

Information Sheet No. 4 - Generic TIC Build up

INTRODUCTION TO TIC FACTOR ESTIMATES

1 Detailed Methodology for preparing an Estimate using a sized equipment list and applying factors

This method is used where there is no past definitive Estimate available. However, it is very important to Estimate the equipment cost as accurate as possible in view of applying installed factors.

2 Data required

- A sized equipment list
- Copy of Plot Plans and Process Flow Diagrams
- Process description of the plant defining the scope of the required facilities

3 Method to produce an Estimate using above data

Check that equipment list gives sufficient technical information for cost purposes. If necessary obtain further data from Process department i.e. surface areas of heat exchangers, base tube area of air coolers, motor ratings for all rotating equipment.

3.1 Equipment Cost

- 3.1.1 Produce a cost per piece of equipment using initially "In House" cost database
- 3.1.2 For specialist specific package equipment obtain a vendor price

3.2 Installed Cost

- 3.2.1 From the above equipment data summarise the cost into equipment type either for all combined process units or for each individual unit.
- 3.2.2 Against each category apply installed factors (refer to details shown later)
- 3.2.3 The installed cost is considered to be on an UK basis, hence adjustments to be made where necessary to suit a specific site location.

4 Development of the Overall Estimate Summary

- 4.1 Prepare summaries showing initially (if required) individual Process unit or combined units installed cost
- 4.2 Prepare summary of Offsites and Utilities installed cost
- 4.3 Combine (i) and (ii) above to create an Overall Estimate Summary which includes the following:
 - 4.3.1 Total installed cost of Process, Offsites, and Utility units including where applicable cost of piling, major structures, buildings, major computer control costs, spare parts, catalyst and chemicals and high voltage electrical equipment
 - 4.3.2 Bonds & Insurance
 - 4.3.3 Taxes and license fees
 - 4.3.4 Forward Escalation (if required)
 - 4.3.5 Contingency
- 4.4 Estimate Notes - These to include the following points:
 - 4.4.1 Scope of facilities
 - 4.4.2 Basis of Estimate
 - 4.4.3 List of exclusions

5 Installed Factors

- 5.1 Installed cost factors are ratios which when applied to the cost of an equipment item or category type, gives the total cost with its associated commodity materials, its associated direct and indirect labour, freight and contractor's home office engineering and site supervision. Developed factors generally fall into three major criteria i) type of equipment ii) size of equipment and iii) metallurgy of equipment.
- 5.2 Each type of equipment has different installation requirements, as examples:
 - 5.2.1 Towers have more piping than tanks
 - 5.2.2 Compressors have more complex foundations than heat exchangers, etc.
- 5.3 In addition, the size of the equipment and the metallurgy of the equipment both have impact the installed cost factor similarly, although the equipment cost may change, the installation does not change at all, nor does it change proportionally to the change in equipment cost. For example, a pump will require almost the same engineering and instruments for all sizes or materials of construction. Another example, an alloy vessel may cost three times as much as the same carbon steel vessel, but only installation costs, which change, are piping and control valves.
- 5.4 There are other elements that affect the installed cost factor and require adjustment by the estimator. These elements include items such as pressure (generally, the higher the pressure the lower the factor), uniqueness of the item, etc. Any impact on equipment price also impacts the installed cost factor.
- 5.5 The installed cost factors are guidelines only. The ideal situation would be to develop factors for every possible size, material and pressure. However, for ease of use, the factors are grouped into categories. Consequently, the factors are not precise enough to differentiate the true installed cost differences between, for instance, very similar items. The factors are best used in cases where averages are satisfactory. The goal is to not use installed cost factors blindly, but to apply common sense based on judgement and experience.

6 Scope of Factors

- 6.1 The factors are based on a battery limit scope and include the following items:
 - 6.1.1 Equipment installation
 - 6.1.2 Spread footing foundation material and labour
 - 6.1.3 Equipment ladders and platforms material and labour
 - 6.1.4 Battery limits piping materials and labour
 - 6.1.5 Instrument materials and labour
 - 6.1.6 Electrical materials and labour
 - 6.1.7 Insulation, painting and fireproofing materials and labour
 - 6.1.8 Construction indirect costs
 - 6.1.9 Engineering costs
- 6.2 The factors exclude the following items:
 - 6.2.1 Piling
 - 6.2.2 Major structures and buildings
 - 6.2.3 Major computer control costs
 - 6.2.4 Spare parts
 - 6.2.5 High voltage electrical equipment
 - 6.2.6 License fees
 - 6.2.7 Catalyst and chemicals
 - 6.2.8 Start-up costs
 - 6.2.9 Site development, i.e., cut and fill, demolition
 - 6.2.10 Any unusual construction requirements



Information sheet No 4

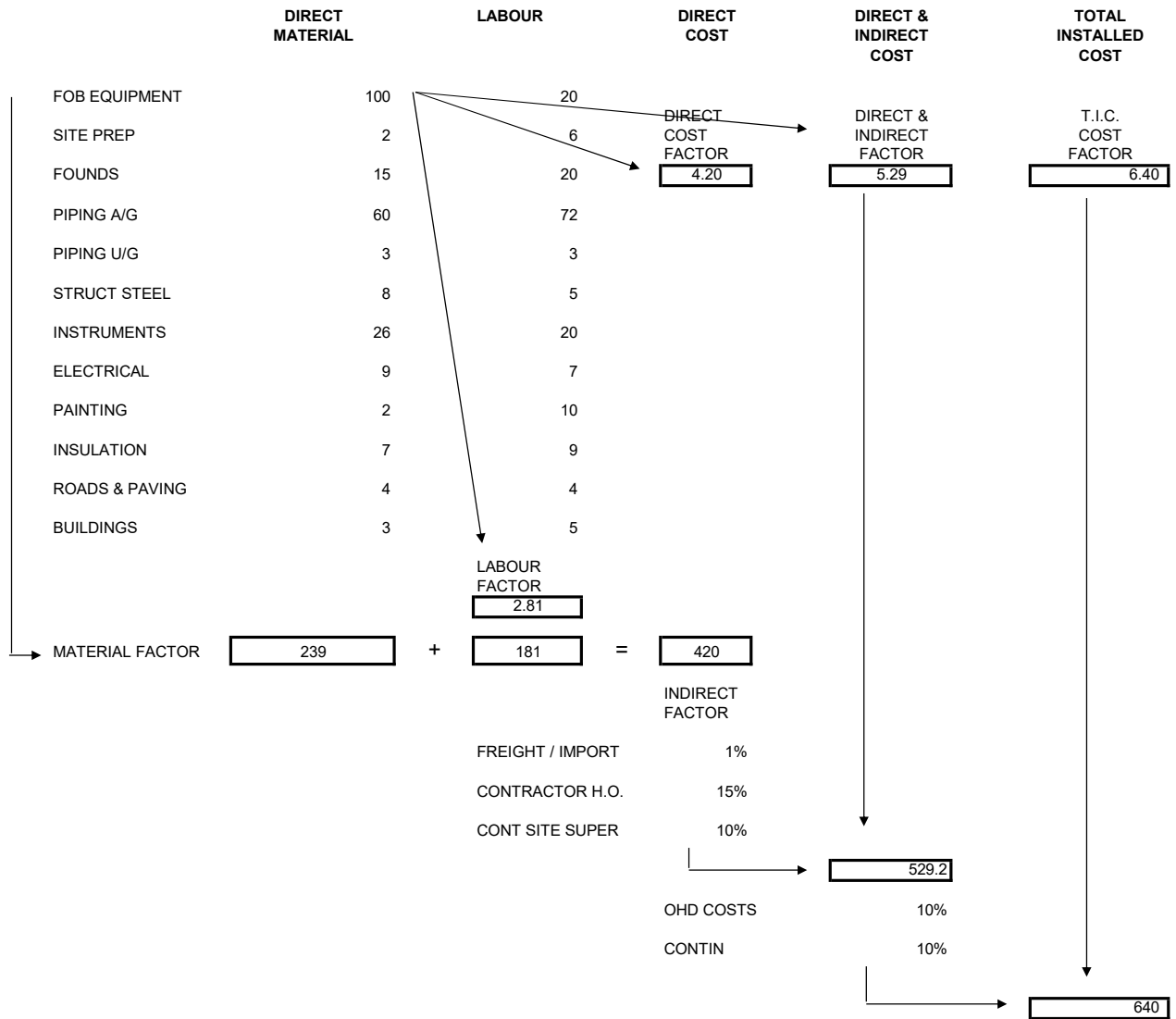
				UK FACTOR		LOCALISED FACTOR	
				Direct+Indirect	TIC Inc O/H and Contin	Direct+Indirect	TIC Inc O/H and Contin
SHEET	1		VESSEL VERTICAL / COLUMNS -CARBON STEEL	5.29	6.40	5.29	6.40
SHEET	2		VESSELS VERTICAL/COLUMNS - ST STEEL	2.68	3.25	2.68	3.25
SHEET	3		VESSELS HORIZONTAL - CARBON STEEL	4.39	5.32	4.39	5.32
SHEET	4		REACTORS	5.07	6.13	5.07	6.13
SHEET	4A		REACTORS - EXCEPTIONAL COST	2.80	3.38	2.80	3.38
SHEET	5		STORAGE TANKS - ONE PIECE SUPPLY	3.58	4.34	3.58	4.34
SHEET	6		STORAGE TANKS - SITE BUILT SUB CONTRACT SUPPLY & ERECT	3.26	3.95	3.26	3.95
SHEET	7		SHELL & TUBE EXCHANGERS	3.63	4.39	3.63	4.39
SHEET	8		AIR COOLERS	3.37	4.07	3.37	4.07
SHEET	9		BOILERS C/W PUMP MOTOR AND FEED WATER DRUM	3.00	3.63	3.00	3.63
SHEET	10		DIRECT FIRED HEATER CYLINDRICAL TYPE	3.09	3.73	3.09	3.73
SHEET	11		STACKS - STEEL	3.49	4.23	3.49	4.23
SHEET	12		CENTRIFUGAL / PROPORTIONING PUMPS - MOTOR DRIVE	4.30	5.20	4.30	5.20
SHEET	13		CENTRIFUGAL / PROPORTIONING PUMPS - TURBINE DRIVE	4.74	5.73	4.74	5.73
SHEET	14		CENTRIF / RECIP COMPRESSOR - MOTOR DRIVE	3.68	4.46	3.68	4.46
SHEET	15		CENTRIF / RECIP COMPRESSOR - TURBINE DRIVE	4.01	4.86	4.01	4.86
SHEET	16		BLOWER - MOTOR DRIVE	3.89	4.70	3.89	4.70
SHEET	17		WATER TREATMENT UNIT	3.25	3.94	3.25	3.94
SHEET	18		COOLING TOWERS	2.71	3.28	2.71	3.28

LOCALISED OVERALL LOCATION FACTOR

RATIO ESTIMATING

MAJOR EQUIPMENT ITEM:-

VESSEL VERTICAL / COLUMNS -CARBON STEEL





RATIO ESTIMATING

MAJOR EQUIPMENT ITEM:-

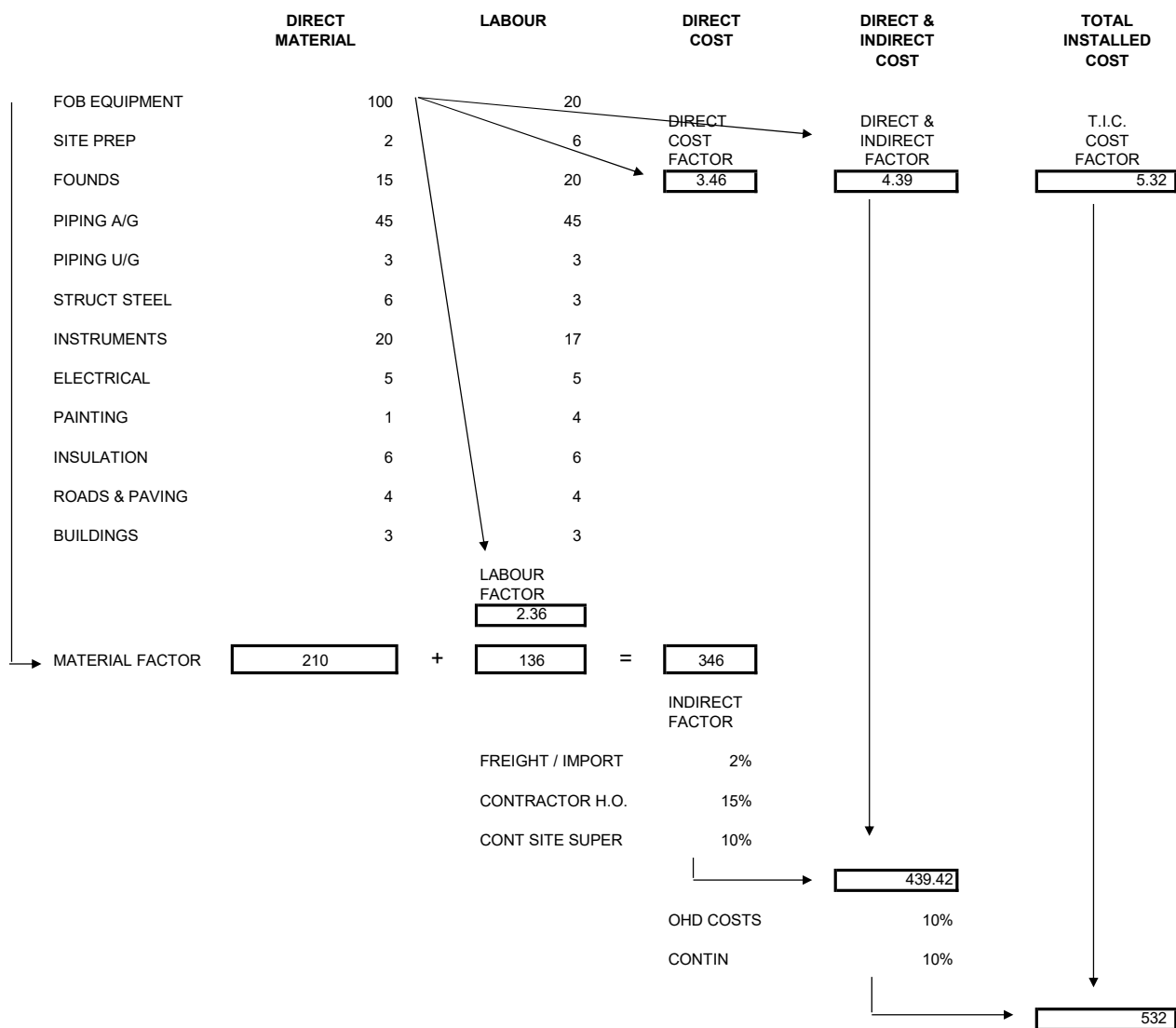
VESSELS VERTICAL / COLUMNS - ST STEEL

	DIRECT MATERIAL	LABOUR	DIRECT COST	DIRECT & INDIRECT COST	TOTAL INSTALLED COST
FOB EQUIPMENT	100.00	5.00	DIRECT COST FACTOR 2.13	DIRECT & INDIRECT FACTOR 2.68	T.I.C. COST FACTOR 3.25
SITE PREP	0.50	1.50			
FOUNDATIONS	3.75	4.90			
PIPING A/G	30.00	36.00			
PIPING U/G	0.75	0.75			
STRUCT STEEL	2.00	1.00			
INSTRUMENTS	6.25	6.00			
ELECTRICAL	2.25	2.25			
PAINTING	0.50	2.50			
INSULATION	1.75	1.75			
ROADS & PAVING	1.00	1.00			
BUILDINGS	0.75	0.75			
		LABOUR FACTOR 1.63			
MATERIAL FACTOR	149.50	+	63.40	=	212.90
			INDIRECT FACTOR		
		FREIGHT / IMPORT	1%		
		CONTRACTOR H.O.	15%		
		CONT SITE SUPER	10%		
				268.25	
		OHD COSTS	10%		
		CONTIN	10%		
					325

RATIO ESTIMATING

MAJOR EQUIPMENT ITEM:-

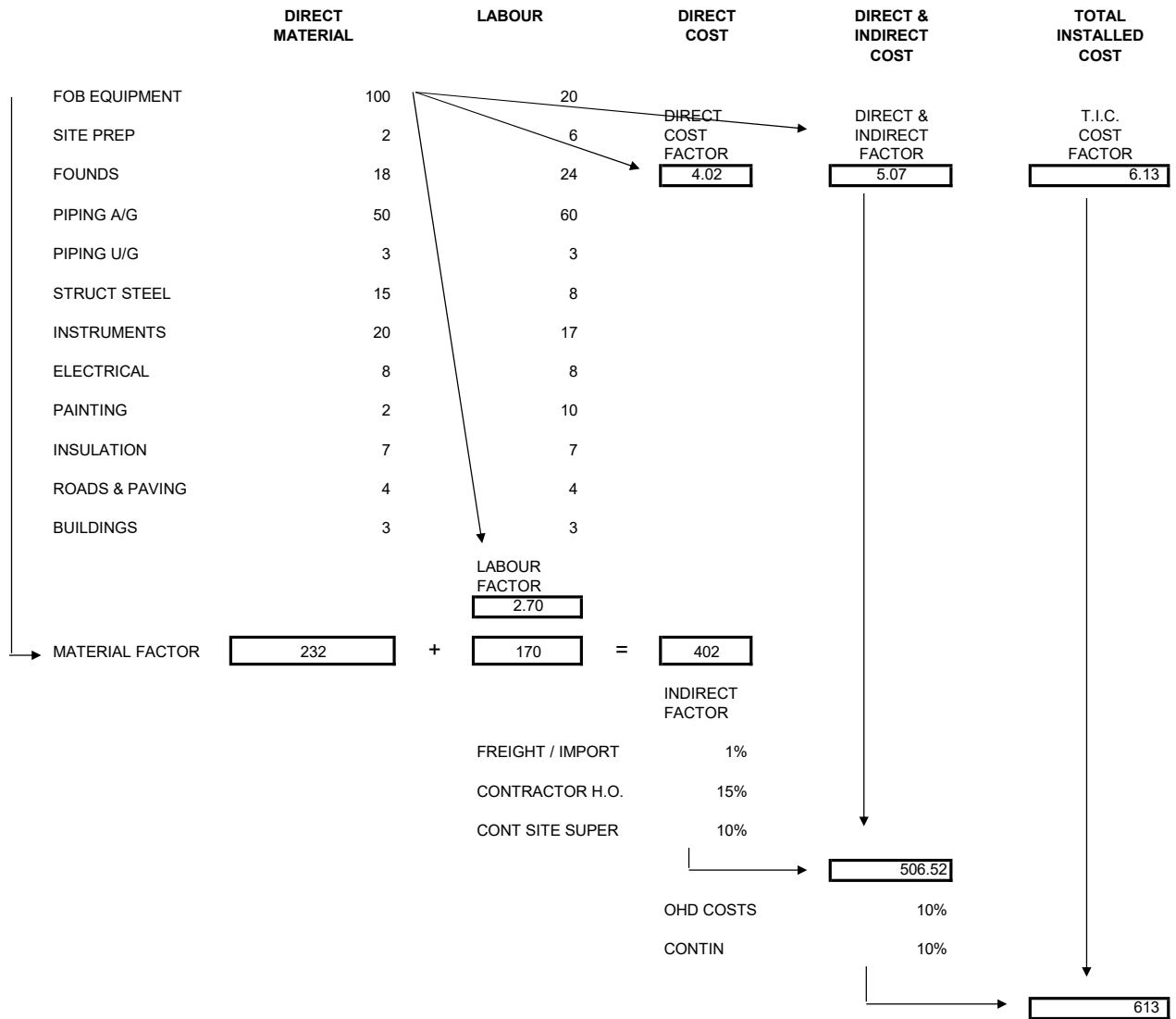
VESSELS HORIZONTAL - CARBON STEEL



RATIO ESTIMATING

MAJOR EQUIPMENT ITEM:-

REACTORS

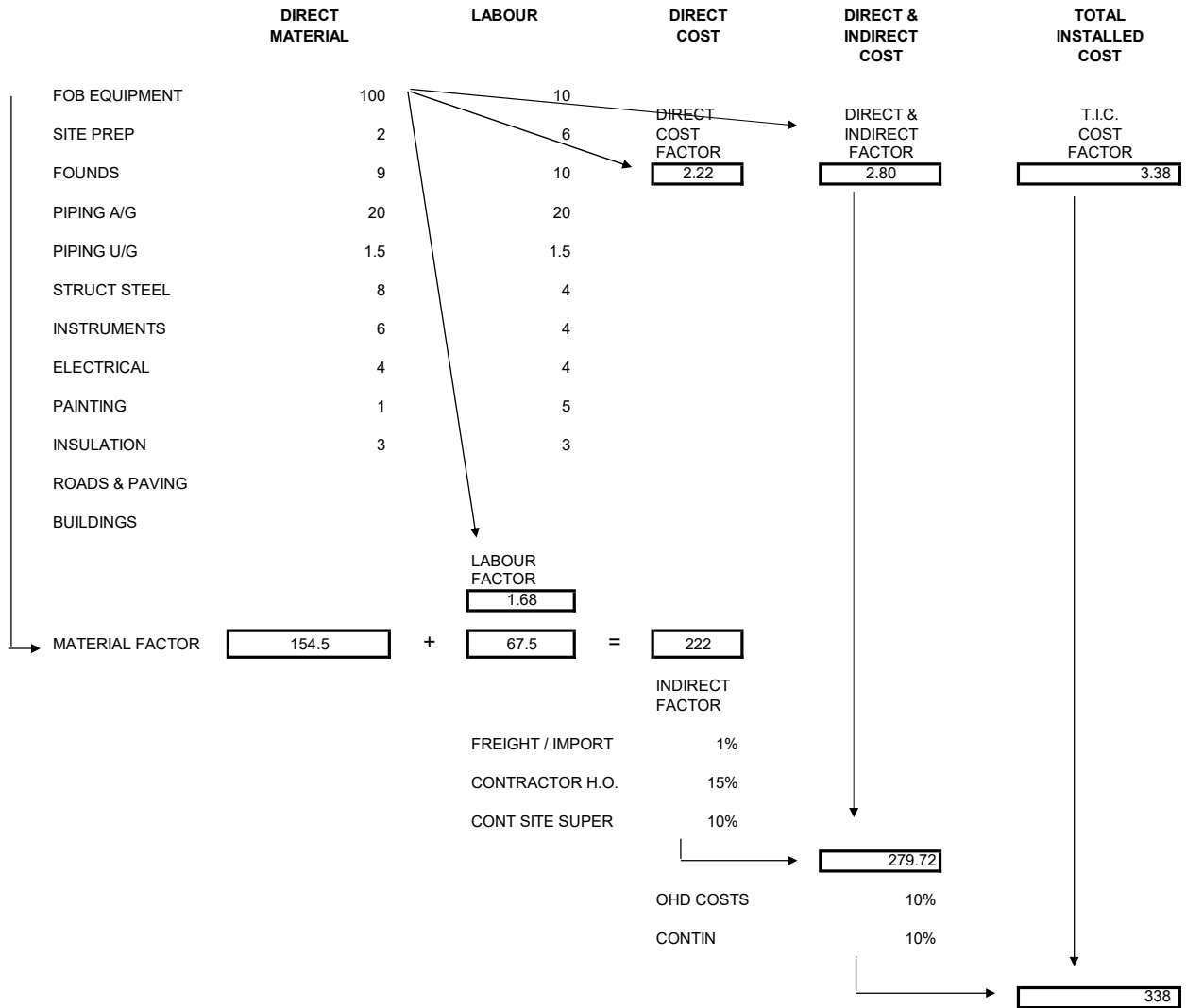




RATIO ESTIMATING - ADJUSTED FOR EXCEPTIONAL COSTS REACTORS

MAJOR EQUIPMENT ITEM:-

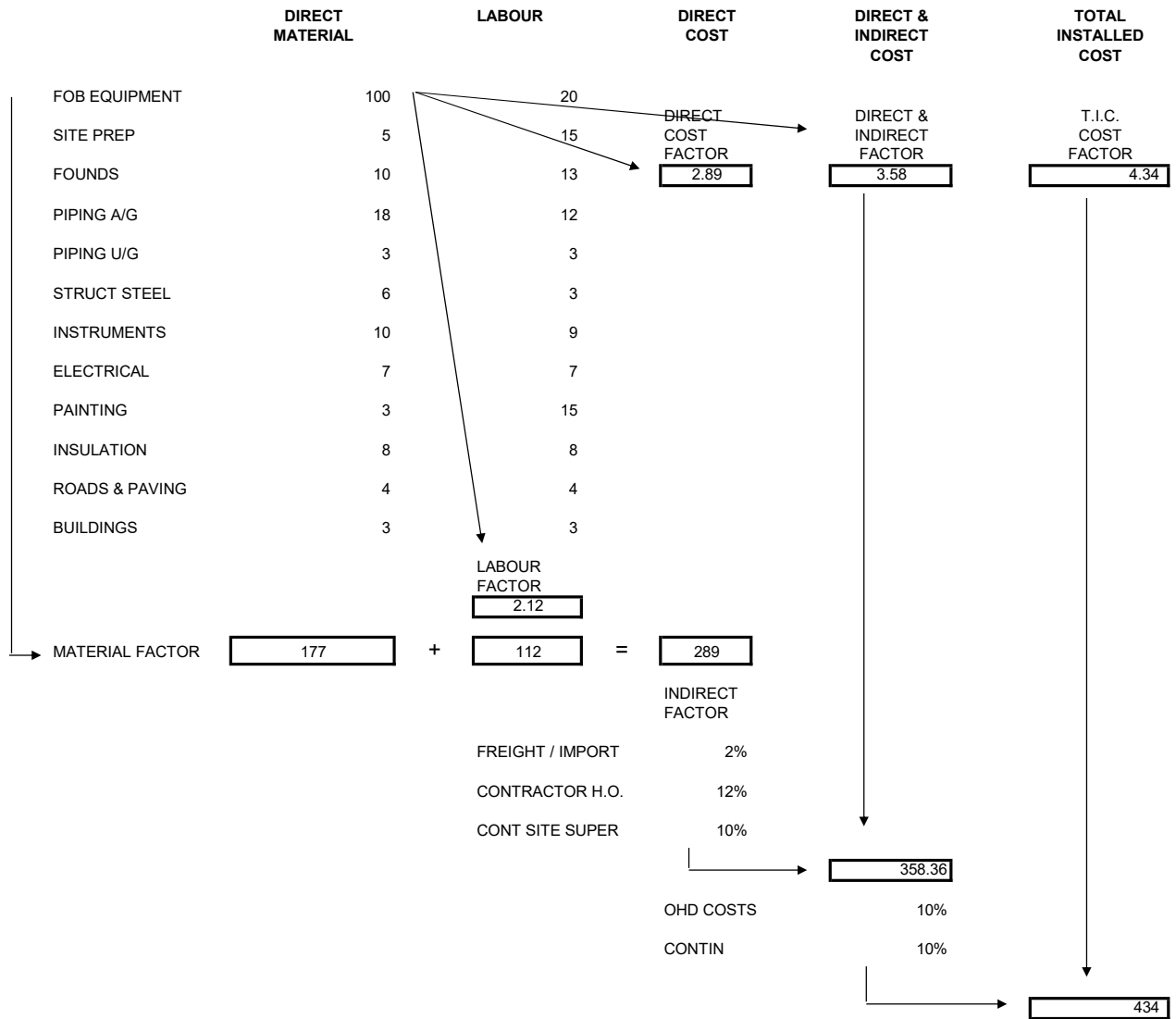
REACTORS - EXCEPTIONAL COST



RATIO ESTIMATING

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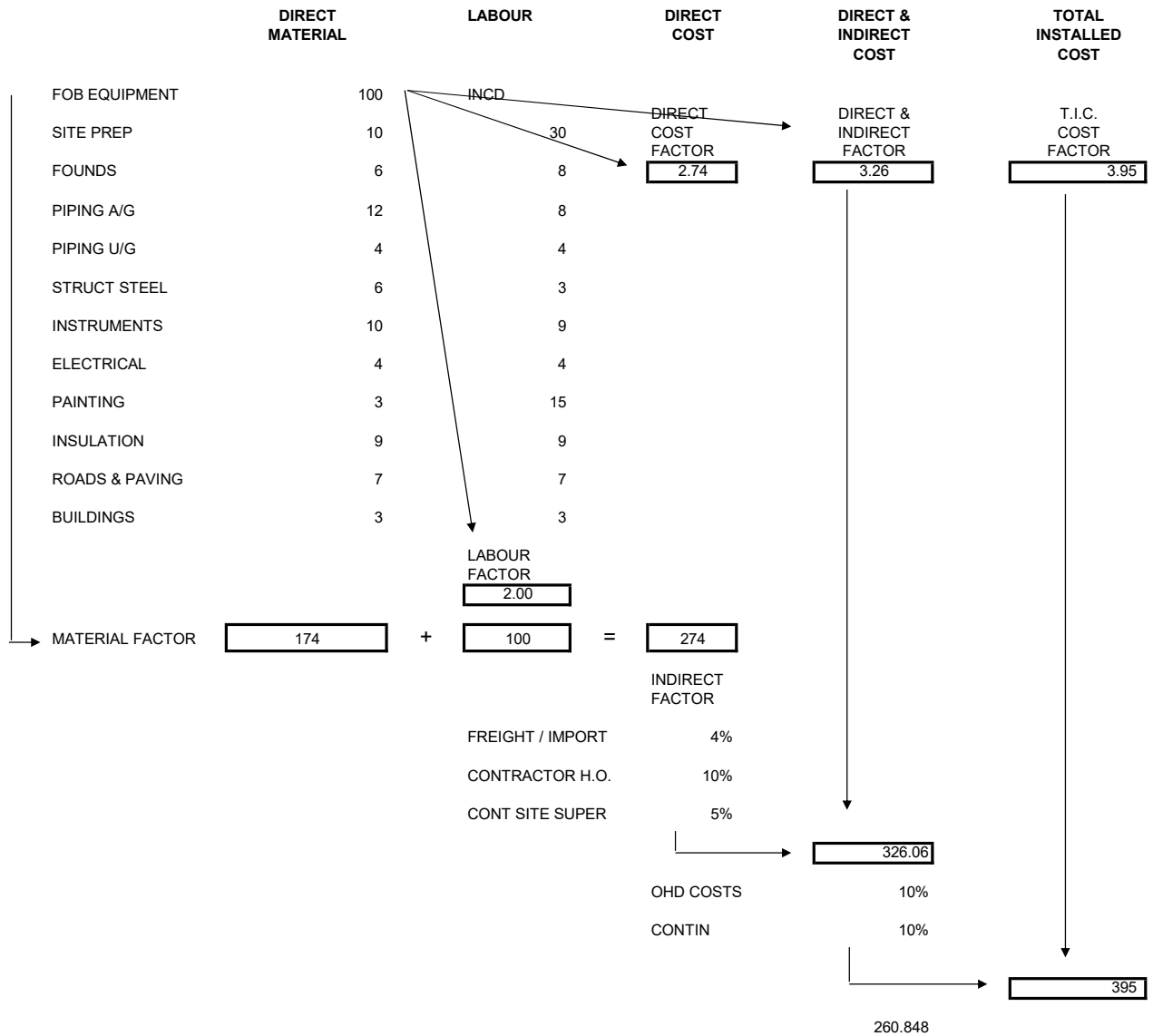
STORAGE TANKS - ONE PIECE SUPPLY



RATIO ESTIMATING

MAJOR EQUIPMENT ITEM:-

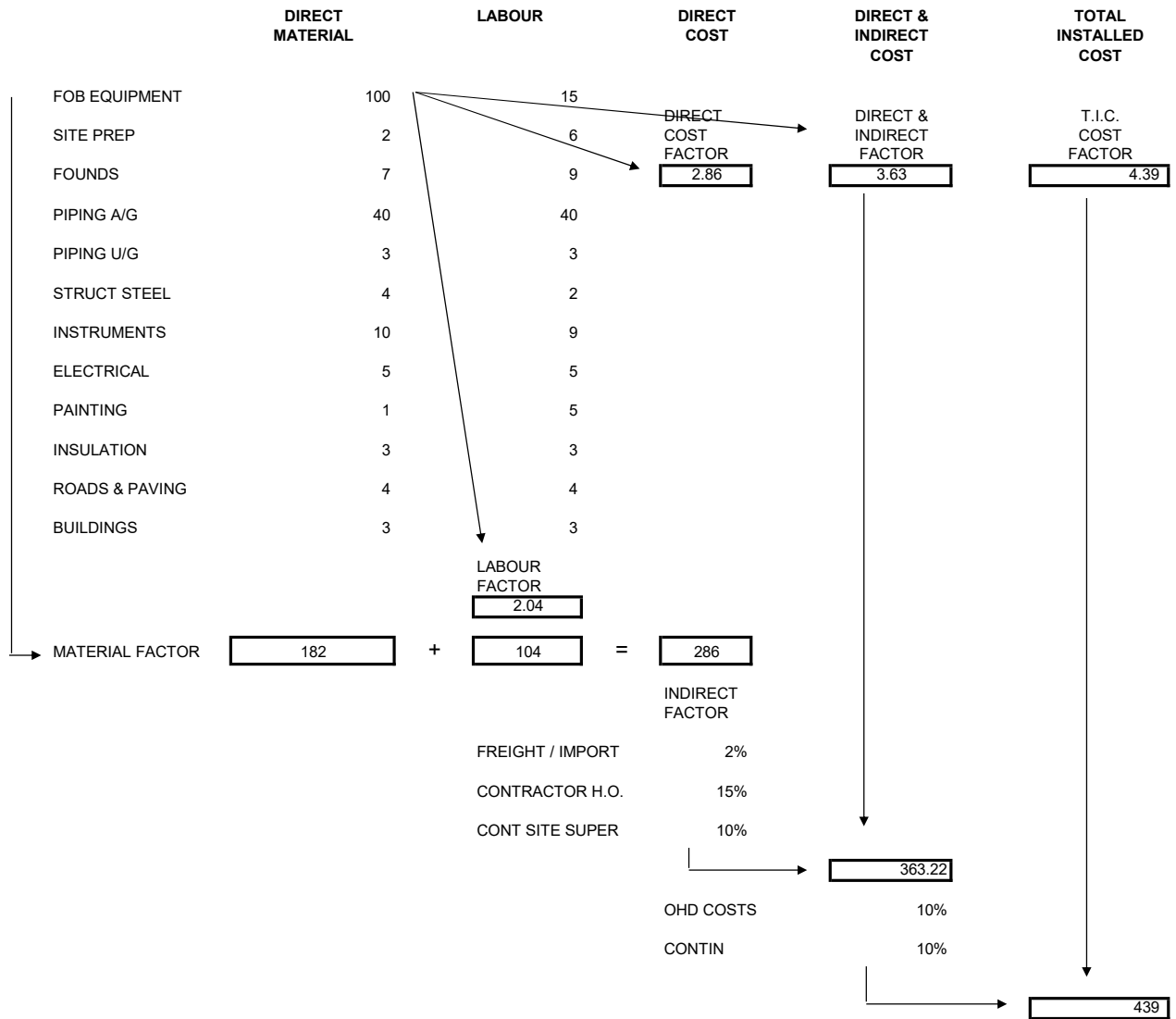
STORAGE TANKS - SITE BUILT SUB CONTRACT SUPPLY & ERECT



RATIO ESTIMATING

MAJOR EQUIPMENT ITEM:-

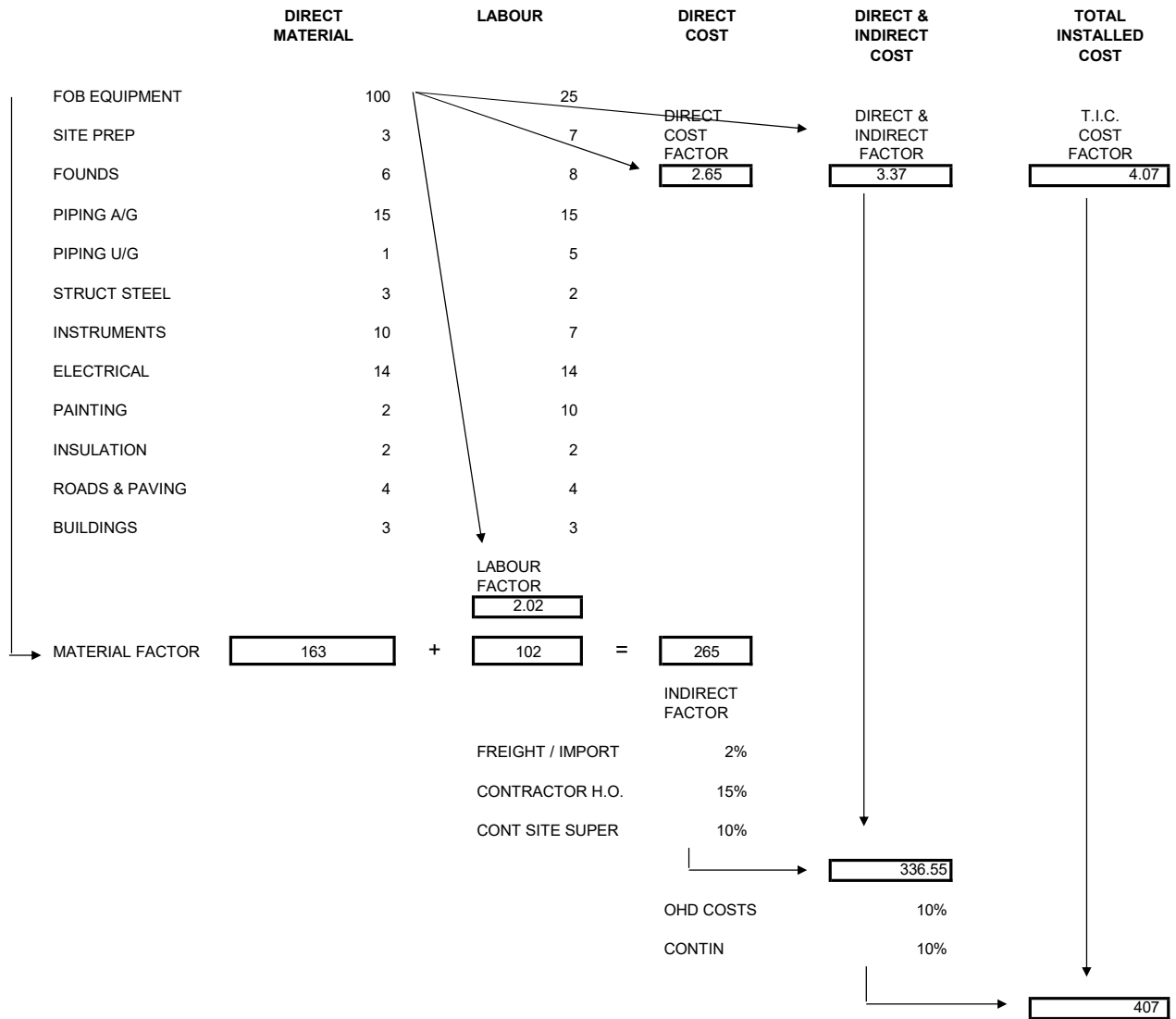
SHELL & TUBE EXCHANGERS



RATIO ESTIMATING

MAJOR EQUIPMENT ITEM:-

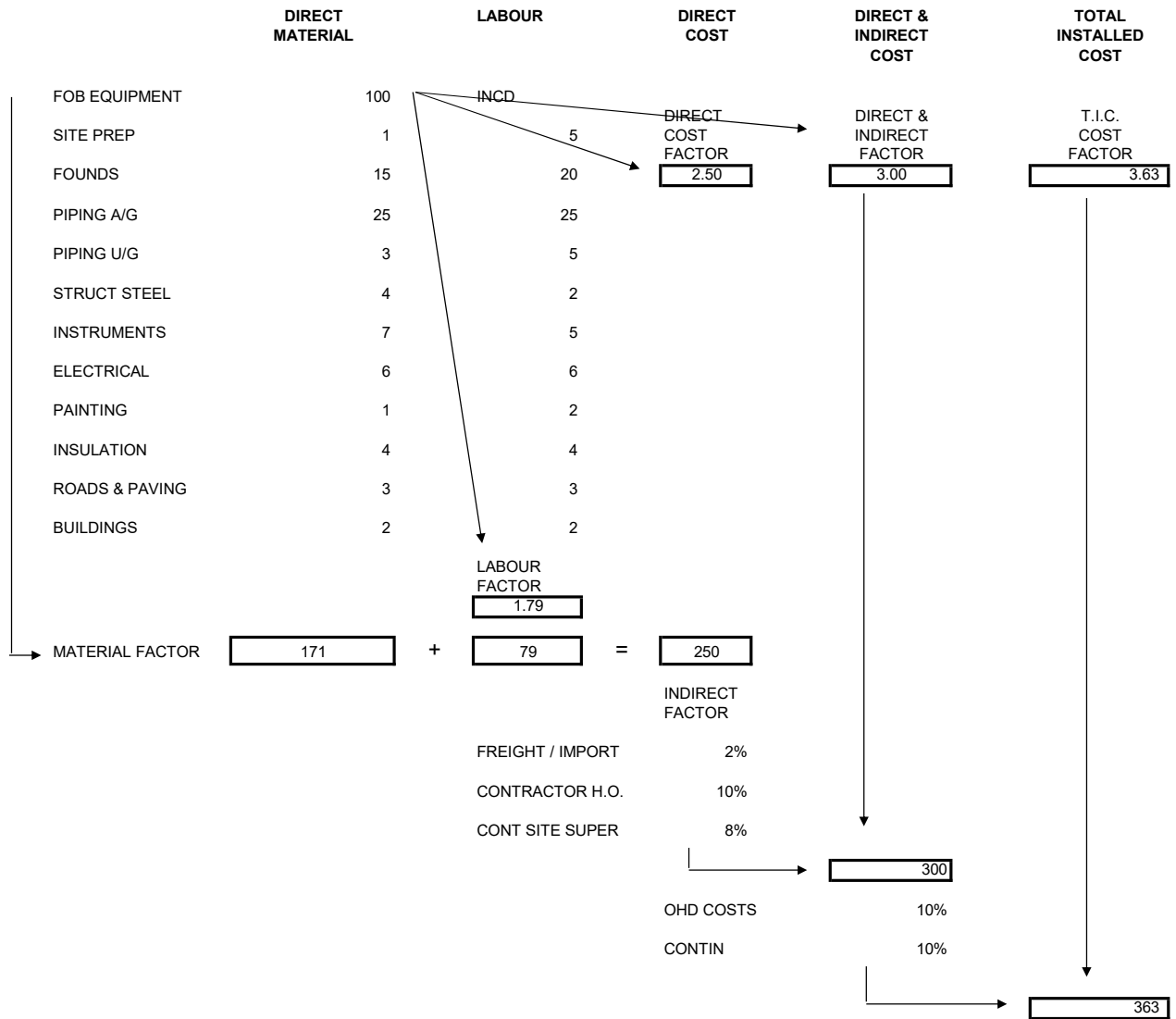
AIR COOLERS



RATIO ESTIMATING

MAJOR EQUIPMENT ITEM:-

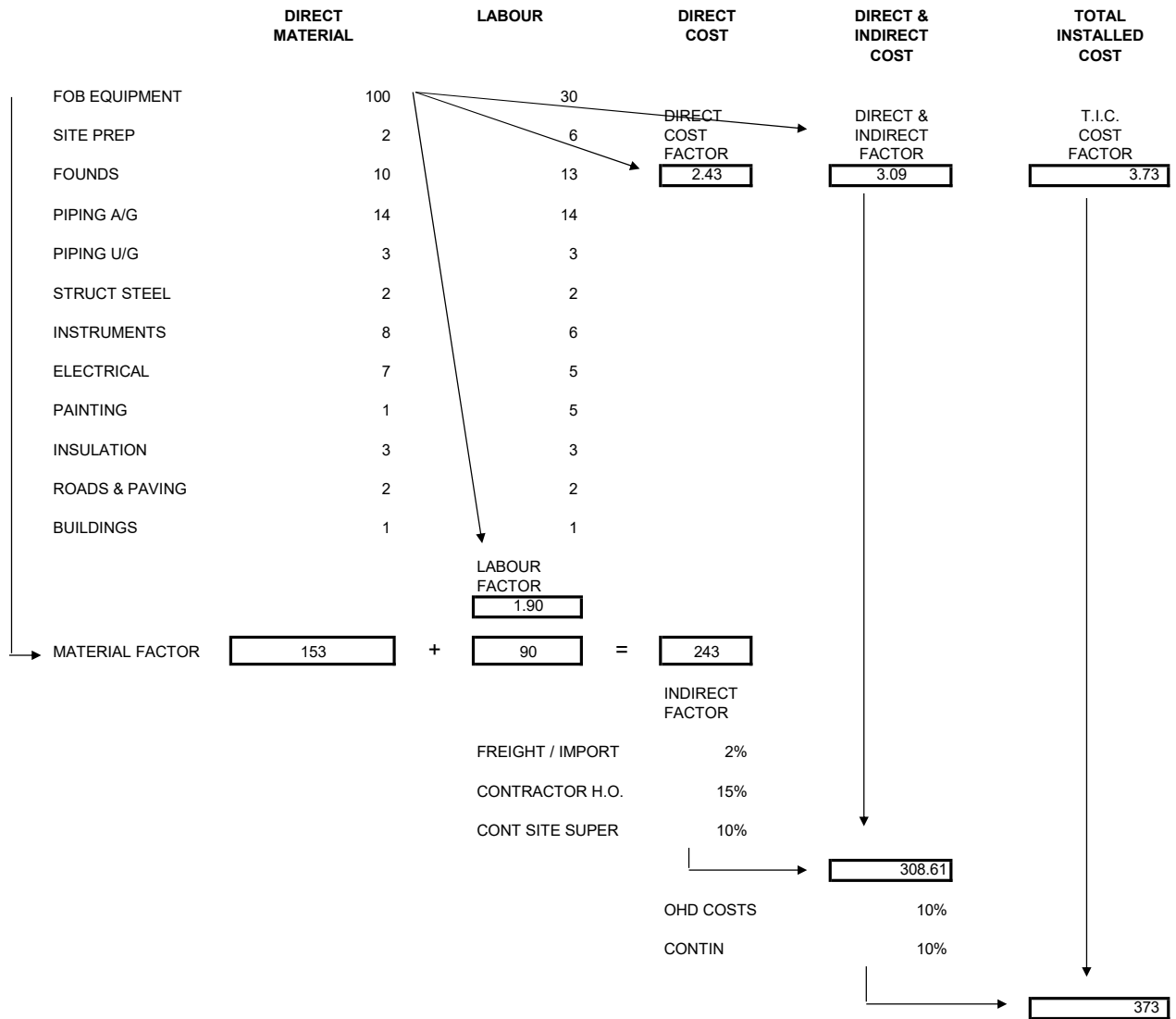
BOILERS C/W PUMP MOTOR AND FEED WATER DRUM



RATIO ESTIMATING

MAJOR EQUIPMENT ITEM:-

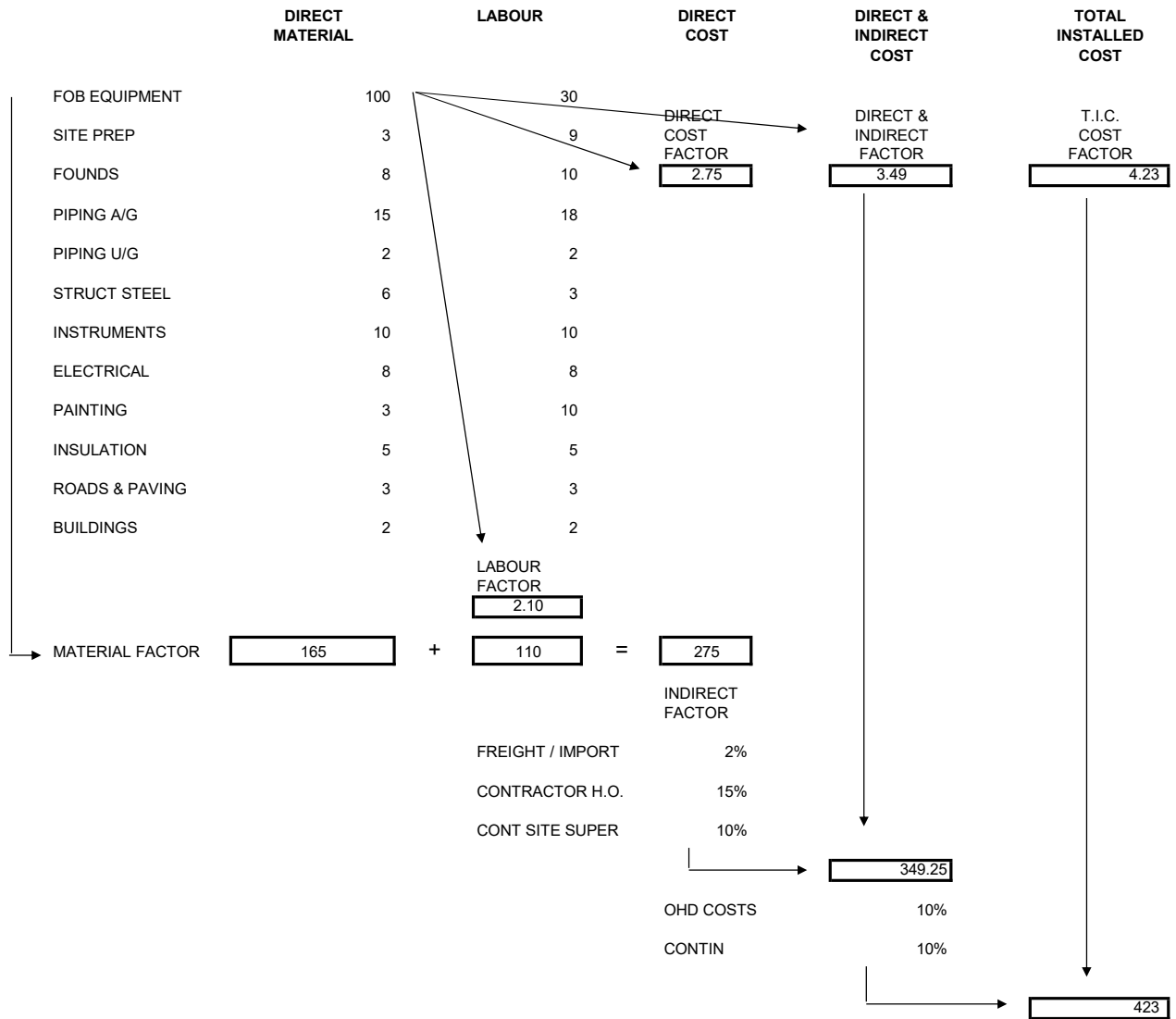
DIRECT FIRED HEATER CYLINDRICAL TYPE



RATIO ESTIMATING

MAJOR EQUIPMENT ITEM:-

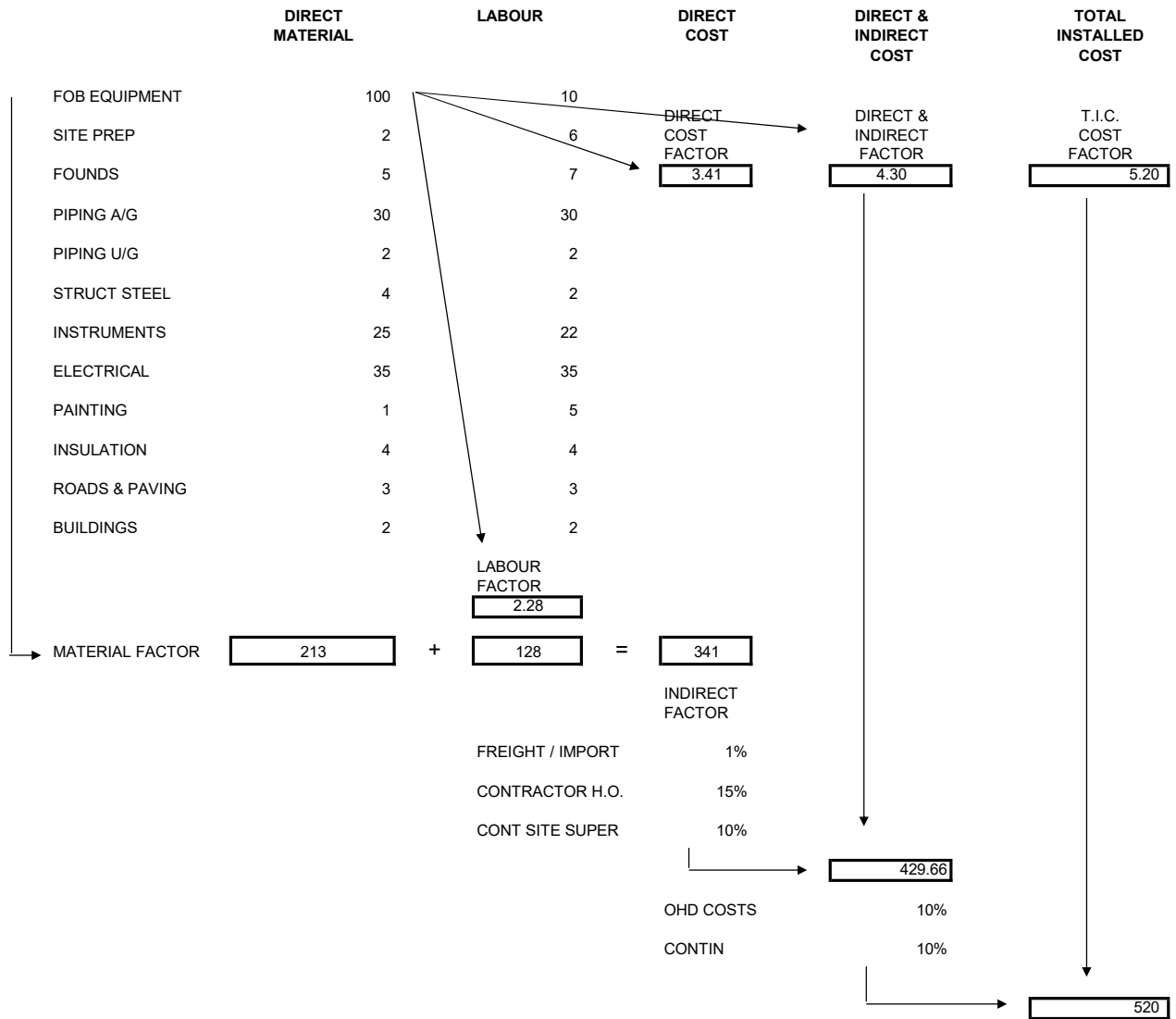
STACKS - STEEL



RATIO ESTIMATING

MAJOR EQUIPMENT ITEM:-

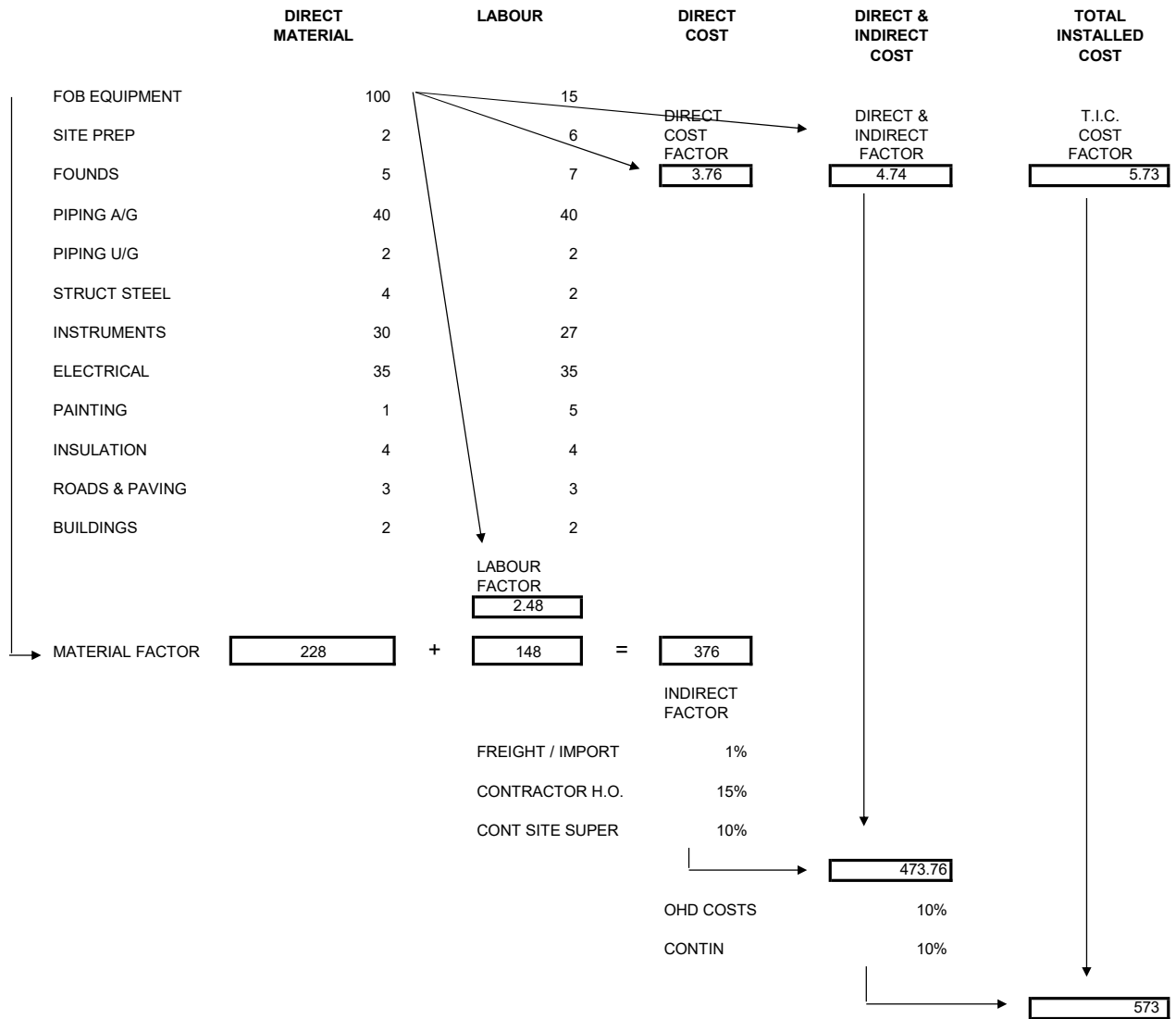
CENTRIFUGAL / PROPORTIONING PUMPS - MOTOR DRIVE



RATIO ESTIMATING

MAJOR EQUIPMENT ITEM:-

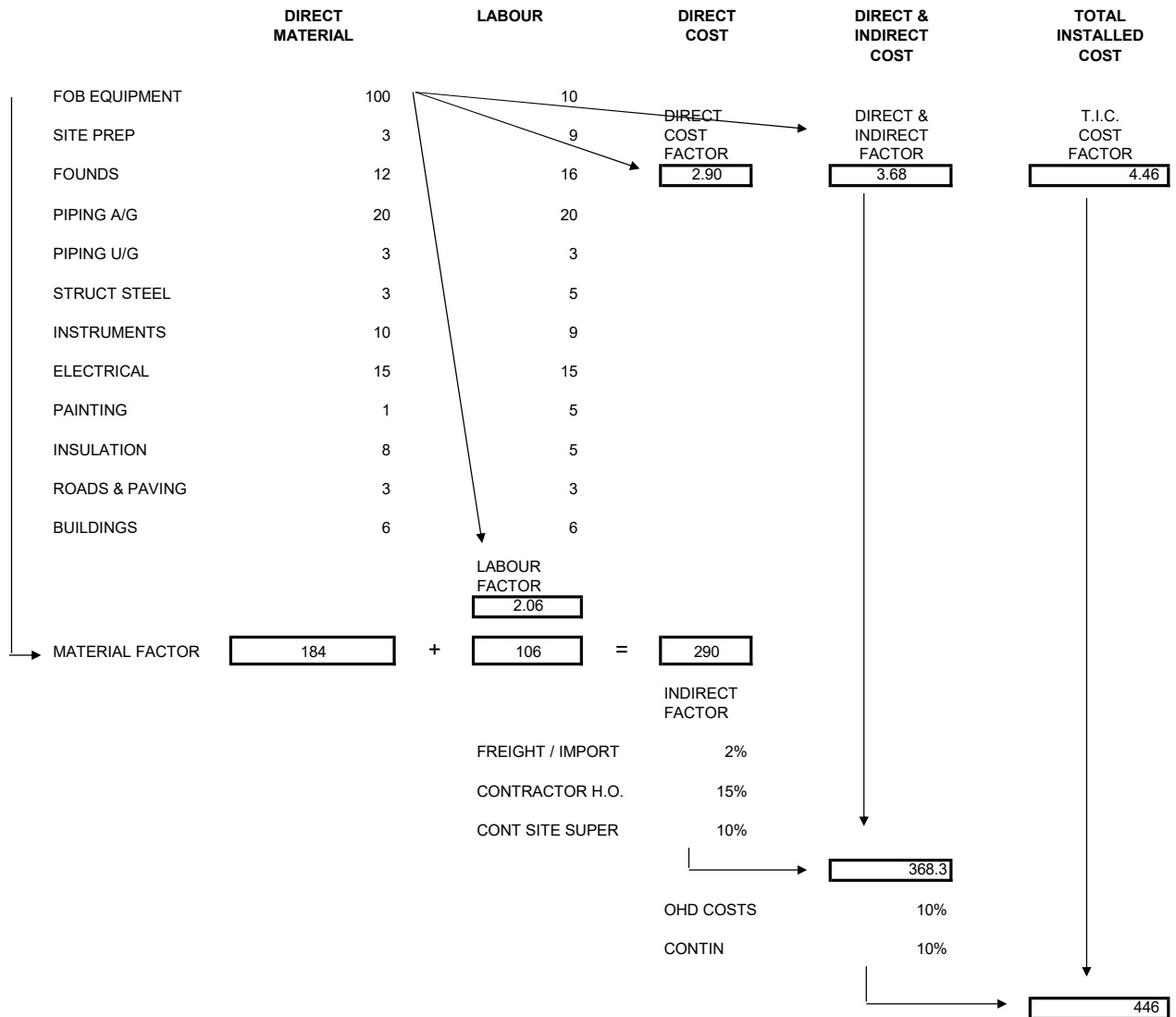
CENTRIFUGAL / PROPORTIONING PUMPS - TURBINE DRIVE



RATIO ESTIMATING

MAJOR EQUIPMENT ITEM:-

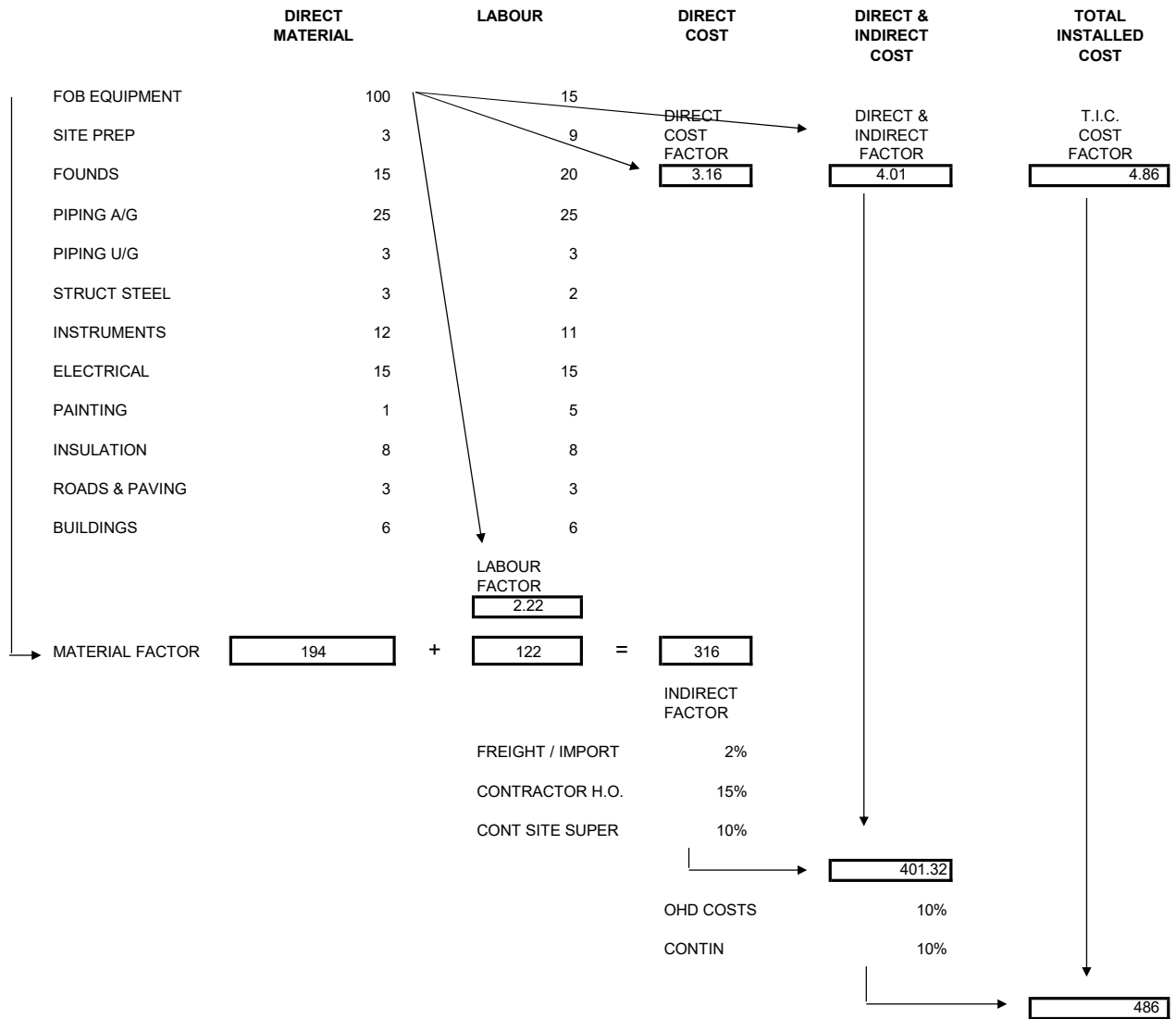
CENTRIF / RECIP COMPRESSOR - MOTOR DRIVE



RATIO ESTIMATING

MAJOR EQUIPMENT ITEM:-

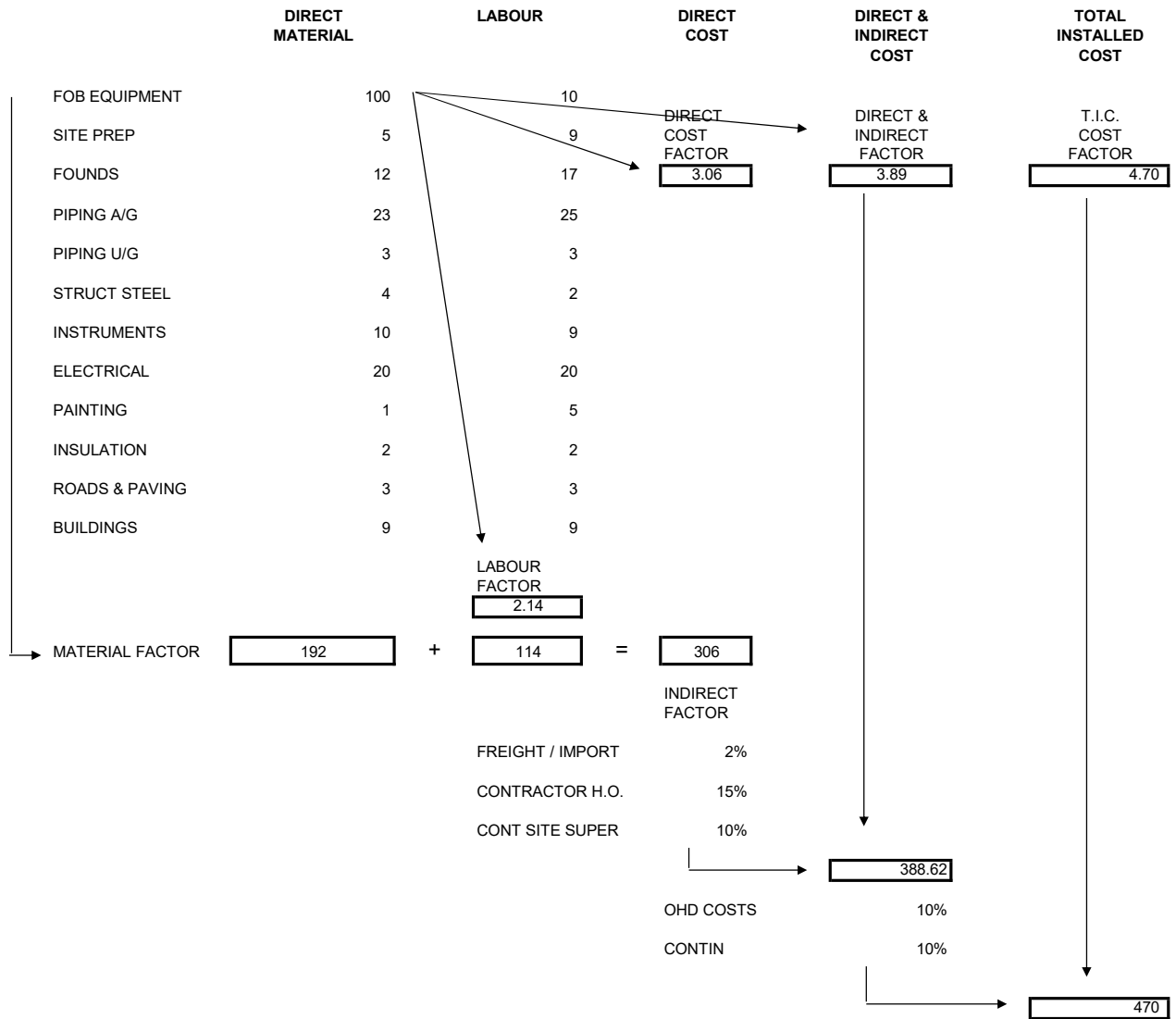
CENTRIF / RECIP COMPRESSOR - TURBINE DRIVE



RATIO ESTIMATING

MAJOR EQUIPMENT ITEM:-

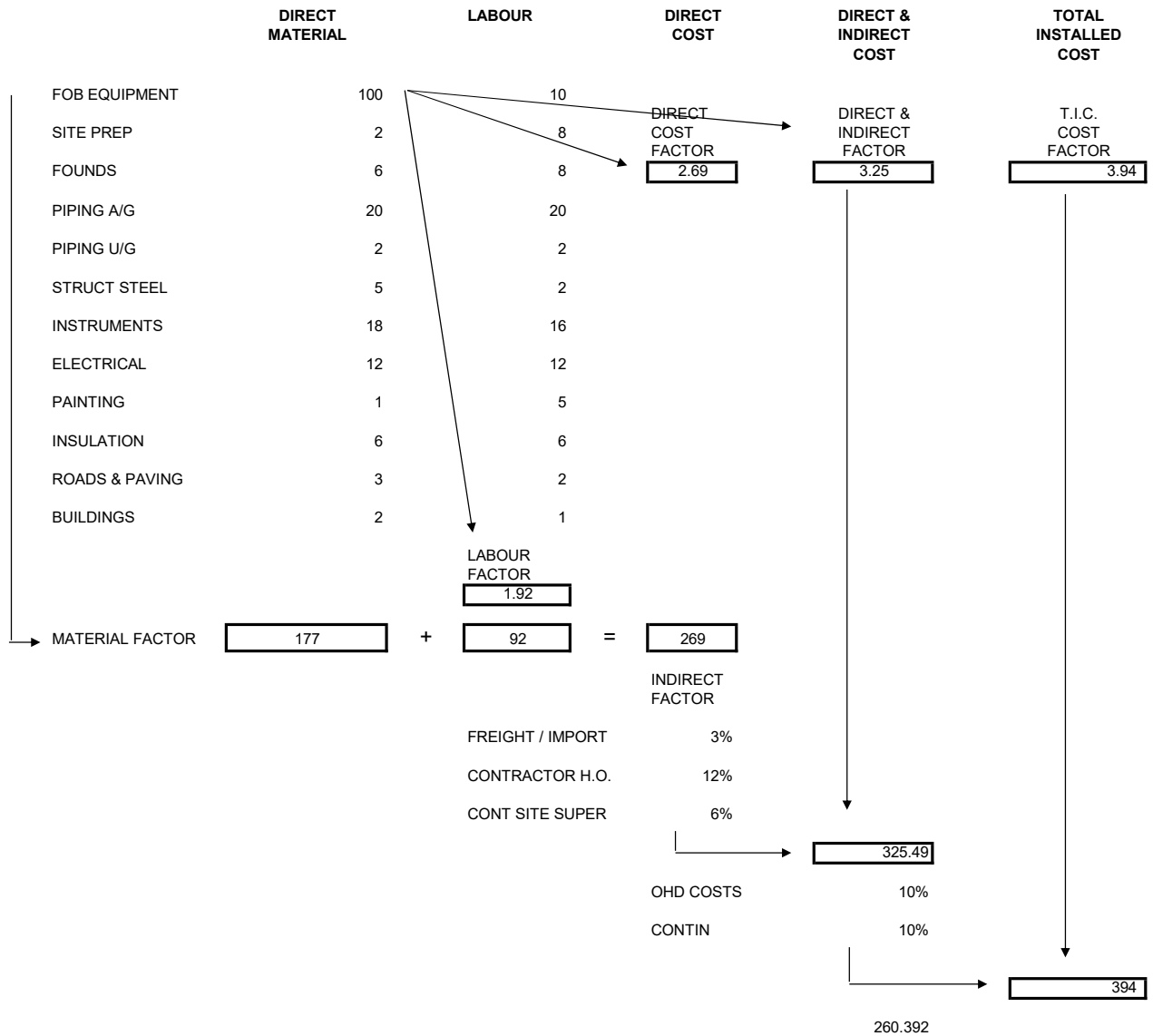
BLOWER - MOTOR DRIVE



RATIO ESTIMATING

MAJOR EQUIPMENT ITEM:-

WATER TREATMENT UNIT



RATIO ESTIMATING

MAJOR EQUIPMENT ITEM:-

COOLING TOWERS

