

**JD GRAY ASSOCIATES  
MANUFACTURING PRODUCTIVITY CONSULTANTS**

## **Semi-Automated Manufacturing System**

### **Paced Final Assembly Line For A Large Apparatus**

## **Industrial Engineering Proposal and Equipment Budget Cost**

**JD GRAY ASSOCIATES  
MANUFACTURING PRODUCTIVITY CONSULTANTS**

**Phase One — Time Study Only**

**JD GRAY ASSOCIATES  
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**INDUSTRIAL ENGINEERING PROPOSAL**

**PACED FINAL ASSEMBLY**

***Phase One — Time Study Only***

- Phase One allows an upfront initial gain up to 10% (see example # 1) before any paced assembly automation takes place.
- Time Study develops the unit cost expectation at a 100% normal work effort.

Service Activity	Fee Per Family	Number of Families	Service & Fee Selection
Work Measurement (see example # 2)	\$1,800	16	\$28,800
Line Balance (see example # 3)	\$1,200	Phase Two	
Final Equipment Specification/Quote	\$ 900	Phase Three	
Component Part Containerization	\$1,200	Phase Three	
Work Station Layout	\$1,800	Phase Three	
Work Station Visual Aids (see example # 4)	\$1,500	Phase Three	
Work Station Fixtures/Tooling	\$ 600	Phase Three	
Work Station Bill of Material	\$ 600	Phase Three	
Work Station Instructions	\$ 900	Phase Three	
Group Leader Training	\$ 600	Phase Three	
Paced System Set-up	\$ 900	Phase Three	
Paced System Installation	\$1,500	Phase Three	
Paced System Follow-up	\$1,500	Phase Three	
Industrial Engineering Fixed Price			
Expenses - Travel and Per Diem for 16 Weeks On-site Data Collection	(USA)		\$24,000
Expenses – Travel and Per Diem for 2 Weeks On-site System Installation	(USA)		\$3,000
Industrial Engineering and Expenses			\$55,800

**JD GRAY ASSOCIATES  
MANUFACTURING PRODUCTIVITY CONSULTANTS**

**AGREEMENT**

- JD Gray Associates to perform aforementioned industrial engineering services on the time study operations of

**SIXTEEN FINAL ASSEMBLY FAMILIES  
(DIFFERENT BUILD SEQUENCES)**

**FINAL ASSEMBLY STATIONS**

STATION 1	STATION 5	STATION 9	STATION 13
STATION 2	STATION 6	STATION 10	STATION 14
STATION 3	STATION 7	STATION 11	STATION 15
STATION 4	STATION 8	STATION 12	STATION 16

.....for a cost of \$55,800.

- JD Gray Associates shall submit detailed service fee invoices to company. Said invoices shall contain a detailed itemization of the date(s) on which services were provided and a description of tasks completed during the period with respect to which the invoice is submitted.
- Each compensation payment made by company to JD Gray Associates shall be within 10 days.
- Company Property – JD Gray Associates agrees that any confidential information furnished by company to JD Gray Associates or acquired by JD Gray Associates during the period in which JD Gray Associates is retained by company is and shall remain the sole and exclusive property of company and shall be placed in the hands of company by JD Gray Associates upon termination of this Agreement including any copies made thereof.
- Confidentiality – JD Gray Associates agrees that at no time, either during or after the period in which JD Gray Associates is retained by company shall JD Gray Associates utilize or disclose to any third party any of the confidential information of company.

Date: \_\_\_\_\_

COMPANY OFFICIAL \_\_\_\_\_

Purchase Order Number: \_\_\_\_\_

<b>CONTRACT TERMS – PAYMENT SCHEDULE – PHASE ONE</b>		
<b>NO</b>	<b>DESCRIPTION</b>	<b>AMOUNT</b>
1	20% upon approval and Purchase Order Assignment	\$11,160
2	20% end of 1 <sup>st</sup> month	\$11,160
3	20% end of 2 <sup>nd</sup> month	\$11,160
4	20% end of 3 <sup>rd</sup> month	\$11,160
5	20% upon implementation	\$11,160
<b>QUOTATION NUMBER 1809</b>		

**JD GRAY ASSOCIATES  
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**Phase Two — Line Balance Only**

**JD GRAY ASSOCIATES  
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**INDUSTRIAL ENGINEERING PROPOSAL**

**PACED FINAL ASSEMBLY**

**Phase Two — Line Balance Only**

- Phase Two allows gains up to 5% (see example # 1) before any paced assembly automation takes place.
- Eliminates time bottlenecks for all operations
- Our staff has time and motion, performance leveling, and split station methodology know-how developed over the processing of thousands of assemblies for the paced technique..

Service Activity	Fee Per Family	Number of Families	Service & Fee Selection
Work Measurement (see example # 2)	\$1,800	Phase One	
Line Balance (see example # 3)	\$1,200	16	\$19,200
Final Equipment Specification/Quote	\$ 900	Phase Three	
Component Part Containerization	\$1,200	Phase Three	
Work Station Layout	\$1,800	Phase Three	
Work Station Visual Aids (see example # 4)	\$1,500	Phase Three	
Work Station Fixtures/Tooling	\$ 600	Phase Three	
Work Station Bill of Material	\$ 600	Phase Three	
Work Station Instructions	\$ 900	Phase Three	
Group Leader Training	\$ 600	Phase Three	
Paced System Set-up	\$ 900	Phase Three	
Paced System Installation	\$1,500	Phase Three	
Paced System Follow-up	\$1,500	Phase Three	
Industrial Engineering Fixed Price			
Expenses - Travel and Per Diem for 0 Weeks On-site Data Collection	(USA)		
Expenses – Travel and Per Diem for 2 Weeks On-site System Installation	(USA)		\$3,000
Industrial Engineering and Expenses			\$22,200

PO BOX 63 SUMMIT HILL, PA 18250

[www.jdgray-associates.com](http://www.jdgray-associates.com)

**JD GRAY ASSOCIATES  
MANUFACTURING PRODUCTIVITY CONSULTANTS**

**AGREEMENT**

- JD Gray Associates to perform aforementioned industrial engineering services on the line balance operations of

**SIXTEEN FINAL ASSEMBLY FAMILIES  
(DIFFERENT BUILD SEQUENCES)**

**FINAL ASSEMBLY STATIONS**

STATION 1	STATION 5	STATION 9	STATION 13
STATION 2	STATION 6	STATION 10	STATION 14
STATION 3	STATION 7	STATION 11	STATION 15
STATION 4	STATION 8	STATION 12	STATION 16

...for a cost of \$22,200.

- JD Gray Associates shall submit detailed service fee invoices to company. Said invoices shall contain a detailed itemization of the date(s) on which services were provided and a description of tasks completed during the period with respect to which the invoice is submitted.
- Each compensation payment made by company to JD Gray Associates shall be within 10 days.
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Date: \_\_\_\_\_

COMPANY OFFICIAL \_\_\_\_\_

Purchase Order Number: \_\_\_\_\_

<b>CONTRACT TERMS – PAYMENT SCHEDULE – PHASE ONE</b>		
<b>NO</b>	<b>DESCRIPTION</b>	<b>AMOUNT</b>
1	20% upon approval and Purchase Order Assignment	\$4,440
2	20% end of 1 <sup>st</sup> month	\$4,440
3	20% end of 2 <sup>nd</sup> month	\$4,440
4	20% end of 3 <sup>rd</sup> month	\$4,440
5	20% upon implementation	\$4,440
<b>QUOTATION NUMBER 1810</b>		

**JD GRAY ASSOCIATES  
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**Phase Three — Paced Assembly Industrial  
Engineering Services**



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**INDUSTRIAL ENGINEERING PROPOSAL**

**PACED FINAL ASSEMBLY**

***Phase Three — Paced Assembly***

- Phase Three allows an upfront initial gain of 10%-25% (see example # 1).

<b>Service Activity</b>			<b>Fee Per Family</b>	<b>Number of Families</b>	<b>Service &amp; Fee Selection</b>
Work Measurement (see example # 2)			\$1,800	Phase One	
Line Balance (see example # 3)			\$1,200	Phase Two	
Final Equipment Specification/Quote			\$ 900	16	\$14,400
Component Part Containerization			\$1,200	16	\$19,200
Work Station Layout including Small Transfer Conveyor for Non Painted Parts			\$1,800	16	\$28,800
Work Station Visual Aids (see example # 4)			\$1,500	16	\$24,000
Work Station Holding Frames for Non Painted Parts			\$ 600	16	\$9,600
Work Station Bill of Material			\$ 600	16	\$9,600
Work Station Instructions			\$ 900	16	\$14,400
Group Leader Training			\$ 600	16	\$9,600
Paced System Set-up			\$ 900	16	\$14,400
Paced System Installation			\$1,500	16	\$24,000
Paced System Follow-up			\$1,500	16	\$24,000
Industrial Engineering Fixed Price					
Expenses - Travel and Per Diem for 2 Weeks On-site Data Collection			(USA)		\$3,000
Expenses – Travel and Per Diem for 2 Weeks On-site System Installation			(USA)		\$3,000
Industrial Engineering and Expenses					\$198,000

**JD GRAY ASSOCIATES  
MANUFACTURING PRODUCTIVITY CONSULTANTS  
AGREEMENT**

- JD Gray Associates to perform aforementioned industrial engineering services on the paced assembly line operations of

**SIXTEEN FINAL ASSEMBLY FAMILIES  
(DIFFERENT BUILD SEQUENCES)**

**FINAL ASSEMBLY STATIONS**

STATION 1	STATION 5	STATION 9	STATION 13
STATION 2	STATION 6	STATION 10	STATION 14
STATION 3	STATION 7	STATION 11	STATION 15
STATION 4	STATION 8	STATION 12	STATION 16

...for a cost of \$198,000.

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Date: \_\_\_\_\_

COMPANY OFFICIAL \_\_\_\_\_

Purchase Order Number: \_\_\_\_\_

<b>CONTRACT TERMS – PAYMENT SCHEDULE</b>		
<b>NO</b>	<b>DESCRIPTION</b>	<b>AMOUNT</b>
1	20% upon approval and Purchase Order Assignment	\$39,600
2	20% end of 1 <sup>st</sup> month	\$39,600
3	20% end of 2 <sup>nd</sup> month	\$39,600
4	20% end of 3 <sup>rd</sup> month	\$39,600
5	20% upon implementation	\$39,600
<b>QUOTATION NUMBER 1811</b>		

**Phase Four – Paced Assembly Equipment  
Budget Cost and General Specification**

# **JD GRAY ASSOCIATES MANUFACTURING PRODUCTIVITY CONSULTANTS**

## **OVERHEAD MONORAIL**

Cost: \$275,000

Length: 1500 linear feet

Hanging Pattern: same hanging pattern every 60 feet. Hooks spaced every 4 feet for different painted parts that would weigh 100 pounds maximum.

Speed: Speed of the overhead monorail would be variable from 0 feet per minute to 1ft per min with a normal speed of 7.2 inches per minute. Timer to be supplied.

Emergency Stops: 20 emergency stops located at each station.



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## TOW LINE SYSTEM

Cost: - \$1,500,000

Length: 1500 linear feet

Pulled Item: Large Apparatus with wheels

Speed: Speed of the overhead monorail would be variable from 0 feet per minute to 1ft per min with a normal speed of 7.2 inches per minute. Timer to be supplied.

Emergency Stops: 20 emergency stops located at each station.

Tow and Drag Line Conveyors. In-floor and on-floor tow lines. Can handle the heaviest of loads. Closed loop or straight tow lines along with pusher type lines are available.

