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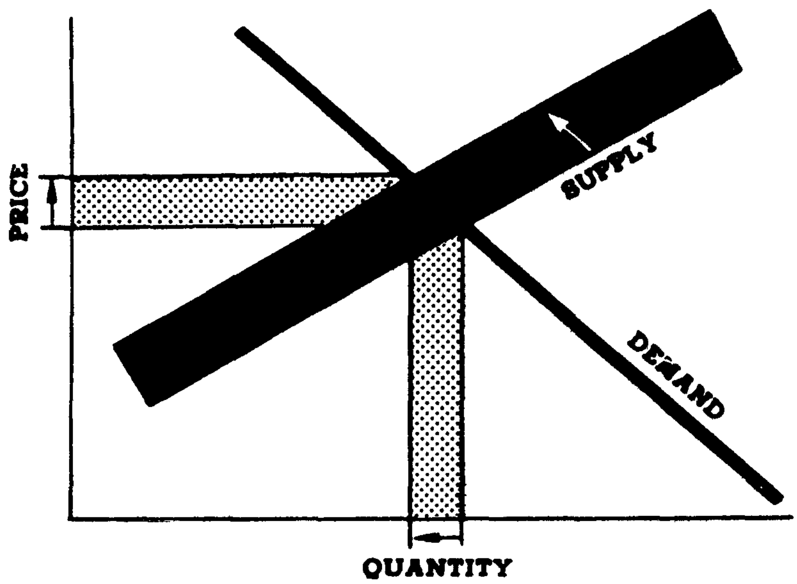
ECONOMIC ANALYSIS OF PROPOSED
AND INTERIM FINAL EFFLUENT GUIDELINES

THE SPECIALTY STEEL INDUSTRY



U.S. ENVIRONMENTAL PROTECTION AGENCY
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ECONOMIC ANALYSIS

OF

PROPOSED AND INTERIM FINAL

EFFLUENT GUIDELINES

THE SPECIALTY STEEL INDUSTRY

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U.S. ENVIRONMENTAL PROTECTION AGENCY

OFFICE OF PLANNING AND EVALUATION

WASHINGTON, D.C. 20460

CONTRACT NO. 68-01-1545

PREFACE

The attached document is a contractor's study prepared for the Office of Planning and Evaluation of the Environmental Protection Agency ("EPA"). The purpose of the study is to analyze the economic impact which could result from the application of alternative effluent limitation guidelines and standards of performance to be established under sections 304(b) and 306 of the Federal Water Pollution Control Act, as amended.

The study supplements the technical study ("EPA Development Document") supporting the issuance of proposed regulations under sections 304(b) and 306. The Development Document surveys existing and potential waste treatment control methods and technology within particular industrial source categories and supports proposal of certain effluent limitation guidelines and standards of performance based upon an analysis of the feasibility of these guidelines and standards in accordance with the requirements of sections 304(b) and 306 of the Act. Presented in the Development Document are the investment and operating costs associated with various alternative control and treatment technologies. The attached document supplements this analysis by estimating the broader economic effects which might result from the required application of various control methods and technologies. This study investigates the effect of alternative approaches in terms of product price increases, effects upon employment and the continued viability of affected plants, effects upon foreign trade and other competitive effects.

The study has been prepared with the supervision and review of the Office of Planning and Evaluation of EPA. This report was submitted in fulfillment of Contract No. 68-01-1545, Task Order No. 4, by A. T. Kearney, Inc. Work was completed as of February, 1976.

This report is being released and circulated at approximately the same time as publication in the Federal Register of a notice of proposed and interim final rule making under sections 304(b) and 306 of the Act for the subject point source category. The study is not an official EPA publication. It will be considered along with the information contained in the Development Document and any comments received by EPA on either document before or during rule making proceedings necessary to establish final regulations. Prior to final promulgation of regulations, the accompanying study shall have standing in any EPA proceeding or court proceeding only to the extent that it represents the views of the contractor who studied the subject industry. It cannot be cited, referenced, or represented in any respect in any such proceeding as a statement of EPA's views regarding the subject industry.

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PLANNING AND EVALUATION

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TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd)

TABLE OF CONTENTS (Cont'd)

LIST OF TABLES

LIST OF TABLES (Cont'd)

LIST OF TABLES (Cont'd)

LIST OF TABLES (Cont'd)

LIST OF FIGURES

LIST OF EXHIBITS

LIST OF EXHIBITS (Cont'd)

LIST OF EXHIBITS (Cont'd)

LIST OF EXHIBITS (Cont'd)

ENVIRONMENTAL PROTECTION AGENCY

ECONOMIC ANALYSIS OF THE PROPOSED AND INTERIM FINAL EFFLUENT GUIDELINES ON THE SPECIALTY STEEL INDUSTRY

EXECUTIVE SUMMARY

INTRODUCTION

(a) Scope of the Industry

The objective of this study is to determine the impact of the costs of water pollution abatement on the specialty steel industry. This industry is defined to include the manufacture and processing of stainless, tool, and high alloy (5% or more alloy content) steels, and falls within the following four digit SIC industries defined by the Bureau of the Census:

- SIC 3312 - Integrated Steel Producers
- SIC 3315 - Steel Wire Processors
- SIC 3316 - Cold Rolled Steel Sheet, Strip, and Bar Processors
- SIC 3317 - Steel Pipe and Tube Processors

Specialty steels are produced by about 160 establishments. Industry employment in recent years of efficient capacity utilization (such as 1973 and 1974) has been estimated at 65,000. Industry net tonnage shipments accounted for about 1.4% of overall U.S. steel shipments, and included 1,345,000 tons of stainless steel, 113,000 tons of tool steel, and an estimated 73,000 tons of high alloy steel. The value of these shipments was about $2.2 billion for stainless steel, $300 million for tool steel, and an estimated $500 million for high alloy steel.

The establishments which are the subject of this study are those where specialty steel products account for 50% or more of total plant output tonnage. There are 87 such establishments included in the study, of which 25 are integrated producers, 14 are wire processors, six are cold rolled sheet, strip and bar processors, and 42 are pipe and tube processors. Total employment at these establishments in 1974 is estimated to have been 47,000.

(b) Scope of the Analysis

The scope of this study was limited to estimating the costs of water pollution abatement. Assessment of health and welfare benefits associated with the proposed guidelines was not included. Assessment of the cumulative impact of other governmental health, energy, trade, and environmental regulations was also outside the scope of this analysis, which is concerned only with the incremental impact of the proposed guidelines in relation to estimated baseline conditions. These other factors are accounted for only in a general way through the assumptions underlying the baseline industry forecast. Estimates of the technology required to achieve compliance with the guidelines, and of the costs associated with this technology, were provided to Kearney by EPA through its technical contractors, Datagraphics, Inc. and Cyrus William Rice.

(c) Compliance Dates

The Federal Water Pollution Control Act specified July, 1977 as the date by which firms were to comply with regulations requiring application of the "Best Practicable Technology Currently Available" (BPT), and July, 1983 was the specified date for compliance with the more restrictive "Best Available Control Technology Economically Achievable" (BAT) regulations. However, in view of the time frame for promulgation of these regulations and the existence of outstanding direct discharge permits, it appears that compliance with the BPT regulations will occur during the period between 1979 and 1981. It also appears that compliance with the BAT regulations will occur in 1983 or some time thereafter.

ECONOMIC IMPACT ANALYSIS

The economic effects of the proposed regulations depend critically upon the estimates and assumptions made in the baseline forecast, particularly those relating to developments in foreign specialty steel markets and in U.S. trade policy. Imports represented about 13% of domestic consumption of both stainless and tool steels in 1974. These proportions are believed to have risen to as much as 21% for stainless steel and 29% for tool steel in the worldwide recession of 1975. In June of that year the major domestic producers petitioned the U.S. International Trade Commission for relief from import competition which, they contended, was inflicting major injury upon them and on their employees.

Additional unit costs to domestic producers arising from compliance with the proposed effluent guidelines are estimated to be, in general, a very small fraction of present industry prices and average costs. In the absence of strong competitive pressure from imports, resulting in an unhealthy market environment for domestic producers, these costs will be passed through to customers or absorbed by the industry with limited adverse impact. In the unlikely event that the baseline competitive position of U.S. versus foreign producers remains as it was in 1975, or deteriorates from that point, profitability conditions in the industry will be such as to make absorption of the incremental effluent controls costs difficult, if not infeasible, for domestic producers.

(a) Estimated Cost Increases

Total incremental unit costs associated with both BPT and BAT compliance, assuming only 75% capacity utilization, are estimated to average about 1% of the 1975 composite industry selling prices, and are estimated at less than 2% of recent prices for all industry segments other than small wire processing establishments.

The estimated total annual incremental costs per ship ton, at 75% operating rates, are summarized for the four major industry process segments in the following table:

Estimated Incremental Unit Costs Associated with BAT and BPT Guidelines by Specialty Steel Industry Segment at 75% Operating Rate

Industry Segment(SIC)	Number of Establishments	Direct Cost /Ship Ton BPT	Direct Cost /Ship Ton BAT	Overall Additional Cost/Ship Ton
Integrated Producers (3312)	25	$12.22	$5.06	$17.28
Wire Processors (3315)	14	29.59		42.09
Cold Rolled Sheet, Strip and Bar Processors (3316)	6	6.90		19.40
Pipe and Tube Processors (3317)	42	7.16		19.66

These costs are based upon 1971 systems and engineering cost estimates adjusted to 1975 levels by appropriate construction, labor and material cost indexes. A 10% cost of capital figure was employed, and the overall additional costs to processing firms included an indirect cost of $12.50 per ton applicable to the case where semifinished product cost increases are passed-through to processors.

Accurate price data for this industry is difficult to obtain because of widespread discounting from published book prices, the substantial proportion (about one-third by tonnage) of individually-priced "made-to-order" products, and apparent inconsistencies between alternative data sources from which composite actual selling prices may be developed. Utilizing Department of Commerce statistics for the value and tonnage of intercompany shipments, composite 1974 selling prices are estimated at $1,630 per ton of stainless steel, and $2,660 per ton of tool steel. Midyear 1975 prices are estimated to have been about 15% above these levels, or $1,870 per ton of stainless steel, and $3,060 per ton of tool steel. Thus, the overall additional costs of water pollution control, by themselves, are not substantial relative to prices, and are less than typical year-to-year fluctuations in prices, even after adjustment for general inflation.

(b) Foreign Trade Influences

Prevailing thought among observers of the industry holds that, on average over the next several years, specialty steel production costs will rise more rapidly abroad than in the U.S., resuming a trend displayed between 1971 and 1974. Both energy and available local labor are rapidly becoming continually more scarce in the industrial nations of Western Europe and Japan, and these are major inputs to specialty steel production. It is also believed likely that growth in foreign demand for these steels, over the longer-term, will more than keep pace with foreign capacity increases. This will allow generally profitable price levels for producers and limit the supply available for export to the U.S. under normal pricing conditions. This general scenario has been incorporated into the study's baseline forecast for the longer term, though it is recognized that during weak periods of the business cycle import competition will intensify and exert significant temporary downward pressures on U.S. prices.

It is also generally believed that foreign specialty steel producers will eventually face pollution control costs similar to those estimated for domestic producers, leaving them with no decisive long-term cost advantage from this source. U.S. producers should therefore, over the long-run, be able to pass through to customers their own added costs resulting from the effluent guidelines. In the shorter term, domestic producers may incur some cost absorption due to import competition, however even this possibility has been sharply reduced by the strong likelihood that import quotas will be in effect for the next five or more years. The lead time that is likely to pass before compliance occurs will further mitigate any adverse short-term effects on domestic producers, as will the probability that many of the establishments involved are operating under permits which have several years to run.

The anticipated increase in foreign production costs relative to those in the U.S., and the expected resumption of strong growth in world steel demand during the next several years, should leave the domestic industry in a considerably improved profit position, and permit a rising level of capital expenditures. Domestic producers' shipments are projected to expand at a long-term average rate of 4% to 4-1/2% per year. Under these conditions, the incremental costs of effluent abatement would be manageable, even if foreign producers incurred substantially lower than baseline pollution control costs. In this case, domestic producers would experience somewhat lower volume expansion and somewhat reduced profitability gains, but would nevertheless find the industry's prospects sufficiently attractive to make the required investments because improved industry baseline conditions would offset the adverse impacts of the regulations.

Significant adverse impact could occur, however, in the unlikely case of compound negative developments in world markets. A low-profit baseline situation could arise if chronically deficient foreign demand and a reversal of favorable trends in relative production costs were combined with the absence of any trade protection for U.S. producers. During the first two or three years of the 1970's, industry profits were quite low--after tax margins averaged well under 3%. Net capital investment was also very low, even in terms of dollar book value, and may in fact have been negative after the effects of inflation on plant and equipment replacement costs are considered. If the domestic industry were once again to suffer from a weak profitability outlook, and, in addition, is required to absorb effluent abatement costs due to weaker pollution control requirements overseas, several establishments might experience difficulty in attracting the capital necessary to achieve compliance. In this case, a 1% reduction in selling prices due to cost absorption could amount to as much as a 40% to 50% decline in earnings. Closure would become a distinct possibility for several establishments.

However, this negative scenario is made unlikely by the recent recommendation of the U.S. International Trade Commission that the industry be granted relief from import competition. It appears highly likely that if the domestic industry faces continued duress due to an adverse competitive position with respect to foreign producers, some form of import quota system or "voluntary" import restrictions will eventually be adopted on a long-term basis. Although such quotas would alleviate the impact of environment regulations on the industry under a pessimistic scenario, such quotas are not considered to be caused by the effluent guidelines regulations. The likelihood of such quotas is incorporated into the baseline conditions of the study.

(c) Price and Volume Impacts

Assuming no decisive long-term cost advantages to foreign producers due to differential effluent abatement requirements, or if a system of import quotas is adopted, domestically specialty steel prices are projected to rise about 1% as a result of the combined costs of the BPT and BAT regulations. Semi-finished product prices are projected to rise less than 1%, prices of processed products other than wire are forecast to increase between 1% to 1.5%, and processed wire prices are forecast to rise between 2% and 3%. These price increases are expected to result in volume reductions for domestic producers averaging less than 1%, since the end-use demand for specialty steels is believed to be inelastic.

It is likely that foreign producers will obtain some temporary cost advantages when the BPT guidelines are initially put into effect. If imports are unrestricted at this time, the forecast short-term price increases will be lower - probably less than 0.5% for "standard specification" items. The volume reduction experienced by U.S. producers should be higher, reflecting the increased market share of imports, and is projected to be of the order of 1.5% to 2%.

Price increases for customized "made-to-order" products are forecast to be somewhat higher than those cited above. It is felt that competitive pressures in these product markets are somewhat weaker, which might enable the producers and processors experiencing the greatest unit cost increases to recover some of the costs they may be required to absorb in their "standard specification" product lines.

(d) Micro-Impacts

Only in two industry segments were potentially important adverse impacts identified due to higher unit abatement costs than other domestic producers or processors. These were the small flat-rolled integrated producing establishments, and the small wire processing plants. The impact on the small flat-rolled integrated producers is expected to be manageable because of existing strong profits and/or specialized product lines. No closures are anticipated.

The potential adverse impact on the small wire processing firms is much greater. U.S. wire processing operations were characterized by particularly low or negative profitability for several years prior to the boom of 1973-74, imports gained a very high percentage of the domestic market, and several integrated producers were reported to be considering termination of wire-processing operations. This industry segment will incur unit pollution abatement costs averaging above 3% of current selling prices, and the potential for closures must be judged to be significant. However, employment effects of potential closures would be minor--affecting well under 1,000 employees in total. Moreover, the likelihood of relief from import competition, the relatively small dollar amounts of investment capital required, and the orientation of many of these firms towards customized products all tend to reduce the likelihood of closure.

(e) Capital Investment and Financing

Capital costs of compliance will be substantial for the integrated producers in relation to present levels of capital expenditures, amounting to somewhat less than two years' gross investment. It appears likely that an adjustment period will occur during which these producers will have to allocate available investment funds primarily to pollution control. The investment costs, however, are not unmanageably high in relation to recent parent company profits in reasonably good years like 1973 and 1974. Moreover, there is likely to be a few years' lead time before compliance occurs during which cyclical conditions are widely expected to be favorable, and investment may therefore be stretched out over a period of years. These integrated producers generally have access to conventional debt finance, and in many cases will be able to issue pollution ontrol revenue bonds.

The absolute dollar amounts of financing required by the smaller processing firms are quite low--about $60,000 for small pipe and lube processors and about $200,000 for small wire processors. Many of these firms appear to qualify for Small Business Administration assistance. Obtaining the necessary capital does not appear to be a major problem for these firms, provided they view long-term profitability conditions in their industry segment as being favorable.

(f) Other Impacts

The overall impact of the regulations on the specialty steel industry itself is expected to be minor. Impacts on customers, suppliers, and local and regional economies is expected to be negligible.

Balance of trade impacts should also be minor in the more probable longer term cases where foreign producers obtain no significant cost advantages as a result of the regulations, or where import quotas are in effect. In the absence of import quotas, foreign producers are likely to obtain some initial short-term cost advantages, and net imports are projected to rise significantly relative to baseline levels. However, the 10% to 15% increase in net imports projected to occur in this case would result, at most, in a $35 to $40 million negative impact on the U.S. balance of trade at 1975 stainless steel prices. This dollar amount is inconsequential in comparison to the overall U.S. trade deficits or surpluses of the 1970s, and in relation to the overall steel industry trade deficit in 1974.

LIMITS OF THE ANALYSIS

Economic impact assessments generally rest on estimates and assumptions subject to wide margins of errors. This is particularly the case with respect to the specialty steel industry because of the limited availability of data pertaining specifically to specialty steel operations, the extreme sensitivity of the industry to general business cycle movements which are difficult to forecast more than one or two years in advance, the key role played by foreign market developments about which data is difficult to obtain, and the importance of governmental policy decisions which can be predicted only at low confidence levels.

The scope of this study is limited to measuring the impact of the proposed guidelines against a baseline forecast. Changes in the assumptions underlying this baseline forecast have a direct bearing on the conclusions of the study. Datagraphics, Inc. and Cyrus Wm. Rice were retained by EPA to provide technical and cost data for the proposed effluent guidelines. Insofar as the cost and technical data furnished by EPA through its technical contractors is modified or inapplicable, the economic impact assessment will correspondingly require modification.

Economic parameters used in financial and economic analytical models have been estimated based on the information available. They are believed to be correct and reasonable by Kearney. However, insofar as they are significantly different from actual market conditions, the impact assessment would have to be modified accordingly.

ENVIRONMENT PROTECTION AGENCY

ECONOMIC ANALYSIS OF THE PROPOSED AND INTERIM FINAL EFFLUENT GUIDELINES ON THE SPECIALTY STEEL INDUSTRY

SUMMARY OF ECONOMIC IMPACTS

	Industry Segments (SIC Code) 3312	3315	3316	3317	Total
Number of Plants in Segment-1975	25	14	6	42	87
Number of Plants in 1983 Baseline	25	14	6	46	91
Costs of Pollution Abatement					
BPT Capital Cost ($ Millions)	123.8	5.7	7.3	4.4	141.2
BAT Capital Cost ($ Millions)	59.3	-0-	-0-	-0-	59.3
Total Capital Cost ($ Millions)	182.1	5.7	7.3	4.4	200.5
Direct Annual Cost/Ship Ton at 75% Capacity Utilization					
BPT (Dollars/Ton)	$12.22	$29.59	$ 6.90	$ 7.16	N.A.
BAT (Dollars/Ton)	5.06	-0-	-0-	-0-	N.A.
Total (Dollars/Ton)	$17.28	$29.59	$ 6.90	$ 7.16	N.A.
Direct Annual Cost/Ship Ton at Full Capacity Utilization					
BPT (Dollars/Ton)	$ 9.96	$23.17	$ 5.90	$ 5.58	N.A.
BAT (Dollars/Ton)	3.97	-0-	-0-	-0-	N.A.
Total (Dollars/Ton)	$13.93	$23.17	$ 5.90	$ 5.58	N.A.
Overall Additional Costs/Ship Ton at 75% Capacity Utilization(1)	$17.28	$42.09	$19.40	$19.66	N.A.
Expected Price Increase Due to Pollution Control-Standard Specification Items (Percent)					
BPT-Import Alternative "A"(2)	0.3-0.5(3)	1.5-2.5	0.6-1.0	0.8-1.2	0.5-1.0
BPT-Import Alternative "B"(2)	0.2-0.4(3)	0.5-1.5	0.3-0.5	0.3-0.5	0.3-0.5
BPT plus BAT	0.5-0.8(3)	1.8-3.4	0.6-1.2	1.0-1.5	0.7-1.2
Plant Closures Anticipated (Number)	-0-	0-5	-0-	-0-	0-5
Percent Reduction in Segment Capacity Due to Closures	-0-	0-10	-0-	-0-	0-0.15
Employment					
Estimated Employment in Segment-1975	35,700	3,200	1,700	6,400	47,000
Projected Employment in Segment-1983	34,000	2,700	1,500	6,800	45,000
Employees Affected by Closures	-0-	0-500	-0-	-0-	0-500
Community Effects	None	Minor	None	None	Minor
Balance of Trade Effects					Minor(4)

Notes:
(1) Processors' overall costs include an indirect cost of $12.50 per ship ton resulting from projected price increases for semifinished product purchases.
(2) Import Alternative "A" assumes import quotas in effect between 1976 and 1980. Import Alternative "B" assumes unrestricted imports.
(3) Price increases for semifinished specialty steels.
(4) Maximum increase in trade deficit (or decrease in trade surplus) estimated at $35 to $40 million.

I - SPECIALTY STEEL INDUSTRY CHARACTERISTICS

A - INTRODUCTION

STATEMENT OF THE PROBLEM

The 1972 amendments to the Federal Water Pollution Control Act have required the Environmental Protection Agency (EPA) to establish effluent limitations for most major industries which are sources of water pollution. Studies are now under way to establish these limitations. These effluent limitations will apply to existing and new plants. At successive future dates, progressively more restrictive limitations will be imposed.

The Federal Water Pollution Control Act specified July 1977 as the date by which firms were to comply with effluent regulations requiring application of the "Best Practicable Control Technology Currently Available" BPCTCA (or BPT). July 1983 was the date specified for compliance with a more restrictive set of regulations requiring the application of the "Best Available Control Technology Economically Achieveable," BACTEA (or BAT). However, in view of the later-than-anticipated promulgation of these regulations, it appears that compliance with the BPT regulations will occur during the period between 1979 and 1981. Compliance with the BAT regulations will occur some time thereafter.

In support of the staff studies being conducted to comply with the requirements of the 1972 amendments to the Federal Water Pollution Control Act, EPA requested A. T. Kearney, Inc. to conduct a study of the economic impact associated with the adoption of proposed water effluent guidelines in selected segments of the steel industry.

SCOPE OF INDUSTRY COVERAGE

(a) Relationships to Other Studies

The steel industry was segmented by EPA into three major groupings for purposes of effluent limitations and economic analysis. The three groups consisted of:

1. Primary operations of integrated carbon steel producers.

2. Intermediate and finishing operations of carbon steel processors.

3. Primary, intermediate, and finishing operations associated with specialty steel producers and processors.

Operations associated with carbon steel products are covered under separate studies. Establishments covered in these studies are not included in the present study in order to eliminate duplication of impact.

(b) Scope of This Study

The scope of industry coverage in the body of this report includes stainless steel, tool steel and high alloy steel.

These industry segments are included in four 4-digit Standard Industrial Classification (SIC) industries defined by the Bureau of the Census as:

SIC 3312 - Blast Furnaces (Including Coke Ovens), Steel Works, and Rolling Mills

SIC 3315 - Steel Wire Drawing and Steel Nails and Spikes

SIC 3316 - Cold Rolled Steel Sheet, Strip and Bars

SIC 3317 - Steel Pipe and Tubes.

Though they were originally considered in the study scope this report does not include independent forgers of specialty steel.

(c) Study Results Previously Reported

Four additional SIC codes were included in the scope of the study. These are:

SIC 2819 - Industrial Inorganic Chemicals, Not Elsewhere Classified

SIC 3313 - Electrometallurgical Products

SIC 3324 - Steel Investment Foundries

SIC 3325 - Steel Foundries, Not Elsewhere Classified.

These codes cover such industries as are engaged in the manufacture of calcium carbide (SIC Code 2819), specialty ferro-alloys (SIC Code 3313), and high alloy steel foundry products (SIC Codes 3324 and 3325). These industries are essentially different from the specialty steels industry as defined above.

They possess different production processes and effluent problems. Therefore, these industries have been reported separately.

Reports have been submitted to EPA as follows:

- High Alloy Steel Foundry Industry was reported in "Study of Economic Impact of Costs of Water Pollution Abatement on Ferroalloy Manufacturing," Task Order No. 4 under BOA 68-01-1545 Phase II Report, dated March 1974.
- Specialty Ferroalloy and Calcium Carbide Industry reported in EPA 230/1-74-034 Phase II, December 1974. "Economic Analysis of Effluent Guidelines on the Electrolytically Produced Chromium, Manganese and Synthetic Manganese Dioxide Industries; and on the Calcium Carbide Industry."

(d) Product versus Industry Coverage

In all cases the establishments which produce the products covered in this study make up only a small portion of the establishments which fall into an individual SIC code. The breakdown in SIC Code 3312, the dominant segment in terms of shipments and employment, is typical. Of the 370 establishments included in this segment in the 1972 Census of Manufacturing, only 51 produce stainless, tool or high alloy steel, and only 25 produce one or more of these specialty steel categories as their primary operation.

(e) Scope Limitations

The scope of Kearney's impact study was further defined as follows:

1. Only "costs" to society were included in the study. Assessment of the health and welfare benefits associated with proposed water effluent guidelines was not included.

2. The technology required to achieve the proposed water effluent guidelines and the costs associated with this technology were provided to EPA by its technical contractors, Datagraphics, Inc. and Cyrus Wm. Rice. Evaluation of the validity and reliability of this technology and associated costs was not within the scope of this study and, therefore, was not performed by Kearney.

3. The study was concerned with an assessment during an impact period when the regulation would most likely become effective (the period until 1985). Impact considerations and long-run economic effects beyond this time frame, such as the introduction of dramatic new technologies, are not in the scope of this study.

4. Assessment of the cumulative impact of other environmental, health, energy, and economic regulatory programs of the federal, state and local governments was not included in the scope of this study. These factors are broadly accounted for in a baseline forecast. This study analyzes only the incremental impact of the proposed water effluent guidelines.

STUDY COST DATA

This study is based on assessing the economic impact, utilizing cost data provided by EPA through its contracts with Datagraphics, Inc. and Cyrus Wm. Rice. Plants not yet meeting proposed EPA effluent requirements were surveyed by these contractors. The costs used by Kearney in the impact analyses are those provided by EPA and are based solely on the Datagraphics, Inc. and Cyrus Wm. Rice studies.

METHOD OF APPROACH

The investigations reported herein began in late 1973. A report, based on cost data provided by EPA in December 1973, was written in March 1974. The original cost data underwent extensive modification. Final cost data necessary to assess economic impact were not available until December 1975. Significant data required for analysis have been updated since the original study effort.

The study was conducted in two parts. The first part describes the overall industry in terms of operating characteristics, markets, financial factors and geographic location. Major industry segments are defined in terms of size and production processes. Financial statistics of firms in the industry are organized to form company profiles. These profiles are designed to assist in determining whether plants can remain viable and profitable, and to aid in assessing the financial impact of compliance with the proposed effluent guidelines. Finally, a methodology for assessing economic impact is developed for use in the second part of the study.

The steps taken to complete the first part included:

1. Published data and information from previous studies, trade journals, government documents and Kearney files were collected and analyzed.

2. Representatives of the following agencies and organizations were interviewed for purposes of developing additional industry information:

(a) Environmental Protection Agency.

(b) Datagraphics, Inc.

(c) Cyrus Wm. Rice.

(d) American Iron and Steel Institute.

(e) Wire Association.

(f) Welded Steel Tube Institute.

(g) Ferroalloys Association.

(h) Steel Founders' Society of America.

(i) Steel Service Center Institute.

(j) Federal Trade Commission.

3. Additional information was furnished by selected specialty steel industry executives.

4. Specialty steel establishments were visited and new data collected to supplement the initial data base and gain a broad understanding of operating characteristics of the various specialty steel production processes. This understanding facilitated the assessment of the effects of water control on individual establishments and on the industry as a whole.

5. A financial data base was established. Dun and

Bradstreet reports were used and were supplemented with other data, including the Securities and Exchange Commission Schedule 10K reports, annual reports and plant interviews.

6. Representatives of EPA and Kearney met to discuss a draft report of the first part of this study and the costs used in the impact analysis.

The second part of the study develops a methodology for economic impact analysis. The methodology is then used to determine the potential effects on the industry of compliance with the proposed effluent guidelines. Alternative scenarios were developed and used to project potential price and volume changes expected to result from compliance. From this analysis, production curtailment, employment effects and secondary effects are determined where applicable.

The steps taken to complete this second part of the study were as follows:

1. Various sources of industry financial information were reviewed to determine the industry's ability to support large capital expenditures and to absorb higher operating costs.

2. Cost data for pollution abatement were obtained from EPA and the information was evaluated to determine its applicability to the segments established in the first part of the study.

3. The proposed guidelines were applied to assess differences in the magnitude of impact on industry segments.

4. Financial institutions, insurance companies, and brokerage houses were contacted for information concerning the financing of capital equipment for pollution abatement. Where pertinent, this information was used in the financial analysis.

5. Based on the data collected, impact assessments were developed by size of establishments in the impacted segments.

6. This report was prepared to cover the findings in both parts of the study.

Sources of data used in this study are presented in Exhibit I-1.* A list of contacts for other information utilized in this study is shown in Exhibit I-2.

REPORT ORGANIZATION

The structures and characteristics of the stainless steel, tool steel, and high alloy steel markets are such that they may be grouped together into one industry segment, referred to in this report as the "Specialty Steel Industry." Industry structure, market characteristics, cost data and economic impact are

* All exhibits appear at the end of the chapter in which they are referenced.

classified within this segment by specialty steel industry category, establishment size, product form type and, where appropriate, plant SIC code.

As indicated previously, the high alloy steel foundry, specialty ferroalloy and calcium carbide industries are essentially different industries and relatively minor in terms of tonnage, value of shipments, number of plants and employment.

B - SEGMENTATION OF THE INDUSTRY

The specialty steel industry is segmented along several different lines which are applicable to the assessment of economic impact developed in this study. The following distinctions are of particular importance in classifying specialty steel products and processes:

- Specialty Steel Product Definitions
- Definition of Specialty Steel Industry Establishments
- Industry Structure.

SPECIALTY STEEL PRODUCT DEFINITIONS

For present purposes, specialty steel products are classified as follows:

1. Stainless Steel. The term "stainless" is applied to any steel grade that is alloyed with sufficient chromium or chromium-nickel to significantly resist corrosion or oxidation. The addition of these materials to alloys of ircn and carbon reduces susceptibility to such conditions as rust when exposed to moisture. The dividing line between "stainless" and "low alloy" steel is generally taken to be 4% chromium.

The American Iron and Steel Institute (AISI) classifications distinguish between stainless and heat resisting steels, since stainless steels are not necessarily high temperature resistant. In this study heat resisting steels are included in the stainless steel classification. The inclusion of these steels has no significant effect on the analysis of economic impact because the shipment tonnages of heat resisting steel are minor relative to those for stainless steels. Heat resisting steels accounted for less than 2% of the combined stainless and heat resisting tonnage shipped during the 1971-1974 period, and in 1973 amounted to less than 1% of this total.

2. Tool Steel. Tool steels are generally defined as any steel used to cut, form or otherwise change the shape of materials to adapt them to a definite use. They may be classified as follows:

(a) High speed steels.

(b) Hot work steels.

(c) Shock resisting steels.

(d) Cold work steels.

(e) Special purpose tool steel.

3. High Alloy Steel (including the super-alloys). High alloy steel is defined in this study as any steel which contains alloying additions in excess of 5% of total content. Because they are frequently produced by the same facilities used to produce high alloy steel, super-alloys have been included in the high alloy steel statistics in this report. However, many of the super-alloys contain little, if any, iron, and therefore are not properly classified as "steel." The super-alloys are divided into five principal groups:

(a) Nickel-Base.

(b) Iron-Nickel-Base.

(c) Cobalt-Base.

(d) Molybdenum-Base.

(e) Titanium-Base.

Each group contains other alloying elements which are added to impart specific physical properties.

Most statistics pertaining to "alloy" steels refer to that class of steels encompassed by the following AISI definition:

> "'By common custom steel is considered to be alloy steel when the maximum of the range given for the content of alloying elements exceeds one or more of the following limits; manganese, 1.65%; silicon, 0.60%; copper, 0.60%; or in which a definite range or a definite minimum quantity of any of the following elements is specified or required within the limits of the recognized field of constructional alloy steels: aluminum, chromium up to 3.99%, cobalt, columbium, molybdenum, nickel, titanium, tungsten, vanadium, zirconium, or any other alloying element added to obtain a desired alloying effect.' It may be noted that steels that contain 4.00% or more of chromium are included by convention among the special types of alloy steels known as stainless steels."

This definition covers approximately 10.2 million tons, not including stainless and heat resisting steels, or about 9.3% of the total 1974 net shipments reported by AISI. The alloy steel referred to in this study is a small fraction of this 10.2-million-ton total. This study does not include high strength low alloy steel (HSLA), as this class of steels, though accounting for a large fraction of the reported total alloy steel tonnage, does not contain alloying additives in excess of 5%.

DEFINITION OF SPECIALTY STEEL INDUSTRY ESTABLISHMENTS

Specialty steel establishments (1) are defined here as separately operated establishments where the manufacture or processing (conversion) of stainless, tool and high alloy steel (in any combination) accounts for more than 50% of the total plant production. This report's analysis is focused on this group of establishments; however, the study does contain some information and observations about other establishments which produce specialty steels.

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(1) Establishment as defined by the Standard Industrial Classification Manual is:

"An economic unit, generally at a single physical location where business is conducted or where services or industrial operations are performed. (For example: a factory, mill, or store.)"

"Where distinct and separate economic activities are performed at a single physical location (such as construction activities operated out of the same physical location as a lumber yard), each activity should be treated as a separate establishment wherever (1) no one industry description in the classification includes such combined activities; (2) the employment in each such economic activity is significant; and (3) reports can be prepared on the number of employees, their wages and salaries, sales or receipts, and other establishment type data..."

"An establishment is not necessarily identical with the enterprise or company which may consist of one or more establishments. Also, it is to be distinguished from sub-units, departments or divisions. Supplemental interpretations of the definition of an establishment are included in the industry descriptions of the Standard Industrial Classification where appropriate."

Establishments whose primary activity is the production or conversion of carbon steel have been covered in separate EPA reports and are excluded from this study. This study also excludes forging establishments except where specialty steel comprises more than 50% of total plant production, and processes are utilized which are covered in this investigation.

INDUSTRY STRUCTURE

Judged by the size of operations and revenues, the specialty steel industry is composed mainly of relatively small companies. Several major steel companies make specialty steels, but their output accounts for no more than one-third of the specialty steel industry's tonnage shipments.

Exhibit I-3 provides a complete listing of establishments engaged in specialty steel production, citing plant location, categories of specialty steel produced, and product form type. Those establishments for which specialty steel accounts for over 50% of production, and which were included in the economic impact study, are listed separately from the remaining establishments. Exhibit I-4 summarizes the total numbers of establishments in each product category and form type group, and the numbers of establishments where specialty steel accounts for more than 50% of output (and which, therefore, are the focus of this study).

(a) Integrated Producers

Integrated producers are included in SIC Code 3312. These companies may be grouped into three classifications as follows:

1. Eight of the nation's major carbon steel companies also participate in specialty steel operations in varying degrees. Specialty steel accounts for only a minor part of this group's total steel production. These companies, including those who have no establishments for which specialty steel comprises over 50% of total plant production, are listed with their product specialization, in Table I-1 below:

Table I-1

Major Steel Companies Participating in the Specialty Steel Industry

Company	Types of Specialty Steel
Armco Steel Corp.	Stainless and High Alloy
Bethlehem Steel Corp.	Tool
Jones & Laughlin Steel Corp.	Stainless
McLouth Steel Co.	Stainless
Republic Steel Corp.	Stainless and High Alloy
Sharon Steel Corp.	Stainless
Timken Company	Stainless
United States Steel Corp.	Stainless

2. A second group of companies consists of relatively large, diversified producers, whose major business is specialty steels. These companies produce and convert a wide range of stainless, tool and high alloy products.

3. A third group includes integrated steel producers who concentrate on particular specialty steel categories or product form types. Among those included in this group are producers who manufacture stainless steel of all or most product form types,

producers who manufacture stainless, tool and high alloy bars, and producers who manufacture only stainless steel plate.

A list of integrated producer establishments where specialty steel accounts for over 50% of total production (and which are included in the economic impact analysis), citing plant locations, size, employment, categories of specialty steel produced, type of primary production and product form types, appears in Exhibit I-5.

(b) Firms Which Purchase Semi-Finished Specialty Steel and Convert

In addition to integrated producers, the specialty steel industry includes firms which purchase semi-finished specialty steels and which roll, draw, fabricate, or otherwise convert or finish these materials.

These establishments[2] may be grouped into three segments by type of product form produced:

1. Specialty Steel Wire Processors. These processors, who are included in SIC Code 3315, purchase steel in wire rod form from domestic or foreign integrated producers for conversion into wire for end-use or for further processing by others. They are

(2) All further industry descriptions (and the economic impact analysis) associated with firms which purchase semi-finished specialty steel and convert apply to stainless steel. All 62 of the converting establishments where specialty steel accounts for over 50% of total plant production process stainless steel. No establishment processes tool steel only.

converters and do not melt or hot roll specialty steel. Those specific establishments of large integrated steel companies which convert specialty steel into wire for end use, but do not melt or hot roll steel, are included in this group.

2. Specialty Steel Cold Rolled Sheet, Strip and Bar Processors. These nonintegrated processors, who are included in SIC Code 3316, purchase semi-finished specialty steel and cold roll sheet and strip or cold finish bars. As with the wire processors, some of the establishments in this group are specific plants of integrated companies which process, but do not melt or hot roll, specialty steel.

3. Specialty Steel Pipe and Tube Processors. These processors, who are included in SIC Code 3317, purchase tube rounds, hollows or skelp from integrated specialty steel producers and convert them into pipe and tubing. They are nonintegrated in that they do not melt or hot roll steel, although they may hot pierce or hot extrude prior to subsequent cold finishing.

A list of establishments which convert semi-finished specialty steel for end-use or for further processing appears in Exhibit I-6. Only those plants are listed in which specialty steel products account for over 50% of production, and which are, therefore, the focus of this study. The establishments are grouped by major product form type, and approximate employment figures are provided for each plant.

C - SPECIALTY STEEL MARKET AND INDUSTRY CHARACTERISTICS

INTRODUCTION

This section discusses market characteristics of the specialty steel industry and provides available market data relevant to the economic impact analysis. The discussion is organized under the following subject headings:

- Market Demand
- Market Segmentation
- Principal Markets
- Channels of Distribution
- Industry Size
- Product Line Offering
- Employment
- Foreign Trade.

MARKET DEMAND

(a) General Demand Factors

Demand for specialty steels is generated by technical or decorative applications requiring the physical and chemical properties inherent in stainless, tool and high alloy steels. Among the most important of such properties provided by various grades of specialty steel are the following:

- Corrosion resistance.
- Heat and cold resistance.
- Wear and abrasion resistance.

- Shock and impact resistance.
- Hardness, red hardness, and depth of hardness.
- Nondeforming qualities.
- High stress resistance at extreme temperatures.
- High strength.
- Toughness at low temperatures.
- Cleanability.
- Retention of purity of materials in contact.
- Lowered maintenance costs.
- Long product life.
- Decorative qualities.

Typical customer product applications require specific specialty steel form types and grade numbers. Economically feasible substitutes for these specialty steel products are generally unavailable under present technology.

As specialty steels are almost exclusively used as an input in the manufacture of other, more highly processed, products, rather than for their own final consumption value, the demand for specialty steels is derived from other, more fundamental product demands. In most cases, specialty steel inputs account for a relatively small fraction of the total production costs of end-use products containing them. The customers of the specialty steel industry as a whole include the construction industry as well as a broad spectrum of hard goods and capital goods manufacturers.

Domestic demand for stainless and tool steels is satisfied by both domestic and foreign producers, and import competition has had a significant impact on the industry.

(b) <u>Product Applications</u>

The following paragraphs summarize the key functional characteristics of the three categories of specialty steel.

1. <u>Stainless Steel</u>. Principal applications for stainless steel products are in areas where the following characteristics are desirable:

- Corrosion resistance.
- Retention of purity of materials in contact.
- High tensile strength to weight ratios.
- Toughness at low temperatures.
- Cleanability.
- Lowered maintenance costs.
- Long product life.
- Decorative qualities.

2. <u>Tool Steel</u>. Tool steel is used to cut, form, blank, shape and forge other materials. Principal applications include:

(a) Applications requiring long life at relatively high operating temperatures (such as for heavy cuts in high speed machining).

(b) Finishing operations in which extreme wear resistance and the ability to retain a smooth cutting edge on light cuts is necessary.

(c) Applications requiring high resistance both to wear or abrasion and to shock or impact.

3. High Alloy Steel. High alloy steel and the super-alloy steels have been developed to withstand the combination of extreme temperatures and high stress. About 100 grades have been developed for special applications such as jet engine parts, gas turbine parts, critical nuclear and missile parts, and aerospace structural members and skins.

(c) Potential Substitutes

Efforts to find suitable substitutes for stainless steel and tool steel have been going on for a long time. The specialty steels are expensive to buy and work and they are generally purchased as a last resort to satisfy specific material requirements.

1. Stainless Steel. The chromium and nickel content which gives stainless steel its distinctive properties also makes it a relatively expensive material. A number of less satisfactory substitutes are available for various specific applications. Chief among these substitutes are aluminum, chrome or nickel plated steel or brass, and plastics. These materials, however, are not necessarily appropriate to the same applications. Glass, wood and surface coatings may be used in place of stainless steel in a limited number of cases. Overall, stainless steel is frequently preferred to potential substitutes despite a

substantial cost disadvantage, and its usage continues to grow.

Moreover, in some applications there are presently no viable substitutes for stainless steel. In other cases (e.g., stainless steel used in food processing equipment) legal requirements dictate the continued use of stainless steel over possible substitute materials.

2. Tool Steel. High alloy content and high labor intensity in production make tool steels relatively expensive. There has been a long history of research efforts devoted to finding cheaper substitutes for tool steel. Shortages of nickel, vanadium, tungsten and other alloying elements during World War II caused certain grades to be changed and others to be eliminated. Lower production rates and increased fabrication costs often resulted. Carburizing of carbon or alloy steel or hard surface plating are substitutes for tool steel in certain applications. Carbide cutting tools, which contain many of the ingredients of tool steel in a different form, have gradually been substituted for high speed tool steel during the last 30 years. In recent years ceramic tools have also been used. Few other substitutes exist for tool steel in most applications, and in many cases there are no viable substitutes.

3. High Alloy Steel. High alloy steel and the superalloys are fairly new products brought about by the growth of the aerospace industry. High alloy steel is very high priced because it contains large proportions of expensive additive agents

and is unusually difficult to forge, machine or weld. However, when high alloy steel properties are required, there are generally no substitutes. Occasionally, the super-alloys, which are no true "steels" but are made by specialty steel producers, are used in place of high alloy steels.

MARKET SEGMENTATION

The manufacture of specialty steels may be segmented by the category of steel produced, while converting operations may be classified by product form type. The major categories of specialty steels are:

- Stainless Steel.
- Tool Steel.
- High Alloy Steel (including the super-alloys).

Many grades of steel exist within each category of specialty steels. A grade encompasses steel of a specific metallurgical analysis produced by alloying iron with other elements whose weight concentrations are controlled within specified limits. The grades are generally referred to by a standard AISI grade number. Users expect steel of a specific grade to possess the analysis and all properties associated with the grade, regardless of the producer from whom it is purchased.

Principal product form types include:

- Ingots.
- Blooms, billets, slabs.

- Plate, sheet, strip.
- Bar.
- Rods, wire rods, wire.
- Pipe, tubing.

Product form types are available in numerous lengths, widths, diameters and gauges. There is little differentiation among specialty steels of the same category, grade, product form type, length, width and gauge. Comparable products of different producers may be viewed as interchangeable.

The net ton is used by the specialty steel industry as a measure of product quantity. However, the industry responds to many orders for quantities of specialty steels amounting to a few hundred pounds or less, a practice which is unusual in the high tonnage carbon steel industry.

PRINCIPAL MARKETS

The principal markets for each of the three major specialty steel categories are presented as follows.

(a) Stainless Steel

Table I-2 summarizes the market distribution of stainless steel producers' tonnage shipments in 1970, 1972 and 1974. Exhibit I-7 presents actual stainless steel tonnages shipped by product form type for 1970 through 1974.

Table I-2

Estimated Market Distribution of Net Total Domestic Shipments of Stainless Steel Producers

Market	Percent of Tonnage Shipped 1970	1972	1974
Automotive	11.8%	14.4%	12.9%
Machinery, Industrial Equipment, and Tools	11.3	10.1	10.7
Non-Electric	8.0	7.3	8.7
Electrical	3.2	2.7	2.0
Domestic and Commercial Applications	9.2	10.8	7.8
Appliances, Utensils and Cutlery	6.6	7.2	4.9
Equipment	2.6	3.5	3.0
Construction, Maintenance, and Contractors' Products	4.0	5.4	4.5
Industrial Fasteners	2.1	2.1	2.1
Forgings	2.0	1.9	1.9
Aircraft and Aerospace, Rail Transport, and Marine	2.5	1.2	1.3
Other End-Use Markets	4.8	6.1	7.0
Total End-Use Markets	47.6%	51.9%	48.2%
Steel Service Centers and Distributors	41.5	40.4	43.0
Steel for Converting and Processing	10.9	7.7	8.9
Total	100.0%	100.0%	100.0%

Source: Exhibit I-7.

As indicated in Table I-2, roughly 10% of producers' shipments consist of steel for further processing and converting, and an additional 40% of shipments go to steel service centers and distributors. These service centers and warehouse distributors resell stainless steel, frequently for further conversion and fabrication into end products. Thus, only about half of stainless producers' shipments are direct to end-use markets.

Table I-2 indicates a tendency of producers' shipments direct to end-users--particularly in the automotive, domestic and commercial, and construction markets--to form a significantly larger fraction of total shipments in years of expanding business activity (such as 1972) than in years of recession (such as 1970 and 1974). The table also shows the decline in importance of the aerospace, rail, and marine transportation markets for specialty steels in the early 1970's, and a corresponding increase in the importance of "other," fragmented end-use markets.

While recent statistics on the market distribution of steel service centers' stainless shipments are apparently unavailable, the Steel Service Center Institute of Cleveland, Ohio conducted a 1969 survey of its members' specialty steel markets. The results of this survey, for broad customer categories, are presented in Table I-3. They are also combined with the distribution of direct shipments of stainless steel producers to end-users in 1970 to provide a rough composite of the end-use distribution of about 90% of stainless steel tonnage shipments.

Table I-3

Estimated Composite End-Use Distribution of Stainless Steel Products by Markets, 1969-1970

Market Group	Percent of Producers' Direct Tonnage Shipments(1)	Percent of Service Center Tonnage Shipments(2)	Percent of Composite End-Use Tonnage Shipments(3)
Machinery, Equipment, and Tools	23.5%	32%	26.5%
Automotive	25.0	N/A(4)	13.5(4)
Domestic and Commercial Equipment	5.5	18	11.5
Construction and Contractors' Equipment	8.5	14	11.0
Appliances, Utensils, and Cutlery	14.0	7	11.0
Shipbuilding and Marine Equipment	0.5	5	2.5
Aircraft and Aerospace	1.5	4	2.5
Other	22.0	20	21.5(4)
Total	100.0%	100%	100.0%

Notes: (1) Based upon Table I-2 and Exhibit I-7, AISI data for 1970. Direct shipments to end-users comprised 47.6% of all stainless steel shipments in 1970.

(2) Steel Service Center Institute figures for 1969. Shipments from stainless steel producers to steel service centers comprised 41.5% of all stainless steel shipments.

(3) Based upon 89.1% of stainless steel producers' 1970 shipments which were either to service centers or direct to end-users. Estimates involve mingling of 1969 and 1970 data.

(4) Shipments to the automotive industry are probably greater, and shipments to other end-users lower, than the figures cited, since separate figures for service center shipments to the automotive industry were unavailable.

Sources: Exhibit I-7; and Steel Service Center Institute.

(b) Tool Steel

Table I-4 below summarizes the percentage distribution of reported tool steel shipments by market for 1970, 1972 and 1974. Exhibit I-8 presents tool steel tonnage shipments by market during the years 1970 through 1974. It is estimated that over 50% of total tool steel shipments are bars. The majority of the remaining shipments are in rods or wire form. A very small amount of plate, sheet and strip is shipped.

Table I-4

Estimated Market Distribution of Total Shipments of Tool Steel Producers, 1970, 1972 and 1974

Market	Percent of Tonnage Shipped 1970	1972	1974
Steel Service Centers and Distributors	20.8%	19.8%	20.3%
Machinery, Industrial Equipment and Tools	13.2	11.1	13.2
Forgings	3.7	3.4	2.1
Construction and Maintenance	0.7	0.7	0.9
Other and Unclassified	61.6	65.0	63.5
Total	100.0%	100.0%	100.0%

Source: Exhibit I-8.

The majority of tool steel shipments are not classified by market destination. Moreover, the shipments to steel service centers may not be viewed as end-use shipments, as these centers normally resell tool steel for further conversion and fabrication. Roughly 75%-80% of tool steel shipments, for which end-use is reported, is to manufacturers of industrial machinery, equipment and tools. Tool steel industry sources indicate these industrial markets also absorb the great bulk of unclassified shipments. The automotive industry is said to account for about 20% of the end-use market for tool steel.

(c) High Alloy Steel

A detailed classification of high alloy steel shipments by principal end-use market is not available. However, the major high alloy steel markets are manufacturers of chemical processing machinery, petroleum processing machinery, electric power generation equipment (including nuclear), high temperature heating equipment, and aerospace equipment. Exhibit I-9 presents actual high alloy steel shipments by product form type (but not by market) for the years 1971, 1972 and 1973.

CHANNELS OF DISTRIBUTION

Most specialty steel reaches end-use markets either through direct shipments from integrated producers and processors of semi-finished steels or through resale from steel service centers and warehouse distributors. As is indicated in Tables I-3 and I-4, steel service centers and distributors account for approximately 40% of stainless steel tonnage shipments and about 20% of tool steel tonnage. Service centers account for roughly equivalent proportions of dollar sales for each of these specialty steel categories. The role of steel service centers in distributing high alloy steel products is far smaller. Kearney estimates that sales of service centers and warehouses account for less than 10% of the high alloy steel total.

Far more specialty steel is sold indirectly through steel service centers and distributors than to any individual end-use market.

INDUSTRY SIZE

(a) Tonnage and Value of Shipments

Sales and shipments of the specialty steel industry are markedly cyclical. The duration and timing of specialty steel cycles generally correspond to those of the steel industry as a whole, but the amplitude of the fluctuations is much more pronounced for specialty steels. On average, during the period since 1965, specialty steel shipments comprise about 1% of total steel industry tonnage shipments, but account for 7% to 10% of the total dollar value of steel industry shipments. Kearney estimates the value of stainless steel shipments in 1974 at about $2.2 billion, up from about $1.5 billion in 1973. The value of tool steel shipments in 1974 was estimated at about $300 million, compared with $240 million in 1973.

Table I-5 summarizes specialty steel tonnage shipments in relation to the steel industry as a whole during the past several years. More detailed information on shipments is provided in Exhibits I-1, I-8 and I-9.

Table I-5

Shipments of Specialty Steel by Grade in Relation to Total Steel Industry Shipments, 1964-1975

Year	Total Steel Industry (000 Net Tons)	Stainless Steel		Tool Steel		High Alloy Steel	
		000 Net Tons	Percent of Total	000 Net Tons	Percent of Total	000 Net Tons	Percent of Total
1964	8[illegible],945	771	0.9%	102	0.1%	N/A	
1966	89,995	933	1.0	121	0.1	N/A	
1968	91,856	819	0.9	106	0.1	N/A	
1970	90,798	709	0.8	88	0.1	N/A	
1972	91,805	855	0.9	90	0.1	49.8	0.05%
1973	111,430	1,134	1.0	111	0.1	64.6(2)	0.06
1974	109,472	1,345	1.2	113	0.1		
1975(1)	80,597	753	0.9	70	0.1		

Notes: (1) First 11 months at annual rate.
(2) Kearney estimate.

Sources: Exhibits I-7, I-8 and I-9; and AISI Annual Statistical Reports.

(b) Number of Establishments

Kearney identified 160 establishments which produce or convert (process) specialty steel. As had been noted previously, only those specialty steel establishments where stainless, tool and high alloy steel operations account for more than 50% of the total plant production are the focus of the analysis of this report. Kearney has identified 87 establishments satisfying this criterion. Table I-6 summarizes the number of specialty steel establishments identified by major type. A more detailed breakdown of the number of specialty steel establishments by level of integration, and by grades of steel and product form types produced is provided in Exhibit I-4.

Table I-6

Number of Specialty Steel Establishments by Major Type

Type of Establishment	Number of Establishments: All Identified Establishments	Number of Establishments: Plants Where Specialty Steel Operations Account for Over 50% of Production
Integrated Producers		
Flat Rolled Product Plants		8
Section Product Plants		17
Subtotal	51	25
Firms Which Purchase Semi-Finished Specialty Steel and Convert		
Cold Rolled Sheet, Strip and Bar Processors	37	6
Wire Processors	18	14
Pipe and Tube Processors	53	42
Subtotal	108	62
Total	159	87

Sources: Exhibits I-3 and I-4.

Roughly half the integrated producer establishments are primarily engaged in specialty steel production. About three-quarters of the wire processors and a somewhat higher proportion of pipe and tube processing establishments are primarily oriented towards specialty steels. However, most of the cold rolled sheet, strip and bar processors produce only small amounts of high alloy steel, and in only about one-sixth of these establishments does specialty steel output account for over 50% of plant production.

The integrated establishments primarily engaged in specialty steel production were further segmented by size for purpose of economic impact analysis. Of the flat rolled product plants, three were considered large (producing over 100,000 tons per year), while four were considered small (producing less than 100,000 tons per year). Of the section product plants, seven were large (over 100,000 tons per year), four were medium-sized (20,000-100,000 tons per year), and seven were small (less than 20,000 tons per year). A listing of the integrated producer establishments included in each size category appears in Exhibit I-5.

PRODUCT LINE OFFERING

Specialty steel establishments vary considerably in the variety of product line offered. In general, establishments which purchase specialty steel and convert furnish only one or two product forms in a single steel grade (stainless steel for wire and for pipe and tube processors, and stainless or alloy steel for cold rolled sheet, strip and bar processors). Integrated establishments, however, frequently produce several forms of steel, and nearly half of these establishments produce more than one specialty steel grade.

Table I-7 summarizes the specialty steel grade mix of the integrated producers. Exhibit I-4 provides a more complete enumeration of integrated and other establishments producing each of various combinations of product form and grade.

Table I-7

Number of Integrated Specialty Steel Establishments by Categories of Specialty Steel Produced

Categories Produced	All Identified Establishments	Plants Where Specialty Steel Operations Account for Over 50% of Production
All Three Specialty Grades	9	5
Two Grades Only	14(1)	9(1)
Stainless Steel Only	20	6
Tool or High Alloy Steel Only	8	5
Total	51	25

Note: (1) Only one of these establishments does not produce stainless steel.

Source: Exhibit I-4.

EMPLOYMENT

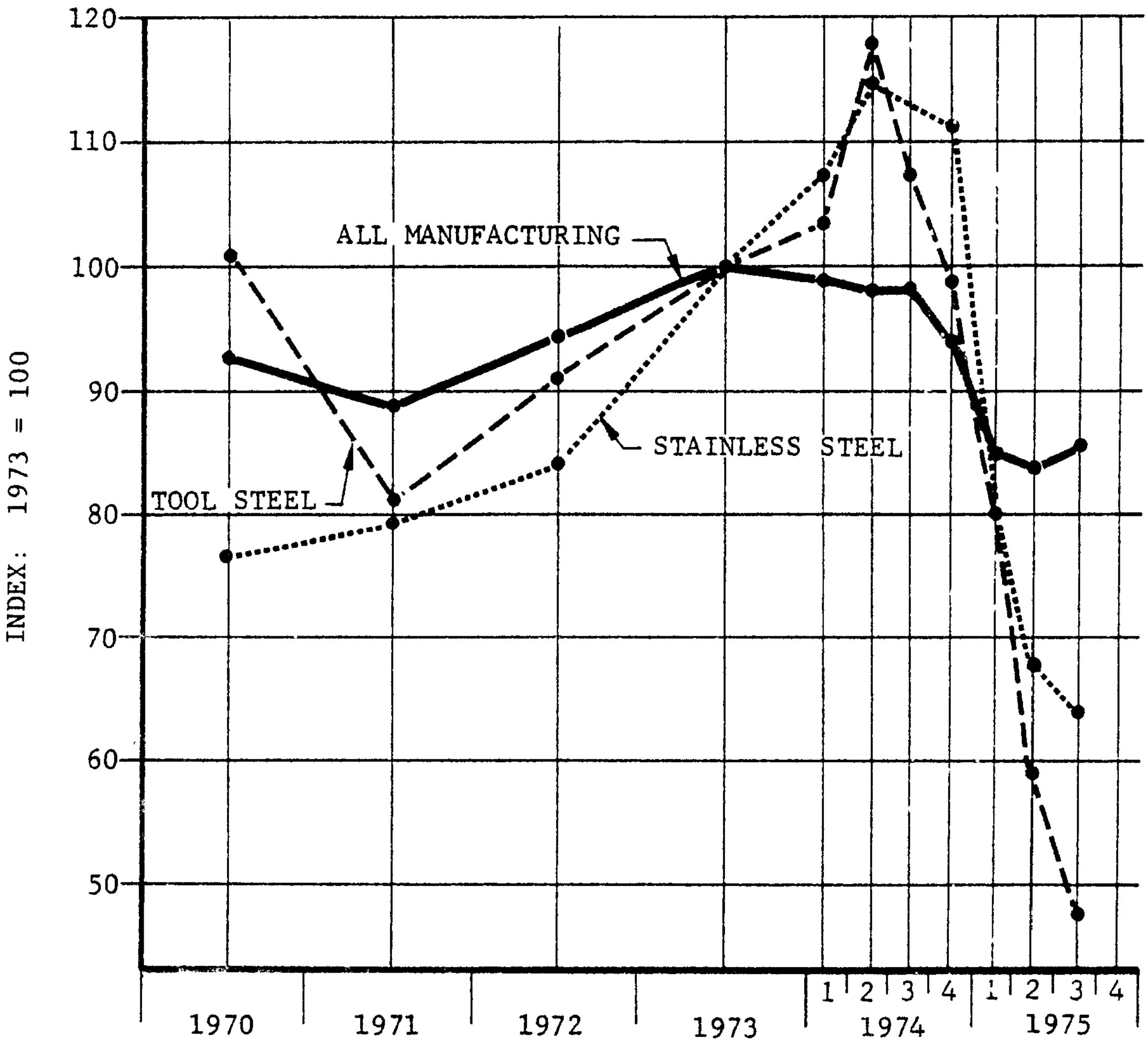
Total employment in U.S. specialty steel operations has been estimated at about 65,000 during recent periods of efficient capacity utilization, as in 1973 and early 1974. The establishments identified by Kearney as being primarily engaged in specialty steel production employ about 45,000 of these workers. Of this number, roughly 25,000, or 55%, are employed by the ten large integrated producer establishments, and an additional 9,000, or 20%, are employed at other integrated plants. The 62 establishments identified by Kearney as being primarily engaged in processing and converting semi-finished specialty steel account for only about 11,000, or 25% of the 45,000 employees. Wire processors employed about 3,000 of these workers, pipe and tube processors employed 6,000, and cold rolled sheet, strip and bar processors employed less than 2,000. Exhibits I-5 and I-6 give approximate employment figures for each of the establishments primarily engaged in specialty steel operations.

Specialty steel operations are highly labor intensive in relation to the steel industry in general. In 1974, approximately 25 tons of specialty steel were shipped for each employee, while the steel industry as a whole shipped over 200 tons of product per employee. In terms of value of shipments, specialty steels accounted for slightly more than 10% of the steel industry total in 1974, while accounting for over 12% of steel industry employment. Moreover, tool steel production tends to be less automated than carbon steel operations, and requires an average level of employee skill higher than the steel industry as a whole.

The highly cyclical nature of specialty steel production is reflected in industry employment figures as well as in industry shipments. The impact of the 1974-1975 recession is evidenced by a 27% reduction in employment at 12 representative specialty steel companies (accounting for about 35% of specialty steel employment) between July 1974 and July 1975. This compares with a 15% reduction in payroll employment in primary metals industries and a 10.5% reduction in total manufacturing payroll employment during the same period. Employment of production workers at these specialty steel companies declined more than 31% over this 12-month period, compared with a 17.4% decline in employment of production workers in primary metals industries and a 13% decline in all manufacturing. Total man-hours worked at specialty steel companies surveyed in connection with the industry's petition for relief to the U.S. International Trade Commission declined an even more pronounced 45% between the third quarter of 1974 and the third quarter of 1975.

Figure I-1

Cyclical Trends in Man-Hours Worked by Production and Related Workers - Stainless Steel, Tool Steel and All Manufacturing Industries



Sources: J. K. Lasser Survey, reported in Testimony to U.S. International Trade Commission, re: Specialty Steel; and U.S. Department of Commerce Survey of Current Business

FOREIGN TRADE

In recent years, foreign trade has been a major factor in the domestic specialty steel market. The Tool and Stainless Steel Industry Committee, comprised of companies accounting for about 75% of domestic specialty steel production, petitioned the U.S. International Trade Commission in June 1975 for relief from import competition. The Committee contended this competition was inflicting major injury on U.S. producers and their employees.

(a) General Environment

Until about 15 years ago, imports were only a minor factor in domestic steel markets. As the world's largest and most diversified producer of mill products, the United States was a consistent and substantial net exporter of steel from the beginning of the century until 1959. At about that time steel production in a number of foreign countries began to exceed these nations' domestic and traditional export requirements. This expanding foreign supply, made competitive by hourly labor costs far lower than those in the United States and the overvaluation of the U.S. dollar in foreign exchange, brought about a shift in the U.S. position from a net exporter of steel to a net importer.

Between 1958 and 1964 steel imports to this country rose from two million tons to 7.7 million, and a further increase to 19.5 million tons was posted by 1968. Since 1968, steel imports have generally fallen in the range of 15 to 20 million tons annually, equalling 16% to 22% of domestic producers' shipments. Export shipments of U.S. producers have also risen during this period, but by a far smaller amount, averaging about 5.5 million tons annually in the early 1970's, compared with an average of 3.1 million tons in the mid-1960's. Steel is an important negative item in the U.S. balance of trade. The U.S. has experienced a steel trade deficit in each year since 1965, and in 1974, this deficit totalled nearly $3 billion.

(b) Overall Specialty Steel Balance of Trade

Approximately 90% of identifiable specialty steel product imports are stainless steels; the remaining 10% are tool steels. Little high alloy steel is imported. Imports of stainless and tool steels are believed to have significant effects on the overall level of shipments of domestic producers. A large increase in the average level of specialty steel imports to this country during the years from about 1964 to 1972 appears to have been a major cause of stagnation in domestic producers' shipment levels over that time period.

Figure I-2 on the following page illustrates the rapid rise in stainless steel imports during the late 1960's, both in tonnage terms and as a percent of apparent domestic consumption. Figure I-3 illustrates the rising importance of tool steel imports as a fraction of apparent U.S. consumption tonnage. Exhibits I-10 and I-11 provide annual tonnage statistics of

Figure I-2

Stainless Steel Imports

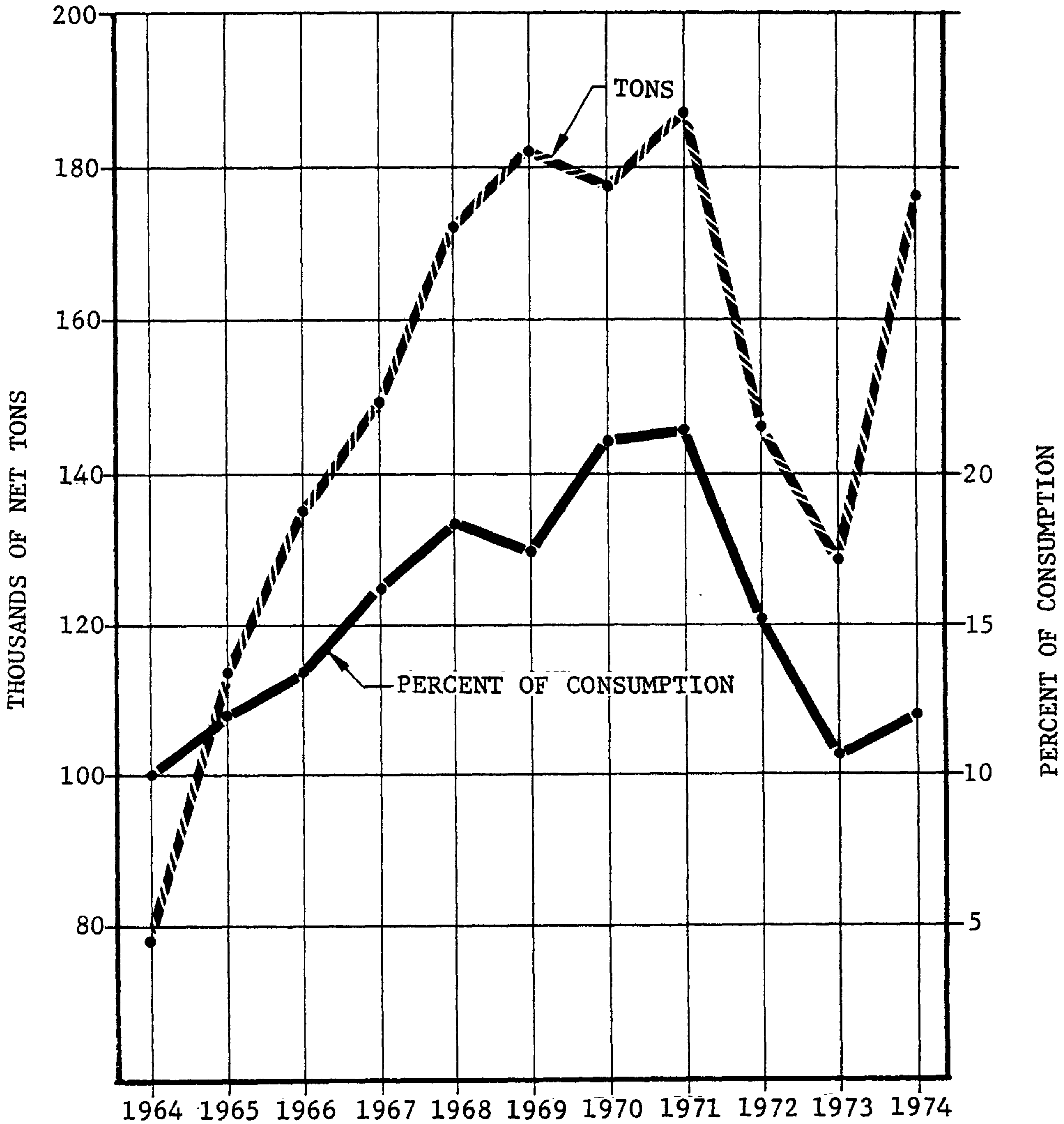
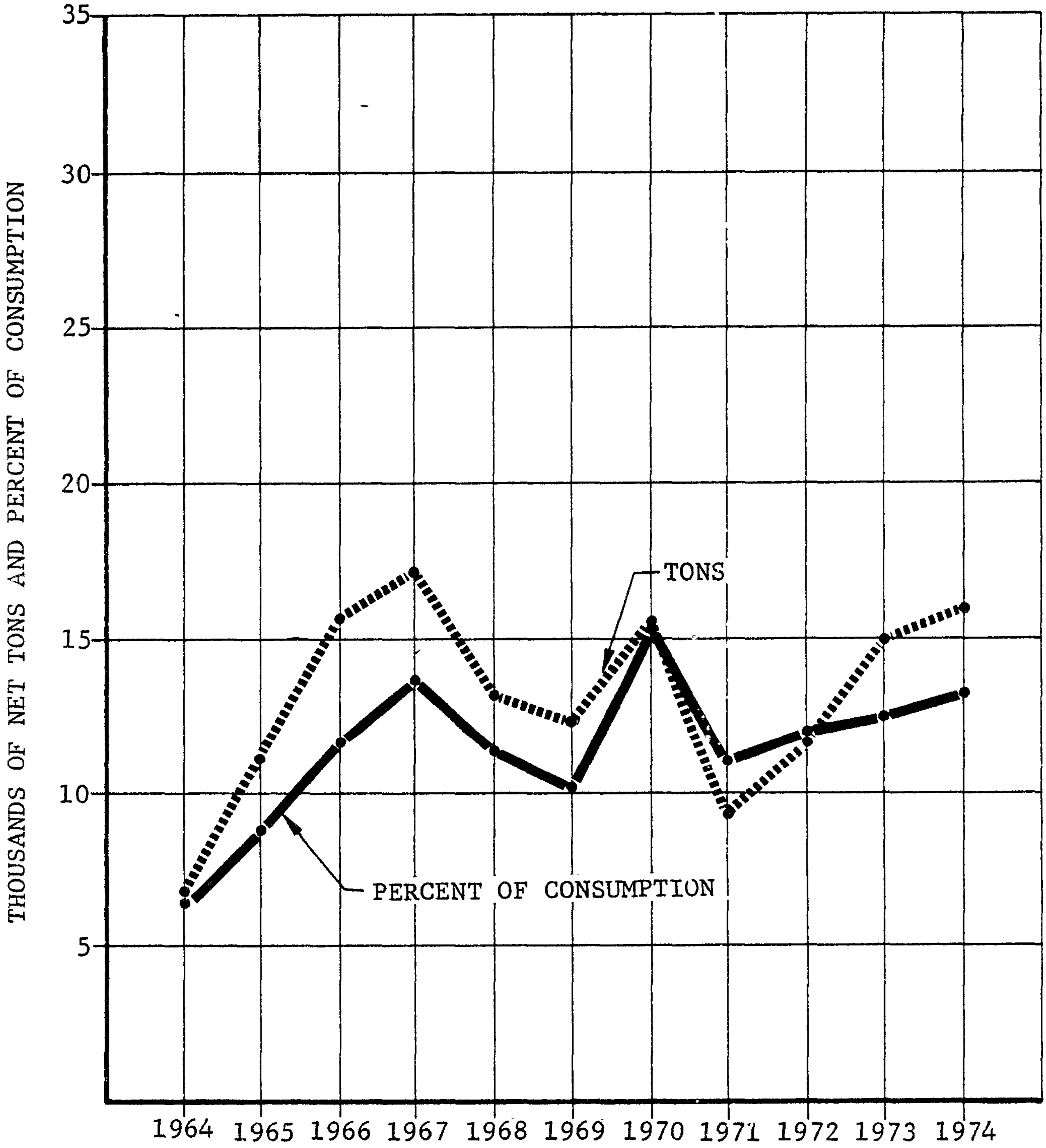


Figure I-3

Tool Steel Imports



stainless and tool steel imports, respectively, in relation to exports and to domestic production and consumption of the two categories of specialty steel.

Since the mid-1960's, the volume of specialty steel imports has been strongly related to world business cycle developments. For reasons discussed in Section III of this report, foreign producers appear to be under considerably stronger pressure to maintain output levels during periods of weak demand and relatively low prices than are U.S. producers. As a result, imports have tended to be highest relative to overall domestic consumption during recession years. Figure I-2 indicates that tool steel imports as a percent of consumption reached at least temporary highs in the recession years of 1967, 1970 and 1974. Stainless steel imports as a percent of consumption attained its highest levels during the 1970-1971 business downturn. Strong world demand for steel in the boom years of 1972 and 1973, together with price controls and the dollar devaluations which made the U.S. a relatively unattractive market, led to lowered import levels in those years. However, both stainless and tool steel imports posted dramatic increases relative to domestic consumption in the adverse world economic environment of 1975, as is indicated in Table I-8 on the following page.

Table I-8

Specialty Steel Imports and Apparent Domestic Consumption, 1970-1975
(Thousands of Net Tons)

Year	Stainless Steel			Tool Steel		
	Imports	Domestic Consumption(1)	Imports as a % of Consumption	Imports	Domestic Consumption(1)	Imports as a % of Consumption
1970	177.2	802.9	21.4%	15.5	101.7	15.2%
1971	191.9	855.2	22.4	9.2	83.6	11.0
1972	149.1	941.6	15.8	11.9	99.0	12.0
1973	128.3	1,166.4	11.0	15.0	119.6	12.5
1974	176.1	1,383.6	12.7	16.0	120.8	13.2
1975(2)	192.0	897.7	21.4	27.0	92.0	29.3

Notes: (1) Domestic producers' shipments plus imports minus exports.
(2) Estimated annual rate based on first seven months data.

Source: Exhibits I-10 and I-11.

As indicated in Exhibit I-10, U.S. stainless steel exports during the period 1964-1974 held fairly steady in the 80,000- to 120,000-ton range, except during 1971 and 1972, two years of weak overseas demand, and 1974, when the cumulative effects of U.S. price controls and the U.S. dollar devaluation made overseas markets highly attractive to domestic producers. Otherwise there appear to have been no consistent patterns in stainless steel exports.

Tool steel exports from this country, however, rose strongly and consistently during the period between 1968 and 1974. However, the base from which this increase was posted was very small, and in 1974 tool steel exports amounted to only 8,500 tons, or 7.5% of U.S. producers' shipments.

The net volume of specialty steel imports to this country rose very sharply from about 21,000 tons, or about 2.5% of the domestic market in 1964, to 143,000 tons, or about 15% of apparent

U.S. consumption, in 1971. Thereafter, the effects of U.S. price controls, the dollar devaluation, strong overseas demand, and "voluntary" import restraints caused net imports to drop off to 46,000 tons in 1974, accounting for only 3% of the U.S. market in that year. However, the sharp deterioration of foreign business conditions in late 1974 and in 1975 brought about a renewed surge in net imports to the point where they constitute at least 15% of the domestic market.

Estimates of the dollar balance of trade in specialty steel are highly suspect because of definitional discrepancies in the U.S. Department of Commerce import and export statistics, and inconsistencies between the Commerce Department's trade tonnage and average value statistics and similar data emanating from industry sources. On the basis of the net import tonnages indicated in Exhibits I-10 and I-11 and composite industry selling prices in the domestic market, Kearney has derived dollar balance of trade figures which are indicated in Table I-9 on the following page. These figures cannot be viewed with much confidence, however, if only because the average values of imports and exports probably vary considerably from composite domestic prices due to differences in specific product mix and freight and insurance charges.

Table I-9

Specialty Steel Trade Balance, 1972-1974
(Millions of Dollars)

Year	Stainless Steel Trade Balance	Tool Steel Trade Balance	Total
1972	-105	-25	-103
1973	- 43	-32	- 75
1974	- 63	-43	-106

Sources: Exhibits I-10 and I-11; U.S. Bureau of the Census, Current Industrial Reports Series MA-33B.

The specialty steel deficit figures in Table I-9 are larger than those implied by Department of Commerce figures. They indicate that while this deficit was substantial, it amounted to under 5% of estimated specialty steel dollar shipments compared with a comparable statistic of over 12% for the steel industry as a whole. However, the specialty steel dollar trade deficit appears to have risen dramatically in 1975. Based on net import tonnage figures for the first seven months of the year, and assuming a 15% increase in composite prices over the 1974 average price, the specialty steel deficit in 1975 may have been as high as $350 million.

(c) Foreign Trade Impacts on Stainless Steel Processors

Table I-10 summarizes the significance of imports relative to domestic producers' shipments of several specified processed stainless steel products.

Table I-10

Imports of Selected Processed Stainless Steel Items as a Percent of Domestic Producers' Shipments
(Based on Product Tonnages)

Product	1972	1973	1974	1975(1)
Stainless Wire	63	57	83	N/A
Stainless Cold Rolled				
Sheet	17	9	11	25
Strip	5	3	4	8
Bars	12	5	14	29

Note: (1) Based upon first eight months figures. 1975 statistics from testimony before U.S. International Trade Commission of Raymond C. Meyer, re: Specialty Steel.

Sources: American Metal Markets, February 1974, and American Iron and Steel Institute, Annual Statistical Reports.

As indicated in the table, imported stainless steel wire is extremely important in domestic markets, probably accounting for over 40% of U.S. consumption by tonnage. Foreign stainless wire, in the years prior to the 1973 devaluation of the dollar, was occasionally as much as 40% cheaper than the U.S. product. This price differential narrowed substantially in 1973 and 1974, but imports of stainless wire continued to rise rapidly as domestic capacity proved insufficient to meet a surge in demand resulting from the boom in capital spending in early 1974. Industry sources believe that after foreign demand recovers from the 1975 recession, foreign stainless wire prices will equal or exceed the U.S. level, stimulating the demand for domestic production. This projected easing of competitive pressure will be needed to sustain U.S. production capacity in a product line which has had profitability problems in the recent past.

The importance of cold rolled sheet strip and bar imports in U.S. markets appears to reflect the cyclical variations exhibited in the specialty steel market as a whole. Import statistics are not available for stainless steel pipe and tube products. The role of imports in these product markets is believed to be minor because their high bulk to weight characteristic generally makes shipping the processed product so costly as to make imports uncompetitive.

ENVIRONMENTAL PROTECTION AGENCY

SOURCES OF PUBLISHED DATA

STUDIES AND REPORTS

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ENVIRONMENTAL PROTECTION AGENCY: Effluent Guidelines Study for the Ferroalloys Manufacturing Industry. Prepared by Datagraphics, Inc. Washington: Environmental Protection Agency, 1974.

NATIONAL AIR POLLUTION CONTROL AGENCY: A Cost Analysis of Air Pollution Controls in the Integrated Iron and Steel Industry. Prepared by Battelle Memorial Institute. National Air Pollution Control Agency, 1969.

A Systems Analysis Study of the Integrated Iron and Steel Industry. Prepared by Battelle Memorial Institute. National Air Pollution Control Agency, 1969.

ARTICLES AND DATA

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ENVIRONMENTAL PROTECTION AGENCY

SPECIALTY STEEL INDUSTRY

INDUSTRIAL AND COMMERCIAL CONTACTS

Banks	
American National Bank	Chicago, Illinois
Chemical Trust Company	New York, New York
Continental Bank of Alhambra	Alhambra, California
Continental Illinois National Bank and Trust Company	Chicago, Illinois
Detroit Bank and Trust Company	Detroit, Michigan
First National Bank of Chicago	Chicago, Illinois
First National City Bank	New York, New York
Long Island Trust Company	New York, New York
National Boulevard Bank	Chicago, Illinois

Industry Associations	
American Iron and Steel Association	Washington, D.C.
Ferroalloys Association	Washington, D.C.
Pennsylvania Industrial Development Authority	Harrisburg, Pennsylvania
Steel Founders Society of America	Cleveland, Ohio
Welded Steel Tube Institute	Cleveland, Ohio
Wire Association	Branford, Connecticut

Industry Executives of:	
Allegheny-Ludlum Industries	Pittsburgh, Pennsylvania
Armco Steel Corporation	Baltimore, Maryland
Bishop Tube Company	Frazer, Pennsylvania
Carpenter Technical Corp.	Union, New Jersey
Continental Steel Corp.	Kokomo, Indiana
Crucible, Inc. Division of Colt Ind.	Pittsburgh, Pennsylvania
Cyclops Corp.	Pittsburgh, Pennsylvania
Interlake, Inc.	Chicago, Illinois
Plymouth Tube Division, Van Pelt Corp.	Winfield, Illinois
Washington Steel Co.	Washington, Pennsylvania

Steel Industry Consultant	
George W. Stamm, Consultant	Chicago, Illinois

ENVIRONMENTAL PROTECTION AGENCY

SUMMARY OF SPECIALTY STEEL CATEGORIES AND PRODUCT
FORM TYPES MANUFACTURED BY ESTABLISHMENTS ENGAGED IN SPECIALTY STEEL PRODUCTION

Key	Company	Plant	State	Ingots, Blooms, Slabs and Billets	Plates	Bars	Sheet	Strip	Wire	Rods	Wire Rods	Tube	Tube Rounds or Hollows	Pipe
	Establishments Where Specialty Steel Accounts for More Than 50% of Total Plant Production (Included in Economic Analysis)													
d	Acme Tube, Inc.	Somerset,	N.J.									SS		
b	ACS Industries, Inc.	Woonsocket,	R.I.						SS					
d	Alaskan Copper and Brass Co.	Seattle,	Wash.									SS		
a a a a	Allegheny-Ludlum Ind.	Brackenridge/ Natrona/ W. Leechburg	Pa.(1)	SS, HA			SS	SS						
a		Dunkirk,/							SS, TS	SS, TS	SS, TS			
a		Watervliet,	N.Y.(1)	SS, TS, HA		SS, TS, HA						SS, HA		
a		New Hartford,	N.Y.	HA		HA								
c		New Castle,	Ind.				SS	SS						
c		Wallingford,	Conn.					SS				SS		SS
a	Armco Steel Corp.	Baltimore,	Md.	SS, HA		SS, HA			SS, HA	SS, HA	SS, HA		SS	
a		Butler,	Pa.	SS			SS	SS						
d		Houston,	Tex.									SS		SS
d		Wildwood,	Fla.									SS		SS
d	Barber Corporation	Fernandina Beach,	Fla.									SS		SS
d	Bishop Tube Co., Christiana Metals	Frazer,	Pa.									SS		SS
a	Borg-Warner Corp.	New Castle,	Ind.	SS, TS	SS, TS		TS							
a	Braeburn Division, Continental C & S	Braeburn,	Pa.	TS		TS								
b	Branford Wire and Mfg. Co.	North Haven,	Conn.						SS					
d	Bristol Metal Products	Bristol,	Tenn.									SS		SS
b	Brookfield Wire Co.	Brookfield,	Mass.						SS					
a	Cabot Industries	Kokomo,	Ind.	SS, HA		SS, HA			SS, HA					
a	Carpenter Technology Corp.	Reading,	Pa.	SS, TS, HA		SS, TS, HA		SS	SS, TS, HA	SS	SS			
a		Bridgeport,	Conn.	SS		SS			SS	SS	SS			
d		Union,	N.J.									SS		SS
d		Jamesburg,	N.J.									SS		SS
d		El Cajon,	Calif.									SS		SS
a	Columbia Tool Steel Co.	Chicago Heights,	Ill.	TS		TS								
d	Consolidated Metals Corp.	Clifton,	N.J.									SS		
a	Crucible Division, Colt Ind.	Midland,	Pa.	SS, HA		SS	SS	SS					SS	
d		East Troy,	Wisc.									SS		SS
d		Carrollton,	Ga.									SS		SS
d		Fullerton,	Calif.									SS		SS
a	Cyclops Corp.	Bridgeville,	Pa.	SS, TS, HA		SS, TS, HA			SS, TS, HA		SS, TS			
c		Coshocton,	Ohio					SS						
d	Damascus Tube Division, Sharon Steel	Greenville,	Pa.									SS		SS
d	Davis Pipe & Metal	Bristol,	Va.									SS		SS
b	Driver-Harris Co.	Harrison,	N.J.						SS					
b	Durable Wire Co.	Branford,	Conn.						SS					
a	Eastmet Co.	Baltimore,	Md.	SS, HA	SS, HA		SS, HA	SS						
b	Eaton Corp.	Cleveland,	Ohio						SS					
a	Electralloy	Oil City,	Pa.	SS, HA, TS										
d	Felker Bros. Mfg. Co.	Marshfield,	Wisc.									SS		
d	Flexonics Division of U.O.P.	Bartlett,	Ill.									SS		
b	General Cable Corp.	New York,	N.Y.						SS					
d	Gibson Tube, Inc.	Berkeley Heights,	N.J.									SS		
d	Greenville Tubes Division, Emerson	Greenville,	Pa.									SS		
d		Clarksville,	Ark.									SS		

Key: a - Integrated Producer.
b - Firm that purchases semi-finished specialty steel and converts - specialty wire producer.
c - Firm that purchases semi-finished specialty steel and converts - specialty cold rolled sheet, strip and bar processor.
d - Firm that purchases semi-finished specialty steel and converts - specialty steel pipe and tube processor.

Category: SS - Stainless Steel.
TS - Tool Steel.
HA - High Alloy Steel.

ENVIRONMENTAL PROTECTION AGENCY

SUMMARY OF ESTABLISHMENTS ENGAGED IN SPECIALTY STEEL PRODUCTION

Key	Company	Plant	State	Ingots, Blooms, Slabs and Billets	Plates	Bars	Sheet	Strip	Wire	Rods	Wire Rods	Tube	Tube Rounds or Hollows	Pipe
	Establishments Where Specialty Steel Accounts for More Than 50% of Total Plan Production (Included in Economic Analysis) (Continued)													
d	Handy and Harmon Tube Co.	Norristown,	Pa.									SS		
a	Harper, H M. Division, I.T T.	Morton Grove,	Ill.	SS		SS			SS			SS		SS
b	Howmet Corp.	Northampton,	Mass.						SS					
d	Inductoweld Tube Corp.	Bronx,	N.Y.									SS		
b	International Wire Products Co.	Wyckopf,	N.J.						SS					
a	Jessup Steel Division, Athlone	Washington,	Pa.	SS, TS	SS, TS	SS, TS	TS							
a	Jones & Laughlin Steel Corp.	Warren,	Mich	SS		SS			SS	SS				
c		Louisville,	Ohio[1]				SS	SS						
a	Joslyn Stainless Steels	Ft. Wayne,	Ind.	SS		SS		SS						
a	Latrobe Steel Co	Latrobe	Pa.	SS,TS,HA		SS,TS,HA			SS,TS,HA	SS,TS,HA	SS,TS			
b	Maryland Specialty Wire, Inc.	Cockeysville,	Md.			SS,TS			SS,TS,HA					
b	National Standard Co.	Niles,	Mich.					SS	SS					
d	Oakley Tube Corp.	Skokie,	Ill.									SS		
d		Englewood,	Colo.									SS		
d	Plymouth Tube Division, Van Pelt	Dunkirk,	N.Y.									SS		
d		Horsham,	Pa.									SS		
b	Porter, H. K. Co	Somerville,	Mass.						SS					
d	Scientific Tube, Inc.	Addison,	Ill.									SS		
d	Sterling Stainless Tube, I.T.T.	Englewood,	Colo.									SS		
a	Simonds Division, Wallace-Murray	Lockport,	N.Y.	SS, TS	SS, TS	SS, TS								
d	Superior Tube Co.		Pa.									SS		SS
d		Wapakoneta,	Ohio									SS		SS
d	Swepco Tube Co.	Clifton,	N.J.									SS		SS
b	Sylvania Division, G T.E.	Warren,	Pa.						SS			SS		SS
b	Techalloy Co.	Rahns,	Pa.					SS	SS					
a	Teledyne	Monaca,	Pa.	TS	TS				TS	TS				
c		New Bedford,	Mass.					SS						
a		Latrobe,	Pa	TS, HA		TS, HA			TS, HA	TS				
a		Monroe,	N.C.	HA		HA								
d		Elkhart,	Ind.									SS		
d	Tube Manufacturing Co.	Somerville,	N.J.									SS		
d	Tube Methods, Inc.	Bridgeport.	Pa.									SS		
d	Tubemaker Corp.	Melrose Park	Ill.									SS		
d	Tubex Corp.	Chicago,	Ill.									SS		
c	Ulbrich Stainless Steel	Wallingford.	Conn.					SS				SS		
d	Uniform Tubes, Inc.	Collegeville,	Pa.									SS		
d	United Industries, Inc.	Chicago,	Ill.									SS		
d	Wall Tube Co.	Newport,	Tenn.									SS		
a	Washington Steel Co	Washington,	Pa.	SS			SS	SS						
d	Wilson Lee Engineering Co.	Elyria,	Ohio									SS		
d	Youngstown Welding & Engineering	Youngstown.	Ohio									SS		SS
	Other Establishments Engaged in Specialty Steel Production													
a	Allegheny-Ludlum Industries	Ferndale,	Mich.	SS										
a		Detroit,	Mich.	TS										
a	Babcock & Wilcox Co	Beaver Falls,	Pa.	SS		SS						SS		SS
c	Baron Steel Co.	Toledo	Ohio											
a	Bethlehem Steel Corp.	Bethlehem,	Pa.	TS		TS			TS					

Key:
- a - Integrated Producer.
- b - Firm that purchases simi-finished specialty steel and converts - specialty wire producer.
- c - Firm that purchases semi-finished specialty steel and converts - specialty cold rolled sheet, strip and bar processor.
- d - Firm that purchases semi-finished specialty steel and converts - specialty steel pipe and tube processor.

Category:
- SS - Stainless Steel.
- TS - Tool Steel.
- HA - High Alloy Steel.

ENVIRONMENTAL PROTECTION AGENCY

SUMMARY OF ESTABLISHMENTS ENGAGED IN SPECIALTY STEEL PRODUCTION

Key	Company	Plant	State	Ingots, Blooms, Slabs and Billets	Plates	Bars	Sheet	Strip	Wire	Rods	Wire Rods	Tube	Tube Rounds or Hollows	Pipe
	Other Establishments Engaged in Specialty Steel Production (Continued)													
c	Bliss and Laughlin	Harvey,	Ill			HA								
c		Cleveland,	Ohio			HA								
c		Detroit,	Mich			HA								
c		Los Angeles,	Calif			HA								
c		Mansfield,	Ohio			HA								
c		Buffalo,	N.Y.			HA								
c		Houston,	Tex.			HA								
d	Bundy Corp	Warren,	Mich.									SS		SS
a	Cameron Iron Works	Houston,	Tex.	SS,TS,HA										
a	Champion Steel Co.	Orwell,	Ohio	TS		TS								
a	Crucible Division, Colt Industries	Syracuse,	N.Y	SS,TS,HA		SS,TS,HA			SS,TS,HA	SS,TS	SS, TS			
c		Harrison,	N.J.					SS						
c	Cuyahoga Division, Hoover Ball	Solon,	Ohio			SS			SS					
a	Cyclops Corp	Pittsburgh,	Pa (1)		SS,TS,HA		SS,TS,HA							
a		Titusville,	Pa	SS,TS,HA		SS,TS,HA								
d		Wheatland,	Pa									SS		SS
a	Driver W.B Co., Subsid. G.T.E.	Newark,	N.J	SS, HA				SS, HA	SS, HA					
c	Fitzsimmons Steel Co	Youngstown,	Ohio			HA								
c	Fort Howard Steel Co	Green Bay,	Wisc.			HA								
c	Greer Steel Co.	Dover,	Ohio					HA						
a	Heppenstall Corp	Pittsburgh,	Pa (1)											
a		Philadelphia,	Pa	SS,TS,HA										
a	International Nickel Co.	Huntington,	W. Va.	SS, HA	SS, HA	SS, HA	SS, HA	SS	SS, HA		SS, HA	SS, HA		
a	Jessup Steel Division, Athlone	Owensboro,	Ky.	SS										
d	Jones and Laughlin Steel Corp.	Oil City,	Pa									SS		
c		Los Angeles,	Calif.					SS						
a	Jorgenson Steel Corp	Seattle,	Wash.	SS										
c	LaSalle Steel Co.	Hammond,	Ind.			HA								
c		Spring City,	Pa.			HA								
a	Lukens Steel	Coatesville,	Pa.	SS	SS									
b	Madison Wire	Buffalo,	N.Y.						SS					
a	McLouth Steel Co.	Detroit,	Mich.	SS			SS	SS						
c	Moltrop Steel Products	Beaver Falls,	Pa.			SS								
a	National Forge Co.	Irvine,	Pa.	SS										
b	New England High Carbon Wire	Millbury,	Mass.						SS					
b	Newman Crosby	Pawtucket,	R.I.					SS	SS					
d	Pacific Tube Co.	Los Angeles,	Calif.									SS		SS
a	Phoenix Steel Corp.	Claymont,	Del.	SS	SS							SS		SS
c	Plymouth Steel Co.	Detroit,	Mich.			HA								
c		Los Angeles,	Calif.			HA								
d	Plymouth Tube Division, Van Pelt	Birmingham,	Ala.									SS		
d		Streator,	Ill.									SS		
d		Winnamac,	Ind.									SS		
d		Dunkirk,	N.Y.									SS		
d		Horsham,	Pa.									SS		
c	Precision Drawn Steel Co.	Pennsauken,	N.J.			HA			SS					
c		Biloxi,	Miss.			HA								
c	Production Steel Division, Whittaker	Detroit,	Mich.					SS						
a	Republic Steel Corp.	Cleveland,	Ohio									SS		
a		Canton,	Ohio	SS, HA		SS, HA	SS							
d	Rome Manufacturing Division, Revere C&B	Rome,	N.Y.									SS		
c	Rome Strip Steel Co.	Rome,	N.Y.					SS	SS					
c	Screw & Bolt Corp.	Ambridge,	Pa.			HA								
c		Chicago,	Ill.			HA								
c		Newark,	Ohio			HA								
c		Plymouth,	Mich.			HA								
c		Putnam,	Conn.			HA								
a	Sharon Steel Co.	Farrell,	Pa.	SS	SS		SS	SS						
d	Smith Tube Corp.	Ridgewood,	N.J.									SS		

Key a - Integrated Producer.
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c - Firm that purchases semi-finished specialty steel and converts - specialty cold rolled sheet, strip and bar processor.
d - Firm that purchases semi-finished specialty steel and converts - specialty steel pipe and tube processor.

Category: SS - Stainless Steel.
TS - Tool Steel.

ENVIRONMENTAL PROTECTION AGENCY

SUMMARY OF ESTABLISHMENTS ENGAGED IN SPECIALTY STEEL PRODUCTION

Key	Company	Plant	State	Ingots, Blooms, Slabs and Billets	Plates	Bars	Sheet	Strip	Wire	Rods	Wire Rods	Tube	Tube Rounds or Hollows	Pipe
c	Superior Drawn Steel Co.	Monaco,	Pa.			HA								
d	Teledyne - Vasco	Carnegie,	Pa.									SS		
d		Scottdale,	Pa.									SS		
a	Temescal Division, Airco	Berkeley,	Calif.	SS, HA										
a	Timken Co.	Canton,	Ohio	SS, TS		SS, TS						TS		
a	U.S. Steel Corp.	Vandergrift,	Pa.	SS	SS	SS	SS	SS						
a		Duquesne,	Pa.	SS		SS						SS	SS	
a		Munhall,	Pa.	SS	SS									
a		Johnstown,	Pa.	SS										
a		South Chicago,	Ill.	SS	SS	SS								
b		Waukegan,	Ill.						SS					
c	Washington Steel Co.	Los Angeles,	Calif.					SS						
c	Western Cold Drawn	Elyria,	Ohio			SS			SS					

Key:
a - Integrated Producer.
b - Firm that purchases semi-finished specialty steel and converts - specialty wire processor.
c - Firm that purchases semi-finished specialty steel and converts - specialty cold rolled sheet, strip and bar processor.
d - Firm that purchases semi-finished specialty steel and converts - specialty steel pipe and tube processor.

Category:
SS - Stainless Steel.
TS - Tool Steel.
HA - High Alloy Steel.

Note: (1) These plants receive raw materials (ingots, blooms, slabs, and billets) exclusively from divisional transfers. The parent corporation considers these plants a part of the primary production plant at another geographical location.

Sources: Directory of Iron and Steel Plants, Association of Iron and Steel Engineers, 1975.
Directory of Iron and Steel Works at the United States and Canada, American Iron and Steel Institute, 1974.
Specialty steel industry consultants.

EXHIBIT I-3
Page 4 of 4

ENVIRONMENTAL PROTECTION AGENCY

SUMMARY BY CATEGORY AND PRODUCT FORM TYPE
OF THE NUMBER OF ESTABLISHMENTS ENGAGED IN SPECIALTY STEEL MANUFACTURING

ESTABLISHMENTS WHERE SPECIALTY STEEL ACCOUNTS FOR MORE THAN 50% OF TOTAL PLANT PRODUCTION(1)

	Type of Producer and Categories Produced and/or Processed												
	Integrated Producers								Firms Which Purchase Semi-Finished Specialty Steel and Convert				
Product Form Type	Stainless Tool and High Alloy Steel	Stainless and Tool Steel Only	Stainless and High Alloy Steel Only	Tool and High Alloy Steel Only	Stainless Steel Only	Tool Steel Only	High Alloy Steel Only	Total Number of Integrated Producers Manufacturing the Designated Product Form Type(3)	Specialty Wire Processors Stainless Steel	Specialty Cold Rolled Sheet, Strip and Bar Processors Stainless Steel	Specialty Steel Pipe and Tube Processors Stainless Steel	Total Number of Processors Producing the Designated Product Form Type	Total Number of Establishments Producing the Designated Product Form Type
Ingots, Blooms, Slabs and Billets	5	3	5	1	6	3	2	25					25
Plates		3	1			1		5					5
Bars	4	2	2	1	5	2	2	18	1			1	19
Sheet			1		4	2		7		2		2	9
Strip					7			7	2	6		8	15
Wire	3	1	2	1	3	1		11	14			14	25
Rods	1	1	1		3	2		8					8
Wire Rods		3	1		2			6					6
Tube			1		1			2	1	2	42	45	47
Tube Rounds and Hollows					2			2					2
Pipe					1			1	1	1	17	19	20
Total Number of Establishments Producing Each Grade Mix(2)	5	3	5	1	6	3	2	25	14	6	42	62	87

Notes: (1) In this table, plants which are considered as a single operating unit by the parent company are classified as a single establishment, although they may be geographically separated.
(2) Indicates the total number of establishments listed under each specialty steel grade category is not equal to the sum of the establishments producing each product form type because (a) most establishments produce more than one product form type and a total would involve double counting, and (b) many establishments produce some product form types in more specialty steel categories than others.
(3) Equal to the sum of the establishments in each grade mix category, as these categories are mutually exclusive.

Source: Exhibit I-3.

ENVIRONMENTAL PROTECTION AGENCY

SUMMARY BY CATEGORY AND PRODUCT FORM TYPE
OF THE NUMBER OF ESTABLISHMENTS ENGAGED IN SPECIALTY STEEL MANUFACTURING

FOR ALL ESTABLISHMENTS

	Type of Producer and Categories Produced and/or Processed													
	Integrated Producers								Firms Which Purchase Semi-Finished Specialty Steel and Convert					
									Specialty Wire Processors	Specialty Cold Rolled Sheet, Strip and Bar Processors		Specialty Steel Pipe and Tube Processors		
Product Form Type	Stainless Tool and High Alloy Steel	Stainless and Tool Steel Only	Stainless and High Alloy Steel Only	Tool and High Alloy Steel Only	Stainless Steel Only	Tool Steel Only	High Alloy Steel Only	Total Number of Integrated Producers Manufacturing the Designated Product Form Type	Stainless Steel	Stainless Steel	Alloy Steel	Stainless Steel	Total Number of Processors Producing the Designated Product Form Type	Total Number of Establishments Producing the Designated Product Form Type
Ingots, Blooms, Slabs and Billets	9(1)	4(2)	9	1	20(2)	6	2	51						51
Plates	1	3	2		6	1		13						13
Bars	6	3	4	1	9	4	2	29	1	3	21		25	54
Sheet	1		2		8	2		13		2			2	15
Strip			1		11			12	3	11	1		15	27
Wire	4	1	4	1	3	2		15	18	4			22	37
Rods	1	2	1		3	2		9						9
Wire Rods		4	2		2			8						8
Tube			2		5	1		8	1	2		53	56	64
Tube Rounds and Hollows					3			3						3
Pipe					3			3	1	1		20	22	25
Total Number of Establishments Producing Each Grade Mix(2)	9(1)	4(2)	9	1	20(2)	6	2	51	18	15	22	53	108	159

Notes: (1) This figure includes two plants which receive raw materials (ingots, blooms, slabs, and billets) exclusively from interdivisional transfers. The parent corporations consider these plants part of the primary production operation. However, since they are located at different geographical locations, they are classified as separate integrated establishments.

(2) Indicates the total number of establishments which produce this (these) category (categories) of specialty steel. These are derived from Exhibit I-3. The total of all establishments listed under each specialty steel category is not applicable as most establishments produce more than one product form type and a total would involve double counting.

Source: Exhibit I-3.

CLASSIFICATION OF INTEGRATED PRODUCER ESTABLISHMENTS PRIMARILY ENGAGED IN THE PRODUCTION OF SPECIALTY STEELS BY SIZE AND MAJOR PRODUCT LINE

Product Line and Plant Size Category	Plant Location	Approximate Plant Employment	Specialty Steel Categories		
			Stainless	Tool	High Alloy
Flat-Rolled Products					
Large - Over 100,000 Tons per Year					
Allegheny-Ludlum	Brackenridge/Natrona/W. Leechburg, Pa.	6,800	X		X
Armco Steel Corporation	Butler, Pennsylvania	4,200	X		
Crucible, Inc.	Midland, Pennsylvania	4,500	X		X
Small - Under 100,000 Tons per Year					
Borg-Warner Corporation	New Castle, Indiana	750	X	X	
Jessup Steel Division	Washington, Pennsylvania	1,100	X	X	
Eastmet Corporation	Baltimore, Maryland	1,000	X		X
Washington Steel Company	Washington, Pennsylvania	800	X		
Section Products					
Large - Over 100,000 Tons per Year					
Allegheny-Ludlum	Watervliet/Dunkirk, New York	2,200	X	X	X
Armco Steel Corporation	Baltimore, Maryland	1,350	X		X
Carpenter Technology	Bridgeport, Connecticut	810	X		
	Reading, Pennsylvania	2,800	X	X	X
Cyclops Corporation	Bridgeville, Pennsylvania	950	X	X	X
Jones and Laughlin Steel	Warren, Michigan	1,000	X		
Latrobe Steel Company	Latrobe, Pennsylvania	1,400	X	X	X
Medium - 20-100,000 Tons per Year					
Cabot Industries	Kokomo, Indiana	2,100	X		X
Joslyn Stainless Steel	Fort Wayne, Indiana	750	X		
Simonds Steel Division	Lockport, New York	400	X	X	
Electralloy	Oil City, Pennsylvania	300	X	X	X
Small - Under 20,000 Tons per Year					
Allegheny-Ludlum	New Hartford, New York	400			X
Braeburn Division, Continental	Braeburn, Pennsylvania	350		X	
Columbia Tool Steel Company	Chicago Heights, Illinois	150		X	
Harper Division, I.T.T.	Morton Grove, Illinois	350	X		
Teledyne Corporation	Latrobe, Pennsylvania	850		X	X
	Monaco, Pennsylvania	250		X	
	Monroe, North Carolina	200			X

EXHIBIT I-5

ENVIRONMENTAL PROTECTION AGENCY

NONINTEGRATED PROCESSING ESTABLISHMENTS PRIMARILY ENGAGED IN THE PROCESSING OF SPECIALTY STEELS

Specialty Wire Processors

Firm Name	Size(1)	Plant Location	Estimated Employment
ACS Industries	(S)	Woonsocket, Rhode Island	110
Branford Wire & Mfg. Company	(S)	North Haven, Connecticut	80
Brookfield Wire Company	(S)	Brookfield, Massachusetts	70
Driver-Harris Company	(L)	Harrison, New Jersey	340
Durable Wire Company	(S)	Branford, Connecticut	50
Eaton Corporation	(L)	Cleveland, Ohio	700
General Cable Corporation	(L)	New York, New York	240
Howmet Corporation	(S)	Northampton, Massachusetts	80
International Wire Products	(S)	Wycopf, New Jersey	180
Maryland Specialty Wire, Inc.	(S)	Cockeysville, Maryland	200
National Standard Company	(L)	Niles, Michigan	600
H.K. Porter Company	(L)	Somerville, Massachusetts	210
Sylvania Division, G.T.E.	(S)	Warren, Pennsylvania	100
Techalloy Company	(S)	Rahna, Pennsylvania	200

Note: (1) (L) = large. (S) = small.

Sources: Directory of Iron and Steel Plants, Association of Iron and Steel Engineers, 1975.
Directory of Iron and Steel Works of the United States and Canada, American Iron and Steel Institute, 1974.
Specialty steel industry consultants.
Iron and Steel Works of the World, Metal Bulletin Book Ltd., 1974.

NONINTEGRATED PROCESSING ESTABLISHMENTS PRIMARILY ENGAGED IN THE PROCESSING OF SPECIALTY STEELS

Specialty Cold Rolled Sheet, Strip and Bar Processors			
Firm Name	Size(1)	Plant Location	Estimated Employment
Allegheny-Ludlum	(S)	New Castle, Indiana	375
	(L)	Wallingford, Connecticut	200
Cyclops Corporation	(L)	Coshocton, Ohio	300
Jones & Laughlin	(S)	Louisville, Ohio	400
Teledyne	(S)	New Bedford, Massachusetts	250
Ulbrich Stainless Steel Co.	(S)	Wallingford, Connecticut	200

Note: (1) (L) = large. (S) = small.

Sources: Directory of Iron and Steel Plants, Association of Iron and Steel Engineers, 1975.
Directory of Iron and Steel Works of the United States and Canada, American Iron and Steel Institute, 1974.
Specialty steel industry consultants.
Iron and Steel Work of the World, Metal Bulletin Book, Ltd., 1974.

NONINTEGRATED PROCESSING ESTABLISHMENTS PRIMARILY ENGAGED IN THE PROCESSING OF SPECIALTY STEELS

Specialty Pipe and Tube Processors			Estimated
Firm Name	Size(1)	Plant Location	Employment
Acme Tube Company	(S)	Somerset, New Jersey	N/A
Alaskan Copper & Brass Co.	(S)	Seattle, Washington	N/A
Armco Steel Corporation	(S)	Houston, Texas	50
	(S)	Wildwood, Florida	200
Barber Corporation	(S)	Fernandina Beach, Florida	15
Bishop Tube Company	(S)	Frazer, Pennsylvania	180
Bristol Metal Products	(S)	Bristol, Tennessee	250
Cartech Corporation	(S)	El Cajon, California	110
	(S)	Jamesburg, New Jersey	N/A
	(L)	Union, New Jersey	300
Consolidated Metals Corp.	(S)	Clifton, New Jersey	30
Crucible Division, Colt	(L)	East Troy, Wisconsin	310
	(S)	Carrollton, Georgia	100
	(S)	Fullerton, California	100
Damascus Tube Div. Sharon	(S)	Greenville, Pennsylvania	230
Davis Pipe & Metal	(S)	Bristol, Virginia	25
Felker Bros. Mfg.	(S)	Marshfield, Wisconsin	220
Flexonics Division, U.O.P.	(L)	Bartlett, Illinois	400
Gibson Tube, Inc.	(S)	Berkeley Heights, New Jersey	20
Greenville Tube Div., Emerson	(L)	Greenville, Pennsylvania	300
	(S)	Clarksville, Arkansas	250
Handy & Harmon	(S)	Norristown, Pennsylvania	200
Inductoweld Tube	(S)	Bronx, New York	10

NONINTEGRATED PROCESSING ESTABLISHMENTS PRIMARILY ENGAGED IN THE PROCESSING OF SPECIALTY STEELS

Specialty Pipe and Tube Processors			Estimated
Firm Name	Size(1)	Plant Location	Employment
Oakley Tube Corp.	(S)	Skokie, Illinois	30
	(S)	Englewood, Colorado	40
Plymouth Tube Company	(S)	Dunkirk, New York	80
	(S)	Horsham, Pennsylvania	35
		Wisconsin	37
Scientific Tube Company	(S)	Addison, Illinois	5
Sterling Stainless Tube	(S)	Englewood, Colorado	100
Superior Tube Company	(L)	Norristown, Pennsylvania	900
	(S)	Wapakoneta, Ohio	180
Swepco Tube Company	(S)	Clifton, New Jersey	200
Teledyne	(S)	Elkhart, Indiana	175
Tube Mfg. Company	(S)	Somerville, New Jersey	30
Tube Methods, Inc.	(S)	Bridgeport, Pennsylvania	100
Tubemaker Corporation	(S)	Melrose Park, Illinois	N/A
Tubex Corporation	(S)	Chicago, Illinois	25
Uniform Tubes, Inc.	(L)	Collegeville, Pennsylvania	400
United Industries	(S)	Chicago, Illinois	135
Wall Tube Company	(L)	Newport, Tennessee	350
Wilson, Lee Engineering Co.	(S)	Elyria, Ohio	N/A
Youngstown Welding & Engineering Company	(L)	Youngstown, Ohio	300

Note: (1) (L) = large. (S) = small.

Source: Welded Steel Tube Institute.

ENVIRONMENTAL PROTECTION AGENCY

STAINLESS STEEL SHIPMENTS BY MARKET AND PRODUCT FORM TYPE - 1970
(Net Tons)

	Ingots, Blooms, Slabs, Billets, Tube Rounds, Sheet Bars, etc.	Wire Rods	Structural Shapes (Heavy)	Plates	Bars: Hot Rolled (Including Light Shapes)	Bars: Cold Finished	Pipe and Tubing	Wire Drawn	Sheets: Hot Rolled	Sheets: Cold Rolled	Strip: Hot Rolled	Strip: Cold Rolled	All Other	Net Total Stainless Steel Products	Percent of Net Total Domestic Shipments
Steel for Converting and Processing	32,311	3,403	-	2,717	576	2,984	1,091	1,949	6,384	3,676	11,945	15,877	-	82,913	
Less Shipments to Reporting Members	5,597	202	-	616	10	4	698	136	-	944	1,078	1,300	-	10,585	
Group Total	26,714	3,201	-	2,101	566	2,980	393	1,813	6,384	2,732	10,867	14,577	-	72,328	10.94
Forgings (Not elsewhere classified)	9,824	-	-	-	1,417	1,985	-	-	-	-	-	-	-	13,226	2.00
Industrial Fasteners	3	489	-	-	225	9,753	-	2,118	-	203	13	581	13	13,398	2.03
Steel Service Centers and Distributors	6,534	1,513	21	34,316	15,031	33,021	13,762	5,172	11,600	96,394	7,852	48,965	31	274,212	41.49
Construction, Including Maintenance	148	-	56	1,137	237	87	361	25	78	1,117	-	1,039	-	4,285	.65
Contractors' Products	-(1)	115	-	451	220	1,704	353	231	253	7,436	71	11,257	-	22,091	3.34
Automotive	352	-	-	442	4,029	4,545	125	678	981	12,293	71	54,732	-	78,248	11.84
Rail Transportation	-	-	-	861	13	26	-	-	5	1,191	-	2,112	-	4,208	.64
Shipbuilding and Marine Equipment	-	-	-	1,738	100	215	194	29	-	583	-	100	-	2,959	.45
Aircraft and Aerospace	1,673	28	-	53	3,891	1,452	463	36	-	618	17	1,213	-	9,444	1.43
Oil and Gas Drilling	431	-	-	-	297	796	233	-	-	-	-	-	-	1,757	.27
Mining, Quarrying and Lumbering	-	-	-	70	199	83	3	-	-	213	-	58	-	626	.09
Agricultural	5	-	-	3	18	7	51	-	11	623	28	500	-	1,246	.19
Machinery, Industrial Equipment and Tools	1,624	1,336	-	3,382	4,380	11,681	6,697	2,858	2,184	8,542	693	9,502	67	52,946	8.01
Electrical Equipment	70	-	-	179	7,263	3,383	1,230	663	71	2,461	-	6,106	-	21,426	3.24
Appliances, Utensils and Cutlery	-	-	-	37	32	850	26	151	561	4,987	83	36,604	-	43,331	6.56
Other Domestic and Commercial Equipment	-	10	-	37	378	3,136	534	249	136	4,188	133	8,506	-	17,307	2.62
Container Packaging and Shipping Materials	-	-	-	19	76	694	59	-	229	221	3	3,099	-	4,400	.67
Ordnance and Other Military	36	-	-	309	94	150	59	36	-	743	-	315	-	1,742	.26
Nonclassified Shipments	277	1	-	8,926	3,343	912	6,214	387	655	-	-	528	517	21,760	3.29
Total Domestic - All Groups (1 to 21)	47,691	6,693	77	54,061	41,809	77,460	30,757	14,446	23,148	144,545	19,831	199,794	628	660,940	100.00
Export (Reporting Companies Only)(3)	3,771	80	-	693	1,023	1,685	1,362	228	10,619	13,174	3,577	12,280	5	48,497	xxx
Total - All Groups (1 to 21)	51,462	6,773	77	54,754	42,832	79,145	32,119	14,674	33,767	157,719	23,408	212,074	633	709,437	xxx

Notes: (1) - = No shipments of that product for that classification.
(2) xxx = Not applicable.
(3) = includes only direct exports of reporting producers.

Source: American Iron and Steel Institute, Annual Statistical Report and AIS 16-S, 1970.

STAINLESS STEEL SHIPMENTS BY MARKET AND PRODUCT FORM TYPE - 1971
(Net Tons)

	Ingots, Blooms, Slabs, Billets, Tube Rounds, Sheet Bars, etc.	Wire Rods	Structural Shapes (Heavy)	Plates	Bars: Hot Rolled (Including Light Shapes)	Bars: Cold Finished	Pipe and Tubing	Wire-Drawn	Sheets: Hot Rolled	Sheets: Cold Rolled	Strip: Hot Rolled	Strip: Cold Rolled	Other	Net Total Stainless Steel Products	Percent of Net Total Domestic Shipments
Steel for Converting and Processing	19,320	4,790	-	2,287	817	[illegible]	891	2,539	5,266	5,446	11,223	16,280	-	69,7[illegible]	
Less Shipments to Reporting Members	2,691	452	-	555	229	43	295	160	1,572	819	1,280	1,229	-	9,32[illegible]	xxx
Group Total	16,629	4,338	-	1,732	588	886	596	2,379	3,694	4,627	9,943	15,051	-	60,46[illegible]	[illegible].34
Forgings (Not elsewhere classified)	10,282	-	-	-	2,520	723	-	-	-	-	-	-	-	13,5[illegible]	[illegible]
Industrial Fasteners	8	1,912	-	-	205	5,248	-	5,002	-	115	5	783	-	13,27[illegible]	[illegible]
Steel Service Centers and Distributors	4,453	1,570	50	29,581	14,144	33,203	9,765	3,694	6,473	108,853	4,642	60,417	9	276,3[illegible]	[illegible]
Construction, Including Maintenance	102	62	126	632	266	116	1,037	16	44	1,865	-	563	-	4,829	.71
Contractors' Products	-(1)	27	-	651	324	1,233	295	546	182	10,831	140	14,660	-	28,989	4.2[illegible]
Automotive	300	114	-	1,065	5,828	3,831	112	2,075	2,139	15,855	50	69,211	-	130,580	1[illegible].70
Rail Transportation	4	-	-	30	7	8	8	-	-	1,157	-	2,213	-	3,427	.50
Shipbuilding and Marine Equipment	-	-	-	442	214	211	206	60	-	217	-	114	-	1,464	.21
Aircraft and Aerospace	1,786	19	-	25	2,078	902	47	88	3	601	39	876	-	6,464	.94
Oil and Gas Drilling	322	-	-	-	298	489	356	-	-	-	-	-	-	1,465	.21
Mining, Quarrying and Lumbering	-	-	-	226	86	17	54	-	-	210	-	47	-	640	.09
Agricultural	-	-	-	-	33	27	30	26	25	1,142	19	720	-	2,022	.30
Machinery, Industrial Equipment and Tools	2,246	1,973	-	4,735	4,099	10,477	5,751	2,529	823	14,440	371	9,791	41	57,276	8.37
Electrical Equipment	195	14	-	261	6,734	3,336	1,392	870	110	2,254	14	6,158	-	21,252	3.11
Appliances, Utensils and Cutlery	-	-	-	48	26	762	29	112	310	6,010	63	37,415	-	44,775	6.54
Other Domestic and Commercial Equipment	-	51	-	215	923	2,319	725	246	317	5,301	465	10,756	-	2[illegible],218	3.19
Container Packaging and Shipping Materials	-	-	-	-	116	19	78	-	119	817	12	3,493	-	[illegible],654	.68
Ordnance and Other Military	-	-	-	73	193	[illegible]	14	-	4	1,228	-	113	4	1,938	.26
Nonclassified Shipments	364	-	-	9,934	2,300	558	5,212	228	265	-	-	384	220	19,405	2.84
Total Domestic - All Groups (1 to 21)	36,631	10,080	176	49,650	40,886	64,542	25,617	17,871	14,503	[illegible]75,523	[illegible]	[illegible]	274	[illegible]	[illegible]
Export (Reporting Companies Only)(3)	46	45	-	[illegible],178	1,25[illegible]	944	[illegible],090	256	3,552	1[illegible],030	4,[illegible]45	[illegible],692	-	35,[illegible]	xxx
Total - All Groups (1 to 21)	36,677	10,125	176	50,828	42,139	65,486	26,707	18,127	18,060	[illegible]	[illegible]	2[illegible],458	274	71[illegible]	xxx

Notes: (1) - = No shipments of that product for that classification.
(2) xxx = Not applicable.
(3) = Includes only direct exports of reporting producers.

Source: American Iron and Steel Institute, Annual Statistical Report and AIS 16-S, 197[illegible].

STAINLESS STEEL SHIPMENTS BY MARKET AND PRODUCT FORM TYPE - 1972

(Net Tons)

	Ingots, Blooms, Slabs, Billets, Tube Rounds, Sheet Bars, etc.	Wire Rods	Structural Shapes (Heavy)	Plates	Bars: Hot Rolled (Including Light Shapes)	Bars: Cold Finished	Pipe and Tubing	Wire-Drawn	Sheets: Hot Rolled	Sheets: Cold Rolled	Strip: Hot Rolled	Strip: Cold Rolled	All Other	Net Total Stainless Steel Products	Percent of Net Total Domestic Shipments
Steel for Converting and Processing	24,371	5,811	2	2,932	551	480	910	2,656	20,308	10,935	15,160	16,197	9	100,322	7.73%
Less Shipments to Reporting Members	8,375	435	-	563	85	36	282	98	16,929	1,107	6,954	2,555	-	37,419	xxx
Group Total	15,996	5,376	2	2,369	466	444	628	2,558	3,379	9,828	8,206	13,642	9	62,903	7.73
Forgings (Not elsewhere classified)	12,447	-	-	-	2,466	734	-	-	-	19	-	-	-	15,666	xxx
Industrial Fasteners	27	2,558	-	-	148	4,816	-	8,564	-	96	10	717	-	16,936	xxx
Steel Service Centers and Distributors	7,555	311	145	31,426	13,759	32,208	12,664	5,189	4,488	159,659	1,590	59,936	27	328,957	1.93
Construction, Including Maintenance	329	192	272	586	284	90	665	1,472	177	1,115	13	809	-	6,004	2.08
Contractors' Products	34	54	-	1,133	286	1,028	327	1,007	1,112	13,543	373	18,730	-	37,627	40.44
Automotive	300	504	-	2,815	8,739	4,176	187	2,725	2,907	18,504	144	75,747	-	116,748	.73
Rail Transportation	-(1)	-	-	285	-	19	27	-	-	679	-	892	-	1,902	4.63
Shipbuilding and Marine Equipment	-	-	-	460	286	105	449	50	-	139	37	79	-	1,605	14.35
Aircraft and Aerospace	1,409	21	-	29	2,398	871	55	126	25	497	6	1,071	-	6,508	.23
Oil and Gas Drilling	513	-	-	-	346	548	492	-	-	4	-	-	-	1,903	.20
Mining, Quarrying and Lumbering	-	-	-	217	-	17	97	-	-	212	-	20	-	563	.80
Agricultural	-	-	-	-	55	29	13	11	131	1,289	-	878	-	2,406	.23
Machinery, Industrial Equipment and															.07
Tools	1,998	1,882	-	4,162	3,214	9,820	3,977	2,936	760	18,685	992	11,211	76	59,713	.30
Electrical Equipment	936	21	-	317	4,314	2,129	1,784	1,851	46	2,919	40	7,671	-	22,028	
Appliances, Utensils and Cutlery	-	-	-	79	40	950	46	107	339	7,312	479	49,378	-	58,730	7.34
Other Domestic and Commercial															2.71
Equipment	-	329	-	142	960	2,561	907	1,066	356	8,073	931	13,399	-	28,724	7.22
Container Packaging and Shipping Materials	-	-	-	4	17	16	39	-	-	469	-	2,352	-	2,897	3.53
Ordnance and Other Military	-	7	-	265	417	297	58	10	3	1,048	2	125	-	2,232	
Nonclassified Shipments	2,988	1,781	-	11,790	5,718	8,975	5,625	1,705	297	-	-	298	167	39,344	.36
Total Domestic - All Groups															.27
(1 to 21)	44,532	13,036	419	56,079	43,913	69,833	28,040	29,377	14,020	244,090	12,823	256,955	279	813,396	4.84
Export (Reporting Companies Only)(3)	79	115	3	506	898	605	732	382	3,701	14,609	3,107	16,529	1	41,267	100.00
Total - All Groups (1 to 21)	44,611	13,151	422	56,585	44,811	70,438	28,772	29,759	17,721	258,699	15,930	273,484	280	854,663	xxx

Notes: (1) - = No shipments of that product for that classification.
(2) xxx = Not applicable.
(3) Includes only direct exports of reporting producers.

Source: American Iron and Steel Institute, Annual Statistical Report and AIS 16-S, 1972.

EXHIBIT I-7

STAINLESS STEEL SHIPMENTS BY MARKET AND PRODUCT FORM TYPE - 1973
(Net Tons)

	Ingots, Blooms, Slabs, Billets, Tube Rounds, Sheet Bars, etc.	Wire Rods	Structural Shapes (Heavy)	Plates	Bars: Hot Rolled (Including Light Shapes)	Bars: Cold Finished	Pipe and Tubing	Wire-Drawn	Sheets: Hot Rolled	Sheets: Cold Rolled	Strip: Hot Rolled	Strip: Cold Rolled	All Other	Net Total Stainless Steel Products	Percent of Net Total Domestic Shipments
Steel for Converting and Processing	53,845	10,215	-	2,468	882	785	1,737	3,162	35,680	15,033	17,811	23,528	10	165,156	7.76%
Less Shipments to Reporting Members	33,049	602	-	1,357	721	71	1,010	129	31,246	6,255	3,275	3,662	-	81,377	xxx
Group Total	20,796	9,613	-	1,111	161	714	727	3,033	4,434	8,778	14,536	19,866	10	83,779	7.76
Forgings (Not elsewhere classified)	17,674	-	-	2	3,112	623	-	-	-	-	-	-	-		
Industrial Fasteners	-	4,316	-	-	171	6,553	-	10,103	-	133	16	1,002	-	21,411	1.98
Steel Service Centers and Distributors	5,949	1,980	98	44,426	15,749	46,131	14,955	7,199	5,945	241,868	1,867	77,082	8	22,294	2.06
Construction, Including Maintenance	662	621	91	874	311	412	834	4,492	124	910	10	605	-	463,257	42.90
Contractors' Products	-	40	-	1,124	812	1,434	274	1,004	1,000	25,196	848	21,038	-	9,946	.92
Automotive	363	1,094	-	1,428	12,036	5,507	180	3,743	3,446	20,923	137	89,149	36	52,770	4.89
Rail Transportation	-	-	-	686	17	14	8	-	3	1,339	87	393	-	138,042	12.78
Shipbuilding and Marine Equipment	-	-	-	15	181	312	385	83	21	285	325	111	-	2,547	.24
Aircraft and Aerospace	1,525	149	-	61	2,518	1,315	48	155	692	801	66	1,086	-	1,718	.16
Oil and Gas Drilling	345	-	-	-	315	748	480	-	-	-	-	-	-	8,416	.78
Mining, Quarrying and Lumbering	3	-	-	228	11	58	69	17	-	171	-	66	-	1,888	.17
Agricultural	-	-	-	5	98	29	39	76	321	2,328	-	616	-	623	.06
Machinery, Industrial Equipment and														3,512	.33
Tools	3,276	2,471	-	6,367	3,965	12,645	5,047	3,814	1,036	26,307	1,221	13,413	89	79,651	7.38
Electrical Equipment	707	66	-	466	5,106	2,595	1,364	2,150	15	4,469	9	8,084	-	25,031	2.32
Appliances, Utensils and Cutlery	-	77	-	121	288	1,009	60	45	552	10,211	1,746	59,216	-	73,325	6.79
Other Domestic and Commercial Equipment	-	30	-	67	1,019	3,800	818	938	1,226	8,089	1,362	12,359	-	29,708	2.75
Container Packaging and Shipping Materials	-	-	-	-	20	36	72	-	8	310	55	3,576	-	4,077	.38
Ordnance and Other Military	31	5	-	305	324	320	1	-	72	1,084	14	353	-	2,509	.23
Nonclassified Shipments	3,005	2,670	-	19,321	7,844	9,678	9,636	2,087	408	1	-	276	304	55,230	5.12
Total Domestic - All Groups (1 to 21)	54,336	23,132	189	76,607	54,058	93,933	34,997	38,939	19,303	353,203	22,299	308,291	447	1,079,734	100.00
Export (Reporting Companies Only)(3)	102	247	-	1,392	1,546	908	914	195	1,532	22,927	3,635	20,766	-12	54,152	xxx
Total - All Groups (1 to 21)	54,438	23,379	189	77,999	55,604	94,841	35,911	39,134	20,835	376,130	25,934	329,057	435	1,133,886	xxx

Notes: (1) - = No shipments of that product for that classification.
(2) xxx = Not applicable.
(3) Includes only direct exports of reporting producers.

Source: American Iron and Steel Institute, Annual Statistical Report and AIS 16-S, 1973.

STAINLESS STEEL SHIPMENTS BY MARKET AND PRODUCT FORM TYPE - 1974

					Bars										
	Ingots, Blooms, Slabs, Billets, Tube Rounds Sheet Bars, etc.	Wire Rods	Structural Shapes (Heavy)	Plates	Hot Rolled (Including Light Shapes)	Cold Finished	Pipe and Tubing	Wire-Drawn	Sheets		Strip		Other	Net Total Stainless Steel Products	Percent of Net Total Domestic Shipments
									Hot Rolled	Cold Rolled	Hot Rolled	Cold Rolled			
Steel for Converting and Processing	52,819	11,530	- (1)	5,527	690	928	1,588	4,906	8,948	18,801	6,007	42,631	-	154,375	8.86%
Less Shipments to Reporting Members	28,911	1,717	-	1,160	659	88	608	290	1,998	1,867	102	3,876	-	41,276	xxx
Group Total	23,908	9,813	-	4,367	31	840	980	4,616	6,950	16,934	5,905	38,755	-	113,099	8.86%
Forgings (Not elsewhere classified)	20,705	-	-	-	2,774	554	-	-	-	-	-	-	-	24,033	1.88
Industrial Fasteners	2,615	4,545	-	10	143	7,137	-	11,641	-	279	-	779	-	27,149	2.13
Steel Service Centers and Distributors	4,461	1,205	67	72,873	17,333	53,408	16,368	6,205	6,292	288,462	1,950	79,598	2	548,224	42.95
Construction, Including Maintenance	179	33	55	1,467	389	359	108	3,530	442	1,128	-	988	-	8,678	.68
Contractors' Products	14	19	-	1,284	375	1,940	368	1,471	2,624	23,713	568	16,070	-	48,446	3.80
Automotive	375	1,433	-	313	7,741	2,302	193	1,885	19,938	55,467	4,221	70,470	-	164,338	12.87
Rail Transportation	-	-	-	507	20	111	-	80	-	2,989	-	3,846	-	7,553	.59
Shipbuilding and Marine Equipment	-	-	-	30	143	329	184	59	115	39	212	294	-	1,405	.11
Aircraft and Aerospace	919	12	-	60	3,125	1,336	44	145	15	704	82	1,252	-	7,694	.60
Oil and Gas Drilling	154	-	-	-	354	995	-	7	-	7	-	17	-	1,534	.12
Mining, Quarrying and Lumbering	-	-	-	233	15	48	77	23		240	-	21	-	657	.05
Agricultural	-	-	-	-	8	41	33	24	83	1,955	-	702	-	2,846	.22
Machinery, Industrial Equipment and Tools	9,256	5,681	-	10,203	8,189	16,962	3,874	3,988	979	35,298	1,447	15,177	-	111,054	8.70
Electrical Equipment	377	27	-	910	7,040	3,792	1,540	1,097	-	3,551	-	7,378	-	25,712	2.01
Appliances, Utensils and Cutlery	-	56	-	154	30	1,162	68	22	464	8,707	223	51,533	-	62,419	4.89
Other Domestic and Commercial Equipment	-	57	-	404	748	3,862	1,087	684	633	13,481	313	16,396	-	37,665	2.95
Container Packaging and Shipping Materials	-	-	-	33	16	51	45	-	-	701	136	4,441	-	5,423	.43
Ordnance and Other Military	-	-	-	504	115	164	10	4	-	1,553	-	191	-	2,541	.20
Nonclassified Shipments	3,251	1,842	-	31,856	9,337	9,415	17,660	1,973	489	-	-	201	-	76,024	5.96
Total Domestic - All Groups (1 to 21)(3)	66,214	24,723	122	125,208	57,926	104,808	42,639	37,454	39,024	455,208	15,057	308,109	2	1,276,494	100.0%
Export (Reporting Companies Only)	667	214	29	1,978	1,181	1,205	678	676	5,479	20,304	2,063	17,679	-	52,153	xxx
Total - All Groups (1 to 21)	66,881	24,937	151	127,186	59,107	106,013	43,317	38,130	44,503	475,512	17,120	325,788	2	1,328,647	xxx

Notes: (1) - = No shipments of that product for that classification.
(2) xxx = Not applicable.
(3) Includes only direct exports of reporting producers.

Source: American Iron and Steel Institute, Annual Statistical Report and AIS 16-S, 1974.

ENVIRONMENTAL PROTECTION AGENCY

TOOL STEEL SHIPMENTS BY MARKET DURING THE YEARS 1970 THROUGH 1974
(Net Tons)

Market	Year 1970	1971	1972	1973	1974
Steel for Converting and Processing	206	10	164	157	130
Forgings	3,296	2,760	3,102	3,269	2,425
Industrial Fasteners (Bolts, Nuts, Rivets and Screws)	163	66	62	89	123
Steel Service Centers and Distributors	18,339	15,446	17,858	22,818	22,952
Construction, Including Maintenance	662	498	643	1,086	976
Contractors Products	-	-	3	-	4
Automotive	26	-	10	-	-
Aircraft and Aerospace	186	114	123	-	129
Mining Quarrying and Lumbering	311	132	107	120	121
Agricultural	4	-	-	-	-
Machinery, Industrial Equipment and Tools	11,659	9,013	10,028	13,767	14,966
Domestic and Commercial Equipment	8	12	2	15	58
Ordnance and Other Military	41	52	4	6	3
Other	53,372	49,646	58,055	69,262	71,184
Direct Export[(1)]	64	261	69	155	264
Total	88,337	78,010	90,230	110,744	113,335

Note: (1) Most tool steel exports are not shipped directly by specialty steel producers and are included in other market categories. For total export figures see Exhibit I-11.

Sources: American Iron and Steel Institute, AIS 16-S for the years 1970, 1971, 1972, 1973 and 1974.

EXHIBIT I-8

ENVIRONMENTAL PROTECTION AGENCY

HIGH ALLOY STEEL SHIPMENTS BY PRODUCT FORM TYPE - 1971-1973

	1971			1972			1973		
Product Form Type	High Alloy Steel	Alloy Steel	Total	High Alloy Steel	Alloy Steel	Total	High Alloy Steel	Alloy Steel	Total
Ingots and Alloys for Castings	6,923	3,460	10,383	6,949	631	7,580	7,300	2,150	9,450
Blooms, Slabs, Billets, Sheets, Bars, and Tube Rounds	4,623	6,197	10,820	6,762	15,928	22,690	9,725	18,781	28,506
Wire - Rods and Drawn Coils	434	158	592	1,014	309	1,323	1,333	137	1,470
Plates	584	65	649	639	32	671	967	-	967
Bars - Hot Rolled and Cold Finished	3,875	4,767	8,642	6,024	4,782	10,806	6,374	7,586	13,960
Tubing	100	-	100	99	-	99	215	-	215
Sheets - Hot Rolled and Cold Rolled	2,167	-	2,167	2,776	114	2,890	3,061	-	3,061
Strip - Hot Rolled and Cold Rolled	2,153	-	2,153	3,082	-	3,082	4,442	-	4,442
All Other Products	310	456	766	259	314	573	429	310	739
Shipments not Reported	2,057	788	2,845	740	1,070	1,810	1,484	1,220	2,704
Gross Shipments	23,226	15,891	39,117	28,344	23,180	51,524	35,330	30,184	65,514
Less Shipments to Reporting Companies	2,154	717	2,871	316	1,387	1,703	507	374	881
Net Shipments	21,072	15,174	36,246	28,028	21,793	49,821	34,823	29,810	64,633

Notes: (1) All shipments are produced in vacuum melting furnaces.
(2) The low alloy steel produced with vacuum melting equipment is included in the total high alloy tonnage for the analysis of economic impact. The reason for this is that high alloy and low alloy vacuum melted steel is in all cases produced on the same vacuum melting equipment and in all cases the tonnages of high alloy production are greater than those for low alloy production. On this basis, the costs associated with the proposed effluent guidelines will apply to both the high and low alloy steel produced in vacuum melted furnaces and therefore the combined tonnages will be used for the analysis of economic impact.

Source: Subcommittee on General Legislation of the United States Senate Committee on Armed Services.

EXHIBIT I-9

ENVIRONMENTAL PROTECTION AGENCY

STAINLESS STEEL PRODUCTION, CONSUMPTION, IMPORTS AND EXPORTS - 1964-1975
(Thousands of Net Tons)

Year	Domestic Producers' Shipments	Exports	Exports as a Percent of U.S. Shipments	Imports	Apparent Domestic Consumption(1)	Imports as a Percent of Domestic Consumption	Net Imports	Net Imports as a Percent of Domestic Consumption
1975(2)	744.7	39.0	5.2	192.0	897.7	21.4	153.0	17.0
1974	1,344.7	137.2	10.2	176.1	1,383.6	12.7	38.9	2.8
1973	1,133.8	95.7	8.4	128.3	1,166.4	11.0	32.6	2.8
1972	855.0	62.5	7.3	149.1	941.6	15.8	86.6	9.2
1971	718.1	54.8	7.6	191.9	855.2	22.4	137.1	16.0
1970	709.4	83.7	11.8	177.2	802.9	22.1	93.5	11.6
1969	910.4	87.3	9.6	182.2	1,005.3	18.1	94.9	9.4
1968	819.0	87.6	10.7	174.0	905.4	19.2	86.4	9.5
1967	837.0	115.0	13.7	149.3	871.3	17.1	34.3	3.9
1966	932.9	89.3	9.6	137.4	981.0	14.0	48.1	4.9
1965	879.2	93.1	10.6	113.5	899.6	12.6	20.4	2.3
1964	771.2	96.0	12.4	79.4	754.6	10.5	16.6	2.2

Notes: (1) Apparent domestic consumption equals domestic producers' shipments minus exports plus imports, and thus includes net additions to stocks.
(2) Import, export, and shipments figures are annual rates based on first seven months data, as reported in testimony of S. Nehmer before U.S. International Trade Commission, re. Specialty Steel.

Source: American Iron and Steel Institute, Annual Statistical Reports.

EXHIBIT I-10

ENVIRONMENTAL PROTECTION AGENCY

TOOL STEEL PRODUCTION, CONSUMPTION, IMPORTS AND EXPORTS - 1964-1975
(Thousands of Net Tons)

Year	Domestic Producers' Shipments	Exports	Exports Percent of U.S. Shipments	Imports	Apparent Domestic Consumption(1)	Imports Percent of Domestic Consumption	Net Imports	Net Imports Percent of Domestic Consumption
1975(2)	73.0	8.0	10.9	27.0	92.0	29.3	19.0	20.7
1974	113.3	8.5	7.5	16.0	120.8	13.2	7.5	6.2
1973	110.7	6.7	6.1	15.0	119.6	12.5	8.3	6.9
1972	90.2	3.1	3.4	11.9	99.0	12.0	8.8	8.9
1971	78.0	3.6	4.6	9.2	83.6	11.0	5.6	6.7
1970	88.3	2.1	2.4	15.5	101.7	15.2	13.4	13.2
1969	113.9	2.7	2.4	12.5	123.7	10.1	9.8	7.9
1968	106.4	1.6	1.5	13.6	118.4	11.5	12.0	10.1
1967	109.9	1.6	1.5	17.2	125.5	13.7	15.6	12.4
1966	121.3	1.8	1.5	15.8	135.3	11.7	14.0	10.3
1965	118.2	1.7	1.4	11.2	127.7	8.8	9.5	7.4
1964	102.4	2.3	2.2	6.8	106.9	6.4	4.5	4.2

Notes: (1) Apparent domestic consumption equals domestic producers' shipments minus exports plus imports, and thus includes net additions to stocks.
(2) Import, export, and shipments figures are annual rates based on first seven months data, as reported in testimony of S. Nehmer before U.S. International Trade Commission, re: Specialty Steel.

Source: American Iron and Steel Institute, Annual Statistical Reports.

EXHIBIT I-11

II - FINANCIAL CHARACTERISTICS OF THE FIRMS IN THE INDUSTRY

The availability of financial information for firms in the specialty steel industry is limited for the following reasons:

1. Government and steel industry financial data usually combine the specialty steel segment with the high tonnage carbon steel producing companies.

2. Many of the specialty steel producers that report publicly are subsidiaries or divisions of large diversified corporations. Financial data for these subsidiaries or divisions are usually included in total corporate data, and are not available for individual subsidiaries, divisions, or plants.

3. Many of the specialty steel companies, particularly the nonintegrated processors, are relatively small and/or privately held. Most of these firms consider financial information highly confidential and do not disclose it publicly.

4. Available financial data are of limited use because they usually do not allow a breakdown by category of specialty steel produced (stainless, tool, or high alloy steel).

Where possible, financial characteristics have been presented for the specialty steel industry only. The financial information that is available has been supplemented by direct contacts with individual firms.

GENERAL FINANCIAL CHARACTERISTICS

Table II-1, below, presents the distribution of specialty steel industry employment and shipments value by establishment size for those establishments where specialty steel production represents more than 50% of plant output and whose parent firms reported these statistics.

Table II-1

Specialty Steel Industry Statistics, 1974

Establishment Size by Number of Employees	Number of Establishments	Total Number of Employees	Value of Shipments Reporting Plants(1)(2) ($ Millions)
Less than 100	16	570	-
100-249	23	3,890	69.3
250-499	21	6,850	254.4
500-999	9	7,110	463.1
1,000-2,499	7	10,150	335.9
Over 2,500	4	18,300	928.0
Unknown	5	-	-
Total	87	47,000	2,050.7(1)

Notes: (1) Includes only firms reporting separate shipment values for specialty steel products. These firms include 17 of the 25 integrated producer establishments and 13 of the 62 processing establishments. These establishments, however, are believed to account for over 80% of the total industry shipments value.

(2) Total shipments value of multi-establishment firms is included in the size category of the firm's largest establishment.

Sources: Dun and Bradstreet; Fortune Double 500 Survey, 1975; state directories; annual reports; and Iron Age Industry Analysis, April 28, 1975.

The industry is dominated by the larger firms. Establishments with over 500 employees account for about 75% of total reported employment. Firms having at least one establishment with over 500 employees account for nearly 85% of total value of shipments reported in Table II-1 and probably account for at least 75% of the actual total value of industry shipments.

For purposes of economic impact analysis, the establishments primarily oriented towards specialty steel production have been divided into the four product line categories described in Chapter I. Exhibit II-1 provides financial statistics, where available, for firms having establishments in each of these industry segments. These statistics include specialty steel sales and profits, and parent company sales, profits, assets, debt, equity, and current ratios. Firms having both integrated and nonintegrated establishments are included with the integrated producers.

As is evident from the data in this exhibit, individual firm sales and profit data for specialty steel operations are available for only a minority of the establishments included in the study (though these tend to be the larger establishments). Even overall parent firm sales, profit, and other financial data are generally unavailable for the smaller specialty steel processors. Moreover, where separate data for specialty steel operations are available, they are subject to arbitrary accounting allocations and may not be fully reflective of true economic conditions. In many cases, the specialty steel data includes distributive operations and operations at establishments where specialty steel accounts for less than 50% of plant output, and thus may not relate exclusively to the plants included in this study.

The specialty steel sales of 12 reporting integrated producers (in SIC 3312), operating 17 integrated establishments and 11 processing establishments, totalled over $1.85 billion in 1974.[1] Average sales per firm, therefore, were about $150 million. Average sales per integrated establishment were about $110 million. Specialty steel profits of this group of firms totalled $160 million, yielding an average margin on sales of 8.5% for these reporting firms. This represents an average profit per firm of about $13 million and an average profit per integrated establishment of $9.4 million. There were insufficient reported data from individual specialty steel processing firms (SIC 3315-17) to draw meaningful averages from these sources.

PROFITABILITY

As noted, profitability data relating to specialty steel operations are available for only a limited number of individual firms. The available specialty steel profits and sales data for these firms are included in the financial statistics in Exhibit II-1. Profits attributable to specialty steel operations totalled $175 million on $2.05 billion sales for the 15 reporting integrated and processing firms, yielding a pre-tax margin of 8.5%.

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(1) 1973 figures were used for two of the smaller firms in this group.

This margin did not differ significantly between the 12 integrated and three nonintegrated firms.

More complete profit margins data for the specialty steel industry as a whole were presented to the U.S. International Trade Commission as a part of evidence related to the 1975 industry petition for relief from import competition. These data were collected in a survey by J. K. Lasser & Co. which covered firms accounting for about 70% of U.S. specialty steel shipment tonnage. Table II-2 below indicates the before- and after-tax industry profit margins reported by this survey for the years 1969-1974, and for the first three quarters of 1975.

Table II-2

Stainless and Tool Steel Profits as a Percent of Sales, 1969-1975

	Specialty Steel Margins		After-Tax Margins	
Year	Pre-Tax(1)	After-Tax	Steel Producers(2)	All Manufacturing Firms
1969	8.5	4.3	4.6	4.8
1970	3.7	1.9	2.8	4.0
1971	0.4	0.2	2.8	4.2
1972	4.7	2.4	3.4	4.3
1973	7.8	3.9	4.4	5.0
1974	11.2	5.6	6.4	5.5
1975	6.5(3)	N/A	N/A	N/A

Notes: (1) Net profits.
(2) As reported by AISI.
(3) First three quarters only.

Source: Testimony before U.S. International Trade Commission, re: Specialty Steel.

These data indicate that specialty steel operations exhibited a cyclical profitability pattern similar to that of the steel industry as a whole. Specialty steel profits as a percent of sales were reported to be somewhat lower than similar margins for the steel industry as a whole and for all manufacturing firms. However, it may be misleading to conclude on this basis that specialty steel operations were relatively unprofitable in the more meaningful sense of rate of return on capital invested. The labor intensity of the specialty steel industry suggests that sales values may be high per dollar of invested capital, at least in relation to the carbon steel industry. Moreover, the reported profits of carbon steel producers include earnings on non-steel operations, which are typically in expanding, high-yielding industries.

The Lasser survey did not break down specialty steel profits by industry segment as defined in this study. It did, however, indicate the average profit margins of reporting firms in various product lines. These margins for 1973, 1974, and the first half of 1975 are presented in Table II-3. These figures should be interpreted cautiously as they are believed to be drawn largely from integrated producers and may also include arbitrary standard cost accounting allocations. Thus, these data may not accurately reflect profit conditions facing the processing firms producing the various items, particularly the smaller of these firms.

Table II-3

Profits as a Percent of Sales
in Selected Specialty Steel Product Lines

Product Line	Sales Reported by Surveyed Firms ($ Millions)	Net Profit Margins Before Taxes(1) 1973	1974	1975(2)
Flat Stainless Steel Plate	183.2	14.0	21.7	20.7
Stainless Hot Rolled Wire Rods	21.6	(13.1)	9.7	2.6
Stainless Steel Bars	79.3	(4.7)	3.7	(2.7)
Stainless Cold Rolled Sheet	403.0	9.4	15.3	3.0
Stainless Cold Rolled Strip	388.8	11.7	15.8	1.5
High Speed Tool Steels	4.1	(11.1)	(0.4)	(3.6)
Tool Steel Bars	41.7	4.9	6.9	7.9

Notes: (1) Figures in parentheses indicate losses.
(2) First half figures only.

Source: Testimony before U.S. International Trade Commission, re: Specialty Steel.

As indicated in Table II-3, there is considerable variation in profit margins among the various specialty steel items. The bulk items of the industry appear to have been quite profitable in 1974, and reduced profit margins were maintained even in the depths of the 1975 recession. Several of the processed items, however, appear to have been unprofitable except during the 1974 boom in steel demand. However, this apparent unprofitability may result from the orientation of the survey toward the large integrated producers, whose processed products are mainly non-customized "standard specification" items which have faced particularly strong import competition. The specialized processing firms, particularly the smaller ones, produce largely for the customized "made-to-order" market, and are thought to be less exposed to competing foreign producers. These processing firms' profit margins may be significantly higher than those of integrated producers in these product lines.

BALANCE SHEET ITEMS

Lenders' evaluations of the economic strength and creditworthiness of corporations are based fundamentally upon judgments about the basic profitability outlook for their industries and products lines, and particularly upon their abilities to generate sufficient cash flow to comfortably repay borrowings. However, when future trends are unclear, or in distinguishing between firms with apparently similar prospects, creditors frequently examine several standard balance sheet items and financial ratios. Several of these critical statistics have been reviewed for those firms in the specialty steel market for which they are available. These statistics appear on an individual firm basis in Exhibit II-1. The industry averages presented in this section apply only to the data reported in Exhibit II-1, and refer to balance sheets of the firm as a whole and not specifically to specialty steel operations.

(a) Capital Invested

Table II-4 indicates recent sales and profits as a percentage of long-term capital invested for reporting firms in various specialty steel industry segments, where long-term capital invested includes long-term debt plus equity. Where available, 1974 data were used; otherwise 1973 data were employed. The intermingling of figures from two years is a possible source of distortions, but appears to be of limited importance because the firms for whom 1974 statistics are reported, as a group, do not have dramatically different average ratios from the group of firms for whom 1973 statistics are reported.

Table II-4

Sales and Profits as a Percent of Long-Term Capital Invested for Specialty Steel Producing Firms by Industry Segment(1)

Industry Segment	Number of Firms Reporting	1974 Sales as a Percent of Long-Term Capital(2)	1974 Profit as a Percent of Long-Term Capital(2)
Integrated Producers			
Large	4	201.8%	18.4%
Small and Medium(2)	3	217.6	9.7
Wire Processors(3)	3	229.9	21.6
Sheet, Strip and Bar Processors(4)			
Pipe and Tube Processors(3)	3	180.8	25.0

Notes: (1) Total corporate sales or profits of firms in industry segment as a percent of total corporate long-term debt plus equity.
(2) 1973 data employed for two firms for which 1974 data were unavailable.
(3) 1973 data.
(4) All reporting firms having wire processing establishments were integrated producers.

Source: Exhibit II-1.

Table II-4 indicates a relatively high ratio of profits to long-term capital invested for reporting firms other than small and medium sized integrated producers. To the extent that these measures are valid and these firms are typical of others in the industry, it does not appear to be populated by weak corporations.

(b) Debt-Equity Ratios

Exhibit II-1 indicates the debt-equity ratios of reporting firms. All but nine of the 31 firms for whom the statistic is collected have ratios of less than 0.5, and only three have ratios in excess of 0.6. Thus, the reporting firms appear to meet this particular institutional criterion of credit-worthiness.

(c) Current Ratio

The ratio of current assets to current liabilities further describes the financial condition of the specialty steel producers. Exhibit II-2 details these ratios from 1963 to 1975 for four major specialty steel producers. These four producers have maintained a higher current ratio than the iron and steel industry in general. This higher ratio indicates that the company can more readily cover existing obligations with current assets.

Current ratios have also been obtained for several companies who engage in specialty steel as a secondary or subsidiary activity. The average current ratios of all firms engaged in specialty steel operations who report these statistics, which are applicable to their overall operations (i.e., including activities other than specialty steel production), are given by specialty steel product category in Table II-5 below. These ratios are significantly higher than the 1.9 figure applicable to the iron and steel industry as a whole in 1973.

Table II-5

Current Ratios for Reporting Specialty Steel Producers and Processors (1973)

Specialty Steel Category	Average Current Ratio(1)
Integrated Producers	2.49
Wire Processors	2.21
Sheet, Strip and Bar Processors(2)	
Pipe and Tube Processors	2.17

Notes: (1) The simple average ratio for all companies in the category for which data were available.
(2) Sheet, strip and bar processors are included with integrated producers.

FINANCING ADDITIONAL CAPITAL REQUIREMENTS

Compliance with EPA effluent guidelines for pollution abatement will require greater than ordinary investment expenditures for companies producing and/or processing specialty steel. Exhibit II-3 presents historical capital expenditures as a percent of gross plant for the four major specialty steel producers. Since 1970, these expenditures for three of the firms have typically ranged between 4% and 7% of gross plant value. The J. K. Lasser survey, referred to earlier in this section, indicated that capital outlays associated with specialty steels (excluding research and development expenditures) averaged between 2.5% and 4% of the total specialty steel sales of the reporting integrated producers in each year between 1971 and 1974. Pollution abatement related expenditures accounted for less than than 20% of overall capital expenditures (and less than 1% of sales) in each of these years, and were only 11% of capital spending (0.3% of sales) in 1974.

In most cases, companies prefer to finance their capital investments from their cash flow, rather than by accumulating additional debt. Exhibit II-4 details cash flow and gross capital expenditure statistics for the four major specialty steel producers during the period from 1964 to 1974. These figures indicate that in recent years the cash flow of these companies has been adequate to support substantial increases in their capital spending. In earlier periods, however, two of these firms frequently lacked sufficient cash flow to cover capital expansion, even in the absence of major investment in pollution control equipment.

As indicated in Exhibit II-4, gross capital expenditures for these firms in the early 1970's tended to be fairly low relative to depreciation, indicating at best low levels of net investment. This is particularly so since inflation typically causes book depreciation figures to be far lower than the current replacement values of depreciated plant and equipment. Thus the dollar figures reported tend to overstate the net investment in new plant and equipment which is actually occuring.

There are three major sources of financing available to specialty steel companies seeking to utilize external sources of funds:

1. <u>Conventional Debt Accumulation</u>. This alternative should be open to the majority of those firms in the industry for which financial statistics were obtained. Most of these companies satisfy the established institutional criteria for borrowers.

2. <u>Common or Preferred Stock Issues</u>. Common or preferred stock issues are not a likely source of new capital because of the unwillingness of these companies to dilute earnings which are prone to strong cyclical swings. Moreover, in the past, the stocks of these companies were not favored by large investors because of their relatively low earnings growth. Although market opinion has recently begun to swing in favor of these companies, the selling costs of new issues might be still substantial.

3. <u>Pollution Control Revenue Bonds</u>. These revenue bonds, which provide tax-exempt earnings to the bond holders, have been utilized previously by the iron and steel industry. In 1971, $7.4 million of these bonds were issued for the steel industry. In 1972, $145.9 million were issued for steel companies, accounting for nearly 30% of the value of all such issues. Because the interest rate is below the prime lending rate, and favorable tax treatment is possible, revenue bonds represent a desirable alternative in financing additional investments in pollution control. However, where the capital requirement is under $500,000, the cost of issuing this type of bond is too high to justify this method of financing.

4. Small Business Administration Assistance. According to Small Business Administration (SBA) sources, SBA assistance is available to many of the firms in this industry. The "small" business criterion for the four SIC's under study is total organizational employment of less than 1,000. Two forms of SBA assistance are available: direct loans which are normally limited to $500,000 for no more than 30 years at 6-5/8%, and guaranteed loans for which the SBA can guarantee up to 90% of loans not exceeding $4 million--the interest charged by lenders on the guaranteed portion not to exceed 10-3/4%.

ENVIRONMENTAL PROTECTION AGENCY

FINANCIAL DATA OF SPECIALTY STEEL INTEGRATED PRODUCERS - 1974

	Specialty Steel(1)			Parent Company								
Company	Number of Employees(4)	Sales(5) $(10⁶)	Profits(5) $(10⁶)	Sales $(10⁶)	Profits Before Tax $(10⁶)	Debt $(10⁶)	Equity $(10⁶)	Total Assets $(10⁶)	Current Liabilities $(10⁶)(1)	Current Assets $(10⁶)	Debt Equity Ratio(6)	Current Ratio(1)
Allegheny Ludlum(2)(3)	10,000	518.8	31.4	981.9	76.5	133.2	304.4	656.3	146.4	320.3	0.44	2.19
Armco Steel(2)(3)	5,800	-*	-	3,190.1	319.3	468.9	1,274.7	2,541.7	373.7	853.1	0.37	2.28
Athlone Industries (Jessop Steel)(3)	1,100	95.9	4.4	261.7	26.3	-	48.0	169.9	29.8	76.8	0.28	2.57
Borg-Warner Corp.(1)	750	-	-	1,767.8	72.7	135.5	675.5	1,171.5	307.8	641.9	.20	2.09
Cabot Corporation (Stellite Division)(3)	2,100	100.4	5.7	400.6	41.2	-	262.9	562.5	63.3	164.5	0.55	2.59
Carpenter Technology(2)(3)	4,000	205.2	27.4	264.4	31.5	18.4	123.8	189.1	28.0	100.3	0.15	3.58
Columbia Tool Steel(1)	15	5.0	-	5.0	-	-	3.6	4.8	0.5	3.4	-	6.80
Colt Industries (Crucible Division)(3)	5,000	204.0	36.7	1,143.5	136.8	-	339.7	777.6	396.3	421.6	0.45	1.06
Continental Copper and Steel (Braeburn)	350	10.9	1.9	152.9	10.9	-	48.8	102.9	29.3	55.8	0.56	1.90
Cyclops(2)(3)	1,250	-	-	652.9	35.9	50.3	148.3	340.3	91.4	179.9	0.34	1.97
Eastmet Corporation(1)	1,000	66.2	6.3	105.1	6.9	10.0	32.0	65.9	22.4	48.2	0.31	2.15
ITT (Harper Division)(3)	350	-	-	11,154.4	1,045.5	-	4,134.0	10,696.5	589.9	448.3	0.24	0.76
Jones & Laughlin(2)	1,400	-	-	2,216.6	268.1	233.6	-	-	238.1	494.3	0.22	2.07
Joslyn Stainless Steel(1)	750	-	-	149.4	10.4	12.5	63.9	105.6	27.2	69.5	0.20	2.55
Latrobe Steel(2)	1,400	73.4	7.9	73.4	5.4	9.4	-	-	9.3	22.0	0.45	2.36
Teledyne(3)	1,750	375.7	15.7	1,699.9	65.0	-	497.2	1,127.6	207.4	496.4	0.56	2.39
Wallace Murray (Simonds)(3)	400	121.2	7.8	318.6	22.1	-	100.6	197.3	38.2	116.6	0.62	3.05
Washington Steel(2)	800	87.4	14.6	87.4	12.6	5.4	-	-	8.2	25.5	0.15	3.13

Notes:
(1) 1973 data from Moody's, Dun & Bradstreet and annual reports, 1973 and 1974.
(2) Source: Iron Age 1974 Industry Financial Analysis, April 28, 1975.
(3) Source: The Fortune Double 500 Directory, 1975.
(4) Includes only employees at establishments where specialty steel operations account for over 50% of total plant output.
(5) In some cases, company specialty steel sales and profits figures include distributive operations and operations at establishments primarily devoted to carbon steel production.
(6) Computed from 1974 debt and equity figures where available, otherwise based on 1973 data from Moody's, Dun & Bradstreet and annual reports.

* - = Not available.

ENVIRONMENTAL PROTECTION AGENCY

FINANCIAL DATA OF SPECIALTY STEEL PROCESSORS - 1974

Specialty Steel Wire Processors	Specialty Steel[1] Number of Employees[5]	Specialty Steel[1] Sales[6] ($000,000)	Specialty Steel[1] Profits[6] ($000,000)	Total Parent Company Sales ($000,000)	Total Parent Company Profits Before Tax ($000,000)	Total Parent Company Debt ($000,000)	Total Parent Company Equity ($000,000)	Total Parent Company Total Assets ($000,000)	Total Parent Company Current Liabilities(1) ($000,000)	Current Assets(1)	Debt Equity Ratio(7)	Current Ratio(1)
Driver-Harris Company[1]	340			40.3	1.9	3.3	16.0	30.0	9.1	20.1	0.21	2.23
Eaton Corporation[3]	700			1,759.7	-	-	594.3	1,316.8	266.2	700.4	0.51	2.63
General Cable[3]	240	-	-	518.7	75.1	-	183.3	363.0	86.9	144.8	0.48	1.66
H. K. Porter Co.[3]	210	109	11.6	363.4	33.9	-	97.3	152.4	42.2	87.5	0.01	2.07
Howmet Corporation[3]	80			416.4	46.1	-	158.5	444.4	76.0	195.5	1.12	2.57
National Standard Company[1]	600	-	-	218.8	26.2	33.8	80.1	157.7	37.1	93.3	.42	2.51
Sylvania Products (GTE)[1]	100	-	-	1207.8	122.2	109.9	384.5	844.6	350.2	625.6	0.29	1.79
Specialty Sheet Strip and Bar Processors[4]												
Tube Processors												
Emerson Electric (Greenville Tube)[1]	250	-	-	937.6	158.2	49.3	451.8	602.6	106.6	422.2	.11	3.96
Handy & Harmon Tube[3]	200	-	-	319.0	26.0	-	45.4	157.2	72.0	100.7	0.58	1.40
Phillips Petroleum (Wall Tube)[3]	350	-	-	4,980.7	429.8	-	2,273.7	4,028.1	620.8	1,232.0	0.40	1.99
Sharon Steel[2]	230	64.3	4.2	464.4	84.3	33.2	-	-	48.6	103.8	0.20	2.12
Synalloy (Bristol Metal Products)[1]	250	13.3	0.9	40.3	1.8	7.4	13.5	25.9	5.0	16.3	0.55	3.22
U. O. P. (Flexonics)[1]	400	-	-	418.9	33.2	66.6	183.8	396.4	124.0	214.3	0.36	1.73
Whittaker Corporation (Bishop Tube Production Steel)(3)				778.2	35.0	-	182.4	563.4	196.4	368.0	0.99	1.87
Wilson, Lee Engineering Co., Inc.	-	-	-	12.9	.4	-	-	8.7	5.9	7.5	-	1.27

Notes:
(1) 1973 data from Moody's, Dun & Bradstreet and annual reports, 1973 and 1974.
(2) Source: Iron Age 1974, Industry Financial Analysis, April 28, 1975.
(3) Source: The Fortune Double 500 Directory, 1975.
(4) Specialty Sheet, Strip and Bar Processors are included with Specialty Steel Integrated Producers.
(5) Includes only employees at establishments where specialty steel operations account for over 50% of total plant output.
(6) In some cases, company specialty steel sales and profits figures include distributive operations and operations at establishments primarily devoted to carbon steel production.
(7) Computed from 1974 debt and equity figures where available, otherwise based on 1973 data from Moody's, Dun & Bradstreet, and annual reports.

ENVIRONMENTAL PROTECTION AGENCY

CURRENT RATIO[1] OF SELECTED INTEGRATED SPECIALTY STEEL PRODUCERS (SIC 3312)

Year	Allegheny Ludlum	Carpenter Technology	Cyclops	Latrobe	Steel Industry[2]
1975	2.1:1	2.9:1	1.8:1	N.A.[3]	N.A.
1974	2.1:1	2.9	1.8	N.A.	1.8:1
1973	2.2:1	3.6	2.0	N.A.	1.9:1
1972	2.3:1	3.7:1	2.0:1	2.4:1	1.9:1
1971	2.8	4.4	2.3	2.1	1.9
1970	2.6	2.7	2.2	2.6	1.9
1969	3.0	3.0	3.1	2.6	1.8
1968	3.5	3.6	3.0	2.5	2.0
1967	3.8	3.3	2.6	2.5	2.2
1966	3.8	3.1	2.9	2.2	2.3
1965	3.6	3.4	2.5	2.3	2.4
1964	3.9	3.4	3.1	2.9	2.4
1963	3.7	3.5	3.0	3.3	2.7

Notes: (1) Ratio of current assets to current liabilities.
(2) Sources: American Iron and Steel Institute, and Standard & Poors Industry Surveys, Steel-Coal, September 19, 1974. Annual Statistical Report, 1974.
(3) N.A. - Not Available.

Includes Carbon Steel Segment.

EXHIBIT II-2

ENVIRONMENTAL PROTECTION AGENCY

CAPITAL EXPENDITURES FOR MAJOR SPECIALTY STEEL PRODUCERS
(As a Percentage of Gross Plant)

Year	Allegheny Ludlum	Carpenter Technology	Cyclops	Latrobe(2)	Iron and Steel Industry
1974	5.6%	8.3%	6.6%	N.A.(1)	N.A.
1973	4.2	6.8	4.3	3.0%	N.A.
1972	5.9	4.4	3.9	2.7	3.5%
1971	3.6	5.5	6.7	1.0	2.3
1970	5.1	5.7	4.4	0.9	5.6
1969	7.7	5.7	2.9	7.1	6.9
1968	9.9	11.3	5.2	23.4	8.2
1967	7.0	14.7	6.1	17.3	8.2
1966	15.3	9.9	12.2	7.0	7.9
1965	11.7	5.0	14.3	6.2	7.9
1964	3.5	3.3	4.0	12.4	7.4
1963	3.0	9.3	4.0	25.3	5.1
Capital Expenditures ($ Millions)					
1972	$27.7	$ 5.85	$10.70	$5.14	-
1973	20.7	9.64	12.28	N.A.	-
1974	28.8	12.68	19.92	N.A.	-

Source: Standard & Poor's Industry Surveys, Steel-Coal, September 25, 1975.

Notes: (1) N.A. - Not Available.
(2) Latrobe Steel acquired by Timkens Co., April 25, 1975.

EXHIBIT II-3

ENVIRONMENTAL PROTECTION AGENCY

MEASURING THE ABILITY TO FINANCE EXPENDITURES THROUGH
CASH FLOW FOR MAJOR SPECIALTY STEEL PRODUCERS (WITHIN SIC 3312)
(Millions of Dollars)

Allegheny Ludlum

	Earnings	Depreciation	Cash Flow(2)	Dividends	Adjusted Cash Flow(2)	Gross Capital Expenditures	Adjusted Cash Flow as a Percent of Capital Expenditures
1974	$45.07	$18.64	$63.71	$13.22	$50.49	$28.80	175%
1973	31.18	17.61	48.79	11.50	37.29	20.73	180
1972	17.70	17.13	34.93	10.79	24.14	27.68	87
1971	1.02	16.61	17.63	12.21	5.42	15.94	34
1970	11.92	15.73	27.65	17.42	10.23	22.30	46
1969	22.35	13.51	35.86	16.48	19.38	31.91	61
1968	22.88	12.84	35.72	15.27	20.45	37.85	54
1967	24.91	16.38	41.29	12.65	28.64	23.59	100
1966	31.19	14.24	45.43	9.06	36.37	37.30	98
1965	19.47	10.02	29.49	8.09	21.40	28.56	75
1964	15.85	8.67	24.52	7.89	16.63	7.16	200

Cyclops

	Earnings	Depreciation	Cash Flow(2)	Dividends	Adjusted Cash Flow(2)	Gross Capital Expenditures	Adjusted Cash Flow as a Percent of Capital Expenditures
1974	$19.51	$13.73	$33.24	$ 5.84	$27.40	$19.92	137%
1973	8.64	13.14	21.78	3.15	18.63	12.28	152
1972	7.69	12.62	20.31	3.15	17.16	10.70	160
1971	4.12	10.50	14.62	3.14	11.48	19.93	58
1970	1.43	8.74	10.17	4.50	5.67	12.38	46
1969	9.35	8.56	17.91	4.33	13.58	6.08	223
1968	10.08	8.26	18.34	4.10	14.24	10.65	134
1967	6.50	12.77	19.27	3.99	15.28	12.02	127
1966	10.11	11.78	21.89	3.98	17.91	21.73	82
1965	10.62	10.06	20.68	3.58	17.10	22.73	75
1964	8.34	8.76	17.10	3.18	13.92	11.33	123

Notes: (1) Cash flow = earnings + depreciation.
(2) Adjusted cash flow = cash flow - dividends.

Source: Annual reports.

ENVIRONMENTAL PROTECTION AGENCY

MEASURING THE ABILITY TO FINANCE EXPENDITURES THROUGH CASH FLOW FOR MAJOR PRODUCERS
(Millions of Dollars)

Year	Earnings	Depreciation	Cash Flow(1)	Dividends	Adjusted Cash Flow(2)	Gross Capital Expenditures	Adjusted Cash Flow as a Percent of Capital Expenditures
Carpenter Technology							
1974	$17.40	$6.49	$23.89	$5.78	$18.11	$12.68	142%
1973	14.02	5.75	19.77	3.81	15.96	9.64	166
1972	6.60	5.66	12.26	4.25	8.01	5.85	137
1971	4.06	5.47	9.53	6.43	3.10	7.23	43
1970	11.06	5.09	16.15	6.84	9.31	7.23	129
1969	11.31	5.07	16.38	6.94	9.44	6.75	140
1968	11.81	6.33	18.14	6.93	11.21	12.64	89
1967	15.84	5.28	21.12	6.26	14.86	14.04	106
1966	14.92	4.47	19.39	4.12	15.27	8.18	187
1965	11.14	4.29	15.43	4.51	10.92	3.73	293
1964	6.97	4.24	11.21	3.00	9.21	2.35	392
Latrobe Steel							
1974	N.A.	N.A.	N.A.		N.A.	N.A.	N.A.
1973	(.46)	1.74	1.28	-	1.28	1.13	113
1972	(2.74)	1.78	(.96)	-	(.96)	0.40	0
1971	(.46)	1.85	1.39	.18	1.21	0.36	336
1970	0.92	1.80	2.72	.72	2.00	2.94	68
1969	2.45	1.34	3.79	.71	3.08	9.05	34
1968	2.51	1.23	3.74	.71	3.03	5.17	59
1967	3.16	1.33	4.49	.88	3.61	1.76	205
1966	2.19	1.20	3.39	.70	2.69	1.48	182
1965	1.53	1.20	2.73	.69	2.04	2.82	72
1964	1.77	0.88	2.65	.69	1.96	5.14	38

Notes: (1) Cash flow = earnings + depreciation.
(2) Adjusted cash flow = cash flow - dividends.
N.A. Not Available.

Source: Annual reports, 1974.

III - PRICING ANALYSIS

MARKET STRUCTURE

(a) Supply

The supply side of the domestic specialty steel market is marked by a large number of producers and processors of varying sizes who manufacture a wide variety of overlapping product lines. As indicated in the exhibits to Chapter I of this report, about 160 firms maintain establishments which produce specialty steels, and somewhat more than half this number operate establishments where specialty steel accounts for over 50% of total plant output. The firms primarily oriented towards specialty steel production range in size from 17 firms with less than 100 specialty steel employees to a firm with over 10,000 such employees.

Ten large firms with integrated production facilities account for the bulk of the industry's production and sales, but none of these has a dominant role in the market. Many establishments primarily devoted to carbon steel production have the potential to increase their production of specialty steels in response to favorable market conditions, thereby assisting competitive forces in the industry. In addition, most of the integrated producers, and a few of the processing firms, have the ability to make significant shifts in the composition of their output between product forms in response to changing marketing opportunities. Thus, the production of specialty steel in this country takes place within a reasonably competitive framework.

(b) Demand

The demand side of the domestic market is characterized by an even larger number of customers. As indicated in Chapter I, 55% to 60% of the tonnage sold outside the industry (i.e., tonnage not sold for converting and processing) goes directly to end-users in a wide range of producers' and consumers' durable goods industries and in various types of construction. The remaining tonnage is shipped to steel service centers and warehouse distributors, who maintain an active and highly competitive market in many varieties of steel.

(c) World Market Relationships

The U.S. market for stainless and tool steel forms a part of a broader worldwide market linked by substantial international trade flows. The U.S. is the world's largest specialty steel consumer, but does not dominate either the world supply or the world demand except in the case of high alloy products. Industry observers believe the U.S. accounts for 25% to 30% of free world stainless steel consumption, 40% to 60% of tool steel consumption, and 65% to 75% of high alloy steel consumption.

Foreign specialty steel production is generally organized along less competitive lines than is U.S. production. In Japan and in many Western European nations, specialty steel facilities are partially owned by governments or are cartelized under public guidance. Trade protection, export incentives, and direct subsidies are frequently extended to foreign producers with the goals of supporting full employment, improving foreign exchange earnings, and enabling these producers to build installations of efficient scale while their internal markets develop. This supportive role of government to foreign specialty steel producers is not enjoyed by domestic producers who often find themselves cast as apparent adversaries of U.S. governmental policy.

PRICING TECHNIQUES

The nominal pricing mechanism utilized by specialty steel producers is a system of base prices which are developed for each grade of steel. "Extras" are added for size, surface quality, and order volume. Base prices reflect alloy content and the difficulty of producing the grade. "Extras" reflect the costs of producing particular shape(s), width(s), diameter(s), length(s), and surface qualities. Base prices and extras are published by each producer and are generally available to customers. Competitive pressures normally result in published base prices and extras for all producers being almost identical.

Actual industry selling prices are almost always below published book prices, indicating the probable existence of some degree of discrimination by producer firms between buyers.

Such discounting probably reflects, to an even greater degree, the resistance of producers to lowering established product prices in periods of weak demand that are viewed as temporary. While movements in published book prices do parallel movements in actual selling prices to some degree, the actual discount from published prices varies considerably among specific products and over time. In early 1974, when demand for specialty steels was strong and the lingering effects of price controls were still felt, actual selling prices were usually less than 5% below book prices. In the weak demand years of 1971 and 1972, by comparison, actual selling prices of many products ranged between 20% and 30% below book prices.

COST AND SUPPLY DETERMINANTS

The integrated specialty steel industry, like the high tonnage carbon steel industry, requires a substantial fixed capital investment and finds its profitability eroded by idle capacity. However, labor and raw materials costs are relatively more important in the specialty steel industry, which leads to a significantly different relationship between selling prices and supply tonnages.

(a) Raw Materials

Integrated carbon steel producers generally have significant control over their input mix of raw materials and can fairly easily shift to lower output grades requiring fewer processing steps. Moreover, the carbon steel industry is the major or predominant user of many of its raw materials inputs, allowing much of the slack in prices during periods of weak demand to be shifted back to suppliers. The specialty steel producers, in contrast, tend to have little control over the quantities of expensive alloying materials they must use to produce high quality products. They also are unable to exert a major influence on the price of these materials because they typically account for a limited proportion of total demand in markets that are often worldwide in scope.

The most critical raw materials used in producing specialty steels are chromium and nickel ferralloys, chrome-nickel scrap, and carbon steel scrap. Sixty to eight-five percent of the raw materials used in making "new" stainless steel consist of select grades of carbon steel and stainless steel scrap. The balance consists of ferroalloys and other additive agents. The most common additive agents used include ferrochromium, nickel, ferromanganese, ferromolybdenum, ferrotungsten, and ferrovanadium.

Domestic stainless steel producers are only one consuming group among many in the U.S. market for carbon steel scrap, and thus would be limited in their ability to shift back a slackening in price to these suppliers, even in a closed domestic market. Moreover, unlike virtually all other countries, which consider these materials to be strategic national resources, the United States allows the exportation of stainless and carbon steel scrap. Because large quantities of chrome-nickel and carbon steel scrap were exported to foreign steel producing countries prior to 1974, the role of demand conditions in the U.S. specialty steel market as a determinant of the price of the industry's major raw materials inputs was further limited.

Practically all ferrochromium and nickel (in its varying alloying forms) must be imported into this country, requiring domestic specialty steel producers to purchase these raw materials in competition with buyers throughout the world. A few attempts by integrated specialty steel producers to achieve the raw materials flexibility of integrated carbon steel producers have been unsuccessful.

(b) Labor Intensity

As was described in Section I, U.S. specialty steel operations are labor-intensive by the standards of the steel industry as a whole. The specialty steel producers employ many times the number of workers per ton of product that are used in carbon steel production, and also account for a substantially larger fraction of steel industry employment than of steel industry dollar sales volume. As indicated in the J. K. Lasser & Co. survey, which was presented as evidence before the U.S. International Trade Commission and is described in Chapter II, direct labor costs typically account for 18% to 29% of total specialty steel unit production costs. A precisely comparable statistic for the steel industry as a whole was unavailable. However, total non-salaried employee costs of American Iron and Steel Institute reporting companies comprised only 19% of these firms' total costs in 1974, inclusive of non-steel operations. The proportion of direct labor costs to total steelmaking costs was probably significantly lower than 19%.

(c) Elasticity of Domestic Supply

Taken together, labor and raw materials costs typically account for between 75% and 80% of specialty steel producers' overall costs. As has been described in preceding paragraphs, these producers have little ability to influence the prices of the raw materials they purchase. They also have only limited control over the wage rates of their employees, which are normally negotiated within the context of the steel industry as a whole. As a result, the variable cost per unit of specialty steel output (i.e., the variable cost per ship ton) does not appear to fall off substantially as output is reduced from high levels of capacity utilization. Because the response of unit variable costs to downward adjustments in output levels appears to be small, a major reduction in volume should lead to a far smaller proportional decline in the prices at which suppliers can sell. Conversely, a relatively small reduction in the industry selling price should force a substantial curtailment in the tonnage producers are able to supply and still cover variable costs.

As is discussed in a subsequent paragraph of this chapter, the price and volume coordinates observed in the specialty steel market over consecutive short time intervals (such as quarters or years) appear to reflect fluctuating demand moving along a relatively stable supply curve. The dynamics of this supply relationship involve prices reacting to shifts in the level of demand. Output changes are typically the first reaction to short-run demand changes, and are followed by the corresponding adjustments in price.

The short-term stability of the industry's supply function, combined with fluctuating demand, makes it possible to infer or estimate the industry's supply elasticity by observing short-term market volume changes and the subsequent short-term reactions of industry prices. In making such inferences, actual industry price changes should be adjusted for the effects of general inflation, while actual industry output changes should be adjusted to exclude the effects of long-term trend growth in the supply potential of the economy at large and of long-term trend growth in aggregate economic demand.

A rigorous estimation of the supply elasticity of specialty steels was not attempted in this study. The qualitative observations made in this chapter about labor and raw materials costs and intensities in the industry imply a fairly high supply elasticity. This judgment was checked against recent short-term movements in industry prices and output levels, utilizing methods described in the previous paragraph. Between 1969 and 1971, stainless steel tonnage shipments (adjusted for the trend increase in economic output reflected by growth in "real" GNP) declined 24%. This was associated with a decline in stainless steel prices (adjusted for general inflation measured by the Implicit Price Deflator for GNP) of about 16% between early 1970 and early 1972. Similarly adjusted stainless steel shipments increased 37% between 1971 and 1973, and were followed by an adjusted price increase of 15% between early 1972 and early 1974. Thus, the experience of recent years is consistent with a high short-term supply elasticity of specialty steels, and suggests a range of 1.5 to 3.0.

(d) Supply of Imports

The supply elasticity of specialty steel imports is far more difficult to determine with any precision than is the domestic supply elasticity. In part this is due to an even more incomplete data base upon which to draw estimates, and in part it is due to a presumption of less stability of supply in international markets. The overall supply function of foreign producers is thought to be less elastic than that of U.S. producers. In part this results from the modest growth rate of the U.S. specialty steel industry during the past decade or more, which has led to limited investment in new and modernized plant. In addition to directly lowering the fixed cost component in U.S. producers' cost structures relative to that of foreign producers, the relatively low level of investment in new plant left the U.S. with less modernized, more labor-intensive production facilities. The overall effect is to make variable production costs a substantially higher fraction of total costs in this country at optimum operating rates, and to make reductions in per ton variable costs more difficult to effect as output levels are reduced.

Of additional importance in contributing to the inelasticity of foreign producers' supply is the use of the foreign steel industry as an instrument of social-political policy in Japan and in most Western European countries. As has been noted earlier, the industry is frequently partially government owned or is government subsidized in many of these nations, allowing production to proceed at levels that might otherwise be unprofitable during periods of slack demand. Moreover, apart from supply inelasticity resulting from economic factors, the goal of full employment is more strongly emphasized overseas, so that producers are often pressured to maintain labor forces and output levels in times when it is unprofitable for them to do so.

The supply of imports to the U.S., however, is considerably more elastic with respect to price than is the overall production supply from foreign producers. This is because the supply available to the U.S. market is a residual--the amount remaining after foreign demand is satisfied, not only in the producing countries themselves but in potential importing countries other than the U.S. An increase in the U.S. price relative to that of these other nations, may cause a considerably larger proportion of even a relatively fixed total foreign supply to enter the U.S. market.

Over longer time periods, these import flows, or even the prospect of these flows, will tend to equalize prices among the various national markets, with allowances for variations in product quality, transport costs, and a premium for reliability of supply.

MARKET PRICE INFLUENCES

The durable and capital goods industries utilizing specialty steels are subject to major cyclical variations in demand, frequently of the order of 30% or more over the course of a business cycle. The demand for specialty steels is largely derived from the demand for these products, and therefore itself varies substantially over the business cycle.

The supply function of specialty steel producers has traditionally been more stable in the short term. Unit labor costs, and, until recently, unit plant, equipment and raw materials costs, at any given level of output, did not exhibit nearly as great year-to-year variations as did demand.

The result of this interaction between a relatively stable supply function and sharp year-to-year fluctuations in the amount of product demanded at any given price, is to cause the price-volume coordinates observable in the market to move along the industry's supply function, rather than its demand curve. Instead of displaying the reduced volume of output which would result from a rise in prices if demand were stable, the specialty steel market data reveal the tendency of increased levels of demand for end-products using these steels to contemporaneously raise both prices and output levels. This phenomenon makes it difficult to observe the pure effect of price on demand, and hence the price elasticity of demand, in market statistics.

MARKET PRICES

Accurate price data for this industry are difficult to obtain. Published book values do not generally reflect actual selling prices, and difficulties arise due to apparent inconsistencies between the various published sources of actual price data. For purposes of this study the composite stainless and tool steel prices in Table III-1 are used. These composite prices were obtained from statistics of the value of intercompany shipments and statistics of the related tonnage volume shipped.[1]

(1) To the extent that reported individual dollar and tonnage shipment figures erroneously include transfers to other plants of the same company, these composite price data are probably somewhat lower than actual composite selling prices.

Table III-1

Composite Prices of
Stainless and Tool Steels

Year	Stainless ($/Net Ton)	Tool Steel ($/Net Ton)
1969	1,170	1,980
1970	1,330	1,920
1971	1,240	1,980
1972	1,210	2,130
1973	1,320	2,140
1974	1,630	2,660
1975(1)	1,870	3,060

Note: (1) A. T. Kearney estimate of composite prices as of July 1, based on typical price increase from 1974 average levels, as detailed in Exhibit III-1 (15% increase used for stainless and tool steel).

Source: Department of Commerce, Current Industrial Reports: Steel Mill Products. Series MA 33B (Year) - 1.

For purposes of comparison, Exhibit III-1 portrays price data presented to the U.S. International Trade Commission on behalf of the Tool and Stainless Steel Industry Committee. For six stainless and three tool steel generic product form types, a composite average price is shown based upon net dollar sales and total shipments tonnage. The yearly average "actual" selling price of a specified product belonging to each generic product form type is also presented.

ENVIRONMENTAL PROTECTION AGENCY

SELECTED SPECIALTY STEEL INDUSTRY SELLING PRICES - 1969-1975
(Dollars per Net Ton)

	Stainless Steel													Tool Steel						
	Flat Stainless Steel Plate		Stainless Hot Rolled Wire Rod		Stainless Bars		Stainless Cold Rolled Sheet		Stainless Hot Rolled Sheet		Stainless Cold Rolled Strip		High Speed Rod		High Speed Bar		Tool Steel Bar	
Year	Composite Average(1)	Typical Actual(2)(3)	Composite Average(1)	Typical Actual(2)(4)	Composite Average(1)	Typical Actual (2)(5)	Composite Average(1)	Typical Actual (2)(6)	Composite Average(1)	Typical Actual (2)(7)	Composite Average(1)	Typical Actual (2)(8)	Composite Average(1)	Typical Actual (2)(7)	Composite Average(1)	Typical Actual (2)(9)	Composite Average(1)	Typical Actual (2)(10)
1969	1,227	1,161	1,208	1,019	1,310	1,302	962	969	521	N/A	997	1,090	3,529	N/A	3,371	3,160	1,428	1,396
1970	1,432	1,232	1,413	1,072	1,385	1,445	1,083	1,083	621	N/A	1,077	1,198	2,726	N/A	3,432	3,220	1,582	1,478
1971	1,400	1,164	1,231	1,007	1,359	1,510	1,033	992	790	N/A	1,089	1,208	2,631	N/A	3,532	3,180	1,588	1,530
1972	1,361	1,182	1,155	968	1,374	1,432	1,003	942	642	N/A	1,096	1,196	2,925	N/A	3,741	3,205	1,561	1,577
1973	1,460	1,240	1,300	986	1,496	1,336	1,069	1,013	674	N/A	1,180	1,222	2,772	N/A	3,811	3,410	1,671	1,657
1974	1,766	1,544	1,734	N/A(3)	1,947	1,604	1,343	1,262	1,395	N/A	1,474	1,478	3,567	N/A	4,774	4,440	2,072	2,026
1975	2,026	1,767	2,198	N/A(7)	2,316	1,902	1,524	1,338	1,673	N/A	1,703	1,622	4,346	N/A	5,824	5,330	2,568	2,349

Notes:
(1) Composite Averages - Total Net Sales for Product Form (as reported in source-ARS) ÷ Total Sales for Product Form (ARS).
(2) Typical Average for one year is the numerical average between the January 1st actual selling prices of that and the succeeding year except for 1975. The 1975 Typical Average is the actual selling price as of July 1, 1975.
(3) Typical Average is for Grade 304, HRAP, 1/4" x 48" x 240".
(4) Typical Average is for Grade 304, .250" to .287" Rd.
(5) Typical Average is for Grade 304, HR, 1" Rd.
(6) Typical Average is for Grade 304, 2B Finish, 8-14 ga. x 48" x coil.
(7) No data available in source.
(8) Typical Average is for Grade 304, 2 Finish, .035" x over 12" to 18" x coil.
(9) Typical Average is for Grade M-2, 1" Rd. x Cut Length HR.
(10) Typical Average is for Grade A-2, 1-1/2" Rd. HR.

Source: Testimony before U.S. International Trade Commission, re: Specialty Steel.

IV - IMPACT FRAMEWORK

INTRODUCTION

The economic framework established for impact assessment is based on analytical models of the U.S. specialty steel industry within the institutional context of the U.S. economy.

APPROACH TO ASSESSMENT

The impact analysis attempts to assess the range of economic adjustments which may occur as a result of the change in pollution abatement control efforts implicit in the effluent limitation guidelines. Both short-term and long-term changes will take place at the industry level which may have different impact individual plants and firms or classes of plants and firms. In addition, the controls may have significant specific effects on the national or regional economy, such as altering the balance of foreign trade.

In estimating impacts, Kearney first attempts to examine changes in market relationships, and then to determine the effects of these changed market conditions on specific plants and firms. Iterative adjustments may then be made to make the market and industry impacts consistent with the impacts on individual firms and plants.[1]

ASSUMPTIONS

The framework established for impact assessment is based on several key assumptions:

1. The cost and technical data base provided by other EPA contractors, i.e., Datagraphics, Inc. and Cyrus Wm. Rice, are assumed to reflect the true conditions which will result from the effluent limitation guidelines.

2. Compliance with the BPT effluent guidelines limitations is assumed to occur between 1979 and 1981, and compliance with the BAT guidelines is assumed to occur a few years later. Specialty steel producers and processors are assumed to act and plan the conduct of their business on this basis at the time the regulation is effective in 1976.

3. The lead time provided the industry to meet the required BPT and BAT standards is assumed to be adequate to purchase and install the required equipment without creating abnormally long lead times or significant short-term increases in the real prices of equipment as a result of supply bottlenecks in water treatment systems and related applications engineering.

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(1) For example, an initial market price increase estimated on the basis of pollution control costs of domestic producers will not be consistent with overall supply-demand balance in U.S. or world markets if substantial import flows into this country occur in response to upward movements in prices. In this instance, an iterative adjustment of market price, domestic producers' shipments, and apparent consumption is made in order to develop an impact assessment that is consistent with balance in world supply-demand relationships as a whole.

The existence of previously granted permits for discharge reinforce this assumption.

DYNAMICS OF ADJUSTMENT

(a) Adjustment Horizon

The firms' adjustment requirements are definite and scheduled. Owners and/or managers of specialty steel establishments and their customers know at the time of promulgation what changes will be mandated by the regulation at some point in the future. Of course, there are uncertainties as to the precise impacts of the regulations on the market.

(b) Adjustment versus Baseline

The baseline forecasts developed in Chapter VI estimate industry conditions over the next several years in the absence of effluent guidelines. In addition to the effect of the legislation itself, the promulgation of the effluent guidelines, and publication of associated cost and impact studies, will immediately begin to cause changes in the development of the industry. This is due to entrepreneurs' reactions to the information about future industry conditions provided by these studies.(2)

(2) For example, if it were to become known in the industry that smaller specialty steel processors are subject to relatively higher costs of pollution control, new establishments of this size would be less likely to enter the industry until a full market adjustment to this knowledge takes place.

These adjustments serve to ameliorate real world impacts relative to what they would be in the absence of knowledge about the effects of regulation on the industry. As a result, the original measurement of impact against the baseline may become an idealized calculation which overstates the actual real world impact while the actual real world economic impact could not be accurately forecast using the baseline conditions. An example of how planning adjustments may cause variance from a baseline forecast is illustrated in Exhibit IV-1.

IMPACT FRAMEWORK

(a) Market Conditions

Market changes resulting from the effluent guidelines are measured against the baseline forecast conditions described in Chapter VI. Market impacts are evaluated employing the techniques and assumptions of conventional price theory. The major assumptions about market behavior are listed as follows:

1. Site-specific pollution abatement costs are not considered, and unit costs arising from the controls are assumed to be approximately equal for all establishments in the same industry segment and size category. Cost differences arising from establishment size and process categories are recognized.

2. The markets for noncustomized "standard specification" products are assumed to be fully competitive. Market prices are assumed to rise to cover those unit costs of pollution abatement (including depreciation, operation and maintenance costs,

and return-on-investment) which are common to all establishments supplying a given product. Additional short-term price increases to cover costs incurred by some, but not all, of the size and process categories are assumed if the lower cost categories do not appear to have sufficient capacity to meet overall demand for the product. Higher costs specific to establishments producing less than 20% of the tonnage of the product are, in general, assumed not to be reflected in market prices, as the lower cost plants are assumed to be able to expand their output to meet full market demand if required.(3)

3. The markets for the more customized "made-to-order" products are assumed to be characterized by less than full competition because significant costs are believed to be involved in locating the potential lowest cost producers and/or highest paying customers. In addition, the creation of an adequate customer working relationship needed to service such product orders is assumed to involve time and effort on the part of both customers and suppliers. Hence limited price variation is assumed to occur among similar customized products produced by different firms. Establishment size and process categories having atypically high unit abatement costs, are assumed to be able to pass through at least a fraction of these costs to their "made-to-order" customers.

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(3) Some establishments may actually be insulated from strong market competition due to geographic location or for other reasons. These plants may be able to obtain at least temporary premiums over competitive prices if their costs require it.

4. Forecast changes in industry volume are based upon the projected market price increases and inferred ranges of price elasticities of demand.

(b) Customers and Suppliers

Changed conditions in the specialty steel market resulting from the emissions control guidelines may have a significant impact on the customers and suppliers of the industry. Where they exist, these transferred impacts are identified and described, and the potential for secondary and feedback effects is reviewed.

(c) Capital Investment and Financing

Financing of pollution control equipment creates the potential for additional adverse impacts. Investment requirements may be large in relation to normal capital expenditure levels. Normal channels of financing may not be adequate since cash flow and/or borrowing characteristics of the industry may not be favorable. In order to assess these potential financing impacts, the economic and financial characteristics of the industry are reviewed in relation to the general standards of performance required by financing institutions.

(d) Micro Impacts

In many cases an establishment, or a class of establishments, set apart by size, level of integration, or degree of diversification, is affected to a different extent than the industry as a whole. The primary cause of differential adjustments to pollution controls is the possibility of significantly higher treatment costs for a class of firms in relation to the typical treatment costs which are incurred and are reflected in market demand, supply, and prices.

Some typical cases of potential for differential impacts are as follows:

1. Economies of Size in Pollution Abatement. Treatment system technology is such that its costs cannot be reduced below a minimum point, though the capacity of the system continues to exceed the establishment's actual flow requirements. Moreover, low flow volumes tend to have higher unit treatment costs than higher flow volumes. Thus, technical costs of small firms tend to be higher than those of larger firms, and they may be impacted more seriously unless they attain certain economies in system management and operation. At the opposite end of the size spectrum, potential large scale economies may exist which could differentially benefit the very largest firms.

2. Economies of Process Specialization. Treatment of wastes from different processes may be significantly different, creating economies of process specialization which may result in some firms changing the mix of specialty steel products they offer.

3. Economies of Size in Financing. Institutional factors may create economies of size in financing, allowing large firms to obtain funds at lower cost than small firms, or

giving them access to sources of funds which are not available to the smaller firms.

4. Varying Degrees of Competition in Selling Markets. The specialty steel industry's output consists of customized "made-to-order" products (about one-third of the industry's shipment tonnage), and noncustomized "standard specification" items. The "made-to-order" market is assumed to be less competitive than the "standard specification" product market. Firms or industry segments having relatively high unit costs of pollution abatement are believed to be more capable of passing these costs through to "made-to-order" customers than in their more "standardized" products. Hence, firms or industry segments more heavily oriented towards customized products may be in a better position to adjust to pollution abatement costs.

(e) Closure Criteria

Severely impacted individual firms may close as a result of the economic adjustments required by the abatement controls.

In assessing the probability of such closures, the study examines likely trends in industry segment profitability, including cyclical impacts and changes in competitive conditions (e.g. restrictions on imports). Available data pertaining to the profitability, debt and equity structure, specific product specializations, and other relevant operating characteristics of individual firms are also analyzed in industry segments where closures are considered a significant possibility. The costs of the required investment are analyzed for these firms in relation to corporate cash flow and previous levels of capital expenditure where these data are available. In general, a 10% return on long-term capital invested (debt plus equity) is used as a guideline minimum return necessary to attract major new capital investment.

Such establishments, if any, viewed as likely to close as a result of the BPT or BAT guidelines are assumed to make such a decision and act on it at the time of the issuance of the regulations. Such action would likely result in closing when compliance with the applicable guidelines was required, but might result in a somewhat earlier closure if cyclical conditions in the intervening period are viewed as unfavorable. In the case where the BAT guidelines are judged as likely to precipitate closure, given the present size and product mix of the establishment, the additional alternative of altering these plant characteristics may be feasible. In other cases, plants whose actual closure decision results from the BAT guidelines may terminate operations at the compliance date for the BPT regulations, rather than undertake the BPT investment in order to continue operations for a limited time period.

(f) Other Impacts

Impacts transmitted to other portions of the economy are also considered including foreign trade effects and impacts on local economies.

EXHIBIT IV-1

ENVIRONMENTAL PROTECTION AGENCY

EXAMPLES OF MEASURES OF FUTURE IMPACT

Alternative	Case 1	Case 2
Impact Condition: Small Establishments Close	Baseline forecast indicates growth in number of small establishments.	Baseline forecast indicates decline in number of small establishments.
Impact Base Measure: Present Number of Establishments	Growth does not occur because plans are changed in response to regulations. This measure estimates actual closures.	Part of the decline is attributable to established economic trends and not to the effluent guidelines. Thus, using the present number of shops as a base would overestimate impact. In addition, the initial rate of decline in the number of establishments is likely to accelerate due to the effect of the publication of the guidelines on firms which otherwise would have closed at a later date.
Impact Base Measure: Baseline Number of Establishments	Because growth does not actually occur, this measure overstates real world closures. The difference between the higher baseline estimate and the present number of plants represents a foregone opportunity for the expansion of small business, rather than closures.	The real world closure impact is best estimated by the baseline estimate, since it isolates the closures due to the impact of the effluent guidelines from closures which occur as a result of already established economic trends. However, using the baseline forecast will lead to an overestimate of the number of closures in the first year of enforcement. Publication of the effluent guidelines will accelerate closures which would have resulted later in the period as a result of already established trends, making these appear to be due to the regulation.

V - TECHNICAL AND COSTS DATA BASE

A - SPECIALTY STEEL PRODUCTION PROCESSES

Detailed discussions of the processes that are used to produce specialty steels and that come under the purview of the proposed and interim final effluent guidelines can be found in "Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Alloy and Stainless Steel Segment of the Iron and Steel Manufacturing Point Source Category", dated June 1975. Brief discussions of these processes are found in the Appendix of this report.

B - SPECIALTY STEEL WATER POLLUTION ABATEMENT COSTS

INTRODUCTION

The total specialty steel costs to install and operate water pollution abatement facilities were computed from the costs developed for model plants. For each model plant, representative of a specified segment of the industry, total plant (establishment) costs were based on the costs of the individual processes defining that plant. The costs for each model plant were extended to derive total costs for the industry segment. The total segment costs were summed to provide industry totals. This methodology is more fully discussed in the following sections.

In fulfillment of Contract No. 68-01-1527, Datagraphics, Inc., the technical contractor, submitted to the EPA a draft of "Development Document for Effluent Limitations Guidelines and New Source Performance Standards for the Alloy and Stainless Steel Segment of the Iron and Steel Manufacturing Point Source Category," dated June 1975. This Development Document presents the BPT and BAT guidelines and limitations; discusses control and treatment technology; and presents unit costs of compliance with the proposed guidelines and limitations employing the recommended methodologies. Although these costs will be briefly discussed, the reader is referred to the Development Document for a more complete explanation of the costs, their development and their limitations.

PROCESS COSTS

For the purpose of establishing effluent limitations guidelines and determining the attendant costs of compliance, Datagraphics categorized the production processes found in this industry. The 16 categories selected include melting, molten metal disposition, hot forming, cleaning and finishing operations. The specific categories chosen are listed in Exhibit V-1. For stated production levels expressed in tons per day, BPT and BAT incremental water pollution abatement investment costs per annual ton were developed by Datagraphics for each category. For each category, BPT and BAT incremental operating costs of these treatment facilities per ton processed by operations assigned to that category were also developed by Datagraphics. The investment and operating costs (originally expressed in August 1971 dollars and updated to December 1975 dollars) and the tonnages on which they were based, by category, to comply with BPT and BAT requirements, are shown in Exhibits V-2 and V-3 respectively.

The following points should be noted with respect to the costs developed by Datagraphics, Inc. and provided to A. T. Kearney, Inc. by EPA for use in this study. These costs are presented in Exhibits V-2 and V-3.

- Within each of the 16 process categories, the age and specific type of facility are deemed not to significantly influence costs.

- The feasibility and influence on costs of commingling different waste streams emanating from two or more different process categories is not discussed.

- Important elements of the total investment required to affect pollution abatement in the recommended manner have not been included in the Datagraphics cost estimates. As stated in their Development Document:

  "Construction costs are dependent upon many different variable conditions and in order to determine definitive costs the following parameters are established as the basis of estimates. In addition, the cost estimates as developed reflect only average costs.

  a. The treatment facilities are contained within a 'battery limit' site location and are erected on a 'green field' site. Site clearance costs such as existing plant equipment relocation, etc., are not included in cost estimates.

  b. Equipment costs are based on specific effluent water rates. A change in water flow rates will affect costs.

  c. The treatment facilities are located in close proximity to the steelmaking process area. Piping and other utility costs for interconnecting utility runs between the treatment facilities battery limits and process equipment areas are not included in cost estimates.

  d. Sales and use taxes or freight charges are not included in cost estimates.

  e. Land acquisition costs are not included in cost estimates.

  f. Expansion of existing supporting utilities such as sewage, river water pumping stations, and increased boiler capacity are not included in cost estimates.

  g. Potable water, fire lines and sewage lines to service treatment facilities are not included in cost estimates.

h. Limited instrumentation has been included for pH and fluoride control, but no automatic samplers, temperature indicators, flow meters, recorders, etc., are included in cost estimates.

j. The site conditions are based on:

   1. No hardpan or rock excavation, blasting, etc.
   2. No pilings or spread footing foundations for poor soil conditions.
   3. No well pointing.
   4. No dams, channels, or site drainage required.
   5. No cut and fill or grading of site.
   6. No seeding or planting of grasses and only minor site grubbing and small shrubs clearance; no tree removal.

k. Controls buildings are prefabricated buildings, not brick or block type.

l. No painting, pipe insulation, and steam or electric heat tracing are included.

m. No special guardrails, buildings, lab test facilities, signs, docks are included.

Other factors that affect costs but cannot be evaluated:

a. Geographic location in the United States.

b. Metropolitan or rural areas.

c. Labor rates, local union rules, regulations, and restrictions.

d. Manpower requirements.

e. Type of contract.

f. Weather conditions or season.

g. Transportation of men, materials, and equipment.

h. Building code requirements.

j. Safety requirements."

The cost estimates used in this study to assess economic impact are subject to the above assumptions and qualifications.

MODEL
PLANTS

In order to use the process category investment and operating costs in a meaningful manner, the development of model plants was agreed upon with EPA and Datagraphics, Inc. The model plants were developed to be representative of particular segments of the specialty steel industry. This approach allows the various processes found in any given segment to be sized relative to one another in terms of capacities. This in turn permits the determination of total model plant investment, operating and total annual costs reflective of the costs actual segment establishments will face.

The 87 establishments studied in this assessment were segmented based on overall size, product mix, processes and their capacities. The segments developed for the SIC's under study and the number of establishments in each are shown in Table V-1 on the following page.

Table V-1

Industry Segmentation for Purposes of Model Plant Development and the Number of Establishments in Each

SIC	Model Plant Description	Number
3312	Large Flat Rolled Product Mill	3
3312	Small Flat Rolled Product Mill	4
3312	Large Section Product Mill	7
3312	Medium Section Product Mill	4
3312	Small Section Product Mill	7
3315	Large Wire Drawer	5
3315	Small Wire Drawer	9
3316	Large Sheet, Strip and Bar Processors	2
3316	Small Sheet, Strip and Bar Processors	4
3317	Large Pipe and Tube Makers	8
3317	Small Pipe and Tube Makers	34
	Total	87

Source: Exhibits I-5 and I-6.

Exhibits I-5 and I-6 detail this segmentation showing specific establishments in each segment and their respective numbers of employees.

As available, published information was used to ascertain the processes and their capacities for each establishment in the 11 industry segments. From these data and information furnished by knowledgeable industry personnel, model plant specifications (processes by type and annual capacity) were developed to be representative of the establishments in each segment. The model plants so developed are not meant to reflect the actual configuration of any one establishment. Each model plant was developed, however, so that an actual plant of the specified configuration could exist. The product mix of all establishments in any given segment is also reflected in the product mix of the model plant.

The configurations of all model plants are found in Exhibit V-4. Capacities are expressed in terms of input product tons. Input product tons are defined as the number of different tons entering a given process one or more times. Thus, input product tons are not net of any yield losses incurred in that process nor do they account for the number of times the same ton enters the process. The processes shown in Exhibit V-4 that do not appear in Exhibit V-1 have been included only for completeness of each model plant configuration.

MODEL PLANT COSTING

Starting with the configurations as shown in Exhibit V-4, Datagraphics computed the total investment and operating costs for each model plant. For each process, the annual input product ton capacity was converted to annual input process ton capacity. Input process tons are defined as input product tons multiplied by the average number of times the same ton enters a given process.

The following computations apply to both BPT and BAT costs:

1. Total process investment cost was derived by using the "six-tenths" rule. The unit investment cost reported in Exhibit V-2 or V-3 was scaled to the annual input process ton capacity. The scaled unit investment cost was then multiplied

by the annual input process ton capacity.

2. Total process operating cost was derived by multiplying the annual input process ton capacity by the unit operating cost reported in either Exhibit V-2 or V-3.

3. The individual total process investment and operating costs were summed to give their respective totals for each model plant.

The results of the calculations are shown in Exhibits V-5 and V-6. Exhibit V-5 gives only the BPT costs for SIC 3312. For SIC's 3315-7, both BPT and BAT costs are given, as the methodologies recommended for BPT implementation will also result in compliance with BAT limitations. Exhibit V-6 presents the BAT costs for SIC 3312.

INDUSTRY COSTS

(a) Investment Cost

Total costs for each SIC were developed from the model plant total investment and operating costs. Total industry investment costs by SIC, for both BPT and BAT, were determined by extending the model plant costs by the appropriate number of establishments. These are shown in Table V-2 on the following page.

Table V-2

BPT and BAT Industry Investment Costs

SIC	Description	Total Investment ($ 000's) BPT	BAT
3312	Integrated Producers	$123,829	$59,313
3315	Wire Drawers	5,733	-
3316	Sheet, Strip and Bar Processors	7,264	-
3317	Pipe and Tube Makers	4,412	-
		$141,238	$59,313

Source: Exhibits V-9 and V-10.

(b) Operating Cost

Operating costs are direct costs. They vary directly with production. Because economic impact will be assessed on the basis of tonnages sold, total operating costs per "ship" ton were calculated. Costs per "ship" ton for each model plant were computed by dividing its total operating cost (see Exhibits V-5 and V-6) by its annual "ship" capacity. Model plant total annual "ship" capacities, shown in Exhibit V-7, were developed from the appropriate product mixes and process yields. The process yields as used in these calculations are shown in Exhibit V-8.

The BPT and BAT total operating costs per "ship" ton for SIC 3312, by segment, are displayed in Exhibits V-9 and V-10 respectively. BPT total operating costs for SIC's 3315-7 are found in Exhibit V-9. There are no incremental BAT operating costs for these three SIC's as BPT treatment complies with the BAT regulations.

(c) Annual Cost per "Ship" Ton

Total costs per "ship" ton are dependent upon total annual costs. Total annual costs are comprised of two components: fixed annual charges that are incurred regardless of operating levels; and those operating costs that are directly related to operating levels. For each model plant, total cost per "ship" ton calculations were performed for four assumed capacity utilizations: 60%, 75%, 90% and 100%.

In each case fixed annual charges were added to the total operating costs for one year. This sum was divided by the assumed annual shipments to determine total annual costs per ship ton. Using a capital recovery factor for 10% interest for 10 years, the total investment cost was apportioned to an equivalent annual investment cost. The total operating costs for one year are the total unit operating costs per "ship" ton multiplied by the assumed annual shipments.

The results of these computations to determine total annual cost per ship ton for each model plant are shown in Exhibits V-9 and V-10. Exhibit V-9 presents the BPT costs for all segments and the appropriate SIC totals and weighted averages. Exhibit V-10 presents the same information for SIC 3312 only as it contains all segments incrementally affected by BAT regulations.

The weighted average incremental total annual cost per ship ton, by SIC, for the assumed capacity utilizations is shown in Table V-3.

Table V-3

Incremental SIC Total Annual Cost per Ship Ton as a Function of Capacity Utilization
($/Ship Ton)

SIC	Description	60%	70%	90%	100%
3312	Integrated Producers - BPT	$14.49	$12.22	$10.72	$9.96
3312	Integrated Producers - BAT	6.14	5.06	4.33	3.97
3312	Integrated Producers - BPT and BAT	20.63	17.28	15.05	13.93
3315	Wire Drawers - BPT and BAT	36.00	29.59	25.31	23.17
3316	Sheet, Strip and Bar Processors - BPT and BAT	7.92	6.90	6.23	5.80
3317	Pipe and Tube Makers - BPT and BAT	8.76	7.16	6.11	5.55

Source: Exhibits V-9 and V-10.

ENVIRONMENTAL PROTECTION AGENCY

CATEGORIES USED FOR DEVELOPMENT OF PRODUCTION PROCESS UNIT COSTS

I. Basic Oxygen Furnace (Wet Air Pollution Controls)

II. Vacuum Degassing Subcategory

III. Continuous Casting and Pressure Slab Molding

IV. Hot-Forming (Primary)

V. Hot-Forming (Section)

VI. Hot-Forming (Sheet and Strip)

VII. Hot-Forming (Plate)

VIII. Sulfuric Acid Batch Pickling

IX. Combination Acid Pickling (Continuous)

X. Combination Acid Pickling (Batch Pipe and Tube)

XI. Combination Acid Pickling (Other Batch)

XII. Kolene Scale Removal

XIII. Hydride Scale Removal

XIV. Continuous Alkaline Cleaning

XV. Wire Coating and Pickling

XVI. Cold Rolling (Recirculation)

Source: Datagraphics, Inc.

ENVIRONMENTAL PROTECTION AGENCY

BPT INCREMENTAL WASTE WATER TREATMENT INVESTMENT AND OPERATING COSTS BY CATEGORY

		Base Tonnage (Tons per Day)	Investment Cost ($/Annual Ton)(2)	Operating Cost ($/Ton)
I.	Basic Oxygen Furnace (Wet Air Pollution Controls)	2,800	$ 0.438	$ 0.116
II.	Vacuum Degassing Subcategory	520	3.120	0.265
III.	Continuous Casting and Pressure Slab Molding	600	3.903	0.101
IV.	Hot-Forming (Primary)	2,364	2.602	0.183
V.	Hot-Forming (Section)	360	11.248	0.417
VI.	Hot-Forming (Sheet and Strip)	2,041	8.324	0.536
VII.	Hot-Forming (Plate)	528	34.667	2.244
VIII.	Sulfuric Acid Batch Pickling	250	13.696	-0.524(3)
IX.	Combination Acid Pickling (Continuous)	1,384	3.903	0.827
X.	Combination Acid Pickling (Batch Pipe and Tube)	21	25.574	0.669
XI.	Combination Acid Pickling (Other Batch)	144	5.652	0.191
XII.	Kolene Scale Removal	29	18.509	0.491
XIII.	Hydride Scale Removal	60	23.489	1.142
XIV.	Continuous Alkaline Cleaning	144	7.219	0.286
XV.	Wire Coating and Pickling	547	8.044	0.891
XVI.	Cold Rolling (Recirculation)	2,493	0.102	0.009

Notes:
(1) All costs expressed in December 1975 dollars.
(2) Annual Tons = Base Tonnage x 365.
(3) Net saving relative to current disposition of waste water.

Source: Datagraphics, Inc.

ENVIRONMENTAL PROTECTION AGENCY

BAT INCREMENTAL WASTE WATER TREATMENT INVESTMENT AND OPERATING COSTS BY CATEGORY

		Base Tonnage (Tons per Day)	Investment Cost ($/Annual Ton)(2)	Operating Cos ($/Ton)
I.	Basic Oxygen Furnace (Wet Air Pollution Controls)	2,800	$ 0.343	$0.022
II.	Vacuum Degassing Subcategory	520	2.266	0.289
III.	Continuous Casting and Pressure Slab Molding	600	0.190	0.011
IV.	Hot-Forming (Primary)	2,364	2.980	0.133
V.	Hot-Forming (Section)	360	12.871	0.435
VI.	Hot-Forming (Sheet and Strip)	2,041	6.645	0.302
VII.	Hot-Forming (Plate)	528	0.000	0.000
VIII.	Sulfuric Acid Batch Pickling	250	0.000	0.000
IX.	Combination Acid Pickling (Continuous)	1,384	0.000	0.000
X.	Combination Acid Pickling (Batch Pipe and Tube)	21	0.000	0.000
XI.	Combination Acid Pickling (Other Batch)	144	0.000	0.000
XII.	Kolene Scale Removal	29	0.000	0.000
XIII.	Hydride Scale Removal	60	0.000	0.000
XIV.	Continuous Alkaline Cleaning	144	0.000	0.000
XV.	Wire Coating and Pickling	547	0.000	0.000
XVI.	Cold Rolling (Recirculation)	2,493	0.000	0.000

Notes: (1) All costs expressed in December 1975 dollars.
(2) Annual Tons = Base Tonnage x 365.

Source: Datagraphics, Inc.

ENVIRONMENTAL PROTECTION AGENCY

SPECIALTY STEEL INDUSTRY SEGMENTS: MODEL PLANT CONFIGURATIONS, PROCESSES AND ANNUAL INPUT PRODUCT TON CAPACITIES
(Thousands of Net Tons)

	Integrated Producers - SIC 3312							Wire Drawers SIC 3315		Sheet, Strip and Bar Processors SIC 3316		Pipe and Tube Makers SIC 3317	
	Flat Rolled Products			Section Products									
	Large		Small			Small		Large	Small	Large	Small	Large	Small
	Without Cupola	With Cupola		Large	Medium	Rolling	Forging						
Number of Establishments	2	1	4	7	4	2	5	5	9	2	4	8	34
Processes													
Melting Operations													
Electric Arc	750	750	80	150	50	15	12.5						
BOF		500											
Cupola		350											
Degassing	150			30									
Disposition of Molten													
Teeming	300	1,250		150	50	15	12.5						
Pressure Casting			80										
Continuous Casting	450												
Primary Reduction													
Forging							12						
Rolling/Cogging-Slabs/Blooms/Billets	300	1,200	75	145	30	14							
Secondary Reduction (Hot)													
Forging													
Rolling													
Sections				110	13	7	10.5						
Sheet/Strip	650	900	35										
Plate			40										
Scale Removal													
Sulfuric Acid Batch Pickling		25	12	25									
Combination Acid Pickling (Continuous)	600	750	30							135	45	16	1
Combination Acid Pickling (Batch Pipe and Tube)													
Combination Acid Pickling (Other Batch)			25	40	12								
Kolene Scale Removal	350	40	4	10	10								
Hydride Scale Removal				20	6			8.3	1.1				
Continuous Alkaline Cleaning													
Wire Coating and Pickling				15				8.3	1.1				
Finishing													
Cold Rolling and Drawing	625	800	30	40	4					135	45		
Forging and Extruding					3.5	7							
Drawing-Wire								8.1	1.1				
Pipe and Tube Forming												15	0.9

EXHIBIT V-4

ENVIRONMENTAL PROTECTION AGENCY

BPT MODEL PLANT COSTS
SIC 3312 - INTEGRATED PRODUCERS: LARGE FLAT ROLLED WITHOUT CUPOLA

Processes	Annual Input Capacity		Investment Cost		Annual Operating Cost	
	Product Tons (000's of Tons)	Process Tons (000's of Tons)	Per Annual Input Process Ton ($/Ton)	Total ($ x 000's)	Unit(1) ($/Ton)	Total(2) ($ x 000's)
Melting Operations						
Electric Arc	750	750	$ -	$ -	$ -	$ -
BOF						
Cupola						
Degassing	150	150	3.43	514	0.265	40
Disposition of Molten Metal						
Teeming	300	300	-			
Pressure Casting						
Continuous Casting	450	450	2.92	1,314	0.101	45
Primary Reduction						
Forging						
Rolling/Cogging-Slabs/Blooms/Billets	300	600	3.01	1,806	0.183	110
Secondary Reduction (Hot)						
Forging						
Rolling						
Sections						
Sheet/Strip	650	650	8.79	5,714	0.536	348
Plate						
Scale Removal						
Sulphuric Acid Batch Pickling						
Combination Acid Pickling (Continuous)	600	1,800	2.35	4,230	0.827	1,489
Combination Acid Pickling (Batch Pipe and Tube)						
Combination Acid Pickling (Other Batch)						
Kolene Scale Removal	350	350	4.56	1,596	0.491	172
Hydride Scale Removal						
Continuous Alkaline Cleaning						
Wire Coating and Pickling						
Finishing						
Cold Rolling and Drawing	625	1,875	0.08	150	0.009	17
Forging and Extruding						
Drawing-Wire						
Pipe and Tube Forming						
			Totals	$15,324		$2,221

Notes: (1) Values are found in Exhibit V-2.
(2) Process Ton Capacity x Unit Cost.

Source: Datagraphics, Inc.

ENVIRONMENTAL PROTECTION AGENCY

BPT MODEL PLANT COSTS
SIC 3312 - INTEGRATED PRODUCERS: LARGE FLAT ROLLED WITH CUPOLA

Processes	Annual Input Capacity		Investment Cost		Annual Operating Cost	
	Product Tons (000's of Tons)	Process Tons (000's of Tons)	Per Annual Input Process Ton ($/Ton)	Total ($ x 000's)	Unit(1) ($/Ton)	Total(2) ($ x 000's)
Melting Operations						
Electric Arc	750	750	$ -	$ -	$ -	$ -
BOF	500	500	0.58	290	0.116	58
Cupola	350	350	-	-	-	-
Degassing						
Disposition of Molten Metal						
Teeming	1,250	1,250	-	-	-	-
Pressure Casting						
Continuous Casting						
Primary Reduction						
Forging						
Rolling/Cogging-Slabs/Blooms/Billets	1,200	2,400	1.73	4,152	0.183	439
Secondary Reduction (Hot)						
Forging						
Rolling						
Sections						
Sheet/Strip	900	900	7.72	6,948	0.536	482
Plate						
Scale Removal						
Sulphuric Acid Batch Pickling	25	75	14.82	1,112	-0.524	-39
Combination Acid Pickling (Continuous)	750	2,250	2.14	4,815	0.827	1,861
Combination Acid Pickling (Batch Pipe and Tube)						
Combination Acid Pickling (Other Batch)						
Kolene Scale Removal	40	40	10.87	435	0.491	20
Hydride Scale Removal						
Continuous Alkaline Cleaning						
Wire Coating and Pickling						
Finishing						
Cold Rolling and Drawing	800	2,400	0.07	168	0.009	22
Forging and Extruding						
Drawing-Wire						
Pipe and Tube Forming						
			Totals	$17,920		$2,843

Notes: (1) Values are found in Exhibit V-2.
(2) Process Ton Capacity x Unit Cost.

Source: Datagraphis, Inc.

ENVIRONMENTAL PROTECTION AGENCY

BPT MODEL PLANT COSTS
SIC 3312 - INTEGRATED PRODUCERS: SMALL FLAT ROLLED

Processes	Annual Input Capacity		Investment Cost		Annual Operating Cost	
	Product Tons (000's of Tons)	Process Tons (000's of Tons)	Per Annual Input Process Ton ($/Ton)	Total ($ x 000's)	Unit(1) ($/Ton)	Total(2) ($ x 000's)
Melting Operations						
Electric Arc	80	80	$ -	$ -	$ -	$ -
BOF						
Cupola						
Degassing						
Disposition of Molten Metal						
Teeming						
Pressure Casting	80	80	5.83	466	0.101	8
Continuous Casting						
Primary Reduction						
Forging						
Rolling/Cogging-Slabs/Blooms/Billets	75	150	5.23	784	0.183	27
Secondary Reduction (Hot)						
Forging						
Rolling						
Sections						
Sheet/Strip	35	35	28.29	990	0.536	19
Plate	40	40	65.01	2,600	2.244	90
Scale Removal						
Sulphuric Acid Batch Pickling	12	36	19.87	715	-0.524	-19
Combination Acid Pickling (Continuous)	30	90	7.78	700	0.827	74
Combination Acid Pickling (Batch Pipe and Tube)						
Combination Acid Pickling (Other Batch)	25	75	4.90	368	0.191	14
Kolene Scale Removal	4	4	27.31	109	0.491	2
Hydride Scale Removal						
Continuous Alkaline Cleaning						
Wire Coating and Pickling						
Finishing						
Cold Rolling and Drawing	30	90	0.26	23	0.009	1
Forging and Extruding						
Drawing-Wire						
Pipe and Tube Forming						
			Totals	$6,755		$216

Notes: (1) Values are found in Exhibit V-2.
(2) Process Ton Capacity x Unit Cost.

Source: Datagraphics, Inc.

ENVIRONMENTAL PROTECTION AGENCY

BPT MODEL PLANT COSTS
SIC 3312 - INTEGRATED PRODUCERS: LARGE SECTION PRODUCTS

Processes	Annual Input Capacity: Product Tons (000's of Tons)	Annual Input Capacity: Process Tons (000's of Tons)	Investment Cost: Per Annual Input Process Ton ($/Ton)	Investment Cost: Total ($ x 000's)	Annual Operating Cost: Unit(1) ($/Ton)	Annual Operating Cost: Total(2) ($ x 000's)
Melting Operations						
Electric Arc	150	150	$ -	$ -	$ -	$ -
BOF						
Cupola						
Degassing	30	30	6.52	196	0.265	8
Disposition of Molten Metal						
Teeming	150	150	-	-	-	-
Pressure Casting						
Continuous Casting						
Primary Reduction						
Forging						
Rolling/Cogging-Slabs/Blooms/Billets	145	290	4.03	1,169	0.183	53
Secondary Reduction (Hot)						
Forging						
Rolling						
Sections	110	110	12.07	1,328	0.417	46
Sheet/Strip						
Plate						
Scale Removal						
Sulphuric Acid Batch Pickling	25	75	14.82	1,112	-0.524	-39
Combination Acid Pickling (Continuous)						
Combination Acid Pickling (Batch Pipe and Tube)						
Combination Acid Pickling (Other Batch)	40	120	4.06	487	0.191	23
Kolene Scale Removal	10	10	18.93	189	0.491	5
Hydride Scale Removal	20	20	24.36	487	1.142	23
Continuous Alkaline Cleaning						
Wire Coating and Pickling	15	45	14.59	657	0.891	40
Finishing						
Cold Rolling and Drawing	40	120	0.23	28	0.009	1
Forging and Extruding						
Drawing-Wire						
Pipe and Tube Forming						
			Totals	$5,653		$ 160

Notes: (1) Values are found in Exhibit V-2.
(2) Process Ton Capacity x Unit Cost.

Source: Datagraphics, Inc.

ENVIRONMENTAL PROTECTION AGENCY

BPT MODEL PLANT COSTS
SIC 3312 - INTEGRATED PRODUCERS: MEDIUM SECTION PRODUCTS

Processes	Annual Input Capacity: Product Tons (000's of Tons)	Annual Input Capacity: Process Tons (000's of Tons)	Investment Cost: Per Annual Input Process Ton ($/Ton)	Investment Cost: Total ($ x 000's)	Annual Operating Cost: Unit(1) ($/Ton)	Annual Operating Cost: Total(2) ($ x 000's)
Melting Operations						
Electric Arc	50	50	$ -	$ -	$ -	$ -
BOF						
Cupola						
Degassing						
Disposition of Molten Metal						
Teeming	50	50	-	-	-	-
Pressure Casting						
Continuous Casting						
Primary Reduction						
Forging						
Rolling/Cogging-Slabs/Blooms/Billets	30	60	7.55	453	0.183	11
Secondary Reduction (Hot)						
Forging						
Rolling						
Sections	13	13	28.37	369	0.417	5
Sheet/Strip						
Plate						
Scale Removal						
Sulphuric Acid Batch Pickling						
Combination Acid Pickling (Continuous)						
Combination Acid Pickling (Batch Pipe and Tube)						
Combination Acid Pickling (Other Batch)	12	36	6.58	237	0.191	7
Kolene Scale Removal	10	10	18.93	189	0.491	5
Hydride Scale Removal	6	6	39.42	237	1.142	7
Continuous Alkaline Cleaning						
Wire Coating and Pickling						
Finishing						
Cold Rolling and Drawing	4	12	0.58	7	0.009	0
Forging and Extruding	3.5	3.5	-	-	-	-
Drawing-Wire						
Pipe and Tube Forming						
			Totals	$1,492		$35

Notes: (1) Values are found in Exhibit V-2.
(2) Process Ton Capacity x Unit Cost.

Source: Datagraphics, Inc.

ENVIRONMENTAL PROTECTION AGENCY

BPT MODEL PLANT COSTS
SIC 3312 - INTEGRATED PRODUCERS: SMALL SECTION PRODUCTS, ROLLING

Processes	Annual Input Capacity		Investment Cost		Annual Operating Cost	
	Product Tons (000's of Tons)	Process Tons (000's of Tons)	Per Annual Input Process Ton ($/Ton)	Total ($ x 000's)	Unit(1) ($/Ton)	Total(2) ($ x 000's)
Melting Operations						
Electric Arc	15	15	$ -	$ -	$ -	$ -
BOF						
Cupola						
Degassing						
Disposition of Molten Metal						
Teeming	15	15				
Pressure Casting						
Continuous Casting						
Primary Reduction						
Forging						
Rolling/Cogging-Slabs/Blooms/Billets	14	28	10.25	287	0.183	5
Secondary Reduction (Hot)						
Forging						
Rolling						
Sections	7	7	36.35	254	0.417	3
Sheet/Strip						
Plate						
Scale Removal						
Sulphuric Acid Batch Pickling						
Combination Acid Pickling (Continuous)						
Combination Acid Pickling (Batch Pipe and Tube)						
Combination Acid Pickling (Other Batch)						
Kolene Scale Removal						
Hydride Scale Removal						
Continuous Alkaline Cleaning						
Wire Coating and Pickling						
Finishing						
Cold Rolling and Drawing						
Forging and Extruding	7	7	-	-	-	-
Drawing-Wire						
Pipe and Tube Forming						
			Totals	$541		$ 8

Notes: (1) Values are found in Exhibit V-2.
(2) Process Ton Capacity x Unit Cost.

Source: Datagraphics, Inc.

ENVIRONMENTAL PROTECTION AGENCY

BPT MODEL PLANT COSTS
SIC 3312 - INTEGRATED PRODUCERS: SMALL SECTION PRODUCTS, FORGING

Processes	Annual Input Capacity		Investment Cost		Annual Operating Cost	
	Product Tons (000's of Tons)	Process Tons (000's of Tons)	Per Annual Input Process Ton ($/Ton)	Total ($ x 000's)	Unit(1) ($/Ton)	Total(2) ($ x 000's)
Melting Operations						
Electric Arc	12.5	12.5	$ -	-	-	$ -
BOF						
Cupola						
Degassing						
Disposition of Molten Metal						
Teeming	12.5	12.5	-	-	-	-
Pressure Casting						
Continuous Casting						
Primary Reduction						
Forging	12	12	-	-	-	-
Rolling/Cogging-Slabs/Blooms/Billets						
Secondary Reduction (Hot)						
Forging						
Rolling						
Sections	10.5	10.5	30.90	324	0.417	4
Sheet/Strip						
Plate						
Scale Removal						
Sulphuric Acid Batch Pickling						
Combination Acid Pickling (Continuous)						
Combination Acid Pickling (Batch Pipe and Tube)						
Combination Acid Pickling (Other Batch)						
Kolene Scale Removal						
Hydride Scale Removal						
Continuous Alkaline Cleaning						
Wire Coating and Pickling						
Finishing						
Cold Rolling and Drawing						
Forging and Extruding						
Drawing-Wire						
Pipe and Tube Forming						
			Totals	$324		$4

Notes: (1) Values are found in Exhibit V-2.
(2) Process Ton Capacity x Unit Cost.

Source: Datagraphics, Inc.

ENVIRONMENTAL PROTECTION AGENCY

BPT AND BAT MODEL PLANT COSTS
SIC 3315 - WIRE DRAWERS: LARGE

Processes	Annual Input Capacity: Product Tons (000's of Tons)	Annual Input Capacity: Process Tons (000's of Tons)	Investment Cost: Per Annual Input Process Ton ($/Ton)	Investment Cost: Total ($ x 000's)	Annual Operating Cost: Unit(1) ($/Ton)	Annual Operating Cost: Total(2) ($ x 000's)
Melting Operations						
Electric Arc						
BOF						
Cupola						
Degassing						
Disposition of Molten Metal						
Teeming						
Pressure Casting						
Continuous Casting						
Primary Reduction						
Forging						
Rolling/Cogging-Slabs/Blooms/Billets						
Secondary Reduction (Hot)						
Forging						
Rolling						
Sections						
Sheet/Strip						
Plate						
Scale Removal						
Sulphuric Acid Batch Pickling						
Combination Acid Pickling (Continuous)						
Combination Acid Pickling (Batch Pipe and Tube)						
Combination Acid Pickling (Other Batch)						
Kolene Scale Removal						
Hydride Scale Removal	8.3	8.3	$34.63	$287	$1.142	$ 9
Continuous Alkaline Cleaning						
Wire Coating and Pickling	8.3	24.9	18.49	460	0.891	22
Finishing						
Cold Rolling and Drawing						
Forging and Extruding						
Drawing-Wire						
Pipe and Tube Forming						
			Totals	$747		$31

Notes: (1) Values are found in Exhibit V-2.
(2) Process Ton Capacity x Unit Cost.

Source: Datagraphics, Inc.

ENVIRONMENTAL PROTECTION AGENCY

BPT AND BAT MODEL PLANT COSTS
SIC 3315 - WIRE DRAWERS: SMALL

Processes	Annual Input Capacity: Product Tons (000's of Tons)	Annual Input Capacity: Process Tons (000's of Tons)	Investment Cost: Per Annual Input Process Ton ($/Ton)	Investment Cost: Total ($ x 000's)	Annual Operating Cost: Unit(1) ($/Ton)	Annual Operating Cost: Total(2) ($ x 000's)
Melting Operations						
Electric Arc						
BOF						
Cupola						
Degassing						
Disposition of Molten Metal						
Teeming						
Pressure Casting						
Continuous Casting						
Primary Reduction						
Forging						
Rolling/Cogging-Slabs/Blooms/Billets						
Secondary Reduction (Hot)						
Forging						
Rolling						
Sections						
Sheet/Strip						
Plate						
Scale Removal						
Sulphuric Acid Batch Pickling						
Combination Acid Pickling (Continuous)						
Combination Acid Pickling (Batch Pipe and Tube)						
Combination Acid Pickling (Other Batch)						
Kolene Scale Removal						
Hydride Scale Removal	1.1	1.1	$77.71	$ 85	$1.142	$1
Continuous Alkaline Cleaning						
Wire Coating and Pickling	1.1	3.3	41.51	137	0.891	3
Finishing						
Cold Rolling and Drawing						
Forging and Extruding						
Drawing-Wire						
Pipe and Tube Forming						
			Totals	$222		$4

Notes: (1) Values are found in Exhibit V-2.
(2) Process Ton Capacity x Unit Cost.

Source: Datagraphics, Inc.

ENVIRONMENTAL PROTECTION AGENCY

BPT AND BAT MODEL PLANT COSTS
SIC 3316 - SHEET STRIP AND BAR PROCESSORS: LARGE

Processes	Annual Input Capacity		Investment Cost		Annual Operating Cost	
	Product Tons (000's of Tons)	Process Tons (000's of Tons)	Per Annual Input Process Ton ($/Ton)	Total ($ x 000's)	Unit(1) ($/Ton)	Total(2) ($ x 000's)
Melting Operations						
Electric Arc						
BOF						
Cupola						
Degassing						
Disposition of Molten Metal						
Teeming						
Pressure Casting						
Continuous Casting						
Primary Reduction						
Forging						
Rolling/Cogging-Slabs/Blooms/Billets						
Secondary Reduction (Hot)						
Forging						
Rolling						
Sections						
Sheet/Strip						
Plate						
Scale Removal						
Sulphuric Acid Batch Pickling						
Combination Acid Pickling (Continuous)	135	405	$4.27	$1,729	$0.827	$335
Combination Acid Pickling (Batch Pipe and Tube)						
Combination Acid Pickling (Other Batch)						
Kolene Scale Removal						
Hydride Scale Removal						
Continuous Alkaline Cleaning						
Wire Coating and Pickling						
Finishing						
Cold Rolling and Drawing	135	405	0.14	57	0.009	4
Forging and Extruding						
Drawing-Wire						
Pipe and Tube Forming						
			Totals	$1,786		$339

Notes: (1) Values are found in Exhibit V-2.
(2) Process Ton Capacity x Unit Cost.

Source: Datagraphics, Inc.

ENVIRONMENTAL PROTECTION AGENCY

BPT AND BAT MODEL PLANT COSTS
SIC 3316 - SHEET STRIP AND BAR PROCESSORS: SMALL

Processes	Annual Input Capacity		Investment Cost		Annual Operating Cost	
	Product Tons (000's of Tons)	Process Tons (000's of Tons)	Per Annual Input Process Ton ($/Ton)	Total ($ x 000's)	Unit(1) ($/Ton)	Total(2) ($ x 000's)
Melting Operations						
Electric Arc						
BOF						
Cupola						
Degassing						
Disposition of Molten Metal						
Teeming						
Pressure Casting						
Continuous Casting						
Primary Reduction						
Forging						
Rolling/Cogging-Slabs/Blooms/Billets						
Secondary Reduction (Hot)						
Forging						
Rolling						
Sections						
Sheet/Strip						
Plate						
Scale Removal						
Sulphuric Acid Batch Pickling						
Combination Acid Pickling (Continuous)	45	135	$6.62	$894	$0.827	$112
Combination Acid Pickling (Batch Pipe and Tube)						
Combination Acid Pickling (Other Batch)						
Kolene Scale Removal						
Hydride Scale Removal						
Continuous Alkaline Cleaning						
Wire Coating and Pickling						
Finishing						
Cold Rolling and Drawing	45	135	0.22	30	0.009	1
Forging and Extruding						
Drawing-Wire						
Pipe and Tube Forming						
			Totals	$924		$113

Notes: (1) Values are found in Exhibit V-2.
(2) Process Ton Capacity x Unit Cost.

Source: Datagraphics, Inc.

ENVIRONMENTAL PROTECTION AGENCY

BPT AND BAT MODEL PLANT COSTS
SIC 3317 - PIPE AND TUBE MAKERS: LARGE

Processes	Annual Input Capacity: Product Tons (000's of Tons)	Annual Input Capacity: Process Tons (000's of Tons)	Investment Cost: Per Annual Input Process Ton ($/Ton)	Investment Cost: Total ($ x 000's)	Annual Operating Cost: Unit(1) ($/Ton)	Annual Operating Cost: Total(2) ($ x 000's)
Melting Operations						
Electric Arc						
BOF						
Cupola						
Degassing						
Disposition of Molten Metal						
Teeming						
Pressure Casting						
Continuous Casting						
Primary Reduction						
Forging						
Rolling/Cogging-Slabs/Blooms/Billets						
Secondary Reduction (Hot)						
Forging						
Rolling						
Sections						
Sheet/Strip						
Plate						
Scale Removal						
Sulphuric Acid Batch Pickling						
Combination Acid Pickling (Continuous)						
Combination Acid Pickling (Batch Pipe and Tube)	16	16	$19.05	$305	$0.669	$11
Combination Acid Pickling (Other Batch)						
Kolene Scale Removal						
Hydride Scale Removal						
Continuous Alkaline Cleaning						
Wire Coating and Pickling						
Finishing						
Cold Rolling and Drawing						
Forging and Extruding						
Drawing-Wire						
Pipe and Tube Forming	15	15	-	-	-	-
			Totals	$305		$11

Notes: (1) Values are found in Exhibit V-2.
(2) Process Ton Capacity x Unit Cost.

Source: Datagraphics, Inc.

ENVIRONMENTAL PROTECTION AGENCY

BPT AND BAT MODEL PLANT COSTS
SIC 3317 - PIPE AND TUBE MAKERS: SMALL

Processes	Annual Input Capacity: Product Tons (000's of Tons)	Annual Input Capacity: Process Tons (000's of Tons)	Investment Cost: Per Annual Input Process Ton ($/Ton)	Investment Cost: Total ($ x 000's)	Annual Operating Cost: Unit(1) ($/Ton)	Annual Operating Cost: Total(2) ($ x 000's)
Melting Operations						
Electric Arc						
BOF						
Cupola						
Degassing						
Disposition of Molten Metal						
Teeming						
Pressure Casting						
Continuous Casting						
Primary Reduction						
Forging						
Rolling/Cogging-Slabs/Blooms/Billets						
Secondary Reduction (Hot)						
Forging						
Rolling						
Sections						
Sheet/Strip						
Plate						
Scale Removal						
Sulphuric Acid Batch Pickling						
Combination Acid Pickling (Continuous)						
Combination Acid Pickling (Batch Pipe and Tube)	1	1	$57.75	$58	$0.669	$1
Combination Acid Pickling (Other Batch)						
Kolene Scale Removal						
Hydride Scale Removal						
Continuous Alkaline Cleaning						
Wire Coating and Pickling						
Finishing						
Cold Rolling and Drawing						
Forging and Extruding						
Drawing-Wire						
Pipe and Tube Forming	.9	.9	-	-	-	-
			Totals	$58		$1

Notes: (1) Values are found in Exhibit V-2.
(2) Process Ton Capacity x Unit Cost.

Source: Datagraphics, Inc.

BAT MODEL PLANT COSTS
SIC 3312 - INTEGRATED PRODUCERS: LARGE FLAT ROLLED WITHOUT CUPOLA

Processes	Annual Input Capacity		Investment Cost		Annual Operating Cost	
	Product Tons (000's of Tons)	Process Tons (000's of Tons)	Per Annual Input Process Ton ($/Ton)	Total ($ x 000's)	Unit(1) ($/Ton)	Total(2) ($ x 000's)
Melting Operations						
Electric Arc	750	750	$ -	$ -	$ -	$ -
BOF						
Cupola						
Degassing	150	150	2.49	374	0.289	43
Disposition of Molten Metal						
Teeming	300	300	-	-	-	-
Pressure Casting						
Continuous Casting	450	450	0.14	63	0.011	5
Primary Reduction						
Forging						
Rolling/Cogging-Slabs/Blooms/Billets	300	600	3.44	2,064	0.133	80
Secondary Reduction (Hot)						
Forging						
Rolling						
Sections						
Sheet/Strip	650	650	7.02	4,563	0.302	196
Plate						
Scale Removal						
Sulphuric Acid Batch Pickling						
Combination Acid Pickling (Continuous)	600	1,800	-	-	-	-
Combination Acid Pickling (Batch Pipe and Tube)						
Combination Acid Pickling (Other Batch)						
Kolene Scale Removal	350	350	-	-	-	-
Hydride Scale Removal						
Continuous Alkaline Cleaning						
Wire Coating and Pickling						
Finishing						
Cold Rolling and Drawing	625	1,875	-	-	-	-
Forging and Extruding						
Drawing-Wire			Totals	$7,064		$324
Pipe and Tube Forming						

Notes: (1) Values are found in Exhibit V-2.
(2) Process Ton Capacity x Unit Cost.

Source: Datagraphics, Inc.

ENVIRONMENTAL PROTECTION AGENCY

BAT MODEL PLANT COSTS
SIC 3312 - INTEGRATED PRODUCERS: LARGE FLAT ROLLED WITHOUT CUPOLA

Processes	Annual Input Capacity		Investment Cost		Annual Operating Cost	
	Product Tons (000's of Tons)	Process Tons (000's of Tons)	Per Annual Input Process Ton ($/Ton)	Total ($ x 000's)	Unit(1) ($/Ton)	Total(2) ($ x 000's)
Melting Operations						
Electric Arc	750	750	$ -	$ -	$ -	$ -
BOF	500	500	0.46	230	0.022	11
Cupola	350	350	-	-	-	-
Degassing						
Disposition of Molten Metal						
Teeming	1,250	1,250				
Pressure Casting						
Continuous Casting						
Primary Reduction						
Forging						
Rolling/Cogging-Slabs/Blooms/Billets	1,200	2,400	1.97	4.728	0.133	319
Secondary Reduction (Hot)						
Forging						
Rolling						
Sections						
Sheet/Strip	900	900	6.16	5,544	0.302	272
Plate						
Scale Removal						
Sulphuric Acid Batch Pickling	25	75	-	-	-	-
Combination Acid Pickling (Continuous)	750	2,250	-	-	-	-
Combination Acid Pickling (Batch Pipe and Tube)						
Combination Acid Pickling (Other Batch)						
Kolene Scale Removal	40	40	-	-	-	-
Hydride Scale Removal						
Continuous Alkaline Cleaning						
Wire Coating and Pickling						
Finishing						
Cold Rolling and Drawing	800	2,400	-	-	-	-
Forging and Extruding						
Drawing-Wire						
Pipe and Tube Forming						
			Total	$10,502		$602

Notes: (1) Values are found in Exhibit V-2.
(2) Process Ton Capacity x Unit Cost.

Source: Datagraphics, Inc.

ENVIRONMENTAL PROTECTION AGENCY

BAT MODEL PLANT COSTS
SIC 3312 - INTEGRATED PRODUCERS: SMALL FLAT ROLLED

Processes	Annual Input Capacity: Product Tons (000's of Tons)	Annual Input Capacity: Process Tons (000's of Tons)	Investment Cost: Per Annual Input Process Ton ($/Ton)	Investment Cost: Total ($ x 000's)	Annual Operating Cost: Unit(1) ($/Ton)	Annual Operating Cost: Total(2) ($ x 000's)
Melting Operations						
Electric Arc	80	80	$ -	$ -	$ -	$ -
BOF						
Cupola						
Degassing						
Disposition of Molten Metal						
Teeming						
Pressure Casting	80	80	0.28	22	0.011	1
Continuous Casting						
Primary Reduction						
Forging						
Rolling/Cogging-Slabs/Blooms/Billets	75	150	6.00	900	0.133	20
Secondary Reduction (Hot)						
Forging						
Rolling						
Sections						
Sheet/Strip	35	35	22.58	790	0.302	11
Plate	40	40	-	-	-	-
Scale Removal						
Sulphuric Acid Batch Pickling	12	36	-	-	-	-
Combination Acid Pickling (Continuous)	30	90	-	-	-	-
Combination Acid Pickling (Batch Pipe and Tube)						
Combination Acid Pickling (Other Batch)	25	75	-	-	-	-
Kolene Scale Removal	4	4	-	-	-	-
Hydride Scale Removal						
Continuous Alkaline Cleaning						
Wire Coating and Pickling						
Finishing						
Cold Rolling and Drawing	30	90	-	-	-	-
Forging and Extruding						
Drawing-Wire						
Pipe and Tube Forming						
		Totals		$1,712		$32

Notes: (1) Values are found in Exhibit V-2.
(2) Process Ton Capacity x Unit Cost.

Source: Datagraphics, Inc.

ENVIRONMENTAL PROTECTION AGENCY

BAT MODEL PLANT COSTS
SIC 3312 - INTEGRATED PRODUCERS: LARGE SECTION PRODUCTS

Processes	Annual Input Capacity		Investment Cost		Annual Operating Cost	
	Product Tons (000's of Tons)	Process Tons (000's of Tons)	Per Annual Input Process Ton ($/Ton)	Total ($ x 000's)	Unit(1) ($/Ton)	Total(2) ($ x 000's)
Melting Operations						
Electric Arc	150	150	$ -	$ -	$ -	$ -
BOF						
Cupola						
Degassing	30	30	4.74	142	0.289	9
Disposition of Molten Metal						
Teeming	150	150	-	-	-	-
Pressure Casting						
Continuous Casting						
Primary Reduction						
Forging						
Rolling/Cogging-Slabs/Blooms/Billets	145	290	4.60	1,334	0.133	39
Secondary Reduction (Hot)						
Forging						
Rolling						
Sections	110	110	13.82	1,520	0.435	48
Sheet/Strip						
Plate						
Scale Removal						
Sulphuric Acid Batch Pickling	25	75	-	-	-	-
Combination Acid Pickling (Continuous)						
Combination Acid Pickling (Batch Pipe and Tube)						
Combination Acid Pickling (Other Batch)	40	120	-	-	-	-
Kolene Scale Removal	10	10	-	-	-	-
Hydride Scale Removal	20	20	-	-	-	-
Continuous Alkaline Cleaning						
Wire Coating and Pickling	15	45	-	-	-	-
Finishing						
Cold Rolling and Drawing	40	120	-	-	-	-
Forging and Extruding						
Drawing-Wire						
Pipe and Tube Forming						
		Totals		$2,996		$96

Notes: (1) Values are found in Exhibit V-2.
(2) Process Ton Capacity x Unit Cost.

Source: Datagraphics, Inc.

ENVIRONMENTAL PROTECTION AGENCY

BAT MODEL PLANT COSTS
SIC 3312 - INTEGRATED PRODUCERS: MEDIUM SECTION PRODUCTS

Processes	Annual Input Capacity: Product Tons (000's of Tons)	Annual Input Capacity: Process Tons (000's of Tons)	Investment Cost: Per Annual Input Process Ton ($/Ton)	Investment Cost: Total ($ x 000's)	Annual Operating Cost: Unit(1) ($/Ton)	Annual Operating Cost: Total(2) ($ x 000's)
Melting Operations						
Electric Arc	50	50	$ -	$ -	$ -	$ -
BOF						
Cupola						
Degassing						
Disposition of Molten Metal						
Teeming	50	50	-	-	-	-
Pressure Casting						
Continuous Casting						
Primary Reduction						
Forging						
Rolling/Cogging-Slabs/Blooms/Billets	30	60	8.66	520	0.133	8
Secondary Reduction (Hot)						
Forging						
Rolling						
Sections	13	13	32.47	422	0.435	6
Sheet/Strip						
Plate						
Scale Removal						
Sulphuric Acid Batch Pickling						
Combination Acid Pickling (Continuous)						
Combination Acid Pickling (Batch Pipe and Tube)						
Combination Acid Pickling (Other Batch)	12	36	-	-	-	-
Kolene Scale Removal	10	10	-	-	-	-
Hydride Scale Removal	6	6	-	-	-	-
Continuous Alkaline Cleaning						
Wire Coating and Pickling						
Finishing						
Cold Rolling and Drawing	4	12	-	-	-	-
Forging and Extruding	3.5	3.5	-	-	-	-
Drawing-Wire						
Pipe and Tube Forming						
			Totals	$942		$14

Notes: (1) Values are found in Exhibit V-2.
(2) Process Ton Capacity x Unit Cost.

Source: Datagraphics, Inc.

ENVIRONMENTAL PROTECTION AGENCY

BAT MODEL PLANT COSTS
SIC 3312 - INTEGRATED PRODUCERS: SMALL SECTION PRODUCTS, ROLLING

Processes	Annual Input Capacity: Product Tons (000's of Tons)	Annual Input Capacity: Process Tons (000's of Tons)	Investment Cost: Per Annual Input Process Ton ($/Ton)	Investment Cost: Total ($ x 000's)	Annual Operating Cost: Unit(1) ($/Ton)	Annual Operating Cost: Total(2) ($ x 000's)
Melting Operations						
Electric Arc	15	15	$ -	$ -	$ -	$-
BOF						
Cupola						
Degassing						
Disposition of Molten Metal						
Teeming	15	15	-	-	-	4
Pressure Casting						
Continuous Casting						
Primary Reduction						
Forging						
Rolling/Cogging-Slabs/Blooms/Billets	14	28	11.74	329	0.133	4
Secondary Reduction (Hot)						
Forging						
Rolling						
Sections	7	7	41.59	291	0.435	3
Sheet/Strip						
Plate						
Scale Removal						
Sulphuric Acid Batch Pickling						
Combination Acid Pickling (Continuous)						
Combination Acid Pickling (Batch Pipe and Tube)						
Combination Acid Pickling (Other Batch)						
Kolene Scale Removal						
Hydride Scale Removal						
Continuous Alkaline Cleaning						
Wire Coating and Pickling						
Finishing						
Cold Rolling and Drawing						
Forging and Extruding	7	7	-	-	-	-
Drawing-Wire						
Pipe and Tube Forming						
			Totals	$620		$7

Notes: (1) Values are found in Exhibit V-2.
(2) Process Ton Capacity x Unit Cost.

Source: Datagraphics, Inc.

ENVIRONMENTAL PROTECTION AGENCY

BAT MODEL PLANT COSTS
SIC 3312 - INTEGRATED PRODUCERS: SMALL SECTION PRODUCTS, FORGING

Processes	Annual Input Capacity		Investment Cost		Annual Operating Cost	
	Product Tons (000's of Tons)	Process Tons (000's of Tons)	Per Annual Input Process Ton ($/Ton)	Total ($ x 000's)	Unit(1) ($/Ton)	Total(2) ($ x 000's)
Melting Operations						
Electric Arc	12.5	12.5	$ -	$ -	$ -	$-
BOF						
Cupola						
Degassing						
Disposition of Molten Metal						
Teeming	12.5	12.5	-	-	-	-
Pressure Casting						
Continuous Casting						
Primary Reduction						
Forging	12	12	-	-	-	-
Rolling/Cogging-Slabs/Blooms/Billets						
Secondary Reduction (Hot)						
Forging						
Rolling						
Sections	10.5	10.5	35.37	371	0.435	5
Sheet/Strip						
Plate						
Scale Removal						
Sulphuric Acid Batch Pickling						
Combination Acid Pickling (Continuous)						
Combination Acid Pickling (Batch Pipe and Tube)						
Combination Acid Pickling (Other Batch)						
Kolene Scale Removal						
Hydride Scale Removal						
Continuous Alkaline Cleaning						
Wire Coating and Pickling						
Finishing						
Cold Rolling and Drawing						
Forging and Extruding						
Drawing-Wire						
Pipe and Tube Forming						
			Totals	$371		$5

Notes: (1) Values are found in Exhibit V-2.
(2) Process Ton Capacity x Unit Cost.

Source: Datagraphics, Inc.

ENVIRONMENTAL PROTECTION AGENCY

MODEL PLANT SHIPMENT PRODUCT MIX
(Thousands of Net Tons)

Product	Integrated Producers-SIC 3312							Wire Drawers SIC 3315		Sheet Strip and Bar Processors SIC 3316		Pipe and Tube Makers SIC 3317	
	Flat Rolled Products			Section Products									
	Large		Small	Large	Medium	Small		Large	Small	Large	Small	Large	Small
	Without Cupola	With Cupola				Rolling	Forging						
Primary Forms						3.5							
Ingots					15								
Blooms/Bars					9								
Forgings					3								
Plate			36										
Hot and Cold Rolled Sheet and Ship	553	708	27										
Hot Rolled Section Product				50	7	6.2 (Hot and Cold Rolled Section Product combined)	9						
Cold Rolled Section Product				36	3								
Wire				13				7.9	1				
Cold Processed Sheet, Strip and Bars										118	39		
Pipe and Tube												15	.9
Total - Model Plant	553	708	63	99	37	9.7	9	7.9	1	118	39	15	.9
Number of Establishments	2	1	5	7	3	2	5	5	9	2	4	8	34
Total - Industry Segment	1,106	708	315	693	111	19.4	45	39.5	9	236	156	120	30.6

Sources: Datagraphics, Inc.; and A. T. Kearney, Inc.

EXHIBIT V-7

ENVIRONMENTAL PROTECTION AGENCY

PROCESS YIELDS AS USED TO DETERMINE MODEL PLANT TOTAL ANNUAL SHIP CAPACITIES

Process or Operation	Yield (1)
All Melting Operations	100.0%
Teeming	90.0
Casting - Pressure or Continuous	94.5
Primary Reduction	75.0
Secondary Reduction	90.0
All Scale Removal Processes	98.5
Cold Rolling	88.5
Drawing	88.5
Pipe and Tube Making	95.0

Notes: (1) Defined as output relative to input product ton Capacity.

Sources: Datagraphics, Inc., and A. T. Kearney, Inc.

ENVIRONMENTAL PROTECTION AGENCY

INCREMENTAL BPT TOTAL INVESTMENT COSTS AND TOTAL ANNUAL COSTS PER SHIP TON FOR SIC 3312

Industry Segment	Number of Real Establishments in Segment	Model Capacities(1)		Model BPT Costs(2)		Total Segment Ship Capacity (10^3 NT)(3)	Industry Segment Costs				
							Total Investment(4) ($\$ \cdot 10^3$)	Total Annual Cost/Ship Ton ($/NT)(5)			
		R.S.T. (10^3 NT)	Shipment (10^3 NT)	Total Investment ($\$ \cdot 10^3$)	Total Operating ($/NT Ship)			60% Ship Capacity	75% Ship Capacity	90% Ship Capacity	100% Ship Capacity
Large Flat Products Without Cupola	2	750	553	$15,324	$4.02	1,106	$30,648	$11.54	$10.03	$ 9.03	$ 8.53
Large Flat Products With Cupola	1	1,250	708	17,920	4.02	708	17,920	10.88	9.51	8.60	8.14
Small Flat Products	4	80	63	6,755	3.43	252	27,020	32.51	26.70	22.82	20.88
Large Section Products	7	150	99	5,653	1.62	693	39,571	17.11	14.01	11.95	10.91
Medium Section Products	4	50	37	1,492	0.95	148	5,968	11.89	9.70	8.24	7.51
Small Section Products - Rolled	2	15	9.7	541	0.82	19.4	1,082	15.95	12.92	10.91	9.90
Small Section Products - Forged	5	12.5	9	324	0.44	45	1,620	10.20	8.25	6.95	6.30
Totals and Composites	25					2,971.4	$123,829	$14.49	$12.22	$10.72	$ 9.96

Notes: (1) See Exhibits V-5, V-7 and V-8.

(2) Costs as provided by Datagraphics, Inc. through the EPA. (See Exhibit V-5.)

(3) Column (1) x Column (3).

(4) Column (1) x Column (4).

(5) [(Column (4) x [Crf (10%, 10 years) = 0.16275]) / (Column (3) x appropriate percentage)] + Column (5).

ENVIRONMENTAL PROTECTION AGENCY

INCREMENTAL BPT TOTAL INVESTMENT COSTS AND TOTAL ANNUAL COSTS PER SHIP TON FOR SIC's 3315-7

SIC	Industry Segment	Number of Real Establishments in Segment	Model Capacities(1) Input (10^3 NT)	Model Capacities(1) Shipments (10^3 NT)	Model BPT Costs(2) Total Investment ($\cdot 10^3$)	Model BPT Costs(2) Total Operating ($/NT Ship)	Total Segment Ship Capacity ($\cdot 10^3$ NT)(3)	Industry Segment Costs: Total Investment(4) ($\cdot 10^3$)	Total Annual Cost/Ship Ton ($/NT(5)): 60% Ship Capacity	75% Ship Capacity	90% Ship Capacity	100% Ship Capacity
3315	Large Wire Drawers	5	8.3	7.9	$747	$3.92	39.5	$3,735	$29.57	$24.44	$21.02	$19.31
3315	Small Wire Drawers	9	1.1	1.0	222	4.00	9.0	1,998	64.22	52.17	44.14	40.13
3315	Totals and Composites	14					48.5	$5,733	$36.00	$29.59	$25.31	$23.17
3316	Large Sheet, Strip and Bar Processors	2	135	118	$1,786	$2.87	236	$3,572	$6.98	$6.15	$5.61	$5.33
3316	Small Sheet, Strip and Bar Processors	4	45	39	924	2.90	156	3,692	9.33	8.04	7.18	6.76
3316	Totals and Composites	6					392	$7,264	$7.92	$6.90	$6.23	$5.90
3317	Large Pipe and Tube Makers	8	16	15.0	$ 305	$0.73	120	$2,440	$6.25	$5.14	$4.41	$4.04
3317	Small Pipe and Tube Makers	34	1	.9	58	1.11	30.6	1,972	18.59	15.09	12.76	11.60
3317	Totals and Composites	42					150.6	$4,412	$8.76	$7.16	$6.11	$5.58

Notes: (1) See Exhibits V-8, V-10 and V-11.

(2) Costs as provided by Datagraphics, Inc. through the EPA. (See Exhibit V-8.)

(3) Column (1) x Column (3).

(4) Column (1) x Column (4).

(5) [(Column (4) x [Crf (10%, 10 years) = 0.16275]) / (Column (3) x appropriate percentage)] + Column (5).

ENVIRONMENTAL PROTECTION AGENCY

INCREMENTAL BAT TOTAL INVESTMENT COSTS AND TOTAL ANNUAL COSTS PER SHIP TON FOR SIC 3312

Industry Segment	Number of Real Establishments in Segment	Model Capacities		Model BAT Costs(2)		Total Segment Ship Capacity	Total Investment(4)	Industry Segment Costs: Total Annual Cost/Ship Ton ($/NT)(5)			
		R.S.T. (10^3 NT)	Shipments(1) (10^3 NT)	Total Investment ($ x 10^3)	Total Operating ($/NT Ship)	(10^3 NT)(3)	($ x 10^3)	60% Ship Capacity	75% Ship Capacity	90% Ship Capacity	100% Ship Capacity
Large Flat Products Without Cupola	2	750	553	$ 7,064	$0.59	1,106	$14,128	$4.05	$3.36	$2.90	$2.67
Large Flat Products With Cupola	1	1,250	708	10,502	0.85	708	10,502	4.87	4.07	3.53	3.26
Small Flat Products	4	80	63	1,712	0.51	252	6,848	7.88	6.41	5.42	4.93
Large Section Products	7	150	99	2,996	0.97	693	20,972	9.18	7.54	6.44	5.90
Medium Section Products	4	50	37	942	0.38	148	3,768	7.29	5.90	4.98	4.52
Small Section Products - Rolled	2	15	9.7	620	0.72	19.4	1,240	18.06	14.59	12.28	11.12
Small Section Products - Forged	5	12.5	9	371	0.56	45	1,855	11.74	9.51	8.01	7.27
Totals and Composites	25					2,971.4	$59,313	$6.14	$5.06	$4.33	$3.97

Notes: (1) See Exhibits V-6, V-7 and V-8.

(2) Costs as provided by Datagraphics, Inc. through the EPA. (See Exhibit V-6.)

(3) Column (1) x Column (3).

(4) Column (1) x Column (4).

(5) [(Column (4) x [Crf 10%, 10 years) = 0.16275]) / (Column (3) x appropriate percentage)] + Column (5).

EXHIBIT V-10

VI - IMPACT ANALYSIS

A - BASELINE INDUSTRY FORECAST

A baseline forecast has been developed to assist in determining the economic impact of the proposed effluent guidelines on the specialty steel industry. This forecast assesses industry conditions in the absence of environmental controls, allowing the impacts arising from the enforcement of the effluent guidelines to be measured against this base.

MARKET CONDITIONS

The key influences on market conditions facing domestic specialty steel producers are end-user demand for specialty steel products, the availability of competing imports, and trends in exports.

(a) End-User Demand

The major end-use markets for specialty steel products were identified in Chapter I. Growth projections for these industries, published by Chase Econometrics, Predicasts, the U.S. Industrial Outlook, and the U.S. Department of Labor's "The Structure of the U.S. Economy in 1980 and 1985," were surveyed and assessed. Major variances exist between the forecasts emanating from these diverse sources; therefore, a relatively low level of confidence should be placed in the growth projections.

The industries using each of the three grades of specialty steel are highly cyclical in nature, experiencing major year-to-year swings in output. Therefore, projected growth rates for these industries may be strongly influenced by the particular years used as the base and final years of the forecast period. In forming its own growth projections, Kearney has used the 1972-1974 three-year output averages as a base in order to reduce cyclical effects.

Table VI-1 below summarizes the long-range growth rates projected for each of the major markets for stainless steel, and the resulting weighted average growth rate projected for all end-using industries.

Table VI-1

Projected Long-Term Growth of Industries Which Are End-Users of Stainless Steel - 1972-1985

Market	Estimated Percent of Total End-Use Consumption of Stainless Steel (1972-1974 Average)	Projected Average Annual Growth in Output (Percent)	
		1972-1974 Average to 1980	1980 to 1985
Industrial Machinery, Equipment and Tools	26.5%	6.0%	3.5%
Automotive	13.5	4.0	4.0
Domestic and Commercial Equipment	11.5	7.5	5.0
Construction and Equipment	11.0	4.0	5.0
Appliances, Cutlery and Utensils	11.0	5.0	5.0
Others	26.5	4.0	3.5
Average (approximately)	100.0%	5.0%	4.0%

The quantity of stainless steel required for a given level of end-users' output is projected to decline by about 1% per year between the 1972-1974 average and 1980, and about 1/2% between 1980 and 1985, reflecting historical and projected steel market trends, technological improvements, and probable impacts of governmental regulations other than the proposed effluent guidelines. Thus, the long-term average growth rate in domestic stainless steel consumption demand is projected at about 4% annually between the base period and 1980, and about 3-1/2% annually between 1980 and 1985.

The end-use industries requiring tool steel have shown little or no growth since the mid-1960's, and apparent tool steel consumption in the U.S. has declined slightly during this period. However, most forecasters anticipate strong growth in the near future in the industrial equipment markets which account for roughly 70% of end-use consumption of tool steels, based on a widely anticipated capital boom in the late 1970's. Average long-term growth for industries which are end-users of tool steel is therefore projected at 5-1/2% annually between the base period (1972-1974 average) and 1980, and at 3% annually between 1980 and 1985. The resulting long-term average growth rate in tool steel consumption demand is projected at about 4-1/2% annually between the base period and 1980, and about 2-1/2% annually between 1980 and 1985.

The end-users of high alloy steel are largely industries with sophisticated technology, which are considered likely to exhibit above average growth in the near future. Electrical (including nuclear) power generating equipment and the petroleum industry are also important users of high alloy steels; thus, the industry is expected to derive substantial benefits from efforts to expand domestic energy sources. Finally the aircraft and aerospace industry, which is also a major market for high alloy steels, is expected to show a considerable recovery in the late 1970's from its depressed position of recent years. As a result of these trends, industries which are end-users of high alloy steels are expected to grow at a long-term average annual rate of 7% between the base period and 1980, and at a 3% rate between 1980 and 1985.

(b) Level of Imports

Business cycle swings in this country and, more critically, overseas strongly affect the significance of imports in relation to total domestic consumption of specialty steels. These cyclical variations partially obscure basic long-term trends in specialty steel imports. Viewed from the perspective of 1975, a deep recession year throughout the world, imports appear to be increasing at a rapid pace. They appear extremely threatening to the market position of U.S. producers in the absence of quotas or other restrictions. During the price control and "shortage" years of 1973 and 1974, however, imports appeared to be on a declining trend for several years, and were not significantly higher than in 1964 and 1965. Even in 1975, stainless steel imports as a percent of apparent U.S. consumption are estimated to be no higher than during the 1970-1971 recession period.

Prevailing thought among observers of the industry holds that, on average over the next several years, specialty steel production costs will rise more rapidly abroad than in the U.S., resuming a trend displayed between 1971 and 1974. Both energy and available local labor are rapidly becoming continually more scarce in the industrial nations of Western Europe and Japan, and these are major inputs to specialty steel production. It is also believed likely that growth in foreign demand for these steels, over the longer-term, will more than keep pace with foreign capacity increases. This will allow generally profitable price levels for producers and limit the supply available for export to the U.S. under normal pricing conditions. This general scenario has been incorporated into the baseline forecast for the longer term, though it is recognized that, during weak periods of the business cycle, import competition will intensify and imports will temporarily gain a larger share of the U.S. market.

While this study was being prepared, a petition for relief from import competition, raised by U.S. producers under the Foreign Trade Act of 1974, was approved by the International Trade Commission and awaits Presidential action.

The baseline growth of specialty steel imports will be significantly affected by the final decision as to whether and what form of relief is granted. Moreover, the policy adopted regarding import limitations will also strongly influence the impact of the proposed effluent guidelines on domestic shipments and prices. Therefore, two alternative cases are considered:

1. Alternative A. Following anticipated U.S. International Trade Commission recommendations, imports through 1980 are assumed to be restricted by quota to the 1974 levels of 175,000 tons of stainless steel and 16,000 tons of tool steel. Thereafter, import quotas are assumed to be lifted gradually over a two-year period. Imports are assumed to reach the unrestricted levels of Alternative B by 1982.

2. Alternative B. Imports are assumed to be unrestricted throughout the period, but to gradually decline by 1978 to their 1972 market share of about 16% of domestic specialty steel consumption. Thereafter, imports are expected to rise on a long-term basis, reaching about 18-1/2% of specialty steel consumption by 1983.

In both alternative cases, high alloy steel imports are assumed to remain negligible because of their extremely specialized applications.

Significant difficulties for U.S. producers could occur in the unlikely case of compound negative developments in world markets. A low-profit baseline situation could arise if chronically deficient foreign demand and a reversal of favorable trends in U.S. production costs relative to those overseas were combined with the absence of any trade protection for U.S. producers. During the first two or three years of 1970's, industry profits were quite low--after tax margins averaged well under 3%. Net capital investment was also very low, even in terms of dollar book value, and may in fact have been negative after the effects of inflation on plant and equipment replacement costs are considered.

It appears highly likely that if the domestic industry faces chronic duress due to an adverse competitive position with respect to foreign producers, some form of import quota system or "voluntary" import restrictions will eventually be adopted on a long-term basis. The likelihood of such quotas in the event of highly adverse long-term trade developments is incorporated into the baseline conditions of the study.

(c) Export Trends

Exports of stainless steel as a percentage of U.S. producers' net shipments declined on average between the mid-1960's and the mid-1970's. However, the more rapid rise projected for labor and raw materials costs abroad than in the U.S., and the enhanced competitive position of U.S. products resulting from the dollar devaluations of the early 1970's, are expected to halt this decline. Exports as a percentage of U.S. consumption are projected to fluctuate cyclically but to average about 8-1/2% during the 1976-1983 period. This equals the weighted average which prevailed during the 1970-1974 period.

Tool steel exports have increased markedly relative to domestic producers' total shipments in recent years. Price controls during the 1972-1974 period were undoubtedly responsible for much of this increase, but partial 1975 data indicate a continuing rise in the export percentage of total shipments. The same factors which will maintain stainless steel exports during the next eight years should also stimulate tool steel exports. Tool steel exports as a percent of domestic consumption are forecast to decline by 1978 from the very high 8-1/2% level posted in 1975 to the 6% weighted average which prevailed during the 1971-1975 period. Thereafter this percentage is projected to rise 1/2% per year, regaining the 8-1/2% level by 1983.

High alloy steel exports are projected to remain negligible throughout the forecast period.

BASELINE FORECAST

The assumptions and projections of the preceding sections have been utilized to develop a forecast of domestic consumption, imports, exports, and producers' shipments under the two alternative import cases. The shipments forecast is then used to project trends in industry capacity, number of establishments, and employment.

(a) Shipments

Table VI-2 presents projections of U.S. producers' specialty steel shipments by category for the years 1976 through

1983 for import Alternatives A and B. Greater forecast detail for stainless and tool steels under the two alternative cases, including domestic consumption, imports, and exports, is provided in Exhibits VI-1 and VI-2. A cyclical pattern has been built into these projections in order to provide a general picture of the durations and magnitudes anticipated in future specialty steel cycles. The projections should not be viewed as being precise on a year-by-year basis.

Table VI-2

Forecast of Net Specialty Steel Shipments - 1976-1983
(Thousands of Tons)

	Stainless Steel		Tool Steel		
Year	Alternative "A"	Alternative "B"	Alternative "A"	Alternative "B"	High Alloy Steel
1972	855		90		49.8
1973	1,134		111		64.6
1974	1,345		113		73.0
1975	745		73		55.0
1976	920	910	94	87	62.0
1977	1,110	1,085	117	108	75.0
1978	1,310	1,265	140	130	85.0
1979	1,435	1,370	145	135	90.0
1980	1,510	1,425	150	140	94.0
1981	1,185	1,140	120	110	80.0
1982	1,280	1,280	130	130	88.0
1983	1,535	1,535	150	150	103.0

(b) Industry Capacity

On the basis of its industry survey and industry testimony to the U.S. Foreign Trade Commission, Kearney estimates the industry's net shipment capacity for stainless plus tool steels in 1975 at about 1.7 million tons. An additional 150,000 tons of basic steel capacity is scheduled to be on-line by 1977 or

1978. Present capacity is more than adequate to meet the projected 1977 level of shipments. Present capacity, plus scheduled additions, are sufficient to support projected shipment levels through 1982 at utilization rates of less than 90%. In 1983, a very modest 50,000 to 100,000 tons of additional specialty steel refining capacity would be required to hold industry operating rates below 90%.

(c) Number of Firms and Establishments in the Industry

Kearney's industry survey identified one firm which recently entered the stainless tube and pipe market. Based on the tonnages projected in Table VI-2, no new firms are expected to enter the specialty steel industry in the foreseeable future, except through the acquisition of existing facilities.

Although 1975 has been a difficult year for many firms in the specialty steel business, no firms with establishments primarily devoted to specialty steel production are expected to close. Economic recovery, a generally improved competitive position with respect to foreign producers, and a probable measure of protection against imports, if needed, are expected to boost shipment tonnages from their current depressed levels, and to considerably improve profitability levels in the industry. Moreover, potential downward adjustments in capacity devoted to particular product forms (such as stainless steel wire) are most likely to occur through one or both of the following means:

1. Integrated establishments giving up specific product lines.

2. Establishments having only minor specialty steel production relative to total plant output shifting facilities usage to carbon steel products.

In addition to the stainless steel pipe and tube plant just completed by the recent entrant to the market, the construction of two new stainless steel pipe and tube plants by firms with existing establishments is currently under way, and a third firm is also considering adding a new pipe and tube plant. Some integrated producer firms were planning to expand capacity at existing establishments, but no plans were uncovered for the construction of entirely new establishments in the near future. No plans were uncovered for new establishments processing specialty wire or cold rolled sheet, strip, and bars.

Most specialty steel companies have not yet finalized their facilities planning for 1983. However, industry sources indicated that under market conditions currently projected for the intervening period, their most likely response to potential new capacity requirements will be to increase capacity at present facilities. On this basis, the projected number of establishments primarily devoted to specialty steel production between 1977 and 1983 should include the four additional pipe and tube processing plants described previously, but otherwise remain the same as in 1975. Table VI-3 summarizes this projection.

Table VI-3

Projected Number of Establishments Where Specialty Steel Accounts for Over 50% of Total Plant Output - 1977 and 1983

Type of Establishment	Projected Number of Establishment in 1977 and 1983
Integrated Producers	
Flat Rolled Products	8
Section Products	17
	25
Firms Which Purchase Semi-Finished Specialty Steel and Convert	
Wire Processors	14
Cold Rolled Sheet, Strip, and Bar Processors	6
Pipe and Tube Processors	46
	66
Total	91

(d) Employment

Steel tonnage shipments per employee have increased an average of 3% to 3.5% annually over the last 20 years, and these gains have accelerated to an average increase of over 4% in recent years. Gains in terms of tonnage shipments per production worker have been even more rapid. On the basis of projected productivity gains in the specialty steel industry, the forecast increases in tonnage shipments through 1980 are expected to be achieved without any substantial changes in industry employment from 1974 levels. In the period between 1980 and 1983, the projected slower average growth in industry shipments may well cause a 0.5% yearly decline in specialty steel employment.

Table VI-4 presents projected 1977 and 1983 employment in establishments where specialty steel comprises over 50% of total plant production.

Table VI-4

Forecast Employment in Establishments Where Specialty Steel Accounts for Over 50% of Plant Output - 1977 and 1983

	Employment		
	Estimated	Projected	
Type of Establishment	1974	1977	1983
Integrated Producers	35,700	35,400	34,000
Specialty Wire Processors	3,200	3,000	2,700
Specialty Cold Rolled Sheet, Strip and Bar Processors	1,700	1,600	1,500
Specialty Pipe and Tube Processors	6,400	7,000	6,800
Total	47,000	47,000	45,000

MARKET ASSUMPTIONS

Several important assumptions made in developing the forecasts in this section are summarized as follows:

1. The U.S. economy is expected to continue to provide a generally stable growth environment, and no extreme changes in the organization or ownership of industry are anticipated.

2. No major technological breakthroughs which would sharply enhance the use of products competitive with specialty steels or otherwise undermine their market position are anticipated.

3. Capital investment in the U.S. is expected to show relatively strong growth in the late 1970's.

4. U.S. and foreign business cycles will be closely timed. The import environment will be as discussed earlier in this section.

5. Major new types of environmental, health, energy, labor, or other governmental economic regulation, which would cause special hardship to the specialty steel industry or severely restrict customers' ability to use specialty steels, will not be adopted unless they are presently near or in the implementation stage.

PRICE DETERMINATION

Pricing in the specialty steel market is discussed in Chapter III of this study. The essential features of price determination in the market are summarized as follows:

1. The domestic market is competitive because of the large number and variety of producers and customers, and the ability of diversified steel producers to vary production of the less customized specialty steel items in response to price incentives.

2. A major secondary market is provided by steel service centers and warehouse distributors.

3. The supply of imports to the U.S. specialty steel market is probably quite elastic in response to significant cost differentials between U.S. and foreign producers, and import

competition has an important impact on U.S. industry pricing. However, import restrictions are quite possible for the next several years, and both rapidly increasing foreign variable costs and increased foreign demand relative to capacity is expected to limit competition from imports in the long run.

4. Price differentials between producers exist for the more highly customized products, and this segment of the market is significantly less competitive than the industry as a whole. It is also believed to be largely insulated from import competition.

5. The specialty steel market is characterized by substantial fluctuations in demand, resulting from the cyclicality of the industries which use these steels, imposed upon a relatively stable short-term industry supply.

B - ECONOMIC IMPACT

MARKET PRICE ADJUSTMENT TO BPT GUIDELINES

Additional unit costs arising from the proposed effluent guidelines will amount to a relatively small fraction of present industry prices and average costs. Any cost pass-throughs to customers would be averaged over the cycle, and would be significantly lower than the typical year-to-year price swings for most standard specification production items.

National policies adopted with respect to imports will be important in determining the extent to which the minimum added costs arising from the regulations will be passed on to customers. Most foreign producers do not presently face similar pollution abatement controls, and in the short run will not experience similar cost increases. It is likely, however, that many foreign governments will eventually require pollution control measures. The interest many of these nations have shown in promoting specialty steel exports suggests that, in some cases, part of these foreign producers' pollution abatement costs may be offset through general export subsidies. However, specific foreign government assistance to offset pollution control costs is unlikely. Thus, in the long run, foreign producers are not expected to gain any decisive cost advantage vis-a-vis U.S. producers due to environmental regulations in and of themselves.

In the event that foreign trade in specialty steels remains unrestricted, a fairly elastic supply of imported standard specification items will probably cause temporary absorption of much of the direct costs of effluent controls by domestic producers, although the pressure from imports will be less than would be the case if foreign producers gained cost advantages for an extended time period. The processing establishments would absorb at most a fraction of the indirect costs associated with semifinished steel, since this input material potentially could be imported. The prices of the more customized "made to order" products, however, are likely to rise to reflect at least the pollution abatement costs attributable to their own tonnage. It is also possible that some of the costs actually attributable to the noncustomized items will be passed through to customers via the prices of "made-to-order" products.

In the highly probable event that imports are limited by quota for at least the next five years, domestic producers should be able to pass through to customers the full level of added costs incurred due to the regulations. Although the imports permitted under the quota might not share these added costs, these imports would be fixed at a low level. The incremental production required to adjust supply to domestic demand would necessarily come from domestic sources, and prices would reflect at least the level of emissions control costs common to all U.S. specialty steel industry segments.

The cost increases experienced by establishments primarily devoted to specialty steel operations would probably impact prices of all U.S. specialty steel. Many plants primarily devoted to carbon steel production also produce specialty steels, and hold a significant share of the market. Hypothetically, these establishments could attempt to pass through all of their effluent controls costs in carbon steel, ratner than specialty steel prices. However, this possibility is unlikely due to the substantially greater proportional impact of overall pollution control regulations on carbon steel costs, and the probable absence of import protection for carbon steels comparable to that likely to be given to specialty steels. Moreover, to the extent that competitive forces operate in the carbon steel industry, the presence of several firms with no significant specialty steel operations will tend to prevent any cost increase actually attributable to these steels from affecting carbon steel prices. Therefore, it is assumed that no significant cost advantages will accrue to carbon steel producing establishments having minor specialty steel operations.

In the event of limited import competition, integrated producers' incremental costs associated with each of the "finished" specialty steel product form types will be roughly the same as those incurred by the larger processors (SIC's 3315-17). The costs associated with the semifinished product will be incurred directly by the integrated producers, and indirectly by the processors, through increased material input prices. The incremental treatment costs arising from the finishing processes, except for economies of scale, are the same for both groups of producers. The cost differentials arising from these economices of scale are minor relative to the composite selling prices of each of the product form types.

Moreover, the cost differentials between large and small processors are also minor relative to composite selling prices, except in the case of wire processors. As a result, the price increases arising in each of the product form type categories would approximately equal the cost increases incurred by the larger processors.

The smaller wire processors probably would find it necessary to absorb a major portion of their direct pollution control costs in their standard specification product lines. Such cost absorption might be reduced if they were able to raise their "made-to-order" product prices by more than the costs actually attributable on a tonnage basis to these customized products (i.e., if market conditions permit this), or they were able to increase the importance of customized products relative to their total output.

ESTIMATED BPT COST FACTORS AND MARKET PRICE INCREASES

The specific costs incurred in meeting the effluent guidelines are depreciation, capital charges, and equipment operating expenses. These costs are discussed in Section V. The cost estimates utilized in this study were developed several years prior to the final preparation of the report. These costs were originally developed on the basis of 1971 systems engineering and equipment costs, but have been adjusted to reflect December 1975 construction costs and 1975 operating costs. Investment costs were adjusted using the Engineering News Record Construction Cost Index (1913 = 100), while the Department of Labor's Wholesale Price Index (1967 = 100) and Unit Labor Cost Index (1967 = 100) have been to adjust operating costs.

Table VI-5 on the following page summarizes these adjusted BPT costs by industry segment and plant size for establishments where specialty steel accounts for over 50% of total output. A 10% cost of capital based on the average required investment has been assumed in the calculations. Per ton costs are computed on the basis of a 75% operating rate, which is approximately equal to the industry average over a normal business cycle, and also on the basis of full capacity operations. A more detailed cost analysis appears in Exhibit V-9.

An indirect cost of $6.00 to $9.00 per ton must be added to the proccessing firms' direct pollution abatement costs shown in Table VI-5, in the case of import limitation (Alternative A). This cost represents the increased prices paid by these processors for their semifinished specialty steel product inputs. In the case of unrestricted imports, any increase in semifinished specialty steel input costs is likely to be minor.

Table VI-5

Estimated BPT Costs by Establishment Size and Industry Segment - 1975 Prices

Industry Segment	Number of Establishments	Cost for Model Segment: Total Capital Investment ($ Millions)	Operating Cost per Shipped Ton	Total Annual Cost/Shipped Ton: At 75% Capacity Utilization	At Full Capacity Utilization
3312	25	$123.8		$12.22	$ 9.96
Flat Rolled - Large with Cupola	2	$ 30.6	$4.02	$10.03	$ 8.53
	1	17.9	4.02	9.51	8.14
Flat Rolled - Small	4	27.0	3.43	26.70	20.88
Section - Large	7	39.6	1.62	14.01	10.91
Section - Medium	4	6.0	0.95	9.70	7.51
Section - Small (Rolled)	2	1.1	0.82	12.92	9.90
Section - Small (Forged)	5	1.6	0.44	8.25	6.30
3315	14	$ 5.7		$29.59	$23.17
Large	5	$ 3.7	$3.92	$24.44	$19.31
Small	9	2.0	4.00	52.17	40.13
3316	6	$ 7.3		$ 6.90	$ 5.90
Large	2	$ 3.6	$2.87	$ 6.15	$ 5.33
Small	4	3.7	2.90	8.04	6.76
3317	42	$ 4.4		$ 7.16	$ 5.58
Large	8	$ 2.4	$0.73	$ 3.14	$ 4.04
Small	34	2.0	1.11	15.09	11.60
Total, All Plants	87				

Source: Exhibit V-9.

Composite 1974 industry selling prices, estimated on the basis of a weighted average unit value of shipments to other companies, were $1,630 per ton of stainless steel and $2,660 per ton of tool steel. Midyear 1975 prices are estimated to have been about 15% above these levels, or $1,870 per ton of stainless steel and $3,060 per ton of tool steel. High alloy steel prices are estimated to have been in the range of $12,000 per ton. The average effluent control costs, including indirect costs to processors, at 75% operating rates, are in the range of 0.6% to 0.8% of these composite market prices, except in the case of processed wire. The higher costs of the four small, integrated flat rolled product plants are associated with specialized production of stainless steel plate, and are not projected to impact general industry prices.

The size related additional unit abatement costs of small pipe and tube processors and cold rolled processors average about 0.4% of existing industry selling prices for these products, and should be barely detectable in industry pricing. Additional per ton abatement costs of small wire processors are more substantial, amounting to about 1.5% of composite prices.

Table VI-6 summarizes the percentage range of market price increases projected to occur for various specialty steel products due to BPT guidelines. Import Alternatives A and B, respectively involving a five-year quota and unrestricted imports, are discussed earlier in this section.

Table VI-6

Forecast Percentage Price Increases for Specialty Steel Products Attributable to BPT Guidelines

	Projected Range of Percent Price Increases
Import Alternative A	
Non-Customized Processed Wire	1.5-2.5
Other Non-Customized Finished Products	0.6-1.2
Semi-Finished Products	0.3-0.5
Customized Processed Wire	2.0-3.5
Other Customized Finished Products	0.7-1.5
Import Alternative B	
Non-Customized Processed Wire	0.5-1.5
Other Non-Customized Finished Products	0.3-0.5
Semi-Finished Products	0.2-0.4
Customized Processed Wire	1.5-3.0
Other Customized Finished Products	0.6-1.0

BAT COST FACTORS AND MARKET PRICE ADJUSTMENTS

Additional direct costs will be incurred by integrated producers in meeting the BAT requirements of the effluent guidelines. Table VI-7 summarizes these BAT costs by size and product group for the impacted producers. The price and cost of capital assumptions are the same as those employed in computing the BPT costs. Per ton costs are again presented both for a 75% operating factor and for full capacity operations. A more detailed cost analysis appears in Exhibit V-10.

Table VI-7

Estimated BAT Costs by Establishment Size and Industry Segment - 1975 Prices

		Cost for Model Segment			
				Total Annual Cost/Shipped Ton	
Industry Segment	Number of Establishments	Total Capital Investment ($ Millions)	Operating Cost per Shipped Ton	At 75% Capacity Utilization	At Full Capacity Utilization
3312					
Flat Rolled - Large	2	$14.1	$0.59	$ 3.36	$ 2.67
with Cupola	1	10.5	0.85	4.07	3.26
Flat Rolled - Small	4	6.8	0.51	6.41	4.93
Section - Large	7	21.0	0.97	7.54	5.90
Section - Medium	4	3.8	0.38	5.90	4.52
Section - Small (Rolled)	2	1.2	0.72	14.59	11.12
(Forged)	5	1.9	0.56	9.51	7.27
	25	$59.3		$ 5.06	$ 3.97

Source: Exhibit V-10.

As indicated in Table VI-7, the additional unit costs arising from the BAT guidelines are very small in relation to the estimated 1975 composite industry selling prices of stainless and tool steels, which were $1,870 per ton and $3,060 per ton respectively. The costs average less than 0.3% of average selling prices and are less than 0.8% of prices for all industry segments. Since this percentage increment is well below the typical year-to-year variation in real (inflation-adjusted) industry prices, and since the industry will have several years over which to schedule any potential cost pass-throughs, the impact of the BAT costs is expected to be hardly noticeable in industry price changes occurring in the particular year compliance is achieved.

It is likely that by the mid-1980's most foreign specialty steel producers will also face environmental regulations, leaving them with no decisive cost advantages over U.S. producers as a result of the effluent regulations. Thus, competition from foreign suppliers is not projected to prevent long-term price increses resulting from the combined incremental costs of the BPT and BAT effluent guidelines, except during periods of severe recession abroad. This cost pass-through is projected to be realized even under the assumption that imports will be unrestricted by quota after 1980. However, in possible future periods of cyclically related weakness in foreign steel demand, import competition could create a general market environment in which U.S. specialty steel producers could have temporary difficulties in successfully implementing market price increases regardless of cause.

Under import Alternative A, which assumed the imposition of quotas between 1976 and 1980, the BPT cost pass-through would occur around the year of compliance, and the additional BAT cost pass-through would probably impact gradually between the years of BPT and BAT compliance.

Many producers are expected to make the required capital investment for BAT at the time of BPT compliance, while others may act to raise prices in advance in order to set aside funds for the BAT investment.

Under import Alternative B, which assumed unrestricted imports throughout the period, much of the BPT cost pass-through probably could not be effected immediately. The price increases resulting from both the BPT and BAT effluent guidelines would tend to occur gradually during the period through the mid-1980's, as foreign producers incurred pollution control costs and as rising relative costs abroad and foreign demand pressures on capacity improved the competitive position of U.S. producers. Once again, domestic price increases would be difficult to implement for general competitive reasons during periods of weak foreign specialty steel demand, but domestic producers would be able to pass through pollution controls costs on average over the business cycle.

Table VI-8 summarizes the overall addition to specialty steel producers' unit costs resulting from both the BAT and BPT guidelines at 75% establishment and industry capacity utilization rates. The average unit costs associated with the semifinished product have been added to the specialty processors direct unit costs. These costs, which are estimated at $11.00 to $14.00 per ton, are assumed to be reflected in the prices of the semifinished steel they purchase.

Table VI-8

Estimated Overall Addition to Unit Costs Arising from BPT and BAT Guidelines by Specialty Steel Establishment Size and Industry Segment - 1975 Prices

Industry Segment	Number of Establishments	Direct Costs/Shipped Ton at 75% Operating Factor: BPT	Direct Costs/Shipped Ton at 75% Operating Factor: BAT	Overall Additional Costs/Shipped Ton at 75% Industry Operating Factor(1)
3312	29	$11.22	$5.06	$17.28
Flat Rolled - Large	2	$10.03	$3.30	$13.39
with Cupola	1	9.51	4.07	13.58
Flat Rolled - Small	4	26.70	6.41	33.11
Section - Large	7	14.03	7.54	21.55
Section - Medium	4	9.70	5.90	15.60
Section - Small (Rolled)	2	12.97	14.59	27.91
(Forged)	5	8.29	9.91	17.76
3315	14	$29.50		$52.09
Large	5	[illegible]		$36.94
Small	9	32.17		64.67
3316	6	$6.90		$19.40
Large	2	$6.15		$18.65
Small	4	8.06		20.56
3317	42	$7.16		$19.66
Large	8	$5.14		$17.64
Small	34	15.09		27.59

Note: (1) Processors' overall costs are assumed to include an indirect cost of $11.00 to $14.00 per ton, semi-finished product. The above data are based on the median value of $12.50.

Source: Tables VI-5 and VI-7.

The unit cost differentials among the industry size segments indicated in Table VI-8 are, except in the cases of wire processors and small integrated producers specializing in stainless steel plate, a minor fraction (0.5% at most) of industry selling prices. In light of probable existing unit cost variations between firms and segments of the industry, and the further unit cost differentials which arise from fluctuating capacity utilization rates, the effluent abatement cost differentials between these firms are not expected to have a decisive impact either on market pricing or on the ability of individual firms to compete in the market.

Market price increases resulting from the BPT and BAT guidelines have been projected on the basis of the costs presented in Table VI-8 and the following considerations:

1. Prices of semifinished specialty steels and non-processed products are projected to rise within a percentage range centered on the median unit cost increase attributable to these products at 75% operating rates. This median unit cost increase is about $12.50 per ton.

2. Prices of standard specification cold rolled sheet strip and bars are projected to rise within a percentage range centered on the median unit cost increases of large integrated producers and SIC code 3316 processors at 75% operating rates. There is little difference among the average unit costs projected for the various industry process and size segments in this market.

3. Prices of standard specification pipe and tube products are projected to rise within a percentage range centered on the unit cost increase estimated for the smaller establishments in this process segment at 75% operating rates. The smaller processors play a major role in this market and are assumed to be decisive in market pricing.

4. Prices of standard specification processed wire products are projected to rise within a percentage range bounded by the estimated unit cost increases of the large and small wire processing segments at 75% operating rates. Foreign producers, however, have been very active in this market, and could serve to restrict cost pass-throughs on a long-term basis if their own unit pollution control costs are significantly below those of domestic processors. Therefore, the projected price increase in processed wire must be viewed as a high side estimate.

5. Customized "made-to-order" products are projected to rise to cover at least the additional unit pollution control costs of the supplying industry segments. To the extent that market conditions permit, these custom products may rise in price by even more than unit costs for some products, since higher cost producers may attempt to recover some of the costs they may be required to absorb in their "standard specification" product lines.

Table VI-9 below, presents the overall percentage price increase projected for various specialty steel items as a result of compliance with both the BPT and BAT guidelines.

Table VI-9

Projected Overall Percentage
Price Increases for Specialty Steel
Products Due to BPT/BAT Guidelines

	Projected Percentage Price Increase (1)	
Type of Product	Non-Customized "Standard Specification" Items	Customized "Made-to-Order" Items
Processed Wire	1.8-3.4	2.0-4.0
Processed Cold Rolled Sheet, Strip and Bars	0.6-1.2	0.9-1.2
Processed Pipe and Tube	1.0-1.5	1.2-2.0
Semi-Finished Products	0.5-0.8	-

Note: (1) Price increases due to effluent guidelines only.

ELASTICITY
OF DEMAND

The impact of the projected price increases on industry volume depends upon the elasticity of demand for specialty steel products. No published estimates of the price elasticity of demand for specialty steel have been identified. Moreover, it is extremely difficult to obtain a reliable estimate of this elasticity from empirical market data. As has been discussed in Chapter III, the specialty steel market is characterized by strong short-term fluctuations in demand, resulting from sharp cyclical swings in the demand for the durable goods in which specialty steels are used. Therefore, when price and volume coordinates for several years or quarters are mapped out, they tend to rise and fall together, revealing the market's relatively stable supply conditions, rather than its unstable demand function. This phenomenon obscures the actual relationship for any given level of demand resulting from unchanged end-use requirements for these steels, where a rise in prices should tend to reduce the tonnage sold to users.

An order of magnitude estimate of the price elasticity of demand for specialty steels may be developed by an evaluation of the following two factors:

1. Availability of Substitutes. As was noted in Chapter I, feasible substitutes for stainless steel and tool steel are available in some applications but, in general, substitution

of alternative inputs is difficult. High alloy steels have no viable substitutes in most applications. The substitution of other products for specialty steels, as a group, in response to price increases of less than major proportions, is therefore likely to be quite limited.

2. Impact of Specialty Steel Costs on End-Use Product Costs. The end-use markets for specialty steels were detailed in Chapter I. For the most part these steels are inputs to large, high valued machinery, transportation equipment, construction, and durable goods. Specialty steel costs typically account for only a small fraction of the overall cost of the products in which they are used, and therefore increases in specialty steel prices have little impact on the prices of most of the end-products in which they are used.

These factors tend to make the demand for specialty steel inelastic. Because specialty steel costs typically constitute only a small fraction of total end-use product costs, and substitutes are not readily available, there is little incentive for users to sharply reduce consumption as a result of specialty steel price increases. Moreover, the limited role that specialty steel costs play in overall end-use product cost reduces the importance of possible price elasticity in the demand for the end-use products, since an increase in specialty steel prices is likely to have little impact on end-product prices. Hence, an increase in specialty steel prices should result in no substantial reduction in the consumption of the end-products, and little reduction in the specialty steel tonnage used in making these products.

The demand for specialty steels is not believed to be extremely inelastic, however, since substitutes are available in some applications and specialty steels form an important fraction of total product costs in a few end-use markets (such as cutlery). The price elasticity of demand is assumed to be in the range of -0.5 to -1.0.

A comparison of specialty steel prices and tonnage shipments in two years of similar business cycle conditions, 1968 and 1973, when specialty steel demand conditions also may be presumed to have been similar, lends some modest support to this inferred demand elasticity range. Between 1968 and 1973, composite stainless steel prices (adjusted for general price inflation as measured by the Implicit Price Deflator for Gross National Product) declined about 8-1/2%, while apparent U.S. consumption of stainless steel (adjusted for trend expansion of the economy as a whole as measured by growth in real Gross National Product) rose by about 8-1/2%. Thus, a price elasticity of demand of about -1.0 was indicated. However the fraction of real GNP devoted to private nonresidential construction, investment in producers' durable goods, and consumers' durable goods production--the chief end-use markets for specialty steels--was greater in 1973. This indicates that demand conditions for these steels may in fact have been somewhat more favorble in 1973, and the -1.0 figure would overstate the actual elasticity of demand. The assumed range of -0.5 to -1.0% appears reasonable in the context of this limited test.

VOLUME IMPACT

(a) Import Effects on Domestic Producers' Demand

The price elasticity of demand faced by domestic specialty steel producers will be greater than the overall elasticity of consumption demand for specialty steel products if foreign producers' costs do not move together with those of domestic producers. In the case of import Alternative B (unrestricted imports during 1976-1980) foreign producers may gain some temporary cost advantages due to U.S. BPT effluent regulations, and hence U.S. producers may face a short-term demand for their own output which is more elastic than the consumption demand for specialty steels.

For reasons noted in Chapter II, a precise estimate of the price elasticity of supply of imports to the U.S. market was not attempted in this study. However, the impact of the effluent guidelines on U.S. prices and U.S. producers' shipment volumes in this case may be assessed in an imprecise way by utilizing crude assumptions about the foreign supply of and demand for specialty steels and computing the size of the net import flows and the specific percentage increase in worldwide prices which would restore balance to worldwide supply and demand.

As noted in Chapter III, the elasticity of the overall foreign supply of specialty steels is thought to be considerably lower than the 2.5 median value estimated for the U.S. A value of 1.5 may be viewed as a relatively high estimate. The elasticity of foreign demand for specialty steels may be taken to be no higher than the upper bound -1.0 estimate of the U.S. elasticity of consumption demand. The baseline forecast of this section projects imports at about 16% of the U.S. market during the 1976-1980 period, and U.S. exports at about 8-1/2% of the domestic specialty steel market. Further, the U.S. share of overall world consumption is estimated to be at least 25%.

Given these estimates of supply and demand elasticities and base shares of imports and exports in the U.S. market, and a uniform unit cost increase (at any output volume) of about 0.85% of base prices due to the BPT regulations, an average increase in world prices of between 0.15% and 0.2% would be required to restore balance to overall world supply and demand. A price increase of this magnitude would result in an increase of about 10% to 15% in U.S. net imports, that is from about 7.5% to about 8.5% to 9% of the domestic market. The shipments of domestic producers would decline under these circumstances by about 1.5% to 2%.

The assumptions upon which these calculations were based were selected to result in low side estimates of the average price increases which would result from the increased unit costs incurred by U.S. producers, and to yield high side estimates of domestic producers' volume reductions resulting from these increased costs. Moreover, rigiditites and imperfections in world pricing relationships and supply networks would allow slightly higher increases for U.S. producers than would be predicted by the purely competitive model of the world stainless steel market. It is therefore assumed for Alternative B that the actual price increases obtained by U.S. producers would be in the range of 0.2-0.4% for the semifinished product, without any change in the calculated volume decline of 1.5% to 2.0%.

In the case of import Alternative A, import quotas are assumed to insulate the domestic producers from potential import competition due to temporary cost disadvantages resulting from the effluent guidelines. With respect to cost increases resulting from both the BPT and BAT guidelines over the long-run, foreign producers are assumed to incur similar incremental unit costs. In this case, given a foreign consumption demand elasticity about the same as that of the U.S., and a foreign supply elasticity no greater than that of U.S. producers, the volume impact on U.S. producers of the resulting price increases will be no greater than if the domestic market were considered in isolation. The price elasticity of demand for domestically produced specialty steel is assumed to be in the same range as the overall elasticity of demand for specialty steel consumption,[1] or less (in absolute value) than -1.0.

(b) Industry Ability to Absorb Price and Volume Impacts

Since the domestic supply of stainless steel is less than fully elastic at a particular market price, the reduction in volume increases from the baseline growth trend should lead to a slightly lower realized market price (after the imposition of the controls guidelines) than would be obtained merely by adding the incremental cost increases to the baseline price. However, since the short-term elasticity of supply has been estimated to be quite high, and because of the large margin of error possible in both the elasticity and unit effluent control cost estimates, the new price level was projected to equal the full value of this sum, except in the case where import competition prevented a full cost pass-through. The consequent reduction from baseline growth in the volume of shipments of standard

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(1) Technically, it could be somewhat higher (in absolute value) because the shipments base against which the volume change is measured is lower (by the percentage of net imports in domestic consumption) than the consumption base against which the overall price elasticity of demand was measured. This factor would tend to raise the actual elasticity of demand for domestically produced specialty steel by 10% to 20%, which is of minor importance given the large range of uncertainty in the elasticity estimates. Moreover, the probability that the domestic producers' supply elasticity is greater than that of foreign producers, would tend to reduce U.S. net imports somewhat, thus tending to reduce the demand elasticity faced by U.S. producers.

specification items other than processed wire is projected to be in the range of 0.3% to 1.0% due to the BPT guidelines under import Alternative A. The volume reduction from baseline growth due to the combined impact of the BPT and BAT regulations is projected to average slightly less than 1%.

The baseline industry forecast assumes consumption demand growth rates during the late 1970's (using the 1972-1974 average level of shipments as a base) averaging about 4% annually for stainless steels, 4-1/2% annually for tool steels, and 6% annually for high alloy steels. It is also assumed that, even in the case of unrestricted imports, continued growth in overseas steel demand and the rise in labor and raw materials costs of Japanese and European producers will lead to at most a small increase in the import share of the U.S. market from the average levels of the early 1970's. By 1980, total domestic producers' shipments are expected to exceed their extremely high 1974 levels by about 10%, and to rise further by 1983. Under these circumstances, the total volume impact resulting from the BAT/BPT guidelines will probably average less than one-fourth of the average year-to-year increase in specialty steel shipments during the late 1970's. Taken in isolation, they are expected to be absorbed by the industry as a whole without difficulty.

An alternative baseline forecast could be hypothesized in which a generally stagnant U.S. economy, chronically deficient foreign demand, and the absence of any import protection for the

U.S. producers would create a market environment in which the industry would be unable to recover any part of the effluent controls costs through price increases, except by accepting substantial volume reductions. In this unlikely case, industry after-tax profit margins would appear to decline by as much as 25% from their average 1973-1974 levels. However, this decline would actually be attributable to a worsening in the baseline industry conditions rather than to the impact of the effluent guidelines themselves. Under these circumstances, it is probable that, in the absence of the effluent controls, the industry would experience a decline in prices with similar effects on average profitability of firms.

The marked cyclicality of the specialty steel industry could also lead to some relatively minor shorter-term difficulties for producers in the case of unrestricted imports. Price increases to cover the increased costs resulting from the BPT guidelines could probably be effected only gradually under this assumption. The temporary impact of a 0.6 or 0.7% cost increase, with no compensating increase in prices, could spell the difference between a small after-tax operating profit and a small loss in a year of adverse business conditions.

CAPITAL INVESTMENT AND FINANCING

The need to finance pollution control investments poses a problem in several industries. The total BPT and BAT capital cost requirements for the various model plants for the different size and process form segments of the specialty steel industry are detailed in Exhibits V-5 and V-6, respectively.

(a) Total Capital Costs

Total capital costs associated with the BPT regulations are estimated at $141.2 million, of which $123.8 million will fall upon the integrated producer establishments. Total capital costs associated with the BAT regulations are estimated at $59.3 million, all of which will fall upon integrated producer firms. The actual expenditures required for at least the BAT investment may be stretched out over a period of several years, as can be the cash accumulations required to finance these investments. Moreover, many firms in the industry are operating under permits which have several years to run, and which postpone the date upon which compliance with the BPT regulations must be achieved. This allows them a greater time period over which to finance these more immediate investment needs. The integrated producer firms as a group will probably have the option of financing their required investments with pollution control revenue bonds, thus taking advantage of lower-than-competitive rates of interest.

(b) Debt Financing

With only a few exceptions, the producer firms for which financial statistics are available, as listed in Exhibit II-1, meet the institutionally established criteria for borrowers, provided prospects for industry profitability and cash flow are considered reasonably attractive. These firms should be able to resort to traditional debt finance. The few firms with relatively high debt-equity ratios are fairly large in terms of sales and have earned above average profits in the past. They should be able to utilize the credit markets if they choose to do so.

As was noted in Chapter II, financial statistics are unavailable for many of the smaller firms in the industry, and their policies with regard to funding investments cannot be determined. It is presumed, however, that many of these firms will be able to obtain loans, possibly with SBA assistance, for the small investment sums they require.

(c) Internal Financing

Assuming a continuing improvement in economic conditions during the next two or three years, many of the firms in the industry should also be able to finance the BPT investment from internal sources. The total investment requirements due to the BPT regulations are generally less than half the earnings of reporting firms with integrated establishments in a good profits year like 1974, and are far lower for the reporting firms with nonintegrated processing establishments. In years of more typical earnings performance, integrated producing firms would still find it possible to finance the entire BPT investment costs from less than one year's profits.

Exhibit VI-3 indicates the 1974 profits and the BPT and BAT capital costs of reporting specialty steel producing companies by firm, and expresses the ratio of these investment costs to profits. Table VI-10 below summarizes these profits, costs, and ratios for all reporting firms in the major industry segments.

Table VI-10

Estimated BPT and BAT Costs in Relation to 1974 Pre-Tax Profits for Reporting Firms in the Specialty Steel Industry, by Firm SIC

Firm SIC	Number of Firms	Number of Establishments	1974 Pre-Tax Profits ($ x 10^6)	BPT Investment Cost ($ x 10^6)	BPT Investment As Percent of Profits	BAT Investment Cost ($ x 10^6)	BAT Investment As Percent of Profits	Total Investment Cost ($ x 10^6)	Total Investment As Percent of Profits
3312	16	36'	$1,141.6	$129.4	11.3%	$52.0	4.6%	$181.4	15.9%
3313	9	9	404.2	4.6	1.0	(1)	(1)	4.6	1.0
3316(2)	-	-	-	-	-	-	-	-	-
3317	8	9	760.7	1.3	0.2	(1)	(1)	1.3	0.2
Total	33	36	$2,306.5	$135.3		$52.0		$187.3	
Average Percent					5.7%		2.2%		7.8%

Notes: (1) No Incremental BAT Cost.
(2) Of the five SIX 3316 firms, four are included in SIC 3312. The fifth does not report.

Source: Exhibit VI-3.

Profits data are not available for most of the smaller reporting firms in the industry. However, virtually all of these firms maintain only a single wire or pipe and tube processing establishment. The total required capital expenditure for pollution control is only about $200,000 for the small wire processors and about $60,000 for the pipe processors. Financing from internal sources is thought to be feasible for most of these firms.

(d) BPT/BAT Investment in Relation to Historical Capital Expenditures

Exhibit II-4 details historical capital expenditures statistics for four large, integrated specialty steel producing firms between 1964 and 1974. Table VI-11 summarizes the recent capital outlays of three of these firms in relation to their required investment to meet the 1977 BPT and 1983 BAT guidelines.[2]

Table VI-11

Major Producers' Historical Capital Expenditures Compared with BPT/BAT Requirements
(Millions of Dollars)

Company	Historical Capital Expenditures			Estimated Pollution Control Capital Expenditures		
	1974	1973	1970-74 Average	BPT	BAT	Total
Allegheny-Ludlum	$28.8	$20.7	$23.1	$26.8	$14.1	$40.9
Carpenter Technology Corporation	12.7	9.6	9.9	11.9	6.0	17.9
Cyclops	19.9	12.3	15.0	7.5	3.0	10.5

Source: Exhibits II-4 and VI-3.

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(2) The fourth firm, the Latrobe Steel Co., was generally unprofitable between 1971 and 1973, but has recently been acquired by the Timken Corporation. Its past capital expenditures history is therefore not believed to be a good indicator of its ability to make new investments.

Table VI-11 indicates that, for two of the three firms, total capital expenditures for pollution control will amount to somewhat less than two years' expenditures on new plant and equipment at recent average levels. An investment of this size is substantial, and may result in temporary setbacks to plant expansion, moderization and other improvements by these firms. However, it is likely that the pollution control outlays may be financed over a period of several years, mitigating the investment burden in any particular year.

A more fundamental question in the larger firms' capital expenditure decision-making process than the mere availability of funds is whether they will choose to allocate these additional funds to the specialty steel industry. This question must be answered by the firms' convictions about the basic future profitability of the industry. The price and volume analysis of this section suggests that in general pollution control costs will be a minor factor in the determination of industry profitability levels. In the probable baseline case of improved industry profitability, no closures are expected as a result of a lack of capital with which to finance the pollution controls expenditures.

MICRO IMPACTS AND CLOSURE ANALYSIS

The price and volume analysis detailed earlier in this section indicated that the specialty steel industry as a whole is projected to suffer only minor adverse impacts as a result of the costs arising from the effluent limitations guidelines. The impact on individual establishments or industry segments is more difficult to assess because of a general lack of precise information about plant costs, output composition, potential markets, and profitability for individual firms. Potential closures for site-specific reasons are a possibility, but are not considered in the scope of this analysis.

Table VI-8 details the overall increase in unit costs (at a 75% operating factor) estimated to occur in each industry segment as a result of the effluent limitations guidelines. These costs include the increase in semifinished steel prices projected to be passed on to processors by the integrated producer firms. The cost relationships exhibited in this table, along with the projected product price increases presented in Table VI-9, indicate only two industry segments which could potentially experience substantially greater adverse impact than the industry as a whole.

1. Small, Integrated Producers of Flat Rolled Products. These smaller firms are estimated to experience unit pollution control costs about $20 per ton higher than the larger integrated firms producing flat rolled products, an incremental cost equal to about 1% of the estimated composite 1975 industry selling price. However, most of these additional costs arise from specialization in the production of stainless steel plate, and should be passed through to consumers of this product. Of

the four establishments in this group, two are presently earning profit margins for specialty steel operations which are above the average for integrated producers. A third establishment is a specialized manufacturer of tool steels as well as plate. The fourth establishment is a major operation of a parent firm which is considerably more profitable than the establishment itself. The plant accounts for over 35% of total corporate sales and is a specialized producer of armored plate. None of these four establishments is viewed as likely to close because of the cost absorption projected as a result of the BPT or BAT regulations.

2. <u>Specialty Steel Wire Processors</u>. This entire segment is estimated to experience unit pollution control costs comprising a considerably larger fraction of product selling prices than the industry as a whole.

The crucial determinant of the severity of the adverse economic impact of the regulations on wire processors is the future role of imports in this market. This industry segment has been highly vulnerable to import competition in the past, and may be expected to suffer significant adverse impacts if: (a) foreign demand for specialty steel is slow in recovering from the effects of recession and foreign production costs rise more slowly than anticipated, (b) foreign producers do not experience similar unit costs of pollution control over the long term, and (c) imports remain unrestrained by quota. At the present time it appears highly likely that import quotas, effective for a five-year period, will be adopted for specialty steel wire products. In subsequent years, it is believed that increasing foreign demand, and an improved competitive position for U.S. producers, will enable the establishments in this segment to maintain reasonable profitability levels, as indeed they experienced in 1974. The continued viability of establishments in this segment may also be enhanced by an increased emphasis on "made-to-order" products, which are less exposed to import competition, and which already form a major part of the product line of the smaller firms. Finally, the total capital investment requirements for the larger establishments are an extremely small percentage of parent company profits, and no closures are expected to occur among plants in this size group.

In the probable event that the wire processors do gain a degree of insulation from foreign competition, or if foreign producers experience similar cost increases, they are projected to be able to have no major difficulty in passing through to their customers the 2% to 3% cost increases resulting from the BPT/BAT guidelines. There is insufficient evidence available about the particular elasticity of consumption demand for these products to predict the consequent volume reduction with any precision. However, assuming a demand elasticity approximately equal to that for specialty steel products as a whole, the volume impacts should be absorbed by this segment without great difficulty, given the annual demand growth rates projected in the baseline forecast.

The smaller firms in this segment will experience unit cost increases between 1.0% and 1.5% higher than those of the larger processors. Given their orientation toward customized "made-to-order" products, however, they are believed to be capable of passing on most of these higher costs to their customers. The capital investment requirements for smaller establishments in this industry segment are quite small in absolute dollar amounts. The best projection at this time is that all of the firms operating small establishments in this segment will make the small investments necessary to meet the effluent control guidelines and that no closures will occur among these plants.

It is recognized, however, that if baseline conditions are substantially less favorable than anticipated, the smaller wire processors could face a long-term low profitability situation. In this case, the probable absorption of part of their estimated pollution control costs could have a decisively adverse impact, leading to significant potential for closures. However, the total employment of these nine firms is barely over 1,000, and they are scattered across the Northeastern states, so that any employment effects would be minor.

IMPACT ON CUSTOMERS AND SUPPLIERS

As has been discussed in previous sections of this study, the specialty steel industry typically plays a small role in the cost structure of its customers and in the raw materials, equipment, and other markets in which it is a buyer. Since the impact of the guidelines on the specialty steel industry itself is quite small, the impact on these customers and suppliers is projected to be negligible.

OTHER IMPACTS

(a) Local and Regional Impacts

Any possible closures resulting from the costs associated with the effluent guidelines are expected to effect well under 1,000 employees, scattered over the Northeastern states. Consequently, no important local or regional impacts are projected.

(b) Balance of Trade Impacts

The volume impact analysis of this section indicated that, assuming unrestricted imports between 1976 and 1980, net imports of specialty steel could rise 10-15%. Using the Alternative B baseline forecasts of imports in 1980, and estimated 1975 composite industry selling prices (since price increases due to the regulations would be inconsequential in this case), the stainless steel deficit would increase by less than $30 million, and the tool steel deficit would rise by less than $7 million.(3) These sums are minor in

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(3) These composite industry selling prices would considerably overstate the unit value of imports, thereby overestimating the negative balance of payments effects.

relation to either the overall U.S. balance of trade surpluses of 1973 and 1975 or the balance of trade deficits of 1974, 1972, and earlier years.

In the alternative case of restricted imports between 1976 and 1980, and in the analysis of price and volume effects subsequent to the BAT regulations, no appreciable change in import and export tonnages was projected. Any balance of trade impacts would result from the 0.5% to 1.5% projected increases in specialty steel prices and would be in the order of magnitude of $2 to $3 million.

TOTAL ANNUAL COST

The total annual costs incurred by the entire industry segment were calculated for each segment represented by a model plant. As previously discussed in Chapter V-B, annual costs are comprised of fixed costs and direct costs which vary directly with operating levels. Thus, total annual costs were, in each case, calculated for the same four capacity utilizations used in Chapter V-B, namely 60%, 75%, 90% and 100%. The total annual cost in each case, defined by industry segment and utilization, was calculated by multiplying the annual shipments by the appropriate total annual cost per ship ton, as developed in Exhibits V-9 and V-10. The BPT and BAT total annual costs so computed are shown in detail in Exhibits VI-4 and VI-5 respectively.

Table VI-12 summarizes these exhibits.

Table VI-12

Incremental SIC Total Annual Cost as a Function of Capacity Utilization (Millions of Dollars)

SIC	Description	60%	75%	90%	100%
3312	Integrated Producers - BPT	$25.8	$27.2	$28.7	$29.6
3312	Integrated Producers - BAT	10.9	11.3	11.6	11.8
3312	Integrated Producers - BPT and BAT	36.7	38.5	40.3	41.4
3315	Wire Drawers - BPT and BAT	1.0	1.1	1.1	1.1
3316	Sheet, Strip and Bar Processors - BPT and BAT	1.9	2.0	2.2	2.3
3317	Pipe and Tube Makers - BPT and BAT	0.8	0.8	0.8	0.8
	Specialty Steel Industry Total - BPT	$29.5	$31.1	$32.8	$33.8
	Specialty Steel Industry Total - BPT and BAT	$40.4	$42.4	$44.4	$45.6

Sources: Exhibits VI-4 and VI-5.

These total annual costs measure the resources society must expend to exact compliance by the specialty steel industry with the effluent limitations, and will be incurred irrespective of who ultimately pays them. To the extent that these costs are passed on by means of increased prices, consumers of the end-products produced from this industry's output will ultimately pay the price of compliance. To the extent that the total annual costs are not passed on via price increases, the owners of establishments will underwrite them.

The costs detailed above would overstate the actual costs to society of the regulations if several plants were to close rather than incur the investment costs associated with the controls regulations. However, since the only significant potential for closure was limited to the wire drawers, this overstatement would be less than $1 million annually.

ENVIRONMENTAL PROTECTION AGENCY

FORECAST STAINLESS STEEL PRODUCTION, CONSUMPTION, IMPORTS AND EXPORTS - 1976-1983
(Thousands of Net Tons)

	Alternative "A"						Alternative "B"					
	Net Domestic Consumption Demand(1)	Imports		Exports		Domestic Producers' Net Shipments	Net Domestic Consumption Demand(1)	Imports		Exports		Domestic Producers' Net Shipments
Year		Tonnage	Percent of Consumption	Tonnage	Percent of Shipments			Tonnage	Percent of Consumption	Tonnage	Percent of Shipments	
1972(2)	941.6	149.1	15.8	62.5	7.3	855.0	941.6	149.1	15.8	62.5	7.3	855.0
1973(2)	1,166.4	128.3	11.0	95.7	8.4	1,133.8	1,166.4	128.3	11.0	95.7	8.4	1,133.8
1974(2)	1,383.6	176.1	12.7	137.2	10.2	1,344.7	1,383.6	176.1	12.7	137.2	10.2	1,344.7
1975(3)	897.7	192.0	21.4	39.0	5.2	744.7	897.7	172.0	21.4	39.0	5.2	744.7
1976	1,030	175	17	65	7	920	1,030	185	18	65	7	910
1977	1,185	175	15	100	9	1,110	1,185	200	17	100	9	1,085
1978	1,360	175	13	125	9.5	1,310	1,360	220	16	125	9.5	1,265
1979	1,470	175	12	140	10.5	1,435	1,470	240	16.5	140	10.5	1,370
1980	1,530	175	11.5	155	10.5	1,510	1,530	260	17	155	10.5	1,425
1981	1,300	210	16	95	8	1,185	1,300	255	19.5	95	8	1,140
1982	1,430	255	18	105	8	1,280	1,430	255	18	105	8	1,280
1983	1,695	315	18.5	155	10	1,535	1,695	315	18.5	155	10	1,535

Notes: (1) Apparent domestic consumption equals domestic producers' shipments minus exports plus imports, and thus includes net additions to stocks.
(2) Actual data from American Iron and Steel Institute, Annual Statistical Reports.
(3) Import, export, and shipments figures are annual rates based on first seven months data, as reported in testimony of S. Nehmer before U.S. International Trade Commission, re: Specialty Steel.

EXHIBIT VI-1

ENVIRONMENTAL PROTECTION AGENCY

FORECAST TOOL STEEL PRODUCTION, CONSUMPTION, IMPORTS, AND EXPORTS - 1976-1983
(Thousands of Net Tons)

Year	Alternative "A" Net Domestic Consumption Demand(1)	Imports Tonnage	Imports Percent of Consumption	Exports Tonnage	Exports Percent of Shipments	Domestic Producers' Net Shipments	Alternative "B" Net Domestic Consumption Demand(1)	Imports Tonnage	Imports Percent of Consumption	Exports Tonnage	Exports Percent of Shipments	Domestic Producers' Net Shipments
1972(2)	99.0	11.9	12.0	3.1	3.4	90.2	99.0	11.9	12.0	3.1	3.4	90.2
1973(2)	119.6	15.0	12.5	6.7	6.1	110.7	119.6	15.0	12.5	6.7	6.1	110.7
1974(2)	120.8	16.0	13.2	8.5	7.5	113.3	120.8	16.0	13.2	8.5	7.5	113.3
1975(3)	92.0	21.0	29.2	8.0	10.9	73.0	92.0	27.0	29.3	8.0	10.9	73.0
1976	105	16	15	7	7	94	105	25	24	7	8	87
1977	125	16	13	8	7	117	125	25	20	8	7	108
1978	145	16	11	9	6	140	145	23	16	9	7	130
1977	150	16	10.5	11	7	145	150	26	17	11	8	135
1980	155	16	10.5	12	8	150	155	28	18	12	9	140
1981	130	20	15	9	8	120	130	27	21	9	8	110
1982	145	26	18	12	9	130	145	26	18	12	9	130
1983	165	30	18.5	14	9	150	165	30	18.5	14	9	150

Notes:
(1) Apparent domestic consumption equals domestic producers' shipments minus exports plus imports, and thus includes net additions to stocks.
(2) Actual data from American Iron and Steel Institute, Annual Statistical Reports.
(3) Import, export, and shipments figures are annual rates based on first seven months data, as reported in testimony of S. Nehmer before U.S. International Trade Commission, re: Specialty Steel.

EXHIBIT VI-2

ENVIRONMENTAL PROTECTION AGENCY

INCREMENTAL BPT AND BAT INVESTMENT COSTS COMPARED WITH PROFITS FOR REPORTING SPECIALTY STEEL FIRMS

(Millions of Dollars)

SIC 3312 Firms

Firm (Div.) Establishment SIC Location	1974 Firm Pre-Tax Profit	BPT Investment Cost(1)	BPT Investment As Percent of Profit	BAT Investment Cost(1)	BAT Investment As Percent of Profit	Total Investment Cost(1)	Total Investment As Percent of Profit
Allegheny Ludlum Ind., Inc.	$ 76.5	$26.8	35.0%	$14.1	18.4%	$40.9	53.5%
3312 Blackenridge/Natrona/W. Leechburg, Pa.(2)		17.9		10.5		28.4	
3312 Watervliet/Dunkirk, N. Y.		5.7		3.0		8.7	
3312 New Hartford, N. Y.		0.5		0.6		1.1	
3316 Wellington, Conn.		1.8		-		1.8	
3316 New Castle, Ind.		0.9		-		0.9	
Armco Steel Corp.	319.3	21.2	9.7	10.1	4.6	31.3	14.3
3312 Butler, Pa.		15.3		7.1		22.4	
3312 Baltimore, Md.		5.7		3.0		8.7	
3317 Wildwood, Fla.		0.1		-		0.1	
3317 Houston, Tex.		0.1		-		0.1	
Athlone Ind. (Jessop Steel) - 3312 Washington, Pa.	26.3	6.8	25.9	1.7	6.5	8.5	32.3
Borg Warner Corp. - 3312 New Castle, Ind.	72.7	6.8	9.4	1.7	2.3	8.5	11.7
Cabot Corp. (Stellite Div.) - 3312 Kokomo, Ind.	41.2	1.5	3.6	0.9	2.2	2.4	5.8
Carpenter Technology	31.5	11.9	37.8	6.0	19.0	17.9	56.8
3312 Bridgeport, Ct.		5.7		3.0		8.7	
3312 Reading, Pa.		5.7		3.0		8.7	
3317 Union, N. J.		0.3		-		0.3	
3317 El Cajon, Cal.		0.1		-		0.1	
3317 Jamesburg, N. J.		0.1		-		0.1	
Colt Ind. (Crucible Div.)	136.8	15.8	11.5	7.1	5.2	22.9	16.7
3312 Midland, Pa.		15.3		7.1		22.4	
3317 East Troy, Wis. (Trent Tubes)		0.3		-		0.3	
3317 Carrollton, Ga. (Trent Tubes)		0.1		-		0.1	
3317 Fullerton, Ga. (Trent Tubes)		0.1		-		0.1	
Continental Copper & Steel (Braeburn) 3312 Braeburn, Pa.	10.9	0.3	2.8	0.4	3.7	0.7	6.4
Cyclops	35.9	7.5	20.9	3.0	8.4	10.5	29.2
3312 Bridgeville, Pa.		5.7		3.0		8.7	
3316 Coshocton, Ohio		1.8		-		1.8	
Eastmet Corp. - 3312 Baltimore, Md.	6.9	6.8	98.6	1.7	24.6	8.5	123.2

INCREMENTAL BPT AND BAT INVESTMENT COSTS COMPARED WITH PROFITS FOR REPORTING SPECIALTY STEEL FIRMS
(Millions of Dollars)

SIC 3312 Firms

Firm (Div.) Establishment SIC Location	1974 Firm Pre-Tax Profit	BPT Investment Cost [1]	BPT Investment As Percent of Profit	BAT Investment Cost [1]	BAT Investment As Percent of Profit	Total Investment Cost [1]	Total Investment As Percent of Profit
I.T.T. (Harper Div.) - 3312 Morton Grove, Ill.	1,045.5	0.5	(3)	0.6	(3)	1.1	0.1
Jones and Laughlin[4]	268.1	6.6	2.5	3.0	1.1	9.6	3.6
3312 Warren, Mich.		5.7		3.0		8.7	
3316 Louisville, Oh.		0.9		-		0.9	
Joslyn Mfg. and Supply Co. - 3312 Fort Wayne, Ind.	10.4	1.5	14.4	0.9	8.7	2.4	23.1
Latrobe Steel[5] - 3312 Latrobe, Pa.	5.4	5.7	105.6	3.0	55.6	8.7	161.1
Teledyne	65.0	1.9	2.9	1.2	1.8	3.1	4.8
3312 Latrobe, Pa.		0.3		0.4		0.7	
3312 Monaca, Pa.		0.3		0.4		0.7	
3312 Monroe, N. C.		0.3		0.4		0.7	
3316 New Bedford, Mass.		0.9		-		0.9	
3317 Elkhart, Ind.		0.1		-		0.1	
Wallace Murray (Simmonds) - 3312 Lockport, N. Y.	22.1	1.5	6.8	0.9	4.1	2.4	10.9
Washington Steel - 3312 Washington, Pa.	12.6	6.8	54.0	1.7	13.5	8.5	67.5
3312 Firms - Totals / Percents	$2,187.1	$129.9	5.9	$52.6	2.4	$182.5	8.3
3312 Firms - Totals[6] / Percents (6)	$1,141.6	$129.4	11.3	$52.0	4.6	$181.4	15.9

Notes to Investment Cost as Percent of Profit Table.

(1) Appropriate Model Plant Cost.
(2) The W. Leechburg facility is included as part of the Brackenridge/Natrona works. If considered separately, the combined investment costs would increase by 4% for BPT and 27% for BAT.
(3) Less than .05%.
(4) Subsidiary of LTV.
(5) Subsidiary of Timken Co.
(6) These totals and percentages omit values for ITT, Harper Div., as it is definitely an outlier.

Sources: Exhibits II-1, V-9 and V-10.

INCREMENTAL BPT AND BAT INVESTMENT COSTS
COMPARED WITH PROFITS FOR REPORTING SPECIALTY STEEL FIRMS
(Millions of Dollars)

SIC 3315 Firms

Firm (Div.) Location	1974 Firm Pre-Tax Profits	BPT Investment(1) Costs(2)	BPT Investment(1) As Percent of Profits
ACS Industries - Woonsocket, R.I.	$ 1.2	$0.22	18.3%
Armada Corp. (Brookfield Wire) - Brookfield, Mass.	4.9	0.22	4.8
Driver-Harris Co. - Harrison, N. J.	1.9	0.75	39.5
Eaton Corp. - Cleveland, Ohio	172.7	0.75	0.4
General Cable Corp. - New York, N. Y.	75.1	0.75	1.0
GTE Sylvania - Warren, Pa.	122.2	0.22	0.2
Howmet Corp. - Northampton, Mass.	46.1	0.22	0.5
National Standard Co. - Niles, Mich.	26.2	0.75	2.9
H. K. Porter Co. - Somerville, Mass.	33.9	0.75	2.2
3315 Firms - Totals Percent	$484.2	$4.63	1.0%

Notes: (1) No Incremental BAT Costs.
(2) Appropriate Model Plant Costs.

Sources: Exhibits II-1 and V-12.

INCREMENTAL BPT AND BAT INVESTMENT COSTS
COMPARED WITH PROFITS FOR REPORTING SPECIALTY STEEL FIRMS
(Millions of Dollars)

SIC 3317 Firms

Firm (Div.) Location	1974 Firm Pre-Tax Profits	BPT Investment (1) Cost (2)	BPT Investment (1) As Percent of Profits
Emerson Electric (Greenville Tube) -	$158.2	0.36	0.2%
Greenville, Pa.		0.30	
Clarksville, Ariz.		0.06	
Handy & Harmon Tube Co. - Norristown, Pa.	26.0	0.06	0.2
Phillips Petroleum (Wall Tube & Metal Prods.) - Newport, Tenn.	429.8	0.30	0.1
Sharon Steel (Damascus Tubular Prods.) - Greenville, Pa.	84.3	0.06	0.1
Synalloy (Bristol Metal Prods.) - Bristol, Tenn.	1.8	0.06	3.3
U.O.P. (Flexomics) - Bartlett, Ill.	33.2	0.30	0.9
Whittaker Corp (Bishop Tube) - Frazer, Pa.	35.0	0.06	0.2
Lee Wilson Engineering Co., Inc. - Lorain, Ohio	.4	0.06	15.0
3317 Firms - Totals	$768.7	$1.26	
Percent			0.2%

Notes: (1) No Incremental BAT Costs.
(2) Appropriate Model Plant Costs.

Sources: Exhibits II-1 and V-9.

ENVIRONMENTAL PROTECTION AGENCY

INCREMENTAL BPT TOTAL ANNUAL COSTS FOR SIC 3312

Model Plant/ Industry Segment	Number of Establish-ments	Total Ship Capacity (10^3 NT)	Total Annual Cost: 60% of Ship Capacity ($ x 10^3)	75% of Ship Capacity ($ x 10^3)	90% of Ship Capacity ($ x 10^3)	100% of Ship Capacity ($ x 10^3)
Large Flat Products Without Cupola	2	1,106	$ 7,658	$ 8,320	$ 8,988	$ 9,434
Large Flat Products With Cupola	1	708	4,622	5,050	5,480	5,763
Small Flat Products	4	252	4,916	5,046	5,176	5,262
Large Section Products	7	693	7,114	7,282	7,453	7,561
Medium Section Products	4	148	1,056	1,077	1,098	1,111
Small Section Products - Rolled	2	19.4	186	188	190	192
Small Section Products - Forged	5	45	275	278	281	284
Totals	25	2,971.4	$25,827	$27,241	$28,666	$29,607

Source: Exhibit V-9.

ENVIRONMENTAL PROTECTION AGENCY

INCREMENTAL BPT TOTAL ANNUAL COSTS FOR SIC's 3315-7

SIC	Model Plant/ Industry Segment	Number of Establish- ments	Total Ship Capacity (10^3 NT)	Total Annual Cost: 60% of Ship Capacity ($\$ \cdot 10^3$)	75% of Ship Capacity ($\$ \cdot 10^3$)	90% of Ship Capacity ($\$ \cdot 10^3$)	100% of Ship Capacity ($\$ \cdot 10^3$)
3315	Large Wire Drawers	5	39.5	$ 701	$ 724	$ 747	$ 763
3315	Small Wire Drawers	9	9.0	347	352	358	361
3315	Totals	14	48.5	$1,048	$1,076	$1,105	$1,124
3316	Large Sheet, Strip and Bar Processors	2	236	$ 988	$1,089	$1,192	$1,258
3316	Small Sheet, Strip and Bar Processors	4	156	873	941	1,008	1,055
3316	Totals	6	392	$1,861	$2,030	$2,200	$2,313
3317	Large Pipe and Tube Makers	8	120.0	$ 450	$ 463	$ 476	$ 485
3317	Small Pipe and Tube Makers	34	30.6	341	346	351	355
3317	Totals	42	150.6	$ 791	$ 809	$ 827	$ 840

Source: Exhibit V-9.

ENVIRONMENTAL PROTECTION AGENCY

INCREMENTAL BAT TOTAL ANNUAL COSTS FOR SIC 3312

Model Plant/ Industry Segment	Number of Establish-ments	Total Ship Capacity (10^3 NT)	Total Annual Cost			
			60% of Ship Capacity (\$ x 10^3)	75% of Ship Capacity (\$ x 10^3)	90% of Ship Capacity (\$ x 10^3)	100% of Ship Capacity (\$ x 10^3)
Large Flat Products Without Cupola	2	1,106	\$ 2,688	\$ 2,787	\$ 2,887	\$ 2,953
Large Flat Products With Cupola	1	708	2,069	2,161	2,249	2,308
Small Flat Products	4	252	1,191	1,211	1,229	1,242
Large Section Products	7	693	3,817	3,919	4,017	4,089
Medium Section Products	4	148	647	655	663	669
Small Section Products - Rolled	2	19.4	210	212	214	216
Small Section Products - Forged	5	45	317	321	324	327
Totals	25	2,971.4	\$10,939	\$11,266	\$11,583	\$11,804

Source: Exhibit V-10.

EXHIBIT VI-5

APPENDIX

SPECIALTY STEEL PRODUCTION PROCESSES

Although the processes and equipment which are used to produce specialty steels are basically the same as those used for carbon and low alloy steels, there are certain important differences which are related to the high alloy content and special properties of specialty steels, and the generally small batch quantities in which these steels are made. Because stainless steel production processes differ in many respects from tool steel production processes, these will be discussed separately. Similarly, because of the facilities and methods employed by integrated producers by comparison with specialty converters and processors, these two types of operations will be discussed separately.

INTEGRATED PRODUCERS

(a) Melting

1. Stainless Steel. Melting of stainless steel can be carried out by any of the steel melting processes currently used for carbon steels. However, practical considerations have limited actual processes in use to electric arc furnace melting and basic oxygen converter refining. Only one installation of the latter process is known to be in use in the U.S., with all other stainless steel melting being carried out in electric arc furnaces. In the single basic oxygen converter installation, melting is performed in a cupola, while the basic oxygen converter is used for refining.

2. Tool Steel and High Alloy Steel. Melting of tool and high alloy steels is entirely accomplished in electric furnaces, with the majority of installations being electric arc furnaces, and a few small installations being electric induction furnaces. For special purpose metals, electroslag consumable electrode remelting is used for combined melting and casting.

(b) Degassing and Decarburization

Three of the installations for both stainless and tool steels utilize vacuum degassing as a means of removing dissolved gases from molten steel before casting. Other special techniques include vacuum melting and argon-oxygen decarburization.

(c) Casting Operations

1. Stainless Steel. All of the methods of casting which are presently in general use are used for stainless steel. These include three continuous slab casters, and three pressure slab casters, with all of the remaining establishments casting ingots.

2. Tool Steel. Tool and high alloy steels are almost entirely cast into ingots, with the exception of those special metals which are both melted and cast by electroslag consumable electrode remelting.

(d) Hot Rolling Operations

1. Stainless Steel. Ingots are rolled to blooms or

slabs on breakdown mills, either 2-Hi reversing or 3-Hi types. After surface conditioning, slabs from primary rolling mills, continuous casters or pressure casters are heated and rolled on reversing mills or continuous mills to produce hot rolled plate or strip. Blooms or billets from primary rolling mills are rolled to bars or wire rod on continuous bar mills or on 3-Hi bar mills.

2. Tool Steel. Tool steel ingots are usually surface conditioned before breakdown. Primary hot working is performed in presses in six installations, and in rolling mills in all other cases, with the product almost always being billets. After surface conditioning and reheating, the billets are rolled on reversing mills or hand mills to produce bars and rods.

(e) Surface Conditioning Operations

All stainless and tool steel hot rolling operations are followed by surface conditioning operations in which the entire surface of the slab or billet is removed by grinding, milling or turning.

(f) Preparation for Cold Working

1. Stainless Steel. Stainless steel hot rolled coils are annealed in batch or continuous furnaces, after which they are descaled by pickling in acid, or by alternative methods such as shotblasting, kolene treatment or hydride treatment. Bars are annealed, straightened and descaled by pickling. Wire rod is

annealed and descaled by pickling.

2. Tool Steel. Tool steel is annealed and descaled by shotblasting, grinding or pickling.

(g) Cold Working Operations

Stainless Steel - Annealed, pickled hot rolled coils are cold rolled to produce cold rolled strip on cold strip mills of one or more stands. Where severe reductions are required, an annealing operation may be necessary before final cold reduction is performed. A final rolling operation may be performed on a temper rolling mill if special properties, finish or flatness are required. Finished cold rolled coils are slit or sheared to desired width and length. Cold drawn bars are produced by pulling annealed, pickled, hot rolled bars through dies. Where severe reductions are required, the bars may be annealed before final reductions are performed.

Appendix Exhibits 1, 2 and 3 depict typical production flow cycles for bar, strip and plate production.

FIRMS WHICH PURCHASE AND CONVERT SPECIALTY STEEL

Manufacturing processes used by firms which purchase and convert specialty steel can best be presented by describing the processes associated with the predominant product form types.

(a) Specialty Wire Processors

These establishments do not melt or hot roll specialty steels. They start their operation with what is known as hot rod in coils or wire rod coils. Their cold finishing manufacturing process is much the same as would be performed by an integrated producer.

Usually the purchased hot rod is coated for drawing and then cold reduced in draw blocks. The maximum round size considered as wire is one-half-inch diameter. Very fine wire down to the third decimal place is available. Depending on the final size desired, several cycles of drawing, annealing, cleaning (pickling) and coating may be necessary.

Stainless steel and heat resistant wire may be shipped on spools, paper wrapped strapped coils, or in straightened and cut lengths. The method of packaging will depend on the customer's specifications.

Very little tool steel wire is processed by nonintegrated producers. There are several small tool manufacturers who buy high speed tool steel in hot rod coils and further reduce it to decimal sizes by hot drawing, but the quantities are minimal. They find it necessary to do their own reducing because of the relatively small amounts of many small decimal sizes required to produce twist drills, taps, reamers, end mills, etc.

(b) Specialty Cold Rolled
Sheet Strip and
Bar Processors

These establishments do not melt or hot roll specialty steels. The processors in this segment have the capability to cold reduce hot rolled or partially cold reduce coils down to final sizes which are sold for a myriad of applications. The processes may involve cold rolling on a variety of cold rolling equipment, followed by annealing, pickling and slitting. After final gauge is attained on cold rolled sheets, the steel may be stretcher leveled for extremely flat applications.

After final gauge is attained on strip coils the steel may be slit to one of a number of widths and shipped in coils. Some strip may also be shipped in leveled and sheared lengths.

There is relatively little stainless steel bar produced by nonintegrated producers. Those that do participate in this segment of the steel industry buy hot rolled bars in various surface conditions. The bars that they buy may be simply hot rolled and annealed, or they may be rough turned and annealed. The producers in this segment of the industry can cold finish the product they purchase by rough turning, by centerless grinding, by cold drawing, or by some combination of all three methods. Products necessarily require annealing and pickling or shot blasting, prior to shipping.

(c) Specialty Steel Pipe and Tube Processors

These companies and/or plants do not melt specialty steels although they may hot pierce or hot extrude tube hollows for subsequent finishing.

Two distinct types of pipe and tubing are produced. They are welded tubing and seamless tubing. The end-use for which the product is purchased determines the method of production.

Specialty welded tubing processors buy stainless strip either to exact gauge and width or to exact gauge and wide widths which are slit as needed. After edge preparation to ensure a good weld, the strip is cold formed and welded in continuous cold forming and welding mills. Large size tubing may be formed from plate on special presses and then welded.

The weld bead in the inside diameter of the tube may or may not be removed depending on the end-use. After welding, the tube may be annealed and pickled and straightened. Tubing may be shipped in standard 20- to 22-foot lengths or in coils, depending on the size and the use.

Seamless tubing originates with a round billet called a tube round which is then pierced in a hot piercing mill, or hot extruded in a press. The grade and analysis determine for the most part whether piercing or extrusion will be used to put a hole in the tube round. The resultant product is generally referred to as a tube hollow and is the beginning of a finished seamless tube. Usually the integrated steel plant produces the tube hollow. A nonintegrated producer may then buy this product and further cold reduce it to final size. Annealing and pickling are necessary operations for completion of the product.

PRODUCTION
CAPACITY

Based on 1974 stainless steel ingot production data of the American Iron and Steel Institute, and allowing for other specialty steels, specialty steel production capacity is estimated to be of the order of 2.75 million tons. This estimate of production capacity would imply a ship capacity of approximately 1.6 million tons. Historically, specialty steel mills have operated at full capacity only in times of national emergency. However, the American Iron and Steel Institute reported record stainless steel shipments of 1,133,886 net tons in 1973 and 1,344,694 net tons in 1974.

A compounding factor is that stainless producers slowed expansion during the 1969-1972 period because of reduced demand and a lack of capital for expansion purposes. Exhibit II-3 shows 1963-1972 capital expenditures as a percentage of gross plant for four major specialty steel producers--Allegheny-Ludlum, Carpenter Technology, Cyclops, and Latrobe. Capital expenditures were down for most of these companies in 1970, 1971 and 1972.

PRESENT SOURCES OF WATER POLLUTION AND CONTROL TECHNOLOGY

This section will discuss the present sources of water pollution and the control technology in terms of the specific steel-making or finishing process. The processes chosen and the technical discussion of them are based upon the Development Document dated June 1975 prepared under contract to EPA by Datagraphics, Inc.

(a) BOF

In the BOF process, refining takes place when an oxygen lance is lowered into the BOF vessel and the oxygen is admitted. A violent reaction occurs and the resultant turbulence brings the hot gases and the molten metal into intimate contact, causing the impurities to burn off quickly. An oxygen "blow" of 18-22 minutes is normally sufficient to refine the metal.

Wet scrubbers are commonly used to clean exhaust gases from the BOF furnace. The principal water pollution problem comes from the dust which is collected by the wet scrubber system.

The present methods of treating the effluent discharged are passing it either through a classifier, cyclone separator to a thickener or directly to the thickener. Flocculation polymers are generally added to aid settling. The overflow from the thickener may either be recirculated to the scrubber or gas washer or discharged to the plant sewers. The underflow from the thickeners is passed through filters with the filtrate being recirculated to the thickeners while the filter cake may be sent to the sinter plant for recycling.

(b) Vacuum Degassing

In the vacuum degassing process, steel is further refined by subjecting the steel to a high vacuum in an enclosed, refractory lined chamber. Oxygen, carbon, and some steel in the bath are oxidized and are emitted as CO gas and iron oxide fumes. Because alloys may also be added to the steel at this point, the gas stream may also contain suspended solids of zinc, manganese, lead and nitrates. Steam jet ejectors with barometric condensers are used to draw the vacuum in this system. The condensate waste water is either recycled after cooling or discharged directly to the plant sewers.

(c) Continuous Casting and Pressure Slab Molding

In these processes, the steel is cooled by direct contact spray water and the principal contaminant is suspended solids from surface scale and/or mold lining. Additionally, oil from machinery lubrication finds its way into the water effluent. The waste water from this process is presently either being treated by settling pits equipped with drag chain conveyors or flat-bed filters with periodic blow-down. The clarified water is recirculated or sent to a receiving stream. The scale collected may be recycled within the steel plant.

(d) Primary Hot Forming

Primary hot forming encompasses rolling done in blooming and slabbing mills and the subsequent descaling and automatic scarfing operations. Waste water results from mill equipment cooling and high-pressure water descaling. Additionally, the gases from automatic scarfing operations are sometimes passed through high energy venturi scrubbers or precipitators.

The waste waters from descaling and mill equipment cooling are generally discharged to in-ground settling chambers called scale pits. The iron particles settle to the bottom and may be removed periodically by mechanical means. The waters flow out of the scale pits via underflow weirs equipped with launders to trap grease and oil washed into the stream. The oils are then removed by skimming devices and stored in waste-oil tanks having capacities up to 10,000 gallons. The water may either be recycled or discharged to plant sewers.

The waste waters from the scarfer may flow into the same scale pit as waste water from the other mill equipment or it may be routed into a separate pit. The slag settles out and may be removed by mechanical means. The overflow water is generally discharged to plant sewers.

Waste waters from the high-energy venturi scrubber blow-down are usually directed to the scale pit. Wet precipitator waste waters are generally discharged to a thickener with chemical coagulation. The clarified waters can be recycled back to the precipitator systems or discharged to plant sewer systems.

(e) Hot Forming - Sections or Flat Products

The equipment used to form sections or flat products consists of a reheating furnace and several stands of driven rolls which progressively form the desired shape. The waste waters produced, other than the reheat furnace noncontact cooling water, are the result of equipment cooling or high-pressure water descaling systems. The mill equipment discharge and descaling waters are discharged to scale pits. The present method of treatment for these waters is the same as that described above for the primary hot forming equipment.

(f) Acid Batch Pickling

Most alloy and all stainless steels are pickled, i.e., cleaned in solutions of acids to remove surface scale. In the sulphuric acid batch system, a rack of steel, usually light gauge sheet, is submerged in a sulfuric acid bath. Either the bath or the rack of plate is agitated to distribute the pickling solution evenly. After the sulfuric acid bath, the plate is rinsed with water. These operations produce strong spent liquors and rinsewaters, the latter having generally the same constituents as the former but with lesser quantities of contaminants and greater total volume.

Current control and treatment includes the use of contract hauling of concentrated spent liquors for off-site treatment and/or disposal; combination of concentrated spent liquors and rinse waters with alkaline wastes followed by four- to eight-hour settling; and neutralization of acid and alkaline wastes followed by mixing and long-term settling.

(g) Combination Acid Pickling - Continuous

In the continuous method of pickling stainless steel or alloy strip, the front end of the next strip is welded to the tail of the coil which is just passing through the pickler. The pickler itself consists of a long series of driven rolls which carry the strip through a hydrochloric acid bath, a nitric acid-hydrofluoric acid tank, a cold water rinse and a hot water rinse. The strip is then air dried, sheared and recoiled. The major by-products of this operation are contaminated rinse water and two kinds of concentrated spent pickle liquors.

Current control and treatment technology includes the use of either contract hauling of concentrated spent liquors for off-site treatment and/or disposal; or neutralization with lime and lagooning of the neutralized solutions; or neutralization with lime and solids separation by vacuum filtration; or neutralization with lime and clarification in a flocculator-clarifier; or neutralization with evaporation to dryness. At the present time, there is no clearly demonstrated technology for the recirculation and reuse of combination acid pickling waste waters.

(h) Combination Acid Pickling - Batch

The production of stainless steel billets, bars and plate typically involves a single pickling operation in a 10% sulfuric acid solution followed by a 10% nitric-10% hydrofluoric acid bath followed by rinsing.

The production of pipe, tube and wire involves essentially the same type of pickling procedure, the difference being that pickling will be done before each major redrawing operation.

Current control technology for these processes is similar to that described above for the continuous combination acid pickling treatment.

(i) Kolene Scale Removal

The kolene process utilizes highly oxidizing salt baths at temperatures between 371 and 482 C (700-900 F). These salts react far more aggressively with scale than with the base metal. The typical treatment cycle consists of kolene treatment, water quenching, water rinsing, acid dipping, and water rinsing. A unique contaminant produced by this process is hexavalent chromium. The spent liquor and the rinse water contain many of the same metallic elements found in the liquor, principally chromium, nickel and water from the acid pickling processes, and are highly alkaline.

Current control and treatment technology consists of combining and equalizing all of the process water flow from the kolene scale removal process with that of the effluents from acid pickling processes and treating the combined flows in ways similar to those described for combination acid pickling waste waters, with the addition of provisions for reduction of hexavalent chromium as necessary.

(j) Hydride Scale Removal

Sodium hydride descaling depends upon the strong reducing properties of sodium hydride carried at 1.5 to 2% by weight in a fused caustic soda bath at 371 C (700 F). Most scaleforming oxides are reduced to the base metal; oxides of metals that form acid radicals are partly reduced. The hydride is formed in place by the reaction of hydrogen and metallic sodium in open bottom chambers partially immersed in the bath. Most commercial installations use dissolved ammonia as a source of hydrogen. The typical treatment cycle consists of sodium hydride treatment, water quenching, water rinsing, acid dipping, and water rinsing.

The principal contaminants present in the concentrated spent liquor and rinse waters are cyanide and the same metallic elements present in the alloy or stainless product being pickled. Additionally, the waste waters are very alkaline.

Current control and treatment technology is similar to that described for the kolene scale removal process waste water, with the exception that provision is made for cyanide oxidation rather than for chromium.

CONTINUOUS ALKALINE CLEANING

This method of cleaning strips of steel consists of an uncoiler unit; a welding unit which welds the tail of one coil to the beginning of the next; alkaline solution, water quench, water rinse, acid solution and water rinse tanks through which the strip is carried on rolls; a strip shear; and a recoiler or sheet stacker mechanism.

The principal metallic contaminants are cyanide and many of the same metallic elements, principally chromium and nickel, which are present in the alloy or stainless steel being processed.

The current control and treatment technology consists of combining and equalizing the process water flow from the continuous alkaline cleaning process with that of the effluents from acid pickling processes and treatment of the combined flows in ways similar to those described for combination acid pickling waste waters.

WIRE COATING AND PICKLING

Rod for wire is produced in coils by the hot rolling mills and constitutes the raw material for the wire mills. After a heat treatment to achieve the desired microstructure and mechanical properties, the wire is batch pickled.

Wire products are pickled with various acids and are frequently coated with other metals such as copper, lead, and/or molybdenum. These coatings are often applied by electrolytic deposition from solutions of the metal salts. Water is used to rinse the products. The effluents from wire coating operations contain, in addition to suspended solids and oil, copper, lead, and zinc, depending upon the nature of the coating being applied. Additionally, cyanide may be present in the waste from such operations as copper cyanide coating baths.

Current control and treatment technology consists of the combination of such wastes and treatment in ways as described for combination acid pickling waste waters, with prior oxidation of cyanide if necessary.

COLD ROLLING - RECIRCULATION

Cold rolling of steel bar, plate and strip is divided into two categories, the cold reduction mill and the temper pass or skin pass mill. The cold reduction mills vary from tandem, four-high mills for high-volume operations to the special, single-stand, four-high reversing mills used for low-volume specialty products. After cold reduction to the proper thickness, the product is cleaned and annealed and may be sent through a "temper" or "skin" mill which reduces the thickness only a few percent, but imparts the desired mechanical and surface characteristics.

Cold reduction mills use water principally in oil emulsions for flood lubrication of the rolls and the steel being worked, and for rinsing on the final stands. The principal contaminants are oil and suspended solids.

The high cost of rolling oils and the regulations requiring pollution control have prompted the industry to install closed-loop systems with oil recovery devices. These devices range from simple mechanical skimmers and separators to addition of chemicals and flocculation agents to reduce the oil emulsions. Several plants are mixing the acid waste waters from pickling operations to the cold mill waste waters to aid reduction of the emulsions. The oil recovered can be reused on the cold mills. The water may be recirculated back to the cold mills or to the gas cleaning systems.

APPENDIX
EXHIBIT 1

ENVIRONMENTAL PROTECTION AGENCY

STAINLESS STEEL - BAR PRODUCT PRODUCTION FLOW DIAGRAM[1]

Melt in Electric Furnace

↓

INGOT

↓

Roll on Primary Mill

↓

BLOOMS OR BILLETS

↓

↓

↓

Completely Condition

↓

Roll on Secondary Mill

↓

BARS

↓

(Round, Square Hexagonal or Flat)

↓

Anneal

↓

Straighten

↓

Pickle

↓

Condition

↓

Inspect

↓

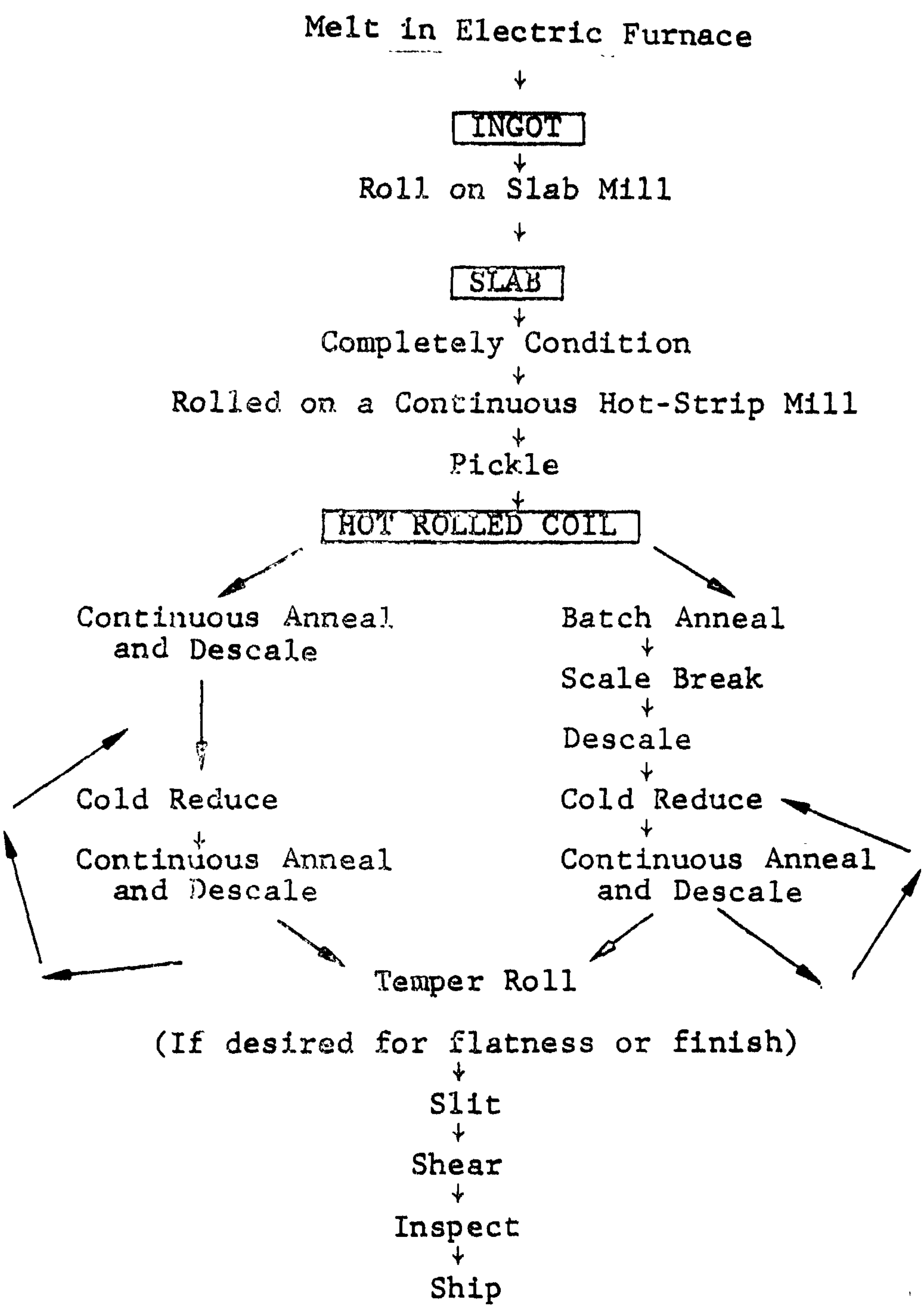
Ship

Note: (1) Capital letters enclosed in a box denote product form types that result from production operations.

Source: United States Steel Corporation, The Making, Shaping, and Treating of Steel.

ENVIRONMENTAL PROTECTION AGENCY

STAINLESS STEEL - SHEET AND STRIP PRODUCTION FLOW DIAGRAM[1]



Note: (1) Capital letters enclosed in a box denote product form types that result from production operations.

Source: United States Steel Corporation, <u>The Making, Shaping, and Treating of Steel</u>.

APPENDIX
EXHIBIT 3

ENVIRONMENTAL PROTECTION AGENCY

STAINLESS STEEL -
SLAB AND PLATE PRODUCTION FLOW DIAGRAM(1)

Melt in Electric Furnace
↓
[INGOT]
↓
Hot Roll or Slab Mill
↓
[SLAB]
↓
Completely Condition
↓
Roll on Plate Mill
↓
[PLATE]
↓
Anneal
↓
Flatten
↓
Pickle
↓
Inspect
↓
Ship

Note: (1) Capital letters enclosed in a box denote product form types that result from production operations.

Source: United States Steel Corporation, The Making, Shaping, and Treating of Steel.