:** 3.5%
- **2010:** 0.9%
- **2011:** 0.8%
- **2012:** 0.9%
- **2013:** 1.2%
- **2014:** 1.2%
- **2015:** 0.8%
- **2016:** 0.5%
- **2017:** 0.6%
- **2018:** 0.4%
- **2019:** 1.3%

TAXES/TARIFFS/IMPORT DUTIES

The corporate tax rate for manufacturing profits in Ireland is 12.5%. This rate applies to profits from the sale of products manufactured in Ireland. In addition, the following activities or services performed in Ireland in connection with engineering and construction work executed outside the EC. This relief applies to professional services provide by engineers, architects, quantity surveyors, and other construction-related professionals.

VALUE ADDED TAX RATES	
0% rate:	Essential goods, such as food & medicines
13.5% rate:	Basic necessities such as electricity, gas, books, etc.
23% rate:	All other goods and services not included above.

Value added tax (VAT) is a tax on general consumption, rather than production. It is applied to a wide range of goods and services and is charged

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• Design / Build contracts or turnkey contracts management contracts (basically a construction management approach where the owner contracts separately with specialist contractors, each of whom performs a certain element of the work, with a construction manager acting as coordinator)
• Negotiated construction contracts
• Cost reimbursable contracts
• Unit rate contracts (often used for civil engineering-type construction or where the design effort is very preliminary)
• The FIDIC form of contract
• Major Fortune 500 companies doing work in Poland will often use their own standard form of contract, modified to suit local conditions.

ARCHITECTURAL / ENGINEERING DATA

The previous table shows typical fees for architectural and engineering services on new buildings/ facilities in Poland. The fees are based on construction projects valued at $5 - 50 million and are expressed as a percentage of the final cost of the building or facility (excluding VAT). These fees can vary, depending on location, type and sophistication of building and market conditions.

The hourly rates that follow are "all in" job rates or selling rates for various construction professionals. They are appropriate for 2019. The rates include employees' salaries, workers' compensation insurance, social security payments, health insurance premiums, unemployment insurance, vacation and holiday payments, establishment charges, overhead mark-ups, and profit. The rates shown are for the Warsaw area and reflect individuals with a minimum of 10 years experience.

• **Poland: US$ / Zloty 3.79 – August 14, 2018**
• Polish professional workers typically work 38.5 – 42.5 hours per week and receive 3 – 4 weeks paid vacation, in addition approximately 8 - 12 public holidays are observed, billable hours per year = 1,780 – 1,860 = 1,840 billable hours.

The following hourly rates reflect work in the commercial, industrial and energy construction sector.

SKILL	US $ LOW	US $ HIGH
Senior Project Manager (25 years experience)	55	85
Project Manager (10 years experience)	45	68
Chemical Engineer (15 years experience)	37	63
C/S/A Engineer (ditto)	35	60
Mechanical Engineer (15 years experience)	36	61
E&I Engineer (ditto)	40	63
CAD Operator	17	29
Cost Engineer (5 years experience)	31	47
Senior Estimator (10 years experience)	35	54
Quantity Surveyor (10 years experience)	32	50
Planner (5 years experience)	28	45
Purchasing Agent (15 years experience)	30	44
S/C Manager (15 years experience)	33	45
Document Control / Secretary	13	22
Construction Manager (20 years experience)	35	50
Field Engineer	29	43
Safety Engineer	23	37
Construction Inspector	24	37
Architect (10 Years Experience)	40	60

ENGINEERING PRODUCTIVITY DESIGN WORK

The following figures show a range of productivity values: (1) Washington, DC (2) Houston Texas, and (3) Warsaw, Poland. The productivity factors are compared against a U.S. basis of 1.00 – Washington DC, engineering labor working on producing the necessary design deliverables for a midsize petrochemical / manufacturing facility (say $10 – $50 million).

REF. #	LOCATION	PRODUCTIVITY VALUE
1	Washington, DC	1.00
2	Houston, TX	0.95
3	Warsaw, Poland	1.15 – 1.35

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They are order-of-magnitude numbers and should be used for early or conceptual budgeting purposes or for comparing and checking proposals submitted by contractors.

- **Swedish SF / M2 Facility Unit Costs in US $'s**

UNIT PRICES

The previous unit price rates include all necessary labor, materials, construction equipment, supervision, overhead costs, general conditions, preliminaries, and profit. They are from projects in and around Stockholm and have been adjusted to reflect 2019 pricing levels. These rates are approximate and should be used as a check of contractor's proposals; the accuracy of these unit prices is +/-15%.

LOCATION FACTOR

The factors shown below are used to quantify cost differences for specific construction methods in different locations. Use of the factors involves either (1) estimating the proposed facility on a U.S. basis or (2) knowing the cost of a particular U.S. facility (often a Gulf Coast project is the model). The U.S. estimate is expressed as a base index of 1.00. Location factors typically reflect disparities in construction materials and labor rates, productivity differen-

Construction Material Costs

MID-SIZED COMMERCIAL OR INDUSTRIAL CONSTRUCTION PROJECT

#	BULK MATERIAL	QTY	SI UNIT	LOCAL COUNTRY UNIT COST IN US $	TOTAL IN US $	USA UNIT COST IN US $ SI UNIT	TOTAL IN US $
1	Blocks (Concrete 8" x 16" x 4")	5,000	Each	2.36	11,812	1.76	8,799
2	Bricks (Common) 1,000	15	1000	641	9,608	455	6,826
3	Bricks (Facing) 1,000	10	1000	768	7,681	626	6,260
4	Cement in bags	150	Ton(M)	181	27,105	282	42,337
5	Conduit 2" / 50 mm rigid galv steel	1,000	M	26.80	26,802	23.07	23,071
6	Instruments 4 # 2" / 4" CV (8 #), 12 # (F/P/T) Devices	20	Each	4,993	99,851	4,495	89,896
7	Copper pipe 0.50" / 12 mm L	1,000	M	6.83	6,832	6.88	6,885
8	R M Concrete 3500 PSI / 25 MPa	350	M3	190	66,557	153	53,661
9	Sand / Stone 1.5" diameter / Imported fill / Hardcore (Average)	2,500	Ton(M)	27.66	69,154	24.69	61,724
10	Stainless steel 304 pipe 1" / 25 mm	1,000	M	18.34	18,339	17.12	17,121
11	Steel pipe A-53 1" / 25 mm diameter	1,000	M	14.47	14,470	12.48	12,478
12	Steel Reinforcement (not installed)	50	Ton(M)	1,552	77,617	1,262	63,103
13	Structural Steel (Fabricated not installed)	50	Ton(M)	2,313	115,643	2,549	127,467
14	Valves (Ball) 4" dia. 150 #	25	Each	811	20,268	742	18,556
	TOTAL				571,739		538,182

NOTE: *Metric Ton = 2,205 lb • Long Ton = 2,240 lb (L) • Short Ton = 2,000 lb (S) • Metric Tonne = 1,000 kg /2,205 lb*

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Switzerland

FACTS IN BRIEF

Official name: Swiss Confederation
Currency: Swiss Franc
Population: 8,250,000 (2019)
Gross domestic product: $710 billion (2019 est.)
Population growth: 0.11% (2018 est.)
Exports: $160 billion f.o.b. (2018)
Capital: Bern 150,000
Imports: $140 billion f.o.b. (2018)
Language: French / Italian
Weights/measures
Metric Area: 41,250 sq km
Chief products: Machinery, consumer goods.
Type of government: Federal Republic
GDP per Head: $80,200 (2019)
Life expectancy: Male 78.5 years; Female 85.3 years

ECONOMIC FORECAST

The Swiss economy / construction industry will grow slowly and steadily in 2019, in contrast to the last three years. The Swiss GDP in 2019 is forecast to be in the 1.9% - 2.3% range. Inflation is forecast to be in the 0.3% to 0.7% in 2019. Unemployment in 2019 should peak at a rate of 2.7%. The Swiss construction sector is forecast to have a reasonable year in 2019, driven by a large extent by the vibrant Swiss housing market. Switzerland is one of the most expensive countries in the world to construct a facility; it is also one of the most highly developed countries in the world.

ARCHITECTURAL/ ENGINEERING RATES

The rates that follow are all in hourly job rates for various construction professionals and are appropriate for 2019. They include employees' salaries, workers' compensation insurance, social security payments, health insurance premiums, unemployment insurance, vacation and holiday payments, establishment charges, overhead, mark-ups, and profit. The rates shown are for the Bern area and reflect individuals with at least 10 years experience.

- **Switzerland: 1 US $ = 1.00 Swiss Franc August 14, 2018**
- Swiss professional workers (Architects and Engineers) typically work 38 – 40 hours per week and receive 2 – 4 weeks paid vacation, plus 8 - 12 paid vacation days, hours worked per year = 1,810 – 1,880

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FACILITY / BUILDING COSTS	COST MODEL SF	COST MODEL M2	SF $ LOW	SF $ HIGH	AVERAGE COST $ SF	AVERAGE $ M2 COST
Tire Manufacturing Facility	73,000	6,784	162	207	185	1,986
Toner Production 2 Floors	98,800	9,182	129	166	147	1,585
Toxicology Research Laboratory 4 Floors	122,000	11,338	452	579	515	5,545
University Research Medical Facility 9 Floors	345,400	32,100	820	1,050	935	10,062
University / Biomedical Genomics	237,500	22,072	478	614	546	5,876
University Class Rooms 2 - 4 Floors (Spec A)	105,700	9,823	169	217	193	2,077
University Class Rooms 2 - 4 Floors (Spec C)	105,700	9,823	162	207	185	1,986
University Class Rooms 2 - 4 Floors (Spec D)	105,700	9,823	170	218	194	2,090
University Dormitory 3 - 5 Floors (Spec A)	123,700	11,496	162	207	185	1,986
University Dormitory 3 - 5 Floors (Spec C)	123,700	11,496	155	199	177	1,902
University Dormitory 3 - 5 Floors (Spec D)	123,700	11,496	154	197	176	1,889
University Laboratory 1 - 2 Floors (Spec A)	79,500	7,388	180	229	204	2,200
University Laboratory 1 - 2 Floors (Spec C)	79,500	7,388	174	222	198	2,129
University Laboratory 1 - 2 Floors (Spec D)	79,500	7,388	172	219	195	2,103
Warehouse 80% / Office 20% / Distribution Center	84,000	7,807	82	103	92	994
Warehouse 90% / Office 10% (Spec A)	51,500	4,786	95	120	107	1,157
Warehouse 90% / Office 10% (Spec F)	51,500	4,786	88	113	100	1,079
Warehouse 90% / Office 10% (Spec C)	51,500	4,786	93	117	105	1,131
Warehouse 90% / Office 10% (Spec E)	51,500	4,786	90	115	103	1,105
Warehouse (VL) Logistics Center	427,000	39,684	75	97	86	923

Unit Prices (Labor + Materials)

REFLECTS 2019 PRICING LEVELS

DESCRIPTION	UNIT OF MEASURE	US$
Break out and remove reinforced concrete foundations	cy	90-110
Excavation by machine for isolated foundations	cy	12.50 - 16.00
Backfill excavated material around foundation in 12" layers	cy	23.50 - 30.00
Remove excavated material from site, 5-mile round trip	cy	19.50 - 21.50
Reinforced concrete in isolated foundations including all necessary form work & reinforcing	cy	370 - 575
Imported stone to underside of slab & foundations and rolled in 12" layers	cy	37.50
Common brick wall, 4" thick	ft2	16.00 - 18.00
Concrete block wall, 8" X 116" X 4"	ft2	8.50 - 10.75
Supply & erect structural steel framing, include prime coating	ton	2,925
Miscellaneous steel brackets/hangars/handrails	ton	4,400
Suspended ceiling, 5/8" thick, fiberglass, including suspension system	ft2	3.50 - 4.10
Carpet tiles, 24" X 24" (average quality)	sy	48.00 - 56.50
Spray painting to concrete walls with interior latex semi-gloss paint, 2 Applications	ft2	0.60 - 0.70

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STATE	LOCATION FACTOR
WISCONSIN (continued)	
Milwaukee	.95
WYOMING	
Casper	.86
Cheyenne	.87
Gillett	.86

The above USA city indexes / location factors are intended for calibrating building / facility costs. The base / standard benchmark city is Washington, D.C; i.e. which is fixed at a value of 1.00. Less built up areas close to major cities, i.e. suburbs outside major cities generally have a lower cost basis than major city center costs by 1 – 5 basis points. Remote locations, such as, Anchorage or Fairbanks in Alaska, will generally have, to a greater degree, higher prices compared to lower 48 states comparable cities, due to increases in logistics and increased shipping / transportation costs of materials and equipment to Alaska, also keep in mind that weather conditions in Alaska can be significantly different to lower the 48 states .

USA PRODUCTIVITY FACTORS (VERSUS GULF COAST)

The normal approach of comparing "process / refinery / manufacturing" construction productivity is to compare various locations around the USA to a known basis or benchmark of 1.00 or 100 for Texas Gulf Coast (open shop labor working from say Mobile, AL in the north and south to say Corpus Christi, TX, - because there is so much historical cost data that has been collected over the last 20 – 30 years, the term Gulf Coast productivity is well known and understood term in the engineering / construction industry):

USA Productivity Factors
VERSUS GULF COAST

STATE	OPEN SHOP / NON-UNION	UNION
Alabama	0.95 - 1.00	1.10 - 1.15
Alaska	1.10 – 1.15	1.25 – 1.35
Arizona (Phoenix / Tucson)	1.00	1.10 - 1.15
Arizona	1.00	1.10
Arkansas	0.95 - 1.00	1.15
California (LA / Long Beach / SF / SD / SJ)	1.10	1.20 – 1.30
California	1.05	1.10 - 1.20
Colorado (Denver)	1.00 - 1.10	1.10 - 1.15
Colorado	1.00	1.05 - 1.10
Connecticut	1.15	1.20 - 1.30
Delaware	1.10	1.20
Florida (Jacksonville / Miami / Orlando / St P)	1.00 – 1.10	1.15 - 1.20
Florida	1.00	1.10
Georgia (Atlanta)	1.00 - 1.10	1.10 - 1.20
Georgia	1.00	1.10
Hawaii	1.10 - 1.15	1.30
Idaho	1.05	1.25
Illinois (Chicago)	1.00 - 1.15	1.20 – 1.30

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Miscellaneous International Construction Reference Data

(WHERE TO FIND INFORMATION)

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THE POSITIVE IMPACT OF INTERNATIONAL CONTRACTING

Engineering and construction related organizations do receive many possible rewards when undertaking construction projects overseas. These potential rewards are listed below. The principal purpose of this section is to furnish reference data that will assist individuals to prepare accurate and timely (CAPEX) cost estimates for overseas construction projects. This section discusses some of the decisions that need to be made and the understanding that is required to make them. In recent times, possibly only ten to twenty years ago, many engineering / construction related organizations in the U.S. and Canada had little or no desire to work in the international construction arena because of the complexities and difficulties involved in performing work overseas. U.S. and Canadian domestic construction presented a large and profitable market for the vast majority of engineering / construction-related organizations. There was no need to work overseas; there was plenty of work in our backyard. However, because of the many political and economic events that have occurred both domestically and internationally in the last decade or two, many engineering and construction organizations have decided to "dive in" and pursue international engineering and construction work. Engineering and Construction related organizations can realize major advantages and benefits from working in the overseas construction arena. Listed below are some of the advantages and benefits that can be achieved by working in this vital and dynamic and growing market.

1. Growth potential of the construction organization is maximized.
2. It presents an opportunity to grow the business and "fill out" the businesses experience roster.
3. Sales revenue of the organization is substantially increased.
4. Assisting domestic clients in establishing new facilities overseas can enhance relationships with existing domestic clients, it is an opportunity to sell future services to a larger group of potential (sophisticated) clients that work in the global construction arena.
5. Return on investment (R.O.I.) is optimized.
6. New profit streams can be developed.

MAIN ISSUES TO CONSIDER PRIOR TO VENTURING AND CONTRACTING OVERSEAS:

- Competition (Current and Future).
- International construction is a growing market, is the country being targeted stable and is there future growth opportunities.
- Financing costs associated with establishing "the" business.
- Associated risks (political and limited growth opportunities).
- Taxation issues US and Local Country.
- Operating / Business structure (stand alone business or a JV).
- Future staffing needs
- Determine current home office resources that can be utilized.
- Determine if local in-country resources are required and their availability.

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About the Firm

Compass International Consultants Inc. was founded in 1992 (C.I.C.I.) the firm is a provider of international construction cost data, location factors, international construction intelligence and cost estimating data publications. The firm has a distinguished reputation for publishing and providing practical construction related publications and related data. Compass International is backed by an excellent staff of experienced professionals earning us a name which ranks among the top firms providing international and domestic engineering and construction cost data.

SERVICES PROVIDES

- Advice on future and current international CAPEX projects
- Conceptual / Detailed Estimating Services (Refineries / LNG facilities / Mines / Pharmaceutical facilities / Power plants / Industrial - Manufacturing facilities)
- Review and critique of Pre-FEED / FEED CAPEX estimates
- Estimating Reviews / Audits of various buildings
- Insurance / Replacement / Fair Value Estimates
- Value Engineering
- Training Seminars (7) Topics
- Location Factors / Global Cost Data
- Bid Documents / Bid Packages
- Procurement Support
- Proposal Assistance
- PM / CM Services
- Benchmarking
- Claim Reviews / Support / Analysis
- Project Planning
- Cost Engineering Support
- Turnaround of Problem Projects

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