

CELANESE CHEMICAL COMPANY
TECHNICAL CENTER
Corpus Christi, Texas

May 1, 1980

TMK-436-80

Celanese Construction Cost
Index - 1980

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New York

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J.D. Underwood

New Jersey Plastics

T. Welch

Summit

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S.I. Goldberg

Edmonton

J. Kuziak
M. Yashchshn

Greer

C. Carter

Newark Terminal

W. D. Coble

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007190

CELANESE CHEMICAL COMPANY, INC.
TECHNICAL CENTER
Corpus Christi, Texas

May 1, 1980

To Mr. A. G. Custer - CCCTC

From T. M. Knox

TMK-436-80

Celanese Construction Cost Index - 1980

The 1979 Celanese Construction Cost Index has been updated according to escalation recorded from 1/79 to 1/80 and projected escalation to mid 1983. (Figure 1).

COST DATA

Prices of equipment and commodities were obtained from purchase orders, quotes, and discounted price lists and used to form the basis for the indicated changes in measured escalation of monitored items.

The attached graphs, Figures 1-17, show the index (7/75 = Base 100) for real costs (Celanese) from 7/75 to 1/80 and projected costs to 7/83. Projected escalations shown on each graph were derived through personal consultations with representatives of manufacturers, vendors, engineering firms, and contractors including:

- 4 - Company Presidents
- 4 - Vice Presidents
- 4 - General Managers
- 1 - Manager - Capital Cost Estimating
- 3 - Managers - Cost Engineering
- 1 - Manager - Purchasing
- 5 - Managers - Regional Sales
- 6 - Sales Representatives

Several people were contacted this year for the first time due to personnel changes plus two new contacts but, for the most part, the contacts are the same ones consulted in previous years. Consultations this year were made by Mr. Shandley, Mr. Ellis, Mr. Seawright, and Mr. Daehnert in Central Purchasing, and those that I made plus one new contact, an engineering firm. As before, when a range in projected escalation was given, e.g., 10-12%/year, the lower number or a weighted average was usually considered, dependent on past experience. Generally,

007191

the projected escalation for the next three years are higher numbers than those given last year (TMK-426-79).

COST INDEX FOR RFAs

Escalation as applied to RFAs, whether for preparation, check estimate, or definitive estimate should be based on the latest Celanese Construction Cost Index (Figure 1). This graph shows the cost index for a total plant battery limits only. When using this index to calculate escalation for a project the escalation expenditure rate is about 70% of the escalation (Figure 1) and should be applied at start of engineering (spending money) to startup of the project.

COST INDEX FOR CAPITAL PLANNING

For preparation of hydrocarbon, R&D, and capital budget planning, the adjusted MSI shown below should be used. Actual escalation, as seen from results of accumulated data used in the preparation of Figure 1 from 7/75 to 1/80, was applied to the previous adjusted MSI beginning with 7/75. From 1/80 to 7/83 the MSI is adjusted in accordance with the projected escalation shown on Figure 1. Mr. J. W. Fella, Corporate Planning, concurs with these projections. Escalation from mid 1983 to mid 1990 is projected by Mr. Fella as shown in the middle column below with the corresponding adjustment of the MSI accordingly:

<u>Mid Year</u>	<u>% Escalation</u>	<u>Adjusted MSI</u>
1975	-	630
1976	2.1	643
1977	2.45	659
1978	8.4	714
1979	10.5	789
1980	11.55	881
1981	10.7	975
1982	10.1	1073
1983	9.5	1175
1984	8.7	1277
1985	8.4	1385
1986	8.2	1498
1987	8.0	1618
1988	7.7	1743
1989	7.7	1877
1990	7.5	2018

007192

EQUIPMENT AND COMMODITIES

Insulation prices monitored for this index are based on a weighted percent of average price base of Fiberglas (30%) Foamglas (50%), and calcium silicate (20%) pipe insulation in required thickness according to the latest Celanese insulation standards. Two vendors were contacted for prices and their best guess projections for escalation. One projected a weighted average of 13.5% and the other 5.9% for 1980 (8% was used for the index Figure 3).

Piping escalation is based on a weighted average for carbon steel (40%) and stainless steel (60%) in Figure 4. Total piping for each material, Figures 6 and 8, is composed of 40% pipe, 40% valves, and 20% fittings (1975 Base). The overall piping index for 1979 was up 21% and the projected escalation was 15%. Stainless steel (316) piping was up 29% and carbon steel piping was up 9%. The large increase in stainless piping was due primarily to the significant increase in the cost of molybdenum. It is interesting to note that total piping costs for 1/80 (Figure 4 - based on monitored prices) is only 3% more than in mid 1975.

Instrumentation escalation is based on pricing of transmitters, recorders, controllers (pneumatic and electronic) and control valves (carbon steel and stainless steel). The instrumentation index for 1/79 to 1/80 was up 12% versus the projected escalation of 6.5% (Figure 9). Electronic transmitters, pneumatic recorders and 316 SS control valve prices increased 16% to 35%. This was the primary accounting for the higher escalation.

Electrical equipment escalation is based on prices of a motor starter, two wire sizes, and conduit. Pricing on a 1500 KVA transformer is monitored also to detect trends but not used in determining escalation rates. The electrical index for 1/79 to 1/80 was up 10% versus the projected escalation of 9% (Figure 10). Two vendors were contacted for escalation projections in 1980; one projected 10% and the other 18%. On a weighted basis of previous projections, 12% was used for the index.

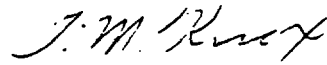
Structural steel escalation is based on a weighted average (1975 Base) using heavy, medium and light weight categories as a percent of total steel cost (less reformer steel) on Bishop MS II project (Figure 11). Another interesting point to note (on Figure 11) is the index for structural steel at 1/80 is the same as at 7/75. Concrete pricing is based on using 140 pounds of rebar per cubic yard of concrete. Escalation is based on annual contracts for concrete and reinforcing steel negotiated by S&D (Figure 12). Total civil escalation is based on 60% structural steel and 40% concrete (Figure 13).

007193

May 1, 1980

Direct labor escalation to 1/80 is based on a 7/75 calculated average rate for construction labor on Celanese projects in the Houston area. Figure 15 is a graphic illustration of the escalation of labor rate only. Total dollars for direct labor cost at 1/80 includes escalation plus 20% added in 1978 due to labor efficiency.

The projected escalation rates shown in this report are weighted averages of projections made by the many people contributing their knowledge and "gut feel. " Peaks and lows are inevitable and no attempt has been made to project when these might occur. I appreciate the help of Mr. Shandley, Mr. Seawright, Mr. Ellis, and Mr. Daehnert in obtaining information and price data.



T. M. KNOX

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007194

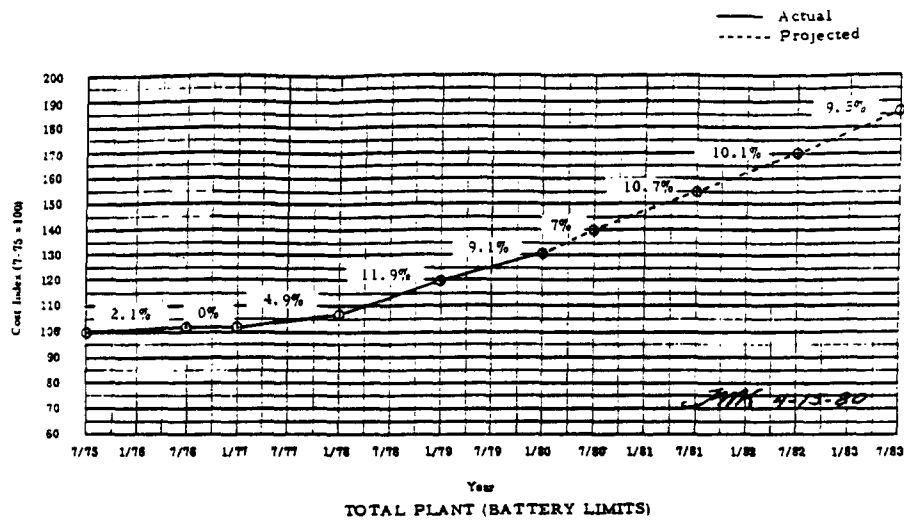
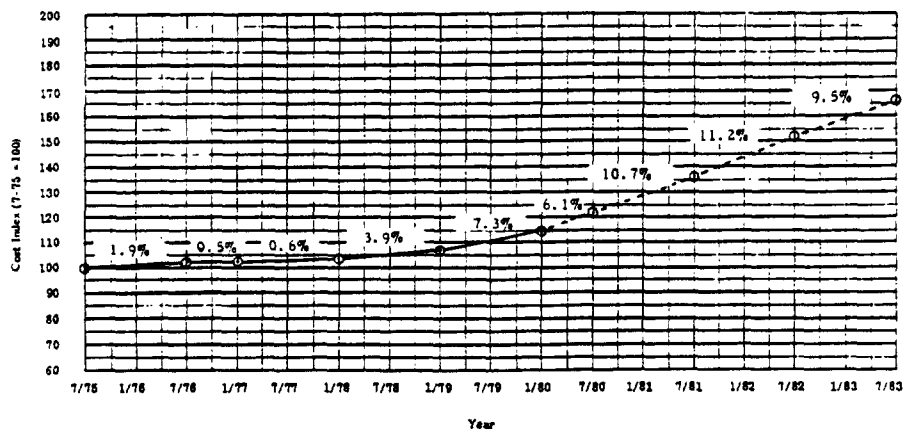


Figure 1

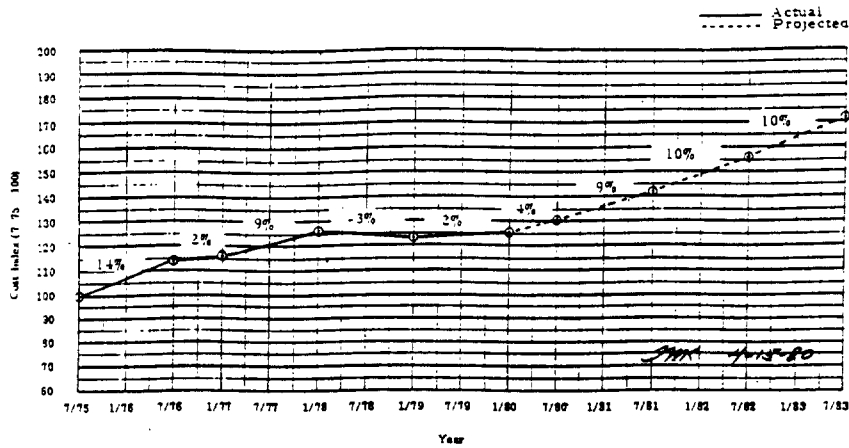


MAJOR EQUIPMENT

Escalation - Based on Projections from 7 Manufacturers
 Three projected Escalation on Fabricated Equipment at 12-20%/Yr.
 Two projected Escalation on Rotating Equipment at 7-10%/Yr and
 Two projected 12-15%/Yr.

Figure 2

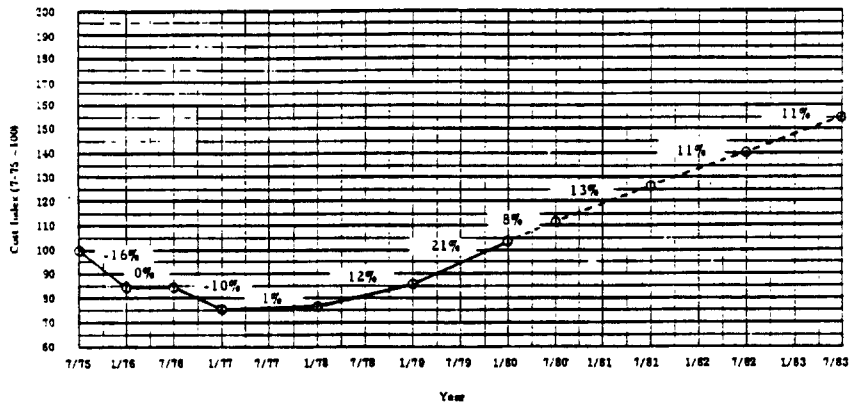
007195



INSULATION

Two Vendors Contacted - Escalation Projected at 9-15%/Yr.

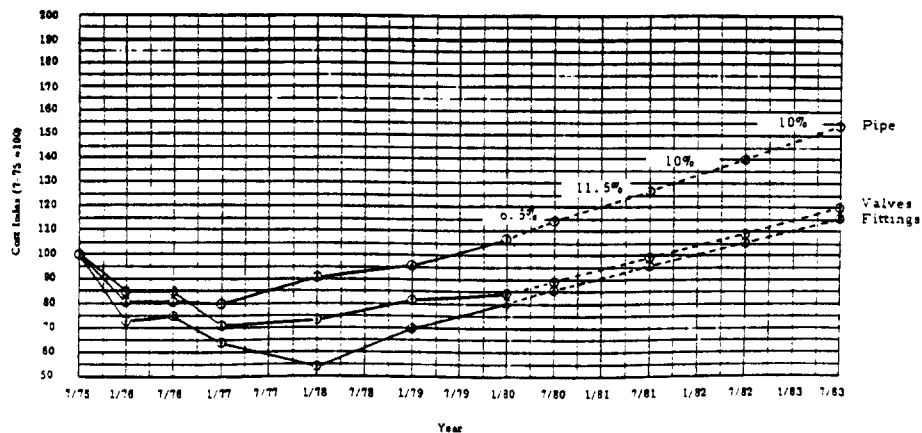
Figure 3



TOTAL PIPING

Ratio: 40% Carbon Steel and 60% Stainless Steel
Three Vendors Projected Escalation at 10-13%/Yr.

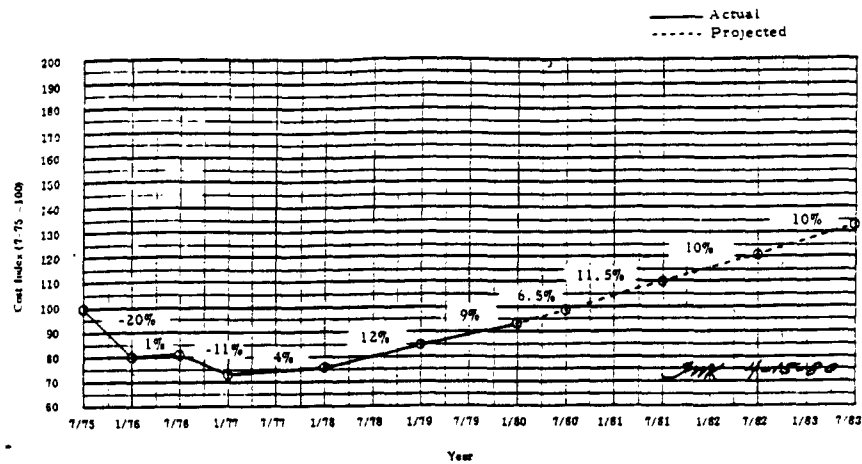
Figure 4



CARBON STEEL PIPE, VALVES & FITTINGS

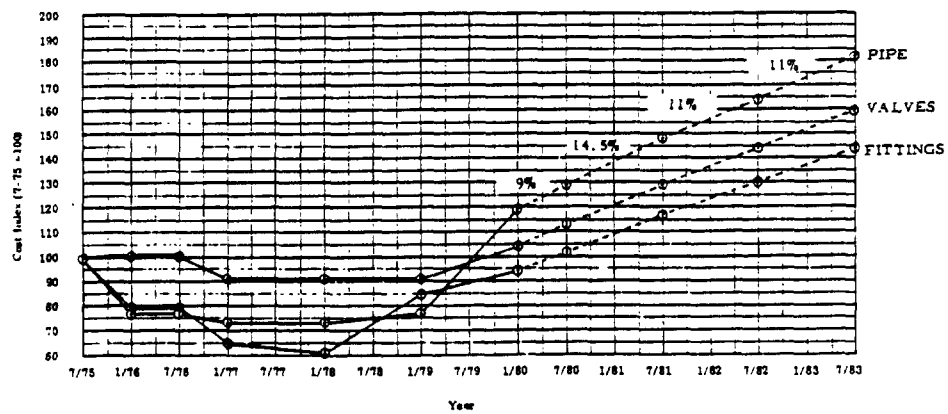
Figure 5

007196



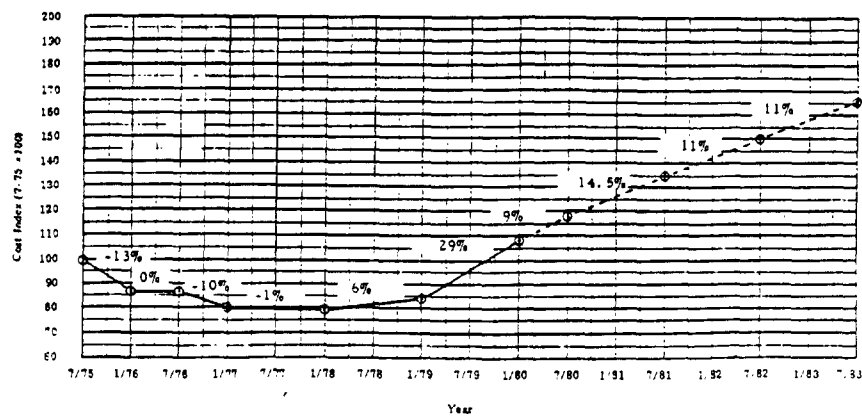
TOTAL PIPING - CARBON STEEL - 40% Pipe, 40% Valves, 20% Fittings

Figure 6



STAINLESS STEEL PIPE, VALVES, & FITTINGS

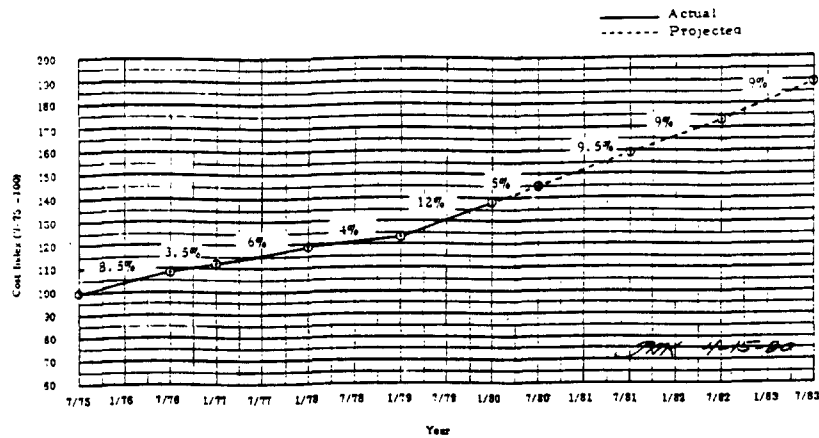
Figure 7



TOTAL STAINLESS STEEL PIPING - 40% Pipe, 40% Valves, 20% Fittings

Figure 8

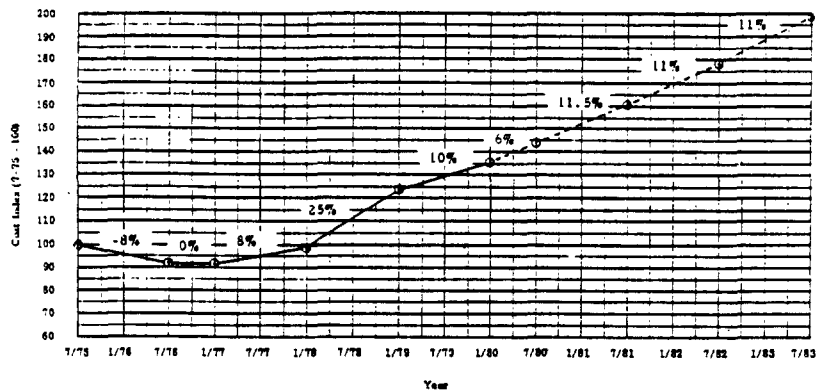
007197



INSTRUMENTATION

Two Vendors Contacted: One projected Escalation at 8-9%/Yr.; the other 10%/Yr.

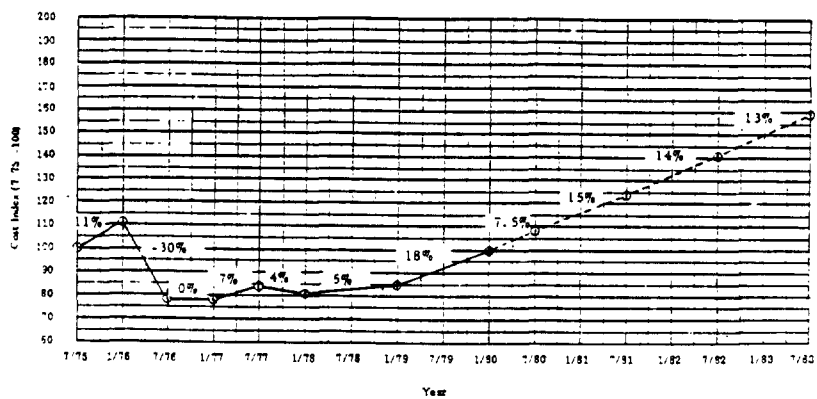
Figure 9



ELECTRICAL

Two Vendors Contacted: One projected escalation at 10%/Yr.; the other 12-14%/Yr.

Figure 10



STRUCTURAL STEEL

Escalation to 1980 was derived from a weighted average of actual prices of the following categories:

Heavy - 41#/Ft. and over - black	16% of Total
Medium - 22 - 40# Ft. - black	33% of Total
Light - 0 - 21 #/Ft. - Black	51% of Total

The percent of total for a weighted average was derived by taking each above class as a percent (based on Dollars) of Total Structural Steel (less Reformer Steel) on Bishop MS-II Project.

Figure 11

007198

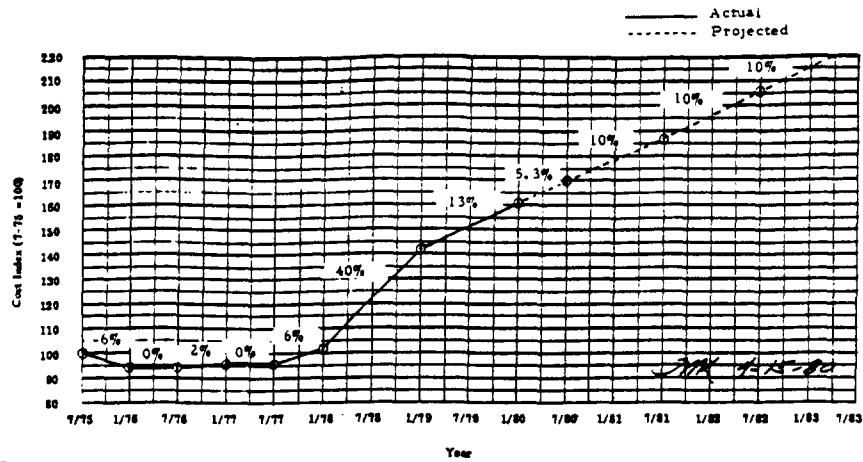


Figure 12

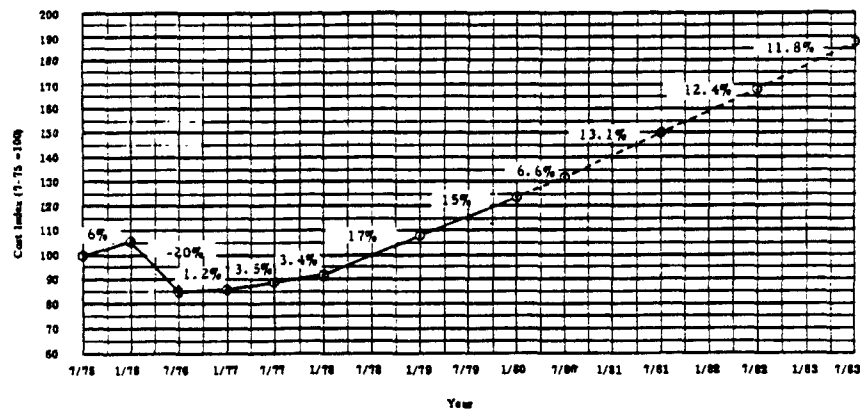


Figure 13

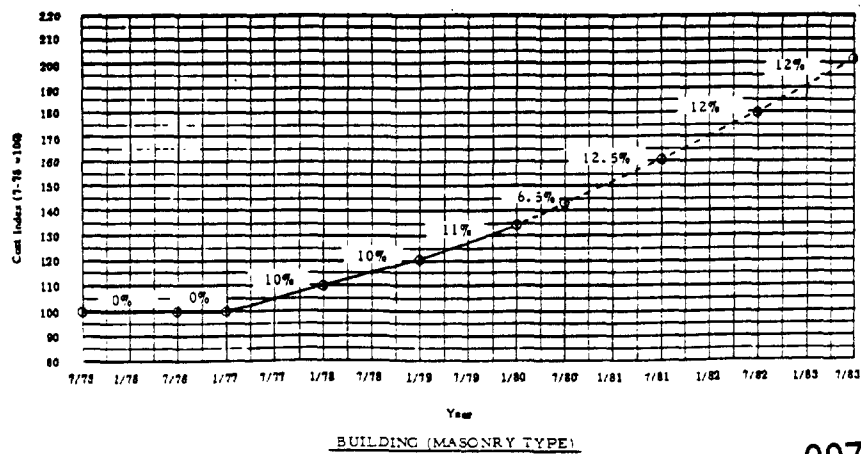
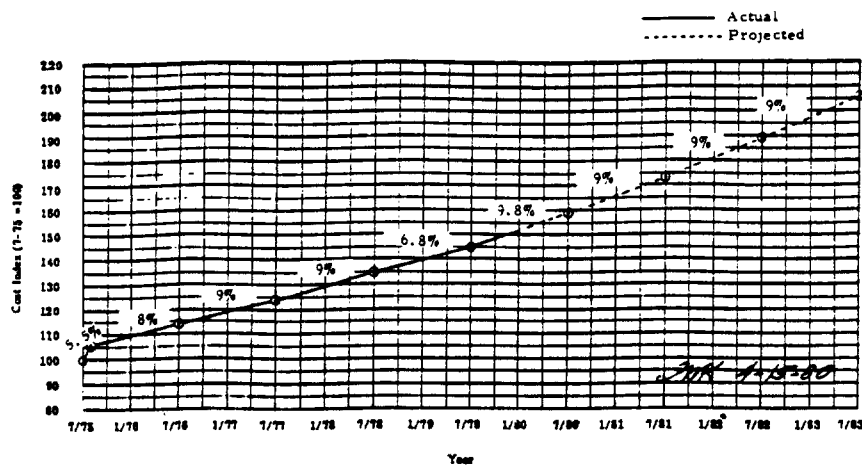


Figure 14

007199

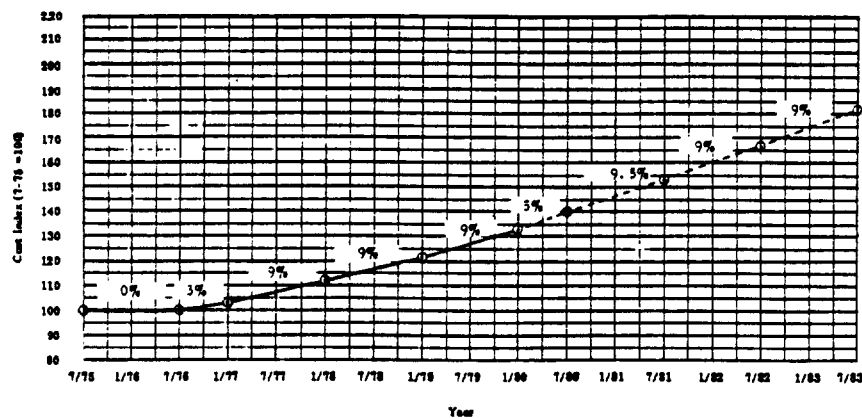


DIRECT LABOR

Projections by Company Estimators

Percents Shown for Actual Escalation are Based on Increase of Average Labor Rate (\$/MH)

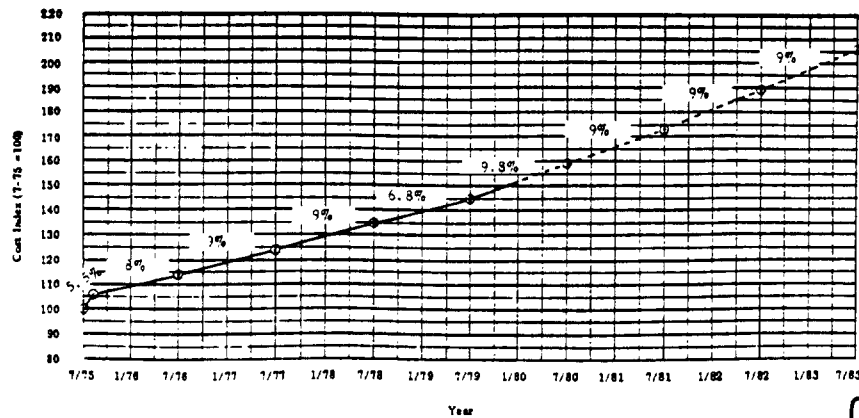
Figure 15



ENGINEERING

Based on Projections by Four Engineering Companies

Figure 16



CONSTRUCTION OVERHEAD (JAPANESE PLUS CONTRACT)

Figure 17

007200