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SECTION 1:

- 1** Introduction, General Comments and Calibration Factors:
includes the following:
Location (Calibration) Factors - International values compared to USA Gulf Coast. (Base of 1.00). Calibrations in this application are used to adjust the benchmark prices depicted in the following SECTIONS (1 thru 700).
25 # Country Calibration Factors.
General Conversion Values - Imperial to Metric Units.
Import Duties General Sales Tax / Value. Added Tax / Consumption Tax.
Detailed Design / Engineering / Architectural and CM Fees 51 # Facility Types.
Union Labor Costs / Inflation Cost Indexes.
USA and Canada State & Province Sales Tax / GST.

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SECTION 10:

- 17** Major Equipment / Production Equipment

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SECTION 20:

- 41** Site, Civil, Piling, Concrete, Masonry and Buildings

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- 47** Structural Steel

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- 49** Piping / (ISBL and OSBL)

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171	600 SECTION 600: Insurance Data
173	700 SECTION 700: Miscellaneous items, Bonds, Spare Parts, Camp Costs, Construction Consumables, Start up issues, Transmission Line Benchmarks and Camp Costs.
197	ABOUT THE FIRM

#	CONSTRUCTION EQUIPMENT / PLANT HIRE (EXCLUDES FUELING & MAINTENANCE)	UNIT		\$ COST
CONTINUED				
176	Pipe rim clamps 14" – 24"	HOUR	Excl Oper	5.91
177	Plasma cutter 10 pack	HOUR	Excl Oper	9.89
178	Pump submersible 50 gpm with 150' hoses	HOUR	Excl Oper	3.46
179	Pump submersible 150 gpm with 150' hoses	HOUR	Excl Oper	4.44
180	Ready Mixed Concrete batch plant 100 CY / hour, gasoline	HOUR	Excl Oper	275.84
181	Rigging spreader beams 5 Ton – 10 Ton	HOUR	Excl Oper	4.45
182	Rigging spreader beams 10 Ton – 25 Ton	HOUR	Excl Oper	9.76
183	Rigging spreader beams 25 Ton – 100 Ton	HOUR	Excl Oper	16.40
184	Rigging spreader beams 100 Ton – 250 Ton	HOUR	Excl Oper	30.33
185	Road stone spreader 12' wide	HOUR	Excl Oper	40.05
186	Road sweeper 72" wide	HOUR	Excl Oper	34.27
187	Roller, non-vibrating, 5 Ton, 48" wide, 2-wheel	HOUR	Excl Oper	14.89
188	Roller, non-vibrating, 10 ton, 84" wide, 2-wheel	HOUR	Excl Oper	25.72
189	Roller, non-vibrating, 25 Ton, 96" wide, 2-wheel	HOUR	Excl Oper	47.51
190	Roller, vibrating, 7.5 Ton, 48" wide, 2-wheel	HOUR	Excl Oper	46.78
191	Roller, vibrating, 12.5 Ton, 48" wide, 2-wheel	HOUR	Excl Oper	70.22
192	Roller, vibrating, 25 Ton, 48" wide, 2-wheel	HOUR	Excl Oper	81.24
193	Roller, vibrating, walking, 1 Ton, 24" wide, 1-wheel	HOUR	Excl Oper	12.13
194	Roller, vibrating, walking, 2.5 Ton, 24" wide, 1-wheel	HOUR	Excl Oper	16.37
195	Roofing hot tar kettle, 500 gallon, propane	HOUR	Excl Oper	6.82
196	Rotary drill, crawler mounted, 4" to 6" dia.	HOUR	Excl Oper	114.88
197	Rotary drill, crawler mounted, 6" to 10" dia.	HOUR	Excl Oper	135.05
198	Rotary drill, crawler mounted, 10" to 16" dia.	HOUR	Excl Oper	180.46
199	Rotary drill, truck mounted, 10" to 16" dia.	HOUR	Excl Oper	194.58
200	Rotary drill, truck mounted, 16" to 20" dia.	HOUR	Excl Oper	219.77
201	Rough terrain 4-WD high lift loaders, maximum 24' lift	HOUR	Excl Oper	10.80
202	Rough terrain 4-WD high lift loaders, maximum 36' lift	HOUR	Excl Oper	12.49
203	Salamander portable heater (excluding propane) 100,000 BTU's	HOUR	Excl Oper	11.81
204	Salamander portable heater (excluding propane) 250,000 BTU's	HOUR	Excl Oper	20.27
205	Sandblaster unit 10 CF capacity, with hoses	HOUR	Excl Oper	9.38
206	Saw Band (Air)	HOUR	Excl Oper	3.96
207	Saw concrete gasoil 5 HP	HOUR	Excl Oper	7.30
208	Saw Table (Electric)	HOUR	Excl Oper	3.68
209	Scissor lifts JLG / Genie, 20' height, 500 pound capacity on flat slab	HOUR	Excl Oper	22.11
210	Scissor lifts JLG / Genie, 30' height, 1,500 pound capacity on flat slab	HOUR	Excl Oper	40.60
211	Scissor lifts JLG / Genie, 30' height, 1,500 pound capacity on flat slab	HOUR	Excl Oper	58.68
212	Scissor lifts JLG / Genie, 20' height, 500 pound capacity rough terrain	HOUR	Excl Oper	29.03
213	Scissor lifts JLG / Genie, 30' height, 1,500 pound capacity rough terrain	HOUR	Excl Oper	47.66
214	Scissor lifts JLG / Genie, 30' height, 1,500 pound capacity rough terrain	HOUR	Excl Oper	65.73
215	Self-propelled grader 65 HP	HOUR	Excl Oper	75.32
216	Self-propelled hydraulic crane 10 ton	HOUR	Excl Oper	98.21
217	Self-propelled hydraulic crane 20 ton	HOUR	Excl Oper	117.96
218	Self-propelled hydraulic crane 50 ton	HOUR	Excl Oper	164.41
219	Self-propelled sheep foot 65 HP	HOUR	Excl Oper	124.89
220	Self-propelled sheep foot 95 HP	HOUR	Excl Oper	163.14
221	Shot Crete installation rig 20 CY/ hour with 2- 100' hoses and 5 CY hopper	HOUR	Excl Oper	56.44
222	Shovel hydraulic crawler with FE 5 CY/ 4 M3 bucket	HOUR	Excl Oper	266.24

Pipelines

A pipeline project covers a numbers of scope items that are not readily appreciated by individuals not familiar with pipeline work, a pipeline project will involve the following issues that need to be planned for and estimated:

- Engineering (the detailed design of the pipeline):
- Procurement of the pipe and other construction related materials:
- Construction:
- Compressor / Pump stations:
- Is the pipeline onshore or offshore:

Other issues that are commonly referred to in pipeline construction are the following:

1. Route (right of way) may require some clearing of trees, brush etc. The right-of-way is a thin strip of land (50' to 100' wide) it is the boundary that encloses the pipeline(s) and the location of the onsite construction work and related were construction activities take place, the pipeline route is leveled as best it can be to give the construction workforce and construction equipment the ability to construct, test and maintain the pipeline during the construction effort and for future maintenance / inspection activities.

2. Surveying the route to be used: A field survey crew marks out the route of the pipeline; usually a 3 man crew does this work.

3. Excavating / trenching: the main run of the pipeline working through barriers i.e. (rivers, roads / highways, rail, other pipelines, etc.)

4. Transporting / Hauling and stringing out the pipeline: The pipe is transported and strung out from main pipe supply site(s) to the right-of-way route of the pipeline, ready for welding operations.

5. Installing the pipe, bending, welding and wrapping the pipe: sometimes bending of the pipe will be required, most of the time a pipeline will be required to cross over mountains / hills and town-

ships, bending the pipe can mitigate this problem, bending machines can perform this work. Welding, wrapping and lowering the pipe into position is the follow on activity. Providing pipe bedding and recovering the pipe with suitable backfill material is the next activity:

6. River / Road Crossings: many times a pipeline will need to cross rivers / steams, roads, railroads and other pipelines. Strategies are developed and planned for in the early stages of the detailed design effort. River crossings can be completed by using coffer dams, sheet piling in sections and pumping out water or by thrust boring / horizontal drilling under the river.

7. Installing compressor / pump stations: These pump stations can be stick-built or pre-engineered buildings:

8. Testing the installed pipeline: An assortment of testing methods can be used such as, hydro, pneumatic, X-rays of welds and ultrasound to make certain the design basis and specifications and industry codes have been met.

9. Cleaning up / Re-seeding / Landscaping: The pipeline(s) right-of-way, compressor stations and temporary construction facilities such as office trailers, temporary fences, warehouses and man camps have been removed and any landscaping has been satisfactory completed.

RULE OF THUMB – ESTIMATING METHOD

- Cost of Pipeline and associated infrastructure (excludes pumping station) in the USA is \$55,000 to \$140,000 per diameter inch-mile. (Example of this, a 20" diameter pipeline could be estimated / budgeted at \$100,000 x 20" this would equate to a cost of \$2,000,000 per mile (note this excludes any pumping stations).

- Compression / Pump Station – budget \$2,000 to \$3,000 per Horse Power (HP).

Pipeline Installation Crew (USA AND CANADA) (2023 BASIS)

#	SKILL	NO. REQUIRED	\$ COST PER HOUR	\$ TOTAL COST FOR 8.5 HOUR DAY
1	Superintendent / Senior Forman includes \$100 per day per diem	1	\$150	\$1,275
2	Forman / Charge Hand includes \$75 per day per diem	1	130	\$1,105
3	Machine Operators includes \$75 per day per diem	2	110	\$1,870
4	Truck Driver includes \$75 per day per diem	1	110	\$935
5	Welder includes \$75 per day per diem	5	10	\$4,675
6	Welder Helper	5	90	\$3,825
TOTAL CREW COST PER DAY				13,685

NOTES

- Camp costs in USA / Canada range between \$50 - \$100 per day for each worker:
- 3 man survey crew \$15,000 - \$20,000 per week

Pipeline Construction Equipment Rates

(RATES INCLUDE FUEL, MAINTENANCE, OVERHEAD & PROFIT IS EXCLUDED, ALSO EXCLUDES OPERATORS)

#	CONSTRUCTION EQUIPMENT DESCRIPTION	\$ HOURLY BILL OUT RATE
1	1 Ton Crew Cab Truck	20.40
2	1 Ton Winch Truck	21.12
3	2.5 Ton Winch Truck	49.04
4	10 Ton Boom Truck / Picker	67.95
5	15 Ton Boom Truck / Picker	76.21
6	20 Ton Boom Truck / Picker	87.82
7	25 Ton Boom Truck / Picker	102.24
8	D8 Dozer / Side boom (Low Ground Pressure)	116.62
9	D7 Dozer / Side boom (Low Ground Pressure)	105.03
10	D6 Dozer (Low Ground Pressure)	88.92
11	D5 Dozer (Low Ground Pressure)	84.13
12	D4 Dozer (Low Ground Pressure)	69.85
13	2CX JCB 75 HP Backhoe 12' dig depth c/w 0.5 CY Front Loader	58.02
14	DX140 Doosan Backhoe 18' dig depth 30" bucket	53.64
15	Cat 8000 Dragline 30 CY bucket 250' boom	630.82
16	Cat 320CL 36" bucket 25' dig depth	113.14
17	FMC / Link-Belt 35-Ton Drag-Line Crane HC-78B, c/w 55' Lattice - Boom 1 CY bucket	62.12
18	Cat 215 Backhoe c/w hydraulic drill attachment	96.23
19	7,500 Cat Foot Pound Hammer	148.88
20	Grove Rough Terrain 528 C 15 Ton Crane	101.92
21	Cat SP/CPX-583 Side boom Pipe layer 333 HP	113.37
22	Cat 587R Side boom Pipe layer 350 HP	124.60
23	John Deere 540B Grapple / tractor	51.26

US Gulf of Mexico Offshore Pipeline Cost Benchmarks:

2023 COST BASIS: 18" TO 24" DIAMETER – 50 MILES / 80 KM IN LENGTH IN WATER N/E 1,500 DEEP.

#	DESCRIPTION	\$ LOW COST PER MILE	\$ HIGH COST PER MILE	\$ LOW COST PER KM	\$ HIGH COST PER KM	% SPLIT
1	Overall project cost	89.75	111.45	55.75	69.22	
2	Materials					12.3% - 14.4%
3	Labor					16.2% - 20.3%
4	Construction in-directs					6.3% - 8.6%
5	Pipe laying vessel & Support vessels					54.2% - 57.3%
6	Detailed Design / Inspection / Project & Construction Management					5.7% - 8.3%

SAMPLE

#	DIRECT CONSTRUCTION	\$ BULK MATERIAL / EQUIPMENT	\$ LABOR	\$ SUB-CONTRACTS / OTHER	\$ TOTAL	% SPLIT OF DC
CONTINUED						
28	IN-DIRECT CONSTRUCTION TOTAL (IDTC)	17,934,494	39,985,679	1,053,893	58,974,066	29.31%
29	DIRECT & IN-DIRECT CONSTRUCTION TOTAL	163,174,191	77,940,985	33,868,090	274,983,266	
30	Procurement / Project Management / Project Control 1% of TC				3,234,475	1% of TC
31	Combined Detailed Design / Construction Management (Some of the major equipment suppliers completed a substantial part of the Detailed Design - (Approx 125,000 hours) 6.39% of TC				20,765,970	6.39% of TC
32	Contingency / Management Reserve 5.38% of TC				17,500,000	5.38% of TC
33	Owner Costs / Consultants / Early Studies 2.63% of TC				8,556,289	2.63% of TC
35	TOTAL US \$ (TC)				325,040,000	

Cost Model #7

MINING BENCHMARKS(2023 COST BASIS:)

	DESCRIPTION	\$ COST
1	Atlas Copco ST7 loader	\$175 / hour excludes operator and fuel
2	Bauer BG 28 Rotary Drill Rig	\$370 / hour excludes operator and fuel
3	P&H 2800 Shovel	\$485 / hour excludes operator and fuel
4	CAT AD 60 U/G hauler	\$235 / hour excludes operator and fuel
5	CAT LHD U/G R3000 Loader	\$200 / hour excludes operator and fuel
6	Volvo A40 Art Truck	\$172 / hour excludes operator and fuel
7	P&H Dragline 9010C 75 CY bucket	\$540 / hour excludes operator and fuel
8	Le Tourneau's D-950 1050 HP Rubber Tire Dozer c/w 35CY blade	\$370 / hour excludes operator and fuel
9	12 CM Continuous U/G mining rig c/w 48" diameter drum head	\$390 / hour excludes operator and fuel
10	Dig & Support 1.5 m x 1.5 M vertical Vent	\$3,400 to \$4,700
11	Dig & Support Initial vertical Shaft 5 M diameter per M	\$11,000 to \$15,600
12	Dig & Support Initial vertical Shaft 7.5 M diameter per M	\$14,100 to \$20,600
13	Dig & Support main horizontal shaft 2.5 M x 2.5 M	\$3,800 to \$8,100
14	Dig & Support main horizontal shaft 3.5 M x 3.5 M	\$4,400 to \$8,000
15	Dig & Support main horizontal shaft 4.5 M x 4.5 M	\$5,350 to \$11,200
16	Dig & Support main horizontal shaft 5 M x 5 M	\$6,700 to \$12,200
17	Dig & Support shaft station per M3	\$740 to \$1,110

Workers Compensation Insurance (WCI)

INSURANCE / STATE UNEMPLOYMENT TAXES:

Listing of statutory payroll Burdens to be considered and estimated.

- Workers Compensation Insurance (premiums set by each state based historical injury / death rates) see listing below.
- Federal / state Unemployment Insurance (FUI/SUI) these rates total between 5.5% and 6.35%
- Federal Social Security (FICA) 7.65%
- Commercial General Liability Insurance – 3%- 4%

The above taxes typically in total add up to between 16.5% and 18%

The following is a listing of typical Workers Compensation Insurance (WCI) by trade for industrial / process type construction work; these rates vary from state to state and vary by the risk factor associated with each trade, i.e. Painters and Structural Steel erectors rates are high, due to the propensity of falls that these trades encounter in their daily work activities, the rates can vary between 5% and 40%. The average that has been used in the cost models depicted in this publication is 13.33%

Workers Compensation Insurance (WCI) FOR INDUSTRIAL / PROCESS TYPE CONSTRUCTION WORK

#	SKILL	% UPLIFT TO BASE HOURLY
1	Boilermakers (Forman)	10.5 – 12.7
2	Boilermakers (Journeyman)	10.5 – 12.7
3	Boilermakers Helper	10.5 – 12.7
4	Carpenter (Forman)	14.5 – 17.7
5	Carpenter (Journeyman)	14.5 – 17.7
6	Carpenters Helper	14.5 – 17.7
7	Cement Mason (Forman)	10.2 – 12.2
8	Cement Mason (Journeyman)	10.2 – 12.2
9	Cement Mason Helper	10.2 – 12.2
10	Concrete Finisher	7.2 – 8.9
11	Equipment Operator (Heavy Crawlers / Cranes)	8.5 – 10.2
12	Equipment Operator (Medium Crawlers / Cranes)	8.5 – 10.2
13	Electrician (Forman)	5.3 – 7.3
14	Electrician (Forman)	5.3 – 7.3
15	Electrician Helper	5.3 – 7.3
16	Instrumentation (Forman)	5.3 – 7.3
17	Instrumentation (Journeyman)	5.3 – 7.3
18	Instrumentation Helper	5.3 – 7.3
19	Insulation (Forman)	27.5 – 37.5
20	Insulator	27.5 – 37.5

	DESCRIPTION	UNIT	UNIT HOURS -30%	UNIT HOURS BASELINE	UNIT HOURS +30%	\$ MATERIAL UNIT RATE -30%	\$ MATERIAL UNIT RATE BASELINE	\$ MATERIAL UNIT RATE + 30%
CONTINUED								
50	Supply and place 4,000 PSI water resistant concrete for walls, with sulfate-resisting cement.	Cu. Yd.	9.44	13.48	17.52	160.31	229.03	297.73
51	Supply and place 4,000 PSI concrete for walls, with sulfate-resisting cement.	Cu. Yd.	9.44	13.49	17.53	160.38	229.11	297.84
52	Supply and place 4,000 PSI water resistant concrete in walls, with sulfate-resisting cement	Cu. Yd.	9.44	13.48	17.53	160.35	229.06	297.77
53	Supply and place 4,000 PSI concrete for columns.	Cu. Yd.	16.03	22.90	29.77	184.99	264.25	343.56
54	Supply and place 4,000 PSI concrete for elevated beams.	Cu. Yd.	11.32	16.18	21.03	167.39	239.14	310.87
55	Supply and place 4,000 PSI concrete for elevated slabs, upper concrete surface horizontal or sloped areas.	Cu. Yd.	11.33	16.18	21.03	167.43	239.19	310.95
56	Supply and place 4,000 PSI concrete for stairs / small landings.	Cu. Yd.	18.83	26.90	34.97	195.32	279.02	362.73
57	Supply and place 4,000 PSI concrete for housekeeping pads, pedestals and curbs on ground and elevated slabs	Cu. Yd.	20.28	28.97	37.66	195.81	279.73	363.65
58	Supply and place 4,000 PSI concrete for housekeeping pads, pedestals and curbs on ground floor (SOG) and elevated slabs already cast and hardened including all supplementary work such as chipping the concrete slab, drilling of anchor holes for rebar connections, supply and epoxy coating / grout.	Cu. Yd.	47.22	67.46	87.70	292.01	417.15	542.28
59	Fabricate and place sawed timber FI formwork for single and continuous footings, foundation beams and slabs, pile caps, grade beams, lighting posts, etc.	Sq. Yd.	0.63	0.90	1.17	81.01	115.73	150.43