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DOT-HS-806-394
DOT-TSC-NHTSA-82-11.3

Surrogate Plant Data Base
Volume III Appendix D: Facilities Planning Data; Operating Manpower, Manufacturing Budgets and Pre-Production Launch Charts

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May 1983
Final Report

U.S. Department of Transportation
National Highway Traffic Safety Administration

Office of Research and Development
Washington DC 20590

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
DOT-HS-806-394		

4. Title and Subtitle	5. Report Date
SURROGATE PLANT DATA BASE Volume III*	May 1983
	6. Performing Organization Code DTS-43
7. Author(s) George E. Byron	8. Performing Organization Report No. DOT-TSC-NHTSA-82-11.3
9. Performing Organization Name and Address U.S. Department of Transportation Research and Special Programs Administration Transportation Systems Center Cambridge MA 02142	10. Work Unit No. (TRAIS) HS274/R2411
	11. Contract or Grant No.
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration Office of Research and Development Washington DC 20590	13. Type of Report and Period Covered FINAL REPORT March 1981 - June 1982
	14. Sponsoring Agency Code NRD-3

15. Supplementary Notes

*This report is made up of four volumes.

16. Abstract

This four volume report consists of a data base describing "surrogate" automobile and truck manufacturing plants developed as part of a methodology for evaluating capital investment requirements in new manufacturing facilities to build new fleets of automobiles. The report describes the data base, its past uses and potential applications. Separately bound appendices contain the actual data base information.

The surrogate plants are typical of automotive manufacturing plants in terms of size, production rates, manufacturing processes, technological sophistication and flexibility. The data for a particular type of surrogate plant, while not representing any specific plant, provides information that, when appropriately aggregated or scaled, will yield accurate industry statistics.

17. Key Words	18. Distribution Statement
Automobile/Truck Manufacturing; Manufacturing Processes; Production; Assembly Plant; Capital Costs; Manpower	DOCUMENT IS AVAILABLE TO THE PUBLIC THROUGH THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VIRGINIA 22161

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	142	

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

PREFACE

The development of Appendix B--Application of Surrogate Plant Data Base-- was made possible through the efforts of Joseph F. Petrie, who is responsible for this Appendix. The author also wishes to acknowledge the Transportation Consulting Division, a division of Booz, Allen & Hamilton, Inc., and Harbour Associates, Inc., who carried out Contract DOT-TSC-1609 encompassing the acquisition and analysis of information relative to manufacturing equipment required to produce a socially acceptable and efficient motor vehicle. He would also like to thank the staff of Raytheon Service Company for providing support.

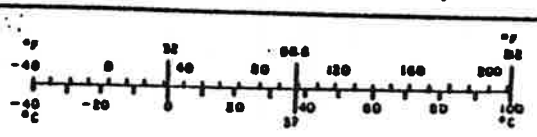
METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
	AREA			
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
	MASS (weight)			
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
	VOLUME			
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
	TEMPERATURE (exact)			
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
	AREA			
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
	MASS (weight)			
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
	VOLUME			
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
	TEMPERATURE (exact)			
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



REPORT CONTENT AND ORGANIZATION

This report documents the Surrogate Plant Data Base, covering typical manufacturing plants and facilities representing the major types used to produce motor vehicles. This report is organized into four separate volumes as follows:

- o VOLUME I
  - INTRODUCTION
  - Appendix A describes how the surrogate plant data was developed. It also describes how a manufacturer would plan for a new component or assembly plant including the staffing functions, personnel requirements, leadtime requirements, and cost requirements associated with the planning of a new component, part, or assembly plant.
  - Appendix B describes how the surrogate plant data base can be used to develop estimates of the capital cost impacts of developing new facilities or modifying existing facilities. It includes a summary of capital cost impact data on 39 automotive manufacturing plants plus a surrogate plant coding scheme and a method for identifying suppliers to the automotive industry.
- o VOLUME II
  - Appendix C provides capital cost data for 39 automotive manufacturing plants broken down by major cost element: land, building and equipment, plant facilities, machinery and equipment, and tooling. It also contains a breakdown of the data by major department in the plant, a summary of the plant's size (i.e., square footage) by major department and a diagram depicting the layout of the plant..

- VOLUME III

  - Appendix D provides operating manpower, manufacturing plant budgets (i.e., labor, maintenance, utilities, taxes and insurance expenses), and pre-production and launch timing charts and expenses for 10 automotive manufacturing plants. The information presented for the 10 plants is representative of the 39 plants included in Volume II, Appendix C.

- VOLUME IV

  - Appendix E discusses the major differences in manufacturing light and heavy duty vehicles in terms of the processes employed and make-up of the plant, and the need to develop surrogate plant data on medium and heavy duty truck assembly and component plants. It includes a list of plants proposed for initial development.

APPENDIX D
FACILITIES PLANNING DATA: OPERATING MANPOWER, MANUFACTURING BUDGETS AND PRE-PRODUCTION LAUNCH CHARTS

INTRODUCTION

This volume contains detailed staffing requirements, manufacturing budgets and pre-production/launch charts for ten major types of plants used in the manufacture of automobiles. The data contained in this volume augments the baseline data on plant manpower and capital requirements presented in Appendix C.

The automobile manufacturers and suppliers, in their efforts to produce safe, efficient automobiles, are considering and implementing a broad range of new technologies. Implementation of each of these technologies for future vehicles has major impacts on capital investment, employment and productivity. Estimates of the magnitude of each of these impacts can be assessed by using the manufacturing data contained in this volume and the other volumes in this report.

To date, the data in these volumes has been used to answer a number of questions of concern to government and industry leaders connected with the automotive industry. The types of questions that can be answered with these data include:

- What are the capital expenditures required by automotive manufacturers to develop fuel efficient vehicles?
- What is the impact on plant manpower of new automotive manufacturing and product technology?
- What are the vehicle cost implications of new automotive technologies?
- What is the required lead time to move R&D results into production of new technology vehicles and components?

The data on plants has been developed using a technique called the "surrogate plant" method. This method starts with the basic assumption that over time the inherent economies of scale and efficiencies connected with different automotive manufacturing techniques have

led to the use of certain standard plant designs and sizes in the manufacture of different automotive components. These "typical" plant designs, when aggregated, provide characteristic per unit manpower and capital requirements for the automotive industry as a whole. The information on plants contained in this report has been developed for surrogate automotive plants which have typical:

- Production levels
- Size
- Manufacturing processes
- Automation levels
- Production flexibility

The surrogate plant is not precisely the same as an actual plant of any given manufacturer, but rather typical of the state-of-the-art of manufacturing facilities of all U.S. manufacturers for the specific function involved.

Appendix C of this report contains detailed capital, manpower and area requirements for 39 major automotive plants. Although many more types of plants are employed in the production of motor vehicles, these 39 plants include operations which account for the vast majority of value added in automotive manufacture.

This appendix augments Appendix C by providing three types of manufacturing data:

- Detailed analysis of manpower by plant and organization. This analysis accounts for each employee by department in the plant.
- Manufacturing budgets. Manufacturing expenses for each plant.
- Pre-production and launch information. Planning, volume levels, manpower requirements and expenses for the pre-production and start-up phase of each plant.

The information is provided for ten major automotive facilities that include all the major categories of automotive plants. Plants covered are:

- Car assembly plant
- Body stamping plant
- Four-cylinder engine plant
- Front-wheel-drive automatic transaxle plant
- Front-wheel-drive manual transaxle plant
- Brake plant

- Steering plant
- CV joint plant
- Suspension plant
- Iron foundry

The rest of this introduction further describes the specific data contained in each section of this appendix.

OPERATING MANPOWER

This section contains a detailed schedule of direct and indirect manpower required to operate each type of plant. Direct labor includes hourly employees who perform manufacturing operations which further the physical progress of the product and indirect labor includes salaried and hourly employees who perform work supporting production, such as equipment and facility maintenance, production control, supervision, quality control, etc.

Manpower requirements are first summarized by the following departments:

- Plant manager
- Plant protection
- Medical
- Controller
- Quality control
- Production control
- Manufacturing engineering
- Personnel
- Product engineering
- Production
- Union.

Then for each department details on the number of people in each salaried position and hourly position are specified.

MANUFACTURING BUDGET

This section provides a detailed manufacturing budget for each of the plants. Labor charges and depreciation are derived from the capital and labor requirements presented in Appendix D and Appendix E. In addition, this budget covers other manufacturing costs including:

- Maintenance
- Perishable tools
- Spoilage
- Utilities
- Supplies
- Taxes and insurance.

The budgets are presented with fixed and nonvariable expenses, which do not change with production volume, separated from variable expenses, which do change with production volume.

PRE-PRODUCTION AND LAUNCH COSTS

Pre-production costs can broadly be defined as the costs absorbed to bring a new model car/truck to production or the advance cost to expand production of an existing product or component. Costs include manpower and facility resources from program inception up to but not including the car/truck or component manufacturing launching. Costs covered include:

- Research and development costs
- Styling costs
- Product engineering costs
- Manufacturing engineering costs
- Pre-production plant costs
- Manufacturing plant costs

In the section of this appendix on pre-production and launch costs a pre-production program timing chart is provided for three types of vehicle changes:

- Minor change
- Major reskin
- New product or new plant

The timing chart shows the scheduled time for all activities connected with pre-production and includes:

- Research and development
- Styling
- Product design
- Die model construction
- Emission development testing
- Manufacturing engineering
- Manufacturing plants
- Production launching.

Then for each plant a separate timing chart is provided that details the new plant-related pre-production work. This covers:

- Architecture/engineering
- Site development
- Building construction
- Plant layout
- Equipment installation and tryout
- Launching.

For each plant manpower requirements by week are also provided.

Launching costs can be defined as the added cost to bring a new model car/truck to full production. Launching costs start on the first day of production and continue until full line speed or capacity is achieved. Launching covers a total range of plant costs and can include:

- Excess direct labor cost over standard
- Excess indirect labor cost over standard
- Excess perishable tools
- Excess scrap costs
- Excess cost of supplies
- All other plant excess costs
- Excess fringe benefit costs.

These costs are incurred because the plant is not operating at its design level during the start-up period.

This report provides charts for each plant, showing the production rates expected during the launch period. Separate charts show direct labor and total labor requirements throughout the launch period.

A pre-production and launch cost budget is provided for each plant. These show pre-production and launch costs due to the manpower and capital required for these phases. In addition, other manufacturing costs are estimated including:

- Maintenance materials
- Perishable tools
- Spoilage
- Utilties
- Taxes and insurance
- Supplies.

OPERATING MANPOWER

THIS SECTION CONTAINS A DETAILED SCHEDULE OF DIRECT AND INDIRECT MANPOWER REQUIRED TO OPERATE THE FOLLOWING SURROGATE PLANTS AT THE PRODUCTION VOLUMES AND IN THE FACILITIES SPECIFIED IN THE FOLLOWING SURROGATE PLANT STUDIES:

- CAR ASSEMBLY PLANT
- BODY STAMPING PLANT
- FOUR-CYLINDER ENGINE PLANT
- FWD AUTOMATIC TRANSAXLE PLANT
- FWD MANUAL TRANSAXLE PLANT
- BRAKE PLANT
- STEERING PLANT
- CV JOINT PLANT
- SUSPENSION PLANT
- IRON FOUNDRY.

DIRECT LABOR INCLUDES HOURLY EMPLOYEES WHO PERFORM MANUFACTURING OPERATIONS WHICH FURTHER THE PHYSICAL PROGRESS OF THE PRODUCT. TOTAL DIRECT LABOR MANPOWER FOR EACH PLANT IS ALSO SHOWN.

INDIRECT LABOR INCLUDES SALARIED AND HOURLY EMPLOYEES WHO PERFORM WORK SUPPORTING PRODUCTION AND WHICH CANNOT BE IDENTIFIED WITH SPECIFIC MANUFACTURING OPERATIONS. INDIRECT LABOR MANPOWER REQUIREMENTS ARE DETAILED BY DEPARTMENT AND JOB CLASSIFICATION FOR EACH OF THE TEN SURROGATE PLANTS AND ARE SUMMARIZED.

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DETAIL ANALYSIS OF MANPOWER
BY PLANT AND ORGANIZATION

DEPARTMENT	PLANT MANPOWER									
	CAR ASSEMBLY	BODY STAMPING	4 CYLINDER ENGINE	F.W.D. A/T	F.W.D. M/T	BRAKE PLANT	STEERING PLANT	C.V JOINT PLANT	SUSPENSION PLANT	IRON FOUNDRY
PLANT MANAGER	10	5	6	10	8	4	3	4	5	8
PLANT PROTECTION	34	32	24	32	24	10	10	10	12	24
MEDICAL	5	5	4	4	4	3	3	3	3	4
CONTROLLER	56	40	30	42	32	10	9	10	10	34
INDUSTRIAL ENGINEER	14	10	10	14	10	5	4	5	5	10
QUALITY CONTROL - SALARY	42	33	24	40	31	9	8	10	12	36
- I/L HOURLY	307	80	30	130	75	25	20	43	55	125
PRODUCTION CONTROL - SALARY	91	90	38	40	34	10	8	11	15	40
- I/L HOURLY	232	420	73	116	85	22	16	55	55	155
MANUFACTURING ENGINEERING -SALARY	50	135	70	105	80	18	14	16	26	88
- I/L HOURLY	376	740	320	390	317	91	78	97	144	502
PERSONNEL - SALARY	19	20	19	20	19	6	6	6	8	20
PRODUCT ENGINEERING - SALARY	15	5	10	23	18	3	3	3	4	16
- I/L HOURLY	26		4	10	8					8
PRODUCTION - SALARY	167	125	50	90	70	22	12	22	25	80
- I/L HOURLY	162	90	5	20	10	8	4	10	10	20
- D/L HOURLY	2,788	1,500	670	1,048	860	260	185	244	445	880
UNION - I/L HOURLY	27	20	8	16	10	4	2	5	6	10
TOTAL - SALARY	503	500	285	420	330	100	80	100	125	360
- I/L HOURLY	1,130	1,350	440	682	505	150	120	210	270	820
- D/L HOURLY	2,788	1,500	670	1,048	860	260	185	244	445	880
GRAND TOTAL	4,421	3,350	1,395	2,150	1,695	510	385	554	840	2,060
CARS/CARSETS/UNITS PER DAY	1,200	3,673	1,632	2,040	2,040	2,040	2,040	2,040	2,040	11,666
TOTAL HOURS PER UNIT	29.5	8.1	6.8	8.4	6.6	2.0	1.5	2.2	3.3	1.4

Trucks 5.7

DETAIL ANALYSIS OF MANPOWER

BY PLANT AND ORGANIZATION

	PLANT MANPOWER									
	CAR ASSEMBLY	BODY STAMPING	4-CYLINDER ENGINE	F.W.D. A/T	F.W.D. M/T	BRAKE PLANT	STEERING PLANT	C.V.JOINT PLANT	SUSPENSION PLANT	IRON FOUNDRY
PLANT MANAGER										
PLANT MANAGER	1	1	1	1	1	1	1	1	1	1
SECRETARY	1	1	1	1	1	1	1	1	1	1
MANUFACTURING MANAGER	1		1	1	1	1				1
PRODUCTION MANAGER	1	1		1						
SUPERINTENDENT	4	2	2	4	4	1	1	2	2	4
CLERK	2		1	2	1				1	1
TOTAL PLANT MANAGER SALARY	10	5	6	10	8	4	3	4	5	8
PLANT PROTECTION										
CHIEF	1	1	1	1	1	1	1	1	1	1
FIRE CHIEF & CAPTAIN	1	2	2	2	2	1	1	1	1	2
SARGEANTS	4	3	2	3	2	1	1	1	1	2
PATROLMEN	24	21	16	21	16	6	6	6	8	16
FIRE MARSHALLS	4	5	3	5	3	1	1	1	1	3
TOTAL PLT.PROTECTION SALARY	34	32	24	32	24	10	10	10	12	24
MEDICAL										
DOCTOR	1	1	1	1	1	1	1	1	1	1
NURSES	4	4	3	3	3	2	2	2	2	4
TOTAL MEDICAL SALARY	5	5	4	4	4	3	3	3	3	4

DETAIL ANALYSIS OF MANPOWER

By Plant and Organization

	PLANT MANPOWER									
	CAR ASSEMBLY	BODY STAMPING	4-CYLINDER ENGINE	F.W.D. A/T	F.W.D. M/T	BRAKE PLANT	STEERING PLANT	C.V.JOINT PLANT	SUSPENSION PLANT	IRON FOUNDRY
CONTROLLER										
CONTROLLER	1	1	1	1	1	1	1	1	1	1
SECRETARY	1	1		1	1					1
BUDGET & FINANCIAL ANALYST										
SUPERVISOR	1	1	1	1	1	1	1	1	1	1
FINANCIAL ANALYST	2	2	2	2	2	1	1	1	1	2
BUDGET ANALYST	5	2	2	2	2	1	1	1	1	3
COST & GENERAL ACCOUNTING										
SUPERVISOR	1	2	1	2	1					1
SECRETARY-CASHIER			1		1	1		1	1	1
SUPERVISOR ACCOUNTING		1	1	1	1					
COST CLERK		4		3		1	1	1	1	1
PAYROLL CLERK	3	1	1	1	1					1
TIMEKEEPER	7	5	3	4	3	2	2	2	2	4
PRODUCT COST ANALYST	3		3	3	3					3
ACCOUNTS PAYABLE	3		2	2	2	1	1	1	1	2
INVOICE			4	4	4					4
BILLING	3	2	2	2	2					2
GENERAL LEDGER	4	2	1	1	1	1	1	1	1	1
OTHER	3	1	2	2	2					2
DATA PROCESSING										
SUPERVISOR	2	1		1						
OPERATORS	9	7		4						
KEY PUNCH	4	4	3	3	3					3
PROGRAMMERS	4	3		2	1					1
TOTAL CONTROLLERS MANPOWER	56	40	30	42	32	10	9	10	10	34

DETAIL ANALYSIS OF MANPOWER

BY PLANT AND ORGANIZATION

	PLANT MANPOWER									
	CAR ASSEMBLY	BODY STAMPING	4 CYLINDER ENGINE	F.W.D. A/T	F.W.D. M/T	BRAKE PLANT	STEERING PLANT	C.V.JOINT PLANT	SUSPENSION PLANT	IRON FOUNDRY
INDUSTRIAL ENGINEERING										
MANAGER	1	1	1	1	1	1	1	1	1	1
SECRETARY			1	1	1					1
DIRECT LABOR MANAGER	1	1	1	1	1					1
SENIOR ENGINEER	3		4	4	4	2	2	2	2	4
AREA ENGINEER	5	5		3						
INDIRECT LABOR MANAGER	1		1	1	1					1
AREA ENGINEER	2	2	2	2	2	1	1	1	1	2
MATERIALS ENGINEER	1	1		1		1		1	1	
TOTAL INDUSTRIAL ENGINEERING MANPOWER	14	10	10	14	10	5	4	5	5	10

DETAIL ANALYSIS OF MANPOWER
BY PLANT AND ORGANIZATION

	PLANT MANPOWER									
	CAR ASSEMBLY	BODY STAMPING	4 CYLINDER ENGINE	F.W.D A/T	F.W.D. M/T	BRAKE PLANT	STEERING PLANT	C.V.JOINT PLANT	SUSPENSION PLANT	IRON FOUNDRY
QUALITY CONTROL										
MANAGER	3	2	1	3	1	1	1	1	1	1
SECRETARY	1	1		1	1					1
QUALITY ENGINEERING-SUPERV	1	3	3	3	3	1	1	1	1	3
SENIOR ENGINEER	4	1	1	4	2				1	4
AREA ENGINEER	6	2	2	6	4	2	2	2	2	6
ANALYST	2		2	2	2	1	1	1	2	2
LAYOUT SUPERVISOR	1	1		1	1			1		1
OTHER	2	3			1					4
CHIEF INSPECTOR	2	1	2	2	2	1	1	1	1	2
CLERK	1	1	1	1	1	1	1	1	1	1
GENERAL FOREMAN	4	2	2	4	2				1	2
RECEIVING FOREMAN	2	3							1	
AREA FOREMAN	12	11	10	12	10	2	1	1	2	8
REWORK SUPERVISOR	1	2		1	1					1
TOTAL QUALITY CONTROL SALARIED STAFF	42	33	24	40	31	9	8	10	12	36
INSPECTION HOURLY										
BODY-IN-WHITE	8									
METAL FINISH	24									
PAINT	10									
TRIM	56									
CHASSIS	54									
FINAL	46									
CAR CONDITIONING	40									

DETAIL ANALYSIS OF MANPOWER
BY PLANT AND ORGANIZATION

	PLANT MANPOWER									
	CAR ASSEMBLY	BODY STAMPING	4CYLINDER ENGINE	F.W.D. A/T	F.W.D. M/T	BRAKE PLANT	STEERING PLANT	C.V.JOINT PLANT	SUSPENSION PLANT	IRON FOUNDRY
QUALITY CONTROL (Continued)										
INSPECTION - HOURLY										
CAR CONDITIONING AUDITS	9									
IN-PROCESS - SAFETY	32	3						2	2	2
RECEIVING & SHIPPING	15	6								
LAYOUT	6	6		10	6	2	2	2	2	4
SALVAGE	5	4								
STAMPINGS		14		4	2					
WELDING		6		4	2				2	
METAL FINISH		8								
AREA INSPECTER		12		10	8	4	4	2	4	10
ASSEMBLY		12								
AUDITS		2								
DYNAMOMETER INSPECTION			2	2	2					
FLOOR INSPECTION-MACHINE			13	60	33	12	8	20	26	
FLOOR INSPECTION-ASSEMBLY			3	16	10	4	4	6	8	
SAFETY			1	4	2	2	2	4	4	
RECEIVING & SHIPPING INSPECTIO			4	10	4	1		4	4	10
SALVAGE & OBSOLETE INSPECTION			6	10	6			1	1	
OTHER								2	2	
CORE ROOM										20
MOULDING LINES										25

	PLANT MANPOWER									
	CAR ASSEMBLY	BODY STAMPING	4 CYLINDER ENGINE	F.W.D. A/T	F.W.D. M/T	BRAKE PLANT	STEERING PLANT	C.V.JOINT PLANT	SUSPENSION PLANT	IRON FOUNDRY
QUALITY CONTROL (Continued)										
INSPECTION - HOURLY										
CLEANING ROOM										
REPAIR										30
OTHER	2	7	1							24
TOTAL - INSPECTION - HOURLY	307	80	30	130	75	25	20	43	55	125
TOTAL - INSPECTION - SALARY	22	20	15	20	17	4	3	4	5	
TOTAL - QUALITY - SALARY	20	13	9	20	14	5	5	6	7	
TOTAL - Q.C. SALARIED STAFF	42	33	24	40	31	9	8	10	12	36
TOTAL - HOURLY STAFF	307	80	30	130	75	25	20	43	55	125
TOTAL - QUALITY CONTROL	1349	113	54	170	106	34	28	53	67	161

DETAIL ANALYSIS OF MANPOWER

BY PLANT AND ORGANIZATION

	PLANT MANPOWER									
	CAR ASSEMBLY	BODY STAMPING	4 CYLINDER ENGINE	F.W.D. A/T	F.W.D. M/T	BRAKE PLANT	STEERING PLANT	C.V.JOINT PLANT	SUSPENSION PLANT	IRON FOUNDRY
PRODUCTION CONTROL										
MANAGER	1	1	1	1	1	1	1	1	1	1
SECRETARY	1	1								1
PRODUCTION COORDINATOR	1	1								
FLOAT ANALYST	1	1								
OTHER	2	1								
TOTAL ADMINISTRATIVE SALARY	6	5	1	1	1	1	1	1	1	2
PLANNING-SUPERVISOR	4	3	2	2	2	1	1		1	2
ENGINEER SPEC.	3	3	3	3	3	1	1	1	1	3
FOLLOW-UP & SCHEDULE SUPERVISOR	5	3	2	2	2			1	1	2
SCHEDULE MAN	6	5	2	2	2	1	1	1	2	4
FOLLOW-UP MAN	15	8	4	4	3			1	1	2
CLERKS	11	4	1	1	1				1	
TOTAL PLANNING SALARY	34	26	14	14	13	3	3	4	7	13
MATERIAL CONTROL-SUPERVISOR	2	1	1	1	1	1	1	1	1	1
GENERAL FOREMAN	4	4	2	2	2					2
FOREMAN	19	12	8	10	8	4	3	3	3	10
CLERKS	1	3	5	5	2				1	5
TOTAL MATERIAL CONTROL-SALARY	26	19	16	18	13	5	4	4	5	18
SHIPPING & RECEIVING - SUPER.	1	2								
FOREMAN	1	16								
TRAFFIC CLERK	11	3	1	1	1	1	1	1	1	1
BILLING CLERK		5								1
TRACER	3	1								
ANALYST	2	2								
OTHER		1	1	1	1					
TOTAL SHIPPING & RECEIVING SALARY	18	30	2	2	2	1	1	1	1	2

DETAIL ANALYSIS OF MANPOWER
BY PLANT AND ORGANIZATION

	PLANT MANPOWER									
	CAR ASSEMBLY	BODY STAMPING	4 CYLINDER ENGINE	F.W.D A/T	F.W.D. M/T	BRAKE PLANT	STEERING PLANT	C.V.JOINT PLANT	SUSPENSION PLANT	IRON FOUNDRY
PRODUCTION CONTROL (CONT'D)										
SHIPPING & RECEIVING (CONT'D)										
DRIVERS	38	20	8	10	8	4	4	4	4	10
CHECKERS	16	10	2	2	2	2	2	2	2	4
MATERIAL HANDLERS		18	6	6	6			4	4	6
STOCK CHASERS		12	5	5	5			4	4	4
OTHER	15	12								2
TOTAL SHIPPING & RECEIVING - HOURLY	79	72	21	23	21	6	6	14	14	26
MATERIAL STORES										
DRIVER/CHECKER	64		23	35	73	6	4	12	12	38
MATERIAL HANDLERS	27	6	4	21	10	3	2	8	8	22
STOCK CHASER	35	48	7	15	10	3		8	8	20
TOTAL - HOURLY	126	54	34	75	43	12	6	28	28	80
MATERIAL HANDLING										
FOREMAN - SALARY		6								2
CRANE OPERATOR		30	1	1	1					10
DRIVERS		225	2	2	2	2	1	2	2	15
TOTAL - HOURLY		225	3	3	3	2	1	2	2	25
BY-PRODUCTS - SALARY										
FOREMAN		2								1
BY-PRODUCTS - HOURLY										
BALER OPERATOR		6								
SHEAR OPERATOR		4								
OTHER		10	2	2	2	2	1	2	2	8
TOTAL - HOURLY		20	2	2	2	2	1	2	2	8

DETAIL ANALYSIS OF MANPOWER
BY PLANT AND ORGANIZATION

	PLANT MANPOWER									
	CAR ASSEMBLY	BODY STAMPING	4 CYLINDER ENGINE	F.W.D. A/T	F.W.D. M/T	BRAKE PLANT	STEERING PLANT	C.V. JOINT PLANT	SUSPENSION PLANT	IRON FOUNDRY
PRODUCTION CONTROL (CONT'D)										
TOOL STORES & CRIB										
SUPERVISOR	1	1	2	2	2					
FOREMAN	2	1	2	2	2			1	1	2
CLERK	3		1	1	1					
TOTAL SALARY	6	2	5	5	5			1	1	2
CRIB ATTENDANT	6	12	9	10	9	2	2	6	6	12
CUTTER GRIND		2	4	4	4	1		2	2	
OTHER		5		3	3			1	1	4
TOTAL HOURLY	6	19	13	17	16	3	2	9	9	16
TOTAL - SALARY	90	76	38	40	34	10	8	11	15	40
TOTAL - HOURLY	211	361	73	116	85	22	16	55	55	155
GRAND TOTAL	301	437	111	156	119	32	24	66	70	195

DETAIL ANALYSIS OF MANPOWER
BY PLANT AND ORGANIZATION

	PLANT MANPOWER									
	CAR ASSEMBLY	BODY STAMPING	4 CYLINDER ENGINE	F.W.D. A/T	F.W.D. M/T	BRAKE PLANT	STEERING PLANT	C.V.JOINT PLANT	SUSPENSION PLANT	IRON FOUNDRY
MANUFACTURING ENGINEERING										
MANAGER	1	1	1	1	1	1	1	1	1	1
SECRETARY	1	1	1	1	1				1	1
SUPERINTENDENT		4		2	2	1	1	1	2	2
CLERK	1	2	1	1	1	1	1	1	1	1
TOTAL SALARY	3	8	3	5	5	3	3	3	5	5
PRODUCTION ENGINEERING										
MANAGER & SUPERINTENDENT	1	3	1	1	1					1
SUPERVISOR TOOL ENGINEER		1	1	2	2	1	1	1	1	1
TOOL ENGINEER	2	2	8	13	10			3	5	8
DIE ENGINEER		6	1	2	2				1	
OTHER	1	2	1							2
TOTAL SALARY	4	14	12	18	15	1	1	4	7	12
JIGS & FIXTURES CUTTER GRIND										
SUPERINTENDENT		2								
GENERAL FOREMAN	1	2	1	1	1					1
FOREMAN	4	11	2	4	3	1	1	1	2	4
CLERK		3								
TOTAL SALARY	5	18	3	5	4	1	1	1	2	5

	PLANT MANPOWER									
	CAR ASSEMBLY	BODY STAMPING	4 CYLINDER ENGINE	F.W.D. A/T	F.W.D. M/T	BRAKE PLANT	STEERING PLANT	C.V.JOINT PLANT	SUSPENSION PLANT	IRON FOUNDRY
MANUFACTURING ENGINEERING (Cont'd)										
PNEUMATIC TOOL REPAIR	10	10								
TOOLMAKER		20	22	28	25	8	6	8	12	20
JIGS & FIXTURE BLDR.	42	18								
TOOL SETTERS			3	4	3					
WELDER REPAIR		68	2	4	2	1	1	1	2	12
TOOL SALVAGE			2	3	2	1	1	1	1	
WELDER TOOL & DIE		6		2	1					4
PATTERN MAKER										10
APPRENTICES		8	3	5	4	2	2	2	3	6
CUTTERGRIND			17	18	17	6	4	6	6	
OTHER	2	5	2	3	2	2	2	1	2	10
TOTAL HOURLY	54	135	51	67	56	20	16	19	26	62
DIE ROOM										
SUPERINTENDENT		1								
GENERAL FOREMAN		4								
FOREMAN		20		2						
TOTAL SALARY		25		2						
DIE MAKER		162		6						
MACHINE OPERATOR		18		7	6	6	6	8	10	8
BORING MILL		10	3	6	4				2	
WELDER TOOL & DIE		10	2	4	2	1		1	2	4
APPRENTICES		19	5	8	5	1	1	2	2	6
OTHER		20	5	5	5	2	1		1	3
TOTAL HOURLY		239	15	36	22	10	8	11	17	21

DETAIL ANALYSIS OF MANPOWER

BY PLANT AND ORGANIZATION

	PLANT MANPOWER									
	CAR ASSEMBLY	BODY STAMPING	4 CYLINDER ENGINE	F.W.D. A/T	F.W.D. M/T	BRAKE PLANT	STEERING PLANT	C.V.JOINT PLANT	SUSPENSION PLANT	IRON FOUNDRY
MANUFACTURING ENGINEERING (Cont'd)										
FACILITIES ENGINEERING										
MANAGER		1	1	1	1					1
SUPERVISOR		3	1	1	1	1	1	1	1	3
PLANT ENGINEER	1	6	2	2	2	2	2	2	2	16
PLANT LAYOUT	3	2	1	2	1					
MATERIAL HANDLING ENGR.		6	1	2	1				1	6
OTHER		2	2	2	2				1	4
TOTAL SALARY	4	20	8	10	8	3	3	3	5	30
JANITORS										
GENERAL FOREMAN	1									
FOREMAN - SALARY	4	4	5	6	5	2	2	2	2	6
DRIVERS - HOURLY	16	10	8	12	10	4		2	4	12
SWEEPER OPERATOR	6	10	5	10	6	2		3	6	28
ATTENDANT GARAGE		1		1	1					
JANITOR FACILITIES	61	45	46	52	48	12		16	18	80
JANITOR OFFICE		3		2	2					4
LABORERS	3	20								20
BOOTH CLEANER	24									
OTHER HOURLY	2	8	1	2	1				1	
TOTAL SALARY	5	4	5	6	5	2	2	2	2	6
TOTAL HOURLY	112	97	60	76	68	20	16	21	31	144

DETAIL ANALYSIS OF MANPOWER
BY PLANT AND ORGANIZATION

	PLANT MANPOWER									
	CAR ASSEMBLY	BODY STAMPING	4 CYLINDER ENGINE	F.W.D. A/T	F.W.D. M/T	BRAKE PLANT	STEERING PLANT	C.V.JOINT PLANT	SUSPENSION PLANT	IRON FOUNDRY
MANUFACTURING ENGINEERING (Cont'd)										
POWER HOUSE										
CHIEF SALARY	1	2	1	1	1					1
ENGINEER		10	5	5	5					5
TOTAL SALARY	1	12	6	6	6					6
BOILER OPERATOR	4	6	6	6	6					5
STEAM ENGINEER	4	2								
BOILER MAINTENANCE		2	1	1	1	1	1	1	1	1
COMPRESSOR MAINTENANCE	4	2	1	1	1	1	1	1	1	2
COAL & ASH HANDLER	6	4	1	2	1					4
OTHER	3							3	3	2
TOTAL HOURLY	21	16	9	16	9	2	2	5	5	14
SET-UP										
GENERAL FOREMAN		3		3	1					
FOREMAN		12		12	8					
TOTAL SALARY		15		15	9					
MAINTENANCE & SERVICE										
SUPERINTENDENT	1	1	4	4	4					4
GENERAL FOREMAN	4	3	6	8	6	1	1	1	1	6
FOREMAN	21	14	21	26	23	4	2	2	2	16
CLERK	2	1	2	2	2	1	1	1	2	2
TOTAL SALARY	28	19	33	40	36	6	4	4	5	28
ELECTRICIAN	36	44	37	40	33	10	8	9	15	38
PIPEFITTER	30	40	36	38	31	8	6	6	12	36
MILLWRIGHT	32	42	34	36	29	7	6	8	12	46
WELDER-MAINTENANCE	8	20						3		6
CARPENTER	2	3	8	8	6	1	1	1	2	4

DETAIL ANALYSIS OF MANPOWER
BY PLANT AND ORGANIZATION

	PLANT MANPOWER									
	CAR ASSEMBLY	BODY STAMPING	4 CYLINDER ENGINE	F.W.D A/T	F.W.D. M/T	BRAKE PLANT	STEERING PLANT	C.V.JOINT PLANT	SUSPENSION PLANT	IRON FOUNDRY
MANUFACTURING ENGINEERING (CONT'D)										
MAINTENANCE & SERVICE (CONT'D)										
PAINTER	2	3								
MACHINE REPAIR	58	58	38	40	33	8	6	10	12	40
OILER	2	5	12	12	10	2	2		4	10
JITNEY REPAIR	8	12	7	7	7	1	1	3	2	10
APPRENTICE	10	12	8	9	8	2	2		4	8
OTHER	1	14	5	5	5				2	
TOTAL HOURLY	189	253	185	195	162	39	32	40	65	205
TOTAL SALARY	50	135	70	105	80	18	14	16	26	88
TOTAL HOURLY	376	740	320	390	317	91	78	97	144	502
TOTAL MANUFACTURING ENGINEERING	426	875	390	495	397	109	90	114	170	590

DETAIL ANALYSIS OF MANPOWER
BY PLANT AND ORGANIZATION

	PLANT MANPOWER									
	CAR ASSEMBLY	BODY STAMPING	4 CYLINDER ENGINE	F.W.D. A/T	F.W.D. M/T	BRAKE PLANT	STEERING PLANT	C.V.JOINT PLANT	SUSPENSION PLANT	IRON FOUNDRY
PERSONNEL										
MANAGER	1	1	1	1	1	1	1	1	1	1
SECRETARY	1	1	2	2	2				1	2
LABOR RELATIONS										
SUPERVISOR	1	1	1	1	1	1	1	1	1	1
PERSONNEL REPRESENTATIVE	4	3	2	3	2	1	1	1	1	3
CLERK		1	1	1	1					1
PERSONNEL ADMINISTRATION										
SUPERVISOR	1	1		1						1
ABSENTEE CONTROL	1	1	1	1	1					1
EMPLOYMENT	2	3	1	1	1	1	1	1	1	1
WORKMAN'S COMPENSATION		1	1	1	1					1
INSURANCE INVESTMENT	2	1	1	1	1					1
INSURANCE REPRESENTATIVE	1	1	1	1	1	1	1	1	1	1
WAGE ADMINISTRATOR	1		1	1	1					1
SALARY ADMINISTRATOR	1	2	1	2	1					2
SAFETY	1	2	1	2	1				1	2
OSHA			1	1	1					1
OTHER	2	1	3		3	1	1	1	1	
TOTAL PERSONNEL SALARY	19	20	19	20	19	6	6	6	8	20

DETAIL ANALYSIS OF MANPOWER
BY PLANT AND ORGANIZATION

	PLANT MANPOWER									
	CAR ASSEMBLY	BODY STAMPING	4 CYLINDER ENGINE	F.W.D. A/T	F.W.D. M/T	BRAKE PLANT	STEERING PLANT	C.V.JOINT PLANT	SUSPENSION PLANT	IRON FOUNDRY
PRODUCT ENGINEERING SALARY										
MANAGER	1	1	1	1	1					1
SUPERVISOR	1	1	2	2	2	1	1	1	1	2
CONTACT ENGINEER	5	3	1	7	4	2	2	2	3	4
TOTAL	7	5	4	10	7	3	3	3	4	7
LABORATORY SUPERVISOR	2		2	2	2					1
LABORATORY TECHNICIAN	4		3	4	3					5
TESTING - HOURLY	6			6	5					4
CLERK				1	1					1
WASTE TREATMENT - HOURLY	12		4	4	4					
OTHER - HOURLY	8			6	4					4
- SALARY	2		1							2
TOTAL	34		10	23	19					9
TOTAL PRODUCTION ENGINEERING										
- SALARY	15	5	10	23	18	3	3	3		16
- HOURLY	26		4	10	8					8
GRAND TOTAL	41	5	14	33	26	3	3	3	4	24

DETAIL ANALYSIS OF MANPOWER

BY PLANT AND ORGANIZATION

	PLANT MANPOWER									
	CAR ASSEMBLY	BODY STAMPING	4 CYLINDER ENGINE	F.W.D. A/T	F.W.D. M/T	BRAKE PLANT	STEERING PLANT	C.V.JOINT PLANT	SUSPENSION PLANT	IRON FOUNDRY
PRODUCTION										
BODY-IN-WHITE										
SUPERINTENDENT	2									
CLERK	1									
GENERAL FOREMAN	4									
FOREMAN	26									
OTHER	3									
TOTAL SALARY	36									
BUFFER OPERATOR	13									
BODY HANDLER	15									
TOTAL HOURLY	28									
TOTAL BODY-IN-WHITE	64									
PAINT										
SUPERINTENDENT	2									
CLERK	2									
GENERAL FOREMAN	4									
FOREMAN	18									
OTHER	2									
TOTAL SALARY	28									
BODY HANDLER	31									
PAINT MIXER	10									
OTHER	14									
TOTAL HOURLY	55									
TRIM										
SUPERINTENDENT	2									
CLERK	2									

	PLANT MANPOWER									
	CAR ASSEMBLY	BODY STAMPING	4 CYLINDER ENGINE	F.W.D. A/T	F.W.D. M/T	BRAKE PLANT	STEERING PLANT	C.V.JOINT PLANT	SUSPENSION PLANT	IRON FOUNDRY
PRODUCTION (Continued)										
TRIM (Cont'd)										
GENERAL FOREMAN	4									
FOREMAN	24									
OTHER	3									
TOTAL TRIM SALARY	35									
BODY HANDLERS	12									
OTHER	2									
TOTAL HOURLY	14									
TOTAL TRIM	49									
CHASSIS										
SUPERINTENDENT	2									
GENERAL FOREMAN	4									
FOREMAN	24									
OTHER	4									
TOTAL SALARY	34									
DRIVER	12									
BRAKE CERTIFICATION	4									
OTHER	2									
TOTAL HOURLY	18									
TOTAL CHASSIS	52									
LARGE PRESS										
SUPERINTENDENT		5								
GENERAL FOREMAN		8								
FOREMAN		51								
CLERK		6								
TOTAL SALARY		70								

	PLANT MANPOWER									
	CAR ASSEMBLY	BODY STAMPING	4 CYLINDER ENGINE	F.W.D. A/T	F.W.D. M/T	BRAKE PLANT	STEERING PLANT	C.V.JOINT PLANT	SUSPENSION PLANT	IRON FOUNDRY
PRODUCTION (Continued)										
FINAL & CUSHION										
SUPERINTENDENT	2									
CLERK	2									
GENERAL FOREMAN	2									
FOREMAN	18									
OTHER	2									
TOTAL SALARY	26									
DRIVER	20									
OTHER	2									
TOTAL HOURLY	22									
TOTAL FINAL & CUSHION	48									
CAR CONDITIONING										
GENERAL FOREMAN	2									
FOREMAN	6									
TOTAL SALARY	8									
PAINT MIXER	2									
DRIVER	18									
GARAGE	3									
OTHER	2									
TOTAL HOURLY	25									
BLANKING & COILS										
LINE SERVICE HOURLY		7								
ROLLS SET-UP		4								
OTHER		2								
TOTAL HOURLY		13								
DIE SET										
GENERAL FOREMAN		3								
FOREMAN		8								

	PLANT MANPOWER									
	CAR ASSEMBLY	BODY STAMPING	4 CYLINDER ENGINE	F.W.D. A/T	F.W.D. M/T	BRAKE PLANT	STEERING PLANT	C.V.JOINT PLANT	SUSPENSION PLANT	IRON FOUNDRY
PRODUCTION (Continued)										
DIE SET (Continued										
TOTAL SALARY		11								
DIE RECORD CLERK		3								
DIE SETTERS		41								
TOTAL HOURLY		44								
SMALL PRESS										
GENERAL FOREMAN		2								
FOREMAN		10								
TOTAL SALARY		12								
TOTAL HOURLY		6								
FOUNDRY										
SUPERINTENDENT										2
CLERK										2
OTHER - SALARY										2
- HOURLY										4
TOTAL										10
MOLTEN METAL										
GENERAL FOREMAN										3
FOREMAN										12
OTHER - SALARY										5
- HOURLY										6
TOTAL										26
CLEANING										
GENERAL FOREMAN										4
FOREMAN										16
OTHER - SALARY										4
- HOURLY										4
TOTAL										28

DETAIL ANALYSIS OF MANPOWER

BY PLANT AND ORGANIZATION

	PLANT MANPOWER									
	CAR ASSEMBLY	BODY STAMPING	4 CYLINDER ENGINE	F.W.D A/T	F.W.D. M/T	BRAKE PLANT	STEERING PLANT	C.V.JOINT PLANT	SUSPENSION PLANT	IRON FOUNDRY
PRODUCTION (Continued)										
CORE MAKING										
GENERAL FOREMAN										
FOREMAN										4
OTHER - SALARY										18
- HOURLY										8
TOTAL										6
										36
PANEL ASSEMBLY										
SUPERINTENDENT		2								
GENERAL FOREMAN		6								
FOREMAN		22								
CLERK		2								
TOTAL SALARY		32								
TOTAL HOURLY		12								
MACHINING										
SUPERINTENDENT			6	6	6	2	1	2	2	
GENERAL FOREMAN			6	12	8	4	2	4	5	
FOREMAN			24	44	34	8	4	8	10	
CLERK & OTHER - SALARY			2	4	2	2	1	1	1	
- HOURLY			2	10	4	4	2	5	5	
TOTAL MACHINING			40	76	54	20	10	20	23	
ASSEMBLY										
SUPERINTENDENT			2	2	2					
GENERAL FOREMAN			2	4	2	1	1	2	2	
FOREMAN			8	14	12	4	2	4	4	
CLERK & OTHER - SALARY			3	4	6	1	1	1	1	
- HOURLY				10	6	4	2	5	5	
TOTAL ASSEMBLY			15	34	26	10	6	12	12	

DETAIL ANALYSIS OF MANPOWER

BY PLANT AND ORGANIZATION

	PLANT MANPOWER									
	CAR ASSEMBLY	BODY STAMPING	4 CYLINDER ENGINE	F.W.D. A/T	F.W.D. M/T	BRAKE PLANT	STEERING PLANT	C.V.JOINT PLANT	SUSPENSION PLANT	IRON FOUNDRY
PRODUCTION TOTAL SALARY	167	125	50	90	70	22	12	22	25	80
PRODUCTION TOTAL HOURLY	162	51	5	20	10	8	4	10	10	20
GRAND TOTAL PRODUCTION	329	164	55	110	80	30	16	32	35	100

DETAIL ANALYSIS OF MANPOWER

BY PLANT AND ORGANIZATION

	PLANT MANPOWER									
	CAR ASSEMBLY	BODY STAMPING	4 CYLINDER ENGINE	F.W.D A/T	F.W.D. M/T	BRAKE PLANT	STEERING PLANT	C.V.JOINT PLANT	SUSPENSION PLANT	IRON FOUNDRY
UNION ACTIVITIES										
QUALITY	2	1	1	1	1					1
PRODUCTION CONTROL	2	1	1	1	1					1
MANUFACTURING ENGINEERING	3	6	1	6	3					1
PRODUCTION	17	6	4	6	4	4	2	4	5	5
VICE-PRESIDENT	1	1							1	1
BENEFITS REPRESENTATIVE	1	1								
SAFETY REPRESENTATIVE	1	1		1						1
TOTAL	27	17	8	16	10	4	2	5	6	10

MANUFACTURING BUDGETS

THIS SECTION CONTAINS A MANUFACTURING BUDGET FOR EACH OF THE TEN PLANTS ADDRESSED IN THE PREVIOUS SECTION, E.G.:

- CAR ASSEMBLY PLANT
- BODY STAMPING PLANT
- FOUR-CYLINDER ENGINE PLANT
- FWD AUTOMATIC TRANSAXLE PLANT
- FWD MANUAL TRANSAXLE PLANT
- BRAKE PLANT
- STEERING PLANT
- CV JOINT PLANT
- SUSPENSION PLANT
- IRON FOUNDRY.

THE MANUFACTURING BUDGETS INCLUDE THE COST OF DIRECT AND INDIRECT LABOR AND RELATED FRINGE BENEFITS; OTHER MANUFACTURING EXPENSES; AND FIXED EXPENSES REQUIRED TO OPERATE AT THE PRODUCTION VOLUMES AND IN THE FACILITIES SPECIFIED IN THE SURROGATE PLANT STUDIES. THE MANUFACTURING BUDGETED EXPENSES ARE SEGREGATED INTO FIXED, NON-VARIABLE, AND VARIABLE CATEGORIES.

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MANUFACTURING BUDGET
CAR ASSEMBLY PLANT

ANNUAL VOLUME 288,000 CARS

($000)

	FIXED AND NON-VARIABLE	VARIABLE	TOTAL
DIRECT LABOR	—	$ 50,000	$ 50,000
FRINGE BENEFITS	—	49,000	49,000
TOTAL	—	99,000	99,000
INDIRECT LABOR			
SALARY	$ 8,300	6,800	15,100
FRINGE BENEFITS	3,100	2,500	5,600
HOURLY	5,600	17,000	22,600
FRINGE BENEFITS	4,800	15,000	19,800
TOTAL	21,800	41,300	63,100
OTHER MANUFACTURING EXPENSES			
MAINTENANCE	830	1,800	2,630
PERISHABLE TOOLS	30	440	470
SPOILAGE	—	2,400	2,400
UTILITIES	4,800	4,100	8,900
SUPPLIES AND OTHER	3,300	3,700	7,000
TOTAL	8,960	12,400	21,400
FIXED EXPENSES			
TAXES AND INSURANCE	7,500	—	7,500
DEPRECIATION	20,000	—	20,000
TOTAL	27,500	—	27,500
TOTAL MANUFACTURING BUDGET	$ 58,260	$ 152,700	$ 211,000

MANUFACTURING BUDGET

BODY STAMPING PLANT

ANNUAL VOLUME 900,000 CAR SETS

($000)

	FIXED AND NON-VARIABLE	VARIABLE	TOTAL
DIRECT LABOR	—	$ 28,100	$ 28,100
FRINGE BENEFITS	—	26,100	26,100
TOTAL		54,200	54,200
INDIRECT LABOR			
SALARY	$ 10,300	5,200	15,500
FRINGE BENEFITS	4,100	2,000	6,100
HOURLY	9,700	18,700	28,400
FRINGE BENEFITS	8,000	15,000	23,000
TOTAL	32,100	40,900	73,000
OTHER MANUFACTURING EXPENSES			
MAINTENANCE	3,100	2,600	5,700
PERISHABLE TOOLS	80	600	680
SPOILAGE	—	6,400	6,400
UTILITIES	6,000	800	6,800
SUPPLIES AND OTHER	4,800	3,100	7,900
TOTAL	13,980	13,500	27,480
FIXED EXPENSES			
TAXES AND INSURANCE	4,400	—	4,400
DEPRECIATION	29,500	—	29,500
TOTAL	33,900	—	33,900
TOTAL MANUFACTURING BUDGET	$ 79,980	$ 108,600	$ 188,580

MANUFACTURING BUDGET

FOUR CYLINDER ENGINE

ANNUAL VOLUME 400,000

	FIXED AND NON-VARIABLE	VARIABLE	TOTAL
DIRECT LABOR	—	$ 12,600	$ 12,600
FRINGE BENEFITS	—	11,500	11,500
TOTAL	—	24,100	24,100
INDIRECT LABOR			
SALARY	$ 4,900	4,000	8,900
FRINGE BENEFITS	1,900	1,600	3,500
HOURLY	3,100	6,700	9,800
FRINGE BENEFITS	2,300	5,300	7,600
TOTAL	12,200	17,600	29,800
OTHER MANUFACTURING EXPENSES			
MAINTENANCE	720	1,700	2,420
PERISHABLE TOOLS	—	1,900	1,900
SPOILAGE	—	1,600	1,600
UTILITIES	3,800	2,200	6,000
SUPPLIES AND OTHER	1,800	1,300	3,100
TOTAL	6,320	8,700	15,020
FIXED EXPENSES			
TAXES AND INSURANCE	2,100	—	2,100
DEPRECIATION	21,000	—	21,000
TOTAL	23,100	—	23,100
TOTAL MANUFACTURING BUDGET	$ 41,620	$ 50,400	$ 92,020

MANUFACTURING BUDGET

F.W.D. AUTOMATIC TRANSAXLE PLANT

ANNUAL VOLUME 500,000

($000)

	FIXED AND NON-VARIABLE	VARIABLE	TOTAL
DIRECT LABOR	—	$ 19,600	$ 19,600
FRINGE BENEFITS	—	16,000	16,000
TOTAL	—	35,600	35,600
INDIRECT LABOR			
SALARY	$ 6,200	7,600	13,800
FRINGE BENEFITS	2,200	2,600	4,800
HOURLY	3,200	11,500	14,700
FRINGE BENEFITS	2,300	8,300	10,600
TOTAL	13,900	30,000	43,900
OTHER MANUFACTURING EXPENSES			
MAINTENANCE	340	3,960	4,300
PERISHABLE TOOLS		5,500	5,500
SPOILAGE		4,100	4,100
UTILITIES	1,200	2,400	3,600
SUPPLIES AND OTHER	680	2,620	3,300
TOTAL	2,220	18,580	20,800
FIXED EXPENSES			
TAXES AND INSURANCE	1,500	—	1,500
DEPRECIATION	23,300	—	23,300
TOTAL	24,800	—	24,800
TOTAL MANUFACTURING BUDGET	$ 40,920	$ 84,180	$ 125,100

F.W.D. MANUAL TRANSAXLE PLANT

ANNUAL VOLUME 500,000

($000)

	FIXED AND NON-VARIABLE	VARIABLE	TOTAL
DIRECT LABOR			
FRINGE BENEFITS	—	$ 16,000	$ 16,000
TOTAL	—	13,000	13,000
	—	29,000	29,000
INDIRECT LABOR			
SALARY	$ 4,700	5,800	10,500
FRINGE BENEFITS	1,600	2,000	3,600
HOURLY	2,400	8,600	11,000
FRINGE BENEFITS	1,750	6,250	8,000
TOTAL	10,450	22,650	33,100
OTHER MANUFACTURING EXPENSES			
MAINTENANCE	280	3,220	3,500
PERISHABLE TOOLS	—	4,500	4,500
SPOILAGE	—	3,400	3,400
UTILITIES	1,000	2,000	3,000
SUPPLIES AND OTHER	560	2,140	2,700
TOTAL	1,840	15,260	17,100
FIXED EXPENSES			
TAXES AND INSURANCE	1,300	—	1,300
DEPRECIATION	15,000	—	15,000
TOTAL	16,300	—	16,300
TOTAL MANUFACTURING BUDGET	$ 28,590	$ 66,910	$ 95,500

MANUFACTURING BUDGET

BRAKE PLANT

ANNUAL VOLUME 500,000

($000)

	FIXED AND NON-VARIABLE	VARIABLE	TOTAL
DIRECT LABOR			
FRINGE BENEFITS	—	$ 4,900	$ 4,900
TOTAL	—	4,000	4,000
INDIRECT LABOR		8,900	8,900
SALARY			
FRINGE BENEFITS	$ 250	2,950	3,200
HOURLY	500	600	1,100
FRINGE BENEFITS	720	2,580	3,300
TOTAL	520	1,880	2,400
OTHER MANUFACTURING EXPENSES	1,990	8,010	10,000
MAINTENANCE			
PERISHABLE TOOLS	90	1,010	1,100
SPOILAGE	—	1,600	1,600
UTILITIES		1,000	1,000
SUPPLIES AND OTHER	300	600	900
TOTAL	170	640	810
FIXED EXPENSES	560	4,850	5,410
TAXES AND INSURANCE			
DEPRECIATION	380	—	380
TOTAL	10,400	—	10,400
	10,780	—	10,780
TOTAL MANUFACTURING BUDGET	$ 13,330	$ 21,760	$ 35,090

STEERING PLANT

ANNUAL VOLUME 500,000

($000)

	FIXED AND NON-VARIABLE	VARIABLE	TOTAL
DIRECT LABOR	—	$ 3,500	$ 3,500
FRINGE BENEFITS	—	2,800	2,800
TOTAL	—	6,300	6,300
INDIRECT LABOR			
SALARY	$ 1,140	1,360	2,500
FRINGE BENEFITS	380	470	850
HOURLY	570	2,030	2,600
FRINGE BENEFITS	420	1,480	1,900
TOTAL	2,510	5,340	7,850
OTHER MANUFACTURING EXPENSES			
MAINTENANCE	90	1,010	1,100
PERISHABLE TOOLS	—	1,600	1,600
SPOILAGE	—	1,000	1,000
UTILITIES	300	600	900
SUPPLIES AND OTHER	170	630	800
TOTAL	560	4,840	5,400
FIXED EXPENSES			
TAXES AND INSURANCE	380	—	380
DEPRECIATION	3,500	—	3,500
TOTAL	3,880	—	3,880
TOTAL MANUFACTURING BUDGET	$ 6,950	$ 16,480	$ 23,430

MANUFACTURING BUDGET

C.V. JOINT PLANT

ANNUAL VOLUME 500,000

($000)

	FIXED AND NON-VARIABLE	VARIABLE	TOTAL
DIRECT LABOR		$ 4,600	$ 4,600
FRINGE BENEFITS		3,400	3,400
TOTAL		8,000	8,000
INDIRECT LABOR			
SALARY	$ 2,000	2,400	4,400
FRINGE BENEFITS	1,500	1,700	3,200
HOURLY	675	2,425	3,100
FRINGE BENEFITS	240	860	1,100
TOTAL	4,415	7,385	11,800
OTHER MANUFACTURING EXPENSES			
MAINTENANCE	110	1,290	1,400
PERISHABLE TOOLS		1,800	1,800
SPOILAGE		1,300	1,300
UTILITIES	400	800	1,200
SUPPLIES AND OTHER	230	870	1,100
TOTAL	740	6,060	6,800
FIXED EXPENSES			
TAXES AND INSURANCE	500		500
DEPRECIATION	6,800		6,800
TOTAL	7,300		7,300
TOTAL MANUFACTURING BUDGET	$ 12,455	$ 21,445	$ 33,900

SUSPENSION PLANT

ANNUAL VOLUME 500,000

($000)

	FIXED AND NON-VARIABLE	VARIABLE	TOTAL
DIRECT LABOR	—	$ 8,300	8,300
FRINGE BENEFITS	—	6,800	6,800
TOTAL	—	15,100	15,100
INDIRECT LABOR			
SALARY	1,800	2,200	4,000
FRINGE BENEFITS	630	770	1,400
HOURLY	1,270	4,530	5,800
FRINGE BENEFITS	920	3,280	4,200
TOTAL	4,620	10,780	15,400
OTHER MANUFACTURING EXPENSES			
MAINTENANCE	120	1,380	1,500
PERISHABLE TOOLS	—	2,000	2,000
SPOILAGE	—	1,000	1,000
UTILITIES	400	800	1,200
SUPPLIES AND OTHER	230	870	1,100
TOTAL	750	6,050	6,800
FIXED EXPENSES			
TAXES AND INSURANCE	500	—	500
DEPRECIATION	4,800	—	4,800
TOTAL	5,300	—	5,300
TOTAL MANUFACTURING BUDGET	$ 10,670	$ 31,930	$ 42,600

MANUFACTURING BUDGET

IRON FOUNDRY

ANNUAL VOLUME 2,800,000 CAR SETS

	FIXED AND NON-VARIABLE	VARIABLE	TOTAL
DIRECT LABOR	$ —	$ 16,500	$ 16,500
FRINGE BENEFITS	—	13,500	13,500
TOTAL	—	30,000	30,000
INDIRECT LABOR			
SALARY	$ 5,220	6,380	11,600
FRINGE BENEFITS	1,845	2,255	4,100
HOURLY	4,000	14,000	18,000
FRINGE BENEFITS	2,850	10,150	13,000
TOTAL	13,915	32,785	46,700
OTHER MANUFACTURING EXPENSES			
MAINTENANCE	540	6,260	6,800
PERISHABLE TOOLS	—	1,800	1,800
SPOILAGE	—	3,200	3,200
UTILITIES	5,300	10,700	16,000
SUPPLIES AND OTHER	1,000	3,800	4,800
TOTAL	6,840	25,760	32,600
FIXED EXPENSES			
TAXES AND INSURANCE	2,700	—	2,700
DEPRECIATION	19,250	—	19,250
TOTAL	21,950	—	21,950
TOTAL MANUFACTURING BUDGET	$42,705	$ 88,545	$ 131,250

PRE-PRODUCTION AND LAUNCHING

THIS SECTION CONTAINS PRE-PRODUCTION TIMING CHARTS FOR A MINOR SKIN CHANGE TO AN EXISTING CAR/TRUCK, A MAJOR SKIN CHANGE TO AN EXISTING CAR/TRUCK, AND AN ALL NEW CAR/TRUCK WITH A NEW BODY/CHASSIS AND POWERTRAIN. IT ALSO INCLUDES PRE-PRODUCTION AND LAUNCH CHARTS FOR THE FOLLOWING TEN PLANTS:

- CAR ASSEMBLY PLANT
- STAMPING PLANT
- FOUR-CYLINDER ENGINE PLANT
- MANUAL TRANSAXLE PLANT
- CV JOINT PLANT
- GREY IRON FOUNDRY
- BRAKE COMPONENTS PLANT
- ELECTRONIC PLANT
- FABRICATED GLASS PLANT
- PLASTIC MOLDING PLANT.

THE PRE-PRODUCTION AND LAUNCH CHARTS INCLUDE DETAILS ON BUILDING CONSTRUCTION, PRE-PRODUCTION MANPOWER, LAUNCHING DAILY RATE, DIRECT LABOR MANPOWER, TOTAL MANPOWER, AND PRE-PRODUCTION AND LAUNCHING COSTS.

TABLE OF CONTENTS

PRE-PRODUCTION COSTS CAN BROADLY BE DEFINED AS THE COSTS ABSORBED TO BRING A NEW MODEL CAR/TRUCK TO PRODUCTION OR THE ADVANCE COST TO EXPAND AN EXISTING PRODUCT OR COMPONENT OR NEW PLANT EXPANSION. SPECIFICALLY THERE ARE FOUR MAJOR TYPES OF PRE-PRODUCTION PROGRAMS:

- MINOR SKIN CHANGE TO AN EXISTING CAR/TRUCK.
- MAJOR SKIN CHANGE TO AN EXISTING CAR/TRUCK.
- ALL NEW CAR/TRUCK WITH NEW BODY/CHASSIS AND POWERTRAIN.
- MAJOR PLANT EXPANSION OR FACILITY EXPANSION OF EXISTING COMPONENT

PRE-PRODUCTION IS THE COST OF MANPOWER AND FACILITY RESOURCES FROM PROGRAM INCEPTION UP TO BUT NOT INCLUDING THE CAR/TRUCK OR COMPONENT LAUNCHING:

- RESEARCH AND DEVELOPMENT COSTS
- STYLING COSTS
- PRODUCT ENGINEERING COSTS
- MANUFACTURING ENGINEERING COSTS
- PRE-PRODUCTION PLANT COSTS
- MANUFACTURING PLANT COSTS

PRE-PRODUCTION COSTS DO NOT INCLUDE THE COSTS OF:

- NEW FACILITIES WHICH ARE CAPITALIZED AND DEPRECIATED.
- NEW TOOLING WHICH IS CAPITALIZED AND AMORTIZED.
- LAUNCHING COSTS WHICH ARE THE ADDED COSTS OF PRODUCTION AFTER PLANT STARTUP.

PRE-PRODUCTION COSTS CAN BE AND ARE CLASSIFIED DIFFERENTLY BY EACH MAJOR AUTOMOTIVE MANUFACTURER. FOR EXAMPLE: RESEARCH AND DEVELOPMENT, STYLING AND PRODUCT ENGINEERING COSTS ARE GENERALLY REFERRED TO AS PROGRAM COSTS AND ARE FINANCIALLY BOOKED AS DEVELOPMENT COSTS.

PRE-PRODUCTION COSTS VARY BY MANUFACTURER IN DIRECT PROPORTION WITH THE LEVEL OF VERTICAL INTEGRATION.

THE ATTACHED SCHEDULES DEFINE THE PRE-PRODUCTION AND DEVELOPMENT ACTIVITIES BY MAJOR FUNCTION.

OUTER SKIN CHANGE	MAJOR SKIN CHANGE	TOTAL NEW CAR	NEW PLANT/PRODUCT
	RESEARCH & DEVELOPMENT SAFETY AERODYNAMICS EMISSIONS	RESEARCH & DEVELOPMENT SAFETY AERODYNAMICS EMISSIONS	
STYLING BODY CLAY MODELS INTERIOR TRIM OUTER ORNAMENTATION GRILLE/LIGHTS	STYLING BODY CLAY MODELS BODY SEATING BUCKS INSTRUMENT PANEL INTERIOR TRIM BUMPER SYSTEMS OUTER ORNAMENTATION GRILLE/LIGHTS	STYLING BODY CLAY MODELS BODY SEATING BUCKS INSTRUMENT PANEL INTERIOR TRIM BUMPER SYSTEMS EXTERIOR ORNAMENTATION GRILLE/LIGHTS	
PRODUCT ENGINEERING BODY DESIGN/DEVELOPMENT BODY DIE MODELS COMPONENT DIE MODELS EMISSIONS TESTING LAB VENDOR COMPONENT SAMPLE TESTING	PRODUCT ENGINEERING BODY DESIGN/DEVELOPMENT BODY DIE MODELS COMPONENT DIE MODELS EMISSIONS TESTING SAFETY TESTING TEST TRACK ENDURANCE TEST LAB VENDOR COMPONENT SAMPLE TESTING	PRODUCT ENGINEERING BODY DESIGN/DEVELOPMENT CHASSIS DESIGN/DEVELOPMENT POWER TRAIN DESIGN/DEVELOPMENT BODY DIE MODELS COMPONENT DIE MODELS BODY/CHASSIS/POWER TRAIN TESTING EMISSIONS TESTING SAFETY TESTING TEST TRACK ENDURANCE TEST LAB VENDOR COMPONENT SAMPLE TESTING	

OUTER SKIN CHANGE	MAJOR SKIN CHANGE	TOTAL NEW CAR	NEW PLANT/PRODUCT
PRE-PRODUCTION PLANT ASSEMBLE FROM PRODUCTION TOOLING AND FACILITIES 10 TO 20 CARS/TRUCKS MANUFACTURING PLANTS MANUFACTURE COMPONENTS FROM PRODUCTION TOOLS & FACILITIES AND SHIP TO PRE-PRODUCTION PLANT. TOTAL PLANT COSTS DURING SHUTDOWN ARE RECORDED AS PRE-PRODUCTION COSTS.	PRE-PRODUCTION PLANT ASSEMBLE FROM PRODUCTION TOOLING AND FACILITIES 20 PLUS CARS/TRUCKS MANUFACTURING PLANTS MANUFACTURE COMPONENTS FROM PRODUCTION TOOLS AND FACILITIES AND SHIP TO PRE-PRODUCTION PLANT. TOTAL PLANT COSTS DURING SHUTDOWN ARE RECORDED AS PRE-PRODUCTION COSTS.	PRE-PRODUCTION PLANT ASSEMBLE FROM PRE-PRODUCTION TOOLING 5 TO 10 CARS/TRUCKS ASSEMBLE FROM PRODUCTION TOOLING 10 TO 20 CARS/TRUCKS MANUFACTURING PLANTS MANUFACTURE COMPONENTS FROM PRODUCTION TOOLS AND FACILITIES AND SHIP TO PRE-PRODUCTION PLANT. TOTAL PLANT COSTS DURING SHUTDOWN ARE RECORDED AS PRE-PRODUCTION COSTS INCLUDING: MACHINERY, EQUIPMENT AND TOOLING STARTUP SCRAP GENERATED IN TRYOUT. TOTAL PLANT MANNING DURING TRYOUT. ALL PLANT OVERHEAD COSTS DUPLICATE PERISHABLE TOOL COSTS.	MANUFACTURING PLANTS THE ENTIRE COST FOR OVERHEAD & MANNING A NEW PLANT ARE PRE-PRODUCTION COSTS. TOTAL COST OF MANNING & OVERHEAD TO FACILITIZE AN EXISTING PLANT WITH A NEW COMPONENT OR PRODUCT IS PRE-PRODUCTION COSTS. THIS INCLUDES: PLANT MANNING FOR STARTUP TO LAUNCH. PLANT OVERHEAD COSTS ARE ALL PRE-PRODUCTION. DUPLICATE PERISHABLE TOOLS.

OUTER SKIN CHANGE	MAJOR SKIN CHANGE	TOTAL NEW CAR	NEW PLANT/PRODUCT
MANUFACTURING ENGINEERING TOOL DIE DESIGN AND ENGINEERING FACILITY DESIGN AND ENGINEERING TOOL & FACILITY ORDERING TOOL & FACILITY FOLLOW-UP -FOR- CAR/TRUCK ASSEMBLY STAMPING COMPONENTS STAMPING ASSEMBLIES BODY ASSEMBLY BODY PAINTING	MANUFACTURING ENGINEERING TOOL AND DIE DESIGN AND ENGINEERING FACILITY DESIGN AND ENGINEERING TOOL & FACILITY ORDERING TOOL & FACILITY FOLLOW-UP PLANT ENGINEERING -FOR- CAR/TRUCK ASSEMBLY STAMPING COMPONENTS STAMPING ASSEMBLIES BODY ASSEMBLY BODY PAINTING INSTRUMENTATION SOFT TRIM BUMPER SYSTEMS GRILLE/LIGHTS/GLASS	MANUFACTURING ENGINEERING TOOL AND DIE DESIGN AND ENGINEERING FACILITY DESIGN AND ENGINEERING TOOL & FACILITY ORDERING TOOL & FACILITY FOLLOW-UP PLANT ENGINEERING EPA/OSHA ENGINEERING -FOR- CAR/TRUCK ASSEMBLY STAMPING COMPONENTS STAMPING ASSEMBLIES BODY ASSEMBLY BODY PAINTING INSTRUMENTATION SOFT TRIM BUMPER SYSTEMS GRILLE/LIGHTS/GLASS ALL OTHER BODY COMPONENTS ALL CHASSIS COMPONENTS ALL POWER TRAIN COMPONENTS EMISSIONS TEST FACILITIES	MANUFACTURING ENGINEERING FOR EXPANSION OF EXISTING PRODUCT IN NEW OR EXISTING PLANT. PLANT ENGINEERING BUILDING POWER HOUSE WASTE TREATMENT EPA/OSHA TOOL & DIE DESIGN AND ENGINEERING FACILITY DESIGN AND ENGINEERING TOOL AND FACILITY ORDERING TOOL AND FACILITY FOLLOW-UP

Launching Costs

Launching Costs can be defined as the added cost to bring a new model car/truck to full production. Specifically launching costs start on the first day of production and continue until full line speed or capacity is achieved. Launching programs result from:

- Minor skin change
- Major skin change
- All new car/truck
- New Manufacturing Component for:
  - Body
  - Chassis
  - Power Train
- Major or Minor Engineering change
- Plant Line speed change
- Launching of a new plant

The launching costs attributed to any one of these programs varies by the type of Manufacturing Facility that is affected.

LAUNCHING COVERS A TOTAL RANGE OF PLANT COSTS AND CAN INCLUDE:

- EXCESS DIRECT LABOR COST OVER STANDARD
- EXCESS INDIRECT LABOR COST OVER STANDARD
- EXCESS PERISHABLE TOOLS
- EXCESS SCRAP COSTS
- EXCESS COST OF SUPPLIES
- ALL OTHER PLANT EXCESS COSTS
- EXCESS FRINGE BENEFIT COSTS

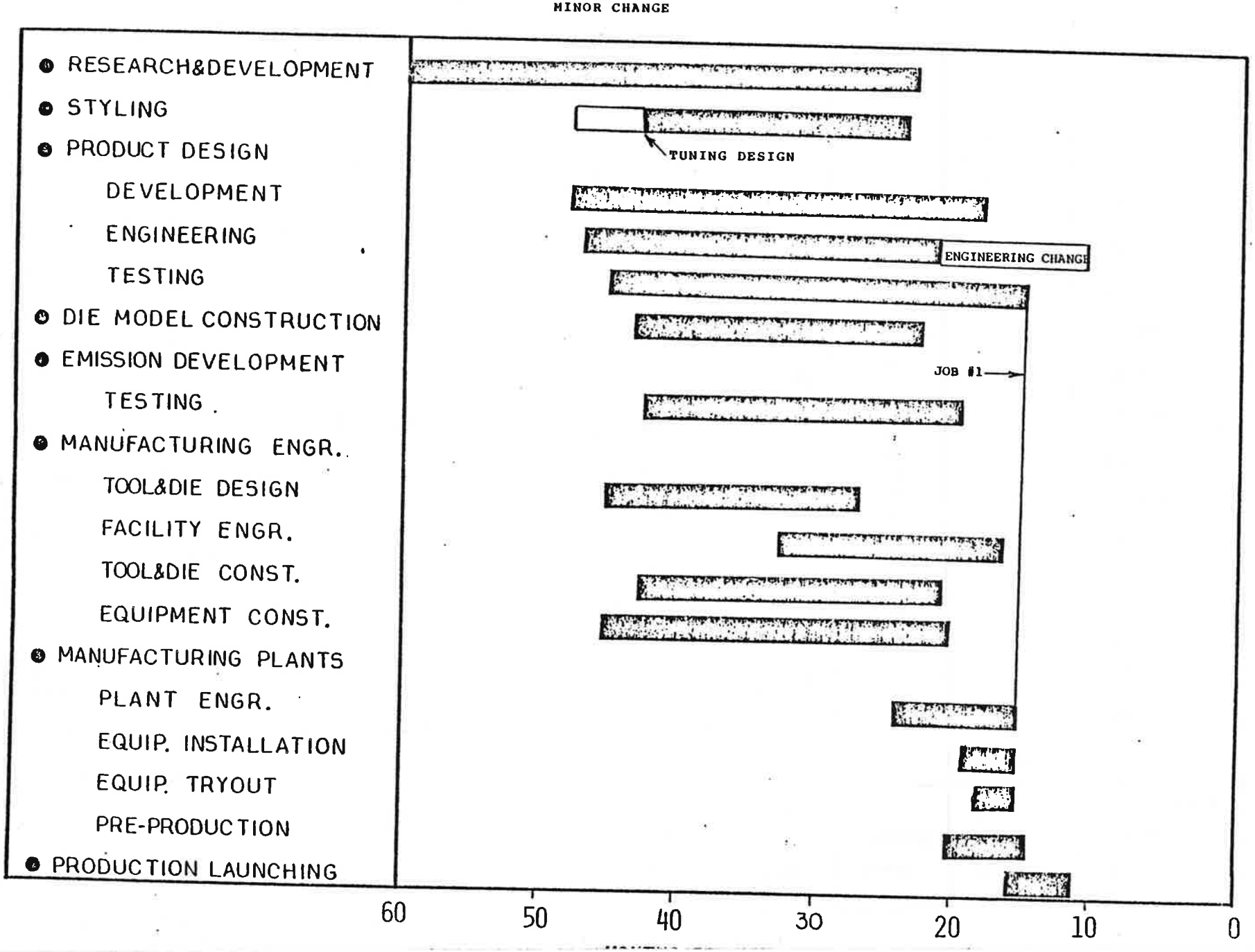
THESE EXCESS COSTS ARE GENERATED AND OCCUR BECAUSE THE SPECIFIC PLANT IS FACILITIZED AND SCHEDULED TO OPERATE AT A DEFINITE LINE SPEED, HOWEVER, THE NEW PRODUCT OR COMPONENT CAN NOT BE PRODUCED AT THAT LINE SPEED BECAUSE:

- ALL COMPONENT PARTS MAY NOT FIT PERFECTLY AS THE NEW FACILITIES AND TOOLS ARE TUNED.
- MINOR ENGINEERING CHANGES TO IMPROVE BODY FITS.
- MINOR ENGINEERING CHANGES TO IMPROVE QUALITY.
- NEW COMPONENTS AND/OR ASSEMBLIES REQUIRE A LEARNING TIME TO INSTALL AT LINE SPEED.

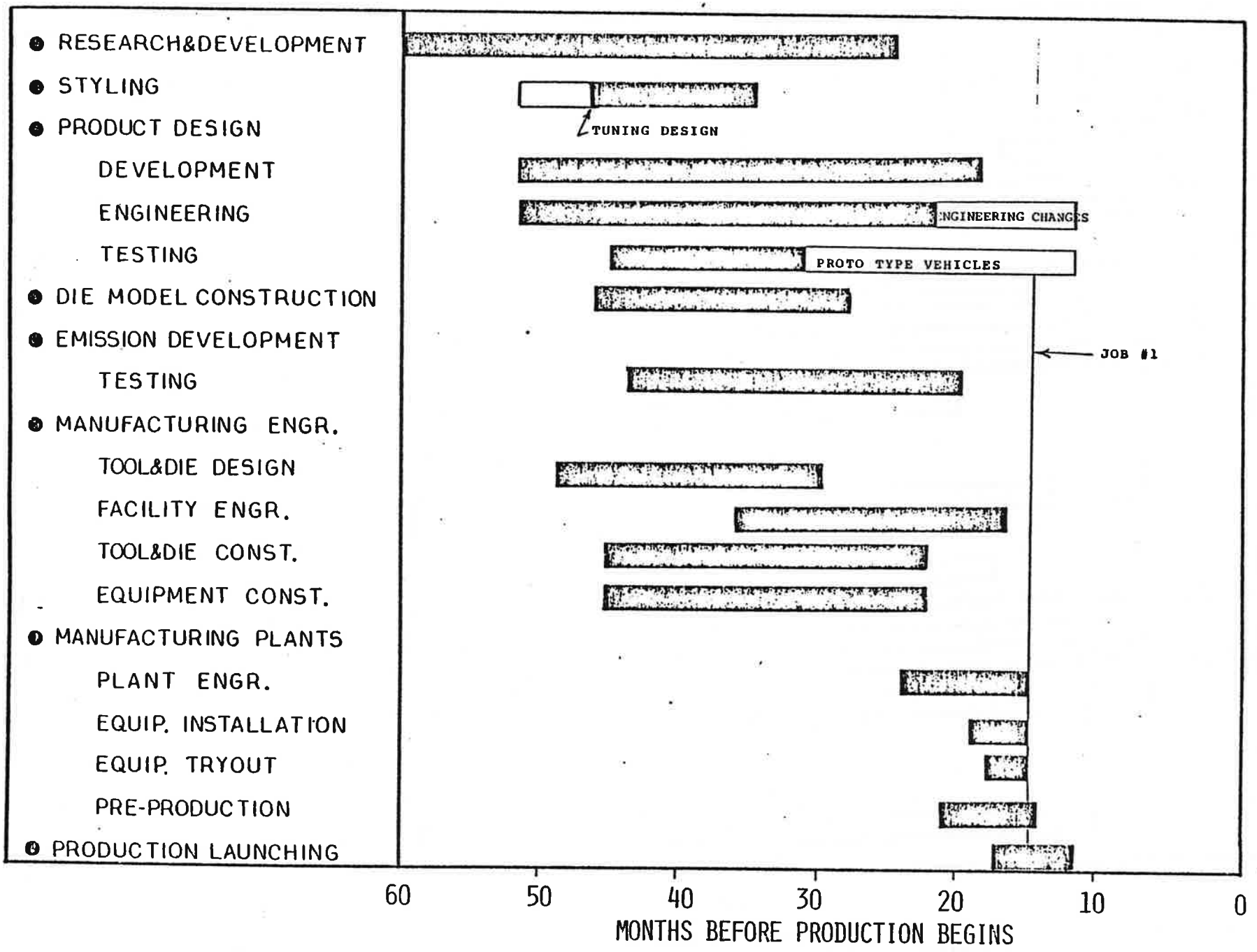
EFFECT ON PLANTS BY PROGRAM

	Minor Skin Change	Major Skin Change	All New Car/Trk	New Mfgr. Comp.	Engr. Change	Plant Line Speed	New Plant or Expansion
Assembly Plant	Minor	Major	Major		Minor to Major - Varies with change	Major	Major
Stamping Plant	Minor	Major	Major				Major
Engine Plant				Major			Major
Transmission Plant				Major			Major
Glass Plant		Major	Major				Major
Suspension Plant			Major	Major			Major
Electrical Plant			Major	Major			Major
Electronics Plant			Major				Major
Trim Plant	Minor	Major	Major				Major
Axle Plant				Major			Major
Machining Plant			Major	Major			Major
Spring Plant			Major				Major
Forge Plant				Major			Major
Foundry Plant				Major			Major

PRE-PRODUCTION PROGRAM TIMING CHART

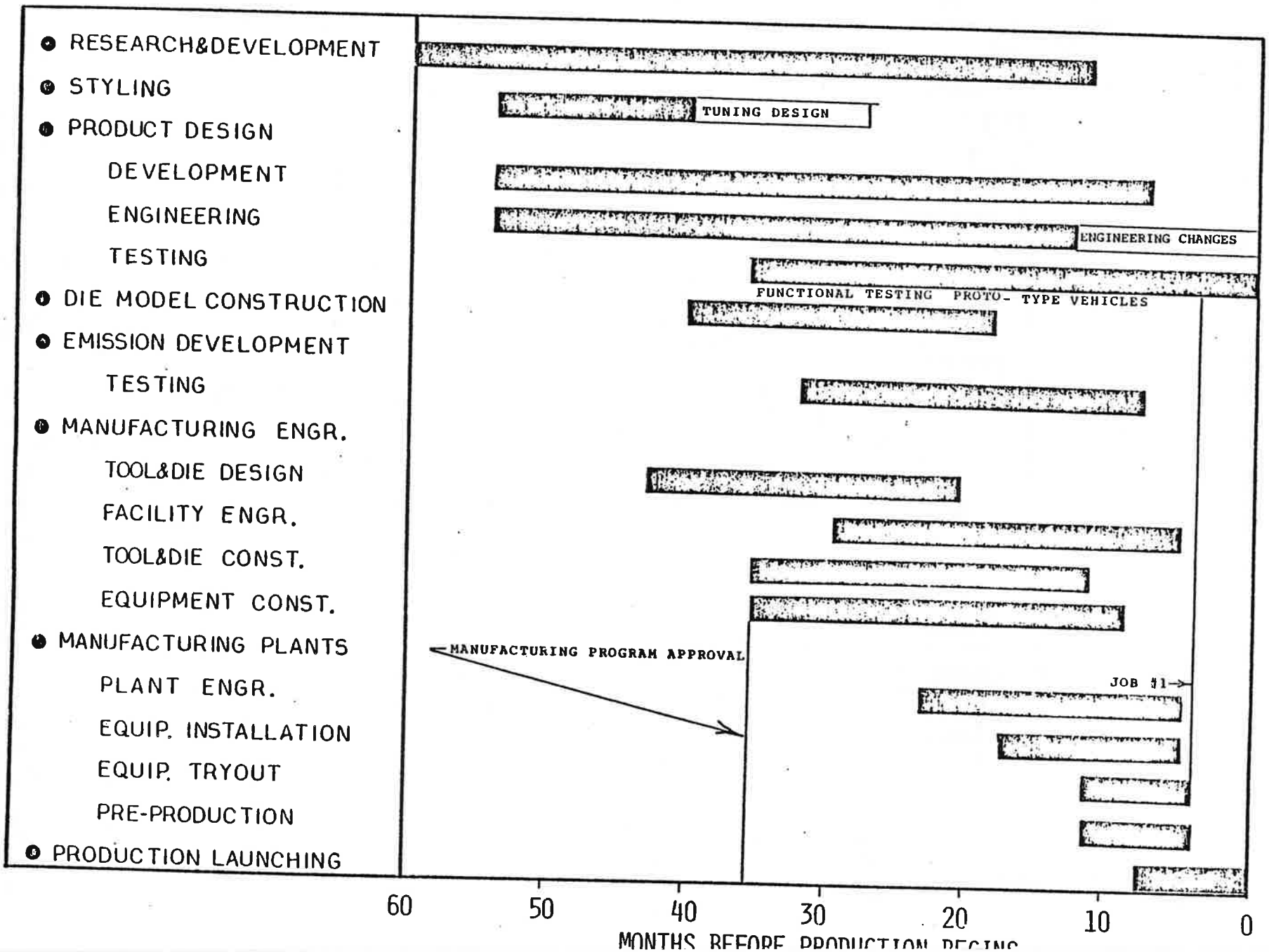


MAJOR RESKIN



PRE-PRODUCTION PROGRAM TIMING CHART

NEW PRODUCT - NEW PLANT

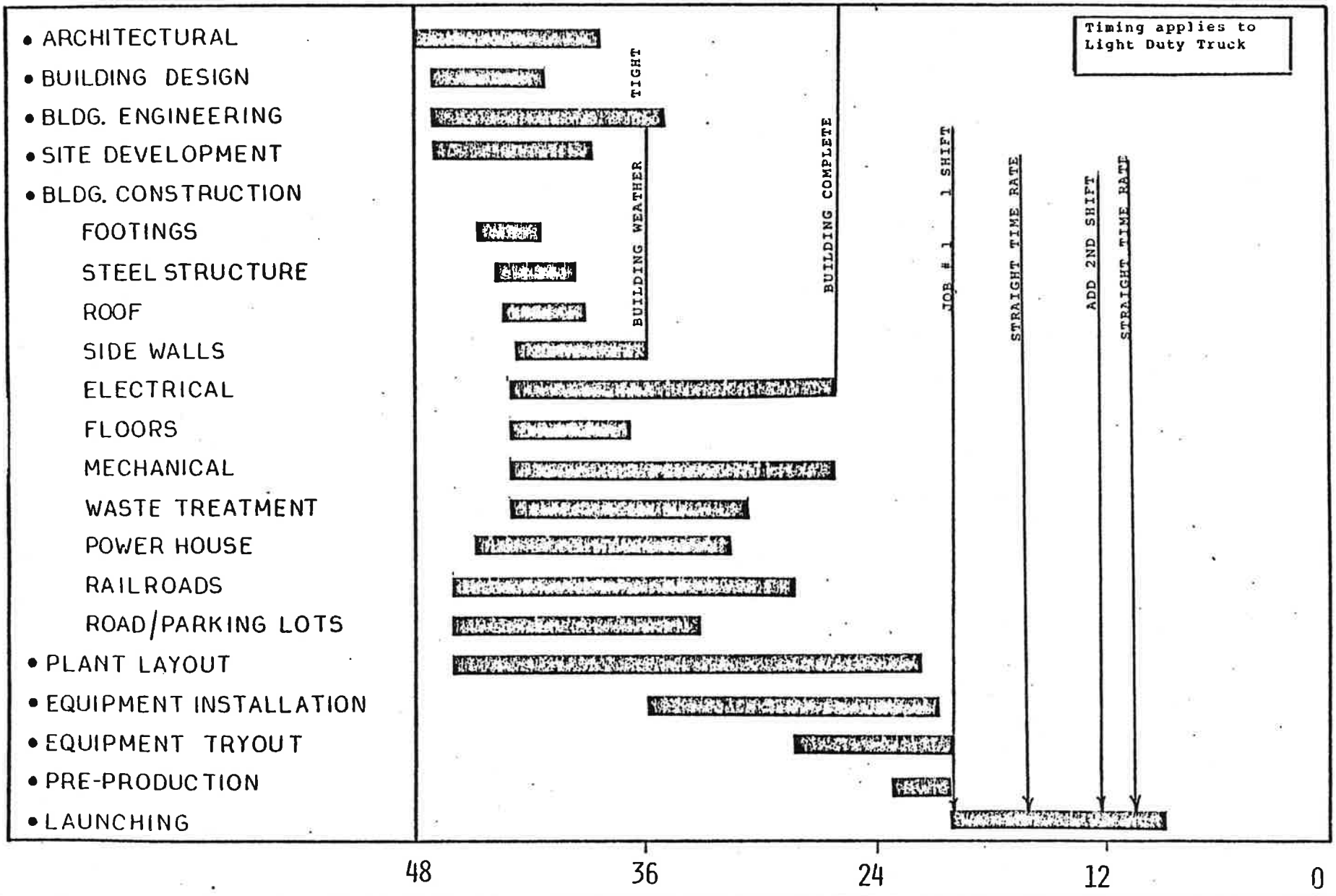


CAR ASSEMBLY PLANT

(NOTE: TIMING CHARTS CONTAINED IN THIS SECTION ALSO APPLY TO A LIGHT DUTY TRUCK PLANT)

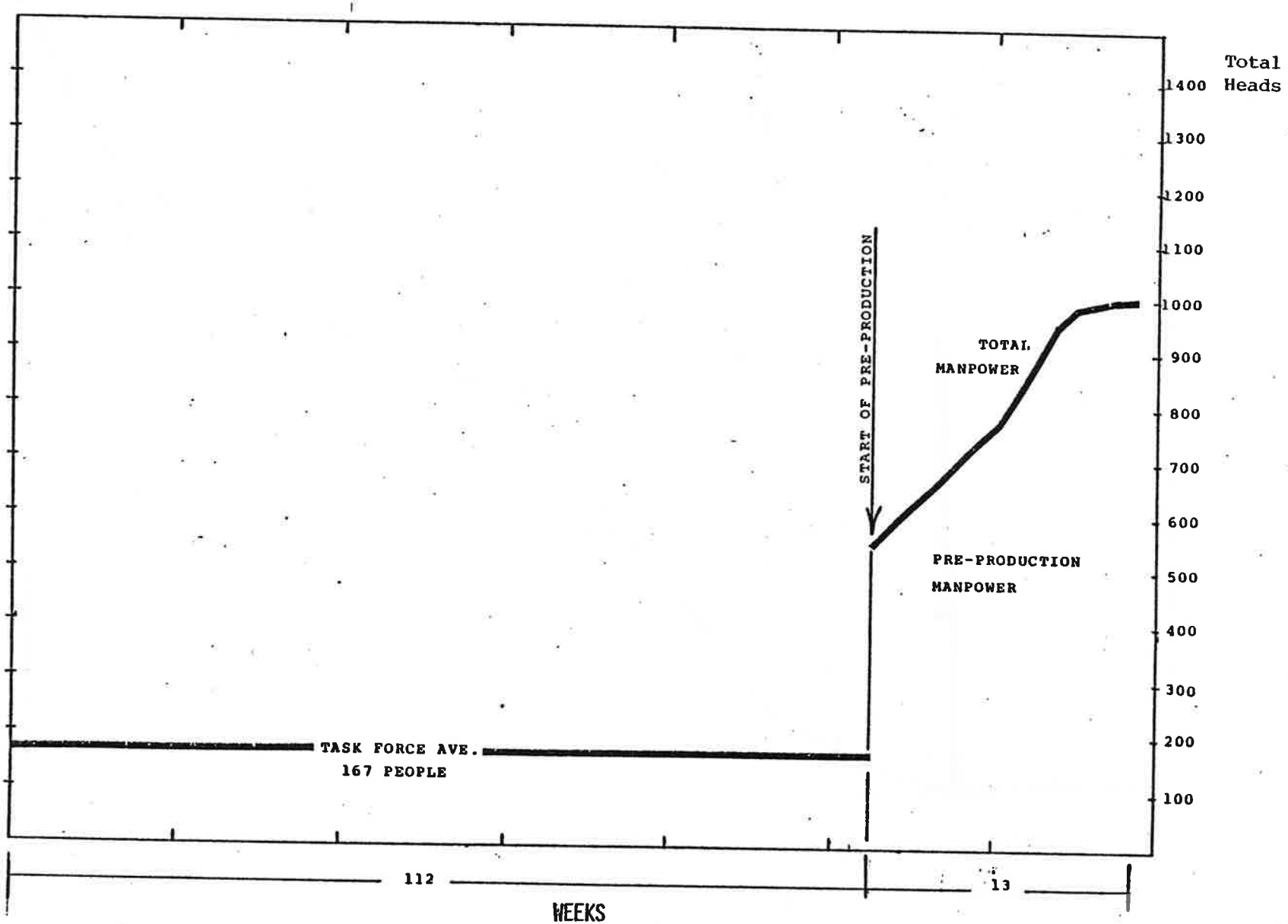
TIMING CHART
FOR
NEW PLANT

CAR ASSEMBLY PLANT



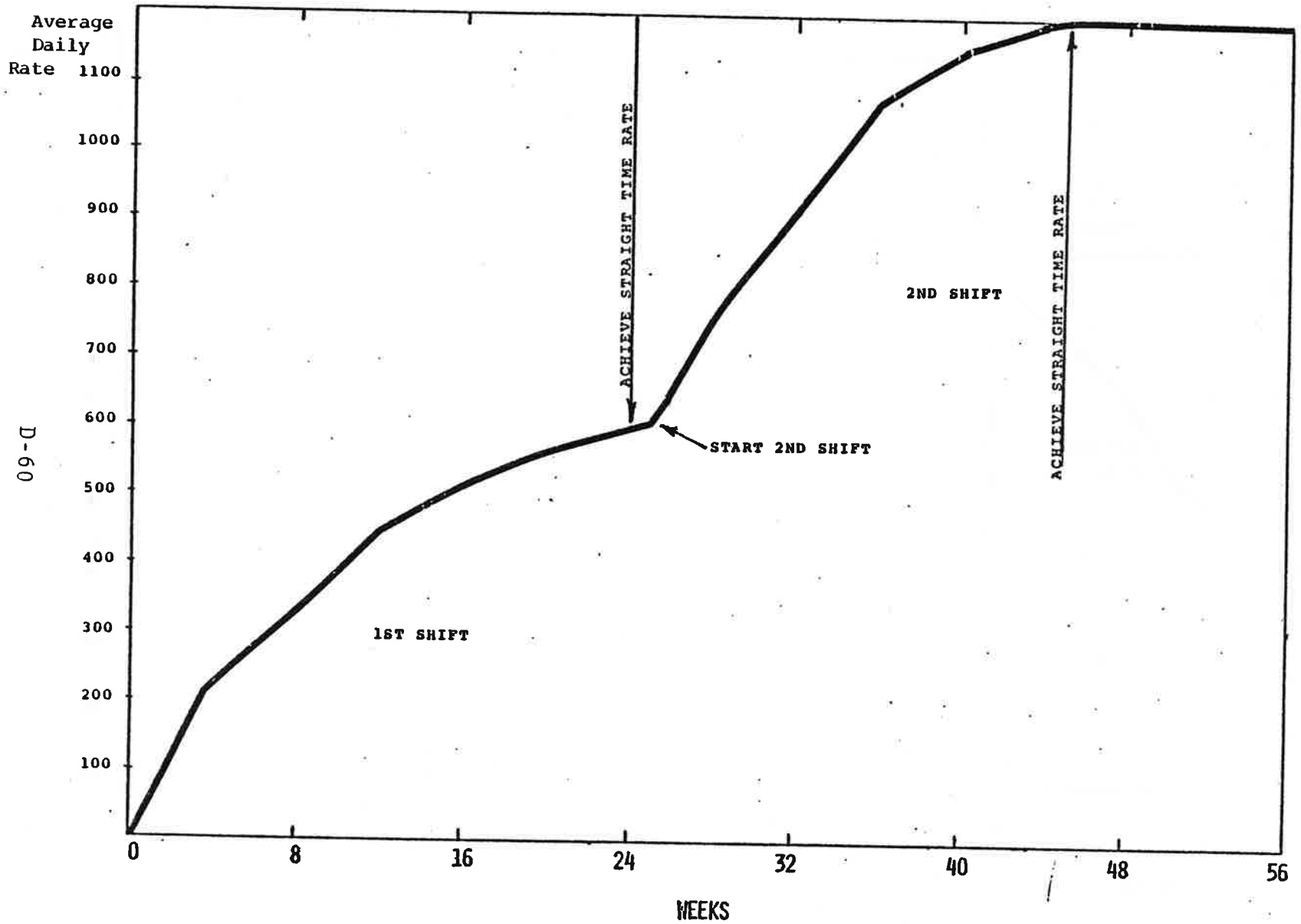
CAR ASSEMBLY PLANT PRE-PRODUCTION MANPOWER

NEW PLANT

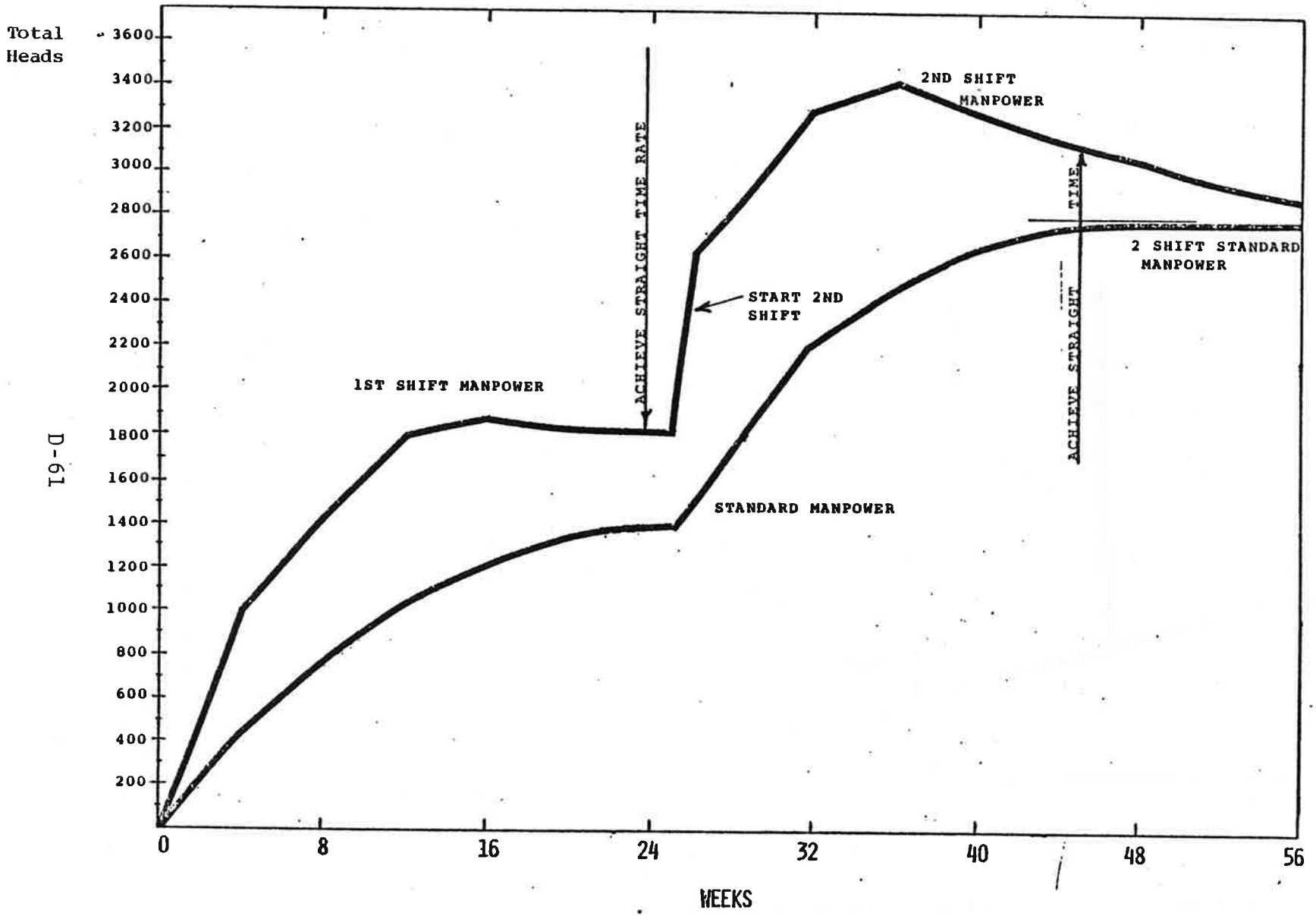


CAR ASSEMBLY PLANT LAUNCH RATE

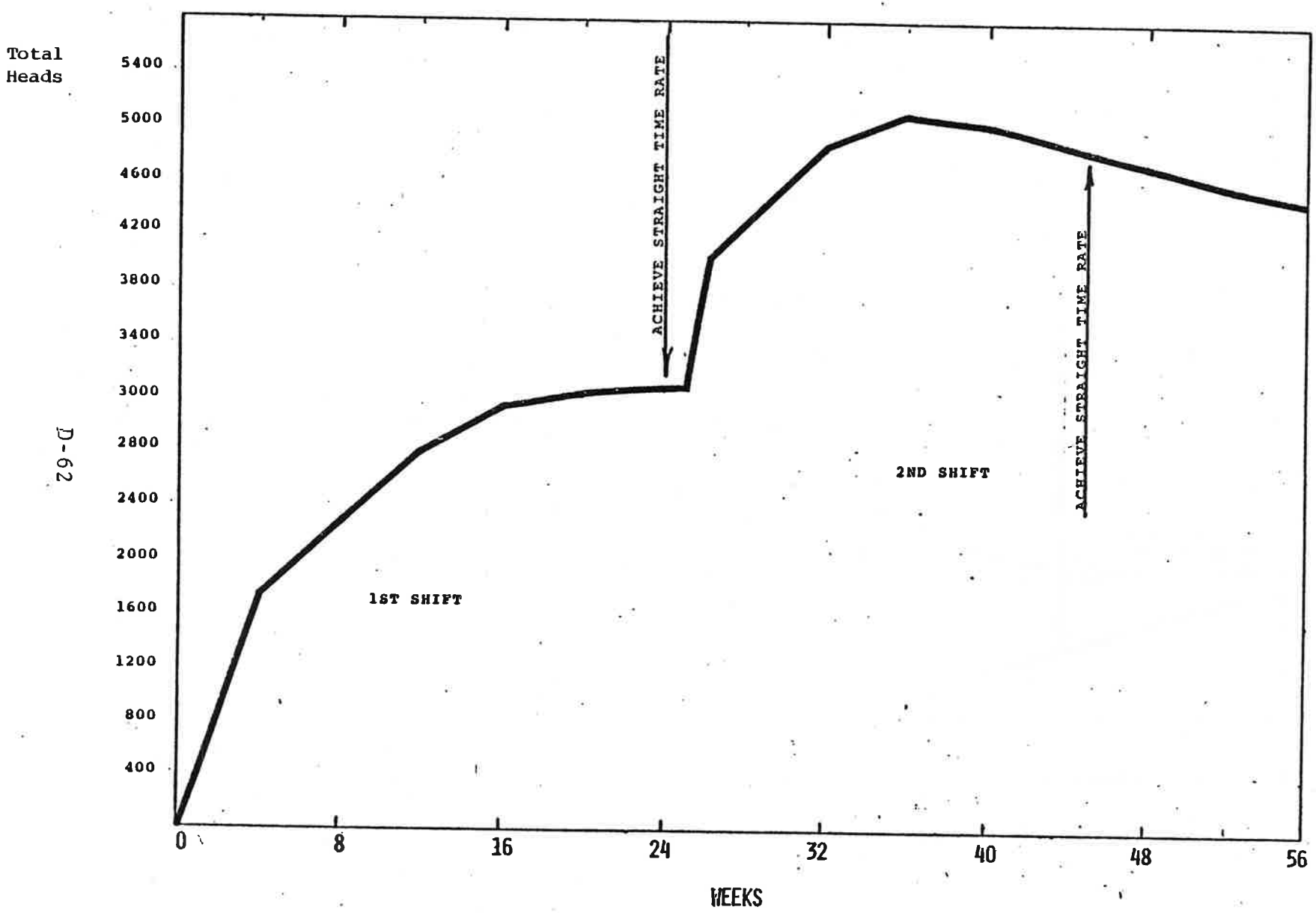
NEW PLANT



CAR ASSEMBLY PLANT LAUNCH DIRECT LABOR MANPOWER NEW PLANT



CAR_ ASSEMBLY PLANT LAUNCH-TOTAL MANPOWER NEW PLANT



CAR ASSEMBLY PLANT

($000)

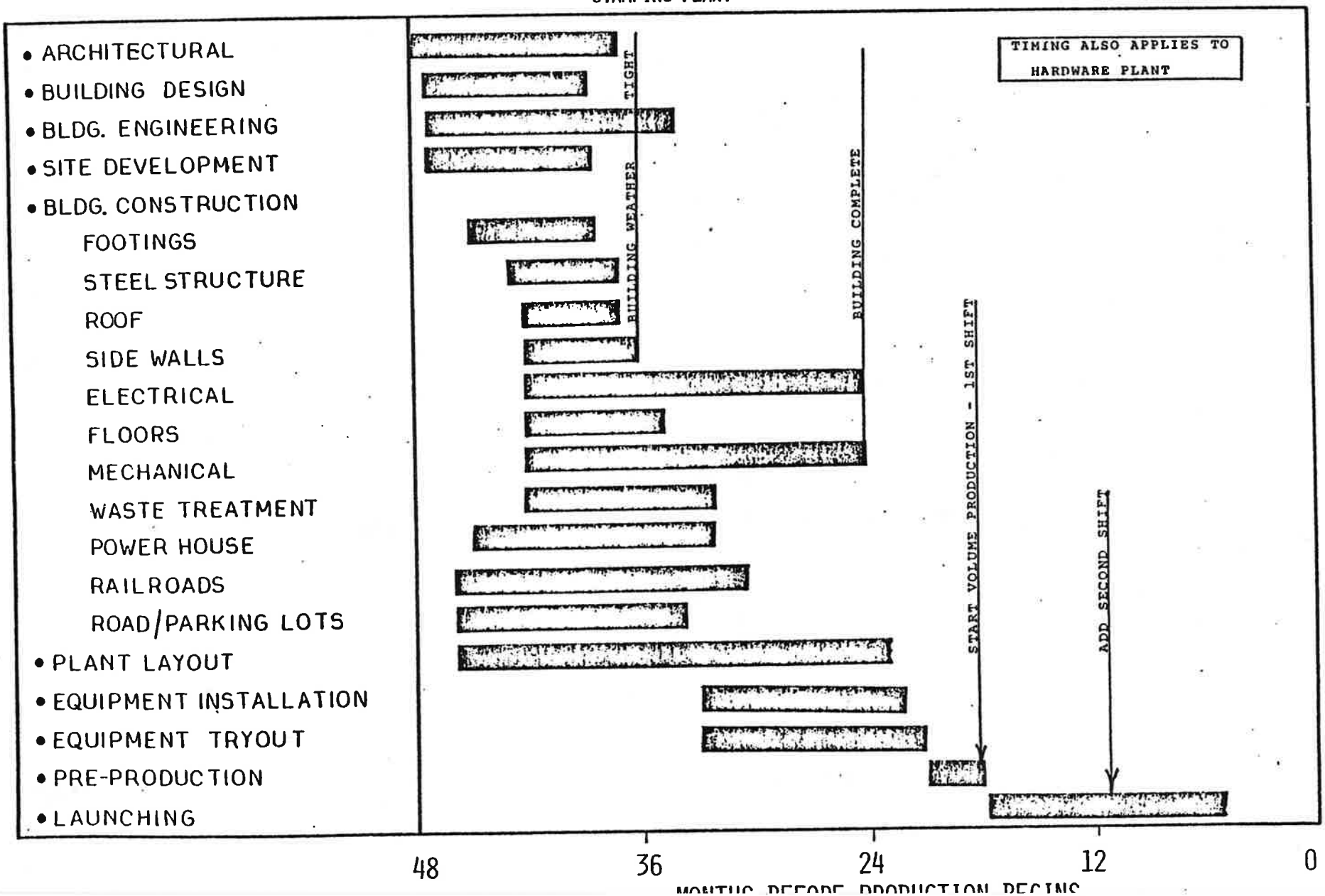
COST ELEMENT	PRE-PRODUCTION COSTS	LAUNCH COSTS	TOTAL COSTS
Manpower Costs			
- Direct Labor	$3,247	$23,452	$26,699
- Indirect Hourly	2,307	7,525	9,832
- Indirect Salary	17,620	4,566	22,186
Total Manpower Costs	$23,174	$35,543	$58,717
Other Manufacturing Expenses			
- Maintenance Materials	$ 105	$ 119	$ 224
- Tools, Perishable	4	5	9
- Spoilage	152	171	323
- Utilities	610	687	1,297
- Taxes/Insurance	955	1,076	2,031
- Depreciation	621	2,888	3,509
- Supplies & Other	417	469	886
Total Other Manufacturing Expenses	$ 2,864	$ 5,415	$ 8,279
TOTAL COSTS	$26,038	$40,958	$66,996

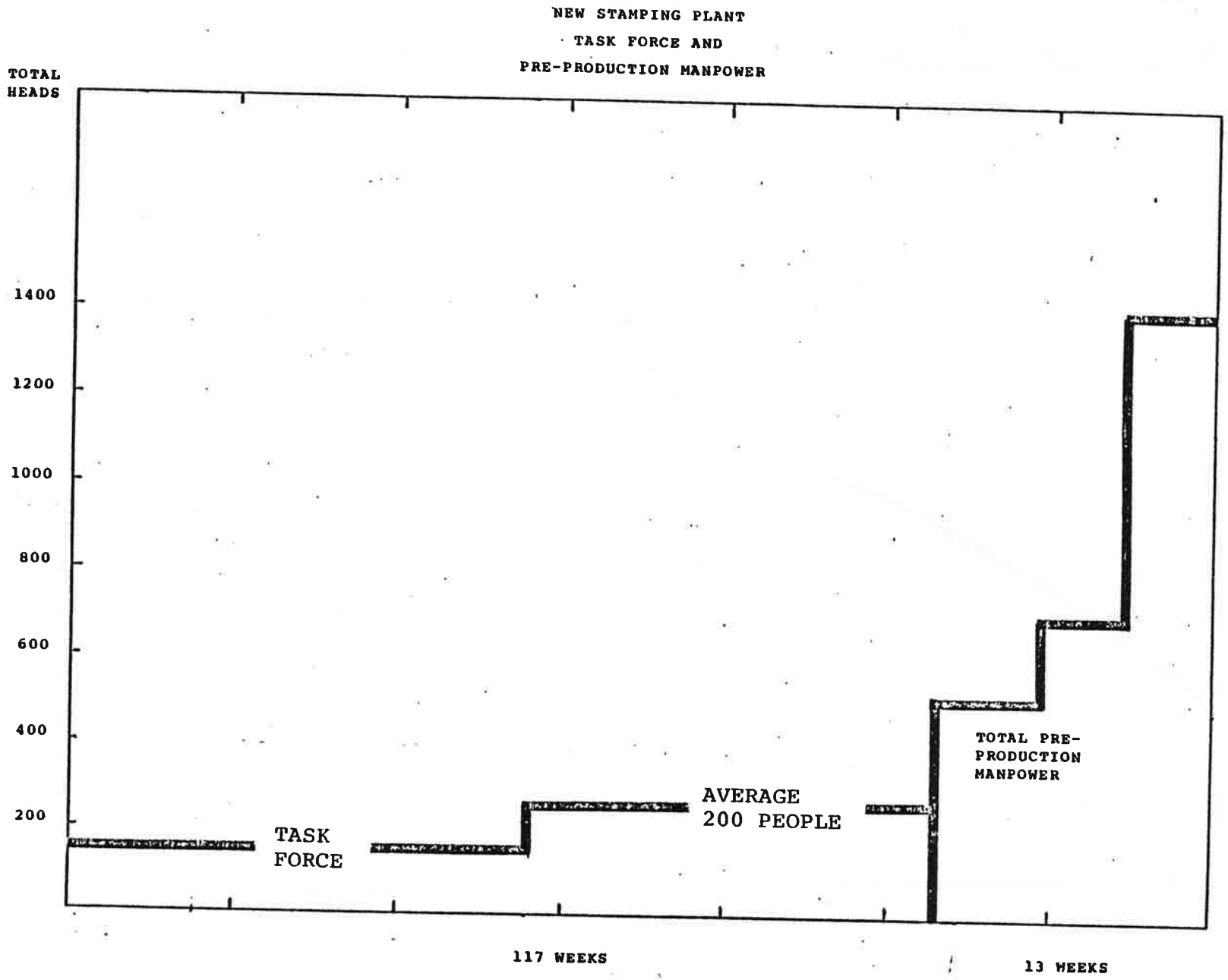
STAMPING PLANT

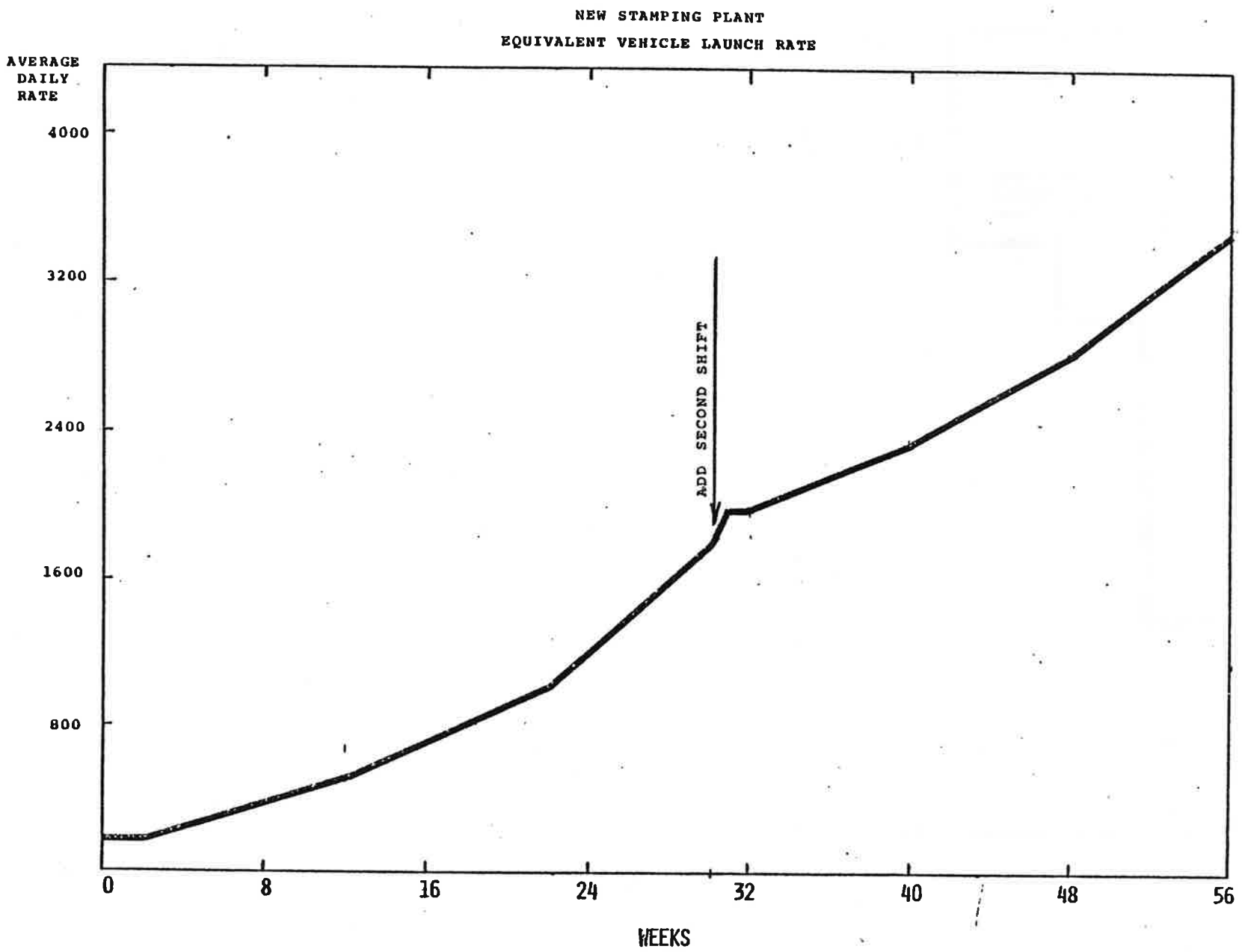
(NOTE: TIMING CHARTS CONTAINED IN THIS SECTION ALSO APPLY TO A HARDWARE PLANT)

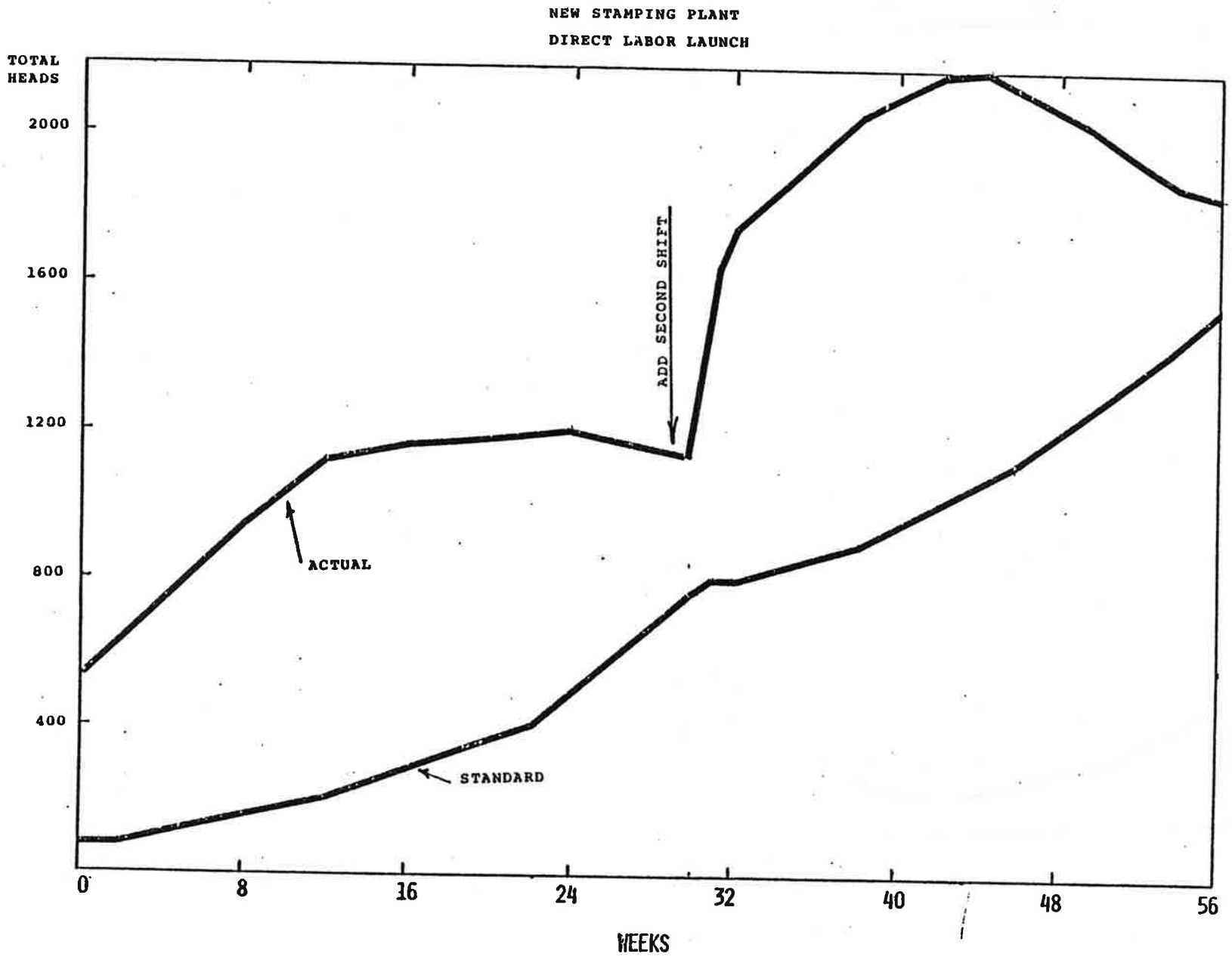
TIMING CHART
FOR
NEW PLANT

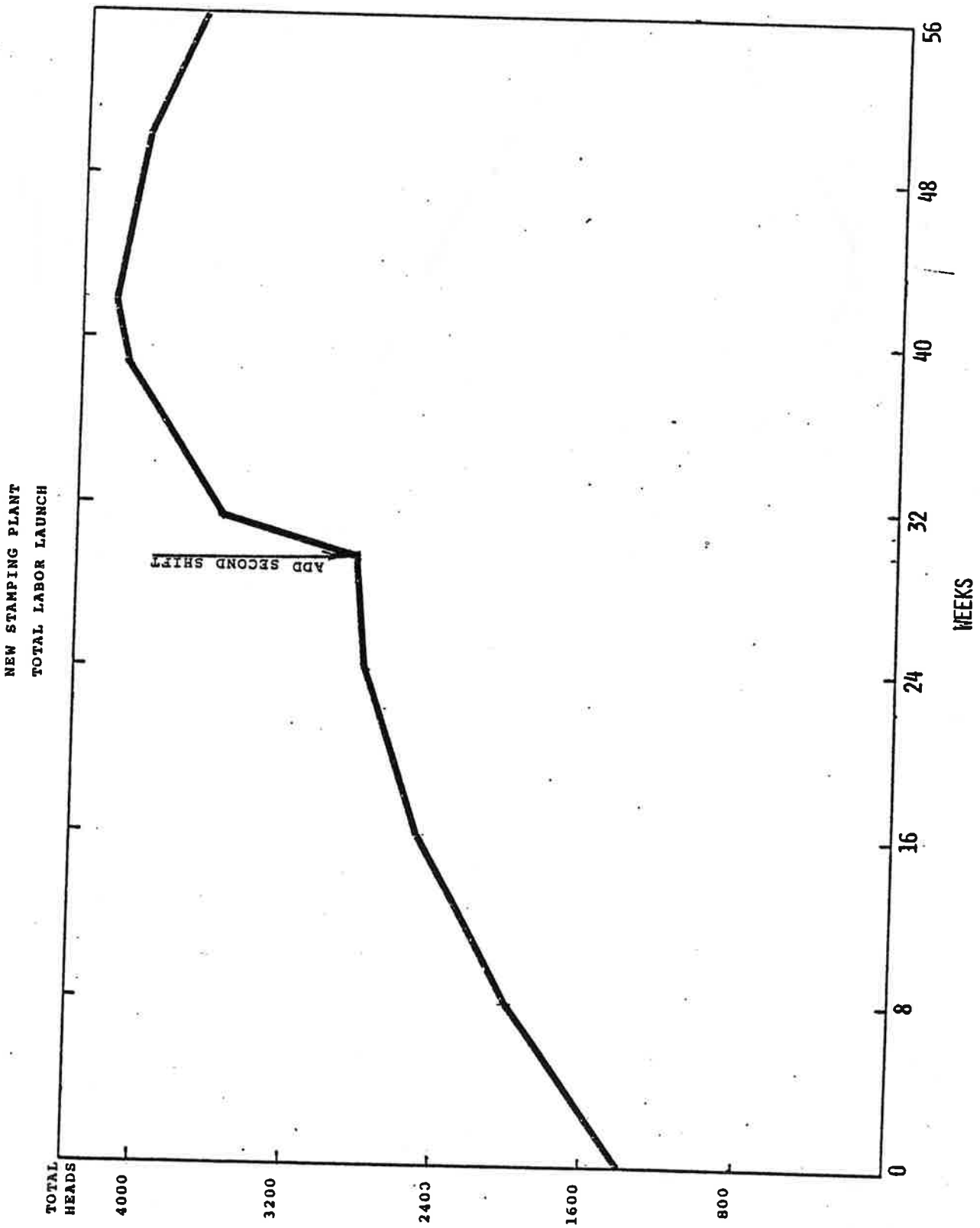
STAMPING PLANT




NEW STAMPING PLANT
TASK FORCE AND
PRE-PRODUCTION MANPOWER
TOTAL HEADS
1400
1200
1000
800
600
400
200
TASK FORCE
AVERAGE 200 PEOPLE
TOTAL PRE-PRODUCTION MANPOWER
117 WEEKS
13 WEEKS


NEW STAMPING PLANT
EQUIVALENT VEHICLE LAUNCH RATE
AVERAGE DAILY RATE
4000
3200
2400
1600
800
ADD SECOND SHIFT
0
8
16
24
32
40
48
56
WEEKS


NEW STAMPING PLANT
DIRECT LABOR LAUNCH
TOTAL HEADS
2000
1600
1200
800
400
ADD SECOND SHIFT
ACTUAL
STANDARD
0
8
16
24
32
40
48
56
WEEKS


NEW STAMPING PLANT
TOTAL LABOR LAUNCH
ADD SECOND SHIFT
TOTAL HEADS
4000
3200
2400
1600
800
0
8
16
24
32
40
48
56
WEEKS

STAMPING PLANT

($000)

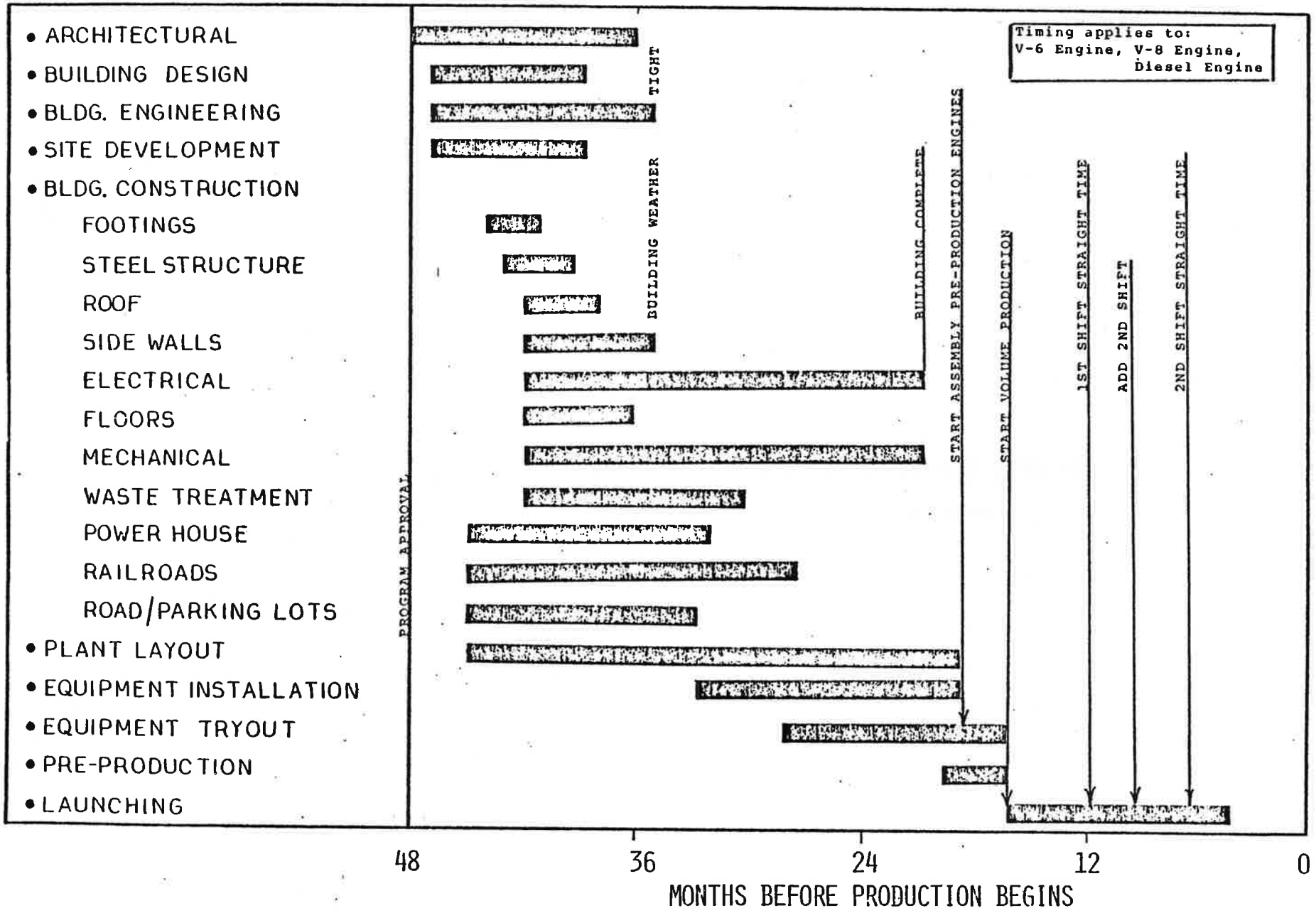
COST ELEMENT	PRE-PRODUCTION COSTS	LAUNCH COSTS	TOTAL COSTS
Manpower Costs			
- Direct Labor	$2,400	$31,400	$ 33,800
- Indirect Hourly	3,100	23,600	26,700
- Indirect Salary	23,100	10,900	34,000
Total Manpower Costs	$28,600	$65,900	$94,500
Other Manufacturing Expenses			
- Maintenance Materials	390	950	1,340
- Tools, Perishable	10	20	30
- Spoilage	800	1,900	2,700
- Utilities	760	1,800	2,560
- Taxes/Insurance	560	1,300	1,860
- Depreciation	1,100	9,000	10,100
- Supplies & Other	600	1,400	2,000
Total Other Manufacturing Expenses	4,220	16,370	20,590
TOTAL COSTS	$32,820	$82,870	$115,090

ENGINE PLANT

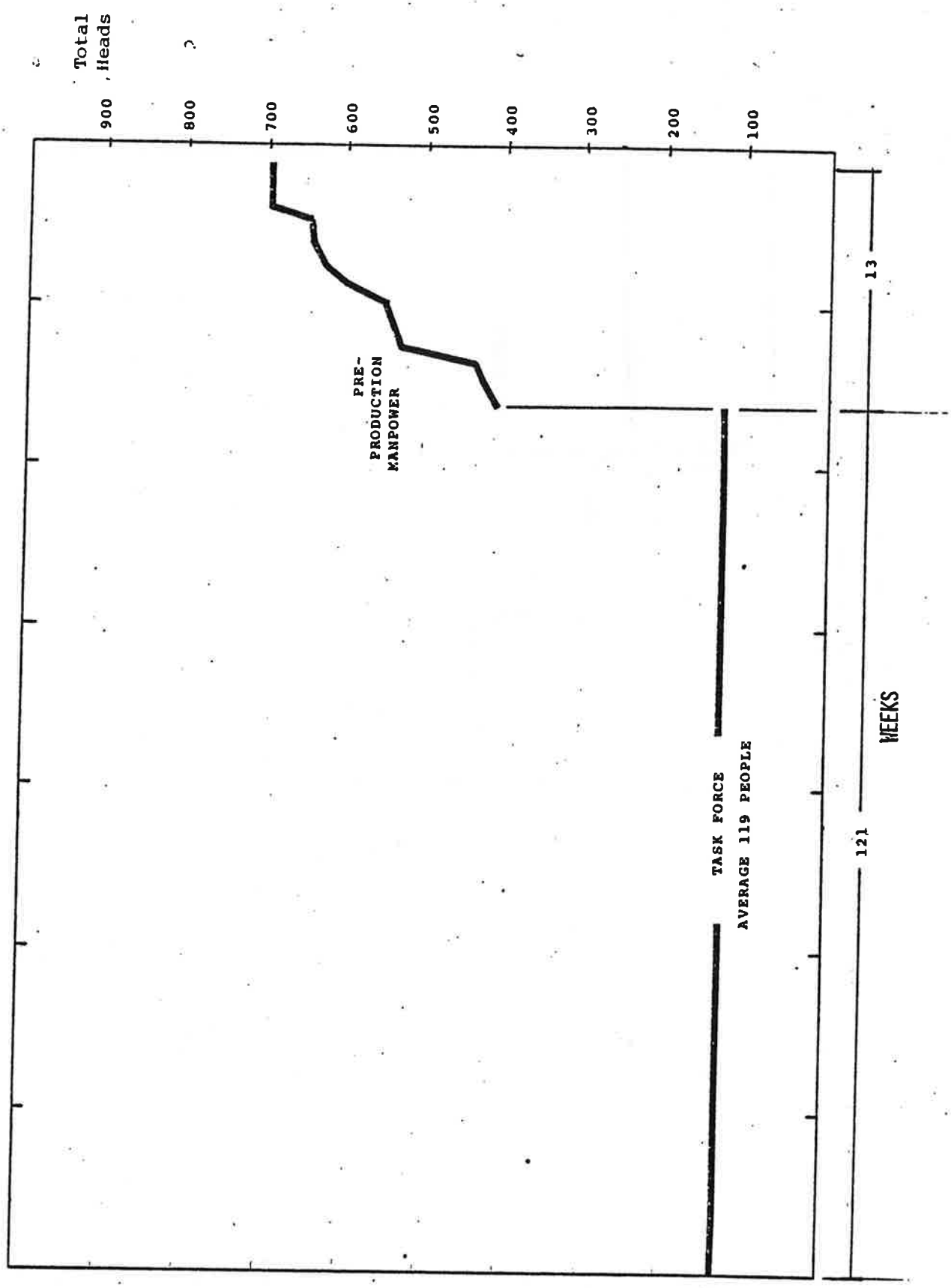
(NOTE: TIMING CHARTS CONTAINED IN THIS SECTION APPLY TO V-6, V-8 GASOLINE AND DIESEL ENGINE PLANTS)

TIMING CHART
FOR
NEW PLANT

ENGINE PLANT

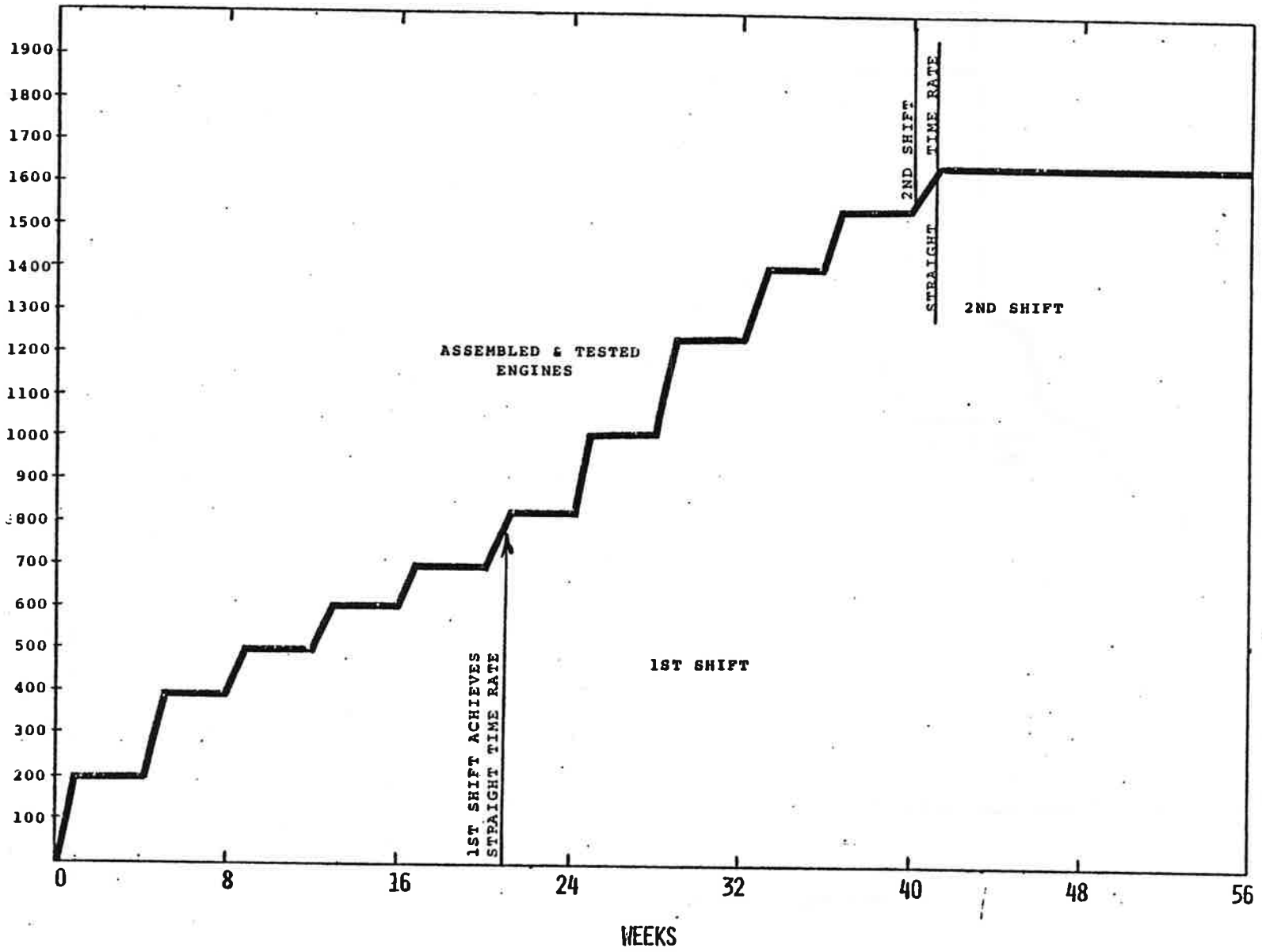


4 CYLINDER ENGINE PLANT PRE-PRODUCTION MANPOWER

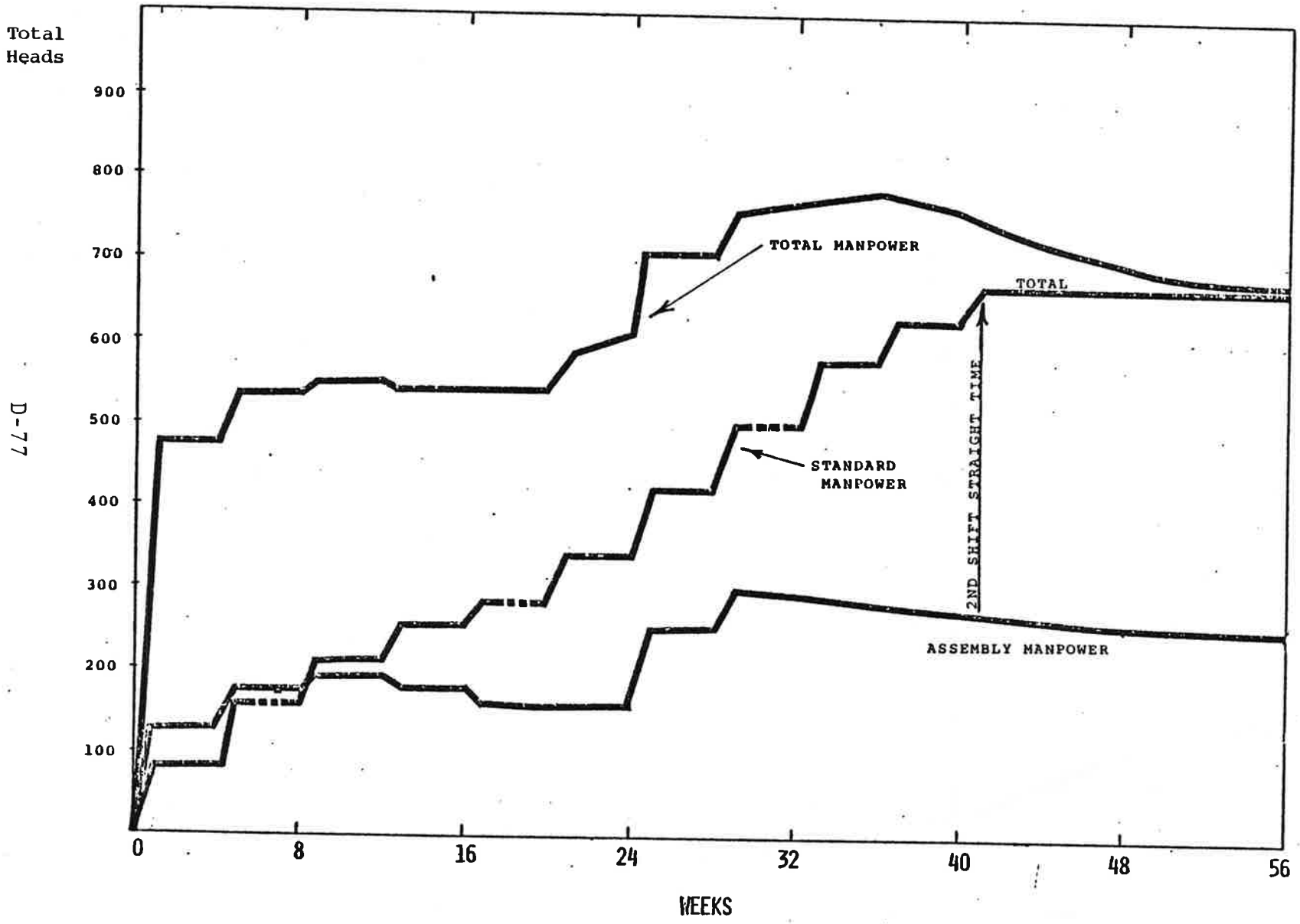


ENGINE PLANT LAUNCH RATE - NEW PLANT

FOUR CYLINDER ENGINE PLANT

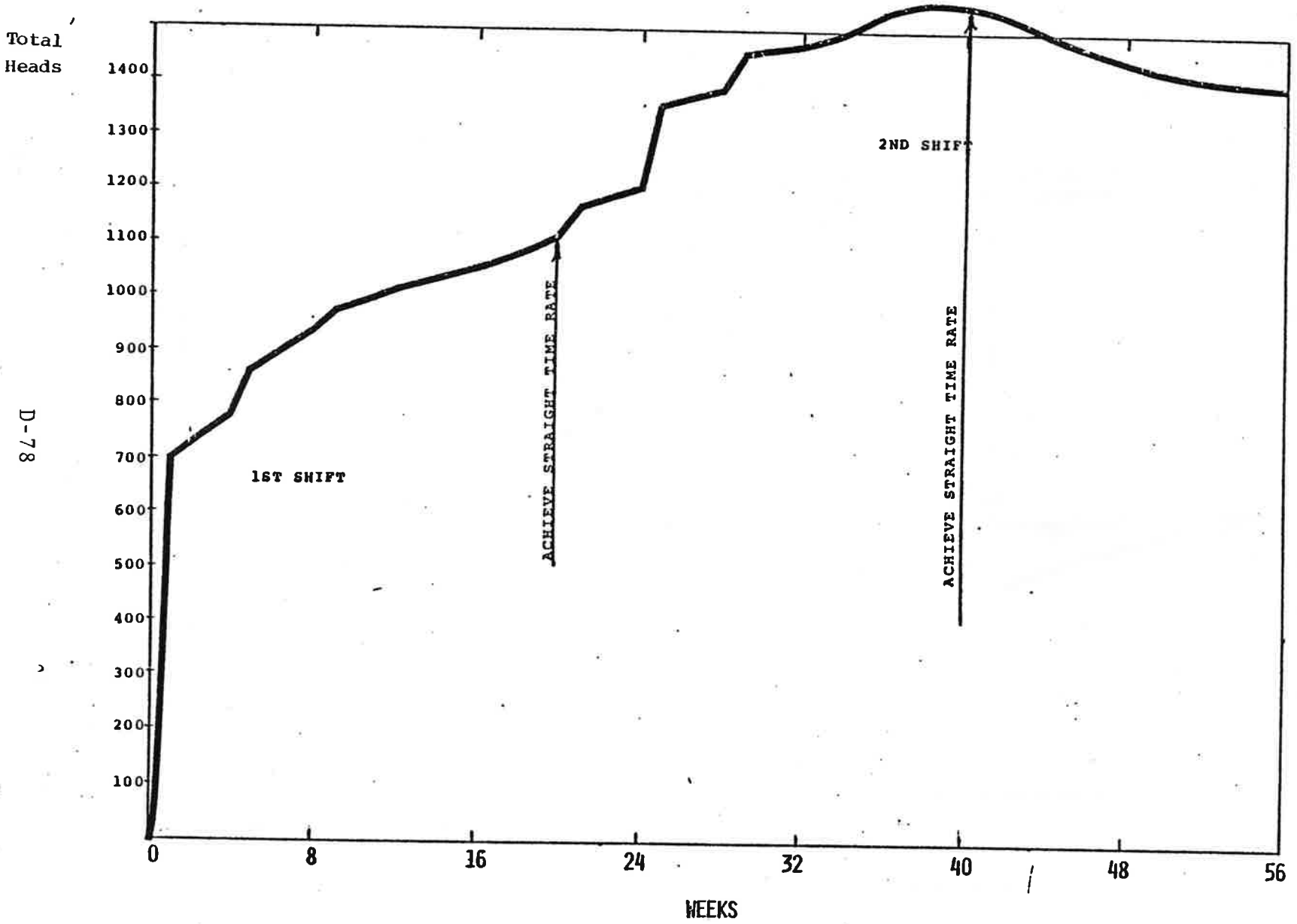


4 CYLINDER ENGINE PLANT LAUNCH DIRECT LABOR MANPOWER



ENGINE PLANT LAUNCH - TOTAL MANPOWER NEW PLANT

FOUR CYLINDER ENGINE PLANT



FOUR CYLINDER ENGINE PLANT

($000)

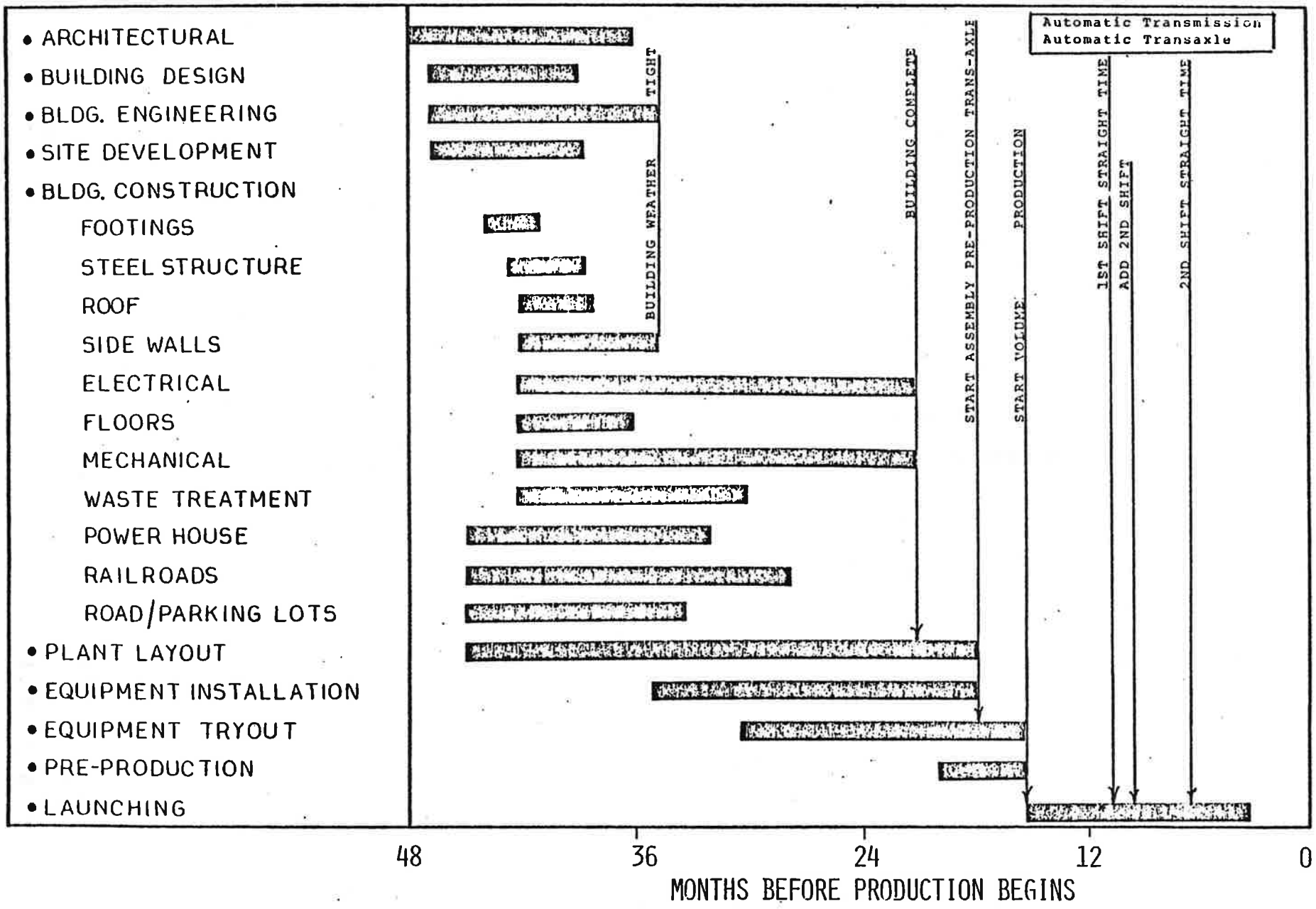
COST ELEMENT	PRE-PRODUCTION COSTS	LAUNCH COSTS	TOTAL COSTS
Manpower Costs			
- Direct Labor	$ 3,380	$ 7,816	$ 11,196
- Indirect Hourly	1,095	3,569	4,664
- Indirect Salary	13,612	2,422	16,034
Total Manpower Costs	$18,087	$ 13,807	$ 31,894
Other Manufacturing Expenses			
- Maintenance Materials	89	98	187
- Tools, Perishable	19	46	65
- Spoilage	197	218	415
- Utilities	471	522	993
- Taxes/Insurance	263	291	554
- Depreciation	441	2,556	2,997
- Supplies & Other	225	249	474
Total Other Manufacturing Expenses	1,705	3,980	5,685
TOTAL COSTS	$19,792	$17,787	$ 37,579

MANUAL TRANSAXLE

(NOTE: TIMING CHARTS CONTAINED IN THIS SECTION ALSO APPLY TO AUTOMATIC TRANSMISSION AND TRANSAXLE PLANTS)

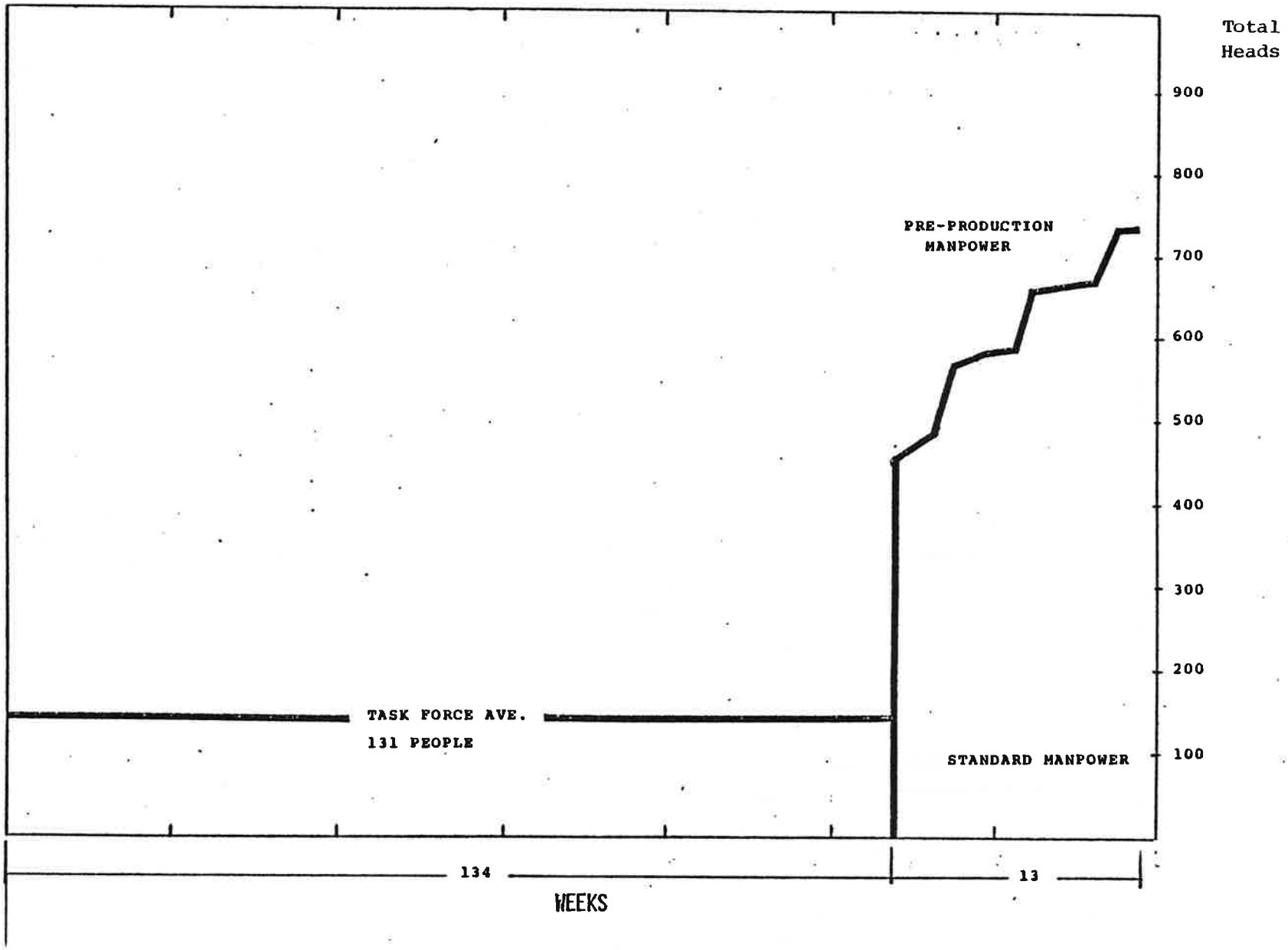
TIMING CHART
FOR
NEW PLANT

MANUAL TRANSAXLE



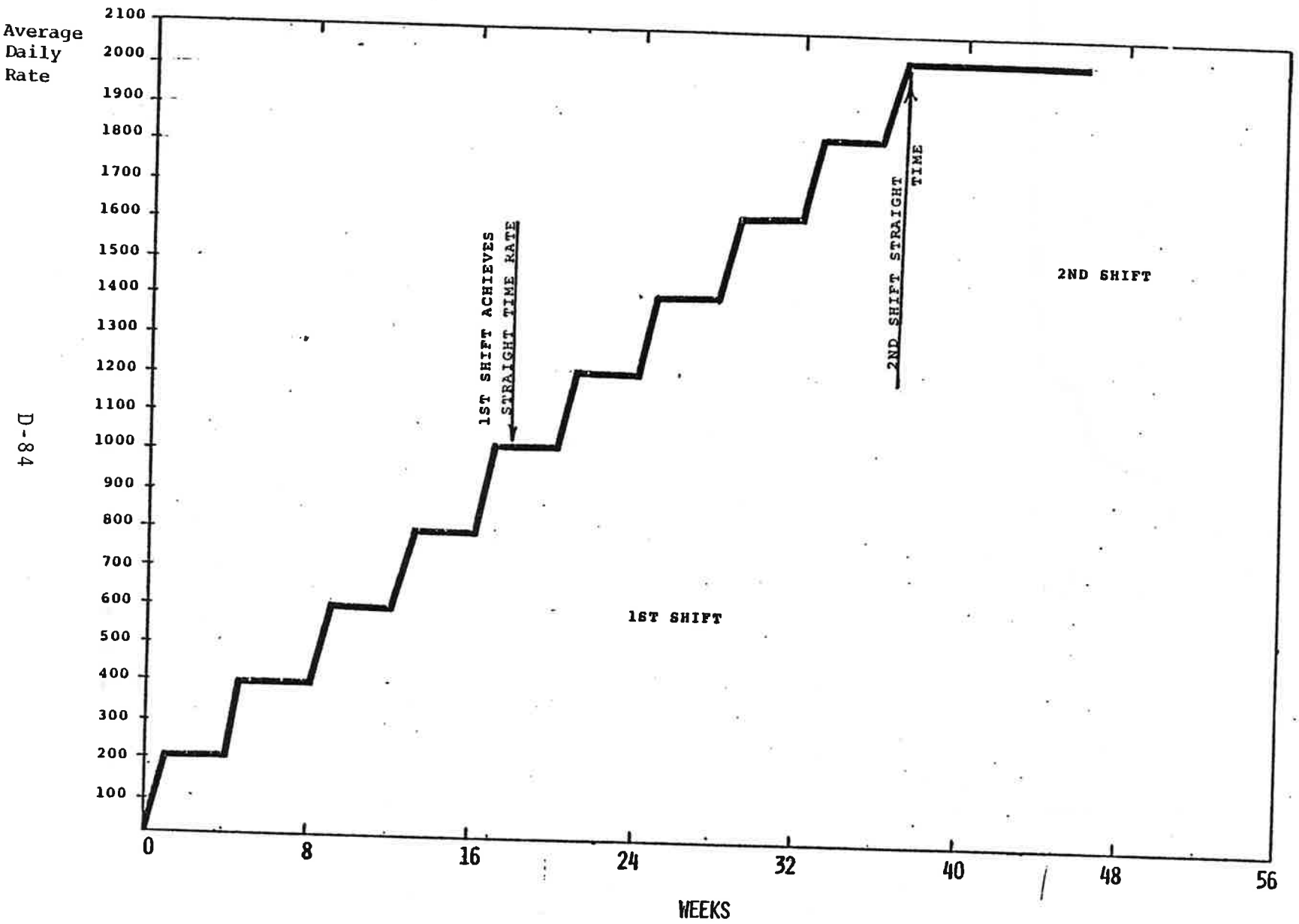
MANUAL TRANSAXLE PLANT PRE-PRODUCTION MANPOWER

(DIRECT & INDIRECT MANPOWER CONSIDERED
. INDIRECT DURING PRE-PRODUCTION PERIOD)



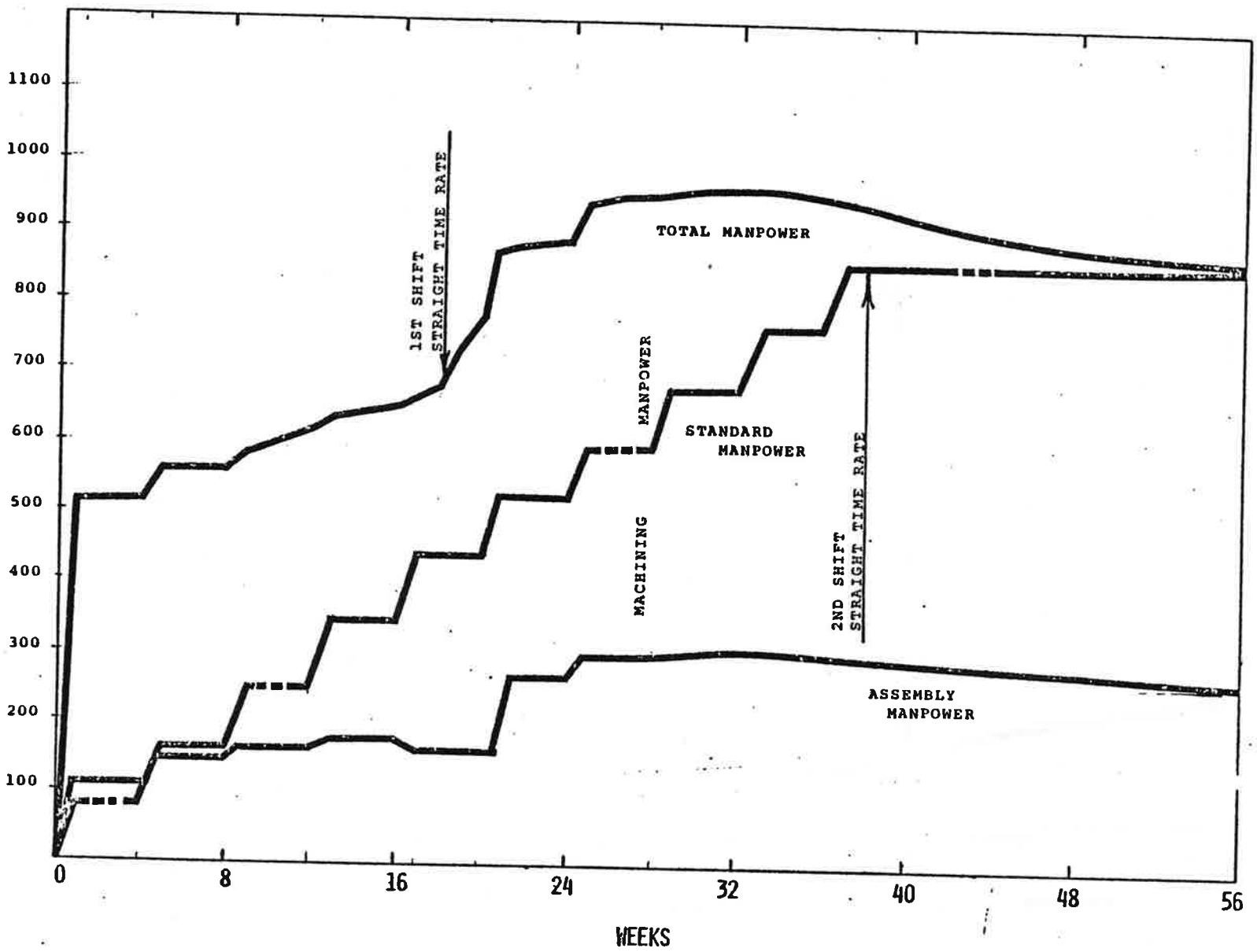
MANUAL TRANSAXLE PLANT LAUNCH RATE

NEW PLANT

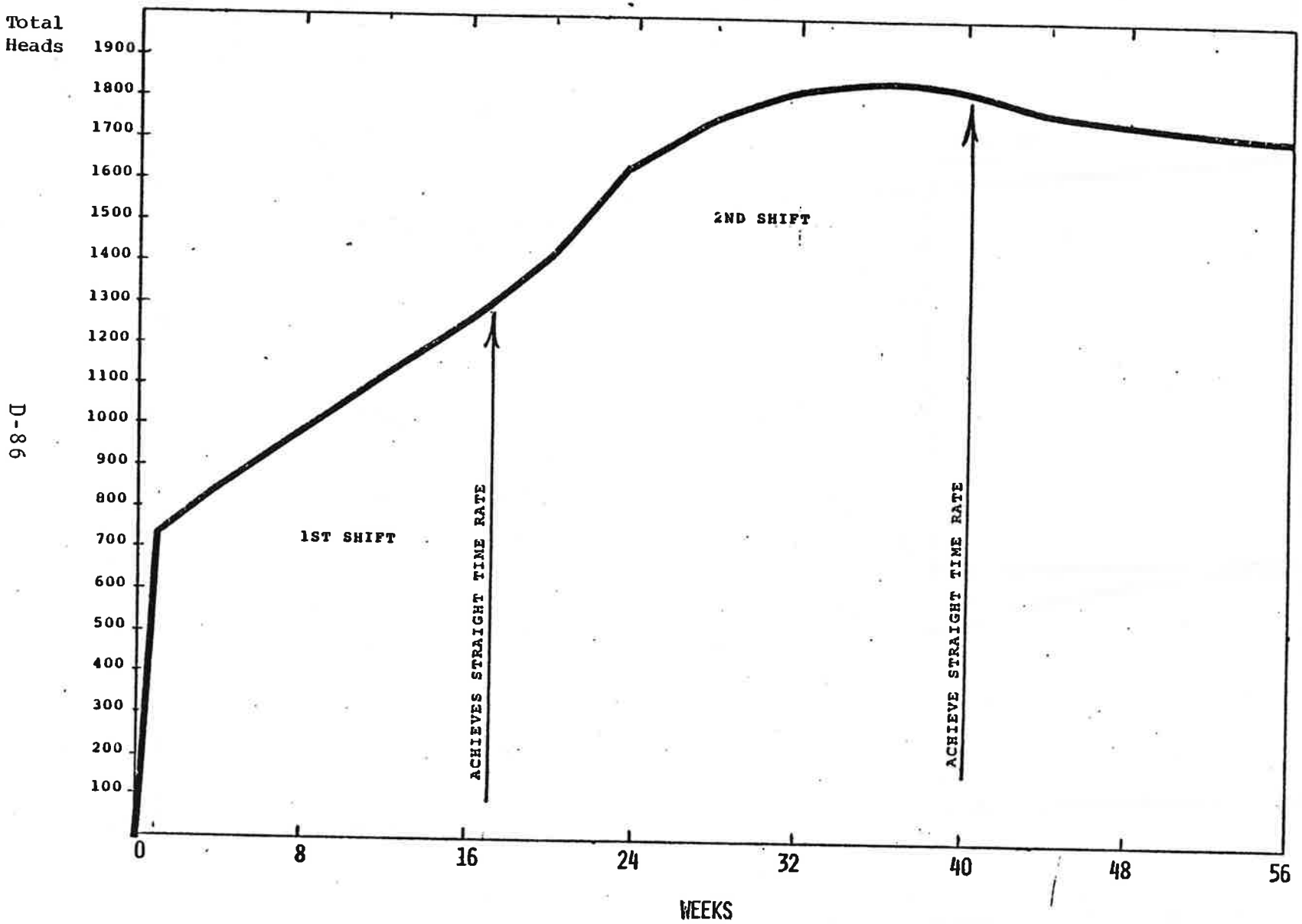


MANUAL TRANSAXLE PLANT LAUNCH - DIRECT MANPOWER

NEW PLANT



MANUAL TRANSAXLE PLANT LAUNCH - TOTAL MANPOWER NEW PLANT



MANUAL TRANSAXLE PLANT

($000)

COST ELEMENT	PRE-PRODUCTION COSTS	LAUNCH COSTS	TOTAL COSTS
Manpower Costs			
- Direct Labor	$ 3,500	$ 7,900	$11,400
- Indirect Hourly	990	3,400	4,390
- Indirect Salary	16,000	2,400	18,400
Total Manpower Costs	$20,490	$ 13,700	$34,190
Other Manufacturing Expenses			
- Maintenance Materials	32	41	73
- Tools, Perishable	5	7	12
- Spoilage	400	520	920
- Utilities	110	457	567
- Taxes/Insurance	151	194	345
- Depreciation	400	1,400	1,800
- Supplies & Other	66	415	481
Total Other Manufacturing Expenses	1,164	3,034	4,198
TOTAL COSTS	$21,654	$ 16,734	$ 38,388

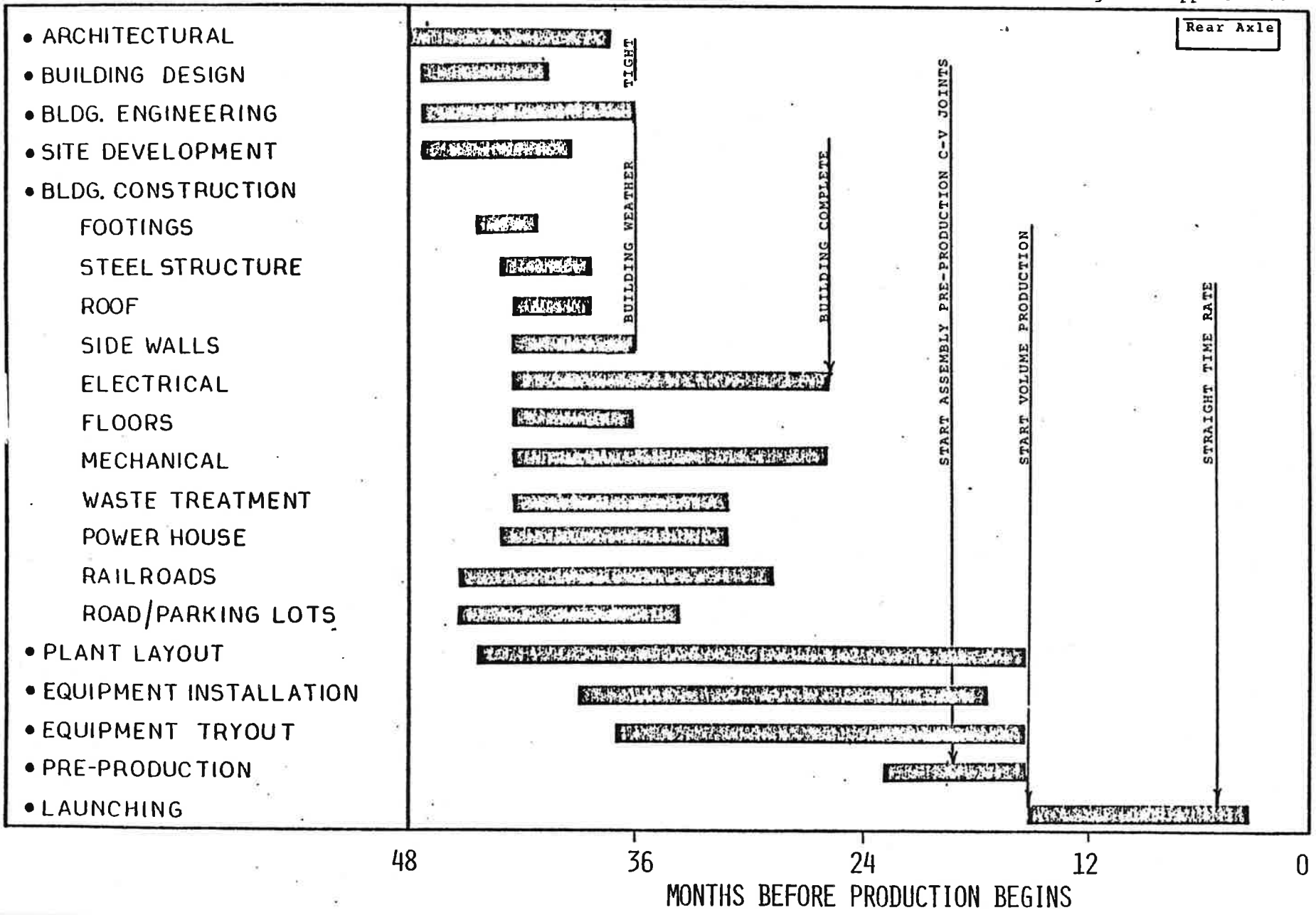
CV JOINTS PLANT

(NOTE: TIMING CHARTS CONTAINED IN THIS SECTION ALSO APPLY TO A REAR AXLE PLANT.)

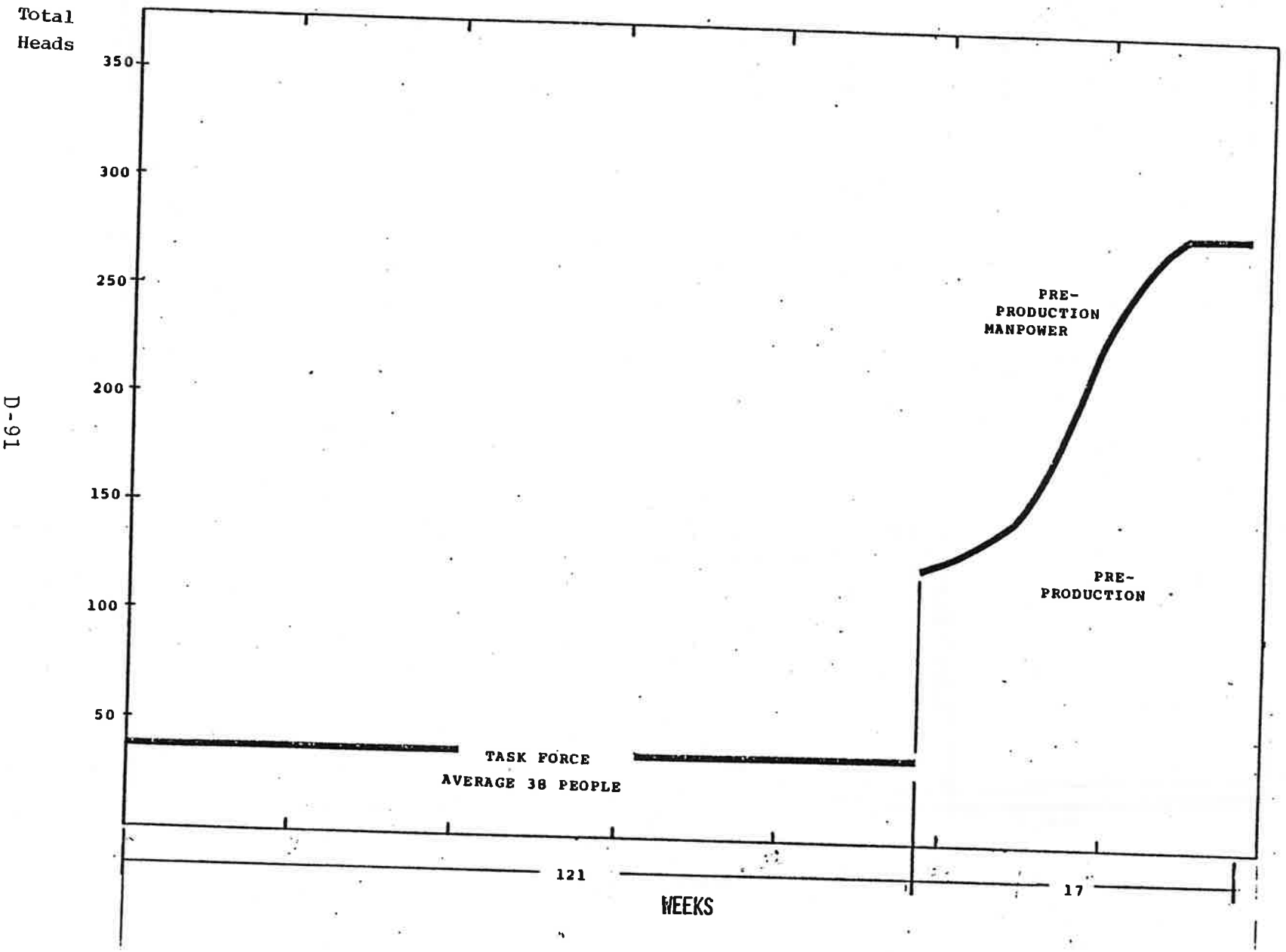
TIMING CHART
FOR
NEW PLANT

C-V JOINTS - NEW PLANT

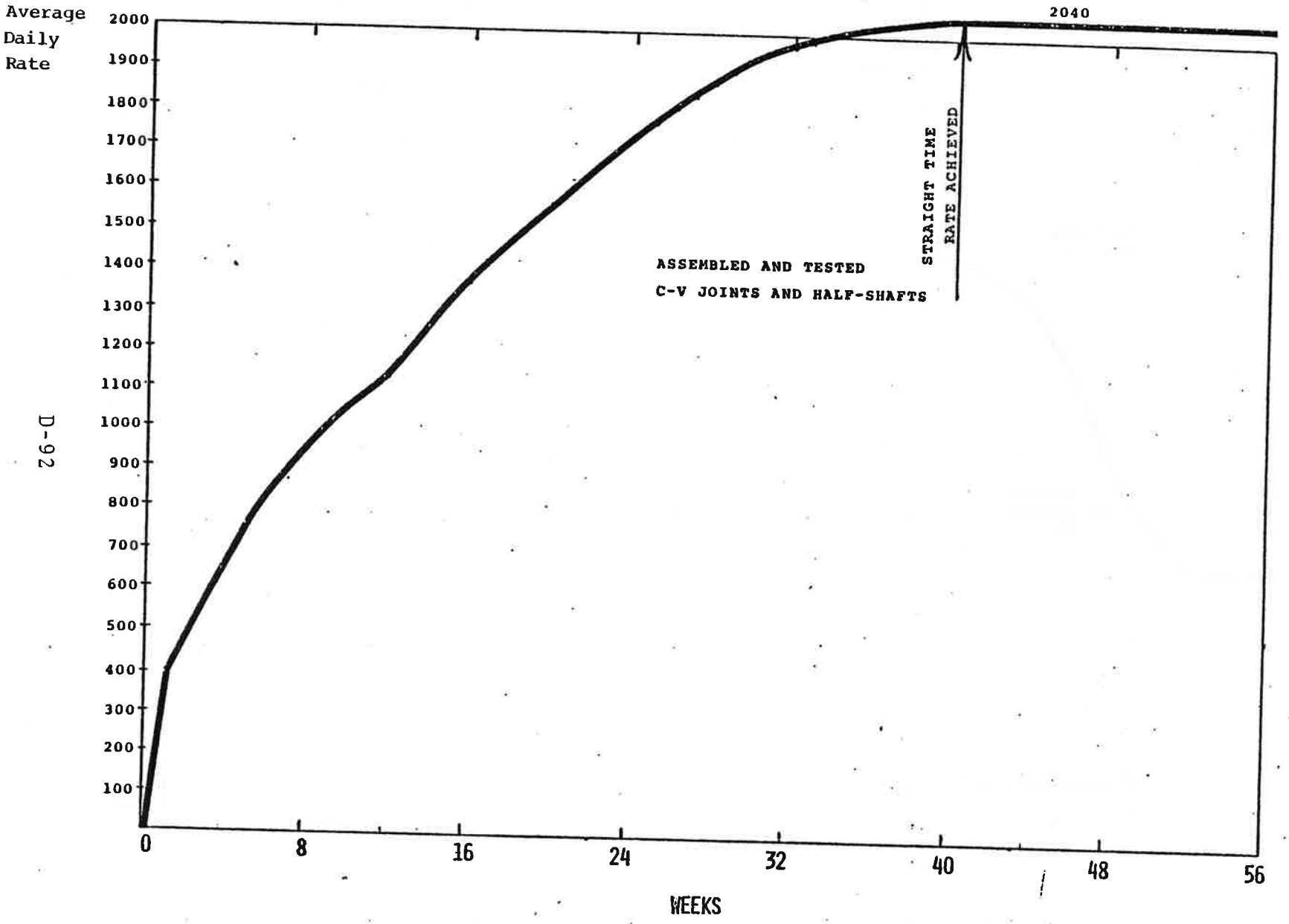
Timing also applies to:



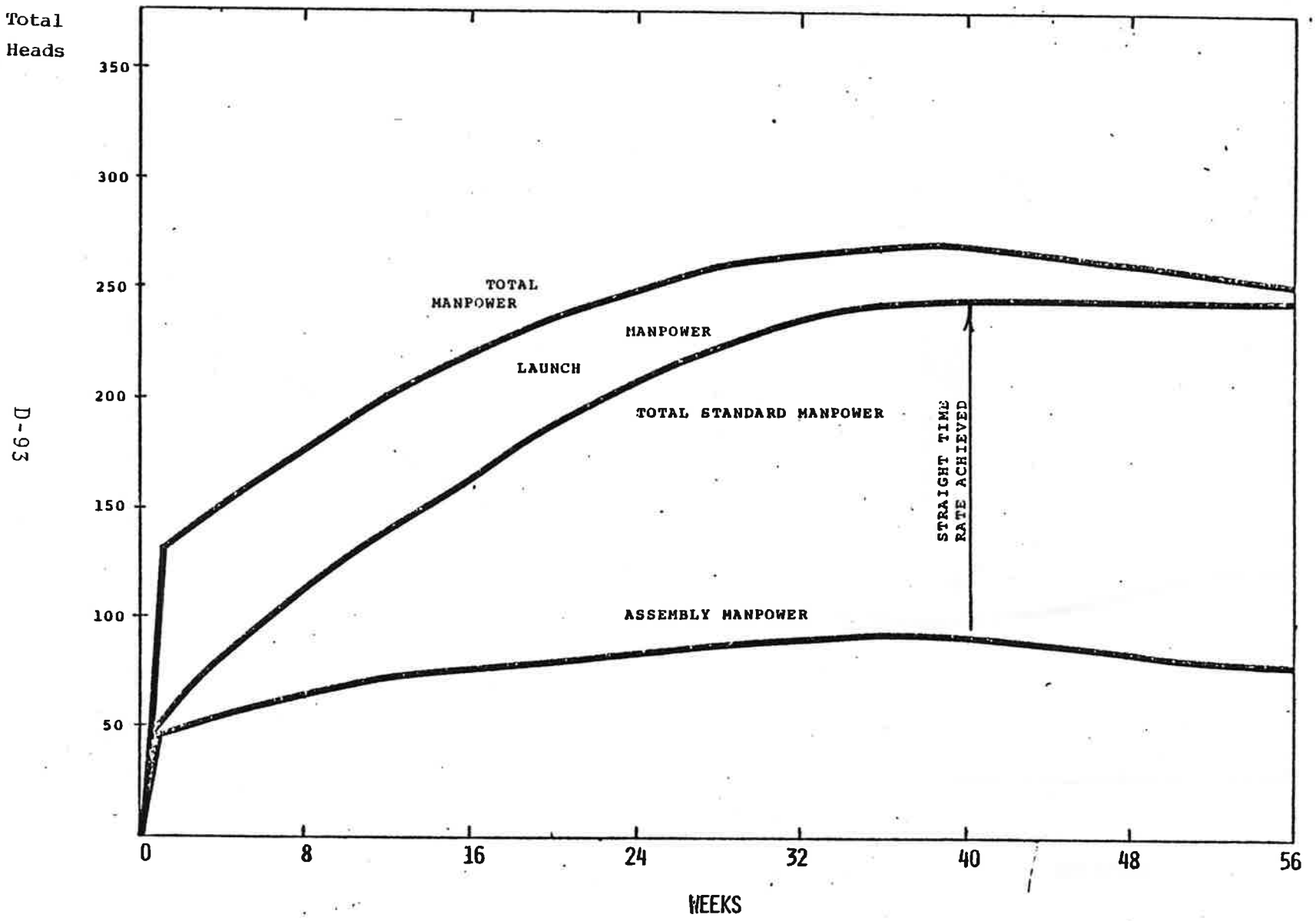
C-V JOINTS PLANT PRE-PRODUCTION MANPOWER



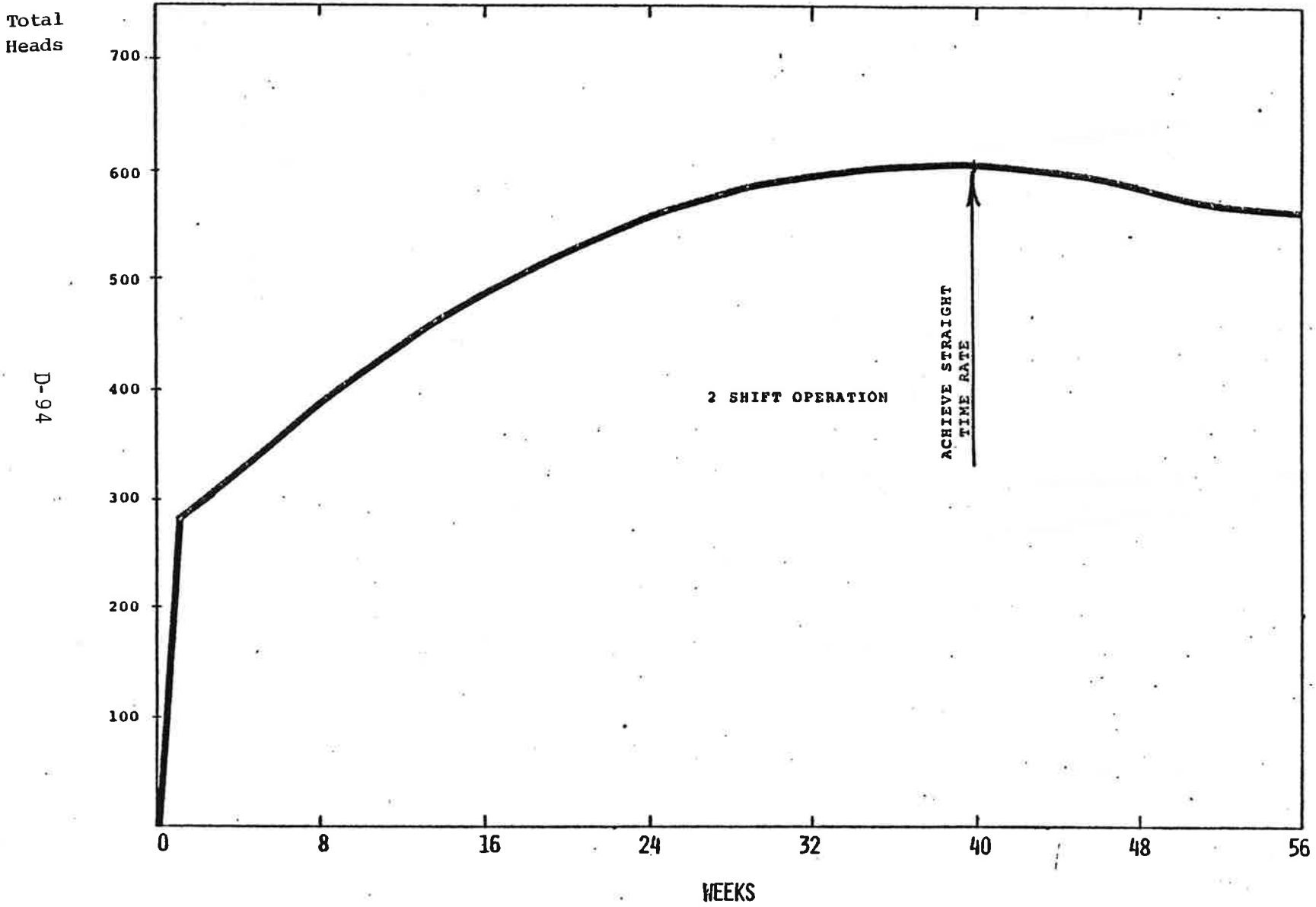
C-V JOINTS PLANT LAUNCH RATE - NEW PLANT



C-V JOINTS PLANT LAUNCH DIRECT LABOR MANPOWER



C-V JOINTS PLANT LAUNCH - TOTAL MANPOWER NEW PLANT



C.V. JOINTS PLANT

($000)

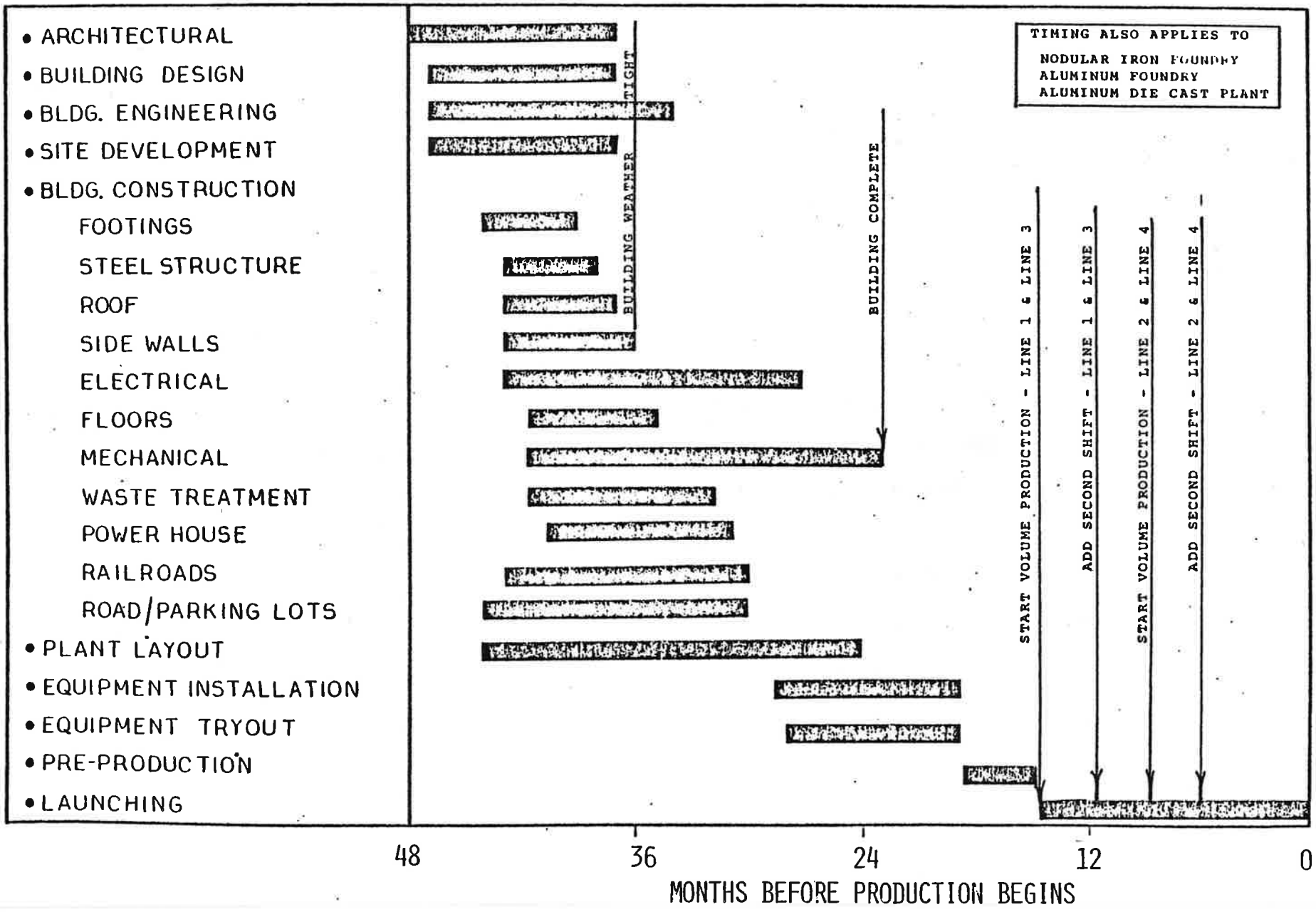
COST ELEMENT	PRE-PRODUCTION COSTS	LAUNCH COSTS	TOTAL COSTS
Manpower Costs			
- Direct Labor	$ 968	$1,348	$ 2,316
- Indirect Hourly	1,007	1,396	2,403
- Indirect Salary	4,471	255	4,726
Total Manpower Costs	6,446	2,999	9,445
Other Manufacturing Expenses			
- Maintenance Materials	100	640	740
- Tools, Perishable	44	280	324
- Spoilage	26	170	196
- Utilities	130	890	1,020
- Taxes/Insurance	4	28	32
- Depreciation	22	1,030	1,052
- Supplies and Other	39	500	539
Total Other Manufacturing Expenses	365	3,538	3,903
TOTAL COSTS	$6,811	$6,537	$13,348

GREY IRON FOUNDRY

(NOTE: TIMING CHARTS CONTAINED IN THIS SECTION ALSO APPLY TO NODULAR IRON AND ALUMINUM FOUNDRIES AND ALUMINUM DIE CASTING PLANTS)

TIMING CHART FOR NEW PLANT

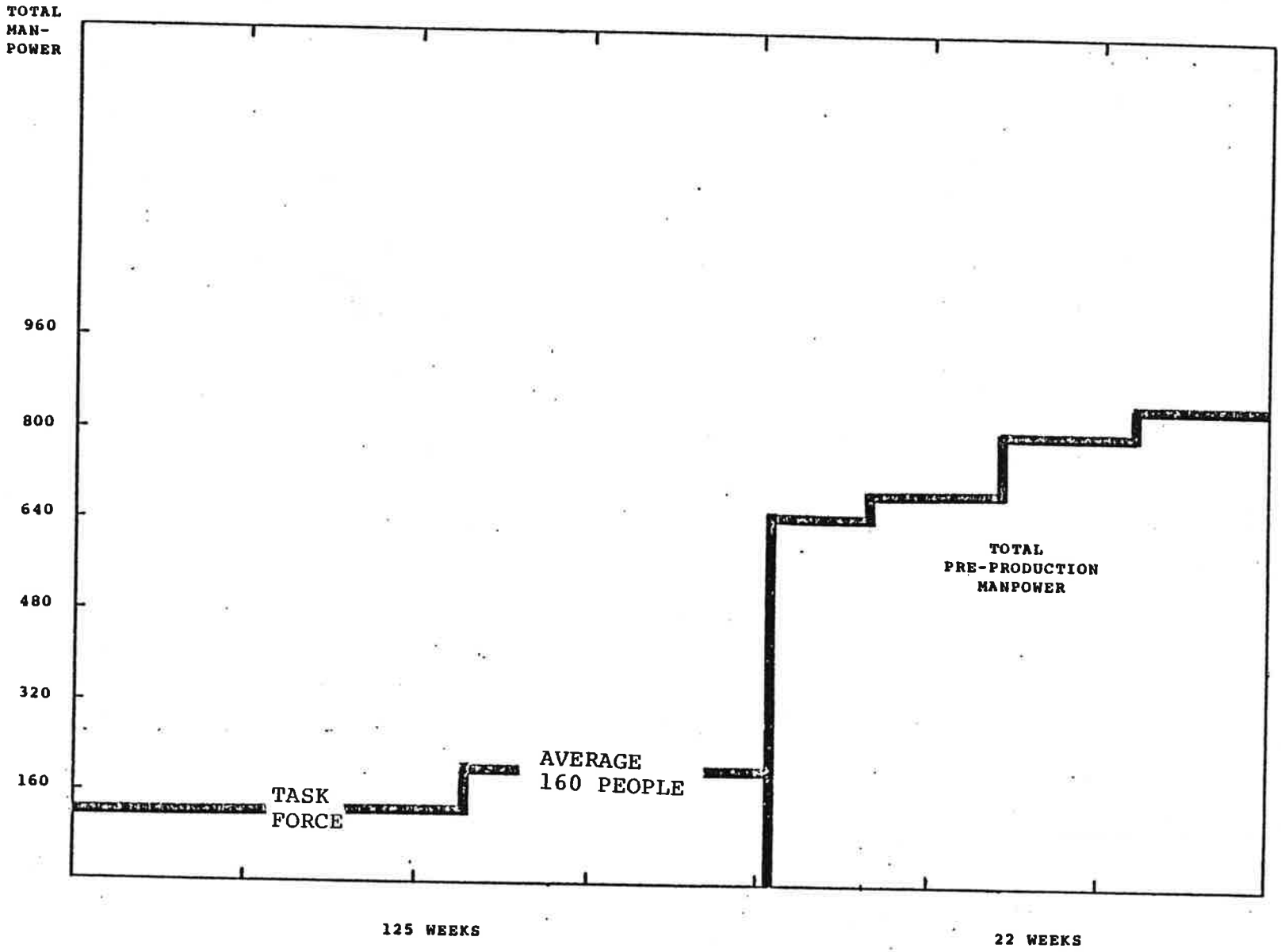
GREY IRON FOUNDRY



GREY IRON FOUNDRY

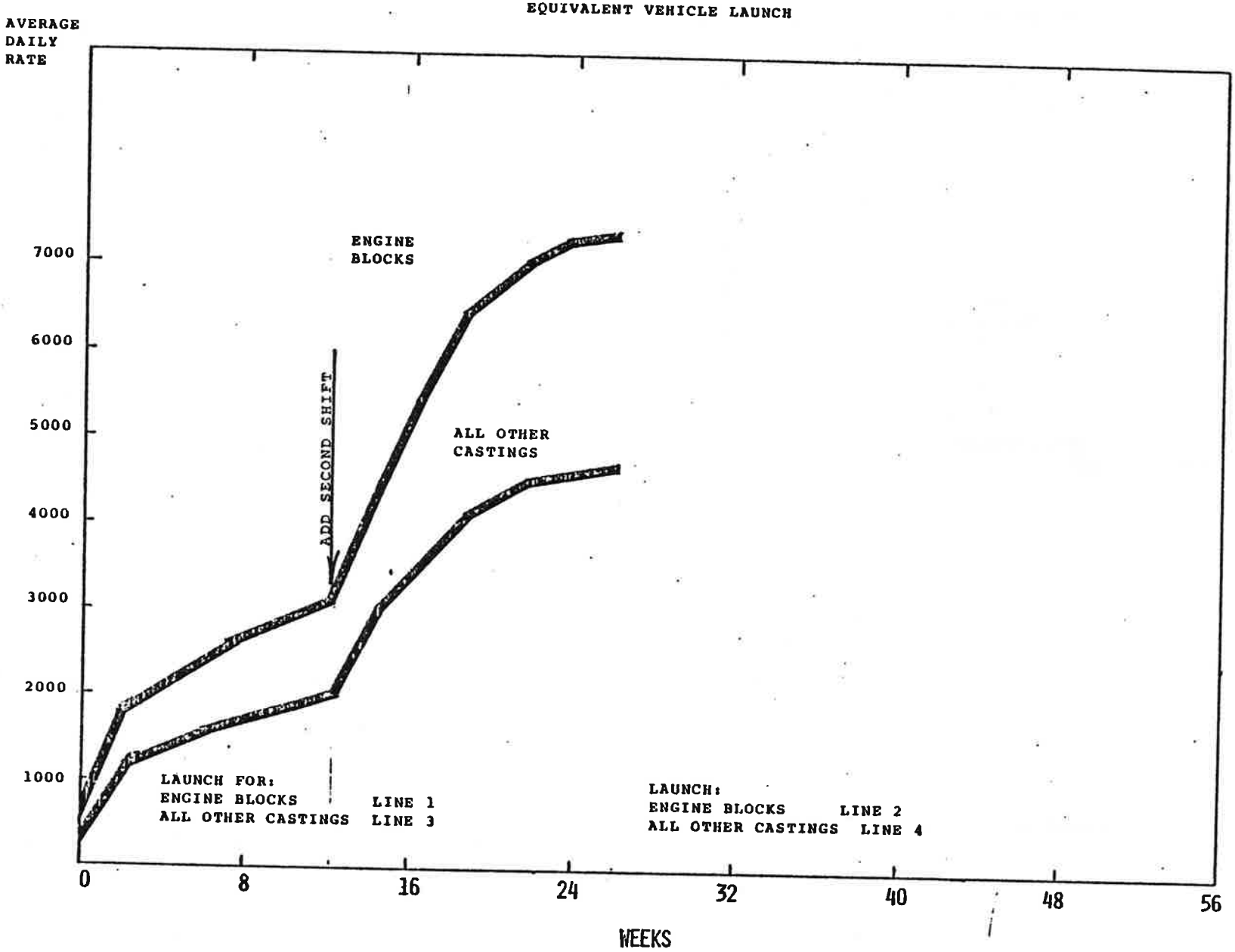
TASK FORCE AND

PRE-PRODUCTION MANPOWER



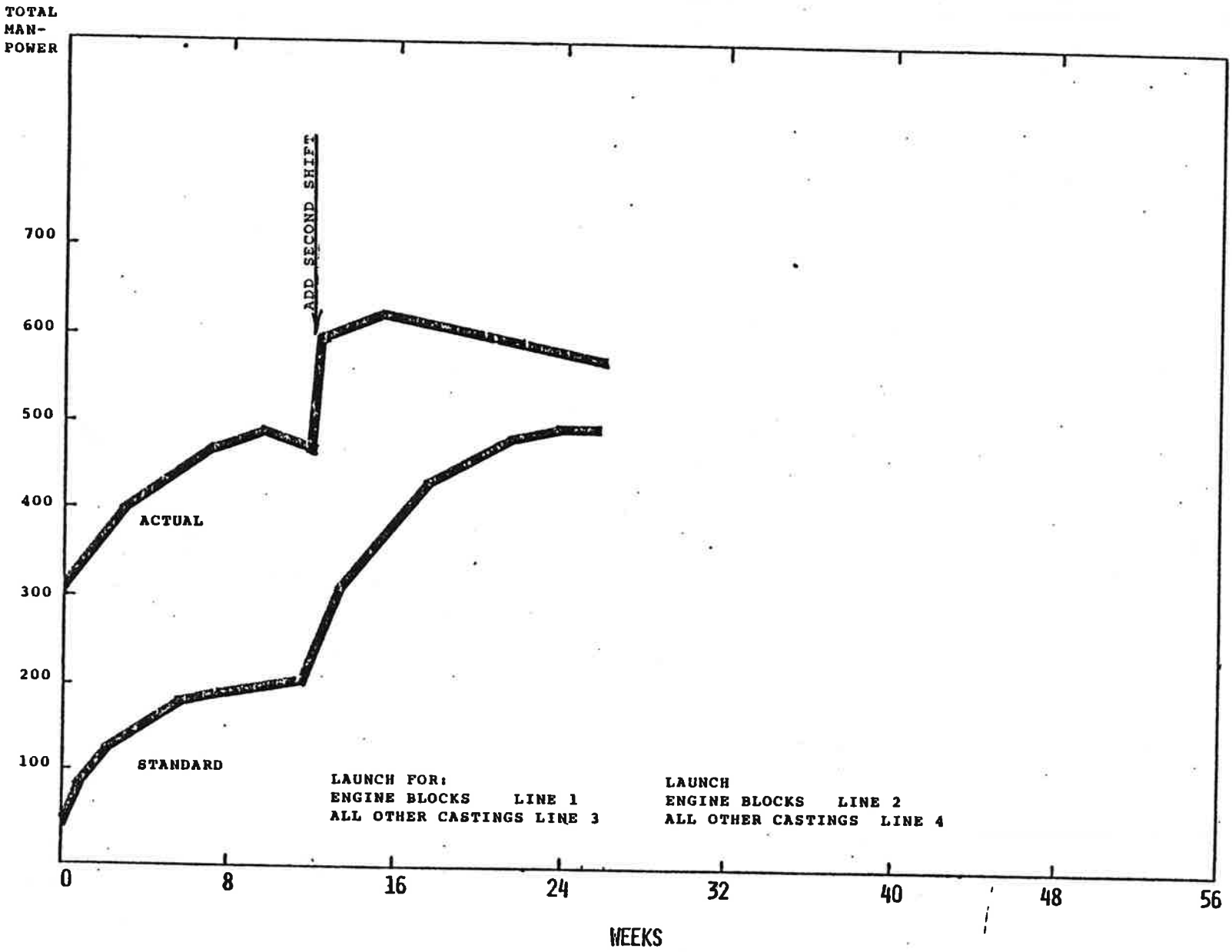
GREY IRON FOUNDRY

EQUIVALENT VEHICLE LAUNCH



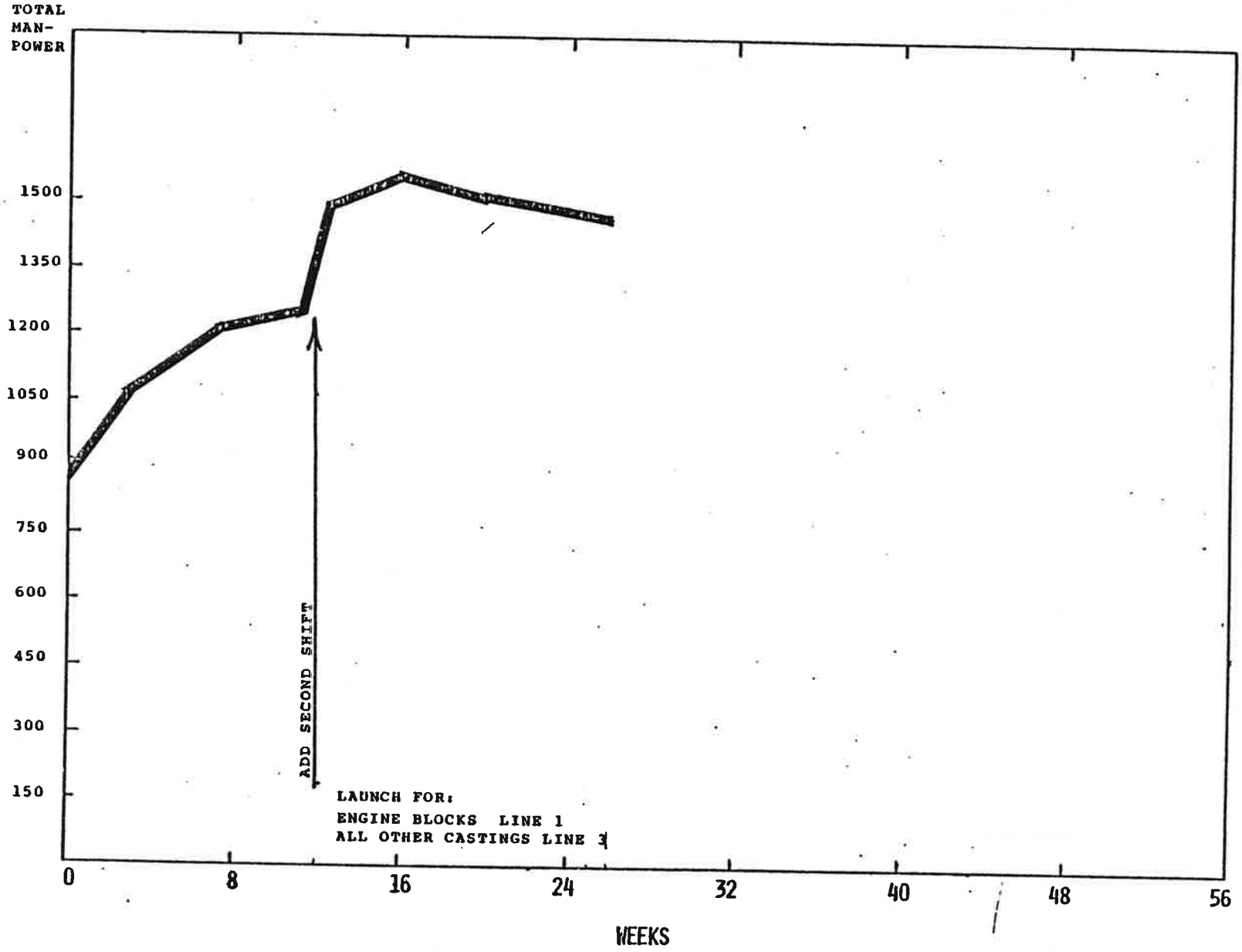
GREY IRON FOUNDRY

DIRECT LABOR LAUNCH



GREY IRON FOUNDRY

TOTAL LABOR LAUNCH



GREY IRON FOUNDRY PLANT

($000)

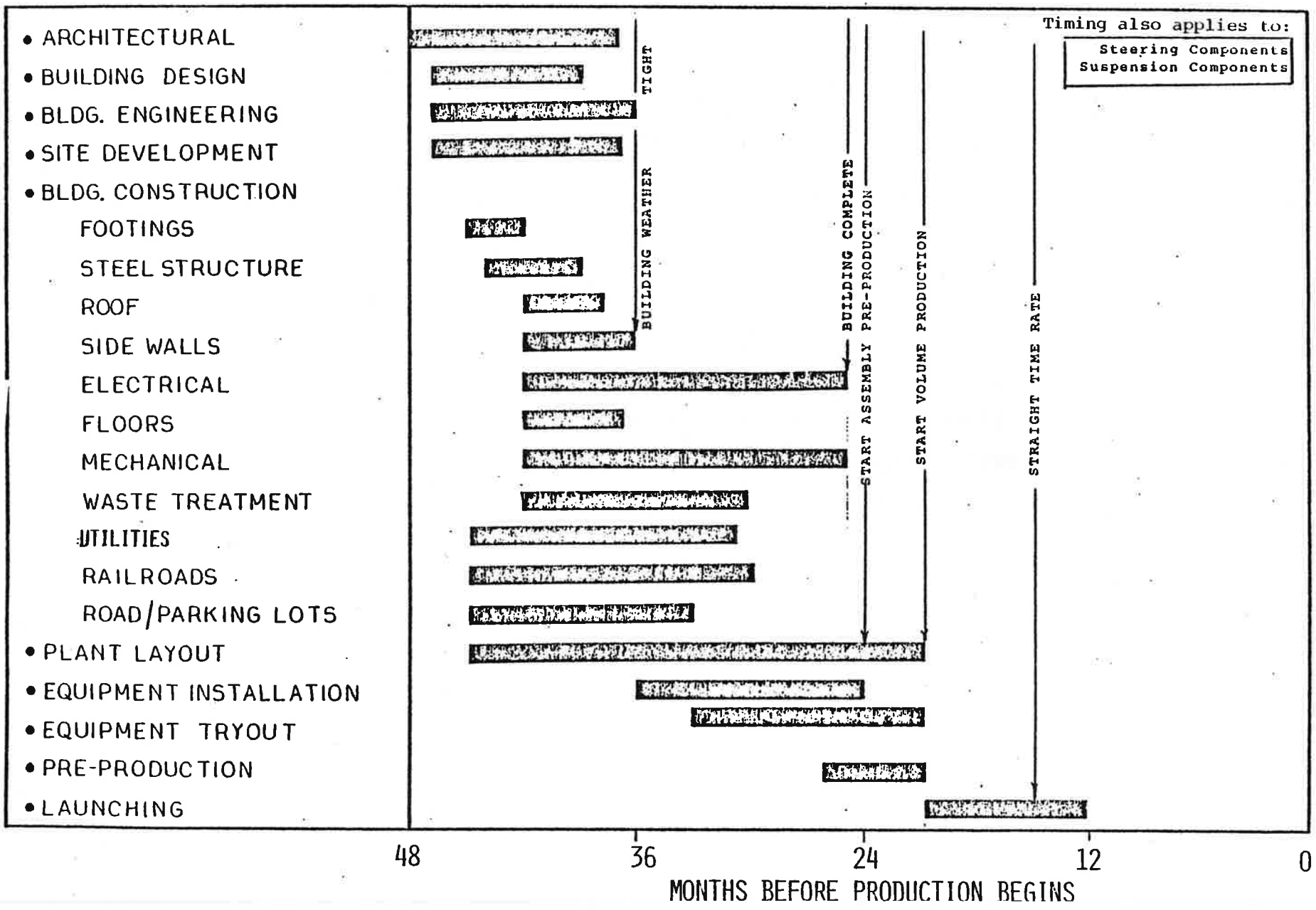
COST ELEMENT	PRE-PRODUCTION COSTS	LAUNCH COSTS	TOTAL COSTS
Manpower Costs			
- Direct Labor	$3,694	$1,296	$4,990
- Indirect Hourly	4,496	1,440	5,936
- Indirect Salary	21,860	2,732	24,592
Total Manpower Costs	30,050	5,468	35,518
Other Manufacturing Expenses			
- Maintenance Materials	88	588	676
- Tools, Perishable	16	110	126
- Spoilage	15	196	211
- Utilities	147	982	1,129
- Taxes/Insurance	25	165	190
- Depreciation	34	1,476	1,510
- Supplies and Other	44	294	338
Total Other Manufacturing Expenses	369	3,811	4,180
TOTAL COSTS	$30,419	$9,279	$39,698

BRAKE COMPONENTS PLANT

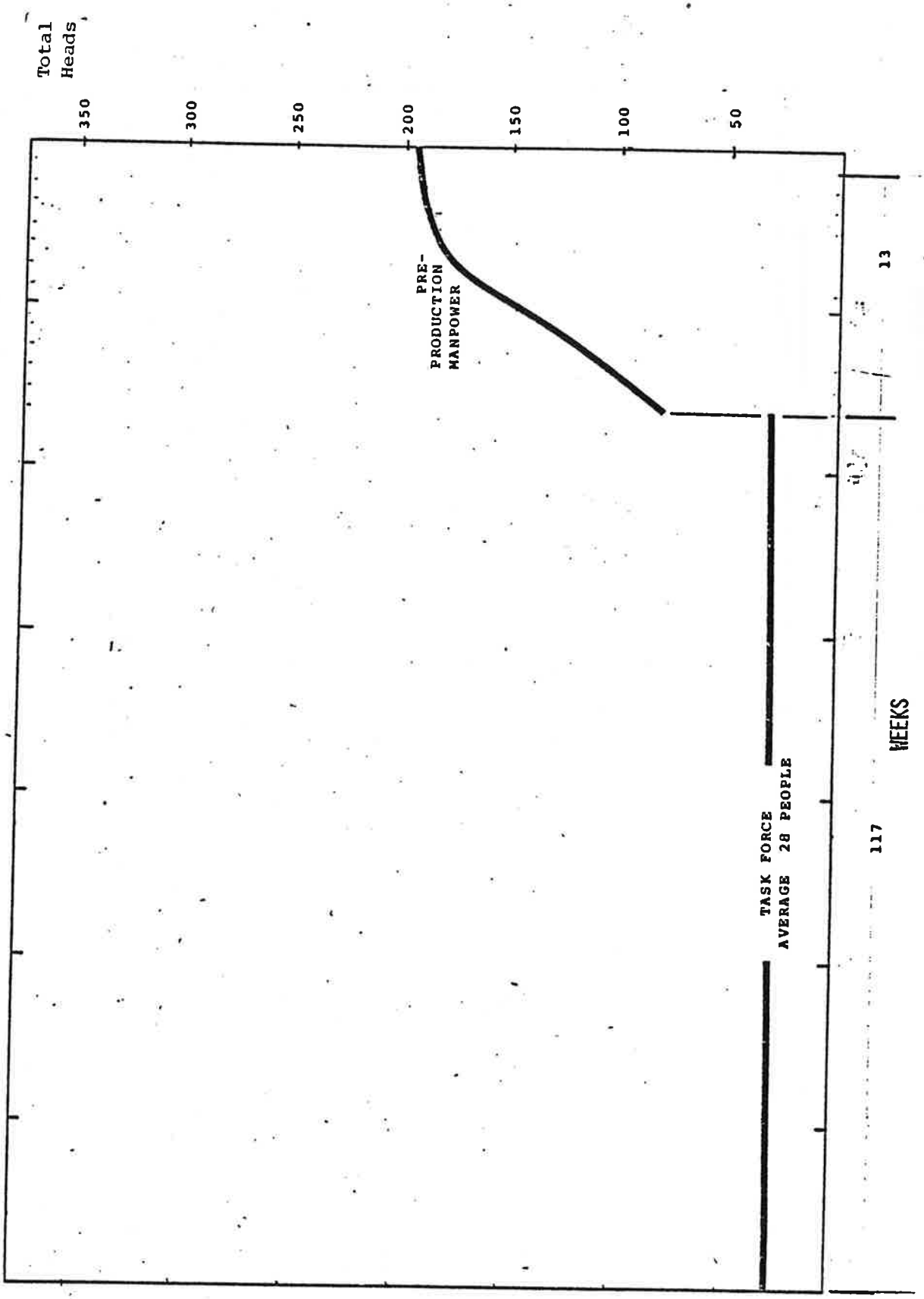
(NOTE: TIMING CHARTS CONTAINED IN THIS SECTION ALSO APPLY TO STEERING AND SUSPENSION COMPONENTS PLANTS)

TIMING CHART FOR NEW PLANT

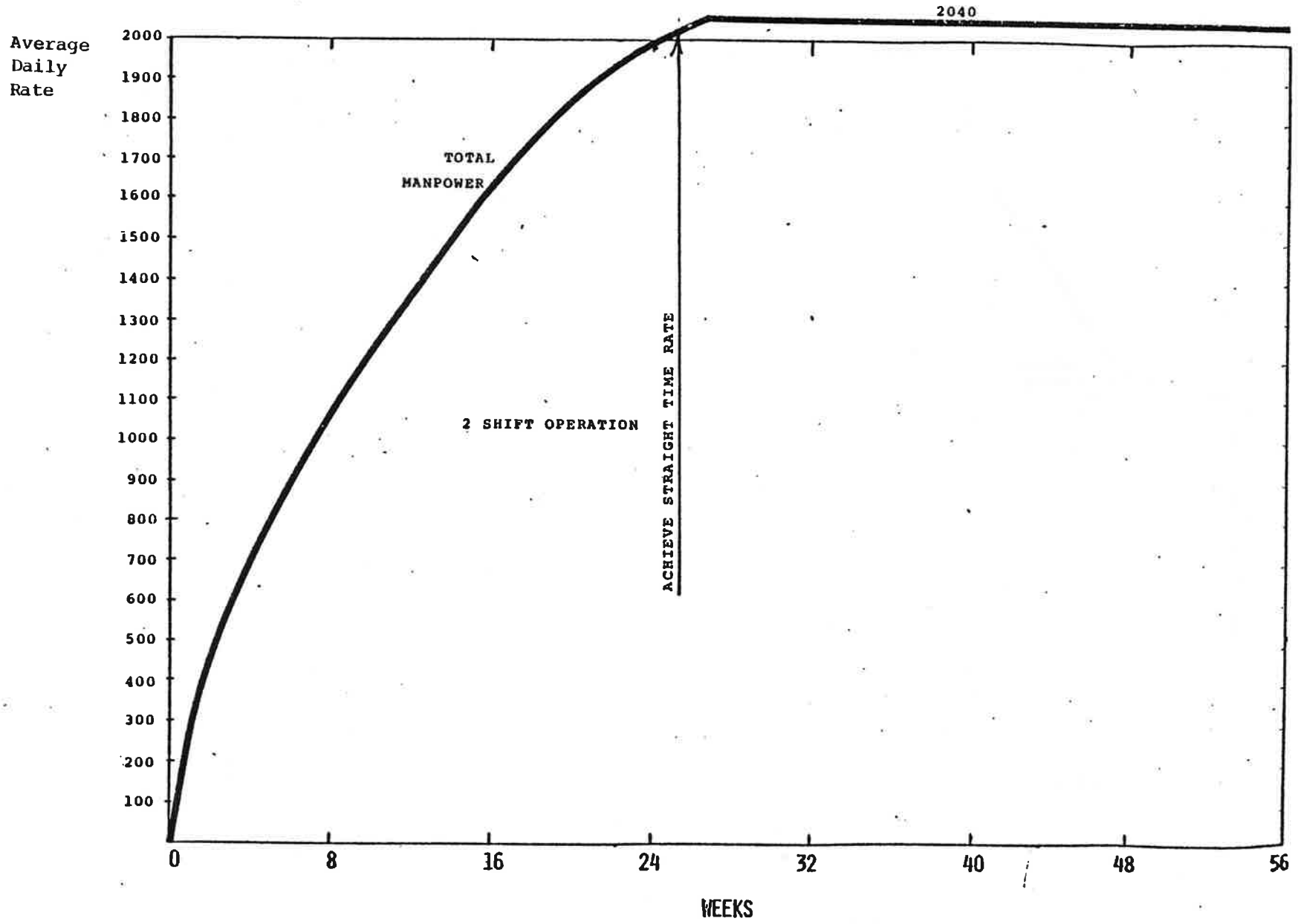
BRAKE COMPONENTS PLANT



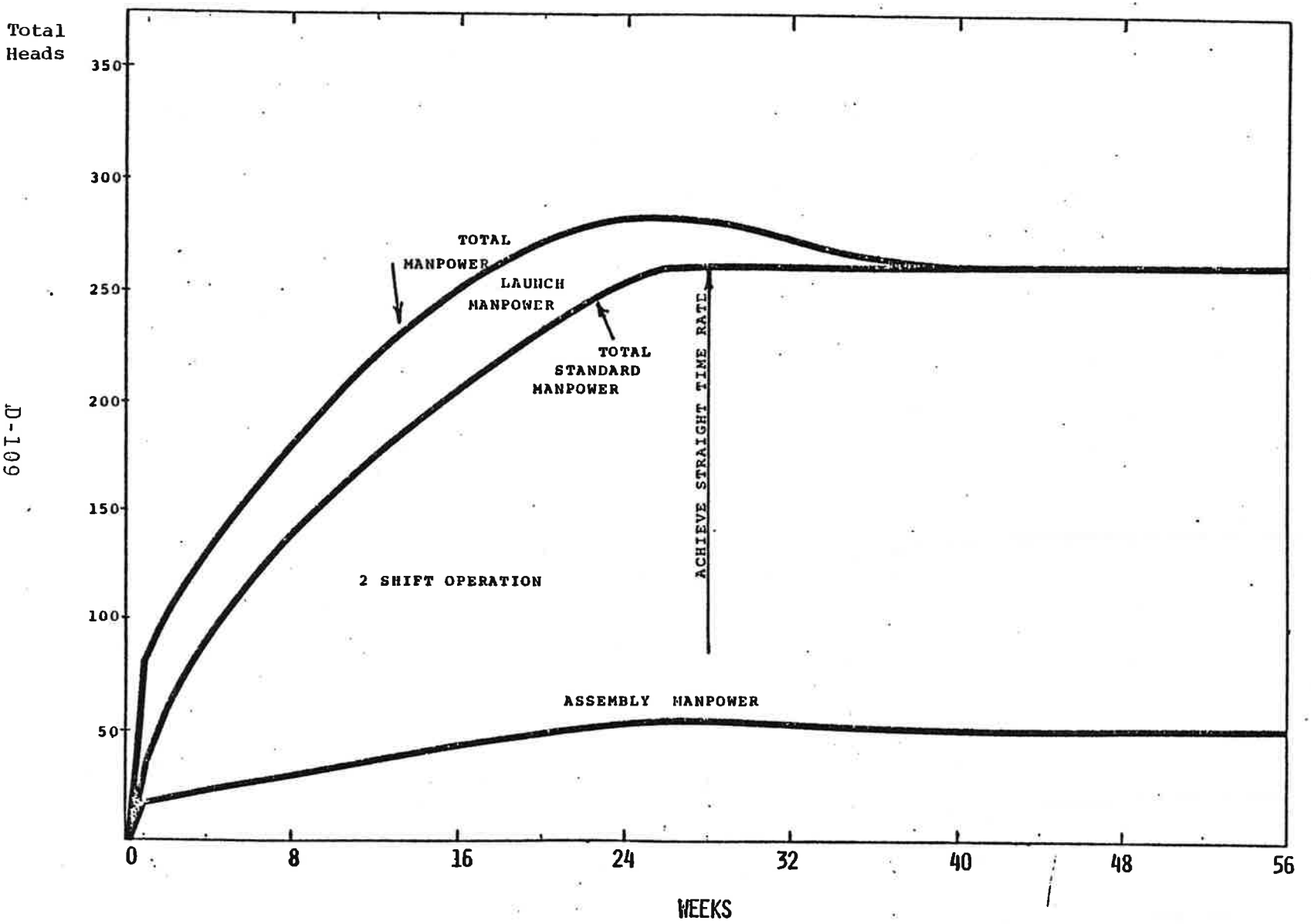
BRAKE COMPONENTS PLANT PRE-PRODUCTION MANPOWER



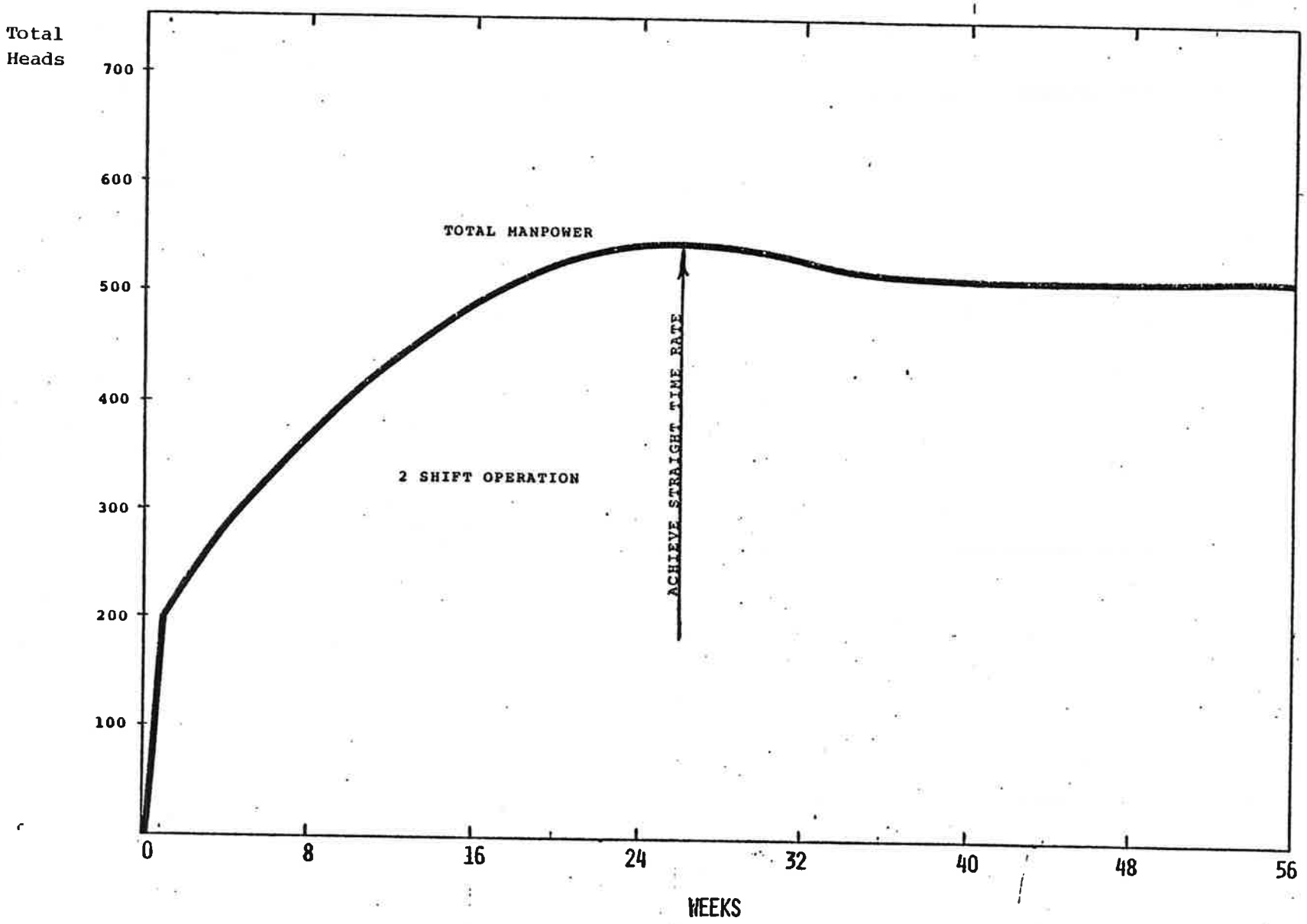
BRAKE COMPONENTS PLANT LAUNCH RATE NEW PLANT



BRAKE COMPONENTS PLANT LAUNCH - DIRECT LABOR



BRAKE COMPONENTS PLANT LAUNCH - TOTAL MANPOWER NEW PLANT



BRAKE COMPONENTS PLANT

($000)

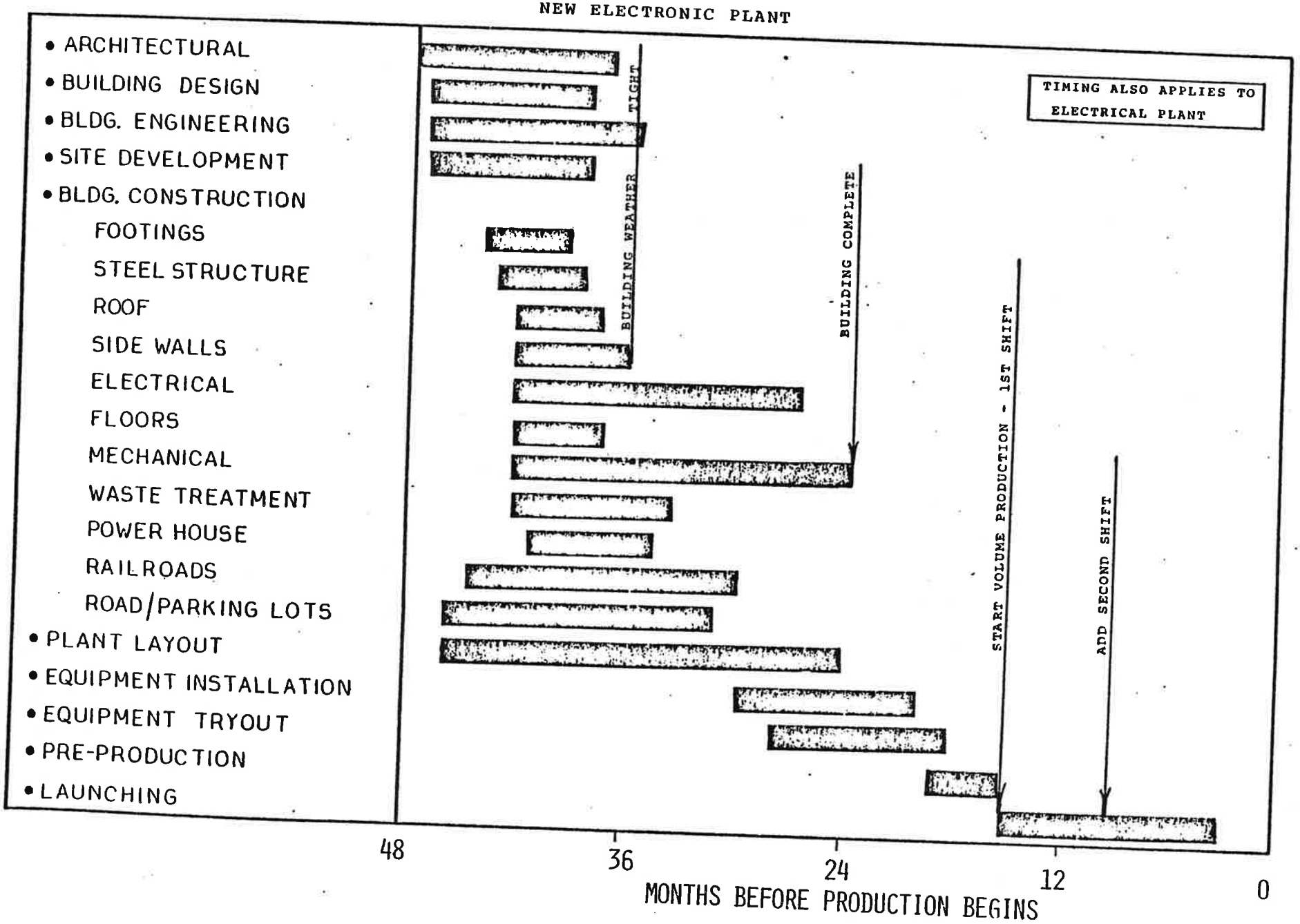
COST ELEMENT	PRE-PRODUCTION COSTS	LAUNCH COSTS	TOTAL COSTS
Manpower Costs			
- Direct Labor	$ 447	$ 665	$ 1,112
- Indirect Hourly	590	724	1,314
- Indirect Salary	3,214	46	3,260
Total Manpower Costs	$ 4,251	$ 1,435	5,686
Other Manufacturing Expenses			
- Maintenance Materials	10	13	23
- Tools, Perishable	54	251	305
- Spoilage	119	161	280
- Utilities	32	141	173
- Taxes/Insurance	45	61	106
- Depreciation	151	743	894
- Supplies & Other	20	130	150
Total Other Manufacturing Expenses	431	1,500	1,931
TOTAL COSTS	$ 4,682	$ 2,935	$ 7,617

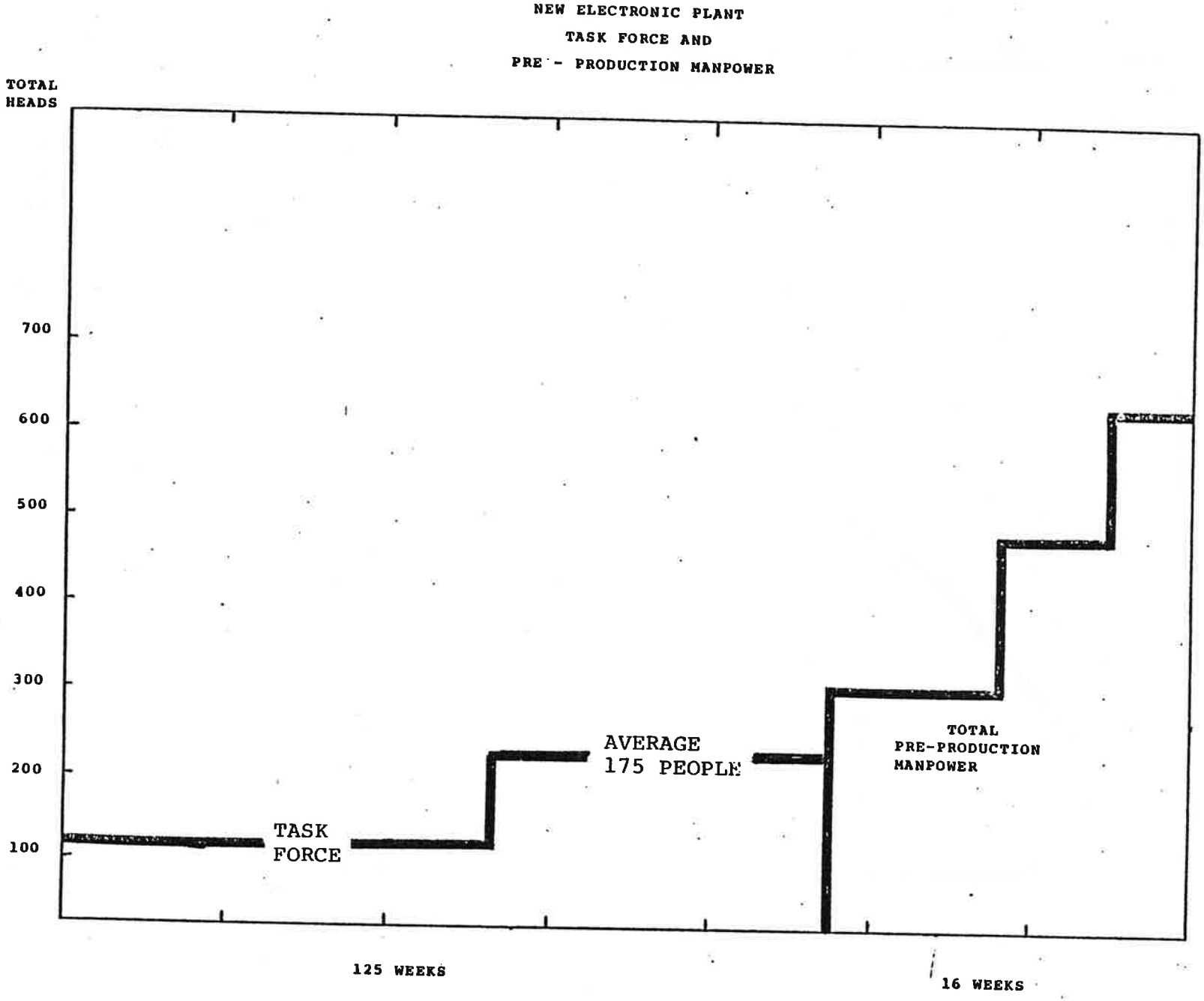
NEW ELECTRONICS PLANT

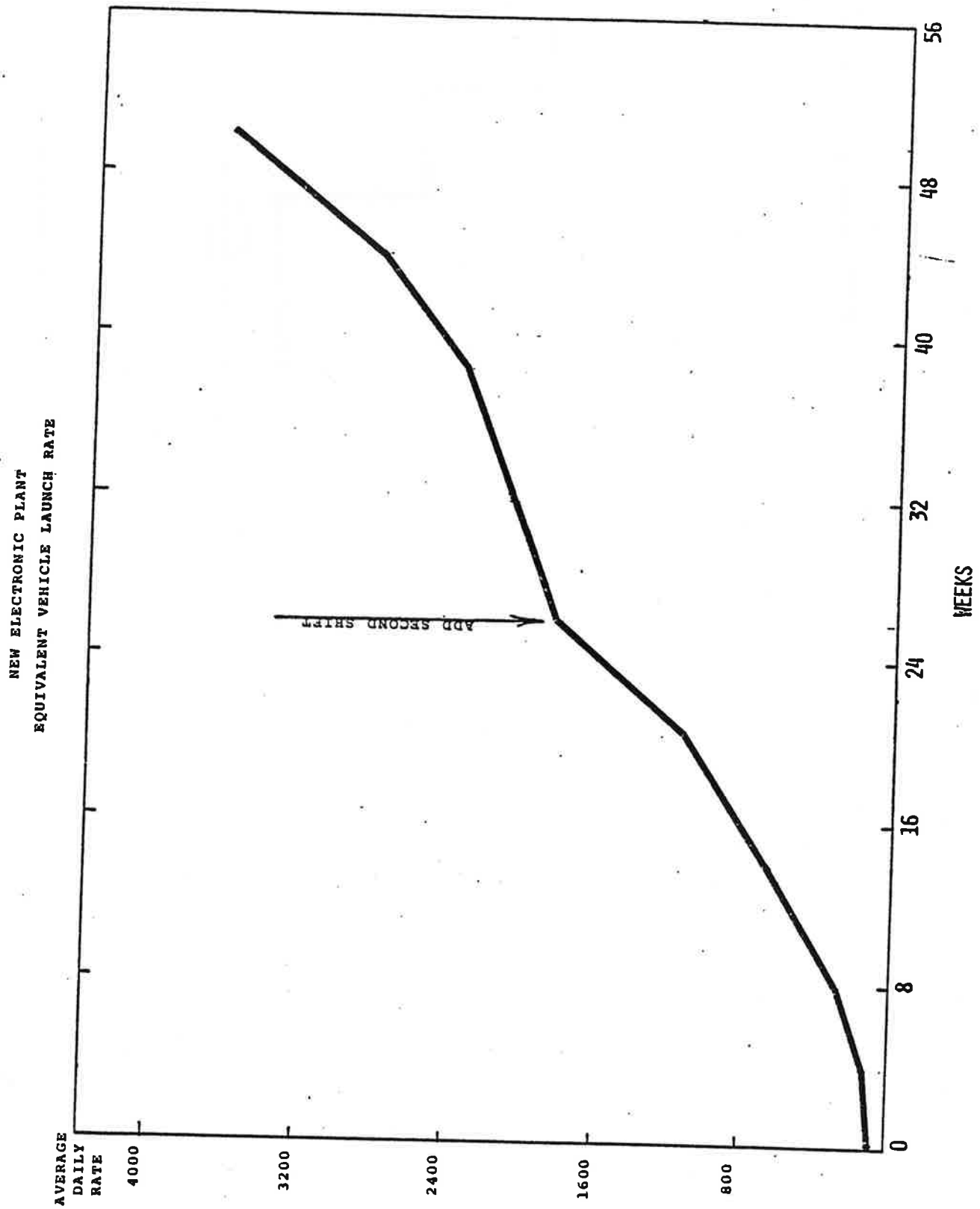
(NOTE: TIMING CHARTS CONTAINED IN THIS SECTION ALSO APPLY TO AN ELECTRICAL PLANT)

FOR

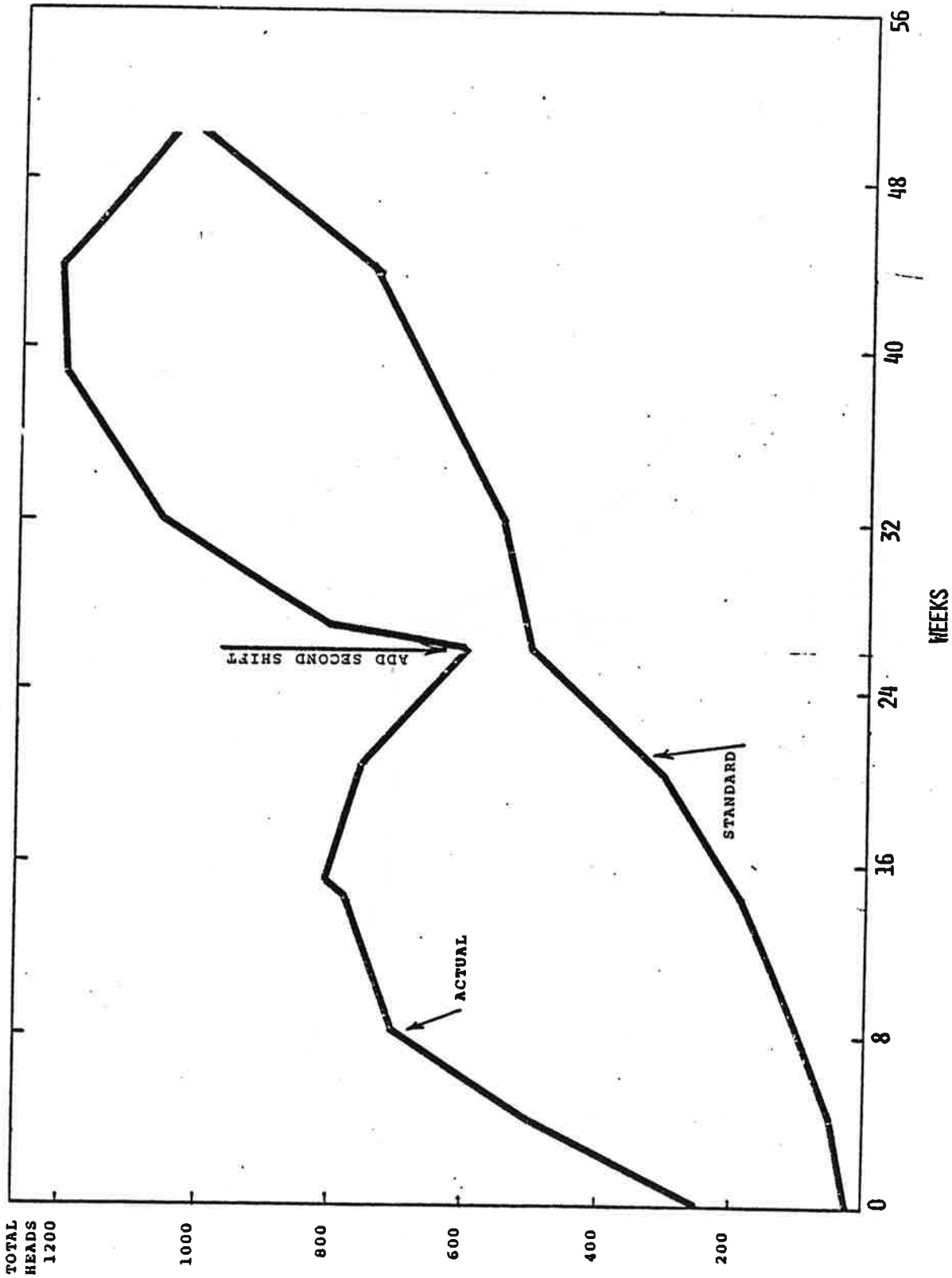
NEW PLANT

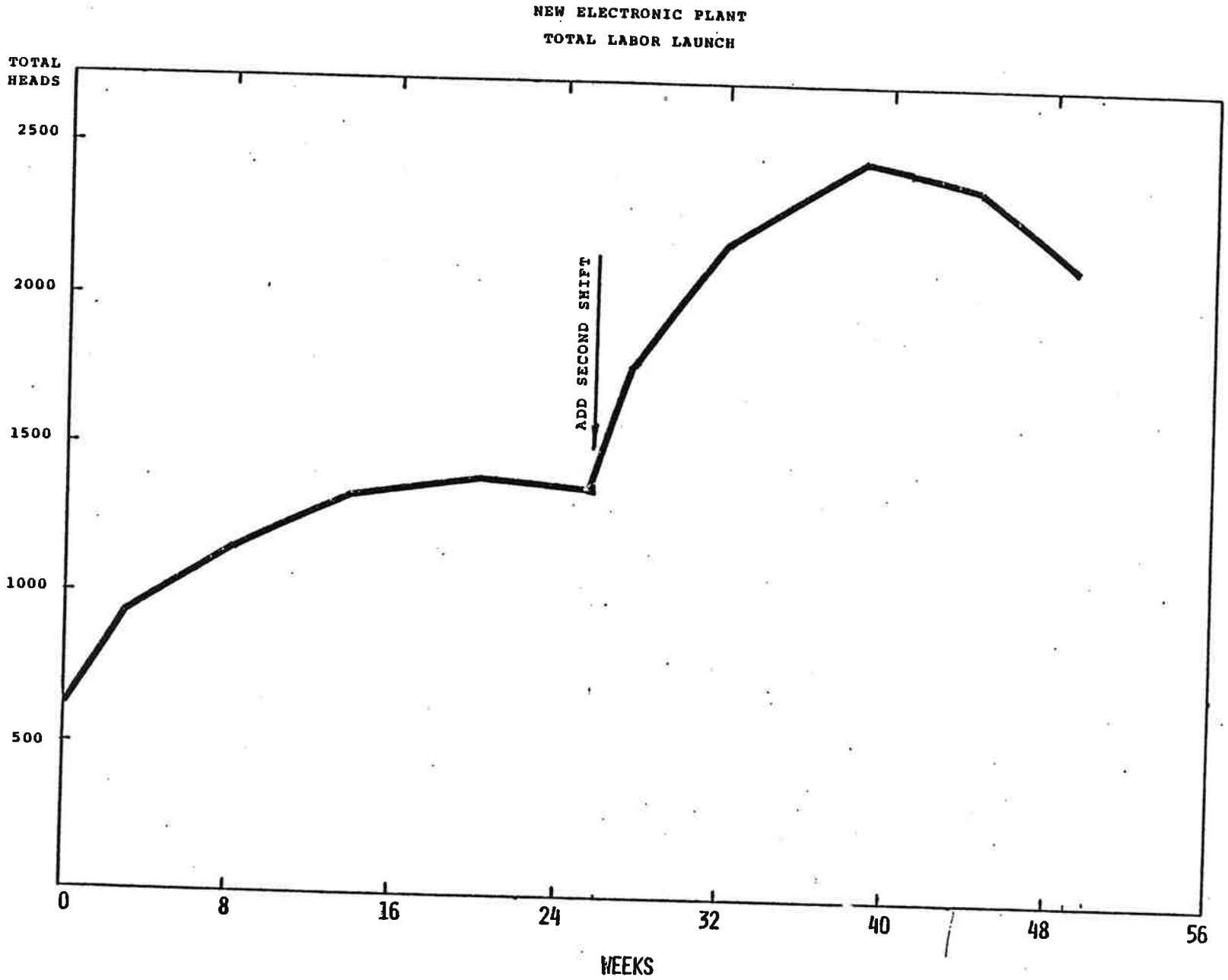



NEW ELECTRONIC PLANT
TASK FORCE AND
PRE - PRODUCTION MANPOWER
TOTAL HEADS
700
600
500
400
300
200
100
TASK FORCE
AVERAGE 175 PEOPLE
TOTAL PRE-PRODUCTION MANPOWER
125 WEEKS
16 WEEKS


NEW ELECTRONIC PLANT
EQUIVALENT VEHICLE LAUNCH RATE
AVERAGE DAILY RATE
4000
3200
2400
1600
800
0
8
16
24
32
40
48
56
WEEKS
ADD SECOND SHIFT

NEW ELECTRONIC PLANT
DIRECT LABOR LAUNCH




NEW ELECTRONIC PLANT
TOTAL LABOR LAUNCH
TOTAL HEADS
2500
2000
1500
1000
500
ADD SECOND SHIFT
0
8
16
24
32
40
48
56
WEEKS

ELECTRONIC PLANT

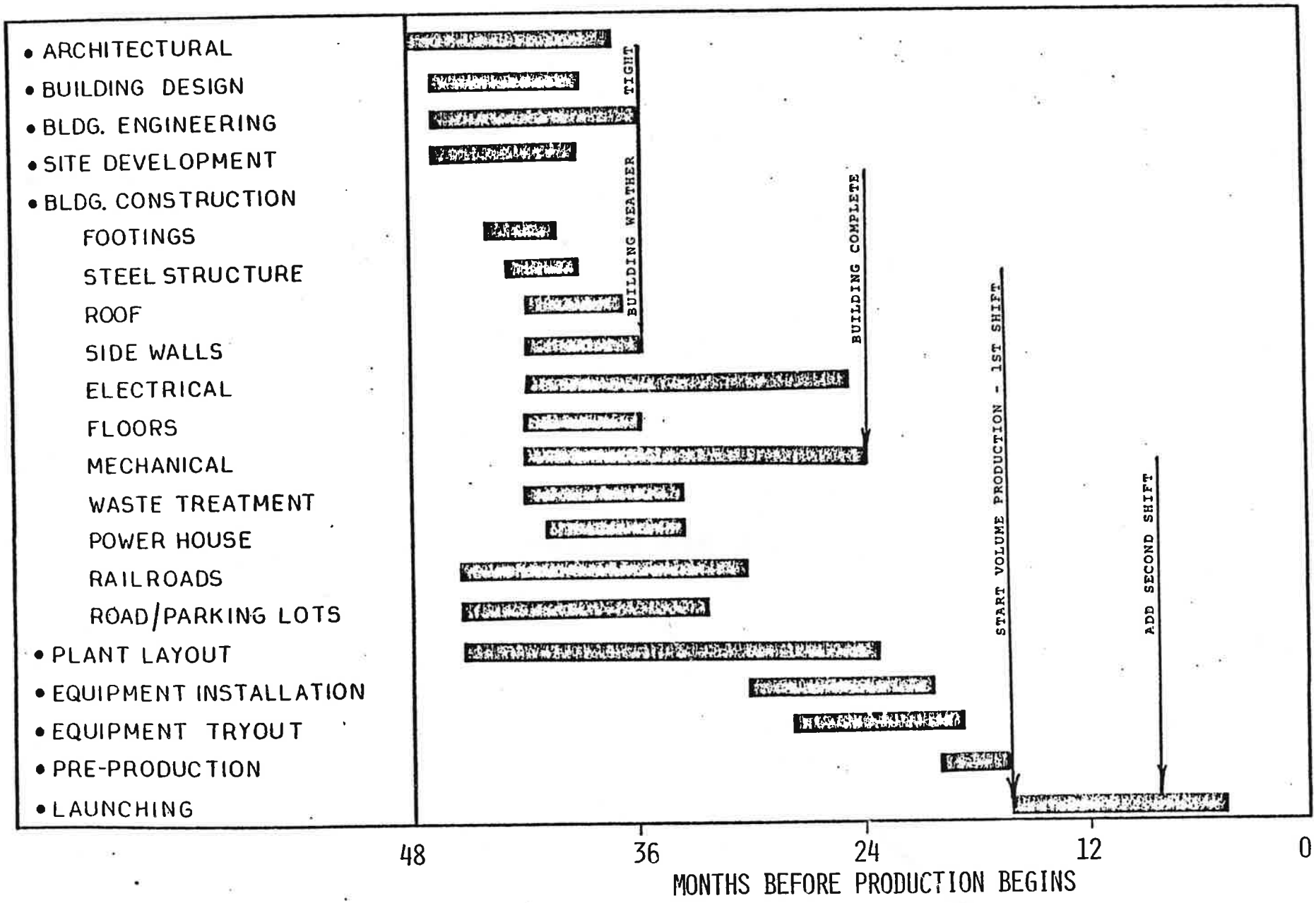
($000)

COST ELEMENT	PRE-PRODUCTION COSTS	LAUNCH COSTS	TOTAL COSTS
Manpower Costs			
- Direct Labor	$ 1,632	$14,770	$ 16,402
- Indirect Hourly	1,885	11,228	13,113
- Indirect Salary	19,988	4,970	24,958
Total Manpower Costs	23,505	30,968	54,473
Other Manufacturing Expenses			
- Maintenance Materials	84	630	714
- Tools, Perishable	48	360	408
- Spoilage	63	470	533
- Utilities	240	900	1,140
- Taxes/Insurance	72	540	612
- Depreciation	80	1,850	1,930
- Supplies and Other	100	790	890
Total Other Manufacturing Expenses	687	5,540	6,227
TOTAL COSTS	$24,192	$36,508	$60,700

FABRICATED GLASS PLANT

TIMING CHART
FOR
NEW PLANT

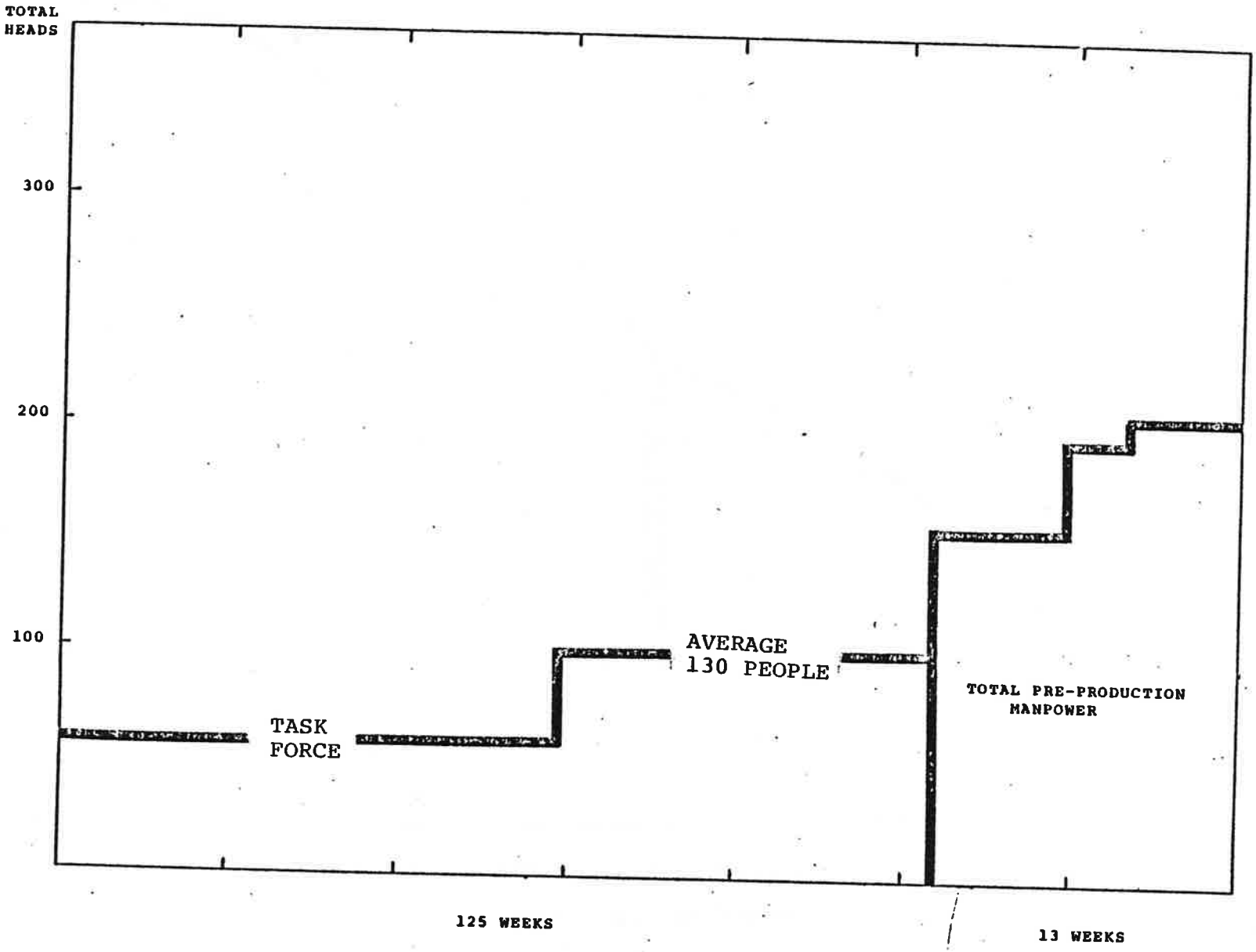
FABRICATED GLASS PLANT



NEW FABRICATED GLASS PLANT

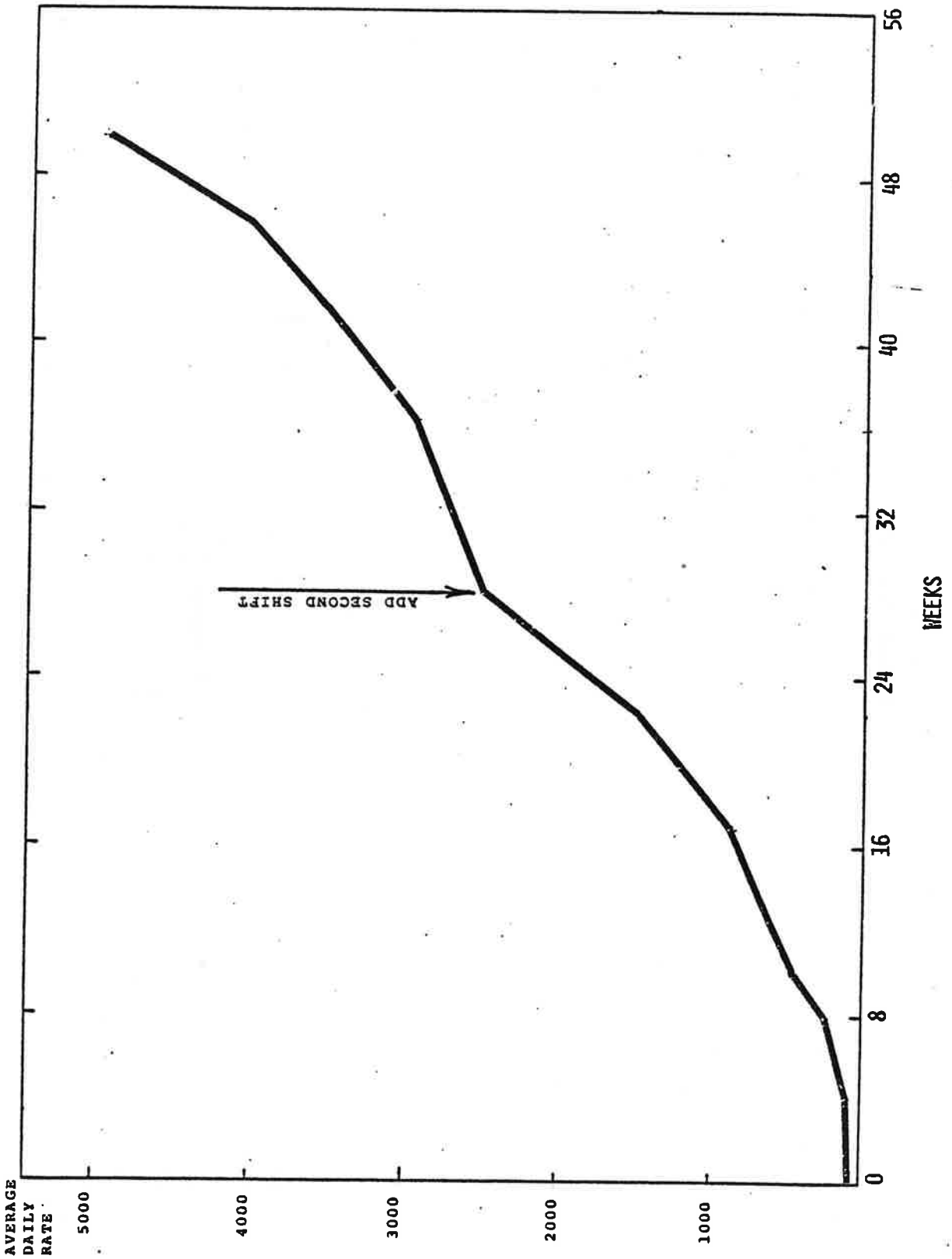
TASK FORCE AND

PRE-PRODUCTION MANPOWER



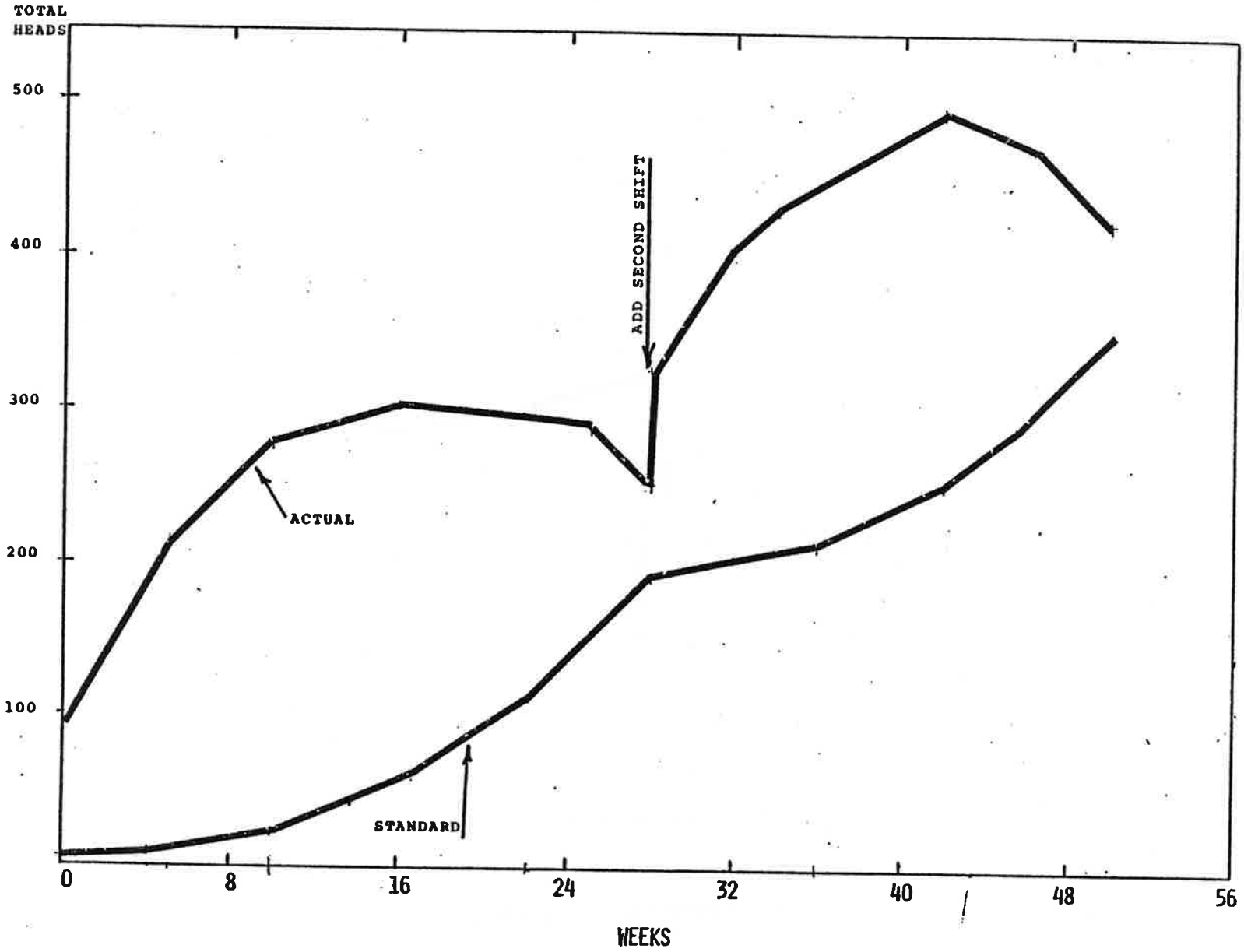
NEW FABRICATED GLASS PLANT

EQUIVALENT VEHICLE LAUNCH RATE



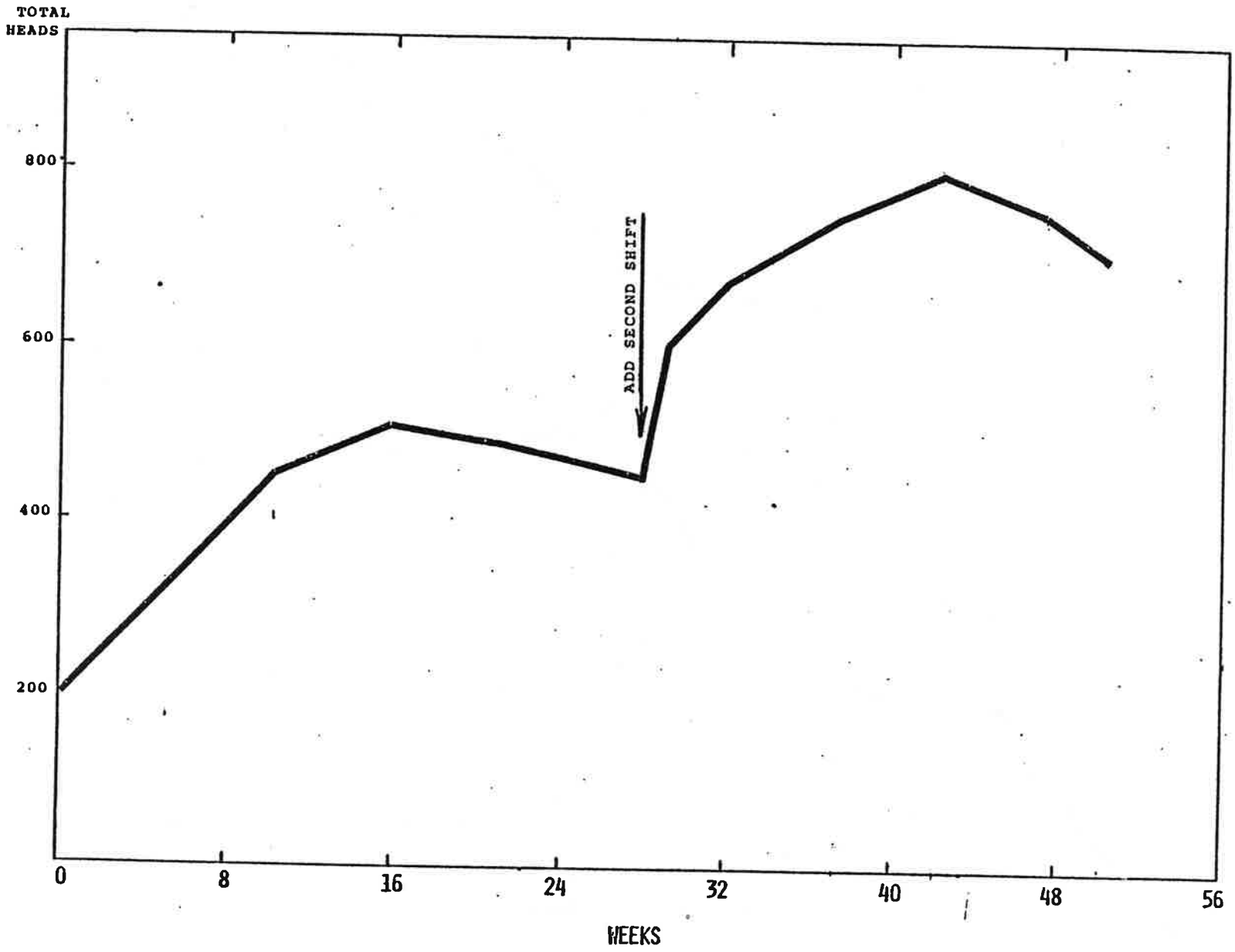
NEW FABRICATED GLASS PLANT

DIRECT LABOR LAUNCH



NEW FABRICATED GLASS PLANT

TOTAL LABOR - LAUNCH



FABRICATED GLASS PLANT

($000)

COST ELEMENT	PRE-PRODUCTION COSTS	LAUNCH COSTS	TOTAL COSTS
Manpower Costs			
- Direct Labor	$ 738	$ 6,623	$ 7,361
- Indirect Hourly	448	3,555	4,003
- Indirect Salary	14,204	1,618	15,822
Total Manpower Costs	15,390	11,796	27,186
Other Manufacturing Expenses			
- Maintenance Materials	43	362	405
- Tools, Perishable	29	252	281
- Spoilage	130	1,145	1,275
- Utilities	166	1,462	1,628
- Taxes/Insurance	43	382	425
- Depreciation	63	1,474	1,537
- Supplies and Other	76	668	744
Total Other Manufacturing Expenses	550	5,745	6,295
TOTAL COSTS	$15,940	$17,541	$33,481

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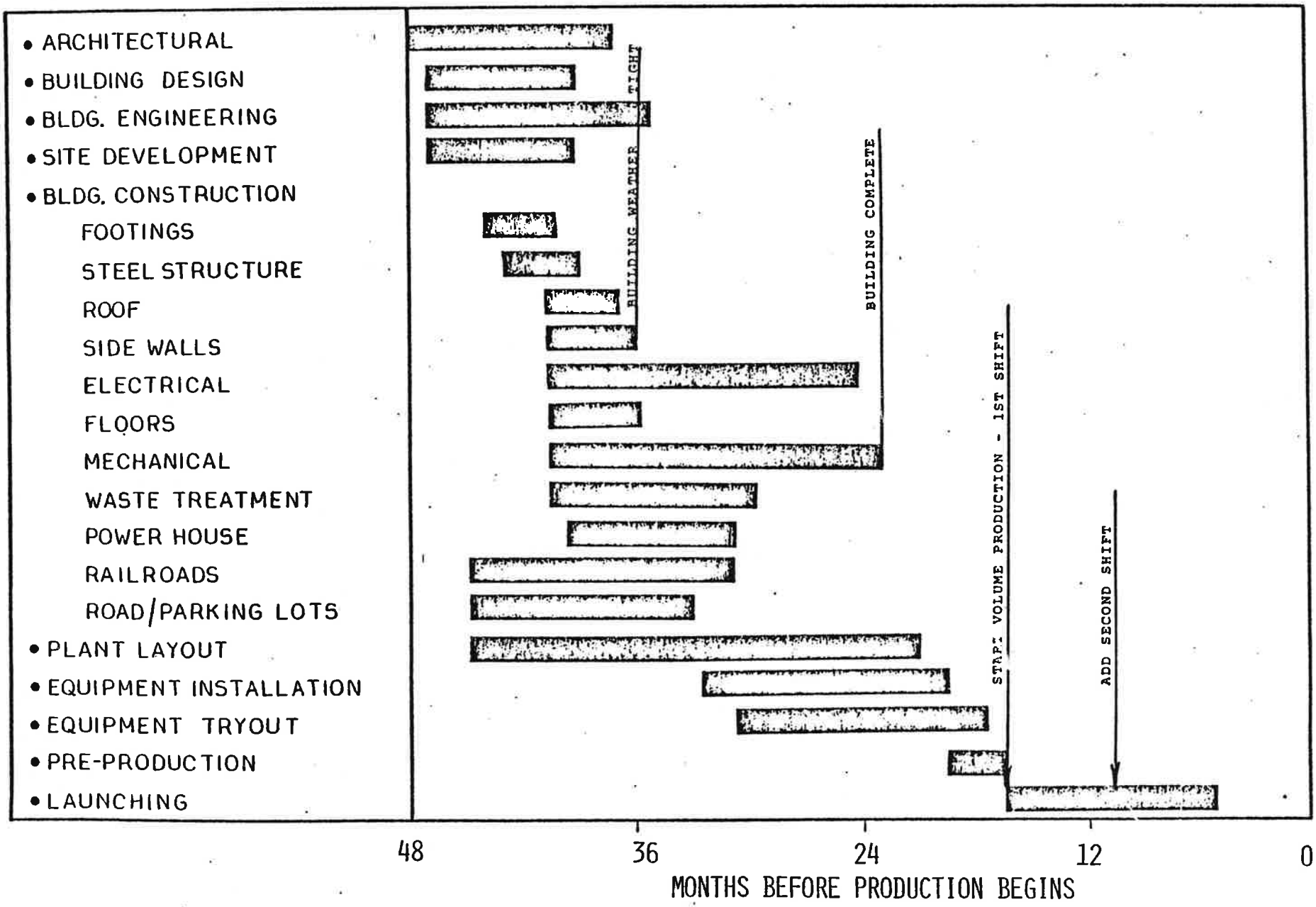
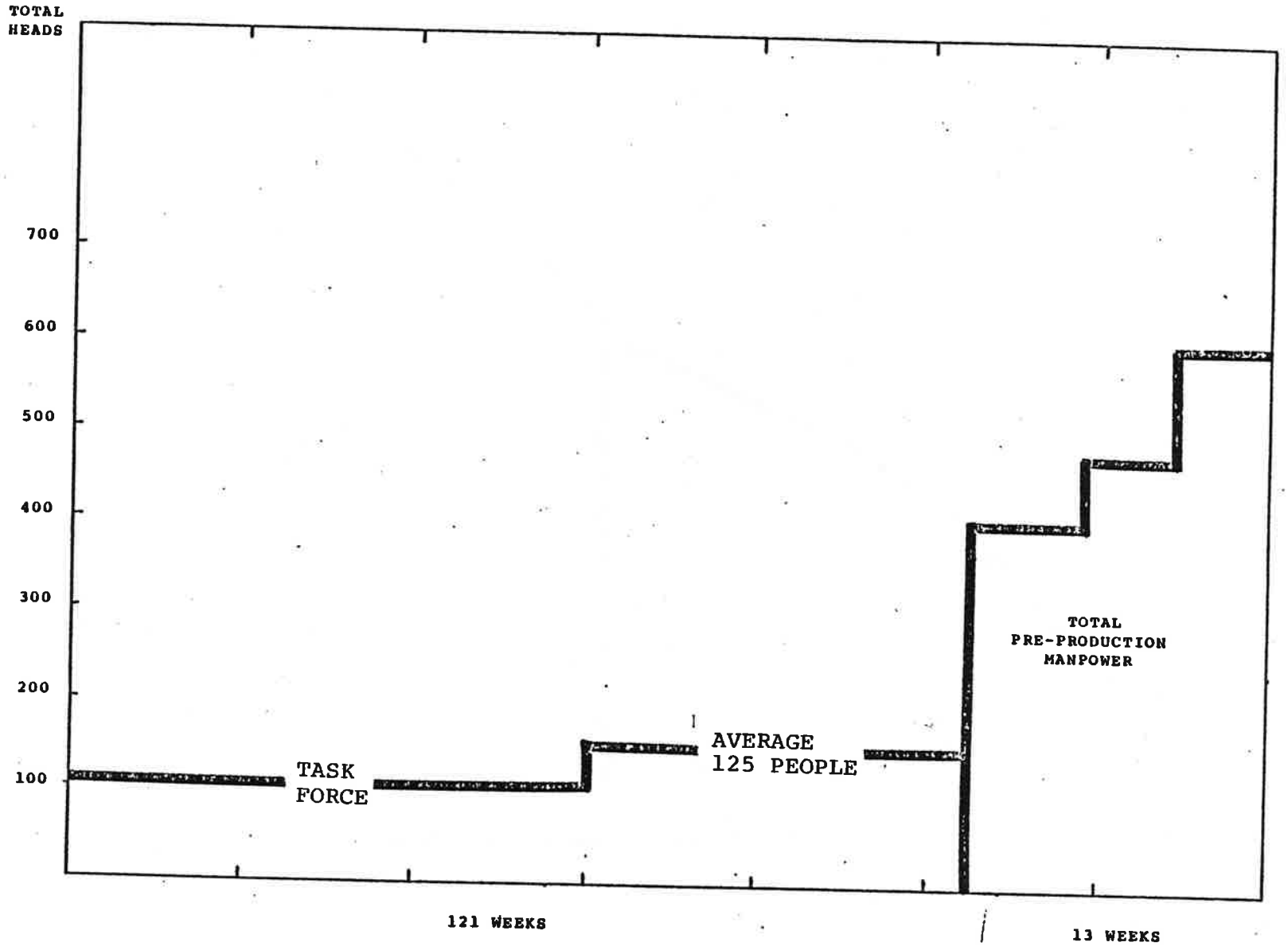
PLASTICS MOLDING CHART

TIMING CHART FOR NEW PLANT

PLASTIC MOLDING PLANT

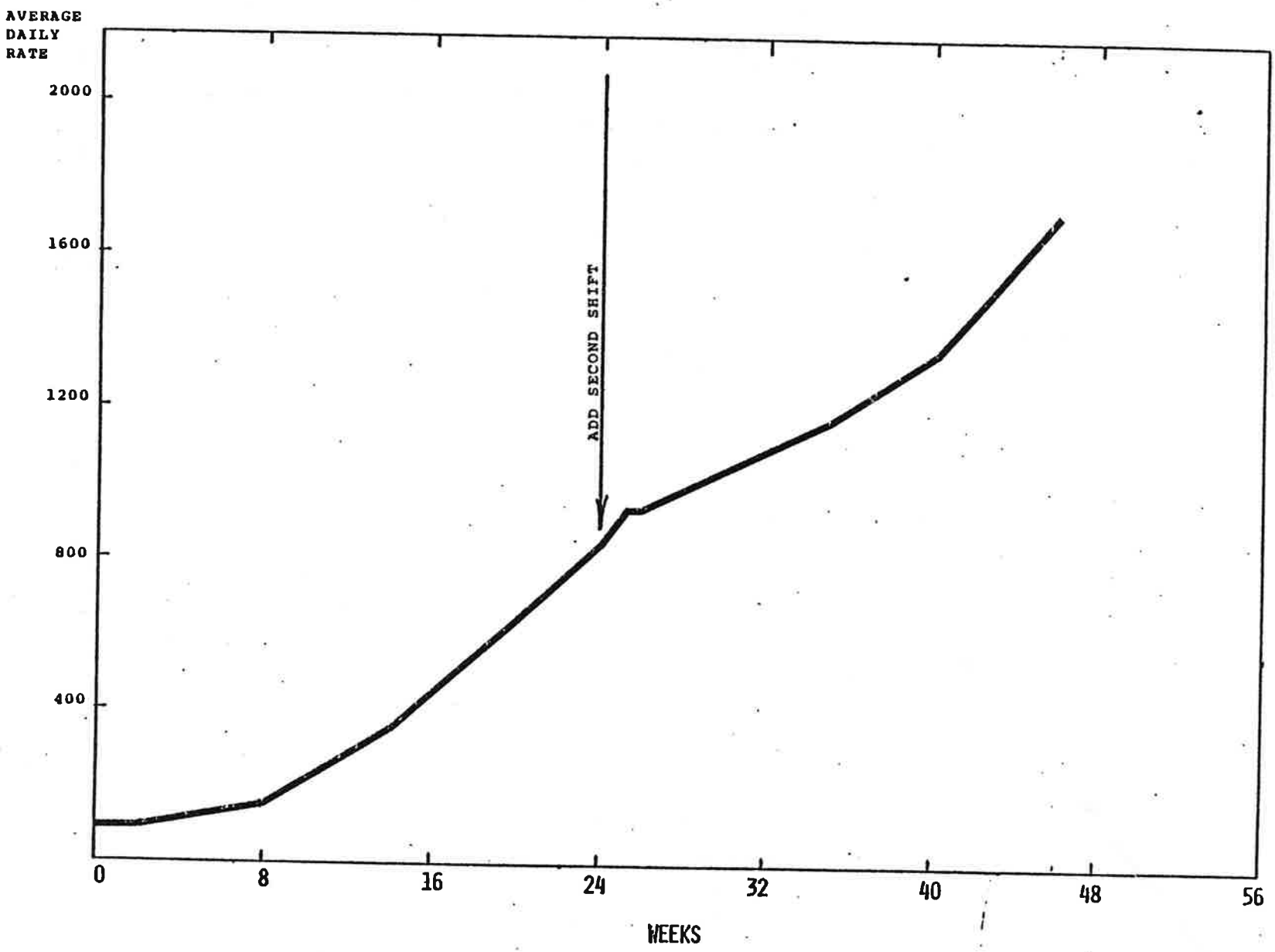


NEW PLASTIC MOLDING PLANT
TASK FORCE AND
PRE-PRODUCTION MANPOWER

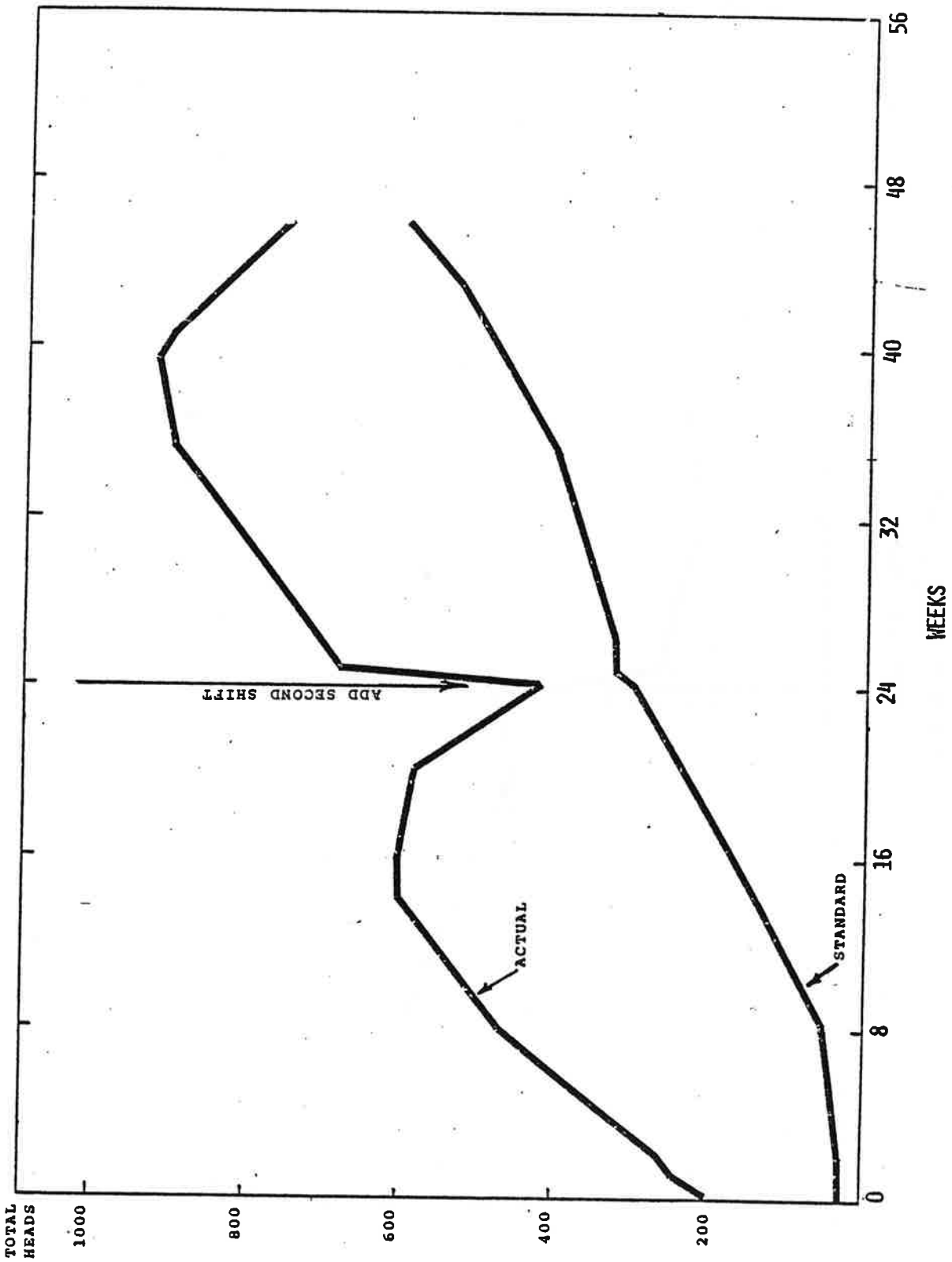


NEW PLASTIC MOLDING PLANT

EQUIVALENT VEHICLE LAUNCH RATE

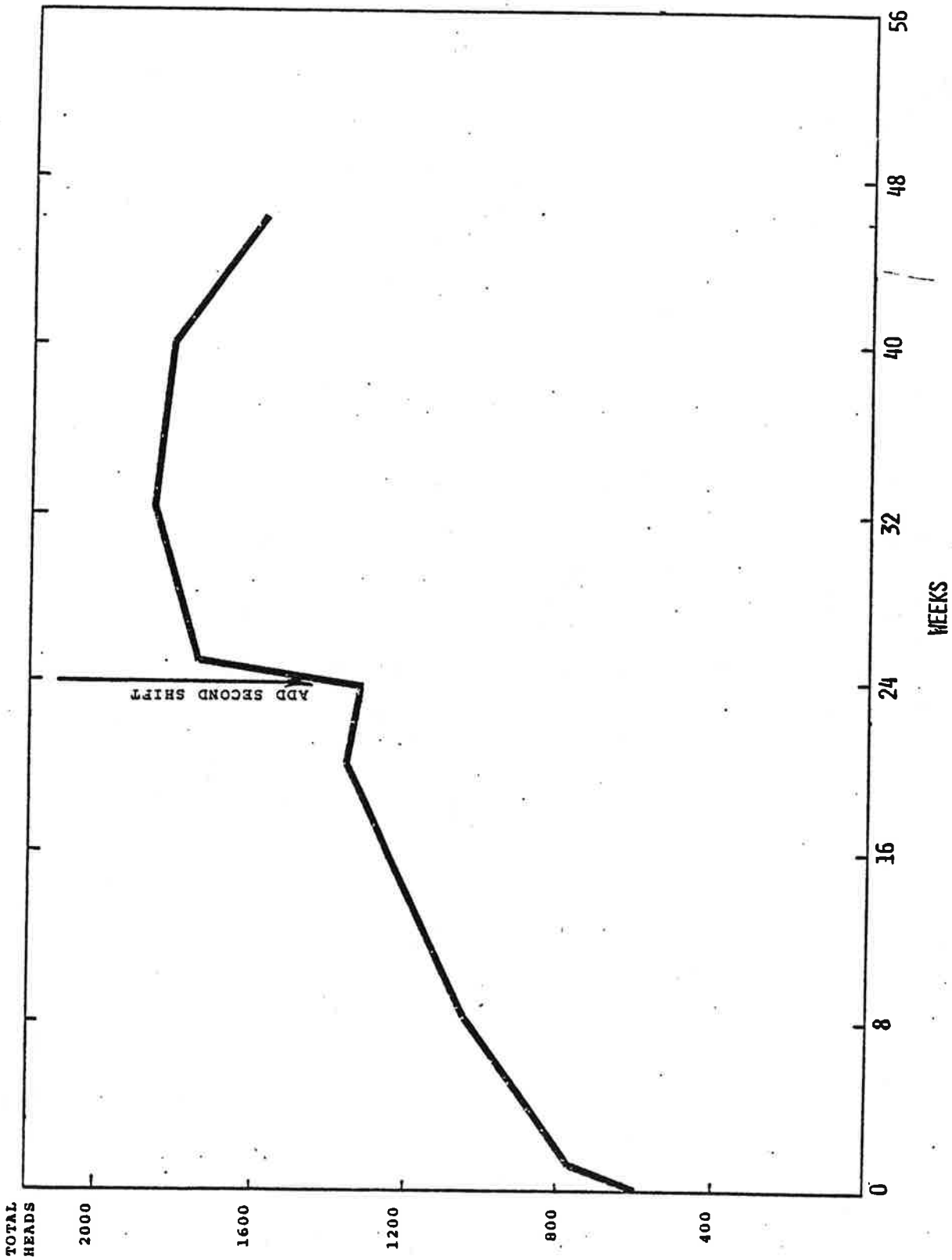


NEW PLASTIC MOLDING PLANT
DIRECT LABOR LAUNCH



NEW PLASTIC MOLDING PLANT

TOTAL LABOR LAUNCH



PLASTIC MOLDING PLANT

($000)

COST ELEMENT	PRE-PRODUCTION COSTS	LAUNCH COSTS	TOTAL COSTS
Manpower Costs			
- Direct Labor	$1,071	$11,621	$12,692
- Indirect Hourly	2,257	11,688	13,945
- Indirect Salary	13,562	2,495	16,057
Total Manpower Costs	16,890	25,804	42,694
Other Manufacturing Expenses			
- Maintenance Materials	160	520	680
- Tools, Perishable	210	690	900
- Spoilage	270	890	1,160
- Utilities	370	1,210	1,580
- Taxes/Insurance	185	600	785
- Depreciation	290	3,400	3,690
- Supplies and Other	220	1,430	1,650
Total Other Manufacturing Expenses	1,705	8,740	10,445
TOTAL COSTS	$18,595	$ 34,544	$ 53,139