COMPASS
INTERNATIONAL INC.

2021

International Hi-Tech / Pharmaceutical / Manufacturing / Cleanroom Facilities Estimating Yearbook

17 TH EDITION

CONTENTS

COMPASS INTERNATIONAL INC.

FACILITY TYPE	TOTAL INSTALLED $ COST PER GROSS SF - LOW VALUE	TOTAL INSTALLED $ COST PER GROSS SF - HIGH VALUE	TOTAL INSTALLED $ COST PER GROSS M2 - LOW VALUE	TOTAL INSTALLED $ COST PER GROSS M2 - HIGH VALUE
CONTINUED				
Automobile production facility	466	701	5,013	7,542
Aseptic products facility (ISO 7 and 8) c/w non classified areas	633	739	6,813	7,955
Bakery (Bread / cookies) c/w mixing, ovens, packaging and storage (275,000 SF)	211	321	2,271	3,454
Biological production API facility - ISO 5, 6, 7 and 8 - with some non classified areas ISO 9 areas & admin / lab areas)	2,428	3,187	26,124	34,297
Bleach manufacturing and main distribution facility	191	327	2,056	3,523
Clean GMP - automated warehouse including Bar coding equipment	345	471	3,709	5,065
Clean GMP - non-automated warehouse excluding Bar coding equipment	256	393	2,755	4,225
Clinical Trials facility (ISO 6 - 8 with some non classified areas)	986	1,141	10,605	12,279
Computer fabrication facility	410	578	4,406	6,222
Cosmetic R&D production facility (22,250 SF)	313	399	3,373	4,294
Data Storage facility - (ISO 9 - clean space - this is a step down from a classified area)	306	380	3,292	4,088
Dairy / Cheese / Butter Production facility (188,000 SF)	200	256	2,150	2,753
Discovery R&D laboratory	932	1,132	10,025	12,180

CONSTRUCTION CATEGORY	M2	SF	$ / SF	$ TOTAL	% OF TPC	REMARKS
CONTINUED						
Construction in directs / temporary site establishment	4,015	43,200	9.77	422,064	6.61%	
Freight	4,015	43,200	0.89	38,448	0.60%	
Detailed design	4,015	43,200	11.94	515,808	8.08%	
Construction management	4,015	43,200	6.88	297,216	4.66%	
Front end studies	4,015	43,200	1,46	63,072	0.99%	
Owner support / engineering	4,015	43,200	1.82	78,624	1.23%	
EPCM fees / minor costs	4,015	43,200	4.88	210,816	3,30%	
Total Project Cost per SF		**43,200**	**147.72**	**6,381,504**	**100%**	
Total Project Cost per M2	**4015**		**Euro 132**			

Excludes

- *Initial material flow / logistics report Euro 78,500*
- *Land purchase (part of an existing production facility)*
- *Employee parking area and lighting (parking for 12 vehicles)*
- *Truck parking area and lighting (parking for 20 trucks)*
- *Security gatehouse and gate entrance*
- *Outdoor patio / smoking area*
- *Landscaping and irrigation system*
- *External signs c/w with lighting*

Table R

VACCINE / BIOLOGICALS MANUFACTURING BUILDING PHASE 2 EXPANSION & MODIFICATION TO EXISTING BUILDING: 22,400 SF / 2,028 M2 ADD ON TO EXISTING FACILITY IN IRELAND
2016 COST BASIS: MAY, 2016 EURO EXCHANGE RATE = 0.88 TO USD ($1.13)

DESCRIPTION	SF	M2	EURO/SF	EURO/M2	TOTAL EURO/M2	% OF TOTAL
General conditions / prelim-inaries includes field survey	22,400	2,082	11.67	125.57	261,435	2.88%
Contractors Resident Site Construction Manager / Field Superintendent & Field Q.S.	22,400	2,082	10.45	112.44	234,104	2.58%
Contractors Field Engineers / Purchasing Staff	22,400	2,082	9.76	105.02	218,647	2.41%
Other Field Staff (Safety)	22,400	2,082	1.52	16.36	34,052	0.38%
Toilets / Porta John's	22,400	2,082	0.3	3.23	6,721	0.07%
Trailers / Porta Cabins	22,400	2,082	0.71	7.64	15,906	0.18%
Temporary Warehouse	22,400	2,082	0.66	7.10	14,786	0.16%
Scaffolding	22,400	2,082	0.17	1.83	3,808	0.04%
Construction Equipment / Cranes	22,400	2,082	1.36	14.63	30,467	0.34%
Safety Equipment	22,400	2,082	0.37	3.98	8,289	0.09%
Field Testing Services	22,400	2,082	0.42	4.52	9,409	0.10%
Field office supplies / computers	22,400	2,082	1.1	11.84	24,643	0.27%
Ongoing / Final Clean up	22,400	2,082	0.66	7.10	14,786	0.16%
Remove pipe bridge / route piping & cables, provide laydown area	22,400	2,082	1.81	19.48	40,548	0.45%
Building demolition work and remove rubble from site	22,400	2,082	2.05	22.06	45,925	0.51%
Staging work / temporary screens and partitions	22,400	2,082	0.81	8.72	18,146	0.20%
Cut out new window openings (12)	22,400	2,082	1.18	12.70	26,435	0.29%
Cut out new door openings (3)	22,400	2,082	1.54	16.57	34,500	0.38%

The following is a comparison of FDA and European Union classified areas 100, 10,000, 100,000 and Clean Manufacturing).

FDA & European Union Classified Areas

100, 10,000, 100,000 AND CLEAN MANUFACTURING

EUROPEAN UNION CATEGORY / CLASS (IN SERVICE)	FDA CATEGORIZATION AIR CHANGES PER HR (AC/H) (IN SERVICE)	EUROPEAN UNION (IN SERVICE)	AT REST	REMARKS
A	100 (240 – 480 AC/H)	100	100	Typically Division 15 & 16 cost is 4 - 5 times higher than class 100,000
B	10,000 (60 – 90 AC/H)	10,000	100	Typically Division 15 & 16 cost is 4 - 5 times higher than class 100,000
C	100,000 (5 – 48 AC/H)	100,000	10,000	Typically Division 15 & 16 cost in the $125 - $200 / SF range
D	Clean Manufacturing Non Classified (3 – 10 AC/H)	Unclassified	100,000	Least expensive application, HVAC / Mechanical values are dependent on market forces typically cost is in the $40- $80 / SF range

The following is a table indicating various space requirements / benchmarks:

TYPICAL SPACE REQUIREMENTS BY BUILDING / FACILITY USE

BLDG / FACILITY TYPE	SF RANGE
Apartment	500 – 1,000 / per person
Hospital	600 – 1,000 / per patient
Office / Admin	75 – 125 / per person
R & D Facility	600 – 1,000 / per person
University Research Facility	650 – 850 / per scientist
Warehouse	1,000-3,500 / per person

The following is a table indicating various live loadings / benchmarks

TYPICAL DESIGN LIVE LOADINGS BY BUILDING / FACILITY USE

BLDG / FACILITY TYPE	SF RANGE
Apartment	50 - 75 pounds / SF
Heavy Duty Manufacturing Facility	250 – 400 pounds / SF
Hospital	75 – 150 pounds / SF
Office / Admin	75 – 100 pounds / SF
R & D Facility	75 – 150 pounds / SF
Warehouse	50 - 100 pounds / SF

The subsequent table indicating various air conditioning requirements / benchmarks:

TYPICAL AIR CONDITIONING / ENERGY REQUIREMENTS BY FACILITY

BLDG / FACILITY TYPE	TONS OF A.C. PER 1,000 SF OF FACILITY
Apartment / Single family home	1.5 – 2.5
Hospital	3.5 – 4.5
Office / Admin	2.5 – 4.0
Computer Center	10 –12.5
R & D Facility	7.5 – 10.0
Warehouse	0.5 – 1.5 (if required)
Natural Gas Heating for a 5 Story Admin / Office (460,000 SF – 450 – 500 people)	240 Therms – 270 Therms per 1,000 SF per year
Natural Gas Cooling for a 5 Story Admin / Office (460,000 SF – 450 – 500 people)	250 Therms – 280 Therms per 1,000 SF per year
Electricity for a 5 Story Admin / Office (460,000 SF – 450 – 500 people)	5,150 – 5,350 kWA per 1,000 SF per year
MMBTU Energy usage	90 – 95 MMBTU per 1,000 SF per year

Piping
CONTINUED

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
SS 304 L -10 Complicated / Intricate (ISBL - Inside Facility) Piping - Numerous changes in direction						
1/2" / 12 mm	16.18	162.66	178.84	53.09	533.51	586.60
3/4" / 18 mm	17.82	184.41	202.22	58.44	604.86	663.30
1" / 25 mm	50.18	209.95	260.13	164.61	688.64	853.24
1 1/2" / 37 mm	59.90	262.91	322.80	196.46	862.33	1,058.79
2" / 50 mm	72.84	307.35	380.19	238.93	1,008.10	1,247.02
3" / 75 mm	93.88	345.18	439.06	307.94	1,132.18	1,440.12
4" / 100 mm	124.65	401.92	526.57	408.84	1,318.30	1,727.14
6" / 150 mm	152.16	496.48	648.64	499.09	1,628.46	2,127.54
8" / 200 mm	207.20	591.05	798.26	679.62	1,938.66	2,618.28
Add 4.5% - 7.5% to labor & material costs for hangars, bolts, gaskets & testing						
SS 304 L -10 Straight run / OSBL Piping - Less Welding						
1/2" / 12 mm	11.71	39.81	51.52	38.40	130.59	168.99
3/4" / 18 mm	13.37	45.50	58.87	43.87	149.23	193.09
1" / 25 mm	15.05	48.91	63.96	49.37	160.42	209.79
1 1/2" / 37 mm	23.40	64.83	88.24	76.77	212.65	289.41
2" / 50 mm	28.43	85.29	113.72	93.24	279.76	373.00
3" / 75 mm	45.14	105.77	150.91	148.07	346.93	495.00
4" / 100 mm	66.86	130.79	197.64	219.29	428.99	648.27
6" / 150 mm	93.60	159.24	252.84	307.02	522.30	829.32
8" / 200 mm	148.76	199.03	347.80	487.95	652.83	1,140.78
Add 4.5% - 7.5% to labor & material costs for hangars, bolts, gaskets & testing						
Sanitary SS pipe Complicated / Intricate (ISBL - Inside Facility) Piping - Numerous changes in direction						
1/2" / 12 mm	210.01	289.88	499.89	688.84	950.80	1,639.64
3/4" / 18 mm	218.21	314.03	532.25	715.74	1,030.02	1,745.76
1" / 25 mm	226.42	362.34	588.76	742.64	1,188.47	1,931.12
1 1/2" / 37 mm	231.34	429.99	661.33	758.80	1,410.36	2,169.16
2" / 50 mm	244.47	458.97	703.44	801.86	1,505.42	2,307.28
3" / 75 mm	295.32	483.12	778.44	968.65	1,584.65	2,553.29
4" / 100 mm	410.17	545.93	956.10	1,345.36	1,790.65	3,136.01
Add 4.5% - 7.5% to labor & material costs for hangars, bolts, gaskets & testing						
Sanitary SS pipe Straight run / OSBL Piping - Less Welding						
1/2" / 12 mm	36.30	71.79	108.09	119.06	235.47	354.53
3/4" / 18 mm	39.60	77.54	117.14	129.90	254.32	384.22
1" / 25 mm	62.70	84.24	146.95	205.66	276.32	481.98
1 1/2" / 37 mm	72.61	92.86	165.47	238.16	304.59	542.75
2" / 50 mm	84.16	110.08	194.24	276.04	361.08	637.11
3" / 75 mm	127.07	129.23	256.30	416.79	423.88	840.67
4" / 100 mm	206.27	157.96	364.23	676.55	518.11	1,194.66
Add 4.5% - 7.5% to labor & material costs for hangars, bolts, gaskets & testing						

plot plans to be had, when this is the case a useful estimating approach is to count the major equipment items and multiply this number of pieces of major equipment by $15,000 to $20,000 the resulting value will provide an adequate starting dollar budget for the instrumentation scope of work. Another conceptual estimating method is to count the "bubbles" on the P. & I. D.'s and to multiply the number of bubbles by $3,200 (L&M 50/50, L = $1,600 M = $1,600). A similar method is to use $1,600 / $2,700 per I / O for a new control system and $850 / $1,000 per I / O for extending an existing control system. The following is a listing of some key instrumentation items.

Key Instrumentation Items

DATA TABLE

INSTRUMENT DEVICE	MATERIAL $ COST	M. H. S
Pressure relief valve 2"	excluded	2.40
Pressure relief valve 4"	excluded	3.40
Electrical Indicating Controller	excluded	17.50
Orifice plate 2" dia 300 #	202	2.50
Ditto 4" dia 300 #	310	3.50
Ditto 6" dia 300 #	364	6.00
Differential pressure switch	excluded	2.50
Orifice union	excluded	2.10
Combustion control alarm switch	excluded	2.10
Position Indicating Meter	excluded	6.60
Gas Regulator	excluded	2.50
Flow switch	excluded	2.10
Sight Glass	excluded	2.50
Flow Meter	excluded	4.40
Electric Flow Transmitter	excluded	10.70
Indicating Controller	excluded	16.50
Anunciator Point	258	0.80
Alarm Switch	563	0.80
Thermowell	excluded	1.70
Solenoid Valve	excluded	2.10
Push Button Station	excluded	2.50
Level Indicator Electronic	1,210	excluded
Thermocouple temperature control	excluded	2.40
2" Control Valve150/300 lb CS Actuator	5,325	3.00
4" ditto	8,335	4.50
6" ditto	11,840	6.00
2" ditto SS 304/316	8,210	3.00
4" ditto	15,050	4.50
6" ditto	24,200	6.00
Thermocouple temperature control	excluded	2.10
12" CS liquid level gauge	583	4.50
1" x 2" 300 lb safety relief valves	2,365	2.50

Table 2

COST BREAK OUT FOR A SOLID DOSAGE CGMP FACILITY

CONSTRUCTION CATEGORY	%	COST / SF	COST / M2	L / M SPLIT
Gen Conditions / Preliminaries	4.7	30.79	331.25	L = 40% / M = 60%
Site work / Civil / foundations	6.4	41.92	451.06	L = 30% / M = 70%
Structural / building enclosure / roof / windows	5.5	36.03	387.63	L = 40% / M = 60%
Architectural finishes internal walls / floors/ ceilings	10.1	66.16	711.83	L = 60% / M = 40%
Pharmaceutical support items i.e. pass thru, airlocks etc	1.7	11.14	119.81	L = 20% / M = 80%
Process / Manufacturing Equipment (P/ME)	17.3	113.32	1219.27	L = 0% / M = 100%
Utility / Support equipment (U/SE)	5.3	34.72	373.53	L = 30% / M = 70%
Install equipment & hook up services (P/ME & U/SE)	1.8	11.79	126.86	L = 60% / M = 40%
Process pipe / services (SS 304 / 316)	6.2	40.61	436.96	L = 55% / M = 45%
Utilities piping (CI, CU, PVC, CS)	1.9	12.45	133.91	L = 55% / M = 45%
HVAC & AHU' s / Ductwork	10.3	67.47	725.92	L = 55% / M = 45%
Plumbing	2.3	15.07	162.10	L = 55% / M = 45%
Fire protection	1.8	11.79	126.86	L = 60% / M = 40%
Facility Electric (excludes s-s)	5.6	36.68	394.68	L = 60% / M = 40%
BMS / Security	3.3	21.62	232.58	L = 60% / M = 40%
Miscellaneous items and vendor assistance	0.3	1.97	21.14	L = 40% / M = 60%
Detailed Design	9.2	60.26	648.40	L = 95% / M = 5%
CM	4.5	29.48	317.15	L = 90% / M = 10%
Validation	1.8	11.79	126.86	L = 95% / M = 5%
TOTAL	**100**	**655.00**	**7047.80**	

Table 3

RESEARCH & DEVELOPMENT FACILITY

DIV NO	DESCRIPTION	%	TOTAL VALUE	SF / COST	M2 / COST
1	Preliminaries / General Requirements	9.53%	2,076,086	28.83	310.26
2	Site Works / Civil	3.76%	819,107 **	11.38	122.41
3	Concrete	5.84%	1,272,228	17.67	190.13
4	Masonry	6.48%	1,411,651	19.61	210.96
5	Metals / Structural Steel	7.46%	1,625,142	22.57	242.87
6	Wood Plastics	4.84%	1,054,381	14.64	157.57
7	Thermal & Moisture Protection	3.55%	773,358	10.74	115.57
8	Doors & Windows	3.36%	731,968	10.17	109.39
9	Finishes	5.73%	1,248,266	17.34	186.55
10	Specialties	1.90%	413,910	5.75	61.86
11	Equipment*	9.31%	2,028,160 *	28.17	303.10
12	Furnishings	0.72%	156,850	2.18	23.44
13	Special Construction	0.32%	69,711	0.97	10.42
14	Conveying Systems (3P / 1G)	1.97%	429,159	5.96	64.14
15A	Plumbing	5.93%	1,291,835	17.94	193.06
15B	HVAC (AHU' s / Ductwork / Balancing)	16.79%	3,657,657	50.80	546.62
15C	Fire Protection / Sprinklers	1.25%	272,309	3.78	40.70
16	Electrical	9.59%	2,089,156	29.02	312.21

Union Labor Costs: The charge / bill out rates is in the right hand column "A", these rates have been calibrated to Washington D.C. for other locations use the city location factors previously indicated.

Note these values should be calibrated with the previous location factors to determine the charge out rate for each specific location. Typical uplift 60 – 95% (used 85% - "A").

- Total Fringe Benefits (Vacation, holidays, sick pay, and employer paid FICA / Unemployment rates, BRI) is average 15 - 30% of base wage.
- Supervision is average 5 - 10% of base wage.
- Workers Compensation Insurance is average 15 - 20% of base wage.
- Overhead and Home Office Support 15 – 20%.
- Profit is average 10 - 15% of base wage.
- Excludes small tools, typically 2 – 6% of total all in rate.
- Excludes construction equipment / fueling and maintenance.
- Excludes general conditions / Division 1 / Preliminaries (trailers and scaffold etc,) / Excludes consumables (gases, rags and grease).

TRADE	BASE WAGE	"A" ALL-IN RATE
Bricklayer	52.80	97.69
Carpenter	51.30	94.86
Electrician	61.02	112.68
Laborer, General	37.93	70.23
Operating Engineer, General	53.47	99.02
Painter, General	46.39	85.92
Plumber / Pipe fitter	61.06	112.64
Roofer	46.03	85.39
Sheet Metal Worker, General	60.34	111.17
Structural Iron Worker	57.82	106.78
AVERAGE RATE	**52.82**	**97.64**

Open Shop / Non - Union Costs: The charge / bill out rates is in the right hand column "A", these rates have been calibrated to Washington D.C. for other locations use the city location factors previously indicated. Typical uplift 60 – 95% (used 85% - "A").

- Total Fringe Benefits (Vacation, holidays, sick pay, and employer paid FICA / Unemployment rates, BRI) is average 15 - 30% of base wage.
- Supervision is average 5 - 10% of base wage.
- Workers Compensation Insurance is average 15 - 20% of base wage.
- Overhead and Home Office Support 15 – 20%.
- Profit is average 10 - 15% of base wage.
- Excludes small tools, typically 2 – 6% of total all in rate.
- Excludes construction equipment and fueling / maintenance.
- Excludes general conditions / Division 1 / Preliminaries (trailers and scaffold etc,) / Excludes consumables (gases, rags and grease).

TRADE	BASE WAGE	"A" ALL-IN RATE
Bricklayer	41.00	76.25
Carpenter	43.07	80.10
Electrician	49.88	92.78
Laborer, General	27.05	50.32
Operating Engineer, General	41.18	76.59
Painter, General	33.61	62.52
Plumber / Pipe fitter	49.64	92.33
Roofer	36.83	68.51
Sheet Metal Worker, General	41.89	77.91
Structural Iron Worker	43.02	80.01
AVERAGE RATE	**40.72**	**75.73**

STATE SALES TAX / GST

Sales tax on materials is indicated below. Typically labor is not taxed. Some businesses may be able to obtain sales tax / exemption forms (certificate) that allow them to claim the sales tax back from the specific state. Additionally, local authority / townships / counties may levy additional taxes such as business and operating taxes, city payroll tax, etc.

- See chart next page.

#	DESCRIPTION	UNIT	MATERIAL	LABOR	TOTAL
	(9) CSI DIVISION 16 ELECTRICAL				
	FEEDER CONDUIT & WIRE				
49	Conduit and wire, 60 A, 3 CU wire 600 V THHN #6, 1 bare CU soft #10, in 1" GRS	LF	7.43	12.50	19.93
50	Conduit and wire, 100 A, 4 CU wire 600 V THHN #2, 1 bare CU soft # 8, in 1" GRS	LF	13.84	17.65	31.49
51	Conduit and wire, 400 A, 4 CU wire 600 V THHN 500 MCM 1 bare CU soft #2, in 3" GRS	LF	74.10	41.54	115.64
52	Conduit and wire, 1000 A, 12 CU wire 600 V THHN 400 MCM, 3bare CU soft # 2/0, in 3" GRS	LF	196.13	116.64	312.77
53	Cable trays ladder type 12", with ells, tees, 4" drop cover, uni-strut hangers	LF	32.98	34.51	67.50
54	EMT conduit 1" diameter attached to walls / ceilings (add 10% - 25% for fittings)	LF	0.05	1.34	1.39
55	Ditto 1.5" diameter ditto (add 10% - 25% for fittings)	LF	0.11	2.09	2.21
56	Ditto 2 " diameter ditto add (10% - 25% for fittings)	LF	0.10	2.82	2.92
57	Flexible conduit 0.75 "diameter attached to walls / ceilings (add 10% - 25% for fittings)	LF	0.04	0.00	0.04
58	Ditto 1" diameter attached to walls / ceilings (add 10% - 25% for fittings)	LF	0.05	1.29	1.34
59	Ditto 1.5" diameter attached to walls / ceilings (add 10% - 25% for fittings)	LF	0.08	1.44	1.51
60	Ditto 2" diameter attached to walls / ceilings (add 10% - 25% for fittings)	LF	0.10	1.90	2.00
	FIXTURES				
61	Fixture, incandescent, commercial grade, surface mounted, with junction box, wire, conduit, 100 watt	EACH	91.16	174.33	265.48
62	Fixture, incandescent, commercial grade, surface mounted, with junction box, wire, conduit, 200 watt	EACH	115.23	179.77	294.99
63	Fixture, fluorescent, commercial grade, recessed, with junction box, wire, conduit, 2'x2'	EACH	166.75	187.01	353.75
64	Fixture, fluorescent, commercial grade, recessed, with junction box, wire, conduit, 2'x4'	EACH	214.92	209.24	424.15
65	Fixture, fluorescent strip, surface mounted, with junction box, wire, conduit, 4', 4 lamp	EACH	204.38	246.05	450.42
66	Fixture, mercury vapor, hi-bay, with junction box, wire, conduit, 1000 watt	EACH	1,056.13	375.83	1,431.96
67	Fixture, metal halide, hi-bay, with junction box, wire, conduit, 400 watt	EACH	671.80	374.09	1,045.89
68	Fixture, high pressure sodium, hi-bay, with junction box, wire, conduit, 1000 watt	EACH	868.81	424.26	1,293.07
69	Perimeter security lights, industrial, 400 watt HPS wall pack, 40' on center	EACH	20.92	10.85	31.77
70	Perimeter security lights, school, 250 watt HPS wall pack, 30' on center	LF	20.29	12.44	32.74
	SIGNAL & COMMUNICATIONS				
71	Telephone system, warehouse, 10,000 SF	EACH	6,111.35		6,111.35
72	Telephone system, office, 150,000 SF	EACH	91,190.35		91,190.35
73	Fire alarm system, warehouse, 10,000 SF	EACH	14,873.98		14,873.98