

**Table 6-17 Estimation of capital investment cost (showing individual components)**

The percentages indicated in the following summary of the various costs constituting the capital investment are approximations applicable to ordinary chemical processing plants. It should be realized that the values given vary depending on many factors, such as plant location, type of process, and complexity of instrumentation.

- I. **Direct costs** = material and labor involved in actual installation of complete facility (65–85% of fixed-capital investment)
  - A. Equipment + installation + instrumentation + piping + electrical + insulation + painting (50–60% of fixed-capital investment)
    - 1. Purchased equipment (15–40% of fixed-capital investment)
    - 2. Installation, including insulation and painting (25–55% of purchased-equipment cost)
    - 3. Instrumentation and controls, installed (8–50% of purchased-equipment cost)
    - 4. Piping, installed (10–80% of purchased-equipment cost)
    - 5. Electrical, installed (10–40% of purchased-equipment cost)
  - B. Buildings, process, and auxiliary (10–70% of purchased-equipment cost)
  - C. Service facilities and yard improvements (40–100% of purchased-equipment cost)
  - D. Land (1–2% of fixed-capital investment or 4–8% of purchased-equipment cost)
- II. **Indirect costs** = expenses which are not directly involved with material and labor of actual installation of complete facility (15–35% of fixed-capital investment)
  - A. Engineering and supervision (5–30% of direct costs)
  - B. Legal expenses (1–3% of fixed-capital investment)
  - C. Construction expense and contractor's fee (10–20% of fixed-capital investment)
  - D. Contingency (5–15% of fixed-capital investment)
- III. **Fixed-capital investment** = direct costs + indirect costs
- IV. **Working capital** (10–20% of total capital investment)
- V. **Total capital investment** = fixed-capital investment + working capital

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**CHAPTER 6** Analysis of Cost Estimation

Component	Cost
Purchased equipment (delivered), $E$	\$100,000
Purchased equipment installation, $39\%E$	39,000
Instrumentation (installed), $43\%E$	43,000
Piping (installed), $31\%E$	31,000
Electrical (installed), $10\%E$	10,000
Buildings (including services), $15\%E$	15,000
Yard improvements, $12\%E$	12,000
Service facilities (installed), $55\%E$	55,000
<b>Total direct plant cost, <math>D</math></b>	<b>305,000</b>
Engineering and supervision, $32\%E$	32,000
Construction expenses, $34\%E$	34,000
Legal expenses, $4\%E$	4,000
Contractor's fee, $19\%E$	19,000
Contingency, $37\%E$	37,000
<b>Total indirect plant cost, <math>I</math></b>	<b>126,000</b>
<b>Fixed-capital investment, <math>D + I</math></b>	<b>\$431,000</b>