THE NATIONAL SHIPBUILDING RESEARCH PROGRAM

Automated Process Application in Steel Fabrication and Subassembly Facilities; Phase I (Process Analysis)

U.S. DEPARTMENT OF THE NAVY
CARDEROCK DIVISION,
NAVAL SURFACE WARFARE CENTER

in cooperation with
National Steel and Shipbuilding Company
San Diego, California
**Report Documentation Page**

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

1. REPORT DATE
   MAY 1999

2. REPORT TYPE
   N/A

3. DATES COVERED
   -

4. TITLE AND SUBTITLE
   The National Shipbuilding Research Program, Automated Process Application in Steel Fabrication and Subassembly Facilities; Phase I (Process Analysis)

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

6. AUTHOR(S)

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
   Naval Surface Warfare Center CD Code 2230-Design Integration Tools Bldg 192, Room 128 9500 MacArthur Blvd Bethesda, MD 20817-5700

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSOR/MONITOR’S ACRONYM(S)

11. SPONSOR/MONITOR’S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
   Approved for public release, distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:
   a. REPORT
      unclassified
   b. ABSTRACT
      unclassified
   c. THIS PAGE
      unclassified

17. LIMITATION OF ABSTRACT
   SAR

18. NUMBER OF PAGES
   205

19a. NAME OF RESPONSIBLE PERSON

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std Z39-18
DISCLAIMER

These reports were prepared as an account of government-sponsored work. Neither the United States, nor the United States Navy, nor any person acting on behalf of the United States Navy (A) makes any warranty or representation, expressed or implied, with respect to the accuracy, completeness or usefulness of the information contained in this report/manual, or that the use of any information, apparatus, method, or process disclosed in this report may not infringe privately owned rights; or (B) assumes any liabilities with respect to the use of or for damages resulting from the use of any information, apparatus, method, or process disclosed in the report. As used in the above, “Persons acting on behalf of the United States Navy” includes any employee, contractor, or subcontractor to the contractor of the United States Navy to the extent that such employee, contractor, or subcontractor to the contractor prepares, handles, or distributes, or provides access to any information pursuant to his employment or contract or subcontract to the contractor with the United States Navy. ANY POSSIBLE IMPLIED WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR PURPOSE ARE SPECIFICALLY DISCLAIMED.
AUTOMATED PROCESS APPLICATION
IN
STEEL FABRICATION AND SUBASSEMBLY FACILITIES
PHASE I
(PROCESS ANALYSIS)

A PROJECT OF
THE NATIONAL SHIPBUILDING RESEARCH PROGRAM
FOR
THE SOCIETY OF NAVAL ARCHITECTS AND MARINE ENGINEERS
SHIP PRODUCTION COMMITTEE
SP-1 FACILITIES AND ENVIRONMENTAL EFFECTS PANEL

BY
NATIONAL STEEL AND SHIPBUILDING CO.
SAN DIEGO, CA

JULY 1998
Final Report

NSRP 1-96-6

Automated Process Application in Steel Fabrication and Subassembly Facilities
Phase I
(Process Analysis)

Contract Number N00167-94-H-0038

A project of
The National Shipbuilding Research Program

for
The Society of Naval Architects and Marine Engineers
Ship Production Committee
SP-1 Facilities and Environmental Effects Panel

by
National Steel and Shipbuilding Co.
San Diego, CA

Project Manager:
John Horvath

Principal Investigators:
Gary Higginbotham
Jeffrey Schaedig

July 1998
**Table of Contents**

EXECUTIVE SUMMARY iii

GLOSSARY OF TERMS iv

1.0 INTRODUCTION 1

2.0 SIMULATION OVERVIEW 1

3.0 SIMULATION PROCESS STEPS 2

4.0 PLANNING THE PROJECT 3

4.1 Research 3
4.2 Simulation Software and Vendor Selection 3

4.2.1 Pros and Cons of SiMPLEx++ 5
4.2.2 Pros and Cons of ProModel 5

4.3 ProModel Basics 5

5.0 SYSTEM DEFINITION 6

5.1 Module Definition 8

5.1.1 Treatment Line 8
5.1.2 Plate Fabrication 9
5.1.3 Profile Fabrication 10
5.1.4 Small Parts Fabrication 11
5.1.5 T-Beam Fabrication 13
5.1.6 General Subassembly 14
5.1.7 Box Girder and Box Stanchion Cell 15
5.1.8 Panel Line 16

5.2 Flowcharts 18

6.0 MODEL BUILDING 18

6.1 Model Specifics 18
6.2 User Interfaces 19
6.3 Data Collection 19
6.4 Verification and Validation 20

7.0 RUN MODELS FOR OUTPUT 21

7.1 “Baseline” Model 21
7.2 “High Output” Model 22
7.3 “Most Likely Operating Condition” Model 22

8.0 OUTPUT ANALYSIS 22

8.1 Analysis of the Profile Fabrication Area Model 22

8.1.1 Analysis of the “Baseline” Model 23
8.1.2 Analysis of the "High Output" Model 24
8.1.3 Analysis of the "Most Likely Operating Condition" Model 27
8.1.4 Determining Constraints and Bottlenecks in the Profile Fabrication Area 29

8.2 Analysis of the Panel Line Model 29
8.2.1 Analysis of the "High Output" Model 30
8.2.2 Analysis of the "Most Likely Operating Condition" Model 31
8.2.3 Determining the Bottlenecks and Constraints in the Panel Line 32

9.0 NEXT STEP - PHASE II 33

10.0 CONCLUSIONS 33

APPENDIX A General Simulation Overview
APPENDIX B Simulation Specification
APPENDIX C Simulation Software Packages
APPENDIX D NASSCO Steel Fabrication and Subassembly Flowchart
APPENDIX E Detailed Performance Statistics for Profile Fabrication and Panel Lines
EXECUTIVE SUMMARY

In an effort to produce cost competitive ships in a time of reduced Defense spending and dominance of the world commercial market by foreign yards, the American shipbuilding industry is investigating methods which will streamline production and reduce fabrication and assembly times. One such method is the introduction of automation into steel fabrication and subassembly processes. Many of the processes in these areas are both labor intensive and repetitive, characteristics which are ideally suited to be handled by automation. The drawback, however, is the capital cost associated with automation, especially when it is not known whether the automation will produce a positive return on the investment dollar. Computer simulation is being used in other manufacturing industries, world-wide, to gain insight into how the introduction of new resources affects the company’s current manufacturing capabilities and whether or not the new resources will produce a positive return on investment. The objective of this project is to utilize computer simulation to provide American shipyards with a method of determining which of their specific processes, in steel fabrication and subassembly, are likely candidates for automation and to what degree.

The project is divided into two phases. In Phase I, the modeled yard, National Steel and Shipbuilding Company (NASSCO), was used to define and understand existing ‘As-Is’ steel subassembly and fabrication processes. Once defined, a computer simulation software package was selected to model the processes. The models were then used to identify bottlenecks and constraints in the system which could be potential areas for automation. In Phase II of the project, new, ‘To-Be’ models will be created which will include automation to reduce or eliminate the constraints in the system. The ‘To-Be’ and ‘As-Is’ models will be compared in an effort to determine the effect automation has on the performance of the system and Return on Investment (ROI). The performance of the ‘To-Be’ models will also be benchmarked against the performance of “world class” shipyards with similar automation to measure the degree to which the automation may make American yards more competitive in the commercial market.

This is the Phase I Final Report. It details the approach taken by the NASSCO project team to carry out the Phase I portion of this project from researching how to initiate a successful computer simulation project to the analysis of the ‘As-Is’ models for bottlenecks and constraints. The report contains information on simulation software, NASSCO’s preparation for a simulation project, the process steps which should be followed when conducting a simulation project, and the approach taken to analyze the simulation models. Decision points and the logic applied by the project team at those points is included throughout this report to help the reader to gain insight into why or why not the same reasoning may be applicable to his or her yard. A general overview of computer simulation modeling is included as an appendix for those who may have little or no experience in this area. NASSCO’s ‘Simulation Specification’, which became the guiding plan for the project, is included with this report to provide the first-time simulation project team with an idea of what is needed when subcontracting the services of a simulation consultant and the scope of work involved when the decision is made to utilize computer simulation.

Two models, the Profile Fabrication Area and the Panel Line, are used in this report to take the reader through the analysis of a simulation model for bottlenecks and constraints. From this analysis, it has been determined that the constraints in the Profile Fabrication Area ultimately become the manpower and space available for the fabrication of profiles. Automation, such as a robotic profile cutter, may eliminate these constraints by providing a higher throughput from a smaller workarea. The bottlenecks in the Panel Line are the one-sided welding operations, the stiffener fitting operations, and the web weldout process. Automation, such as robotic fitting and welding machines, may be utilized to increase throughput in these areas. These automated options will be investigated in Phase II.

Computer simulation is proving to be a valuable tool in this project. It not only allows the team to forecast the effect of future changes to the system’s performance, but provides a means to focus attention on the strengths and weaknesses of the current process. The key to success in both cases is the proper planning of the project including the development of clear objectives. Without taking these measures the project can easily become sidetracked due to excessive model detail and unclear goals. Such experiences tend to foster undue negative feelings toward new tools such as computer simulation. Properly prepared for, however, computer simulation can achieve the same success in the American shipbuilding industry as it has seen in industries such as automotive, defense, medical, and electronics manufacturing.
### GLOSSARY OF TERMS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CM</td>
<td>Cutting Machine</td>
</tr>
<tr>
<td>MT</td>
<td>Manufactured T-beam</td>
</tr>
<tr>
<td>NASSCO</td>
<td>National Steel and Shipbuilding</td>
</tr>
<tr>
<td>NC</td>
<td>Numerical Control</td>
</tr>
<tr>
<td>NSRP</td>
<td>National Shipbuilding Research Program</td>
</tr>
<tr>
<td>ROI</td>
<td>Return on Investment</td>
</tr>
<tr>
<td>SLNC</td>
<td>Sealift New Construction</td>
</tr>
<tr>
<td>SOC 1</td>
<td>Stage of Construction 1 - Steel Fabrication</td>
</tr>
<tr>
<td>SOC 2</td>
<td>Stage of Construction 2 - Subassembly</td>
</tr>
<tr>
<td>SOC 3</td>
<td>Stage of Construction 3 - Assembly</td>
</tr>
<tr>
<td>WIP</td>
<td>Work In Process</td>
</tr>
</tbody>
</table>
1.0 INTRODUCTION

The principal objective of this National Shipbuilding Research Program (NSRP) project is to develop a methodology to identify specific shipbuilding processes within steel fabrication and subassembly that are good candidates for automation, and to determine the degree and mix of automation which will have the best overall effect on the defined areas. The core of the methodology is a “what if” type analysis using computer simulation models. The theory is that by using the simulation model(s), one can select an optimum mix of automation within steel fabrication and subassembly operations that will meet selected production goals.

This project has been divided into two phases, analysis of current ‘As-Is’ processes and comparison to ‘To-Be’ models incorporating automation. This report is the Phase I Final Report of this NSRP project, which was conducted by the Industrial Engineering department at National Steel and Shipbuilding Company (NASSCO) in San Diego, California. Portions of the project were performed on a contractual basis by First Marine International and by Kiran & Associates. Project participants have backgrounds in ship production, production automation, and computer simulation.

Background

To become more competitive in the world commercial market, the American shipbuilding industry must streamline current production methods to reduce span times and production costs. One of the best methods to reduce span times and production costs is to automate production processes. Automation lends itself to labor intensive repetitive processes. Steel fabrication and subassembly, the initial stages of ship production, consist of many production processes that are both labor intensive and repetitive. These two areas have great potential for the application of process automation, and are therefore the focal point of this project.

The automation of shipbuilding production processes is very capital intensive, and the interdependencies between these processes are such that extensive analysis and justification are required by management to make prudent decisions related to the application of automation. Computer simulation software is a tool that can be very beneficial in this analysis and justification. Using simulation models, various automation scenarios can be evaluated for their impact to a particular process as well as to the overall production system within a relatively short period of time and without the need to make capital expenditure. The data output from simulation models can help management to optimize their capital expenditures for process automation. For this reason, computer simulation software has been selected as the primary decision making tool for this project.

In Phase I of this project, a computer simulation model of a sample shipyard’s ‘As-Is’ production processes for steel fabrication and steel subassembly has been created. NASSCO was used as the sample shipyard. Using the ‘As-Is’ simulation model, system bottlenecks, constraints, resource requirements, and throughput capacities have been defined and documented. The second phase of the project includes benchmarking activities to identify ‘world class’ methods and processes for steel fabrication and steel subassembly. The results of the benchmarking activities will be used to define various automation scenarios for the sample shipyard. These scenarios will be simulated by using modified versions of the original simulation model. Projected impacts to the production system for the various automation scenarios will be defined by the outputs of the simulation models. The ultimate goal of these efforts is to use the simulation results as a direct input to related cost benefits analysis.

2.0 SIMULATION OVERVIEW

Study of simulation fundamentals prior to beginning a simulation project for the first time is highly recommended.
There are numerous articles and books on the subject of computer simulation. Many of these publications can be found in college libraries. A large amount of information on simulation can be found by browsing the Internet (e.g., www.wintersim.org). Another good source of information is professional organizations. The following is a list of professional organizations that promote the application of computer simulation.

American Statistical Association (ASA)
Association for Computing Machinery / Special Interest Group on Simulation (ACM / SIGSIM)
Institute for Operations Research and the Management Sciences / College of Simulation (INFORMS / CS)
Institute of Electrical and Electronics Engineers / Computer Society (IEEE / CS)
Institute of Industrial Engineers (IIE)
National Institute of Standards and Technology (NIST)
The Society for Computer Simulation, International (SCS)

3.0 SIMULATION PROCESS STEPS

The process approach used for this project is taken from the basic steps recommended by most texts to be applied to any simulation project. These steps are illustrated by Figure 4.0-1. The overall process is iterative with activities being refined or even redefined during each cycle. Because of the iterative nature of the process, each step does not have to be carried through to completion before the next one can begin. Each of the steps is discussed in detail within the body of this report.

Figure 3.0-1: Simulation Modeling Steps
4.0 PLANNING THE PROJECT

Experienced simulation project participants will emphasize the necessity of good planning in any simulation study. Because of the nature of simulation modeling, it is quite possible for projects with good funding and knowledgeable personnel to fail due to poor planning. Therefore, the number one priority of the NASSCO project team was to outline a plan detailing the objectives of the simulation study and the steps which would be taken to achieve those objectives. This plan became the ‘Simulation Specification’ in Appendix B of this report.

4.1 Research

The first action taken by the NASSCO project team was to learn about computer simulation. The majority of this task was completed by attending the ’96 Winter Simulation Conference. At this conference the project team learned about applications and capabilities of computer simulation. This gave the project team the knowledge needed to define the level of detail required by the model to meet the project objective. The Conference also helped the team to gain insight into the extensive consulting and software resources available in the simulation modeling community.

4.2 Simulation Software and Vendor Selection

Prior to starting a simulation project, one must select the simulation software that is going to be used for the project. There is a wide variety of simulation software packages available for purchase. The reader should make his or her own evaluation of the various simulation packages, and select the one which will best fit their needs. Discrete event simulation is normally used when modeling production processes. Therefore, the selected software package should be good at discrete event simulation. After a review of most of the available PC based simulation packages, the project team narrowed their preference to SimPLE++ and ProModel.

Due to the magnitude and complexity of a single simulation model covering both steel fabrication and steel subassembly activities, it was determined that the required level of expertise in simulation modeling did not exist at NASSCO. Therefore, it was decided that a simulation consultant would be hired to perform all programming tasks. Just as there are numerous simulation software packages available on the market, there are also numerous simulation consultants. Most consultants will specialize with one simulation software package. Therefore, final selection of the software package was influenced by the selection of the consultant, and visa versa. The ‘Simulation Specification’ (Appendix B) was distributed to two simulation consultants - A & P Appledore who specializes in SimPLE++, and Kiran and Associates who specializes in ProModel. The consultants were asked to bid on the programming portion of the project. An evaluation matrix (see Figure 4.2-1) was created to compare the two software packages and the vendor’s proposals. Additional pros and cons of each software package are explained in Sections 4.2.1 and 4.2.2.
<table>
<thead>
<tr>
<th>Feature</th>
<th>ProModel</th>
<th>SiMPLE++</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software license</td>
<td>$16,900 includes 1st year of software maintenance.</td>
<td>Full development license = $29K</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2000 Object License = $15K</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1000 Object License = $10K</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Application License = $10K</td>
</tr>
<tr>
<td>Software maintenance</td>
<td>$2.25K per year</td>
<td>Depending upon the type of software license, annual maintenance fees are $1.5K, $2.3K, or $4.5K</td>
</tr>
<tr>
<td>Minimum hardware requirements</td>
<td>Pentium 133Mhz, 16 Mb RAM, 25 Mb Free Disk Space, 16 Mb Swap File, SVGA, Windows 3.1</td>
<td>Pentium 133Mhz, 64 Mb RAM, 50Mb Free Disk Space, CD ROM, 256 color w/ 1024 x 768, Windows NT</td>
</tr>
<tr>
<td>Operating system requirements</td>
<td>Windows 3.1 or better</td>
<td>Windows NT</td>
</tr>
<tr>
<td>Software training</td>
<td>Purchase of software includes three day training class for one person. Additional three day training sessions $ 1,100 per person.</td>
<td>Three day class. $1,500 per person. Not included with purchase of software.</td>
</tr>
<tr>
<td>Statistical analysis software</td>
<td>Included</td>
<td>Not included.</td>
</tr>
<tr>
<td>Hierarchical modeling used to create the overall model.</td>
<td>Performed external to ProModel using Visual Basic</td>
<td>Built in as part of the object oriented logic.</td>
</tr>
<tr>
<td>Inheritance</td>
<td>Limited</td>
<td>Built in as part of the model logic. Will reduce the time required to make model changes.</td>
</tr>
<tr>
<td>Model optimization</td>
<td>SimRunner optimization software included</td>
<td>None</td>
</tr>
<tr>
<td>Ease of software use</td>
<td>Very straightforward</td>
<td>High skill level necessary for complex models.</td>
</tr>
<tr>
<td>Software user base</td>
<td>Very large user base (&gt;2500) Includes the Navy, Air Force, Army, Newport News, Boeing, Hughes, Vought, Northrop, GM, Ford, Motorola, Hewlett Packard, IBM, Sony, Caterpillar, Disney, and Anderson Consulting</td>
<td>Smaller user base, includes A&amp;P Applodore, Bosch, BMW, Ciba Geigy, Ford, Hewlett Packard, IBM, John Deere, Mercedes Benz, Levi, and Nokia</td>
</tr>
<tr>
<td>Consultant</td>
<td>Kiran &amp; Associates</td>
<td>A&amp;P Applodore</td>
</tr>
<tr>
<td>Location of consultant</td>
<td>San Diego, CA</td>
<td>Newcastle, England</td>
</tr>
<tr>
<td>Accessibility of consultant</td>
<td>Local to NASSCO</td>
<td>20 manweeks on site else communicate by phone, fax, and e-mail</td>
</tr>
<tr>
<td>Consultant's proposed project time span</td>
<td>12-14 weeks</td>
<td>25-27 weeks</td>
</tr>
<tr>
<td>Consulting Fees</td>
<td>$40K - $50K using stochastic data for inputs</td>
<td>$205K using production data for inputs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$176K using stochastic data for inputs</td>
</tr>
<tr>
<td>Consultant's knowledge of shipbuilding</td>
<td>None</td>
<td>Extensive</td>
</tr>
</tbody>
</table>

Figure 4.2-1: Software and Vendor Evaluation Matrix
4.2.1 Pros and Cons of SiMPLEx++

The object oriented and hierarchical features of SiMPLEx++ are very beneficial when creating the overall model. Each one of the individual modules is created incorporating all of the required details. The modules are then summarized into a single object within the overall model (i.e.; the single object representation of a module can be thought of as a black box with all of the related detail activities occurring within the box). This gives the user the ability to run the overall model using different combinations of the ‘what if’ modules, and the ability to zoom in on any of the modules to view the detail activities occurring within. However, the complexity of the software is such that in-house development of simulation models with SiMPLEx++ would be limited, and therefore in all probability the utilization of the software as a tool within the shipyard would be limited as well. The level of expertise required to develop models with SiMPLEx++ is reflected in the higher consulting fees.

4.2.2 Pros and Cons of ProModel

The manufacturing orientation and graphics interface of ProModel is considered to be of great value for in-house development of future simulation models. The hierarchical requirements of the overall model are achieved by using a Visual Basic interface to ProModel. The Visual Basic approach provides the same black box logic provided when using object oriented software. ProModel has a larger user base, so the exchange of tips and techniques is more prevalent. The software is very easy to work with, and therefore improves the probability of extended application within the shipyard. The purchase price and consulting fees are moderately priced. Based on these reasons, ProModel was the selected software for the project and Kiran and Associates was the selected vendor.

4.3 ProModel Basics

Once the software selection was made, it was apparent that in order to be able to provide Kiran and Associates the information necessary to build the models and to be able to draw conclusions from the output, the project team members would have to become familiar with ProModel. The basic training included with the purchase of ProModel proved to be valuable in every stage of the project.

ProModel is a discrete event simulator. Time is broken down into blocks during which events are occurring to change the system and blocks during which nothing is happening at all. Four “characteristics” of the system to be simulated need to be defined in ProModel:

- Entities
- Locations
- Path Networks
- Resources

The entities in ProModel are individual objects such as pieces or products which move from location to location. The entities drive the system. The locations are positions in the model to which entities and resources are directed. The path networks are the defined pathways over which the entities and resources travel. The resources are people or equipment which process or transport the entities. All four of these “characteristics” interact through:

- Processing
- Arrivals

The processing of an entity is a set of instructions for that entity. Typically the processing instructions for an entity are to capture a resource, use the resource to perform an operation on the entity, and then route it to a new location. The arrivals are instructions for the introduction of material (entities) into the system.
The model is further enhanced through other ProModel features:

- Variables
- Attributes
- Macros
- Shift Assignments

*Variables* can be set up in ProModel and used to keep track of data. They are also used for standard computer programming functions such as do loops. *Attributes* are specific details which can be assigned to an entity or location such as dimensions of a part or area of a workstation. These attributes are specific to each piece in the system and can be used for the collection of data. *Macros* perform a similar function as variables, however, in a more flexible way. The macros can represent not only a number but also a set of instructions such as a subroutine. In addition, the modeler has the added benefit of setting up the macro as “user-defined.” This will allow the user of the software to enter in his or her own numbers to be utilized in the model. The input of Manning and some process times in the steel fabrication and subassembly models are done using “user-defined” macros. *Shift assignments* allow the modeler to create a more accurate scenario of how the resources are utilized in the system by including lunches and breaks into the simulation time.

### 5.0 SYSTEM DEFINITION

The first step of the model design phase is to define the system boundary. For this project, the system boundary shall include all manufacturing processes and facilities that are directly related to steel fabrication and steel subassembly. The overall facility layout for NASSCO is shown in Figure 5.0-1. The shaded portions represent NASSCO’s steel fabrication and subassembly areas. All related manufacturing processes are performed within the shaded areas.

![Figure 5.0-1: NASSCO Facility Layout](image)

Figure 5.0-1: NASSCO Facility Layout
NASSCO's steel fabrication consists of five major areas: Treatment Line, Plate, Profile, Small Parts, and T-Beam Fabrication. NASSCO's subassembly consists of three major areas: General Subassembly, Box Girder & Box Stanchion Cell, and Panel Line. The incoming plate and profile storage areas are shown in Figure 5.0-1 to illustrate the location of external inputs to the system.

Selecting the boundary of the simulation model to include both steel fabrication and subassembly creates a problem in that, when one applies the level of detail required to truly show the impact of automation to these areas, the size of the model becomes extremely large and difficult to manage. Within the system boundary there are numerous work centers with multiple pieces of equipment, which perform various processes. In addition, there are several entity types, each of which can have numerous routings and decision points within the model.

The general concept used to simplify the simulation model as defined by this project is to break it down into a collection of modules. These modules are individual simulation models of specific areas within the system. Details of the system logic are defined within the individual modules. The outputs of one module are the inputs to another module. For example, primed plates that output from the treatment line module will be the inputs to the plate fabrication module. The completed modules are joined together into an overall model of the entire system. Interrelationships between the different modules can be seen with the overall model. This is why it is important that the computer simulation software have hierarchical capability.

Multiple variations of the individual modules will be created for the 'What If' (or 'To-Be') analysis portion of the project. Different scenarios for profile fabrication could include: adding a single robotic profile cutter, adding two robotic profile cutters, adding a robotic profile cutter and a specialized machine to cut flatbar only, etc. This will show the impact of different levels of automation within a given area. Different combinations of the 'What If' individual modules will be input into the overall model to ascertain the best mix of automation.

In the NASSCO example, the logical modules are the eight areas highlighted by Figure 5.0-1. Therefore, there will be one overall simulation model of the system consisting of eight integrated modules. Figure 5.0-2 illustrates the overall conceptual design for the NASSCO model.

![Image of simulation model](Figure 5.0-2: NASSCO Simulation Model Conceptual Design)
5.1 Module Definition

Once the general system boundary has been defined, the data collecting process can begin. A good starting point for data collection is to create detailed definitions of the identified system modules. This includes creating detailed facility layouts, defining the processes performed, identifying all pieces of the processing equipment and associated parameters, defining all routings and associated logic, defining all methods of material handling, and defining all inputs and outputs of the module.

The following subsections define the different modules for the NASSCO model. This can serve as a good example for other shipyards. Although the specific details will be different for other shipyards, the processes, material handling methods, inputs, outputs, and data requirements will be very similar to the NASSCO model.

5.1.1 Treatment Line

The treatment line lies in a north/south direction and is adjacent to the steelyard. The treatment line is used to remove mill scale and to add primer to plates and profiles. The equipment consists of an input conveyor system, a shot blast unit (wheelabrator), automated spray painter & dryer, and an output conveyor system.

Plates are loaded onto the input conveyor with the steelyard crane via a transfer car and profiles are loaded onto the input conveyor with a forklift. Plates are processed one at a time, and are typically processed on second shift. Profiles are processed in batches of up to four at a time, and are typically processed on first shift. Completed plates are delivered to the plate fabrication area with an automated material handling system (collator car). Profiles are removed from the end of the output conveyor with a forklift. Processed profiles are grouped together into cassettes. Fully loaded cassettes of profiles are delivered to the profile fabrication area with a log carrier. The general layout of the NASSCO treatment line is shown in Figure 5.1-1. The entities and resources involved in the system and the key requirements used in modeling the area shown in Table 5.1-1.

![Figure 5.1-1: NASSCO Treatment Line](image)
<table>
<thead>
<tr>
<th>Entities</th>
<th>Attributes</th>
<th>Parent Entity</th>
<th>Arrival Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>raw plates</td>
<td>size (length)</td>
<td>none</td>
<td>user defined</td>
</tr>
<tr>
<td>raw flatbar</td>
<td>size (length and width)</td>
<td>none</td>
<td>user defined</td>
</tr>
<tr>
<td>raw bulb flats</td>
<td>size (length and width)</td>
<td>none</td>
<td>user defined</td>
</tr>
<tr>
<td>raw angles</td>
<td>size (length and width)</td>
<td>none</td>
<td>user defined</td>
</tr>
<tr>
<td>raw T’s</td>
<td>size (length and width)</td>
<td>none</td>
<td>user defined</td>
</tr>
<tr>
<td>raw MT’s</td>
<td>size (length and width)</td>
<td>none</td>
<td>user defined</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Resources</th>
<th>Key Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>steelyard crane</td>
<td>operational speed, distance traveled, and downtime</td>
</tr>
<tr>
<td>transfer car</td>
<td>operational speed, distance traveled, and downtime</td>
</tr>
<tr>
<td>forklift</td>
<td>quantity, operational speed, and downtime</td>
</tr>
<tr>
<td>conveyor system</td>
<td>length, width, operational speed, and downtime</td>
</tr>
<tr>
<td>wheelabrator</td>
<td>downtime</td>
</tr>
<tr>
<td>painting system</td>
<td>downtime</td>
</tr>
<tr>
<td>collocator car</td>
<td>operational speed, distance traveled, and downtime</td>
</tr>
<tr>
<td>profile cassettes</td>
<td>quantity and capacity</td>
</tr>
</tbody>
</table>

Table 5.1-1: Treatment Line Entities and Resources

5.1.2 Plate Fabrication

Plate fabrication is contained within a single crane bay. The plate fabrication process consists of cutting / burning detail parts from large blank plates of primed steel.

Plate cutting operations are performed on three NC burning machines (2 plasma and 1 oxy-fuel) contained within the crane bay. Each cutting machine has two cutting heads mounted to a single gantry and four table positions. Typically one operator is required to run each of the burning machines. All plates greater than one inch thick are cut on the oxy-fuel burning machine. It is common for more than one detail part to be cut from a single plate. Processing times are a function of the marking time, cut length and cutting speed. Cutting speeds are a function of the machine type (i.e.; plasma vs. oxy-fuel) and plate thickness.

There is an area setup for manual beveling operations at one end of the bay. A percentage of the plates cut on the plasma machines are sent to the manual beveling station for additional processing. The manual beveling process consists of using hand torches mounted in tractor type devices that ride on tracks. Usually there are two workers in the manual bevel area.

There is an overhead gantry crane that services the entire crane bay. The gantry crane is responsible for all significant material handling operations. Duties include, loading and unloading the burning machines and manual bevel tables, removing excess/scrap material from the burning tables and placing it in scrap bins, and loading completed plates onto outgoing material handling devices. (Note: The burn machine operator and or a helper manually removes small pieces of scrap material and small cut parts from the cutting tables.)

Incoming material is delivered from the treatment line by automated material handling equipment (i.e.; collocator system) and stored in piles within the collocator lane. In process material is stored in piles within the crane bay. Large outgoing detail parts are loaded onto trailers or transfer cars with the overhead crane. Smaller outgoing detail parts are removed from the area by forklift. Trucks will remove loaded scrap tubs as required. Detail parts less than eighteen feet in length are removed from the bay with forklift. The layout of the NASSCO plate fabrication bay is shown in Figure 5.1-2. The entities and resources involved in plate fabrication are listed in Table 5.1-2.
Figure 5.1-2: NASSCO Plate Fabrication

<table>
<thead>
<tr>
<th>Entities</th>
<th>Attributes</th>
<th>Parent Entity</th>
<th>Arrival Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>raw plates</td>
<td>size (thickness)</td>
<td>none</td>
<td>user defined or input from treatment line</td>
</tr>
<tr>
<td></td>
<td>cut length</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>number of pieces in nest</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cut plate</td>
<td>size (length, width, thickness)</td>
<td>raw plate</td>
<td>process driven</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Resources</th>
<th>Key Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>gantry crane</td>
<td>operational speed, distance traveled, and downtime</td>
</tr>
<tr>
<td>transfer crane</td>
<td>operational speed, distance traveled, and downtime</td>
</tr>
<tr>
<td>collocator car</td>
<td>operational speed, distance traveled, and downtime</td>
</tr>
<tr>
<td>plasma cutting machine #1</td>
<td>cutting speeds, setup time, gantry travel speed, and downtime</td>
</tr>
<tr>
<td>plasma cutting machine #2</td>
<td>cutting speeds, setup time, gantry travel speed, and downtime</td>
</tr>
<tr>
<td>oxy-fuel cutting machine</td>
<td>cutting speeds, setup time, gantry travel speed, and downtime</td>
</tr>
<tr>
<td>beveler (manual labor)</td>
<td>number of heads and efficiency</td>
</tr>
<tr>
<td>forklift</td>
<td>quantity, operational speed, and downtime</td>
</tr>
</tbody>
</table>

Table 5.1-2: Plate Fabrication Entities and Resources

5.1.3 Profile Fabrication

Profile fabrication is performed in a single crane bay. The profile fabrication process consists of cutting / burning detail parts from long pieces of primed raw stock. The types of raw stock processed in the Profile Fabrication Area include flatbar, bulb flats, angles, and T's.

The current process is entirely manual and carried out on five rows of roller tables. The fabrication process consists of a layout and a labeling operation followed by a burning operation. The work is divided between a layout crew and a burning crew. The burning crew will follow the layout crew in a round robin fashion (a.k.a. Time Allocation Control Technique or TACT). It is typical for more than one detail part to be fabricated from a single piece of raw stock.

There is an overhead gantry crane that services profile fabrication. The gantry crane is used to load and
unload the material (one piece at a time) onto the roller tables. The gantry crane is also used to remove completed parts and large end cuttings from the roller tables.

Log carriers deliver incoming material. Delivered material is in either cassettes or loaded onto carrier blocks. Large outgoing pieces are grouped by next assembly and placed into cassettes. A log carrier removes these cassettes from the area. Smaller outgoing pieces are grouped together by next assembly on pallets. Some of the smallest pieces are manually loaded onto the outgoing pallets. The pallets are removed from the area by forklift. The layout of the NASSCO Profile Fabrication area is shown in Figure 5.1-3. The entities and resources involved in profile fabrication are shown in Table 5.1-3.

![Figure 5.1-3: NASSCO Profile Fabrication]

<table>
<thead>
<tr>
<th>Entities</th>
<th>Attributes</th>
<th>Parent Entity</th>
<th>Arrival Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>raw flatbar, bulb plates, angles, T's, &amp; MT's</td>
<td>size (thickness)</td>
<td>none</td>
<td>user defined or input from treatment line</td>
</tr>
<tr>
<td></td>
<td>cut length</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>number of pieces in nest</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cut flatbar, bulb plates, angles, T's, &amp; MT's</td>
<td>size (length, width, thickness)</td>
<td>raw plate</td>
<td>process driven</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Resources</th>
<th>Key Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>gantry crane</td>
<td>operational speed, distance traveled, and downtime</td>
</tr>
<tr>
<td>roller tables</td>
<td>length and number of rows</td>
</tr>
<tr>
<td>layout (manual labor)</td>
<td>number of heads and efficiency</td>
</tr>
<tr>
<td>burner (manual labor)</td>
<td>number of heads and efficiency</td>
</tr>
<tr>
<td>forklift</td>
<td>quantity, operational speed, and downtime</td>
</tr>
<tr>
<td>log carrier</td>
<td>quantity, operational speed, and downtime</td>
</tr>
<tr>
<td>cassette</td>
<td>quantity, footprint and holding capacity</td>
</tr>
</tbody>
</table>

Table 5.1-3: Profile Fabrication Entities and Resources

5.1.4 Small Parts Fabrication

The Small Parts Fabrication Area is located in a small craneway. Small parts fabrication consists of cutting commonly used small detail parts (chocks, brackets, etc.) and production aides (wedges, padeyes, etc.)
from steel plate. Parts fabricated in this area are usually less than two-foot square in size.

This area consists of two NC burning machines. Each machine is an oxy-fuel type with multiple cutting heads. Parts cut in this area are cut in large lot sizes. Multiple copies of the same part are cut from a single plate.

Blank plates and large pieces of remnant material are delivered from the plate fabrication area with a transfer car. Incoming material is transported from the transfer car to a section of conveyor.

There are two small gantry cranes (running on the same set of tracks) that service this area. The gantry cranes are used to transfer incoming material from the incoming conveyor to a material storage area located between the two cutting machines. The gantry cranes are also used to load and unload the cutting machines.

Completed parts are grouped on pallets by part type and/or next assembly. Forktrucks remove the pallets of completed parts from the area. The layout of the Small Parts Fabrication area is shown in Figure 5.1-4. The entities and resources involved in small parts fabrication are listed in Table 5.1-4.

![Gantry Crane Diagram](image)

**Figure 5.1-4: NASSCO Small Parts Fabrication**

<table>
<thead>
<tr>
<th>Entities</th>
<th>Attributes</th>
<th>Parent Entity</th>
<th>Arrival Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>raw plates</td>
<td>size (thickness)</td>
<td>none</td>
<td>user defined</td>
</tr>
<tr>
<td></td>
<td>cut length</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>number of pieces in nest</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cut plate</td>
<td>size (length, width, thickness)</td>
<td>raw plate</td>
<td>process driven</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Resources</th>
<th>Key Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>gantry cranes</td>
<td>operational speed, distance traveled, and downtime</td>
</tr>
<tr>
<td>transfer car</td>
<td>operational speed, distance traveled, and downtime</td>
</tr>
<tr>
<td>oxy-fuel cutting machine #1</td>
<td>cutting speeds, setup time, gantry travel speed, and downtime</td>
</tr>
<tr>
<td>oxy-fuel cutting machine #2</td>
<td>cutting speeds, setup time, gantry travel speed, and downtime</td>
</tr>
<tr>
<td>oxy-fuel cutting machine</td>
<td>cutting speeds, setup time, gantry travel speed, and downtime</td>
</tr>
<tr>
<td>forklift</td>
<td>quantity, operational speed, and downtime</td>
</tr>
</tbody>
</table>

Table 5.1-4: Small Parts Fabrication Entities and Resources
5.1.5 T-Beam Fabrication

T-beam fabrication is performed in an area adjacent to Small Parts Fabrication. There are two major pieces of processing equipment used for T-beam fabrication, a flame planer and a T-beam welder.

Unprimed plate material is delivered to the flame planer using automated material handling equipment. Plates are fed to the flame planer's input conveyor from a transfer car. The plates are then conveyed into position and cut to size by the flame planer. The stripped plates will be used for T-beam webs. The webs are conveyed from the flame planer to a second transfer car. The second transfer car will index over to the input side of the T-beam welder and feed the webs into the welder's input conveyor.

T-beam flanges are fabricated from flatbar. Long pieces of flatbar are stored in racks in the T-beam area. As required, pieces of flatbar are loaded onto sawhorses for cutting. Cutting of flatbar is performed manually with a hand held torch. Completed flange pieces are loaded into the T-beam welder’s input conveyor.

The T-beam welder operator will position the web material normal to the flange prior to feeding the material into the welder. The T-beam welding process consists of passing the located web and flange pieces past two stationary welding torches. Completed T-beams output the machine onto a small section of conveyor. (Note: Completed T-beams are more commonly referred to as manufactured T’s or MT’s.)

There is an overhead gantry crane that services this area. The gantry crane is used to assist with the flange cutting operation, and to stack MT’s onto carrier blocks. Log carriers are used to remove stacks of completed MT’s from this area, and to deliver flatbar material. The layout of the T-Beam Fabrication area is shown in Figure 5.1-5. The entities and resources involved in T-Beam fabrication are shown in Table 5.1-5.

![Diagram of T-Beam Fabrication](image)

**Figure 5.1-5: NASSCO T-Beam Fabrication**

<table>
<thead>
<tr>
<th>Entities</th>
<th>Attributes</th>
<th>Parent Entity</th>
<th>Arrival Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>raw flatbar</td>
<td>size (thickness)</td>
<td>none</td>
<td>user defined</td>
</tr>
<tr>
<td></td>
<td>cut length</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>number of pieces in nest</td>
<td></td>
<td></td>
</tr>
<tr>
<td>raw plate</td>
<td>size (length, width, thickness)</td>
<td>none</td>
<td>process driven</td>
</tr>
<tr>
<td>raw MT</td>
<td>size</td>
<td>cut flatbar</td>
<td>process driven</td>
</tr>
<tr>
<td></td>
<td>cut plate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resources</td>
<td>Key Parameters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>gantry crane</td>
<td>operational speed, distance traveled, and downtime</td>
<td></td>
<td></td>
</tr>
<tr>
<td>transfer cars</td>
<td>operational speed, distance traveled, and downtime</td>
<td></td>
<td></td>
</tr>
<tr>
<td>flame planer</td>
<td>cutting speeds, setup time, and downtime</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T-beam welder</td>
<td>setup time, welding speed, and downtime</td>
<td></td>
<td></td>
</tr>
<tr>
<td>manual labor</td>
<td>setup time, cutting speed, and availability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>log carrier</td>
<td>quantity, operational speed, and downtime</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5.1-5: T-Beam Fabrication Entities and Resources

5.1.6 General Subassembly

General subassembly operations are contained within a long craneway located due east of the fabrication areas described above. Operations consist of the fitting and welding together of detail pieces into subassemblies.

This area is divided into a series of workcells. There are four basic types of workcells: minor subassembly, paneling, basic, and line heating. Incoming work is level loaded and grouped within these cells by subassembly type.

Small subassemblies are processed in the minor subassembly area. This area consists of two long waist high worktables. An overhead gantry crane is used to place the work material onto the tables. Fitting and welding operations are performed manually with stick and wire feed welding. There are two are jib cranes that assist with production.

The paneling area is setup to support submerged arc welding (SAW) processes. SAW processes are used mainly for seaming plates. During time periods with heavy concentrations of seaming requirements when floorspace is constrained, plates will be seamed and then transferred to another cell to complete the subassembly. During periods of lighter concentrations of seaming requirements the subassemblies are completed within the paneling area.

There are seven basic cells. Each cell contains a large work area complete with all fitting and welding utilities. All fitting operations consist of locating detail pieces in relation to one another and then tack welding them into position. The resources required for fitting operations include, stick welders, crane service, hand tools, and fitting aides. Usually only one fitter is assigned to a given subassembly. The fitting time is a function of the number of pieces, the size, and the complexity of a given subassembly. Welding operations are performed after fitting. Both manual and semi-automated process are used for welding. The number of welders assigned to a given subassembly will vary depending upon the size of the subassembly. The welding time is a function of the weld footage, weld size, and subassembly complexity.

There are four overhead gantry cranes that service the General Subassembly Area. Each of the cranes rides on the same set of rails, which extend from one end of the shop to the other. The cranes are used to assist with fitting operations, to turn workpieces, and to transport completed subassemblies to line heating and outgoing buffers.

Incoming material consists of subassembly kits (i.e. all plate and profile material for a given subassembly). Material is delivered to the shop on second shift. Material less than eighteen feet in length is delivered by forklift. The collocator system and overhead gantry cranes deliver material greater than eighteen feet in length.

Completed subassemblies are transferred by overhead gantry crane from their build location to an outgoing buffer at the east end of the shop. A percentage of the completed subassemblies will require line heating. Line heating is performed on an acorn table located adjacent to the outgoing buffer area. Outgoing subassemblies are loaded onto trailers with the overhead gantry cranes for delivery to block assembly.
The total number of personnel assigned to the General Subassembly Area is a function of the production schedule. The layout of the General Subassembly Area is shown in Figure 5.1-6. The entities and resources involved in the subassembly process are shown in Table 5.1-6.

![Diagram of General Subassembly Area]

**Figure 5.1-6: NASSCO General Subassembly**

<table>
<thead>
<tr>
<th>Entities</th>
<th>Attributes</th>
<th>Parent Entity</th>
<th>Arrival Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>subassembly kits</td>
<td>size (laydown area)</td>
<td>cut plate</td>
<td>user defined</td>
</tr>
<tr>
<td></td>
<td>number of pieces</td>
<td>cut flatbar</td>
<td></td>
</tr>
<tr>
<td></td>
<td>weld footage</td>
<td>cut bulb flat</td>
<td></td>
</tr>
<tr>
<td></td>
<td>complexity</td>
<td>cut angles</td>
<td></td>
</tr>
<tr>
<td></td>
<td>weight</td>
<td>cut T's</td>
<td></td>
</tr>
<tr>
<td>completed subassembly</td>
<td>size (volume)</td>
<td>subassembly kits</td>
<td>process driven</td>
</tr>
<tr>
<td></td>
<td>weight</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 5.1-6: General Subassembly Entities and Resources**

**5.1.7 Box Girder & Box Stanchion Cell**

Sealift New Construction (SLNC) centerline box girders and box stanchion are assembled in a dedicated cell. The cell is located at the east end of the main block assembly table.

The cell is divided into two areas, one half for box girders and one half for box stanchions. Each area consists of two stations. The first station is an assembly fixture. All fitting operations are completed in the assembly fixtures. The second station is a large open area used to complete welding operations.

There are two dedicated gantry cranes in the cell, one for each area. These cranes are used for fitting operations and to transfer subassemblies from station one to station two. The main block assembly gantry crane is required to assist with loading and unloading the box girder assembly fixture.
There is one fitter in the cell who will alternate between the two assembly fixtures. There is a group of welders that follow behind the welder to complete the subassemblies.

Incoming material less than eighteen feet in length is delivered by forklift. The collocator system and the block assembly gantry crane deliver material greater than eighteen feet in length. Completed subassemblies are removed from the cell and delivered to block assembly with the yard's whirly gantry cranes. The layout of the Box Girder / Box Stanchion Cell is shown in Figure 5.1-7. The entities and resources involved in the fabrication of box girders and box stanchions are listed in Table 5.1-7.

![Figure 5.1-7: NASSCO Box Girder & Box Stanchion Cell](image)

<table>
<thead>
<tr>
<th>Entities</th>
<th>Attributes</th>
<th>Parent Entity</th>
<th>Arrival Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>subassembly kit</td>
<td>size (length)</td>
<td>cut plates</td>
<td>user defined</td>
</tr>
<tr>
<td></td>
<td>number of pieces</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>weld footage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>completed subassembly</td>
<td>size (length)</td>
<td>subassembly kit</td>
<td>process driven</td>
</tr>
<tr>
<td></td>
<td>weight</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Resources</th>
<th>Key Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>gantry crane</td>
<td>operational speed, distance traveled, and downtime</td>
</tr>
<tr>
<td>fitter (manual labor)</td>
<td>number of heads and efficiency</td>
</tr>
<tr>
<td>welder (manual labor)</td>
<td>number of heads and efficiency</td>
</tr>
<tr>
<td>forklift</td>
<td>quantity, operational speed, and downtime</td>
</tr>
</tbody>
</table>

Table 5.1-7: Box Girder / Box Stanchion Entities and Resources

5.1.8 Panel Line

Basic flat panels are fabricated on the Panel Line, which is located adjacent to the Plate Fabrication crane bay. The Panel Line is a series of nine stations connected by a common panel line drive system (similar to a conveyor). There is a single gantry crane that services the entire line.
Station One is the plate fitting station. Incoming plates are received from plate fabrication via a transfer car. Workers will perform some minor edge prep and then fit the incoming plate to the preceding plate. Workers use magnetic plate positioners to align and fair the plates. Deck sockets are installed in this station after all plates in a given panel have been fitted together. Deck sockets are cover-leaf patterns cut into the deck of the SLNC ships in order to lash wheeled cargo down. A bowl is attached to the underside of the deck to prevent water from spilling through the clover-leaf opening. The processing time in this station is a function of the number of plates in a panel and the number of deck sockets (if any).

Station Two is the plate seaming station. Fitted panels are fed into a one sided welder for seaming. The one sided welder can process one seam at a time. A percentage the seams will require rework. There is an inspection and repair pit immediately after the one sided welder. All rework is performed in the inspection pit. Processing time is a function of the number of seams, the length of each seam and the amount of rework.

Station Three is the layout station. Two workers will manually layout and mark the frame and longitudinal stiffener locations on the panel. In addition to layout operations, the edges of the panel are trimmed in this station. Processing time is a function of the layout and trimming times.

Station Four is the longitudinal stiffener fitting station. Log carriers deliver cassettes loaded with longitudinal stiffeners to the panel line. The cassettes are then placed in the stiffener fitting station with either the panel line gantry crane or with one of the yard's whirly gantry cranes. The panel line's gantry crane is used to remove individual stiffeners from the cassette and to position them onto the panel. Fitting aids are used to hold the stiffeners in an upright position, and the crane is released to get another stiffener. The panel is then positioned under a stiffener fitting gantry. The fitting gantry is simply a press used to squeeze out any gaps between the stiffener and the panel. As the stiffener is fitted, it is tack welded to the panel. The fitting gantry can process two stiffeners simultaneously. Processing time is a function of the number and quality of stiffeners in a panel, and the availability of the panel line gantry crane.

Station Five is the longitudinal stiffener welding station. This station consists of a gantry capable of simultaneously welding both sides of four longitudinal stiffeners. This is a fairly automated station. The only manual work consists of aligning the panels and completing wrap welds on the ends of each stiffener. Processing time is a function of the number of stiffeners and the weld lengths.

Stations Six and Seven are web fitting stations. Log carriers deliver webs to the panel line and drop them in the roadway adjacent to the line. One of the yard's whirly gantry cranes is used to place the load of webs onto to panel line. The panel line's gantry crane is then used to fit the webs into place on the panel. Various fitting aids are used for this process. The second web fitting station is simply a rate station. The number of fitters is a function of the number of webs per given panel and the desired line rate. Processing time is a function of the number of webs, the number of fitters assigned, and the availability of the panel line gantry crane.

Stations Eight and Nine are weld out stations. Each station has a service gantry with welding services for up to eight welders suspended above the work. The number of welders assigned to these stations is determined by the scheduled work content. Processing time is a function of the number of welders assigned and the total weld footage. Completed panels are removed from this station by one of the yard's whirly gantry cranes. The Panel Line layout is shown in Figure 5.1-8. The entities and resources involved in the fabrication of panels are listed in Table 5.1-8.

Figure 5.1-8: NASSCO Panel Line
<table>
<thead>
<tr>
<th>Entities</th>
<th>Attributes</th>
<th>Parent Entity</th>
<th>Arrival Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>plates</td>
<td>size (length)</td>
<td>none</td>
<td>input from plate fab</td>
</tr>
<tr>
<td>deck sockets</td>
<td>size (thickness)</td>
<td>none</td>
<td>input from storage</td>
</tr>
<tr>
<td>stiffeners</td>
<td>size (length)</td>
<td>none</td>
<td>input from storage</td>
</tr>
<tr>
<td>webs</td>
<td>size (length)</td>
<td>none</td>
<td>input from storage</td>
</tr>
<tr>
<td>panels</td>
<td>size (length and width)</td>
<td>none</td>
<td>none (output product)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Resources</th>
<th>Key Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>gantry cranes</td>
<td>operational speed, distance traveled, and downtime</td>
</tr>
<tr>
<td>fitter (manual labor)</td>
<td>number of heads and efficiency</td>
</tr>
<tr>
<td>welder (manual labor)</td>
<td>number of heads and efficiency</td>
</tr>
<tr>
<td>one-sided welder</td>
<td>operational speed and downtime</td>
</tr>
<tr>
<td>circular welder</td>
<td>operational speed, and number of machines</td>
</tr>
<tr>
<td>stiffener press</td>
<td>downtime</td>
</tr>
<tr>
<td>stiffener welder</td>
<td>operational speed, downtime, and number of stiffeners</td>
</tr>
</tbody>
</table>

Table 5.1-8: Panel Line Entities and Resources

5.2 Flowcharts

In addition to the module definitions, one must create process flowcharts of the entire system. The flowcharts will define the step-by-step progression of entities through the system. This includes defining the system logic, such as, material storage points, material handling rules, decision points, processing steps, etc. The flowcharts will communicate the system logic to a model developer.

Appendix D contains a copy of the NASSCO model overall flowchart. Originally, a flowchart was created for each of the different simulation modules. The separate flowcharts were then combined into an overall flowchart to show the interrelationships between the different areas. A narrative supplement was also created for the NASSCO model for further clarification to the model developer.

6.0 MODEL BUILDING

Once the processes to be modeled are defined, the actual building of the models can begin. Some general guidelines for the building of the model were established by the NASSCO project team. These guidelines not only addressed the general setup of the model, but also user interfaces, the type of data which was to be collected, and how that data was to be used in the model. During the building of the model additional data was collected, and the models were verified and validated by comparing the output to actual performance data.

6.1 Model Specifies

The following specifics were created by the NASSCO project team as basic guidelines for creating the simulation models.

- For development purposes, the individual modules were created in such a manner that they could be executed without input from other system modules. This reduced the confusion during the ‘As-Is’ model development and validation steps.

- Facilities outside the system boundary were defined but not modeled explicitly. In the NASSCO
model, raw material is introduced to the system from the steelyard. The arrival rate and attributes of raw material entering the system is controlled by user defined functions. Completed detail parts and subassemblies, which are routed to block assembly (SOC 3), simply exit the system.

- Physical processes, such as cutting plates, within the system boundary were modeled to a level which provided an accurate analysis of the time and resources required.

- Material handling processes, such as transporting WIP by crane, were modeled to a level which provided an accurate analysis of the time and resources required.

- In process storage locations were modeled. This is required to show the effect that process and material handling changes have on WIP levels.

- Labor was also included in the model. Personnel are either dedicated (assigned to a specific station) or floating (not assigned to a specific station). Labor was divided into trade classes (e.g.; machine operator, layout, burner, fitter, welder, etc.)

- Resources within the model consist of physical processing equipment (cutting machines, welding units, etc.), material handling equipment (conveyors, fork trucks, cranes, log carriers, etc.), and labor (machine operators, fitters, welders, etc.).

- Downtime of resources is modeled. Downtime includes scheduled and unscheduled downtime.

- There are a variety of entity types within the system. As these entities flow through the system, they can change from one type to another. A single entity can produce several entities as the result of a physical process (A single raw plate will produce several detail parts.). Multiple entities can be joined together to create a single entity (Individual pieces welded together to produce a single subassembly.).

- Each entity has a set of defining attributes (entity type, length, width, height, weight, etc.). These attributes are used to determine routings and processing times. Entity attributes can change as an entity flows through the model.

6.2 User Interfaces

In addition to the ability to execute the overall model, the user should be given the ability to execute any of the individual modules. The user should have the ability to modify certain model parameters. These parameters should include things such as the following:

- simulation duration (clock time)
- resource availability (shift assignments, percent downtime, etc.)
- resource quantities (number of personnel in the labor pools, number of forktrucks, etc.)
- entity attribute functions (user defined distributions)
- entity arrival rates
- physical processing times (cutting and welding speeds, etc.)

6.3 Data Collection

In the data collection phase of the project, all of the pertinent information and system logic is defined, collected and documented. Data will come from a variety of sources including, observation, production, engineering, maintenance, and quality assurance. A general rule of thumb on data collection is the more accurate the data, the more accurate the model. Only key elements that have a direct effect on the system performance are included in the model. The following is a list of the types of data required by the
simulation model.

- machine capacities
- machine downtimes (planned and unplanned)
- material handling equipment (types, quantities, speeds and lifting capacities)
- arrival rates of material (scheduled throughput requirements)
- entity types
- entity attributes
- process parameters (e.g. feedrates, welding speeds, etc.)
- process logic (e.g. decision rules, resource requirements, etc.)
- location definitions (e.g. physical locations of equipment and buffers, etc.)
- path definitions (e.g. physical routings used to transport material within the system)
- labor (trade classification, number of heads, capabilities, shift assignments)

**Stochastic Data**

For most models it is not practical to try to use actual production data from product break down structures and production schedules as direct system inputs. The size and complexity of a simulation model using actual production data would preclude the application of PC based simulation programs. This is what MRP II systems are for. Statistics are used to represent production data within simulation models. For instance, a good source of data for plate fabrication processes is electronic files containing the NC programs used by the burning machines. From this type of file, it is quite possible to attain a complete listing of all plate sizes (i.e. length, width, and thickness) and cutting lengths from which processing times can be derived. The proper method to use this data in a simulation model is to perform statistical analysis on the data in order to define a distribution that accurately represents the data. These distributions are then used within the model to assign attributes to entities. When a raw plate entity is created (enters the system) the simulation model will assign attributes to the entity based on user defined distributions. In this way, the module emulates the real world system without having the complexity of using actual production data.

There are numerous sources of randomness within simulation models of manufacturing systems. The following is an example of some of these sources of randomness.

- interarrival times of parts or raw material
- setup and processing times
- times between failure for equipment
- repair times for equipment
- material sizes (length, width, and thickness or height)
- number of pieces per nest

It is highly recommended that a statistical analysis software package be used to assist with the data analysis. A statistical analysis package will take data in spreadsheet format and automatically fit the data to the proper distribution by performing all applicable “goodness of fit” tests. There are several such packages available on the market. Some of the simulation packages, such as ProModel, include statistical analysis software.

**6.4 Verification and Validation**

Before the experiments can be run, the model must be verified and validated. This process ensures that the users have complete confidence in the output of the model. Only when this is achieved will the experiment results be fully appreciated. In order to achieve this the following must be undertaken.

First, the model must be verified whereby personnel with detailed knowledge of the production system being modeled are asked to check the model behavior to ensure that it reflects the true nature of the real
system. An exact representation is not necessary to pass this test but it is important to ensure that key system behavior characteristics are not neglected. In addition, the modeler performs debugging during the verification phase of the project to make sure the model and its output are running true to the way it was programmed.

Once verified, the accuracy of the model must be validated. To do this, historical real system inputs are fed into the model and the model is executed. The model outputs are then compared against a matching set of historical real system outputs. *Note: Simulation models, which take account of the variability of processes, have outputs that are statistical in nature. The model outputs will therefore have a mean value and a variance associated with that mean.* If the model results and the historical real system outputs agree to within 10% - 15% at the highest level (e.g.; total entities processed within a given module, etc.), then accuracy comparisons on a detailed level can then be made throughout. This process should start by comparing buffer contents and throughputs of each area before getting to the individual resource performances.

It is likely that the model will not pass the validation and verification tests on the first attempt. In this case the following procedure should be carried out:

- Check each of the outputs at the global level for accuracy. The *global level* outputs are the highest level products produced by the model being validated. For example, the number of profiles produced in the Profile Fabrication Area model or the number of panels assembled on the Panel Line. This will isolate the areas in which the inaccuracy is the greatest.

- Having isolated the problem area, the system and product data relevant to these process areas should be verified by revisiting the appropriate data collection points.

- Review process descriptions and assumptions about the suspect area.

- Modify the system as required and revalidate the model.

### 7.0 RUN MODELS FOR OUTPUT

After the models have been verified and validated, they are run to produce the process performance output. The NASSCO project team has completed the building of all eight models (plus the overall model). Two models, the Profile Fabrication Area and the Panel Line, have been included in this report to explain to the reader the analysis process used in this project. The analysis of one or more additional models may be included in the Phase II Final Report.

There were different variations of the Profile Fabrication Area and the Panel Line models which were created for the Phase I analysis:

1. A “baseline” model
2. A “high output” model
3. A “most likely operating condition” model

These variations differed only in the manning levels and material rates which were input into the model.

### 7.1 “Baseline” Model

The “baseline” model uses as its inputs for manning a typical level for current production rates. This is the starting point for the comparison analysis to the automated models. A comparison could be done using only the “baseline” model, however, because of the nature of ship production this may not be the highest possible throughput which may be handled by the system nor is it necessarily the most efficient in resource utilization. Therefore, other variations of the model had to be setup in order to create a “most likely
operating condition” which was representative of an efficiently run real-life process.

7.2 “High Output” Model

The “high output” model uses as its inputs for manning the highest level possible based on constraints of the system. For example, in the Profile Fabrication Area this constraint is based on the number of positions at each workstation. There are 20 positions defined in the model for the Roller Table workstation. Therefore, since each position can support only one person due to equipment and space limitations, the manning limit for the resources which work at this workstation is 20.

Increased manning in the models typically caused decreased utilization of the resources due to the fact that material was being processed during the same time span by more resources. To counteract this decreased utilization, the input rate of material into the system is also increased until the maximum utilization of the location or resource was reached. A limit of 75% to 85% utilization was used in these models (as opposed to 100%) utilization to account for Personal Fatigue and Delay (PF & D). The PF & D takes into account lunches and breaks not currently defined in the shift assignment. ProModel has the capability of defining lunches and breaks in its shift assignment, however, creating a shift assignment for a model with a large number of resources and locations such as the Profile Fabrication Area can become quite involved. A blanket assignment of the same shift to both locations and resources can be done, however, since many resources, such as overhead cranes, do not begin a break without first completing the current task, this may not be the most realistic way to set up shift assignments. Priorities can be assigned for different work stoppage scenarios, however, setting up the priorities, which are in levels from 1 to 999, for each scenario can become quite time consuming. For the purposes of this analysis the project team decided to simplify the exercise by running a 2-8-5 shift with no breaks then applying the 75% to 85% utilization limit to take into account PF & D.

7.3 “Most Likely Operating Condition” Model

When the maximum throughput and manning levels are achieved in the “high output” model any inefficiencies in the model should be addressed and corrected if possible. This results in the creation of a “most likely operating condition” model. In this model, the resources are being used at the most efficient level possible, while material being supplied to the system allows for the highest possible throughput for that manning condition. This is the model which will be used as a comparison to a “most likely operating condition” of an automated process.

8.0 OUTPUT ANALYSIS

Just as it is important to have a clear set of goals when developing the models, it is necessary to plan the analysis of the output. There are many factors which influence the conclusions that can be drawn from the output of the models. Without understanding these factors it is possible to draw wrong conclusions from good results. The modeler must have an understanding of the software and the models in order to fully appreciate the results of the simulation runs.

8.1 Analysis of The Profile Fabrication Area Model

The work done in the Profile Fabrication Area is detailed in Section 5.1.3. The material in the model is brought into the bay by straddle carrier in carrier blocks where it is placed in a storage area. The arrival of the raw stock material into the storage area will become important during the running of the simulation models. By controlling the flooding or starving of the storage area with raw stock material, the output and utilization of the locations and resources can be controlled by the modeler. The individual raw stock pieces are moved into the workstation by overhead crane where it is processed by layout, burners, and in some cases, welders and ironworkers. Once the processing is complete, the material is moved out of the workstation by the overhead crane and placed in a staging location where it remains until there are enough
finished pieces to warrant a move to storage. The material is brought into the system in constant batch sizes which are defined by the model user. The number of pieces from each raw stock material piece is calculated using a distribution determined by current production data. The process times for each type of raw stock are based on the average actual process times per part.

8.1.1 Analysis of The “Baseline” Model

The “baseline” model for the Profile Fabrication Area was set up using a manning level characteristic of the level currently seen in that area today. The throughput for this manning level is also similar to current performance. The manning level and the throughput are shown in Table 8.1-1.

<table>
<thead>
<tr>
<th>Manning</th>
<th>Carrier Block Arrivals Per 8 Hours</th>
<th>Throughput (1 Month)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profile Layout Crew</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Profile Burn Crew</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>T-Beam Fit Crew</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Flatbar Layout Crew</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Flatbar Burn Crew</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>T-Beam Weld Crew</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>T-Beam Paint Crew</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Table 8.1-1: “Baseline” Model Inputs and Throughputs

Graphs of the Resource and Location States for this simulation run are shown in Graph 8.1-1. In order to make the graphs more readable, the positions shown in the Location States for the Roller Table, Production Table 10, and Flatbar Area are only one of several positions defined for those workstations in the simulation model. A more detailed collection of the “baseline” model output statistics (including all of the resources and locations) are included in Appendix E.
Single Capacity Location States

<table>
<thead>
<tr>
<th>Operation</th>
<th>Setup</th>
<th>Idle</th>
<th>Waiting</th>
<th>Blocked</th>
<th>Down</th>
</tr>
</thead>
</table>

Graph 8.1-1: “Baseline” Model Resource and Location States

The resource states from the simulation run show a very high usage for the profile layout crew (90%) and profile burn crew (85%). These numbers are well above the 75% to 85% usage limit that was determined based on PF & D. This basically means that the additional 15% to 20% of the work will actually have to be done on third shift or weekends which is sometimes the case in this area during peak production periods. There are two possible options to lower the resource usage to the acceptable 2-8-5 level used in the models. The amount of material being input into this area can be reduced or the manning can be increased.

The Single Capacity Location State graph shows that almost 75% of the scheduled working time for the Roller Tables is time spent waiting for resources. More people are needed in the Roller Table Workstation to process the material. A further review of the Resource States graph also shows quite a bit of idle time for the T-Welding Crew and Cranes (resources which handle the products from the roller tables). These resources, therefore, would be able to handle additional work from the roller tables if the throughput is increased due to additional manpower. Based on the high percentage of wait time for resources in the roller table area, and the ability of the downstream resources to handle the additional throughput, increasing the manning level for the roller tables seems to be the better of the two options.

The high idle times in the T-Beam Area (Production Table 10), Flatbar Area, and their associated resources suggest that additional work could be processed in these areas. Manning could also be increased since Table 8.1-1 shows that the manning is below the 9 position constraint in these areas. To determine the effects of additional manpower and material input in the Roller Table, T-Beam (Production Table 10), and Flatbar Workstations a “high output” model was created.

8.1.2 Analysis of The “High Output” Model

To see the effects of adding manpower and material input to the system the “high output” model was created in two stages. First, the manpower was increased to the maximum number of people the area could accommodate based on the number of individual positions at the workstation. Second, the amount of raw stock material entering the storage area at the beginning of the process was increased. Controlling the input of material into the storage area was used to starve or flood the system with raw stock in order to bring the throughputs and resource/location usage in line with utilization limits and realistic output data. The changes had no effect on the identification of bottlenecks or constraints in the system because the changes were made at the head of the process.

Increase in Manpower
The results of increasing the manpower at all of the workstations is shown in Table 8.1-2.
Table 8.1-2: “High Output” Model Inputs and Throughput for “Increased Manpower” Condition

The Resource and Location States are shown in Graph 8.1-2. The detailed statistics for the “High Output - Increased Manpower” condition are shown in Appendix E.

Resource States

<table>
<thead>
<tr>
<th>Name</th>
<th>In Use</th>
<th>Travel To Use</th>
<th>Travel To Park</th>
<th>Idle</th>
<th>Down</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLayoutCrew</td>
<td>0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FBurnCrew</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFittingCrew</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TWeldingCrew</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TPaintCrew</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLayoutCrew</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FBurnCrew</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carrier</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crane_600</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crane_590</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Single Capacity Location States

<table>
<thead>
<tr>
<th>Name</th>
<th>Operation</th>
<th>Setup</th>
<th>Idle</th>
<th>Waiting</th>
<th>Blocked</th>
<th>Down</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roller_Table_Position_8</td>
<td>0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Table10_Position_6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flatbar_Area_Position_4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shear</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IronWorker</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BevelStation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DeburrStation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Graph 8.1-2: “High Output - Increased Manpower” Model Resource and Location States

The throughput increased dramatically by adding people to the model, which is not unexpected. With the addition of people, more work is being processed in the same amount of time.

A review of the Resource States shows that the usage of all of the resources (with the exception of the cranes) has been reduced compared to the performance of the “Baseline Condition” because the additional throughput of the system starves the storage area of raw input material. When this happens, no material is
being fed into the system and the resources and locations are idle. In addition, the amount of work is spread over more people so that the average utilization per person is lower. The idle time suggests that the system can handle a further increase in material input into the storage area, thus increasing the amount of raw material available as input to the system.

The graph of the Single Capacity Location States also shows a large amount of idle time for all the locations except the Roller Table Position. The 85% usage in this area is due to a couple of factors. First, there is a greater number of profiles entering the system than T-Beams or flatbars (2 carrier blocks of profiles vs. 1 carrier block of T-Beams or flatbars, see Table 8.1-2). In addition, the Roller Table Area is used to process both profiles and T-Beams. Once processed, the profiles leave the system and the T-Beams are routed to Production Table 10 for further processing. This causes the Roller Table Workstation to have a higher volume of work than Production Table 10, Flatbar Area, Shear, Bevel Station, Debur Station, or the Ironworker which handle a smaller batch of a single product type. Second, two functions are being performed in the Roller Table Workstation - layout and burning. Since the manning level is high enough to provide manpower when needed, the burning operations are able to begin immediately after the completion of the layout process. Therefore, the utilization of the Roller Table Positions equals the addition of the utilizations of the Profile Layout and Burning Crews. In fact, because of the high manning level this additive effect of the utilizations also occurs in the Flatbar Area and Production Table 10 (FLayout Crew + FBurn Crew = Flatbar Area Position 4 and TFitting Crew + TWelding Crew + TPaint Crew = Table 10 Position 6).

The usage of all of the workstations in the Single Capacity Location States has increased with the additional manpower (with the exception of the Ironworker station and the shear which had no increase in manning). There is some wait time for the workstations, however, the time for each workstation is relatively low and was not considered a constraint to the operations at this point. Although the usage times for the locations has increased there is still quite a bit of idle time for Production Table 10, Flatbar Area, Shear, Ironworker, Bevel Station, and Debur Station. Therefore, the system is able to handle an increase in the amount of raw flatbar and T-Beams entering the storage area, which once again, increases the amount of raw stock input to the system.

**Increase in Material to the Storage Area**
The effects of increasing the amount of raw stock entering the Storage Area are shown in Table 8.1-3.

<table>
<thead>
<tr>
<th>Manning</th>
<th>Carrier Block Arrivals Per 8 Hours</th>
<th>Throughput (1 Month)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Profiles 2</td>
<td>Profiles 2 984</td>
</tr>
<tr>
<td></td>
<td>Flatbar 6</td>
<td>Flatbar 6 981</td>
</tr>
<tr>
<td></td>
<td>T-Beams 4</td>
<td>T-Beams 4 4074</td>
</tr>
<tr>
<td>Profile Layout Crew</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Profile Burn Crew</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T-Beam Fit Crew</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flatbar Layout Crew</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flatbar Burn Crew</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T-Beam Weld Crew</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T-Beam Paint Crew</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 8.1-3: “High Output” Model Inputs and Throughput for Increased Manning and Material Condition

The Resource and Location States are shown in Graph 8.1-3. The detailed statistics for the “High Output - Increased Manning and Material” condition are included in Appendix E.
Graph 8.1-3: "High Output - Increased Manning and Material" Model Resource and Location States

Since Production Table 10 (where brackets and outfitting are added to cut T-Beams from the roller tables) has a large amount of idle time in the "increased manning" model, the decision was made to increase the amount of T-Beam raw stock which entered the system and keep the amount of profiles entering the system the same as in the "baseline" model. Only one of the two could be increased because both the profiles and T-Beams are cut on the roller tables. The increase in T-Beam raw stock creates a decrease in the profile throughput in the system. This accounts for the changes in the Profile and T-Beam throughput numbers seen in Table 8.1-3. The amount of flatbar raw stock entering the system was also increased which resulted in an increase in the throughput of flatbars in the system. Although the throughput of the system has been maximized, the Resource and Location States show that the system is not running at its most efficient level. Many of the resources are in use less than 30% of the time while the locations are operating above the 75% to 85% limit. This implies that the manning level is too high. In order to observe the effects of reducing manpower to increase the efficiency of the system the "most likely operation condition" model was created.

8.1.3 Analysis of The "Most Likely Operating Condition" Model

Although the "high output" model may produce the highest throughput for the system, it may not be the most efficient means to provide that throughput. Typically, a process should be run at a level which
produces a reasonably high throughput while utilizing the resources at their highest possible efficiency. This "most likely operating condition" model was created by using the manning and material arrival rate from the "high output" model and decreasing the manpower until each resource group is operating at its most efficient level. After stepping down the resources and monitoring the output, the final results for the "most likely operating condition" model are shown in Table 8.1-4.

<table>
<thead>
<tr>
<th>Manning</th>
<th>Carrier Block Arrivals Per 8 Hours</th>
<th>Throughput (1 Month)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profile Layout Crew 7</td>
<td>Profiles 2</td>
<td>Raw Stock Profiles 1036</td>
</tr>
<tr>
<td>Profile Burn Crew 17</td>
<td>Flatbar 8</td>
<td>Raw Stock Profiles Processed 1028</td>
</tr>
<tr>
<td>T-Beam Fit Crew 3</td>
<td>T-Beams 4</td>
<td>Profile Pieces Produced 3770</td>
</tr>
<tr>
<td>Flatbar Layout Crew 6</td>
<td></td>
<td>Raw Stock Flatbar 2019</td>
</tr>
<tr>
<td>Flatbar Burn Crew 3</td>
<td></td>
<td>Raw Stock Flatbar Processed 2010</td>
</tr>
<tr>
<td>T-Beam Weld Crew 3</td>
<td></td>
<td>Flatbar Pieces Produced 10413</td>
</tr>
<tr>
<td>T-Beam Paint Crew 2</td>
<td></td>
<td>Raw Stock T-Beams 768</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Raw Stock T-Beams Processed 776</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T-Beam Pieces Produced 977</td>
</tr>
</tbody>
</table>

Table 8.1-4: "Most Likely Operating Condition" Model Inputs and Throughput

Although there was a decrease in the manning for the Profile and T-Beam areas, the input raw material being handled by the system in these areas increased by about 5%. This, at first, seems contrary to what is expected. The increase in raw material into the system may be due to the fact that the lower number of people in the system creates a better loading situation for the workstations. The timing due to the manpower level allows for more opportunities for the crane to load additional work onto the tables.

The number of profile pieces produced dropped by 8%. The reduced amount of pieces produced is probably due to a combination of reduced manpower and the statistical nature of how the model determines the number of profiles cut from each raw stock. The calculation is done using stochastic data. Therefore, the number will not be exactly the same for each run, but it should be within the defined range based on the data. In any event, these differences are less than 10%. Realizing that the simulation models are only a representation of the actual process, it can be said that these two sets of numbers are reasonably the same to those from the "high output" model, and that this is a fair representation for the throughput of the system.

The changes in the flatbar area resulted in effects which seem much more in line with what happens when you reduce manpower in an area. The amount of input raw material into the system dropped by 20% while the number of pieces produced remained about the same as in the "high output" model (once again, probably due to the stochastic data). Graph 8.1-4 indicates that there is a greater usage of the Flatbar Layout and Burn Crew, as well as, an increase in the utilization of the Flatbar Tables and Ironworker Area. This accounts for the lower material input. The work areas are too full to add the additional material. These numbers, once again, are reasonable to use for comparisons.

The Resource and Location States graphs show a much better overall usage of the resources and locations. All of which is within the 75% to 85% limits. The detailed performance statistics for the "most likely operating condition" model are included in Appendix E.
8.1.4 Determining Constraints and Bottlenecks in the Profile Fabrication Area

Using the “most likely operating condition” model, the bottlenecks and constraints in the system are determined. The Profile Area model has only a few locations which could be potential bottlenecks by restraining material input into the next workstation where additional processing is to be done. T-Beams, which are cut on the roller tables, are also sent to Table 10 for additional processing. Some flatbars are sent from the Flatbar Area to the Ironworker for beveling, deburring, and further processing. Both the Roller Table and the Flatbar Areas have utilizations which are lower than the downstream destination for their products. Therefore, they are not bottlenecks to the system. All of the workstations have high utilizations, however, and limit additional throughput of material into the system. The constraints in this model are the amount of manpower and the space available for manufacturing.

The use of automation to eliminate these constraints will be investigated in Phase II. Preliminary research has indicated that the use of a robotic profile cutter in place of the Roller Table Workstation and Flatbar Area may be a likely option. The profile cutter would provide a high throughput in less space than what is currently being devoted to profile and flatbar processing. In addition, the manning for the area would be reduced from thirty-three people in the “most likely operating condition” model to three or four needed to run the profile cutter. The effect that the robotic profile cutter would have on the support equipment (cranes, forklifts, etc.) and the storage areas will also be modeled in the next phase of the project.

8.2 Analysis of the Panel Line Model

The work done on the Panel Line is detailed in Section 5.2.8. The Panel Line model is based on a five plate deck panel with longitudinals, webs, and deck sockets. This is the average type of panel which is run down the line. Plates are loaded onto the line by transfer car and moved to each individual station by drive rollers. The panels are removed from the line by one of the yard’s gantry cranes. The plates, stiffeners, webs, and deck socket bowls are replenished in the system as they are consumed so there is no delay in the arrival of material. The process times for each workstation are based on the actual average station time for a five panel deck plate. Because the deck sockets are able to be fitted and welded in the first three stations, they are not considered a constraint to the line move. Therefore, they are not being modeled in the Panel Line model used for this Phase of the project.

A process similar to the one used to analyze the Profile Fabrication Area was used to analyze the Panel Line models, however, only two variations of the model were created:

- A “high output” model
- A “most likely operating condition” model
The model for the Panel Line was created using data from a previous Panel Line study. This study detailed the theoretical maximum throughput of the system using current process times and manning levels for a five plate deck panel. The throughput of the actual line is lower due to inefficiencies in the process which were factored out of the theoretical "maximum," and the use of the line for doing work other than five plate panels. In addition, input material such as plates, webs, stiffeners, etc. are replenished in the modeled system as soon as it is consumed. There is no wait time for the material unless it is specified by the modeler (which will be done to create the most likely operating condition model). Because of these three factors the starting point for the Panel Line model is actually a "high output" model rather than a "baseline" model.

8.2.1 Analysis of the "High Output" Model for the Panel Line

Using the manning level and process times specified in the report the performance for one month was determined by the model and is shown in Table 8.2-1.

<table>
<thead>
<tr>
<th>Manning</th>
<th>Performance (1 Month)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ok Socket Fitters</td>
<td>Number of Panels Completed</td>
</tr>
<tr>
<td>Ok Socket Welders</td>
<td>60</td>
</tr>
<tr>
<td>Stiffener Fitters</td>
<td>Number of Panels Per 8 Hour Shift</td>
</tr>
<tr>
<td>Web Fitters</td>
<td>1.30</td>
</tr>
<tr>
<td>Web Welders (Sta 9)</td>
<td>Panel WIP</td>
</tr>
<tr>
<td>Web Welders (Sta 10)</td>
<td>7</td>
</tr>
<tr>
<td>Hold Time at Trans Car</td>
<td></td>
</tr>
</tbody>
</table>

Table 8.2-1: "High Output" Model Inputs and Performance

Although there are process times and a manning level at every station along the line, the categories listed in Table 8.2-1 are the ones which are flexible according to the report. Other stations have manning levels and process times which remain constant and cannot be changed due to equipment and space limitations. These categories are "hard-wired" into the model. The output for one month, shown in Table 8.2-1, is equal to the theoretical throughput documented in the report. This is a good validation test for the model.

The Resource and Location States for the "high output" model are shown in Graph 8.2-1. Some of the stations and resources have been left out of the graph for clarity. The detailed performance statistics for the "High Output" model are included in Appendix E.
Graph 8.2-1: “High Output” Model Resource and Location States

Three of the resources are above the 75% to 85% usage limit.

- Station 3 One-Sided Welding operator (100%)
- Station 7 Web Fitters (94%)
- One - Sided Welding machine (100%)

In addition, the Location States graph shows that the One-Sided Welding location is also in operation 100% of the time. These usages need to be lowered to within the 75% to 85% limit. This will be done for the creation of the “most likely operating condition” model.

8.2.2 Analysis of “Most Likely Operating Condition” Model

In order to reduce the utilization of the Station 3 One-Sided Welder to the 75% limit each plate was held on the transfer car for a period of time. This starved the line so that the panel which was being seamet could be completed and moved out of Station 3 before the panel behind it was ready to move. Holding each plate on the transfer car created some idle time in Station 3 to account for the PF & D not included in the shift assignment. Creating idle time by holding each plate on the transfer car is something which would never be done in the current real-life process. It can be done, however, in the simulation model as long as the effects of creating the holdup are understood. Because the holdup is at the head of the line all of the Stations are affected the same and the bottlenecks and constraints created relative to each other without the holdup will be the same as those with the holdup. The model inputs for the “most likely operating condition” model and the resulting output are shown in Table 8.2-2.

<table>
<thead>
<tr>
<th>Manning</th>
<th>Performance (1 Month)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dk Socket Fitters</td>
<td>Number of Panels Completed</td>
</tr>
<tr>
<td>Dk Socket Welders</td>
<td>Number of Panels Per 8 Hour Shift</td>
</tr>
<tr>
<td>Stiffener Fitters</td>
<td>Panel WIP</td>
</tr>
<tr>
<td>Web Fitters</td>
<td></td>
</tr>
<tr>
<td>Web Welders (Sta 9)</td>
<td></td>
</tr>
<tr>
<td>Web Welders (Sta 10)</td>
<td></td>
</tr>
<tr>
<td>Hold Time at Trans Car</td>
<td></td>
</tr>
</tbody>
</table>

Table 8.2-2: “Most Likely Operating Condition” Model Inputs and Performance

With a hold time on the transfer car of 40 minutes per plate, the number panels produced per shift dropped
to 1.00. This number is close to the average number of panels per shift which is currently being produced today. As seen in the Resource and Location States Graph 8.2-2 (The detailed statistics are shown in Appendix E.), the Station 3 One-Sided Welding Area now has a 76% utilization. This accounts for the PF & D. The resources also have reasonable utilizations with all of the usages below 75%.

Graph 8.2-2: “Most Likely Operating Condition” Model Resource and Location States

8.2.3 Determining Constraints and Bottlenecks in the Panel Line

Using a hold time of 40 minutes per panel results in one panel being produced per shift. The output, once again, helps to validate the model since this is comparable to the current output of the line. Using the Resource and Single Capacity Location States graphs, the bottlenecks are identified as:
• Station 3 One-Sided Welding operations (76%)
• Station 5 Stiffener Fitting operations (65%)
• Station 9 and 10 Weldout operations (65%)

Automation is being considered to eliminate the bottlenecks caused by the Station 5 Stiffener Fitting operations and the Station 9 and 10 Weldout operations. A robotic stiffener fitting station is being proposed as a replacement for the current fitting operations in Station 5. The robot removes sequenced stiffeners from a cassette, positions them on the panel, and tack welds them into place. Robots will be utilized in Station 9 and 10 to perform the weldout of the panel webs. The automation in both areas will provide the advantages of a higher throughput rate and lower manning. The one-sided welding done in Station 3 is currently a fairly automated process so not much can be done in the way of adding automation to eliminate the bottleneck. Therefore, the bottleneck will have to be eliminated by making changes to the one-sided welding machine and seaming process to increase the throughput of the area. The effects of changes to the one-sided welding operations and the introduction of robotics will be investigated in Phase II.

9.0 NEXT STEP - PHASE II

Once the analysis is complete for all eight sub-modules, the overall model will be validated and its output analyzed. Phase II will begin at this point with the development of ‘To-Be’ models which incorporate automation into the ‘As-Is’ models. The automation will be introduced in areas which constrain the flow of material and are suitable for automation. In order to accurately model the automated processes some benchmarking trips will have to be made to yards with a high degree of automation. The trips will be used to research process times and throughputs for automated processes such as robotic profile cutting and robotic welding systems which will then be used in the ‘To-Be’ models. Once the ‘To-Be’ models are verified and validated, they will be analyzed for their performance and compared to the modeled performance of the ‘As-Is’ simulation models. Comparisons will not only be made on throughput and efficiency, but also return on investment. In addition, the ‘To-Be’ models will be compared to the benchmark information gathered from other yards to measure their performance to current “world class” shipbuilding standards.

10.0 CONCLUSIONS

The importance of proper planning cannot be emphasized enough when conducting a simulation project. Much of the success in this project can be attributed to the planning work which was done beforehand. For example, the NASSCO Project Team has had great success in their use of ProModel. The software has proved to be very compatible with the objectives of the project and the skills of the project team. This success is due to the preparation which was done in researching the different simulation software packages and the development of project objectives.

Formulating clear project objectives is also important. The first reaction when beginning a simulation project is to try to model everything that happens in the process exactly as it occurs in real life. Trying to model a real life process in exact detail will risk the failure of the project. There is too much detail involved. The fault lies not with the computer (with the exception of large models which use too much memory), but with the modeler. The computer merely utilizes the instructions set up by the modeler. The more detailed the instructions; the closer the simulation mimics real-life. The modeler, however, must study, understand, and translate into a programming language, all of the steps which are involved in the process. This can become a very time consuming, complicated task resulting in budget and schedule overruns. Creating clear objectives at the start of the project helps to define the scope of the project and allows the modeler to make assumptions and decisions as to what should or should not be included in the model. It also helps to keep the project team focused when too much detail threatens to sidetrack the project.

It is highly recommended that a project team who is creating a simulation model for the first time use the
services of a consultant to build the model. Compared to the other steps in the simulation process (planning, defining the model, analyzing the output, etc.) the actual building of the models in the computer should take the least amount of time. NASSCO’s subcontractor to build the models, Kiran and Associates, was able to complete even the most complicated of the project’s models in a matter of weeks as opposed to the months it would have taken for the project team to learn the software, understand how to go about setting up the models, and take advantage of the learning curve. In addition, Kiran and Associates was able to give recommendations as to what data should be collected in order to build a model which would meet the objectives of the project. This narrowed the focus of the project team’s studies. If possible, the consultant should be on site or within driving distance of the project location. Because of the nature of the work, it is much easier to conduct project meetings in person rather than over the phone or via the Internet. Frequently, in-person demonstrations of the computer model are needed to understand the frame of reference of both the modeler and project team. Since the validation of a model is a continuous process and corrections have a quick turnaround time, these meetings will happen more often than just the beginning, middle, and end of the project. The modeler should also have a visual understanding of the process which is going to be modeled, so visits to the process location are a must. All of this is more convenient if the consultant is nearby.

Computer simulation has proven to be a valuable tool in this project. The processes which were modeled are large with many interactions and variables. These factors plus the randomness that occurs in the process makes it difficult to use other techniques, such as average times and a spreadsheet, to accurately gain insight into the process. Dealing with these factors is the main advantage of computer simulation. The modeler is able to set up large systems with many decision points, interactions, and variables and then allow the computer to keep track of what is going on during the process. The speed at which this is done by the computer is also beneficial to the project team. For example, the focus of this project is to take a group of existing processes, optimize them, and then compare them to optimized conceptual processes. Once the processes are modeled, years worth of production runs can be done in a matter of minutes, and each run can include changes which alter the entire system. This helps the modeler optimize the model in a short period of time. The conceptual models can be created, viewed, and analyzed to investigate whether improvements will be made by changing the process. All of this can be done before making costly investments in capital or disrupting production to make changes in the manufacturing process.

Although computer simulation has proven to be a valuable tool in this project with an endless list of possibilities in other shipyard applications, it should not be viewed as the ultimate “decision making tool.” Since a simulation model is only a representation of the process being modeled, and it is impossible to develop the model in enough detail to take into account all of the possible outcomes, it should be viewed as one of several tools to be used in the decision making process. The role of computer simulation in this function can be successfully performed with proper planning and project team training, and will definitely aid American shipbuilders in their effort to produce a more cost competitive ship.
APPENDIX A
GENERAL SIMULATION OVERVIEW
See

Computer Simulation – A Practical Perspective
By Roger McHaney
Academic Press, San Diego, Ca, 1991
APPENDIX B
SIMULATION SPECIFICATION
NATIONAL STEEL AND SHIPBUILDING COMPANY

Automated Process Application

in Steel Fabrication

and Sub-Assembly Facilities

Simulation Specification

March 18, 1997
Simulation Specification

CONTENTS

1. INTRODUCTION 1
1.1 Background 1
1.2 General 1

2. PROJECT OBJECTIVES 2
2.1 Overall objective 2
2.2 Requirements of the model 2

3. SCOPE 3
3.1 General 3
3.2 Material and product interfaces 4
3.3 General description of the area to be simulated 4

4. MODEL FUNDAMENTALS AND FORM 8
4.1 Introduction 8
4.2 Key features of the model 8
4.3 Model interfaces 9
4.4 Model hierarchy 9
4.5 Products and processes 10
4.6 Transportation 11
4.7 Management 12
4.8 Representation of manpower 13
4.9 Processing assumptions 13
4.10 Other assumptions 14
4.11 Model users 14
4.12 Possible future development of the model 14

5. MODEL FUNCTIONALITY 14
5.1 Introduction 14
5.2 User interface elements 15

6. OUTPUTS AND INPUTS 16
6.1 Outputs 16
6.2 Inputs 16
6.3 Generation of reports 17
7. PROJECT METHOD
7.1 Project steps
7.2 Data collection
7.3 Model formulation
7.4 Model testing and validation
7.5 Experimenting with the model

8. DELIVERABLES
8.1 General
8.2 Responsibilities
8.3 Project time scale

9. MODEL TESTING AND VALIDATION
9.1 Overview
9.2 Module logic follows system logic
9.3 Negative
9.4 Soak
9.5 Validation
1.0 INTRODUCTION

1.1 Background

US Shipbuilders are currently addressing the substantial gap in competitiveness between International and US yards. One area of potential improvement is the application of automated processes in steel fabrication and assembly. National Steel and Shipbuilding Company (NASSCO) is undertaking a project to develop a standard methodology for identifying potential areas for automation and assessing the effect prior to implementation. The core of the approach is a simulation model whose functionality and method of construction is explained in this document.

1.2 General

The simulation project will have five stages:

- simulation specification,
- data collection,
- model formulation,
- model verification and validation,
- experiments and analysis.

The model will be formulated using a PC based simulation tool. This simulation specification is the first stage of the project. The main body of the document defines:

- project scope and boundaries,
- general description of the area to be modeled,
- model fundamentals and form,
- model functionality,
- outputs and inputs,
- project method,
- deliverables,
- model testing and validation.
2.0 PROJECT OBJECTIVES

2.1 Overall objective

The overall project objective is to develop a method of determining which specific processes, in the area of steel fabrication and sub-assembly, are likely candidates for an upgrade to an automated system, and to what degree. To be classified as a "likely candidate", the conversion to an automated system must reduce production time and produce a positive return on the investment dollar. A computer simulation program will be utilized to examine what degree of automation will be most beneficial to the shipyard. All information will then be gathered into a fixed set of criteria for the analysis and review of the future automated process implementation.

Operations at NASSCO are divided amongst several Stages of Construction (SOC). A given operation will belong to one of the SOC levels as defined below:

SOC 1 Fabrication
SOC 2 Subassembly
SOC 3 Block Assembly
SOC 4 Unit Assembly
SOC 5 On Block
SOC 6 On Board
SOC 7 Test and Trials

The simulation model will focus on NASSCO's current fabrication (SOC 1) and subassembly (SOC 2) areas as a test bed to develop this methodology. The simulation model will be used to:

- simulate current performance of these areas,
- identify production operations that currently constrain the overall throughput,
- perform "what if" scenarios with the insertion of automated processes to replace existing processes which have been identified as constraining the throughput and to determine the effect on performance.

Recent facility developments, (i.e. T-beam process lane), changing from a manual process to an automated process will be used as a case study which will examine the "as was" and "as is" processes to assess the effectiveness of the simulation approach.

The scope of the project described here satisfies all the analytical requirements of the project.

2.2 Requirements of the model

Each operation in the manufacturing process will be modeled as a logical object in isolation. Systems will be modeled by aggregating these objects. Operations will run with dependency on the input conditions, resource allocations and constraints such as sequences, schedules and buffers sizes which will be largely inherent in the model logic.
The simulation model will be capable of the following:

- calculating and displaying the results of changes to the model conditions on each of the objects and on the overall performance of the entire model,

- accepting new and additional performance metrics for any process as the drivers for performance of the objects and the rest of the model,

- providing comparative results data, in tabular and graphical form to allow comparison of "as is" and "candidate automation" processes identified through bottleneck analysis,

- being expanded as a model to incorporate the later stages of construction,

- being used as a "black box" input to other models created at a later time,

- modeling process handling and transportation equipment, labor resources and material

- being used as a shop loading tool to assess process capacity, utilization, duration and efficiency for various product mixes and rate scenarios.

3.0 SCOPE

3.1 General

The purpose of this section is to define the area within NASSCO which will be represented in the simulation model. The perimeter of the model area so defined is known as the system boundary. The information given here outlines the major processes within the system boundary.

The areas of the yard identified for simulation analysis are the treatment line, SOC 1, SOC 2 and the panel line. SOC 1 is the area in which the majority of fabrication work is carried out. SOC 2 is the area in which the majority of sub-assemblies are manufactured. SOC 2 is split geographically into two areas with some sub-assemblies being produced from an area nested at the west end of SOC 1. All processes within this boundary will be modeled in detail.

No external areas will be modeled explicitly, but the simulated area will be connected to external areas via the model interfaces. The stockyard is the supplier of all material (plates and profiles) to the modeled area. SOC 3 is the major customer for SOC 1, SOC 2 and panel line products. These two areas are therefore the most important of the interfaces to the modeled area. The model interfaces will show how changes within the simulated area effect the external areas. In some cases the interfaces may also be used to apply a load or constraint to the simulated area. The configuration of these interfaces is defined in detail in Section 4.3.
The general outline of the area is shown in the figure below.

3.2 Material and product interfaces

Stockyard - This is a large storage area for all incoming plates and profiles. It is the source for all materials in the simulation model area. Plates are handled by a large gantry crane (507 crane). Profiles are picked by a large jib crane or forklift, pre-staged and transported to the treatment line by forklift or straddle carrier.

SOC 3 (excluding the panel line) - This area consists of a number tables on which blocking is carried out and some of the large sub-assemblies are also manufactured.

3.3 General description of the area to be simulated

The subject areas lie along the northern boundary of the yard with the stockyard to the west. Material flow is generally west to east but routes are convoluted and areas are not always dedicated to one type of work.

The area is split into several bays which are serviced by overhead cranes. Several conveyers are used in SOC1 and a collocator system moves material through the whole area. Several transfer cars are used to move material between conveyers, the collocator system and the different crane bays. Forklifts and straddle carriers are also used to move material around within the area and across the boundary to the other areas.
The block diagrams below show the relative position of the major process areas in SOC 1 and SOC 2. The diagrams include the T-beam process lane developments currently underway.

SOC 1

SOC 2

The major production areas to be included in the simulation are as follows.

**Treatment line** - The treatment line lies in a north/south direction and is adjacent to the stockyard. The line which handles both plates and profiles includes shot-blasting, paint spraying and drying. In general profiles are processed during the day and plates are processed at night. Incoming and outgoing material are handled by a conveyor system.

**Plate cutting** - Plate cutting operations are conducted by six NC burning machines, one flame planer and a manual bevel workstation located within four uncovered bays.

- CM100.3 - This is a 2 axis NC plasma machine located in the 2000 crane bay,
- CM100.4 - This is a 3 axis NC plasma machine located in the 2000 crane bay,
- CM100.2 - This is a 3 axis NC gas machine located in the 2000 crane bay,
- Manual Bevel - This workstation located at the east end of the 2000 crane bay consists of tables and sawhorses upon which cut plates are manually beveled using semi-automated cutting torches. This area services the NC burning machines within the 2000 crane bay.
Material for the above machines is delivered from the treatment line to the collocator system were it is stored in buffer piles within the collocator lane. An large gantry crane (2000 crane) is used to load/unload the NC and manual bevel tables. Product leaves the area by forklift (< 18'), trailer, and the collocator system. Product is delivered to the panel line via a transfer car (T4) at the west end of the 2000 crane bay.

- **Flame Planer** - This is a multihead gas machine located north of the T-beam welder and its primary function is to supply the T-beam welder. Material is delivered from the treatment line by the collocator system (C2 to T2). Outgoing material is delivered to the next assembly area by a transfer car (T3).

- **CM300.1 and CM300.2** - These are smaller NC gas machines equipped with multiple torches for cutting of small parts and are located to the north of the flame planer. Some of the incoming material is delivered from the treatment line by the collocator system (C2 to T2). The remainder of the material comes from a storage of remnants within the same crane bay. Outgoing material is placed on pallets and removed by fork trucks.

- **Avenger 3** - This is a new 2 axis NC plasma machine located south of the T-beam welder. It is part of the new T-beam process lane. Material is delivered from the treatment line by the collocator system. This machine's primary function is to supply cut webs to the T-beam welder.

**Profile cutting** - Profile (less flat bar) manual marking and cutting is located at the east end of the 591 crane bay. The process is entirely manual and carried out on tables. Most of the material is delivered in cassettes by a carrier. The remainder of the material is delivered by forklift or by the collocator system (C2 to T2).

**Flatbar cutting** - Major flatbar fabrication operations include manual layout and burn, shear, and iron worker. The location of these operations are split between the middle of the 591 crane bay and the west end of the sub-assembly area.

**Forming** - Forming is carried out at a number of areas in and around the main shop. Major equipment includes one 45ft roll, two small rolls, brake form, frame bender, bulldozer, and a line heating station.

**Transverse deck beams** - The current manufacture of T-beams draws in material from the flame planer into the MT welder. After the MT welding, products are transported by straddle carrier back to the stock yard and effectively become stock. The T-beams are then scheduled via the treatment line to the manual profile cutting area for layout and cutting work before going to the Table 10 sub-assembly area.

The current operations of the T-beam fabrication and subassembly are being removed from the manual profile cutting area and Table 10 sub-assembly operation and relocated to a new line which includes a new NC plasma cutting machine and assembly conveyors. In the new operation, the necessary parts will be produced from the planer and a new NC cutting machine before the MT welder operation. The T-beams will then be moved by transfer car on to the new transverse deck beam assembly line for final cutting and all welding operations.

**Kitting** - Immediately after fabrication, the majority of cut plates and profiles are delivered to a kitting area where they are sorted and collocated into kits for next assembly. The kits are grouped together by block and stored in the kitting area until needed. The kitting area is the large area north of SOC 1 and SOC 2. All material handling is performed by forklift and straddle carrier.

Plates greater than eighteen feet in length are not part of this operation and are stored for next assembly in the 2000 crane bay and the C1 collocator lane.
Longitudinal stiffeners are sorted by block and stored in cassettes in the west end of the kitting area.

Transverse deck beams are sorted by block and stored on carrier blocks in the west end of the kitting area.

**Box Girders** - Box girders are assembled in a dedicated process lane at the East end of Table 1. Large plates (>18") are delivered to the process lane via the collocator system (C1) and the SOC 3 crane (E2). Smaller plates (< 18") are delivered by fork truck. There is a dedicated buffer storage area in the collocator lane for incoming box girder material. The process lane consists of an assembly fixture and a weld out station. The process lane uses a dedicated 15 ton crane for daily operations. Outgoing sub-assemblies planned for Table 1 are delivered to SOC 3 via the E1 and E2 cranes. All other sub-assemblies will be transported to SOC 3 by whirley crane.

**Box Stanchions** - As with box girders, the manufacture of these interim products is performed in a process lane adjacent to the box girder lane. Incoming material and outgoing sub-assemblies will be handled the same as with box girders. The box stanchion process lane consists of an assembly fixture and two weld out stations. There is a dedicated 10 ton crane in this process lane.

**Sub-Assembly** - The majority of sub-assemblies are built in essentially two areas: Table 10 which is the small part of SOC 2 nested at the west end of the 591 crane bay and the primary SOC 2 area which includes the majority of the shop east of the T-beam and flame planer.

Table 10 equipment includes the 591 and 600 overhead cranes. Materials and products are transported to and from this area by forklift and straddle carrier. The common parts built in this area are the transverse deck beams. Under the new developments, the manufacture of T-beams is being transferred to the dedicated T-beam process lane. Both processes will be modeled and compared as a case study.

The primary sub-assembly area consists of 26,000 square feet of table space which is divided into six manufacturing cells. Work is sorted by block and job type and then allocated to these cells. The area is equipped with four overhead bay cranes each of which has a 5 ton capacity. Kits are delivered to this area by fork truck and straddle carrier. Some of the completed sub-assemblies are removed by forklift through the various shop entrances. The majority of completed sub-assemblies exit the shop at the east, where they can be removed by fork truck, carrier, or trailer.

There is a line heating workstation at the east end of the sub-assembly area. All line heating for sub-assembly is performed in this area.

Minor sub-assemblies are processed on two sets of tables within the main area. In addition to the use of the four overhead cranes, there are two jib cranes dedicated to minor sub-assembly.

**Panel line** - The panel line is located to the south of the burning machines and produces built up stiffened flat panels. Plates are delivered one at a time from the 2000 crane bay by transfer car. Frames and longitudinal panels are delivered by straddle carrier and are lifted on to the table by whirley crane. The line consists of 9 workstations which are: fitting, one-side welding, layout, stiffener fitting, stiffener welding, web fitting, two web welding workstations and load-out. The line is serviced by the 500 bay crane which has a capacity of 25 t.

**Buffers** - Currently, buffer exists between all processing areas.
4.0  MODEL FUNDAMENTALS AND FORM

4.1  Introduction

This section deals with a number of issues which must be defined at the beginning of the simulation project. These are:

- key features,
- model interfaces,
- model hierarchy,
- product and process,
- transportation,
- management,
- representation of manpower,
- processing assumptions,
- other assumptions,
- model users,
- future developments.

4.2  Key features of the model

In order to satisfy the objectives, the model will be designed with the following key features:

- Clearly defined system boundary as described in Section 3.
- All physical and control and management processes (machines, transport) within this boundary will be modeled. Facilities outside the boundary will be defined but not modeled explicitly. The simulated area will be connected to these areas via the interfaces, described in Section 4.3.
- Modular approach. Model modules will be created as stand alone objects. This has a number of advantages and allows each model module to be built and validated in isolation. Examples of these modules in the NASSCO model are: treatment line, panel line, Table 10 etc.
- Complete separation of product and process. This means that the definition of the system is totally independent of the material that flows through it.
- Where product is produced by a specific machine, the machine is modeled explicitly. An example of this would be a plate cutting machine. Raw material (uncut plate) will flow to it and product (cut plate) will flow from it.
- The transportation network will be modeled to a level which provides an accurate analysis of time taken to move material between processes. This is required in order to accurately evaluate the effect of changes in material flow and transport enhancements.
4.3 Model interfaces

The model interacts with areas outside the model boundary through interfaces.

The interfaces to the model are:

- steel plates and profiles at the input to the treatment line,
- steel products at output to block assembly,
- technical information,
- consumables such as welding rods and cutting heads,
- outfit items,
- labor resource pool demands (for labor that comes in from other areas of the facility not modeled explicitly).

Since the scope of this study does not include evaluating the impact of external system performances, they will not be considered as constraints. The model will produce demand curves for inputs such as technical information, materials and equipment. These curves can then be used to determine if the input producers can meet the demands of the model. The interface to SOC3 will be used to create the demand which will drive the model.

4.4 Model hierarchy

The final model will consist of a number of hierarchical levels represented by a series of nested frames. These frames will principally fall into one of three categories:

- Master frame. This is the environment within which the entire system operates. All other frames are contained within the master. There is no transfer of material or information across the master.

- System boundary frame. This is defined by the scope of the area to be modeled explicitly. There is no transfer of material or information across the system boundary frame other than through the designated interfaces.

- Intermediate frame. The intermediate frames simply allows the logical groupings that are present in the facility to be represented in the model. The first level intermediate frames in this model are the treatment line, SOC 1, SOC 2 and the panel line.

- Operational frame. This type of frame is designed to represent the level at which actual processing is done in the facility and is the lowest level in the model hierarchy. All calculations of event duration's are carried out at this level in the model. An example of such a frame would be an NC cutting machine.
The grouping of objects does not relate necessarily to the possible “candidate automation processes”. It refers to physical groups based on proximity. The analysis of logical groups such as the “candidate automation processes” will be carried out by tracking the product routes through the facility during the experimentation phase. In modeling the facility, individual machines and workstations must be treated in isolation. The connections between these machines and workstations is established through logical decisions made by the model during the simulation runs or by the attributes of the produce. Even where fixed routes do exist in the facility now, its is desirable that the model have the flexibility to change material routings.

If process lanes were to be modeled as logical groupings, then the dependencies of other process lanes, on the workstations within the logical grouping, would not be represented.

The diagram below shows an example of how the frames will relate to each another. In addition there are source and sink frames. These are the basic material input and output interfaces of stock yard, block assembly, grand assembly and construction point. Only a small number of operational frames have been shown. There will be many others in the model and these will be finalized at the model building stage.

4.5 Products and processes

When representing the physical system, there are only two categories of object:

- products, defined as those objects which have work done to them.
- processes, defined as those objects that do the work.
Products are defined in terms of interim product type (IP type). Processes are defined in terms of IP type capability. Work is allocated in the system by matching IP type for products and processes.

In many cases it will be necessary to define process capability to a greater level of detail and specify secondary parameters (dimensions, material etc.) for each interim product. Such processes will be allocated work by IP type provided that secondary parameter requirements are met.

4.6 Transportation

Transportation can be represented in two ways:

**Explicit transport** - The process of moving products from one physical location to another is carried out by a transporter object. This type of representation is used in situations where the availability of transporters is a constraint and where the destination of the product may vary depending on the availability of space and disruption from other activities. These types of transporter objects are sub-systems in the model.

Within the scope of the model specified, some transporters, such as the whirley cranes, are not dedicated to the area within the system boundary. The external demand for transports will be represented by an interface which restricts their availability.

With physical transportation, the transportation network is modeled explicitly and so becomes another process. The transportation network will be visible and fixed and material objects will only be able to travel along existing routes. In this model, the following transport systems will be modeled explicitly:

- bay cranes,
- whirley cranes,
- the collocators,
- conveyors,
- forklift trucks,
- straddle carriers,
- trailers.

There will be other minor transport instances within the model which may be modeled explicitly, although this cannot be finalized until the model design stage is reached.

**Virtual transport** - The process of moving products from one physical location to another is not modeled explicitly, but is attributed a time on an event by event basis. This time may be obtained from a probability distribution (derived from field data) which represents the natural behavior of the process. The time would also be given a dependence on the attributes of the task, such as the distance traveled and the weight of the load. In modeling terms, this type of representation is relatively easy to create and is used in process flow situations where products have a clearly defined route and usually some dedicated transport equipment. An example of this is the transport if interim products along the panel line.

In virtual transportation material objects simply move between processes and buffers instantly. The routing and transportation of the material object is contained in the model logic. This is done where the system is not sensitive to transportation issues.
4.7 Management

Modeling the management of the system is just as important as modeling the processes within the system. The functions of the management system within the model will be:

- **Material flow** - how material is moved around the system.

- **Assignment of work** - how interim products are allocated for processing.

- **Control of system parameters** - changing system parameters such as processing time to reflect differing interim product capability at a workstation.

- **Collection of data** - controlling the collection of data in the model so that output is consistent and of the required format.

- **Calendar control** - controlling the shift patterns of labor and workstations.

One way of handling these functions efficiently is through a production controller. This will be modeled as a single object which appears at each hierarchical level and within each module throughout the model. At the top level the production controller will control the model input data and start the model running.

The production controller is responsible for all communication and decision making in the model including product allocation routing. Each frame in the model contains a production controller that is concerned only with operations in that frame.

The production controller in intermediate frames controls all communication and logic within this frame, but does not interfere with control in frames above or below in the hierarchical model structure. At the highest frame in the hierarchical structure, the master frame, the production controller inputs and outputs from each of the model modules as well as transportation sub-systems that cross some or all of the model module boundaries.

In order for the model to accurately represent the true behavior of the facility, it is necessary for relevant information from planning, scheduling, routing and production control logic to be represented within the production controller. The first decision is whether to make the system "push" or "pull" managed. Through experience, it has been decided to make the essential driver for the system to be the demand for interim products from SOC 3. The model will therefore be essentially a pull system. However, in reality the area under consideration doesn't operate strictly on a pull basis because some corruption of the build sequence occurs. This can be modeled by allowing individual machines and processes to build interim products out of sequence. The logic for this is as follows:

- Each machine or process area has a sequenced priority task list of interim products to build. In the event that the parts necessary to build the first item on the list are not available, the machine or process area can look down the task list to see if all parts are available.

- If "true" then build that product.

- If "false" then look at the next task on the list and so on.
The level of allowable sequence corruption is defined by the number of tasks the machines or process areas can look through before it finds one that it can build. This number will be set at the data collection stage, but will also form part of the experimentation phase to see the effect of sequence corruption on WIP.

4.8 Representation of manpower

The assignment of personnel will fall into one of the following three categories:

- **Dedicated** - Personnel can be dedicated to a workstation. For example, the personnel who look after the NC burning machines.

- **Process Orientated** - Personnel can be dedicated to a number of workstations because they are good at particular processes. Therefore, a man good at manual burning will be assigned to a number of workstations that perform that task.

- **Floating** - Personnel can be used at any workstation where needed.

A “pool” of personnel will be available in every major area, e.g. SOC 1. These personnel will have an attribute which will identify their skills and efficiency.

Further attributes will be added to each person depending on their category. The dedicated personnel will have an attribute detailing what workstation they are dedicated to. In the case of the process orientated personnel, the attribute will be a table listing the processes which they can do.

4.9 Processing assumptions

The following assumptions will be made:

- for the current processes, the sequence of construction of intermediate products may not be known,

- in order to derive process times in the automated systems, it must be assumed that the product work breakdown structure is defined to plate and bundles of stiffener level. In addition, information will be required on work types and values in a given product,

- automated processes will derive the process times from the Product Work Breakdown Structure,

- undefined process areas will use the same basic product data and empirical performance measures together with resource allocation and efficiency to estimate the necessary times,

- in some cases, the duration of a particular event has little dependency on the attributes of the work. In these cases, an empirical time is assigned to the process.

Modeling of the current system involves a breakdown into areas or modules based on the physical layout of the system. At present, modeling the physical layout means that some product types could be processed at a number of different locations.
For well defined or automated processes, this definition will be straightforward, since parts are manufactured in a consistent sequence using methods, machines or tools with an easily quantifiable performance, given the material attributes of the product. For manual areas, due to corruption of assembly sequences and variety in methods used to make similar products, it may not be possible to model the process and derive a time directly in the way described above. However, it will still be possible to obtain good results in this type of situation by collecting data on work content in man-hours for types of interim product and applying the same constraints to the execution of the work set out above.

4.10 Other assumptions

In addition to the assumptions made above, a number of other factors will be taken into consideration. These are:

- the effect of weather conditions in disrupting work and affecting accuracy,
- the level of rework,
- the level of absenteeism and vacation.

4.11 Model users

The model will be used by the Industrial Engineering department.

On completion of this project, the model could be developed as described in Section 4.12. The user base may therefore expand to include planners, foremen and area managers. The potential future use and expansion of the user base will not be a primary consideration in the development of the model.

4.12 Possible future development of the model

Possible future uses include:

- develop the system interfaces to constraint enabled so that not only will the influx and egress of objects over the boundary be modeled, but can also be disrupted,
- extend system boundary to include others areas such as SOC3.

Extension of the system boundary is a natural progression with the possible long term aim of creating a model of the entire shipyard.

5.0 MODEL FUNCTIONALITY

5.1 Introduction

This section details the functionality required to satisfy the demands of the model outputs and the model user. The five elements of the model output will be handled by the user interface. The user interface will also give easy access to the system history output which will be necessary for testing, validation and experimentation as detailed in the following sections.
5.2 User interface elements

Elements of the user interface fall into one of two categories:

- **Interaction** - the element requires an action from the user for it to open or change its state, for example double clicking on a machine to open the characteristics dialogue box.

- **Display** - the element displays system parameters for the user, for example a display of machine status.

Elements and features of the user interface will be defined during the model development. Examples (taken from Simple++) are given below:

- **The Gauge** - displays a value either graphically as a small bar or as a digit. Typically used to display an output metric or storage area contents.

- **The Plotter** - displays a graph over time and will be used where “change in state” analysis is required. Typically used to display resource (men and equipment) utilization.

- **The Dialogue** - A pop up box with user defined elements used for adjusting or displaying system parameters. These will be used to simplify the operation of the model by grouping elements in a logical and easy to use way. Typically used for adjusting the processing characteristics of a machines: cutting speed, downtime, etc.

- **Object Animation and Color** - Both the animation of the products and processing areas can be controlled. This is useful for changing the element’s picture when its status changes- red for when a part is blocked, for example, or changing the icon of a workstation according to status.

The following are examples of live outputs that will be used in the model:

- each workstation will have a status indicator showing:
  
  ⇒ idle (yellow)
  
  ⇒ processing (green)
  
  ⇒ blocked (red)

- each workstation will have a gauge indicating its current utilization,
- each workstation will have an indicator showing output per week (throughput),
- where workstations have a capacity larger than one an indicator of current number will be included,
- resources will be kept on a “resource shelf” when not utilized.
6.0 OUTPUTS AND INPUTS

6.1 Outputs

The model outputs will be designed to satisfy the primary objective of this simulation project as defined in Section 2.

In order to carry out the evaluation, the following reports will be required.

- throughput reports:
  - parts per period at all levels of system hierarchy
  - tonnes per period and other metrics at all levels of system hierarchy
  - value processed per period at all levels of system hierarchy
  - utilization at all levels of system hierarchy.

- demand profiles for system inputs,

- demand profiles for resource and consumables,

- operation profile report showing exactly what is the status of each processing object during the model run period.

6.2 Inputs

The model will require two types of input:

- product definition file - this file will contain a complete definition of the product and will take the form of a Product Work Breakdown Structure. The exact structure and nature of this file will be determined in the model formulation stage.

- product and process object attributes - attributes assigned to objects so that the required output reports can be generated.

6.2.1 Process object attributes

- NASSCO ID. This is a unique identifier that refers to the shipyard name for the processing object.

- Processing capabilities. What type of work can the process do.

- Capacity. How much can it produce.

- Status. Status is categorized into working and not working. This is not strictly an input but is included in the list of attributes. The object is considered not working during scheduled global downtime caused by shift patterns, weekends or holidays. Working is subdivided into:
- **Down.** The object is broken or undergoing maintenance.
- **Blocked.** The object has finished processing but cannot release the product due to congestion in downstream processing objects.
- **Waiting.** The object is ready to start processing but cannot because it is waiting for input material.
- **Processing.** The object is doing work.

### 6.2.2 Product object attributes

- **Material ID.** This is a unique identifier that refers to the shipyard name for the product object.
- **Physical Attributes.** Categorized into weight, dimensions and other metrics to measure work content.
- **Routing.** This is the route the product objects take through the process objects.
- **Monetary value.**
- **Locations.** Times and locations recorded for the life span of the product.

### 6.3 Generation of reports

The reports outlined in Section 7.1 are produced at the end of the simulation run. The method for the production of each report is outlined below.

- **Throughput reports.** By using the location log for each product object the passage of product objects through each processing object can be determined. When combined with this the relevant product object attributes and the throughput for each processing object can be calculated.

- **Demand profiles for resources and consumables.** The demand on the relevant resource pools and consumable stores is recorded during the model run. This is plotted out at the end of the run.

- **Demand profiles for system inputs.** The demand on the relevant input source is recorded during the model run. This is plotted at the end of the run.

- **Operational profile.** By analyzing the status logs for each processing object, the operational profile in terms of time spent in each of the different operation modes can be plotted.
7.0 PROJECT METHOD

7.1 Project steps

The simulation aspects of the project are divided in the stages shown in Section 1, which are:

- simulation specification,
- data collection,
- model formulation,
- model testing and validation,
- experiments and analysis.

In order to meet the project objectives, the modeling, experiment and analysis phases will be split into two parts. The first stage will be the modeling of the facility as it exists as defined in Section 3. Experiments and analysis will then be carried out to identify areas within the modeled area that could be improved through the introduction of automation.

In the second stage, the identified candidate automated processes will then be modeled as "what if" scenarios and the effect of these changes on performance will be quantified.

In addition, a case study will be carried out which models the T-beam process lane as it was and also as it now exists. The recent changes to the facility in this area will be used to examine the effectiveness of the simulation methodology.

The remainder of the project follows an established logical sequence which is explained in the following sections.

7.2 Data collection

In order to establish which data to collect prior to beginning data collection it is necessary to further define the system, the product work breakdown structure and report requirements. The principal steps in this are as follows:

1. Define, as in Section 3, the system boundary. Decide exactly which parts of the system are to be modeled and exactly how the system is constrained by its material inputs.

2. Break the manufacturing system down into logical elements. These elements, referred to hereafter as processing objects, are the fundamental building blocks from which the model is created.

3. Produce a step by step logical description for the behavior of each of the defined process objects. It appears from the process flow information examples produced by the industrial engineering department that some of this information already exists, albeit in a slightly different form to that required for this step.

4. Determine precisely what parameters affect the performance of each processing object in terms of:
   - product specification and characteristics such as thickness, weld length and area,
• resource requirements including labor, cranes, floor space and consumables,
• environmental factors affecting the process such as the weather,
• operational downtime, shift patterns, maintenance schedules.

5. Some of this information has been collected as a result of previous studies. This will be reformatted and enhanced. Labor will be categorized by skill type.

6. Define the product or products that each process object is capable of producing. These products are referred to as interim products.

7. Describe the inputs to the system boundary. These are also considered to be interim products, the only difference is that they originate from outside the system boundary.

8. Produce a detailed list of all the system outputs.

9. Break down each output into its constituent interim products.

10. Define which attributes define each interim product in terms of the attributes associated with the process objects and information that maybe required to appear on a report. For example, if the throughput measure is tonnes per week, then each interim product must have a weight attribute. Similarly, if a cost profile is required then each interim product would be assigned an attribute that held some measure of the monetary value.

Performance data relating to the process objects is collected from existing input/output from the MRP system, measurements taken by planners, production personnel or the industrial engineering group or, as last resort, time study. There is a considerable amount of data already available although some of this is conflicting and this must be clarified prior to inclusion in the data base. The attributes relating to the interim products are quantified by reviewing the design and the Product Work Breakdown Structure. Again much of this data exists or can be easily generated from TRIBON and CALMA (engineering design CAD systems).

7.3 Model Formulation

The model formulation is the actual model construction.

7.4 Model testing and validation

The model testing and validation specifications are defined in detail in Section 8 of this document.

7.5 Experimenting with the model

This stage of the simulation project assumes that a tested and validated model of the system has been created.

There are numerous investigations that can be carried out with this simulation model. However, the primary objective of this part of the project is to evaluate the effect of automating parts of the steel work areas so the user will be concentrating on what if analysis.
The experiments fall into one of two categories: process experiments and sensitivity analysis. The comparison of the experiment results must be conducted within a framework of known model error.

7.5.1 Process experiments

The process experiments should deal with the following:

- identifying bottleneck areas which have repetitive manual processes and possible were material handling is convoluted,
- quantifying the effectiveness of automation in these areas identified.

The introduction of automation invariably involves capital expenditure and therefore results will highlight a ranked list of improvements against cost.

7.5.2 Sensitivity

The following sensitivities are suggested for experimentation:

- the effect of variance on each process time on overall cycle time,
- the effect of changing the buffer size on throughput or WIP,
- vary the maintenance schedule and breakdown probabilities to gauge the effect on throughput,
- vary the probability of rework at the various workstations

8.0 DELIVERABLES

8.1 General

The following is an outline of what will be produced during the course of the simulation project. A more detailed list will be derived during the development of the proposal for the next phase of the simulation project.

- data collection requirements and specification of data inputs required,
- complete simulation model to the specification outlined in this document,
- a simulation model user manual,
- project reports and documentation of project methodology,
- experiments and analysis to meet the project requirements.

8.2 Responsibilities

The development of the simulation model specified in this document is a major task. The best way to organize and manage the work is to adopt a team approach involving both specialist external resources and NASSCO employees. In general, NASSCO employees will be responsible for data collection, project reports, and conducting experiments. Specialist external resources will be responsible for development of the simulation model, creation of a user manual, and general consulting in the application of the model.
8.3 Project time scale

The expected project program in weeks is shown below.

<table>
<thead>
<tr>
<th>Project Tasks</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>21</th>
<th>22</th>
<th>23</th>
<th>24</th>
<th>25</th>
<th>26</th>
<th>27</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>silent specification and sourcing</td>
<td>silent collection on product</td>
<td>silent collection on product</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>silent level design</td>
<td>silent level design</td>
<td>silent level design</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MODEL DESIGN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>silent level design</td>
<td>silent level design</td>
<td>silent level design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>silent level design</td>
<td>silent level design</td>
<td>silent level design</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXISTING FACILITY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>silent level design</td>
<td>silent level design</td>
<td>silent level design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>silent level design</td>
<td>silent level design</td>
<td>silent level design</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TESTING AND VALIDATION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>silent level design</td>
<td>silent level design</td>
<td>silent level design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>silent level design</td>
<td>silent level design</td>
<td>silent level design</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BOTTLENECK ANALYSIS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>silent level design</td>
<td>silent level design</td>
<td>silent level design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>silent level design</td>
<td>silent level design</td>
<td>silent level design</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MODELING OF AUTOMATION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>silent level design</td>
<td>silent level design</td>
<td>silent level design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>silent level design</td>
<td>silent level design</td>
<td>silent level design</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXPERIMENTS AND ANALYSIS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>silent level design</td>
<td>silent level design</td>
<td>silent level design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>silent level design</td>
<td>silent level design</td>
<td>silent level design</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>REPORTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>silent level design</td>
<td>silent level design</td>
<td>silent level design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>silent level design</td>
<td>silent level design</td>
<td>silent level design</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Methodology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>silent level design</td>
<td>silent level design</td>
<td>silent level design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project reports</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>silent level design</td>
<td>silent level design</td>
<td>silent level design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>User manuals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>silent level design</td>
<td>silent level design</td>
<td>silent level design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
9.0 MODEL TESTING AND VALIDATION

9.1 Overview

This section details the testing and validation procedure that takes place during model building and on completion of the model prior to experimentation.

The model testing will follow the same hierarchical approach as the modeling itself. Therefore, since the model is broken down into a set of modules which interact to make up the whole model, the following approach will be taken:

- test each module individually,
- test the interaction (interface) between two modules,
- test the overall model.

The diagram overpage shows the overall modeling process from building through to implementing results from model experimentation:
Build Module

Verify Module

Validate Module

Experiment

Implement

Run Model with scenarios that cannot be executed to force model failure explanations instead of allowing crashes

Model follows Logic

Negative Test

Soak Test

Run Model with large amounts of data to test programming integrity

Consultation with system experts

Check results against verified past data or proven system results

Realism

Accuracy

Sensitivity Analysis

What If Analysis

Implement Ranked Solution

Measure Effect

Compare Effect with Prediction
9.2 Module logic follows system logic

In the model design phase of the project the model logic and assumptions will be defined and documented after, consultation between NASSCO personnel and the modeling team. This logic and assumptions will be used in the model building phase. The verification of the model logic is the first testing procedure. The model logic should follow the system logic as defined. A manual check of the logic diagrams to ensure that the rules are being obeyed is usually sufficient in the first instance although a logic testing “cradle” is constructed to do this where necessary. This cradle feeds the system module with all its required inputs and checks that the correct logic paths are traveled and outputs obtained.

9.3 Negative

The model logic should be designed so that invalid experiment scenarios cause the model to react in a positive manner. If an invalid scenario occurs the model should not fail but flag the problem and attempt to explain why it cannot deal with it. In simple modeling terms this could mean simple messages are displayed explaining why the model has stopped or is not running. For this test the model should be loaded with invalid scenarios to ensure the model does not just stop or crash.

9.4 Soak

To verify that the model is stable within its environment, i.e. the computer and software on which it is run, the model is run with an overload of data and/or repetitively for a long period of time. This will give confidence that there are no sporadic software glitches or hardware problems associated with the model. This is important when the model is left to carry out experiments for a length of time unattended.

9.5 Validation

Before experimentation can begin, the model must be validated. The validation process ensures that the users have complete confidence in the output of the model. Only when this is achieved will the experiment results be fully appreciated. In order to achieve this the following tests must be undertaken.

9.5.1 Realism

This is a consultative test whereby the system experts, with detailed working knowledge of the system modeled, are asked to check the model behavior to ensure that it reflects the true nature of the real system. An exact representation is not necessary to pass this test but it is important to ensure that important system behavior characteristics are not neglected.

9.5.2 Accuracy

To check model accuracy, the model outputs are compared against an historical or derived data set. In previous sections some consideration has been given to the appropriate level of model accuracy. At the first stage, the accuracy of the model does not have to be particularly high, but the correct logic of the model is crucial.
Simulation models which take account of the variability of processes will have outputs that are also statistical in nature. The results of the model will therefore have a mean value and a variance associated with that mean. A truly validated model must have good matching of both these parameters.

Validation can take place in the same hierarchical way in which model testing is done. This will require that the logic testing cradle not only has the correct inputs and outputs for the running of a module, but that these outputs are realistic. Data must therefore be collected to satisfy the module inputs and outputs.

The procedure for module and complete model validation is essentially the same and includes the following steps:

- Collect data to satisfy the module or model boundary inputs and outputs.

- Run the model over a period of time which is equivalent to the length of time which the real system took to process the material represented by the collected data. For example, for the complete system model, the simulation might be run for the equivalent of one week's production.

- Collect detailed statistics from the real system about the actual throughput of work over the same period. This data collection will be carried out by area supervisors and will be a simple list of completed work and the date and time on which it was completed.

- Compare the results of the simulation model and the real system for the model outputs. This comparison is done at the highest level first with throughput of blocks and the input of plates and stiffeners.

If the model results and the real system outputs agree to within 10%-15% at the highest level, the accuracy comparisons can then be made throughout the model hierarchy. This process will start by comparing buffer contents and then move on to the throughput of each area and workstation before getting to individual machine performances.

The measures of throughput and general system performance are called system metrics. The outputs of the simulation model reflect these system metrics. The following metrics can be compared at global and local levels throughout the validation stage:

**Throughput:**

- make-span (the time that components spend in the system),

- process times at workstations and product areas including set-up and load-out times,

- resource requirements of particular product areas, for example model predictions of the number of welders required in the sub-assembly areas,

- buffer utilization.
What if the model accuracy does not meet the required accuracy?

When the model is first tested it is likely that the accuracy that was set initially will not be met. In this case the following procedure should be carried out:

- Check each of the outputs at the global and local levels for accuracy. This will isolate the areas in which the inaccuracy is greatest.
- Having isolated the problem area, the system and product data relevant to these process areas in the model should be verified by revisiting the appropriate data collection points.
- The problem may lie with an unrealistic description of the process or erroneous assumptions about the activities in that area.
- Modify the system data, product breakdown, system logic or a combination of all three and revalidate the model.

The process of validation usually requires a number of iterations until a satisfactory level of accuracy is achieved.
APPENDIX C
SIMULATION SOFTWARE PACKAGES
See
"Software for Simulation"
By Jerry Banks
Published in the Proceedings of the 1996 Winter Simulation Conference
NASSCO Stage of Construction 1 - Steel Fabrication 'As-Is' Process Flowchart

Storage

Start

Material Handling

Wheel-A-Brator

Plate Fabrication

Profile Fabrication

T-Beam Fabrication

Start

507 crane loads plate onto transfer car

Load plate onto wheel-a-brator conveyor

Start

Profile steel yard

Use fork truck or Pico crane to retrieve profile stock from storage

Is profile stock > 31"?

Yes

Stage profile stock in flat stacks

No

Stage profile stock in flat stacks

Wheel-a-brator staging area

Use fork truck to transfer stacks to the wheel-a-brator staging

Use fork truck to transfer material from stacks to wheel-a-brator conveyor

Blast and Prime

A

Page 1 of 25
NASSCO Stage of Construction 1 - Steel Fabrication 'As-Is' Process Flowchart

Storage  Material Handling  Wheel-A-Brator  Plate Fabrication  Profile Fabrication  T-Beam Fabrication

D

S  No

Flame planer?

Yes

Transfer plate to flame planer with T2 transfer car

120

121

Setup flame planer

122

Strip plate

123

Plate going to subassembly or Table 1?

Yes

Use collocator system (T3 & C1) to transfer to next assembly

124

125

No

C1 collocator lane

Use a trailer to transfer plate to next assembly

126
NASSCO Stage of Construction 1 - Steel Fabrication 'As-Is' Process Flowchart

Storage  →  Material Handling  →  Wheel-A-Brator  →  Plate Fabrication  →  Profile Fabrication  →  T-Beam Fabrication

S

127  Transfer plate to the CM300 burn machine with T2 transfer car

CM300 burn machine staging

128  Load CM300 with area crane or conveyor

129  Setup CM300

130  Cutout detail pieces

131  Label parts

132  Place parts on pallet

133  Remove scrap from table and place in dumpster

134  Transfer pallets to next assembly with fork truck
NASCO Stage of Construction 2 - Steel Subassembly 'As-Is' Process Flowchart

Line Heating

Pre-Subassembly

Subassembly Workcells

Paneling Area

Material Handling

Storage

T

149 Work to be performed in S/A workcells?

No

150 Fit detail pieces onto panel

151 Welding process

152 More fitting required?

No

153 Line heating required?

No

147 Yes

Transport work to the line heat staging area

148 Yes

Transport to SOC3

Line heat staging

SOC 3 staging
NASSCO Panel Line - 'As-Is' Process Flowchart

1. Storage
2. Material Handling
3. Miscellaneous Task
4. Fitting
5. Welding

2000 Crane Bay

- 2000 crane loads plate onto the T4 transfer car
  - 175 Panel line worker performs edge prep operation

- Index T4 to the beginning of the panel line
  - 177

- First plate in the panel?
  - Yes
    - Transfer plate from T4 to the plate fitting station
      - 179

  - No
    - Align plate with previous plate(s) and tack two end points
      - 180

- Transfer plate assembly to the plate fitting station
  - 181

- Fair the surfaces of the plate assembly and tack into place
  - 182

- Last plate in panel?
  - Yes
    - Index plate assembly towards the plate seaming station
      - 184

- No
  - 183

W

Page 21 of 25
NASSCO Steel Fabrication and Subassembly 'As-Is' Process Flowchart Supplement

The intent of this supplement is to define the logic which should be used in the simulation model. The numbered items below directly correspond to the individual flowchart items for the 'As-Is' process flowchart.

1. The 507 crane will pick plates from piles within the steel yard and stage them next to the T1 transfer car. The T1 transfer car will index over to be within reach of the 507 crane. The 507 crane will then transfer the staged plates one at a time to the T1 transfer car. The 507 crane requires one operator and the T1 transfer car is operated by one of the Prime Line workers.
2. The T1 transfer car indexes back in-line with and becomes part of the wheelabrator incoming conveyor. The transfer car and the incoming conveyor are operated manually by one of the workers.
3. Stock within reach of the Pico crane is retrieved by that crane and staged for delivery to the wheelabrator. A forklift performs this operation if the Pico crane is down or if the material is out of the crane's reach. In either case, an operator is required.
4. There is a quick sort of the profile raw stock by length.
5. Place the material greater than 31' in length in its own stack.
6. Place the material less than 31' in length in its own stack.
7. Use a forklift to transfer the stacks of profile material from the profile steel yard to the wheelabrator incoming material staging area. If the raw material is 51' in length, a special spreader bar must be used to transfer the material.
8. Within the wheelabrator incoming material staging area, use a forklift to orient and place the profile material onto the wheelabrator incoming conveyor. The number of profiles loaded at the same time (i.e. side-by-side) will vary from seven pieces for flatbar and four pieces for all other profiles.
9. Feed the material by conveyor through the wheelabrator for processing. The first process is a shot blast to remove any mill scale. The second process is a painting operation where a primer coat is applied to the material. One to two workers are required to operate the conveyors and the wheelabrator. An additional worker is stationed at the exit point of the wheelabrator to hand label all outgoing pieces of material.
10. Profile material is sent straight through to the end of the wheelabrator conveyor system where it is removed from the conveyor by forklift.
11. Plates are transferred from the wheelabrator outgoing conveyor to the C2 collocator car via a turntable.
12. Plates for T-beam manufacture are logically separated from all other plates.
13. Plates scheduled for the flame planer or the CM300 machines are sorted out from the rest.
14. Plates scheduled for the CNC burn machines in the 2000 crane bay are stored in piles within the C2 collocator lane.
15. The 2000 crane is used to remove any scrap and remnant material from the CNC burn machine tables. The 2000 crane will then place this material into centrally located dumpsters within the 2000 crane bay. The dumpsters are periodically emptied by an outside contractor.
16. The 2000 crane will transfer plates from C2 collocator lane storage to the CNC burn machine table. This operation may require some plate shuffling.
17. Sometimes multiple (i.e. mirrored plates) will be processed on the burn machines. There needs to be a check for mirrored plates at this point in the logic. Please see the additional write up on the 2000 crane operations.
18. Same as #16.
19. This task consists of downloading the NC program and loading the plates onto the cutting table.
20. Using the marking heads on the CNC burn machines, layout lines are marked on the plate.
21. Detail pieces are cut from the plate stock.
22. Some of the plates require a manual bevel operation after cutting on the CNC burn tables.
23. Is there an open manual bevel station?
24. No open manual bevel station, therefore transfer piece to manual bevel staging.
25. Transfer plate to the manual bevel station.
26. Determine bevel requirements and setup required equipment.
27. Perform manual bevel operations.
28. Is the piece going directly to next assembly?
29. Next assembly not ready, store the piece in a local storage location.
30. Is the plate going to the panel line?
31. Use the 2000 crane to transfer the plate from to the panel line transfer car.
32. Is the detail piece greater than 18 ft in length? If so, do not use forktrucks for transport.
33. Is the plate going to subassembly?
34. Transfer plates less than 18 ft in length to the subassembly kitting area.
35. Transfer plates less than 18 ft in length to their SOC3 next assembly location.
36. If the plates are greater than 18 ft, are they going to subassembly or to assembly?
37. Using the collocator system, transfer plates to predefined staging piles in the C1 collocator lane.
38. Plates greater than 18 ft in length which are not going to either the panel line, subassembly, or Table 1 are delivered to the next assembly location by trailer.
39. Flatbar stock output from the wheelabrator is loaded into cassettes and then transported to staging area by a log carrier.
40. Same as #39.
41. Same as #41.
42. Is the flatbar going to be processed by the ironworker?
43. Transfer a cassette load of flatbar material from staging to the ironworker staging area.
44. Seize one of the 5 ton overhead cranes from the subassembly area to aide in material handling at the ironworker.
45. Read the manufacturing shop order and setup equipment to perform the task.
46. Process flatbar. Processing time to be a function of the number of cuts.
47. Mark and label each individual piece.
48. Flatbar stock is to be processed on Table 10, use the carrier to transport raw stock in cassettes from the staging area to Table 10.
49. The 507 crane is used to transfer incoming flatbar material from the cassettes to the Table 10 workarea.
50. Workers refer to manufacturing plans and then layout, mark, and label parts to be cut from the flatbar stock.
51. Are the pieces to be cut from the large shear?
52. Pieces are manually cut from raw stock using hand held cutting torches on Table 10.
53. Pieces are to be cut on the large shear, and are therefore loaded onto to pallets for transport to the large shear staging area.
54. Forktrucks transport flatbar material loaded on pallets from Table 10 to the large shear staging area.
55. A gantry crane at the large shear is used to move stock from the staging area to the large shear input table.
56. Parts are processed on the large shear. Cycle time is a function of the number of cuts.
57. Completed parts are stacked onto pallets on the output side of the large shear.
58. Do the sheared parts require beveling?
59. Using a forklift, transport a pallet load of completed parts from the output side of the large shear to the small parts manual bevel staging area.
60. Review the beveling instructions on the manufacturing plan, setup material and equipment to perform the manual beveling operation.
61. Perform the manual beveling operation.
62. Stack beveled pieces onto a pallet.
63. Transfer pallet of beveled pieces to a manual deburr station.
64. Manually deburr parts.
65. Stack the deburred parts onto a pallet.
66. Using a forklift, transfer the pallet of deburred parts to storage.
67. Are the non-flatbar profiles exiting the wheelabrator greater than 31 ft in length?
68. Non-flatbar profiles greater than 31 ft in length are loaded into cassettes as they exit the wheelabrator. A forklift is used for material handling.
69. Non-flatbar profiles less than 31 ft in length are loaded onto carrier blocks as they exit the wheelabrator. A forklift is used for material handling.
70. A log carrier is used to transport non-flatbar profiles loaded in cassettes or on carrier blocks from the output side of the wheelabrator to the profile staging area.
71. A log carrier is used to transport non-flatbar profiles loaded in cassettes or on carrier blocks from the profile staging area to the profile fabrication staging area.
72. Is the raw stock greater than 31 ft in length?  
73. Raw stock is greater than 31 ft in length and therefore, the long load bar must be installed on the 600 crane.  
74. The 600 crane is used to transfer profile raw stock from the staging area to the layout and burn tables.  
75. Workers layout, mark and label detail parts on the pieces of profile raw stock.  
76. Workers use hand torches to cut detail pieces from the profile raw stock.  
77. Are the completed profile parts greater than 31 ft in length?  
78. Completed parts are greater than 31 ft in length and therefore, require that the long load bar be installed on the crane.  
79. Is there a cassette or pallet available for the outgoing profile parts?  
80. If no cassettes or pallets are available, use the 600 crane to transfer the completed profile parts from the layout and burn tables to the outgoing staging area.  
81. Use the 600 crane to load completed profile parts onto cassettes and or pallets. Parts are sorted by part number and next assembly.  
82. Are the completed profile parts going directly to the next assembly area?  
83. Next assembly area is not ready for the completed profile parts, therefore, they are transported to storage by forklift or log carrier.  
84. Profile parts are transported directly to the next assembly location from profile fabrication by either forklift or log carrier.  
85. Is T-beam fabrication area ready to accept the T-beam material (plates) exiting the wheelabrator?  
86. Fabrication is not ready for the just primed T-beam material, therefore, transfer this material to a predefined storage location in the C2 collocator lane.  
87. Is the flange material for a T-beam greater than 14” wide?  
88. Flange material for T-beams greater than 14” wide is stripped from plate using the CM100. Raw material for this operation is stored in the C2 collocator lane. The 2000 crane transfers this material from the C2 storage location onto a trailer.  
89. Trailer loads of material are transported from the 2000 crane bay to the CM100. A forklift is required for this operation.  
90. The 590 crane is used to transfer T-beam flange material from the trailer to the CM100 table.  
91. Workers refer to the manufacturing plan and setup the material and machine accordingly at the CM100.  
92. The CM100 is used to strip T-beam flanges from plate stock.  
93. The 590 crane is used to transfer T-beam flanges from the CM100 table to Table 10.  
94. Workers manually fit the flanges to webs on Table 10.  
95. A T-beam’s flange and web are welded together using gravity welders.  
96. Freshly completed and cooled T-beam welds (web to flange) are stripe coated with paint to prevent rusting.  
97. Flange material for T-beams less than 14” wide is stripped from plate using the flame planer. Raw material for this operation is stored in the C2 collocator lane. The 2000 crane transfers this material from the C2 storage location onto the T2 transfer car.  
98. Material is transported via the T2 transfer car the flame planer input conveyor.  
99. Workers refer to the manufacturing plan, and setup the material and machine.  
100. The flame planer is used to strip T-beam flanges from plate material. The processing time is a function of the feedrate and the length of cut.  
101. Stripped T-beam flanges are transferred from the flame planer output conveyor onto the T3 transfer car. The material is then transferred from T3 to the T-beam welder input conveyor.  
102. T-beams are processed through the T-beam welder.  
103. T-beams exiting the T-beam welder are loaded onto carrier blocks using a local 5 ton gantry crane.  
104. A log carrier transfers a load of T-beams on carrier blocks from the T-beam welder.  
105. Has the blank T-beam been processed through the wheelabrator?  
106. Non-primed T-beams are transported by log carrier to the wheelabrator input staging area.  
107. Forklifts are used to transfer blank T-beams from the wheelabrator input staging area to the input conveyor.
108. T-beams are processed through the wheelabrator.
109. A forklift is used to transfer primed T-beams from the wheelabrator output conveyor and loaded onto carrier blocks.
110. A log carrier is used to transfer loads of T-beams from the wheelabrator output area to the blacksmith area.
111. A gantry crane is used to load T-beams from onto the bulldozer or frame bender.
112. The bulldozer or frame bender is used to straighten the T-beams.
113. Processed T-beams are loaded onto carrier blocks.
114. A log carrier is used to transfer processed T-beams to Table 10.
115. Using the 600 crane, transfer staged T-beams onto Table 10.
116. Manually layout and mark a T-beam.
117. Using a hand torch manually make all cutouts on a T-beam.
118. Use the 600 crane to transfer cut T-beam from Table 10 to the carrier blocks.
119. Using the log carrier, transfer loads of cut T-beams from Table 10 to the profile staging area.
120. Are plates coming from the 2000 crane bay going to the flame planer?
121. Using T2 transfer plates from the 2000 crane bay to the flame planer input conveyor.
122. Worker refers to manufacturing plan to setup material and machine.
123. Process plate across the flame planer. Process time is a function of the feedrate and the length of cut.
124. Is the processed material going from the flame planer to subassembly or to Table 1 SOC3?
125. Using the collocator system (T3 and C1), transfer material from the flame planer to a predefined storage location in the C1 collocator lane.
126. Parts coming off of the flame planer, which are not going to Table 1 or to subassembly, are loaded onto trailers and transported out of the system.
127. Plates are transferred from the 2000 crane to the small parts fabrication input conveyor using the T2 transfer car.
128. The local gantry crane is used to load raw stock onto the CM300 burn table.
129. Worker refers to manufacturing plan to setup material and machine.
130. The CM300 is used to fabricate detail parts.
131. The machine operator manually labels each cut piece on the CM300.
132. The machine operator manually removes small parts from the CM300 table and stacks them onto pallets. The area crane is used to remove the heavier pieces.
133. The machine operator uses the area crane to transfer scrap material to the scrap bin.
134. Pallets of completed small parts are transferred to next assembly or storage by forklifts.
135. Material for subassemblies is delivered to the paneling area from one of three sources. Plates greater than 18 feet long are transported from storage locations in the C2 collocator lane. The Table 1 cranes, collocator car, transfer cars, and shop cranes are used to transport this material into the area. Long profiles are delivered to the area in cassettes and / or carrier blocks by the log carrier. Plates and profiles less than 18 feet in length are delivered in a kits from the subassembly kitting area.
136. If there is not sufficient open floorspace for a given subassembly, place its material in the paneling staging area.
137. Laydown the material in an open space in preparation for paneling.
138. Shop cranes are used to remove completed panels from the workarea. They are transported to the far east end of the shop and loaded onto trailers. The trailers are then transported to the designated area in SOC3.
139. A fitter is assigned to the job and he/she performs all of the required tasks to fit the panel plates together.
140. The welder uses a local crane to position the subarc welding unit onto the panel. He/she then sets up the welding unit to perform the job.
141. The subarc welding unit is used to butt weld panel seams. The process time is a function of the feedrate and weld length.
142. The paneling process requires welding on both sides of the panel.
143. Shop cranes are used to flip the panel over.
144. The welder repeats the setup process for the subarc welding unit.
145. The subarc welding unit is used to butt weld panel seams. The process time is a function of the feedrate and weld length.
146. Are there additional parts to install on the panel?
147. Panels are transported to the line heating area in the east end of the shop using the shop gantry cranes.
148. Completed panels are loaded onto trailers with the shop cranes. The trailers are then transported to the designated area in SOC3.
149. Are the additional parts for the panel to be installed in the subassembly workcells?
150. A fitter is assigned to the job and he/she performs all of the required tasks to fit the detail pieces of a subassembly. A portion of this operation requires assistance from the area cranes.
151. A welder(s) is assigned to the job and he/she performs all of the required tasks to weld the subassembly. Welding time is a function of the method used and the total weld footage.
152. Sometimes there are more detail pieces to fit onto the subassembly after the completion of a welding operation. If this is the case, repeat the fit and weld cycle.
153. Subassemblies that are distorted from the welding process must be processed through the line heating area.
154. Material for subassemblies is delivered to the subassembly workcells from one of three sources. Plates greater than 18 feet long are transported from storage locations in the C2 collocator lane. The Table 1 cranes, collocator car, transfer cars, and shop cranes are used to transport this material into the area. Long profiles are delivered to the area in cassettes and / or carrier blocks by the log carrier. Plates and profiles less than 18 feet in length are delivered in a kits from the subassembly kitting area.
155. If there is not sufficient open floorspace for a given subassembly, place its material in the subassembly workcell staging area.
156. Laydown the material in an open space within the defined subassembly workcell.
157. Subassemblies are transported to the line heating area in the east end of the shop using the shop gantry cranes.
158. Completed subassemblies are transported to the designated area in SOC3. The smaller subassemblies are transported out of the area by forklift. The larger subassemblies are loaded onto trailers in the east end of the shop with the area gantry cranes. The trailers are then transported to the designated area in SOC3.
159. A fitter is assigned to the job and he/she performs all of the required tasks to fit the detail pieces of a subassembly. A portion of this operation requires assistance from the area cranes.
160. A welder(s) is assigned to the job and he/she performs all of the required tasks to weld the subassembly. Welding time is a function of the method used and the total weld footage.
161. Sometimes there are more detail pieces to fit onto the subassembly after the completion of a welding operation. If this is the case, repeat the fit and weld cycle.
162. Subassemblies that are distorted from the welding process must be processed through the line heating area.
163. Material for subassemblies is delivered to the pre-subassembly area from the subassembly kitting area.
164. If there is not sufficient open tablespace for a given subassembly, place its material in the pre-subassembly staging area.
165. Laydown the material in an open space on the pre-subassembly worktables.
166. Completed subassemblies are loaded onto to pallets and then transported by forklift to the designated area in SOC3.
167. A fitter is assigned to the job and he/she performs all of the required tasks to fit the detail pieces of a subassembly. A portion of this operation requires assistance from the area jib cranes.
168. A welder(s) is assigned to the job and he/she performs all of the required tasks to weld the subassembly. Welding time is a function of the method used and the total weld footage.
169. Sometimes there are more detail pieces to fit onto the subassembly after the completion of a welding operation. If this is the case, repeat the fit and weld cycle.
170. Are the completed subassemblies going into larger subassemblies in the paneling area?
171. Are the completed subassemblies going into larger subassemblies in the subassembly workcells?
172. The area gantry cranes are used to transport subassemblies from the line heating staging area to the line heating acorn table.
173. Completed subassemblies are transported to the designated area in SOC3. The smaller subassemblies are transported out of the area by forklift. The larger subassemblies are loaded
onto trailers in the east end of the shop with the area gantry cranes. The trailers are then transported to the designated area in SOC3.

174. Distortions in subassemblies are corrected with the line heating process.
175. A panel line worker coordinates with the 2000 crane operator on the sequence and orientation of plates for the panel line. The crane operator retrieves plates and places them on the T4 transfer car.
176. A worker takes a hand held grinder and removes any slag from the plate edges.
177. The transfer is indexed over and aligned with the beginning of the panel line.
178. The first plate in the panel is simply indexed onto the panel line. Subsequent plates are aligned with previous plates in a panel by using the transfer car to shift the plate back and forth.
179. First plate in the panel is indexed directly to the panel line.
180. Subsequent plates are aligned to the panel using the transfer car. Workers tack both ends of the seam to hold the plates together while indexing to the plate fitting station.
181. The panel assembly is moved down the line (off of the transfer car) using the panel line drive system.
182. Twin magnet beds are used to fair the surfaces of the new plate with the panel assembly.
183. Repeat for above process for additional plates.
184. Plate fitting is complete. Use the panel line drive system to transfer the plate to the next station on the line.
185. Several of the RO/RO vessel blocks have deck sockets. If so, deck sockets are installed prior to seaming.
186. Using a hand grinder, workers remove sharp edges from the deck socket cutouts.
187. Workers manually carry deck sockets from a storage bin and distribute them on the panel as required.
188. Special welding units are lifted onto the panel with panel line’s gantry crane.
189. Deck sockets are welded using the special welding equipment.
190. The panel is moved to the next station on the line.
191. The copper backing bar is cleaned and fluxed ready for the next seam.
192. The panel is aligned over the copper backing bar using the panel line’s drive system, plate pushers, and adjustable magnets.
193. The seam is welded using the one sided welder.
194. If there are more seams, repeat the above process.
195. Using the panel line drive system, the panel is transferred to the next station on the line.
196. Two workers manually layout the stiffener and frame locations on the panel.
197. A portable oxy-acetylene torch unit is used to square the edges of the panel.
198. Using the panel line drive system, the panel is transferred to the next station on the line.
199. Cassettes loaded with stiffeners are transferred from SOC1 storage locations and delivered to the far west end of the panel line.
200. The panel line gantry crane will pick up the loaded cassettes and place them on top of the related panel in the stiffener fitting station.
201. The panel line gantry crane is used to place the stiffeners from the cassette onto the panel one at a time. The stiffeners are prefit using simple fitting aides to hold them in an upright position.
202. A stiffener fitting press is used to squeeze out any gaps between the stiffener and the panel. The stiffeners are then tack welded into position. The press can service up to two stiffeners at a time.
203. Empty cassettes are removed from the line by the area gantry crane.
204. Using the panel line drive system, the panel is transferred to the next station on the line.
205. The panel must be aligned with the stiffener welding gantry. The gantry has some skewing capability which assists with this operation.
206. Both sides of up to four stiffeners are welded simultaneously.
207. If more stiffeners remain to be welded, repeat the above process.
208. Using the panel line drive system, the panel is transferred to the next station on the line.
209. Cassettes loaded with frames are transferred from SOC1 storage locations and delivered to the far west end of the panel line.
210. The panel line gantry crane will pick up the loaded cassettes and place them on top of the related panel in the frame fitting station.
211. The panel line gantry crane is used to place the frames into position one at a time.
212. Fitters manually complete the frame fitting operation.
213. Empty cassettes are removed from the line by the area gantry crane.
214. Using the panel line drive system, the panel is transferred to the next station on the line.
215. Welders are assigned to the panel and welding of the panel is completed.
216. Using the panel line drive system, the panel is transferred to the load out station. This is the last station on the line.
217. The yard whirley cranes will transfer completed panels from the load out station to the next assembly area.
APPENDIX E

DETAILED PERFORMANCE STATISTICS FOR PROFILE FABRICATION AND PANEL LINE MODELS
DETAILED PERFORMANCE STATISTICS FOR THE
"BASELINE" PROFILE FABRICATION AREA MODEL
## LOCATIONS

<table>
<thead>
<tr>
<th>Location Name</th>
<th>Scheduled Hours</th>
<th>Capacity</th>
<th>Total Entries</th>
<th>Average Minutes Per Entry</th>
<th>Average Contents</th>
<th>Maximum Contents</th>
<th>Current Contents</th>
<th>% Util</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roller Table Position 1</td>
<td>743</td>
<td>1</td>
<td>41</td>
<td>1081.380049</td>
<td>0.99454</td>
<td>1</td>
<td>1</td>
<td>99.45</td>
</tr>
<tr>
<td>Roller Table Position 2</td>
<td>722</td>
<td>1</td>
<td>41</td>
<td>1051.378415</td>
<td>0.995072</td>
<td>1</td>
<td>1</td>
<td>99.51</td>
</tr>
<tr>
<td>Roller Table Position 3</td>
<td>598</td>
<td>1</td>
<td>40</td>
<td>891.214700</td>
<td>0.99355</td>
<td>1</td>
<td>1</td>
<td>99.36</td>
</tr>
<tr>
<td>Roller Table Position 4</td>
<td>667</td>
<td>1</td>
<td>41</td>
<td>970.739585</td>
<td>0.994511</td>
<td>1</td>
<td>1</td>
<td>99.45</td>
</tr>
<tr>
<td>Roller Table Position 5</td>
<td>729</td>
<td>1</td>
<td>41</td>
<td>1060.079439</td>
<td>0.993673</td>
<td>1</td>
<td>1</td>
<td>99.37</td>
</tr>
<tr>
<td>Roller Table Position 6</td>
<td>612.0202333</td>
<td>1</td>
<td>42</td>
<td>868.170595</td>
<td>0.992973</td>
<td>1</td>
<td>1</td>
<td>99.30</td>
</tr>
<tr>
<td>Roller Table Position 7</td>
<td>729</td>
<td>1</td>
<td>42</td>
<td>1035.386571</td>
<td>0.994198</td>
<td>1</td>
<td>1</td>
<td>99.42</td>
</tr>
<tr>
<td>Roller Table Position 8</td>
<td>612</td>
<td>1</td>
<td>41</td>
<td>889.208951</td>
<td>0.992853</td>
<td>1</td>
<td>1</td>
<td>99.29</td>
</tr>
<tr>
<td>Roller Table Position 9</td>
<td>688</td>
<td>1</td>
<td>42</td>
<td>975.945595</td>
<td>0.992968</td>
<td>1</td>
<td>1</td>
<td>99.30</td>
</tr>
<tr>
<td>Roller Table Position 10</td>
<td>674</td>
<td>1</td>
<td>41</td>
<td>979.816195</td>
<td>0.993384</td>
<td>1</td>
<td>1</td>
<td>99.34</td>
</tr>
<tr>
<td>Roller Table Position 11</td>
<td>633</td>
<td>1</td>
<td>42</td>
<td>897.380048</td>
<td>0.992363</td>
<td>1</td>
<td>1</td>
<td>99.24</td>
</tr>
<tr>
<td>Roller Table Position 12</td>
<td>660</td>
<td>1</td>
<td>41</td>
<td>959.265049</td>
<td>0.993178</td>
<td>1</td>
<td>1</td>
<td>99.32</td>
</tr>
<tr>
<td>Roller Table Position 13</td>
<td>688</td>
<td>1</td>
<td>44</td>
<td>930.211045</td>
<td>0.991504</td>
<td>1</td>
<td>1</td>
<td>99.15</td>
</tr>
<tr>
<td>Roller Table Position 14</td>
<td>612.0167333</td>
<td>1</td>
<td>41</td>
<td>889.986537</td>
<td>0.993694</td>
<td>1</td>
<td>1</td>
<td>99.37</td>
</tr>
<tr>
<td>Roller Table Position 15</td>
<td>729</td>
<td>1</td>
<td>43</td>
<td>1009.198767</td>
<td>0.992125</td>
<td>1</td>
<td>1</td>
<td>99.21</td>
</tr>
<tr>
<td>Roller Table Position 16</td>
<td>688</td>
<td>1</td>
<td>44</td>
<td>921.402068</td>
<td>0.982115</td>
<td>1</td>
<td>1</td>
<td>98.21</td>
</tr>
<tr>
<td>Roller Table Position 17</td>
<td>557.0031167</td>
<td>1</td>
<td>42</td>
<td>788.094905</td>
<td>0.990419</td>
<td>1</td>
<td>1</td>
<td>99.04</td>
</tr>
<tr>
<td>Roller Table Position 18</td>
<td>667</td>
<td>1</td>
<td>44</td>
<td>890.687045</td>
<td>0.979266</td>
<td>1</td>
<td>1</td>
<td>97.93</td>
</tr>
<tr>
<td>Roller Table Position 19</td>
<td>722</td>
<td>1</td>
<td>44</td>
<td>976.940273</td>
<td>0.992275</td>
<td>1</td>
<td>1</td>
<td>99.23</td>
</tr>
<tr>
<td>Roller Table Position 20</td>
<td>687</td>
<td>1</td>
<td>40</td>
<td>1022.057950</td>
<td>0.991808</td>
<td>1</td>
<td>1</td>
<td>99.18</td>
</tr>
<tr>
<td>Table 10 Position 1</td>
<td>487</td>
<td>1</td>
<td>23</td>
<td>449.292174</td>
<td>0.353652</td>
<td>1</td>
<td>1</td>
<td>35.37</td>
</tr>
<tr>
<td>Table 10 Position 2</td>
<td>446</td>
<td>1</td>
<td>22</td>
<td>387.831227</td>
<td>0.318845</td>
<td>1</td>
<td>0</td>
<td>31.88</td>
</tr>
<tr>
<td>Table 10 Position 3</td>
<td>487</td>
<td>1</td>
<td>22</td>
<td>507.090409</td>
<td>0.381793</td>
<td>1</td>
<td>0</td>
<td>38.18</td>
</tr>
<tr>
<td>Table 10 Position 4</td>
<td>439</td>
<td>1</td>
<td>22</td>
<td>366.604864</td>
<td>0.3062</td>
<td>1</td>
<td>0</td>
<td>30.62</td>
</tr>
<tr>
<td>Table 10 Position 5</td>
<td>439</td>
<td>1</td>
<td>22</td>
<td>346.999500</td>
<td>0.289825</td>
<td>1</td>
<td>0</td>
<td>28.98</td>
</tr>
<tr>
<td>Table 10 Position 6</td>
<td>439</td>
<td>1</td>
<td>22</td>
<td>355.193455</td>
<td>0.296669</td>
<td>1</td>
<td>0</td>
<td>29.67</td>
</tr>
<tr>
<td>Table 10 Position 7</td>
<td>432</td>
<td>1</td>
<td>22</td>
<td>360.496409</td>
<td>0.305977</td>
<td>1</td>
<td>0</td>
<td>30.60</td>
</tr>
<tr>
<td>Table 10 Position 8</td>
<td>487</td>
<td>1</td>
<td>22</td>
<td>484.015364</td>
<td>0.36442</td>
<td>1</td>
<td>1</td>
<td>36.44</td>
</tr>
<tr>
<td>Table 10 Position 9</td>
<td>453</td>
<td>1</td>
<td>22</td>
<td>373.751182</td>
<td>0.302521</td>
<td>1</td>
<td>1</td>
<td>30.25</td>
</tr>
<tr>
<td>Flatbar Area Position 1</td>
<td>425</td>
<td>1</td>
<td>70</td>
<td>172.161486</td>
<td>0.4726</td>
<td>1</td>
<td>0</td>
<td>47.26</td>
</tr>
<tr>
<td>Flatbar Area Position 2</td>
<td>487</td>
<td>1</td>
<td>70</td>
<td>229.980114</td>
<td>0.550945</td>
<td>1</td>
<td>0</td>
<td>55.09</td>
</tr>
<tr>
<td>Flatbar Area Position 3</td>
<td>425</td>
<td>1</td>
<td>70</td>
<td>180.611186</td>
<td>0.495795</td>
<td>1</td>
<td>0</td>
<td>49.58</td>
</tr>
<tr>
<td>Flatbar Area Position 4</td>
<td>425</td>
<td>1</td>
<td>69</td>
<td>164.297928</td>
<td>0.444571</td>
<td>1</td>
<td>0</td>
<td>44.46</td>
</tr>
<tr>
<td>Flatbar Area Position 5</td>
<td>432</td>
<td>1</td>
<td>69</td>
<td>168.496710</td>
<td>0.448544</td>
<td>1</td>
<td>0</td>
<td>44.85</td>
</tr>
<tr>
<td>Flatbar Area Position 6</td>
<td>487</td>
<td>1</td>
<td>69</td>
<td>226.488522</td>
<td>0.534829</td>
<td>1</td>
<td>0</td>
<td>53.48</td>
</tr>
<tr>
<td>Flatbar Area Position 7</td>
<td>439</td>
<td>1</td>
<td>69</td>
<td>175.574087</td>
<td>0.459932</td>
<td>1</td>
<td>0</td>
<td>45.99</td>
</tr>
<tr>
<td>Flatbar Area Position 8</td>
<td>432</td>
<td>1</td>
<td>69</td>
<td>178.660797</td>
<td>0.475602</td>
<td>1</td>
<td>0</td>
<td>47.56</td>
</tr>
<tr>
<td>Flatbar Area Position 9</td>
<td>425</td>
<td>1</td>
<td>69</td>
<td>158.905594</td>
<td>0.429981</td>
<td>1</td>
<td>0</td>
<td>43.00</td>
</tr>
<tr>
<td>Profile Skip Tub</td>
<td>826</td>
<td>25</td>
<td>683</td>
<td>752.504012</td>
<td>10.3705</td>
<td>25</td>
<td>8</td>
<td>41.48</td>
</tr>
<tr>
<td>Table 10 Skip Tub</td>
<td>826</td>
<td>25</td>
<td>199</td>
<td>2678.293412</td>
<td>10.7542</td>
<td>25</td>
<td>24</td>
<td>43.02</td>
</tr>
<tr>
<td>Flatbar Skip Tub</td>
<td>771</td>
<td>25</td>
<td>244</td>
<td>2184.198102</td>
<td>11.5206</td>
<td>25</td>
<td>19</td>
<td>46.08</td>
</tr>
<tr>
<td>ProfileIn</td>
<td>833</td>
<td>999999</td>
<td>1600</td>
<td>15205.614383</td>
<td>486.774</td>
<td>913</td>
<td>901</td>
<td>0.05</td>
</tr>
<tr>
<td>PTableTBeamMIN</td>
<td>425</td>
<td>999999</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>ProfileStorage</td>
<td>425</td>
<td>999999</td>
<td>100</td>
<td>9.570240</td>
<td>0.037504</td>
<td>2</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>ProfileStorage2</td>
<td>425</td>
<td>999999</td>
<td>41</td>
<td>0.000000</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>ProfileOut</td>
<td>833</td>
<td>999999</td>
<td>2890</td>
<td>614.901443</td>
<td>35.5555</td>
<td>129</td>
<td>93</td>
<td>0.00</td>
</tr>
<tr>
<td>FlatbarOut</td>
<td>826</td>
<td>999999</td>
<td>895</td>
<td>1769.725418</td>
<td>31.9593</td>
<td>96</td>
<td>20</td>
<td>0.00</td>
</tr>
<tr>
<td>RTBeamOut</td>
<td>425</td>
<td>999999</td>
<td>199</td>
<td>5.144236</td>
<td>0.0401452</td>
<td>6</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>TBeamOut</td>
<td>757</td>
<td>999999</td>
<td>195</td>
<td>853.173138</td>
<td>3.66289</td>
<td>18</td>
<td>3</td>
<td>0.00</td>
</tr>
<tr>
<td>FlatbarIn</td>
<td>487</td>
<td>999999</td>
<td>624</td>
<td>107.146226</td>
<td>2.28813</td>
<td>18</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>FlatbarStorage</td>
<td>425</td>
<td>999999</td>
<td>50</td>
<td>1.000000</td>
<td>0.00196078</td>
<td>1</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>FlatbarStorage2</td>
<td>425</td>
<td>999999</td>
<td>15</td>
<td>0.000000</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>TBeamIn</td>
<td>833</td>
<td>999999</td>
<td>300</td>
<td>14646.599960</td>
<td>87.9148</td>
<td>164</td>
<td>162</td>
<td>0.01</td>
</tr>
<tr>
<td>TBeamStorage</td>
<td>425</td>
<td>999999</td>
<td>50</td>
<td>5.497740</td>
<td>0.0107799</td>
<td>1</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>TBeamStorage2</td>
<td>425</td>
<td>999999</td>
<td>23</td>
<td>0.000000</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>FrameBender</td>
<td>425</td>
<td>999999</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Bulldozer</td>
<td>425</td>
<td>1</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Bulldozer2</td>
<td>425</td>
<td>1</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>OutgoingPileForProfile</td>
<td>425</td>
<td>999999</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>ScrapBinOut1</td>
<td>425</td>
<td>25</td>
<td>27</td>
<td>1.600000</td>
<td>0.00169412</td>
<td>1</td>
<td>0</td>
<td>0.01</td>
</tr>
<tr>
<td>ScrapBinOut3</td>
<td>425</td>
<td>25</td>
<td>7</td>
<td>2.241000</td>
<td>0.000615176</td>
<td>1</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>ScrapBinOut2</td>
<td>425</td>
<td>25</td>
<td>9</td>
<td>2.619000</td>
<td>0.000924353</td>
<td>1</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>ScrapOut</td>
<td>425</td>
<td>999999</td>
<td>43</td>
<td>0.000000</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Table</td>
<td>425</td>
<td>1</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Table2</td>
<td>425</td>
<td>1</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>ShearStaging</td>
<td>549</td>
<td>999999</td>
<td>15</td>
<td>826.269667</td>
<td>0.376261</td>
<td>1</td>
<td>1</td>
<td>0.00</td>
</tr>
<tr>
<td>Shear</td>
<td>425</td>
<td>1</td>
<td>359</td>
<td>11.834502</td>
<td>0.166612</td>
<td>1</td>
<td>1</td>
<td>16.66</td>
</tr>
<tr>
<td>IronWorkerStaging</td>
<td>432</td>
<td>999999</td>
<td>11</td>
<td>368.727273</td>
<td>0.156481</td>
<td>1</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>IronWorker</td>
<td>425</td>
<td>1</td>
<td>176</td>
<td>21.818182</td>
<td>0.150588</td>
<td>1</td>
<td>0</td>
<td>15.06</td>
</tr>
<tr>
<td>BevelStation</td>
<td>425</td>
<td>1</td>
<td>250</td>
<td>5.000000</td>
<td>0.0490196</td>
<td>1</td>
<td>0</td>
<td>4.90</td>
</tr>
<tr>
<td>DeburrStation</td>
<td>425</td>
<td>1</td>
<td>1662</td>
<td>1.999198</td>
<td>0.130301</td>
<td>1</td>
<td>1</td>
<td>13.03</td>
</tr>
<tr>
<td>Bldg2OutStaging</td>
<td>487</td>
<td>999999</td>
<td>1661</td>
<td>46.731479</td>
<td>2.65643</td>
<td>25</td>
<td>11</td>
<td>0.00</td>
</tr>
<tr>
<td>GeneralStorage</td>
<td>750</td>
<td>999999</td>
<td>66</td>
<td>1544.918121</td>
<td>2.26588</td>
<td>5</td>
<td>1</td>
<td>0.00</td>
</tr>
<tr>
<td>Location</td>
<td>Scheduled Hours</td>
<td>% Empty</td>
<td>% Partially Occupied</td>
<td>% Occupied</td>
<td>% Full</td>
<td>% Down</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>----------------------------</td>
<td>-----------------</td>
<td>---------</td>
<td>----------------------</td>
<td>------------</td>
<td>--------</td>
<td>--------</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>FlatbarToShear</td>
<td>826</td>
<td>3.75</td>
<td>96.11</td>
<td>0.14</td>
<td></td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FlatbarToBevel</td>
<td>439</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FlatbarToDeburr</td>
<td>480</td>
<td>999999</td>
<td>10</td>
<td>206.380400</td>
<td>0.0783525</td>
<td>2</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>BevelToDeburr</td>
<td>432</td>
<td>999999</td>
<td>10</td>
<td>101.819100</td>
<td>0.0392821</td>
<td>1</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>IronWorkerOut</td>
<td>819</td>
<td>999999</td>
<td>630</td>
<td>908.406786</td>
<td>11.6462</td>
<td>30</td>
<td>5</td>
<td>0.00</td>
</tr>
<tr>
<td>ShearOut</td>
<td>805</td>
<td>999999</td>
<td>1056</td>
<td>637.512711</td>
<td>13.9382</td>
<td>32</td>
<td>6</td>
<td>0.00</td>
</tr>
<tr>
<td>BevelOut</td>
<td>432</td>
<td>999999</td>
<td>250</td>
<td>96.983600</td>
<td>0.935413</td>
<td>25</td>
<td>0</td>
<td>0.00</td>
</tr>
</tbody>
</table>

LOCATION STATES BY PERCENTAGE (Multiple Capacity)
<table>
<thead>
<tr>
<th>Location Name</th>
<th>Scheduled Hours</th>
<th>Scheduled %</th>
<th>Operation %</th>
<th>Setup %</th>
<th>Idle %</th>
<th>Waiting %</th>
<th>Blocked %</th>
<th>Down %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roller Table Position 1</td>
<td>743</td>
<td>24.26</td>
<td>0.00</td>
<td>0.55</td>
<td>75.19</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Roller Table Position 2</td>
<td>722</td>
<td>25.28</td>
<td>0.00</td>
<td>0.49</td>
<td>74.23</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Roller Table Position 3</td>
<td>598</td>
<td>29.52</td>
<td>0.00</td>
<td>0.64</td>
<td>69.81</td>
<td>0.03</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Roller Table Position 4</td>
<td>667</td>
<td>27.24</td>
<td>0.00</td>
<td>0.55</td>
<td>72.21</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Roller Table Position 5</td>
<td>729</td>
<td>24.78</td>
<td>0.00</td>
<td>0.63</td>
<td>74.58</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Roller Table Position 6</td>
<td>612.0202333</td>
<td>29.65</td>
<td>0.00</td>
<td>0.70</td>
<td>69.65</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Roller Table Position 7</td>
<td>729</td>
<td>26.70</td>
<td>0.00</td>
<td>0.58</td>
<td>72.72</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Roller Table Position 8</td>
<td>612</td>
<td>29.56</td>
<td>0.00</td>
<td>0.71</td>
<td>69.73</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Roller Table Position 9</td>
<td>688</td>
<td>25.83</td>
<td>0.00</td>
<td>0.70</td>
<td>73.47</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Roller Table Position 10</td>
<td>674</td>
<td>26.41</td>
<td>0.00</td>
<td>0.66</td>
<td>72.93</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Roller Table Position 11</td>
<td>633</td>
<td>29.86</td>
<td>0.00</td>
<td>0.76</td>
<td>69.34</td>
<td>0.03</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Roller Table Position 12</td>
<td>660</td>
<td>28.56</td>
<td>0.00</td>
<td>0.68</td>
<td>70.76</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Roller Table Position 13</td>
<td>688</td>
<td>25.89</td>
<td>0.00</td>
<td>0.85</td>
<td>73.21</td>
<td>0.05</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Roller Table Position 14</td>
<td>612.0167333</td>
<td>30.13</td>
<td>0.00</td>
<td>0.63</td>
<td>69.24</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Roller Table Position 15</td>
<td>729</td>
<td>24.71</td>
<td>0.00</td>
<td>0.79</td>
<td>74.50</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Roller Table Position 16</td>
<td>688</td>
<td>25.55</td>
<td>0.00</td>
<td>1.79</td>
<td>72.64</td>
<td>0.02</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Roller Table Position 17</td>
<td>557.0031167</td>
<td>30.98</td>
<td>0.00</td>
<td>0.96</td>
<td>68.06</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Roller Table Position 18</td>
<td>667</td>
<td>26.42</td>
<td>0.00</td>
<td>2.07</td>
<td>71.43</td>
<td>0.07</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Roller Table Position 19</td>
<td>722</td>
<td>24.23</td>
<td>0.00</td>
<td>0.77</td>
<td>75.00</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Roller Table Position 20</td>
<td>687</td>
<td>26.27</td>
<td>0.00</td>
<td>0.82</td>
<td>72.91</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Table 10 Position 1</td>
<td>487</td>
<td>15.66</td>
<td>0.00</td>
<td>64.63</td>
<td>19.70</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Table 10 Position 2</td>
<td>446</td>
<td>17.12</td>
<td>0.00</td>
<td>68.12</td>
<td>14.77</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Table 10 Position 3</td>
<td>487</td>
<td>15.68</td>
<td>0.00</td>
<td>61.82</td>
<td>22.50</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Table 10 Position 4</td>
<td>439</td>
<td>17.40</td>
<td>0.00</td>
<td>69.38</td>
<td>13.22</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Table 10 Position 5</td>
<td>439</td>
<td>17.38</td>
<td>0.00</td>
<td>71.02</td>
<td>11.60</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Table 10 Position 6</td>
<td>439</td>
<td>17.16</td>
<td>0.00</td>
<td>70.33</td>
<td>12.51</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Table 10 Position 7</td>
<td>432</td>
<td>17.84</td>
<td>0.00</td>
<td>69.40</td>
<td>12.76</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Table 10 Position 8</td>
<td>487</td>
<td>16.05</td>
<td>0.00</td>
<td>63.56</td>
<td>20.40</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Table 10 Position 9</td>
<td>453</td>
<td>16.22</td>
<td>0.00</td>
<td>69.75</td>
<td>14.03</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Flatbar Area Position 1</td>
<td>425</td>
<td>26.46</td>
<td>0.00</td>
<td>52.74</td>
<td>20.80</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Flatbar Area Position 2</td>
<td>487</td>
<td>24.15</td>
<td>0.00</td>
<td>44.91</td>
<td>30.94</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Flatbar Area Position 3</td>
<td>425</td>
<td>26.40</td>
<td>0.00</td>
<td>50.42</td>
<td>23.18</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Flatbar Area Position 4</td>
<td>425</td>
<td>23.54</td>
<td>0.00</td>
<td>55.54</td>
<td>20.92</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Flatbar Area Position 5</td>
<td>432</td>
<td>23.72</td>
<td>0.00</td>
<td>55.15</td>
<td>21.13</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Resource</td>
<td>Units</td>
<td>Scheduled Hours</td>
<td>Number Of Times Used</td>
<td>Average Minutes Per Usage</td>
<td>Average Minutes Travel To Use</td>
<td>Average Minutes Travel To Park</td>
<td>% Blocked In Travel</td>
<td>% Util</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------</td>
<td>-----------------</td>
<td>----------------------</td>
<td>---------------------------</td>
<td>-----------------------------</td>
<td>-------------------------------</td>
<td>---------------------</td>
<td>-------</td>
</tr>
<tr>
<td>FLayoutCrew.1</td>
<td>1</td>
<td>427.2607</td>
<td>300</td>
<td>77.929133</td>
<td>4.119380</td>
<td>4.416923</td>
<td>0.00</td>
<td>96.40</td>
</tr>
<tr>
<td>FLayoutCrew.2</td>
<td>1</td>
<td>427.4926</td>
<td>302</td>
<td>77.529911</td>
<td>4.091842</td>
<td>4.188946</td>
<td>0.00</td>
<td>96.44</td>
</tr>
<tr>
<td>FLayoutCrew.3</td>
<td>1</td>
<td>427.49495</td>
<td>295</td>
<td>78.644190</td>
<td>4.059893</td>
<td>4.493360</td>
<td>0.00</td>
<td>95.47</td>
</tr>
<tr>
<td>FLayoutCrew</td>
<td>3</td>
<td>1282.24825</td>
<td>897</td>
<td>78.029887</td>
<td>4.090591</td>
<td>4.360310</td>
<td>0.00</td>
<td>96.10</td>
</tr>
<tr>
<td>FBurnCrew.1</td>
<td>1</td>
<td>426.7109167</td>
<td>185</td>
<td>132.610670</td>
<td>3.987212</td>
<td>2.381000</td>
<td>0.00</td>
<td>99.06</td>
</tr>
<tr>
<td>FBurnCrew.2</td>
<td>1</td>
<td>426.6133833</td>
<td>194</td>
<td>126.389634</td>
<td>3.878500</td>
<td>2.271778</td>
<td>0.00</td>
<td>99.09</td>
</tr>
<tr>
<td>FBurnCrew.3</td>
<td>1</td>
<td>426.29275</td>
<td>187</td>
<td>131.041439</td>
<td>3.538522</td>
<td>1.718484</td>
<td>0.00</td>
<td>98.70</td>
</tr>
<tr>
<td>FBurnCrew.4</td>
<td>1</td>
<td>426.6019</td>
<td>183</td>
<td>133.602639</td>
<td>3.843005</td>
<td>2.415138</td>
<td>0.00</td>
<td>98.60</td>
</tr>
<tr>
<td>FBurnCrew.5</td>
<td>1</td>
<td>426.69665</td>
<td>190</td>
<td>128.768863</td>
<td>3.558693</td>
<td>2.277800</td>
<td>0.00</td>
<td>98.51</td>
</tr>
<tr>
<td>FBurnCrew</td>
<td>5</td>
<td>2132.9156</td>
<td>939</td>
<td>130.428838</td>
<td>3.761087</td>
<td>2.204497</td>
<td>0.00</td>
<td>98.79</td>
</tr>
<tr>
<td>TFittingCrew</td>
<td>1</td>
<td>426.2099667</td>
<td>216</td>
<td>54.883981</td>
<td>3.197118</td>
<td>2.515820</td>
<td>0.00</td>
<td>49.22</td>
</tr>
<tr>
<td>TWeldingCrew.1</td>
<td>1</td>
<td>425.74545</td>
<td>138</td>
<td>55.217391</td>
<td>3.375551</td>
<td>3.084940</td>
<td>0.00</td>
<td>31.65</td>
</tr>
<tr>
<td>TWeldingCrew.2</td>
<td>1</td>
<td>425.1822</td>
<td>71</td>
<td>58.773803</td>
<td>3.154282</td>
<td>2.604116</td>
<td>0.00</td>
<td>17.24</td>
</tr>
<tr>
<td>TWeldingCrew</td>
<td>2</td>
<td>850.92765</td>
<td>209</td>
<td>56.425550</td>
<td>3.300383</td>
<td>2.910464</td>
<td>0.00</td>
<td>24.45</td>
</tr>
<tr>
<td>TPaintCrew</td>
<td>1</td>
<td>426.38895</td>
<td>201</td>
<td>24.253731</td>
<td>3.629881</td>
<td>3.205269</td>
<td>0.00</td>
<td>21.91</td>
</tr>
<tr>
<td>FLayoutCrew.1</td>
<td>1</td>
<td>425.13315</td>
<td>221</td>
<td>60.135747</td>
<td>1.548220</td>
<td>0.932375</td>
<td>0.00</td>
<td>53.45</td>
</tr>
<tr>
<td>FLayoutCrew.2</td>
<td>1</td>
<td>425.0857</td>
<td>210</td>
<td>60.142857</td>
<td>1.503684</td>
<td>0.537400</td>
<td>0.00</td>
<td>50.77</td>
</tr>
<tr>
<td>FLayoutCrew.3</td>
<td>1</td>
<td>425.04755</td>
<td>203</td>
<td>61.477833</td>
<td>1.368712</td>
<td>0.634623</td>
<td>0.00</td>
<td>50.04</td>
</tr>
<tr>
<td>FLayoutCrew</td>
<td>3</td>
<td>1275.2664</td>
<td>634</td>
<td>60.567823</td>
<td>1.475969</td>
<td>0.706097</td>
<td>0.00</td>
<td>51.42</td>
</tr>
<tr>
<td>FBurnCrew.1</td>
<td>1</td>
<td>425.15465</td>
<td>109</td>
<td>73.211009</td>
<td>1.656578</td>
<td>1.480057</td>
<td>0.00</td>
<td>31.99</td>
</tr>
<tr>
<td>FBurnCrew.2</td>
<td>1</td>
<td>425.0437</td>
<td>73</td>
<td>81.643836</td>
<td>1.538425</td>
<td>1.234121</td>
<td>0.00</td>
<td>23.81</td>
</tr>
<tr>
<td>FBurnCrew.3</td>
<td>1</td>
<td>425.02415</td>
<td>45</td>
<td>78.666667</td>
<td>1.610844</td>
<td>1.081910</td>
<td>0.00</td>
<td>14.17</td>
</tr>
<tr>
<td>FBurnCrew.4</td>
<td>1</td>
<td>425.0437</td>
<td>23</td>
<td>61.739130</td>
<td>1.723087</td>
<td>0.825646</td>
<td>0.00</td>
<td>5.72</td>
</tr>
<tr>
<td>FBurnCrew.5</td>
<td>1</td>
<td>425</td>
<td>2</td>
<td>40.000000</td>
<td>0.520000</td>
<td>0.038519</td>
<td>0.00</td>
<td>0.32</td>
</tr>
<tr>
<td>Resource</td>
<td>Scheduled Hours</td>
<td>Hours</td>
<td>% In Use</td>
<td>% To Use</td>
<td>% To Park</td>
<td>% Idle</td>
<td>% Down</td>
<td></td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------</td>
<td>-------</td>
<td>----------</td>
<td>----------</td>
<td>-----------</td>
<td>-------</td>
<td>--------</td>
<td></td>
</tr>
<tr>
<td>FBurnCrew.6</td>
<td>1</td>
<td>425</td>
<td>0</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>FBurnCrew</td>
<td>6</td>
<td>2550.2662</td>
<td>252</td>
<td>75.317460</td>
<td>1.611234</td>
<td>1.065698</td>
<td>0.00</td>
<td>12.67</td>
</tr>
<tr>
<td>Carrier</td>
<td>1</td>
<td>425</td>
<td>279</td>
<td>2.778387</td>
<td>0.432907</td>
<td>0.412219</td>
<td>0.00</td>
<td>3.51</td>
</tr>
<tr>
<td>Crane 600</td>
<td>1</td>
<td>425</td>
<td>5041</td>
<td>0.758810</td>
<td>0.239388</td>
<td>0.307754</td>
<td>0.00</td>
<td>19.73</td>
</tr>
<tr>
<td>Crane 590</td>
<td>1</td>
<td>425</td>
<td>2347</td>
<td>1.648099</td>
<td>0.203770</td>
<td>0.386285</td>
<td>0.00</td>
<td>17.05</td>
</tr>
<tr>
<td>Truck</td>
<td>1</td>
<td>425</td>
<td>43</td>
<td>2.917628</td>
<td>0.917628</td>
<td>0.000000</td>
<td>0.00</td>
<td>0.65</td>
</tr>
<tr>
<td>Forktruck</td>
<td>1</td>
<td>425</td>
<td>158</td>
<td>3.252696</td>
<td>1.312753</td>
<td>0.788225</td>
<td>0.00</td>
<td>2.83</td>
</tr>
<tr>
<td>ShearCrane</td>
<td>1</td>
<td>425</td>
<td>359</td>
<td>2.309000</td>
<td>0.175000</td>
<td>0.419610</td>
<td>0.00</td>
<td>3.50</td>
</tr>
</tbody>
</table>

**RESOURCE STATES BY PERCENTAGE**

<table>
<thead>
<tr>
<th>Resource</th>
<th>% In Use</th>
<th>% To Use</th>
<th>% To Park</th>
<th>% Idle</th>
<th>% Down</th>
</tr>
</thead>
<tbody>
<tr>
<td>FBurnCrew.1</td>
<td>91.20</td>
<td>5.21</td>
<td>0.90</td>
<td>2.70</td>
<td>0.00</td>
</tr>
<tr>
<td>FBurnCrew.2</td>
<td>91.28</td>
<td>5.15</td>
<td>0.91</td>
<td>2.65</td>
<td>0.00</td>
</tr>
<tr>
<td>FBurnCrew.3</td>
<td>90.45</td>
<td>5.02</td>
<td>0.88</td>
<td>3.66</td>
<td>0.00</td>
</tr>
<tr>
<td>FBurnCrew</td>
<td>1282.24825</td>
<td>90.98</td>
<td>5.13</td>
<td>0.90</td>
<td>3.00</td>
</tr>
<tr>
<td>PBurnCrew.1</td>
<td>426.7109167</td>
<td>95.82</td>
<td>3.24</td>
<td>0.26</td>
<td>0.68</td>
</tr>
<tr>
<td>PBurnCrew.2</td>
<td>426.6133833</td>
<td>95.79</td>
<td>3.30</td>
<td>0.24</td>
<td>0.67</td>
</tr>
<tr>
<td>PBurnCrew.3</td>
<td>426.29275</td>
<td>95.81</td>
<td>2.89</td>
<td>0.21</td>
<td>1.09</td>
</tr>
<tr>
<td>PBurnCrew.4</td>
<td>426.6019</td>
<td>95.52</td>
<td>3.08</td>
<td>0.27</td>
<td>1.13</td>
</tr>
<tr>
<td>PBurnCrew.5</td>
<td>426.69665</td>
<td>95.56</td>
<td>2.95</td>
<td>0.27</td>
<td>1.22</td>
</tr>
<tr>
<td>PBurnCrew</td>
<td>2132.9156</td>
<td>95.70</td>
<td>3.09</td>
<td>0.25</td>
<td>0.96</td>
</tr>
<tr>
<td>TFittingCrew</td>
<td>426.2099667</td>
<td>46.36</td>
<td>2.86</td>
<td>0.88</td>
<td>49.90</td>
</tr>
<tr>
<td>TWeldingCrew.1</td>
<td>425.74545</td>
<td>29.83</td>
<td>1.82</td>
<td>1.82</td>
<td>66.52</td>
</tr>
<tr>
<td>TWeldingCrew.2</td>
<td>425.1822</td>
<td>16.36</td>
<td>0.88</td>
<td>0.88</td>
<td>81.89</td>
</tr>
<tr>
<td>TWeldingCrew</td>
<td>850.92765</td>
<td>23.10</td>
<td>1.35</td>
<td>1.35</td>
<td>74.20</td>
</tr>
<tr>
<td>TPaintCrew</td>
<td>426.38895</td>
<td>19.06</td>
<td>2.85</td>
<td>0.33</td>
<td>77.77</td>
</tr>
<tr>
<td>FLayoutCrew.1</td>
<td>425.13315</td>
<td>52.10</td>
<td>1.35</td>
<td>0.23</td>
<td>46.31</td>
</tr>
<tr>
<td>FLayoutCrew.2</td>
<td>425.0857</td>
<td>49.52</td>
<td>1.25</td>
<td>0.13</td>
<td>49.10</td>
</tr>
<tr>
<td>FLayoutCrew.3</td>
<td>425.04755</td>
<td>48.94</td>
<td>1.10</td>
<td>0.15</td>
<td>49.81</td>
</tr>
<tr>
<td>FLayoutCrew</td>
<td>1275.2664</td>
<td>50.19</td>
<td>1.23</td>
<td>0.17</td>
<td>48.41</td>
</tr>
<tr>
<td>FBurnCrew.1</td>
<td>425.15465</td>
<td>31.28</td>
<td>0.71</td>
<td>0.71</td>
<td>67.30</td>
</tr>
<tr>
<td>FBurnCrew.2</td>
<td>425.0437</td>
<td>23.37</td>
<td>0.44</td>
<td>0.44</td>
<td>75.75</td>
</tr>
<tr>
<td>FBurnCrew.3</td>
<td>425.02415</td>
<td>13.88</td>
<td>0.28</td>
<td>0.28</td>
<td>85.55</td>
</tr>
<tr>
<td>FBurnCrew.4</td>
<td>425.0437</td>
<td>5.57</td>
<td>0.16</td>
<td>0.16</td>
<td>94.12</td>
</tr>
<tr>
<td>FBurnCrew.5</td>
<td>425</td>
<td>0.31</td>
<td>0.00</td>
<td>0.00</td>
<td>99.68</td>
</tr>
<tr>
<td>FBurnCrew.6</td>
<td>425</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>100.00</td>
</tr>
<tr>
<td>FBurnCrew</td>
<td>2550.2662</td>
<td>12.40</td>
<td>0.27</td>
<td>0.27</td>
<td>87.07</td>
</tr>
<tr>
<td>Carrier</td>
<td>425</td>
<td>3.04</td>
<td>0.47</td>
<td>0.24</td>
<td>96.24</td>
</tr>
<tr>
<td>Crane 600</td>
<td>425.04135</td>
<td>15.00</td>
<td>4.73</td>
<td>0.78</td>
<td>79.49</td>
</tr>
<tr>
<td>Crane 590</td>
<td>425</td>
<td>15.17</td>
<td>1.88</td>
<td>0.98</td>
<td>81.97</td>
</tr>
<tr>
<td>Entity</td>
<td>425</td>
<td>0.49</td>
<td>0.15</td>
<td>0.00</td>
<td>99.35</td>
</tr>
<tr>
<td>-----------</td>
<td>-----</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>-------</td>
</tr>
<tr>
<td>Forktruck</td>
<td>425</td>
<td>2.02</td>
<td>0.81</td>
<td>0.56</td>
<td>96.61</td>
</tr>
<tr>
<td>ShearCrane</td>
<td>425</td>
<td>3.25</td>
<td>0.25</td>
<td>0.63</td>
<td>95.87</td>
</tr>
</tbody>
</table>

**FAILED ARRIVALS**

<table>
<thead>
<tr>
<th>Entity Location</th>
<th>Total</th>
<th>Name</th>
<th>Failed</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBlock ProfileStorage</td>
<td>110</td>
<td>------</td>
<td>-------</td>
</tr>
<tr>
<td>CBlock FlatbarStorage</td>
<td>56</td>
<td>------</td>
<td>-------</td>
</tr>
<tr>
<td>CBlock TBeamStorage</td>
<td>56</td>
<td>------</td>
<td>-------</td>
</tr>
</tbody>
</table>

**ENTITY ACTIVITY**

<table>
<thead>
<tr>
<th>Entity</th>
<th>Total Quantity</th>
<th>Current Exit</th>
<th>Total Quantity</th>
<th>Average In System</th>
<th>Average In Move</th>
<th>Average Logic</th>
<th>Average Wait For Res, etc.</th>
<th>Average In Operation</th>
<th>Average Blocked</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profile</td>
<td>2838</td>
<td>1010</td>
<td>15388.231333</td>
<td>18.122112</td>
<td>1236.055733</td>
<td>512.355690</td>
<td>13621.697798</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flatbar</td>
<td>1240</td>
<td>50</td>
<td>2576.029293</td>
<td>25.162192</td>
<td>2244.170659</td>
<td>205.827070</td>
<td>100.869372</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TBeam</td>
<td>215</td>
<td>7</td>
<td>13552.164093</td>
<td>18.279381</td>
<td>1434.985791</td>
<td>956.098028</td>
<td>11142.800893</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RTBeam</td>
<td>0</td>
<td>166</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Scrap</td>
<td>718</td>
<td>8</td>
<td>687.545173</td>
<td>9.328521</td>
<td>678.216652</td>
<td>0.000000</td>
<td>0.000000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scrap2</td>
<td>225</td>
<td>19</td>
<td>2025.767818</td>
<td>12.049920</td>
<td>2013.717898</td>
<td>0.000000</td>
<td>0.000000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scrap3</td>
<td>175</td>
<td>24</td>
<td>2379.510806</td>
<td>5.252629</td>
<td>2374.258177</td>
<td>0.000000</td>
<td>0.000000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CarrierBlock</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>nothing</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>CBlock</td>
<td>200</td>
<td>0</td>
<td>8.072270</td>
<td>8.072270</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ScrapBin</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>SFlatbar</td>
<td>3565</td>
<td>102</td>
<td>2132.571927</td>
<td>13.388283</td>
<td>1923.331307</td>
<td>22.023562</td>
<td>173.828774</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ENTITY STATES BY PERCENTAGE**

<table>
<thead>
<tr>
<th>Entity</th>
<th>% In Move</th>
<th>% Logic</th>
<th>% Wait For Res, etc.</th>
<th>% In Operation</th>
<th>% Blocked</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profile</td>
<td>0.12</td>
<td>8.03</td>
<td>3.33</td>
<td>88.52</td>
<td></td>
</tr>
<tr>
<td>Flatbar</td>
<td>0.98</td>
<td>87.12</td>
<td>7.99</td>
<td>3.92</td>
<td></td>
</tr>
<tr>
<td>TBeam</td>
<td>0.13</td>
<td>10.59</td>
<td>7.05</td>
<td>82.22</td>
<td></td>
</tr>
<tr>
<td>Variable Name</td>
<td>Total Changes</td>
<td>Average Minutes Per Change</td>
<td>Minimum Value</td>
<td>Maximum Value</td>
<td>Current Value</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------------</td>
<td>---------------------------</td>
<td>---------------</td>
<td>---------------</td>
<td>--------------</td>
</tr>
<tr>
<td>v TotalProfilesArrived</td>
<td>699</td>
<td>67.940635</td>
<td>0</td>
<td>699</td>
<td>699</td>
</tr>
<tr>
<td>v TotalFlatbarsArrived</td>
<td>624</td>
<td>76.031046</td>
<td>0</td>
<td>624</td>
<td>624</td>
</tr>
<tr>
<td>v TotalTBeamsArrived</td>
<td>138</td>
<td>344.018029</td>
<td>0</td>
<td>138</td>
<td>138</td>
</tr>
<tr>
<td>v TotalProfilesProcessed</td>
<td>683</td>
<td>69.522054</td>
<td>0</td>
<td>683</td>
<td>683</td>
</tr>
<tr>
<td>v TotalFlatbarsProcessed</td>
<td>244</td>
<td>194.394381</td>
<td>0</td>
<td>244</td>
<td>244</td>
</tr>
<tr>
<td>v TotalTBeamsProcessed</td>
<td>134</td>
<td>354.070679</td>
<td>0</td>
<td>134</td>
<td>134</td>
</tr>
<tr>
<td>v TotalProfilesProduced</td>
<td>2890</td>
<td>16.432067</td>
<td>0</td>
<td>2890</td>
<td>2890</td>
</tr>
<tr>
<td>v TotalFlatbarsProduced</td>
<td>2556</td>
<td>18.591288</td>
<td>0</td>
<td>2556</td>
<td>2556</td>
</tr>
<tr>
<td>v TotalTBeamsProduced</td>
<td>195</td>
<td>243.624949</td>
<td>0</td>
<td>195</td>
<td>195</td>
</tr>
<tr>
<td>v PBatchSize</td>
<td>100</td>
<td>470.401000</td>
<td>0</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>v FBatchSize</td>
<td>50</td>
<td>940.800000</td>
<td>0</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>v TBatchSize</td>
<td>50</td>
<td>940.800000</td>
<td>0</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>v Counter</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v PSrcrap</td>
<td>683</td>
<td>69.530981</td>
<td>0</td>
<td>683</td>
<td>683</td>
</tr>
<tr>
<td>v FSrcrap</td>
<td>244</td>
<td>194.432279</td>
<td>0</td>
<td>244</td>
<td>244</td>
</tr>
<tr>
<td>v TSrcrap</td>
<td>199</td>
<td>238.434317</td>
<td>0</td>
<td>199</td>
<td>199</td>
</tr>
<tr>
<td>v PPerUnit</td>
<td>101</td>
<td>465.743564</td>
<td>0</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>v FPerUnit</td>
<td>53</td>
<td>887.547170</td>
<td>0</td>
<td>11</td>
<td>4</td>
</tr>
<tr>
<td>v TPerUnit</td>
<td>50</td>
<td>940.800000</td>
<td>0</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>v PPerUnitBatch</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v FPerUnitBatch</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v TPerUnitBatch</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v PTotal</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v FTTotal</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v TTTotal</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v TotalFToShear</td>
<td>380</td>
<td>125.023555</td>
<td>0</td>
<td>380</td>
<td>380</td>
</tr>
<tr>
<td>v TotalShearProduced</td>
<td>1661</td>
<td>28.608870</td>
<td>0</td>
<td>1661</td>
<td>1661</td>
</tr>
<tr>
<td>v Count</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v ProfileWIP</td>
<td>740</td>
<td>64.177708</td>
<td>0</td>
<td>658</td>
<td>658</td>
</tr>
<tr>
<td>v TBeamWIP</td>
<td>153</td>
<td>310.290771</td>
<td>0</td>
<td>123</td>
<td>123</td>
</tr>
<tr>
<td>v FlatBarWIP</td>
<td>647</td>
<td>73.328243</td>
<td>0</td>
<td>601</td>
<td>601</td>
</tr>
<tr>
<td>v ProfileFlowTime</td>
<td>41</td>
<td>1139.069537</td>
<td>0</td>
<td>4069.85</td>
<td>1157.79</td>
</tr>
</tbody>
</table>
Single Capacity Location States

Name
Roller_Table_Position_1
Roller_Table_Position_2
Roller_Table_Position_3
Roller_Table_Position_4
Roller_Table_Position_5
Roller_Table_Position_6
Roller_Table_Position_7
Roller_Table_Position_8
Roller_Table_Position_9
Roller_Table_Position_10
Roller_Table_Position_11
Roller_Table_Position_12
Roller_Table_Position_13
Roller_Table_Position_14
Roller_Table_Position_15
Roller_Table_Position_16
Roller_Table_Position_17
Roller_Table_Position_18
Roller_Table_Position_19
Roller_Table_Position_20

Page 1
Single Capacity Location States

Name
Table
Table2
Shear
IronWorker
BevelStation
DeburrStation
DETAILED PERFORMANCE STATISTICS FOR THE
"HIGH OUTPUT - INCREASED MANNING" PROFILE FABRICATION AREA
MODEL
LOCATIONS

<table>
<thead>
<tr>
<th>Location Name</th>
<th>Scheduled Hours</th>
<th>Capacity</th>
<th>Total Entries</th>
<th>Average Minutes Per Entry</th>
<th>Average Contents</th>
<th>Maximum Contents</th>
<th>Current Contents</th>
<th>% Util</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roller Table Position 1</td>
<td>577</td>
<td>1</td>
<td>94</td>
<td>316.784596</td>
<td>0.860131</td>
<td>1</td>
<td>1</td>
<td>86.01</td>
</tr>
<tr>
<td>Roller Table Position 2</td>
<td>652</td>
<td>1</td>
<td>95</td>
<td>362.827137</td>
<td>0.881099</td>
<td>1</td>
<td>1</td>
<td>88.11</td>
</tr>
<tr>
<td>Roller Table Position 3</td>
<td>432</td>
<td>1</td>
<td>95</td>
<td>256.771347</td>
<td>0.941099</td>
<td>1</td>
<td>1</td>
<td>94.11</td>
</tr>
<tr>
<td>Roller Table Position 4</td>
<td>432.0189</td>
<td>1</td>
<td>95</td>
<td>255.825926</td>
<td>0.937593</td>
<td>1</td>
<td>1</td>
<td>93.76</td>
</tr>
<tr>
<td>Roller Table Position 5</td>
<td>432</td>
<td>1</td>
<td>95</td>
<td>254.640589</td>
<td>0.933289</td>
<td>1</td>
<td>1</td>
<td>93.33</td>
</tr>
<tr>
<td>Roller Table Position 6</td>
<td>432</td>
<td>1</td>
<td>95</td>
<td>251.206463</td>
<td>0.920703</td>
<td>1</td>
<td>1</td>
<td>92.07</td>
</tr>
<tr>
<td>Roller Table Position 7</td>
<td>439</td>
<td>1</td>
<td>95</td>
<td>255.990695</td>
<td>0.923277</td>
<td>1</td>
<td>1</td>
<td>92.33</td>
</tr>
<tr>
<td>Roller Table Position 8</td>
<td>439</td>
<td>1</td>
<td>95</td>
<td>263.152168</td>
<td>0.949106</td>
<td>1</td>
<td>1</td>
<td>94.91</td>
</tr>
<tr>
<td>Roller Table Position 9</td>
<td>487</td>
<td>1</td>
<td>95</td>
<td>292.524979</td>
<td>0.951057</td>
<td>1</td>
<td>0</td>
<td>95.11</td>
</tr>
<tr>
<td>Roller Table Position 10</td>
<td>439</td>
<td>1</td>
<td>95</td>
<td>260.690021</td>
<td>0.940226</td>
<td>1</td>
<td>1</td>
<td>94.02</td>
</tr>
<tr>
<td>Roller Table Position 11</td>
<td>432</td>
<td>1</td>
<td>94</td>
<td>254.217021</td>
<td>0.921929</td>
<td>1</td>
<td>1</td>
<td>92.19</td>
</tr>
<tr>
<td>Roller Table Position 12</td>
<td>425.0008333</td>
<td>1</td>
<td>92</td>
<td>253.275272</td>
<td>0.913776</td>
<td>1</td>
<td>1</td>
<td>91.38</td>
</tr>
<tr>
<td>Roller Table Position 13</td>
<td>425</td>
<td>1</td>
<td>92</td>
<td>242.111391</td>
<td>0.8735</td>
<td>1</td>
<td>1</td>
<td>87.35</td>
</tr>
<tr>
<td>Roller Table Position 14</td>
<td>432</td>
<td>1</td>
<td>92</td>
<td>248.448674</td>
<td>0.881839</td>
<td>1</td>
<td>1</td>
<td>88.18</td>
</tr>
<tr>
<td>Roller Table Position 15</td>
<td>439</td>
<td>1</td>
<td>93</td>
<td>249.389613</td>
<td>0.880533</td>
<td>1</td>
<td>1</td>
<td>88.05</td>
</tr>
<tr>
<td>Roller Table Position 16</td>
<td>494</td>
<td>1</td>
<td>93</td>
<td>286.973086</td>
<td>0.900422</td>
<td>1</td>
<td>1</td>
<td>90.04</td>
</tr>
<tr>
<td>Roller Table Position 17</td>
<td>439.0146667</td>
<td>1</td>
<td>93</td>
<td>251.167355</td>
<td>0.88678</td>
<td>1</td>
<td>1</td>
<td>88.68</td>
</tr>
<tr>
<td>Roller Table Position 18</td>
<td>439</td>
<td>1</td>
<td>93</td>
<td>249.304935</td>
<td>0.880234</td>
<td>1</td>
<td>1</td>
<td>88.02</td>
</tr>
<tr>
<td>Roller Table Position 19</td>
<td>439.0128333</td>
<td>1</td>
<td>92</td>
<td>254.529348</td>
<td>0.888891</td>
<td>1</td>
<td>1</td>
<td>88.90</td>
</tr>
<tr>
<td>Roller Table Position 20</td>
<td>432</td>
<td>1</td>
<td>92</td>
<td>254.660772</td>
<td>0.903889</td>
<td>1</td>
<td>1</td>
<td>90.39</td>
</tr>
<tr>
<td>Table10 Position 1</td>
<td>439</td>
<td>1</td>
<td>42</td>
<td>214.057190</td>
<td>0.341321</td>
<td>1</td>
<td>0</td>
<td>34.13</td>
</tr>
<tr>
<td>Table10 Position 2</td>
<td>439</td>
<td>1</td>
<td>42</td>
<td>226.072095</td>
<td>0.360479</td>
<td>1</td>
<td>0</td>
<td>36.05</td>
</tr>
<tr>
<td>Table10 Position 3</td>
<td>487</td>
<td>1</td>
<td>42</td>
<td>305.303714</td>
<td>0.438835</td>
<td>1</td>
<td>0</td>
<td>43.88</td>
</tr>
<tr>
<td>Table10 Position 4</td>
<td>425</td>
<td>1</td>
<td>41</td>
<td>220.500049</td>
<td>0.354529</td>
<td>1</td>
<td>0</td>
<td>35.45</td>
</tr>
<tr>
<td>Table10 Position 5</td>
<td>425</td>
<td>1</td>
<td>41</td>
<td>218.827098</td>
<td>0.35184</td>
<td>1</td>
<td>0</td>
<td>35.18</td>
</tr>
<tr>
<td>Table10 Position 6</td>
<td>425</td>
<td>1</td>
<td>41</td>
<td>217.618122</td>
<td>0.349896</td>
<td>1</td>
<td>0</td>
<td>34.99</td>
</tr>
<tr>
<td>Table10 Position 7</td>
<td>432</td>
<td>1</td>
<td>41</td>
<td>231.590902</td>
<td>0.366328</td>
<td>1</td>
<td>0</td>
<td>36.63</td>
</tr>
<tr>
<td>Table10 Position 8</td>
<td>432</td>
<td>1</td>
<td>41</td>
<td>232.783341</td>
<td>0.368214</td>
<td>1</td>
<td>0</td>
<td>36.82</td>
</tr>
<tr>
<td>Location State</td>
<td>Scheduled Hours</td>
<td>% Empty</td>
<td>% Partially Occupied</td>
<td>% Full</td>
<td>% Down</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
<td>-----------------</td>
<td>-----------</td>
<td>----------------------</td>
<td>--------</td>
<td>--------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Profile Skip Tub</td>
<td>833</td>
<td>3.14</td>
<td>96.14</td>
<td>0.72</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Table10 Skip Tub</td>
<td>826</td>
<td>2.56</td>
<td>96.38</td>
<td>1.06</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flatbar Skip Tub</td>
<td>812</td>
<td>3.38</td>
<td>96.37</td>
<td>0.25</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ProfileIn</td>
<td>833</td>
<td>0.24</td>
<td>99.76</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PTABLETEAMIN</td>
<td>425</td>
<td>100.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Profile Storage</td>
<td>425</td>
<td>97.88</td>
<td>2.12</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Profile Storage2</td>
<td>425</td>
<td>100.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Profile Out</td>
<td>819</td>
<td>1.93</td>
<td>98.07</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flatbar Out</td>
<td>833</td>
<td>0.65</td>
<td>99.35</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RTBeam Out</td>
<td>439</td>
<td>84.29</td>
<td>15.71</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TBeam Out</td>
<td>819</td>
<td>5.18</td>
<td>94.82</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flatbar In</td>
<td>425</td>
<td>66.81</td>
<td>33.19</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flatbar Storage</td>
<td>425</td>
<td>99.79</td>
<td>0.21</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flatbar Storage2</td>
<td>425</td>
<td>100.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TBeam In</td>
<td>625</td>
<td>29.18</td>
<td>70.82</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TBeam Storage</td>
<td>425</td>
<td>98.93</td>
<td>1.07</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TBeam Storage2</td>
<td>425</td>
<td>100.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frame Bender</td>
<td>425</td>
<td>100.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outgoing Pile For Profile</td>
<td>425</td>
<td>100.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scrap Bin Out1</td>
<td>425</td>
<td>99.61</td>
<td>0.39</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scrap Bin Out3</td>
<td>425</td>
<td>99.87</td>
<td>0.13</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scrap Bin Out2</td>
<td>425</td>
<td>99.89</td>
<td>0.11</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scrap Out</td>
<td>425</td>
<td>100.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shear Staging</td>
<td>494</td>
<td>68.00</td>
<td>32.00</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iron Worker Staging</td>
<td>425</td>
<td>91.88</td>
<td>8.12</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bldg2 Out Staging</td>
<td>432</td>
<td>87.12</td>
<td>12.88</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Storage</td>
<td>770</td>
<td>16.09</td>
<td>83.91</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flatbar To Shear</td>
<td>778</td>
<td>2.16</td>
<td>97.84</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flatbar To Bevel</td>
<td>487</td>
<td>84.39</td>
<td>15.61</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flatbar To Debeurr</td>
<td>432</td>
<td>88.44</td>
<td>11.56</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td>Scheduled Hours</td>
<td>Operation %</td>
<td>Setup %</td>
<td>Idle %</td>
<td>Waiting %</td>
<td>Blocked %</td>
<td>Down %</td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td>-----------------</td>
<td>-------------</td>
<td>---------</td>
<td>--------</td>
<td>-----------</td>
<td>-----------</td>
<td>--------</td>
<td></td>
</tr>
<tr>
<td>BevelToDeburr</td>
<td>425</td>
<td>98.42</td>
<td>1.58</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IronWorkerOut</td>
<td>819</td>
<td>4.40</td>
<td>95.60</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ShearOut</td>
<td>729</td>
<td>17.31</td>
<td>82.69</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BevelOut</td>
<td>487</td>
<td>84.35</td>
<td>15.65</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LOCATION STATES BY PERCENTAGE (Single Capacity/Tanks)
<table>
<thead>
<tr>
<th>Resource</th>
<th>Units</th>
<th>Scheduled Hours</th>
<th>Number Of Times Used</th>
<th>Average Minutes Per Usage</th>
<th>Average Minutes Travel To Use</th>
<th>Average Minutes Travel To Park</th>
<th>% Blocked</th>
<th>% Util</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flatbar Area Position 6</td>
<td>425</td>
<td>26.79</td>
<td>0.00</td>
<td>70.81</td>
<td>2.39</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Flatbar Area Position 7</td>
<td>425</td>
<td>29.88</td>
<td>0.00</td>
<td>67.43</td>
<td>2.69</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Flatbar Area Position 8</td>
<td>425</td>
<td>28.97</td>
<td>0.00</td>
<td>68.18</td>
<td>2.64</td>
<td>0.21</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Flatbar Area Position 9</td>
<td>425</td>
<td>28.98</td>
<td>0.00</td>
<td>67.64</td>
<td>3.02</td>
<td>0.37</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Bulldozer</td>
<td>425</td>
<td>0.00</td>
<td>0.00</td>
<td>100.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Bulldozer2</td>
<td>425</td>
<td>0.00</td>
<td>0.00</td>
<td>100.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Table</td>
<td>425</td>
<td>0.00</td>
<td>0.00</td>
<td>100.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Table2</td>
<td>425</td>
<td>0.00</td>
<td>0.00</td>
<td>100.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Shear</td>
<td>425</td>
<td>17.96</td>
<td>0.00</td>
<td>82.04</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>IronWorker</td>
<td>425</td>
<td>8.66</td>
<td>0.00</td>
<td>91.34</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>BevelStation</td>
<td>425</td>
<td>3.43</td>
<td>0.00</td>
<td>96.57</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>DeburrStation</td>
<td>425</td>
<td>11.57</td>
<td>0.00</td>
<td>88.43</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

RESOURCES

<table>
<thead>
<tr>
<th>Resource Name</th>
<th>Units</th>
<th>Scheduled Hours</th>
<th>Number Of Times Used</th>
<th>Average Minutes Per Usage</th>
<th>Average Minutes Travel To Use</th>
<th>Average Minutes Travel To Park</th>
<th>% Blocked</th>
<th>% Util</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLayoutCrew.1</td>
<td>1</td>
<td>426.2326833</td>
<td>239</td>
<td>73.155766</td>
<td>4.584921</td>
<td>4.135079</td>
<td>0.00</td>
<td>72.65</td>
</tr>
<tr>
<td>PLayoutCrew.2</td>
<td>1</td>
<td>426.1024167</td>
<td>228</td>
<td>72.747404</td>
<td>4.385917</td>
<td>3.971500</td>
<td>0.00</td>
<td>68.82</td>
</tr>
<tr>
<td>PLayoutCrew.3</td>
<td>1</td>
<td>426.0416167</td>
<td>211</td>
<td>74.546957</td>
<td>4.494373</td>
<td>4.020283</td>
<td>0.00</td>
<td>65.26</td>
</tr>
<tr>
<td>PLayoutCrew.4</td>
<td>1</td>
<td>426.1252167</td>
<td>207</td>
<td>71.178237</td>
<td>4.511841</td>
<td>4.008373</td>
<td>0.00</td>
<td>61.28</td>
</tr>
<tr>
<td>PLayoutCrew.5</td>
<td>1</td>
<td>425.6947667</td>
<td>182</td>
<td>77.032967</td>
<td>4.454335</td>
<td>3.897543</td>
<td>0.00</td>
<td>58.06</td>
</tr>
<tr>
<td>PLayoutCrew.6</td>
<td>1</td>
<td>425.7530833</td>
<td>157</td>
<td>76.942675</td>
<td>4.480490</td>
<td>3.843918</td>
<td>0.00</td>
<td>50.04</td>
</tr>
<tr>
<td>PLayoutCrew.7</td>
<td>1</td>
<td>425.6001667</td>
<td>138</td>
<td>80.797101</td>
<td>4.755130</td>
<td>4.001268</td>
<td>0.00</td>
<td>46.23</td>
</tr>
<tr>
<td>PLayoutCrew.8</td>
<td>1</td>
<td>425.5461333</td>
<td>127</td>
<td>82.992126</td>
<td>4.761165</td>
<td>3.952078</td>
<td>0.00</td>
<td>43.65</td>
</tr>
<tr>
<td>PLayoutCrew.9</td>
<td>1</td>
<td>425.496</td>
<td>114</td>
<td>80.350877</td>
<td>4.512842</td>
<td>3.674743</td>
<td>0.00</td>
<td>37.89</td>
</tr>
<tr>
<td>PLayoutCrew.10</td>
<td>1</td>
<td>425.4100667</td>
<td>101</td>
<td>84.851485</td>
<td>4.319676</td>
<td>3.469346</td>
<td>0.00</td>
<td>35.30</td>
</tr>
<tr>
<td>PLayoutCrew.11</td>
<td>1</td>
<td>425.29715</td>
<td>83</td>
<td>90.240964</td>
<td>4.570690</td>
<td>3.522367</td>
<td>0.00</td>
<td>30.86</td>
</tr>
<tr>
<td>PLayoutCrew.12</td>
<td>1</td>
<td>425</td>
<td>65</td>
<td>96.153846</td>
<td>4.336862</td>
<td>3.097758</td>
<td>0.00</td>
<td>25.62</td>
</tr>
<tr>
<td>PLayoutCrew.13</td>
<td>1</td>
<td>425.0595833</td>
<td>44</td>
<td>89.545455</td>
<td>4.824818</td>
<td>3.032743</td>
<td>0.00</td>
<td>16.28</td>
</tr>
<tr>
<td>PLayoutCrew.14</td>
<td>1</td>
<td>425.0982833</td>
<td>33</td>
<td>93.939394</td>
<td>5.120879</td>
<td>2.864220</td>
<td>0.00</td>
<td>12.82</td>
</tr>
<tr>
<td>PLayoutCrew.15</td>
<td>1</td>
<td>425</td>
<td>20</td>
<td>106.500000</td>
<td>4.094400</td>
<td>1.782348</td>
<td>0.00</td>
<td>8.67</td>
</tr>
<tr>
<td>PLayoutCrew.16</td>
<td>1</td>
<td>425</td>
<td>15</td>
<td>104.000000</td>
<td>4.632267</td>
<td>1.694732</td>
<td>0.00</td>
<td>6.39</td>
</tr>
<tr>
<td>PLayoutCrew.17</td>
<td>1</td>
<td>425</td>
<td>12</td>
<td>110.833333</td>
<td>4.690250</td>
<td>1.481132</td>
<td>0.00</td>
<td>5.44</td>
</tr>
<tr>
<td>PLayoutCrew.18</td>
<td>1</td>
<td>425</td>
<td>7</td>
<td>105.714286</td>
<td>4.844571</td>
<td>1.027636</td>
<td>0.00</td>
<td>3.03</td>
</tr>
<tr>
<td>PLayoutCrew.19</td>
<td>1</td>
<td>425</td>
<td>4</td>
<td>120.000000</td>
<td>3.867000</td>
<td>0.515600</td>
<td>0.00</td>
<td>1.94</td>
</tr>
<tr>
<td>PLayoutCrew.20</td>
<td>1</td>
<td>425</td>
<td>4</td>
<td>120.000000</td>
<td>5.108750</td>
<td>0.681167</td>
<td>0.00</td>
<td>1.96</td>
</tr>
<tr>
<td>PLayoutCrew</td>
<td>20</td>
<td>8508.457167</td>
<td>1991</td>
<td>79.133068</td>
<td>4.532101</td>
<td>3.602578</td>
<td>0.00</td>
<td>32.63</td>
</tr>
<tr>
<td>PBurnCrew.1</td>
<td>1</td>
<td>426.1504333</td>
<td>166</td>
<td>126.325301</td>
<td>3.168030</td>
<td>2.875332</td>
<td>0.00</td>
<td>84.08</td>
</tr>
<tr>
<td>PBurnCrew.2</td>
<td>1</td>
<td>425.9996333</td>
<td>156</td>
<td>129.685212</td>
<td>3.041898</td>
<td>2.729017</td>
<td>0.00</td>
<td>81.02</td>
</tr>
<tr>
<td>PBurnCrew.3</td>
<td>1</td>
<td>426.1389</td>
<td>146</td>
<td>137.465753</td>
<td>3.277932</td>
<td>2.976282</td>
<td>0.00</td>
<td>80.39</td>
</tr>
</tbody>
</table>

Page 5
<table>
<thead>
<tr>
<th>Resource</th>
<th>425.2217167</th>
<th>8</th>
<th>21.875000</th>
<th>1.662875</th>
<th>0.511654</th>
<th>0.00</th>
<th>0.74</th>
</tr>
</thead>
<tbody>
<tr>
<td>TPaintCrew.9</td>
<td>425.0311333</td>
<td>3</td>
<td>25.000000</td>
<td>0.622667</td>
<td>0.071846</td>
<td>0.00</td>
<td>0.30</td>
</tr>
<tr>
<td>TPaintCrew 9</td>
<td>3833.136833</td>
<td>393</td>
<td>23.664122</td>
<td>1.894642</td>
<td>2.081910</td>
<td>0.00</td>
<td>4.37</td>
</tr>
<tr>
<td>FLayoutCrew.1</td>
<td>425.0184667</td>
<td>131</td>
<td>60.916031</td>
<td>0.984214</td>
<td>0.895361</td>
<td>0.00</td>
<td>31.80</td>
</tr>
<tr>
<td>FLayoutCrew.2</td>
<td>425.0382167</td>
<td>124</td>
<td>61.451613</td>
<td>1.013976</td>
<td>0.917759</td>
<td>0.00</td>
<td>30.37</td>
</tr>
<tr>
<td>FLayoutCrew.3</td>
<td>425.00265</td>
<td>108</td>
<td>61.944444</td>
<td>0.863306</td>
<td>0.790144</td>
<td>0.00</td>
<td>26.60</td>
</tr>
<tr>
<td>FLayoutCrew.4</td>
<td>425.0011333</td>
<td>86</td>
<td>61.046512</td>
<td>1.090988</td>
<td>0.919853</td>
<td>0.00</td>
<td>20.96</td>
</tr>
<tr>
<td>FLayoutCrew.5</td>
<td>425</td>
<td>63</td>
<td>61.190476</td>
<td>1.136492</td>
<td>0.862639</td>
<td>0.00</td>
<td>15.40</td>
</tr>
<tr>
<td>FLayoutCrew.6</td>
<td>425</td>
<td>49</td>
<td>61.224490</td>
<td>1.094041</td>
<td>0.765829</td>
<td>0.00</td>
<td>11.97</td>
</tr>
<tr>
<td>FLayoutCrew.7</td>
<td>425</td>
<td>44</td>
<td>61.705454</td>
<td>1.048909</td>
<td>0.699273</td>
<td>0.00</td>
<td>10.83</td>
</tr>
<tr>
<td>FLayoutCrew.8</td>
<td>425</td>
<td>44</td>
<td>61.704545</td>
<td>0.985233</td>
<td>0.667800</td>
<td>0.00</td>
<td>10.82</td>
</tr>
<tr>
<td>FLayoutCrew.9</td>
<td>425</td>
<td>43</td>
<td>61.744186</td>
<td>1.062581</td>
<td>0.702938</td>
<td>0.00</td>
<td>10.59</td>
</tr>
<tr>
<td>FLayoutCrew 9</td>
<td>3825.060467</td>
<td>692</td>
<td>61.387283</td>
<td>1.014717</td>
<td>0.826099</td>
<td>0.00</td>
<td>18.82</td>
</tr>
<tr>
<td>FBurnCrew.1</td>
<td>425.02415</td>
<td>85</td>
<td>74.823529</td>
<td>1.556306</td>
<td>1.296922</td>
<td>0.00</td>
<td>25.46</td>
</tr>
<tr>
<td>FBurnCrew.2</td>
<td>425.0173333</td>
<td>61</td>
<td>80.000000</td>
<td>1.441557</td>
<td>1.113101</td>
<td>0.00</td>
<td>19.48</td>
</tr>
<tr>
<td>FBurnCrew.3</td>
<td>425</td>
<td>49</td>
<td>81.224490</td>
<td>1.286122</td>
<td>0.928206</td>
<td>0.00</td>
<td>15.86</td>
</tr>
<tr>
<td>FBurnCrew.4</td>
<td>425</td>
<td>39</td>
<td>86.153846</td>
<td>1.574077</td>
<td>0.990145</td>
<td>0.00</td>
<td>13.42</td>
</tr>
<tr>
<td>FBurnCrew.5</td>
<td>425</td>
<td>29</td>
<td>95.862069</td>
<td>1.720966</td>
<td>0.978588</td>
<td>0.00</td>
<td>11.10</td>
</tr>
<tr>
<td>FBurnCrew.6</td>
<td>425.02415</td>
<td>18</td>
<td>97.777778</td>
<td>1.370722</td>
<td>0.601780</td>
<td>0.00</td>
<td>7.00</td>
</tr>
<tr>
<td>FBurnCrew.7</td>
<td>425.0358</td>
<td>11</td>
<td>94.545455</td>
<td>1.800727</td>
<td>0.550222</td>
<td>0.00</td>
<td>4.16</td>
</tr>
<tr>
<td>FBurnCrew.8</td>
<td>425</td>
<td>3</td>
<td>113.333333</td>
<td>2.007667</td>
<td>0.215107</td>
<td>0.00</td>
<td>1.36</td>
</tr>
<tr>
<td>FBurnCrew.9</td>
<td>425</td>
<td>0</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Carrier</td>
<td>425</td>
<td>367</td>
<td>2.869338</td>
<td>0.435807</td>
<td>0.499427</td>
<td>0.00</td>
<td>4.76</td>
</tr>
<tr>
<td>Crane 600</td>
<td>425.0985333</td>
<td>10864</td>
<td>0.755617</td>
<td>0.240224</td>
<td>0.356570</td>
<td>0.00</td>
<td>42.42</td>
</tr>
<tr>
<td>Crane 590</td>
<td>425.0083833</td>
<td>2983</td>
<td>1.644542</td>
<td>0.197347</td>
<td>0.434998</td>
<td>0.00</td>
<td>21.55</td>
</tr>
<tr>
<td>Truck</td>
<td>425</td>
<td>87</td>
<td>2.831989</td>
<td>0.831989</td>
<td>0.000000</td>
<td>0.00</td>
<td>1.25</td>
</tr>
<tr>
<td>Forktruck</td>
<td>425</td>
<td>140</td>
<td>3.308229</td>
<td>1.375657</td>
<td>0.784922</td>
<td>0.00</td>
<td>2.57</td>
</tr>
<tr>
<td>ShearCrane</td>
<td>425</td>
<td>375</td>
<td>2.309000</td>
<td>0.175000</td>
<td>0.420823</td>
<td>0.00</td>
<td>3.65</td>
</tr>
</tbody>
</table>

**RESOURCE STATES BY PERCENTAGE**

<table>
<thead>
<tr>
<th>Resource</th>
<th>Scheduled Hours</th>
<th>% % % %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------</td>
<td>------------------</td>
<td>--------</td>
</tr>
<tr>
<td>FLayoutCrew.1</td>
<td>426.2326833</td>
<td>68.37</td>
</tr>
<tr>
<td>FLayoutCrew.2</td>
<td>426.1024167</td>
<td>64.88</td>
</tr>
<tr>
<td>FLayoutCrew.3</td>
<td>426.0416167</td>
<td>61.53</td>
</tr>
<tr>
<td>FLayoutCrew.4</td>
<td>426.1252167</td>
<td>57.63</td>
</tr>
<tr>
<td>FLayoutCrew.5</td>
<td>425.6947667</td>
<td>54.89</td>
</tr>
<tr>
<td>FLayoutCrew.6</td>
<td>425.7530833</td>
<td>47.29</td>
</tr>
<tr>
<td>FLayoutCrew.7</td>
<td>425.6001667</td>
<td>43.66</td>
</tr>
<tr>
<td>FLayoutCrew.8</td>
<td>425.5461333</td>
<td>41.28</td>
</tr>
<tr>
<td>LayoutCrew</td>
<td>425.496</td>
<td>35.88</td>
</tr>
<tr>
<td>-------------</td>
<td>---------</td>
<td>-------</td>
</tr>
<tr>
<td>LayoutCrew.10</td>
<td>425.4100667</td>
<td>33.58</td>
</tr>
<tr>
<td>LayoutCrew.11</td>
<td>425.29715</td>
<td>29.35</td>
</tr>
<tr>
<td>LayoutCrew.12</td>
<td>425</td>
<td>24.51</td>
</tr>
<tr>
<td>LayoutCrew.13</td>
<td>425.0595833</td>
<td>15.45</td>
</tr>
<tr>
<td>LayoutCrew.14</td>
<td>425.0982833</td>
<td>12.15</td>
</tr>
<tr>
<td>LayoutCrew.15</td>
<td>425</td>
<td>8.35</td>
</tr>
<tr>
<td>LayoutCrew.16</td>
<td>425</td>
<td>6.12</td>
</tr>
<tr>
<td>LayoutCrew.17</td>
<td>425</td>
<td>5.22</td>
</tr>
<tr>
<td>LayoutCrew.18</td>
<td>425</td>
<td>2.90</td>
</tr>
<tr>
<td>LayoutCrew.19</td>
<td>425</td>
<td>1.88</td>
</tr>
<tr>
<td>LayoutCrew.20</td>
<td>425</td>
<td>1.88</td>
</tr>
<tr>
<td>LayoutCrew</td>
<td>8508.457167</td>
<td>30.86</td>
</tr>
<tr>
<td>PBurnCrew.1</td>
<td>426.1504333</td>
<td>82.01</td>
</tr>
<tr>
<td>PBurnCrew.2</td>
<td>425.9996333</td>
<td>79.15</td>
</tr>
<tr>
<td>PBurnCrew.3</td>
<td>426.1389</td>
<td>78.50</td>
</tr>
<tr>
<td>PBurnCrew.4</td>
<td>426.0916167</td>
<td>74.52</td>
</tr>
<tr>
<td>PBurnCrew.5</td>
<td>426.0014167</td>
<td>71.77</td>
</tr>
<tr>
<td>PBurnCrew.6</td>
<td>425.5994333</td>
<td>68.37</td>
</tr>
<tr>
<td>PBurnCrew.7</td>
<td>425.9218333</td>
<td>65.07</td>
</tr>
<tr>
<td>PBurnCrew.8</td>
<td>425.7196</td>
<td>62.43</td>
</tr>
<tr>
<td>PBurnCrew.9</td>
<td>425.6540667</td>
<td>60.73</td>
</tr>
<tr>
<td>PBurnCrew.10</td>
<td>425.4192167</td>
<td>58.67</td>
</tr>
<tr>
<td>PBurnCrew.11</td>
<td>425.697</td>
<td>58.73</td>
</tr>
<tr>
<td>PBurnCrew.12</td>
<td>425.7059</td>
<td>55.30</td>
</tr>
<tr>
<td>PBurnCrew.13</td>
<td>425.5893833</td>
<td>50.60</td>
</tr>
<tr>
<td>PBurnCrew.14</td>
<td>425.5352667</td>
<td>48.79</td>
</tr>
<tr>
<td>PBurnCrew.15</td>
<td>425.3157</td>
<td>44.55</td>
</tr>
<tr>
<td>PBurnCrew.16</td>
<td>425.4170167</td>
<td>37.57</td>
</tr>
<tr>
<td>PBurnCrew.17</td>
<td>425.3747833</td>
<td>32.98</td>
</tr>
<tr>
<td>PBurnCrew.18</td>
<td>425.1307667</td>
<td>24.35</td>
</tr>
<tr>
<td>PBurnCrew.19</td>
<td>425.0120667</td>
<td>16.00</td>
</tr>
<tr>
<td>PBurnCrew.20</td>
<td>425.0604333</td>
<td>11.41</td>
</tr>
<tr>
<td>PBurnCrew</td>
<td>8512.534467</td>
<td>54.09</td>
</tr>
<tr>
<td>TFittingCrew.1</td>
<td>425.1630667</td>
<td>26.11</td>
</tr>
<tr>
<td>TFittingCrew.2</td>
<td>425.2777</td>
<td>21.16</td>
</tr>
<tr>
<td>TFittingCrew.3</td>
<td>425.2808</td>
<td>13.40</td>
</tr>
<tr>
<td>TFittingCrew.4</td>
<td>425.0534833</td>
<td>9.65</td>
</tr>
<tr>
<td>TFittingCrew.5</td>
<td>425.0639833</td>
<td>6.82</td>
</tr>
<tr>
<td>TFittingCrew.6</td>
<td>425.0547667</td>
<td>5.41</td>
</tr>
<tr>
<td>TFittingCrew.7</td>
<td>425</td>
<td>2.12</td>
</tr>
<tr>
<td>TFittingCrew.8</td>
<td>425</td>
<td>1.65</td>
</tr>
<tr>
<td>TFittingCrew.9</td>
<td>425</td>
<td>1.18</td>
</tr>
<tr>
<td>TFittingCrew</td>
<td>3825.8938</td>
<td>9.72</td>
</tr>
<tr>
<td>TWeldingCrew.1</td>
<td>425.5987</td>
<td>26.08</td>
</tr>
<tr>
<td>TWeldingCrew.2</td>
<td>425.24045</td>
<td>20.93</td>
</tr>
<tr>
<td>TWeldingCrew.3</td>
<td>425.3039167</td>
<td>13.87</td>
</tr>
<tr>
<td>TWeldingCrew.4</td>
<td>425.209</td>
<td>9.64</td>
</tr>
<tr>
<td>TWeldingCrew.5</td>
<td>425.0911</td>
<td>6.59</td>
</tr>
<tr>
<td>TWeldingCrew.6</td>
<td>425.0422167</td>
<td>5.65</td>
</tr>
<tr>
<td>TWeldingCrew.7</td>
<td>425</td>
<td>1.88</td>
</tr>
<tr>
<td>TWeldingCrew.8</td>
<td>425</td>
<td>1.65</td>
</tr>
<tr>
<td>TWeldingCrew.9</td>
<td>425</td>
<td>1.18</td>
</tr>
<tr>
<td>TWeldingCrew</td>
<td>3826.485383</td>
<td>9.72</td>
</tr>
<tr>
<td>TPaintCrew.1</td>
<td>426.6702</td>
<td>8.20</td>
</tr>
<tr>
<td>TPaintCrew.2</td>
<td>426.3428833</td>
<td>7.62</td>
</tr>
<tr>
<td>TPaintCrew.3</td>
<td>426.6461333</td>
<td>6.54</td>
</tr>
<tr>
<td>TPaintCrew.4</td>
<td>426.2815167</td>
<td>5.67</td>
</tr>
<tr>
<td>TPaintCrew.5</td>
<td>425.9025667</td>
<td>3.72</td>
</tr>
<tr>
<td>TPaintCrew.6</td>
<td>425.7824833</td>
<td>2.74</td>
</tr>
<tr>
<td>TPaintCrew.7</td>
<td>425.2582</td>
<td>0.88</td>
</tr>
<tr>
<td>TPaintCrew.8</td>
<td>425.2217167</td>
<td>0.69</td>
</tr>
<tr>
<td>TPaintCrew.9</td>
<td>425.0311333</td>
<td>0.29</td>
</tr>
<tr>
<td>TPaintCrew</td>
<td>3833.136883</td>
<td>4.04</td>
</tr>
<tr>
<td>FLayoutCrew.1</td>
<td>425.0184667</td>
<td>31.29</td>
</tr>
<tr>
<td>FLayoutCrew.2</td>
<td>425.0382167</td>
<td>29.88</td>
</tr>
<tr>
<td>FLayoutCrew.3</td>
<td>425.00265</td>
<td>26.24</td>
</tr>
<tr>
<td>FLayoutCrew.4</td>
<td>425.0011333</td>
<td>20.59</td>
</tr>
<tr>
<td>FLayoutCrew.5</td>
<td>425</td>
<td>15.12</td>
</tr>
<tr>
<td>FLayoutCrew.6</td>
<td>425</td>
<td>11.76</td>
</tr>
<tr>
<td>FLayoutCrew.7</td>
<td>425</td>
<td>10.65</td>
</tr>
<tr>
<td>FLayoutCrew.8</td>
<td>425</td>
<td>10.65</td>
</tr>
<tr>
<td>FLayoutCrew.9</td>
<td>425</td>
<td>10.41</td>
</tr>
<tr>
<td>FLayoutCrew</td>
<td>3825.060467</td>
<td>18.51</td>
</tr>
<tr>
<td>FBurnCrew.1</td>
<td>425.02415</td>
<td>24.94</td>
</tr>
<tr>
<td>FBurnCrew.2</td>
<td>425.0173333</td>
<td>19.14</td>
</tr>
<tr>
<td>FBurnCrew.3</td>
<td>425</td>
<td>15.61</td>
</tr>
<tr>
<td>FBurnCrew.4</td>
<td>425</td>
<td>13.18</td>
</tr>
<tr>
<td>FBurnCrew.5</td>
<td>425</td>
<td>10.90</td>
</tr>
<tr>
<td>FBurnCrew.6</td>
<td>425.02415</td>
<td>6.90</td>
</tr>
<tr>
<td>FBurnCrew.7</td>
<td>425.0358</td>
<td>4.08</td>
</tr>
<tr>
<td>FBurnCrew.8</td>
<td>425</td>
<td>1.33</td>
</tr>
<tr>
<td>FBurnCrew.9</td>
<td>425</td>
<td>0.00</td>
</tr>
<tr>
<td>FBurnCrew</td>
<td>3825.101433</td>
<td>10.68</td>
</tr>
<tr>
<td>Carrier</td>
<td>425</td>
<td>4.13</td>
</tr>
<tr>
<td>Crane 600</td>
<td>425.0985333</td>
<td>32.18</td>
</tr>
<tr>
<td>Crane 590</td>
<td>425.0083833</td>
<td>19.24</td>
</tr>
<tr>
<td>Truck</td>
<td>425</td>
<td>0.97</td>
</tr>
<tr>
<td>Forktruck</td>
<td>425</td>
<td>1.82</td>
</tr>
<tr>
<td>ShearCran</td>
<td>425</td>
<td>3.40</td>
</tr>
</tbody>
</table>
### FAILED ARRIVALS

<table>
<thead>
<tr>
<th>Entity</th>
<th>Location</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBlock</td>
<td>ProfileStorage</td>
<td>110</td>
</tr>
<tr>
<td>CBlock</td>
<td>FlatbarStorage</td>
<td>56</td>
</tr>
<tr>
<td>CBlock</td>
<td>TBeamStorage</td>
<td>56</td>
</tr>
</tbody>
</table>

### ENTITY ACTIVITY

<table>
<thead>
<tr>
<th>Entity</th>
<th>Total Exits</th>
<th>Quantity Current</th>
<th>In System</th>
<th>In Move</th>
<th>Wait For Logic</th>
<th>Res, etc.</th>
<th>Operation In</th>
<th>Blocked</th>
<th>In Minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profile</td>
<td>6302</td>
<td>63</td>
<td>1603.365435</td>
<td>33.947746</td>
<td>284.070794</td>
<td>462.945568</td>
<td>822.401327</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flatbar</td>
<td>1607</td>
<td>34</td>
<td>1846.109585</td>
<td>32.458892</td>
<td>1594.975633</td>
<td>162.604441</td>
<td>56.070619</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TBeam</td>
<td>413</td>
<td>8</td>
<td>1808.298174</td>
<td>46.361794</td>
<td>513.900441</td>
<td>909.757906</td>
<td>338.278034</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RTBeam</td>
<td>0</td>
<td>9</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Scrap</td>
<td>1637</td>
<td>16</td>
<td>411.174563</td>
<td>12.690987</td>
<td>398.227567</td>
<td>0.000000</td>
<td>0.256009</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scrap2</td>
<td>275</td>
<td>16</td>
<td>1939.482007</td>
<td>17.364502</td>
<td>1922.117505</td>
<td>0.000000</td>
<td>0.000000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scrap3</td>
<td>350</td>
<td>22</td>
<td>1799.912949</td>
<td>8.708220</td>
<td>1791.204729</td>
<td>0.000000</td>
<td>0.000000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CarrierBlock</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>nothing</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>CBlock</td>
<td>200</td>
<td>0</td>
<td>8.037210</td>
<td>8.037210</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ScrapBin</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>SFlatbar</td>
<td>2980</td>
<td>229</td>
<td>2320.442434</td>
<td>13.868828</td>
<td>2141.734469</td>
<td>21.846980</td>
<td>142.992158</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### ENTITY STATES BY PERCENTAGE

<table>
<thead>
<tr>
<th>Entity</th>
<th>In Move Logic</th>
<th>In Move Wait For</th>
<th>In Operation</th>
<th>Blocked</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profile</td>
<td>2.12</td>
<td>17.72</td>
<td>28.87</td>
<td>51.29</td>
</tr>
<tr>
<td>Flatbar</td>
<td>1.76</td>
<td>86.40</td>
<td>8.81</td>
<td>3.04</td>
</tr>
<tr>
<td>TBeam</td>
<td>2.56</td>
<td>28.42</td>
<td>50.31</td>
<td>18.71</td>
</tr>
<tr>
<td>Scrap</td>
<td>3.09</td>
<td>96.85</td>
<td>0.00</td>
<td>0.06</td>
</tr>
<tr>
<td>Scrap2</td>
<td>0.90</td>
<td>99.10</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Scrap3</td>
<td>0.48</td>
<td>99.52</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>
VARIABLES

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total Changes</th>
<th>Average Minutes Per Change</th>
<th>Minimum Value</th>
<th>Maximum Value</th>
<th>Current Value</th>
<th>Average Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>v TotalProfilesArrived</td>
<td>1577</td>
<td>30.125497</td>
<td>0</td>
<td>1577</td>
<td>1577</td>
<td>815.512</td>
</tr>
<tr>
<td>v TotalFlatbarsArrived</td>
<td>688</td>
<td>68.728605</td>
<td>0</td>
<td>688</td>
<td>688</td>
<td>356.88</td>
</tr>
<tr>
<td>v TotalTBeamsArrived</td>
<td>298</td>
<td>158.780054</td>
<td>0</td>
<td>298</td>
<td>298</td>
<td>155.916</td>
</tr>
<tr>
<td>v TotalProfilesProcessed</td>
<td>1566</td>
<td>30.343257</td>
<td>0</td>
<td>1566</td>
<td>1566</td>
<td>801.98</td>
</tr>
<tr>
<td>v TotalFlatbarsProcessed</td>
<td>291</td>
<td>163.102292</td>
<td>0</td>
<td>291</td>
<td>291</td>
<td>145.405</td>
</tr>
<tr>
<td>v TotalTBeamsProcessed</td>
<td>291</td>
<td>162.146271</td>
<td>0</td>
<td>291</td>
<td>291</td>
<td>152.323</td>
</tr>
<tr>
<td>v TotalProfilesProduced</td>
<td>6232</td>
<td>7.625222</td>
<td>0</td>
<td>6232</td>
<td>6232</td>
<td>3232.6</td>
</tr>
<tr>
<td>v TotalFlatbarsProduced</td>
<td>2699</td>
<td>17.594279</td>
<td>0</td>
<td>2699</td>
<td>2699</td>
<td>1333.75</td>
</tr>
<tr>
<td>v TotalTBeamsProduced</td>
<td>372</td>
<td>127.452987</td>
<td>0</td>
<td>372</td>
<td>372</td>
<td>184.773</td>
</tr>
<tr>
<td>v PBatchSize</td>
<td>100</td>
<td>470.401000</td>
<td>0</td>
<td>16</td>
<td>16</td>
<td>15.8476</td>
</tr>
<tr>
<td>v FBatchSize</td>
<td>50</td>
<td>940.800000</td>
<td>0</td>
<td>16</td>
<td>16</td>
<td>15.8476</td>
</tr>
<tr>
<td>v TBatchSize</td>
<td>50</td>
<td>940.800000</td>
<td>0</td>
<td>6</td>
<td>6</td>
<td>5.94286</td>
</tr>
<tr>
<td>v Counter</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v PSrap</td>
<td>1565</td>
<td>30.358424</td>
<td>0</td>
<td>1565</td>
<td>1565</td>
<td>801.48</td>
</tr>
<tr>
<td>v FSrap</td>
<td>291</td>
<td>163.191302</td>
<td>0</td>
<td>291</td>
<td>291</td>
<td>145.297</td>
</tr>
<tr>
<td>v TSrap</td>
<td>372</td>
<td>126.868425</td>
<td>0</td>
<td>372</td>
<td>372</td>
<td>188.605</td>
</tr>
<tr>
<td>v PPerUnit</td>
<td>100</td>
<td>470.401000</td>
<td>0</td>
<td>10</td>
<td>10</td>
<td>4.53333</td>
</tr>
<tr>
<td>v FPerUnit</td>
<td>51</td>
<td>922.352941</td>
<td>0</td>
<td>10</td>
<td>10</td>
<td>4.21905</td>
</tr>
<tr>
<td>v TPerUnit</td>
<td>50</td>
<td>940.800000</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>1.59048</td>
</tr>
<tr>
<td>v PPerUnitBatch</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v FPerUnitBatch</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v TPerUnitBatch</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v PTotal</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v FTotal</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v TTotal</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v TotalFToShear</td>
<td>397</td>
<td>118.739108</td>
<td>0</td>
<td>397</td>
<td>397</td>
<td>210.025</td>
</tr>
<tr>
<td>v TotalShearProduced</td>
<td>1475</td>
<td>31.801881</td>
<td>0</td>
<td>1475</td>
<td>1475</td>
<td>736.309</td>
</tr>
<tr>
<td>v Count</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v ProfileWIP</td>
<td>1675</td>
<td>28.363528</td>
<td>0</td>
<td>1479</td>
<td>1479</td>
<td>764.934</td>
</tr>
<tr>
<td>v TBeamWIP</td>
<td>318</td>
<td>149.264959</td>
<td>0</td>
<td>279</td>
<td>279</td>
<td>146.913</td>
</tr>
<tr>
<td>v FlatBarWIP</td>
<td>737</td>
<td>64.159132</td>
<td>0</td>
<td>639</td>
<td>639</td>
<td>332.689</td>
</tr>
<tr>
<td>v ProfileFlowTime</td>
<td>98</td>
<td>483.669316</td>
<td>0</td>
<td>3731.47</td>
<td>162.305</td>
<td>303.958</td>
</tr>
<tr>
<td>v TBeamFlowTime</td>
<td>20</td>
<td>2373.312850</td>
<td>0</td>
<td>806.294</td>
<td>184.615</td>
<td>170.451</td>
</tr>
<tr>
<td>v FlatBarFlowTime</td>
<td>49</td>
<td>958.394857</td>
<td>0</td>
<td>4001.67</td>
<td>1306.71</td>
<td>875.085</td>
</tr>
</tbody>
</table>
Single Capacity Location States

Name
Table10_Position_1
Table10_Position_2
Table10_Position_3
Table10_Position_4
Table10_Position_5
Table10_Position_6
Table10_Position_7
Table10_Position_8
Table10_Position_9
Flatbar_Area_Position_1
Flatbar_Area_Position_2
Flatbar_Area_Position_3
Flatbar_Area_Position_4
Flatbar_Area_Position_5
Flatbar_Area_Position_6
Flatbar_Area_Position_7
Flatbar_Area_Position_8
Flatbar_Area_Position_9
Bulldozer
Bulldozer2
Single Capacity Location States

Name
Table
Table2
Shear
IronWorker
BevelStation
DeburrStation
DETAILED PERFORMANCE STATISTICS FOR THE
"HIGH OUTPUT - INCREASED MANNING AND MATERIAL"
PROFILE FABRICATION AREA MODEL
DETAILED PERFORMANCE STATISTICS FOR THE
"HIGH OUTPUT" PANEL LINE MODEL
General Report
Output from C:\ProMod4\models\Simulation Models\Latest AsIs\jeff.MOD
Date: May/19/1998 Time: 02:46:00 PM

Scenario: Model Parameters
Replication: 1 of 1
Warmup Time: 96 hr
Simulation Time: 840 hr

LOCATIONS

<table>
<thead>
<tr>
<th>Location Name</th>
<th>Scheduled Hours</th>
<th>Capacity</th>
<th>Total Entries</th>
<th>Average Minutes Per Entry</th>
<th>Average Contents</th>
<th>Maximum Contents</th>
<th>Current Contents</th>
<th>% Util</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sta1 Plate Fitting</td>
<td>744</td>
<td>5</td>
<td>282</td>
<td>536.515535</td>
<td>3.38928</td>
<td>5</td>
<td>2</td>
<td>67.79</td>
</tr>
<tr>
<td>Sta2 Deck Sockets</td>
<td>744</td>
<td>1</td>
<td>57</td>
<td>783.157895</td>
<td>1</td>
<td>1</td>
<td>100.00</td>
<td></td>
</tr>
<tr>
<td>Sta3 One Sided Welding</td>
<td>357</td>
<td>1</td>
<td>57</td>
<td>182.667946</td>
<td>0.477563</td>
<td>1</td>
<td>1</td>
<td>100.00</td>
</tr>
<tr>
<td>Sta4 Manual Layout</td>
<td>357</td>
<td>1</td>
<td>56</td>
<td>375.789474</td>
<td>0.913688</td>
<td>1</td>
<td>1</td>
<td>91.37</td>
</tr>
<tr>
<td>Sta5 Stiffener Fitting</td>
<td>371</td>
<td>1</td>
<td>56</td>
<td>273.995393</td>
<td>0.716328</td>
<td>1</td>
<td>1</td>
<td>71.63</td>
</tr>
<tr>
<td>Sta6 Stiffener Welding</td>
<td>357</td>
<td>1</td>
<td>56</td>
<td>201.445709</td>
<td>0.517251</td>
<td>1</td>
<td>0</td>
<td>51.73</td>
</tr>
<tr>
<td>Sta7 Web Fitting 1</td>
<td>357</td>
<td>1</td>
<td>56</td>
<td>185.386768</td>
<td>0.484671</td>
<td>1</td>
<td>0</td>
<td>48.47</td>
</tr>
<tr>
<td>Sta8 Web Fitting 2</td>
<td>405</td>
<td>1</td>
<td>57</td>
<td>365.619404</td>
<td>0.857626</td>
<td>1</td>
<td>1</td>
<td>85.76</td>
</tr>
<tr>
<td>Sta9 Weld Out 1</td>
<td>357</td>
<td>1</td>
<td>56</td>
<td>321.161018</td>
<td>0.839637</td>
<td>1</td>
<td>0</td>
<td>83.96</td>
</tr>
<tr>
<td>Sta10 Weld Out 2</td>
<td>357</td>
<td>1</td>
<td>55</td>
<td>0.000000</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0.00</td>
</tr>
</tbody>
</table>

LOCATION STATES BY PERCENTAGE (Multiple Capacity)

<table>
<thead>
<tr>
<th>Location Name</th>
<th>Scheduled Hours</th>
<th>% Empty</th>
<th>% Partially Occupied</th>
<th>% Fully Occupied</th>
<th>% Down</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sta1 Plate Fitting</td>
<td>744</td>
<td>0.00</td>
<td>70.64</td>
<td>29.36</td>
<td>0.00</td>
</tr>
</tbody>
</table>

LOCATION STATES BY PERCENTAGE (Single Capacity/Tanks)

<table>
<thead>
<tr>
<th>Location Name</th>
<th>Scheduled Hours</th>
<th>Operation</th>
<th>Setup</th>
<th>Idle</th>
<th>Waiting</th>
<th>Blocked</th>
<th>Down</th>
</tr>
</thead>
</table>

Page 1
<table>
<thead>
<tr>
<th>Resource Name</th>
<th>Units</th>
<th>Scheduled Hours</th>
<th>Number Of Times Used</th>
<th>Average Minutes Per Usage</th>
<th>Average Minutes Travel To Use</th>
<th>Average Minutes Travel To Park</th>
<th>% Blocked In Travel</th>
<th>% Util</th>
</tr>
</thead>
<tbody>
<tr>
<td>crane500</td>
<td>1</td>
<td>357</td>
<td>228</td>
<td>44.971430</td>
<td>0.039700</td>
<td>0.000000</td>
<td>0.00</td>
<td>47.91</td>
</tr>
<tr>
<td>Stal Plate Fitters.1</td>
<td>1</td>
<td>357</td>
<td>845</td>
<td>19.362324</td>
<td>0.097031</td>
<td>0.054921</td>
<td>0.00</td>
<td>76.76</td>
</tr>
<tr>
<td>Stal Plate Fitters.2</td>
<td>1</td>
<td>357</td>
<td>845</td>
<td>19.362324</td>
<td>0.097031</td>
<td>0.054921</td>
<td>0.00</td>
<td>76.76</td>
</tr>
<tr>
<td>Stal Plate Fitters</td>
<td>2</td>
<td>714</td>
<td>1690</td>
<td>19.362324</td>
<td>0.097031</td>
<td>0.054921</td>
<td>0.00</td>
<td>76.76</td>
</tr>
<tr>
<td>Sta2 Deck Socket Welders.1</td>
<td>1</td>
<td>357</td>
<td>56</td>
<td>0.000000</td>
<td>0.541000</td>
<td>0.388410</td>
<td>0.00</td>
<td>0.14</td>
</tr>
<tr>
<td>Sta2 Deck Socket Welders.2</td>
<td>1</td>
<td>357</td>
<td>56</td>
<td>0.000000</td>
<td>0.541000</td>
<td>0.388410</td>
<td>0.00</td>
<td>0.14</td>
</tr>
<tr>
<td>Sta2 Deck Socket Welders.3</td>
<td>1</td>
<td>357</td>
<td>56</td>
<td>0.000000</td>
<td>0.541000</td>
<td>0.388410</td>
<td>0.00</td>
<td>0.14</td>
</tr>
<tr>
<td>Sta2 Deck Socket Welders.4</td>
<td>1</td>
<td>357</td>
<td>56</td>
<td>0.000000</td>
<td>0.541000</td>
<td>0.388410</td>
<td>0.00</td>
<td>0.14</td>
</tr>
<tr>
<td>Sta2 Deck Socket Welders</td>
<td>4</td>
<td>1428</td>
<td>224</td>
<td>0.000000</td>
<td>0.541000</td>
<td>0.388410</td>
<td>0.00</td>
<td>0.14</td>
</tr>
<tr>
<td>Sta2 Deck Socket Fitters.1</td>
<td>1</td>
<td>357.01025</td>
<td>56</td>
<td>0.000000</td>
<td>0.541000</td>
<td>0.393546</td>
<td>0.00</td>
<td>0.14</td>
</tr>
<tr>
<td>Sta2 Deck Socket Fitters.2</td>
<td>1</td>
<td>357.01025</td>
<td>56</td>
<td>0.000000</td>
<td>0.541000</td>
<td>0.393546</td>
<td>0.00</td>
<td>0.14</td>
</tr>
<tr>
<td>Sta2 Deck Socket Fitters</td>
<td>2</td>
<td>714.0205</td>
<td>112</td>
<td>0.000000</td>
<td>0.541000</td>
<td>0.393546</td>
<td>0.00</td>
<td>0.14</td>
</tr>
<tr>
<td>Sta3 OSW Operator.1</td>
<td>1</td>
<td>357.2222</td>
<td>78</td>
<td>273.582077</td>
<td>0.606000</td>
<td>0.472680</td>
<td>0.00</td>
<td>99.78</td>
</tr>
<tr>
<td>Sta3 OSW Operator.2</td>
<td>1</td>
<td>357.2222</td>
<td>78</td>
<td>273.582077</td>
<td>0.606000</td>
<td>0.472680</td>
<td>0.00</td>
<td>99.78</td>
</tr>
<tr>
<td>Sta3 OSW Operator.2</td>
<td>2</td>
<td>714.4444</td>
<td>156</td>
<td>273.582077</td>
<td>0.606000</td>
<td>0.472680</td>
<td>0.00</td>
<td>99.78</td>
</tr>
<tr>
<td>Sta4 Layout Person.1</td>
<td>1</td>
<td>357.1651833</td>
<td>66</td>
<td>151.163212</td>
<td>0.901000</td>
<td>0.675750</td>
<td>0.00</td>
<td>46.83</td>
</tr>
<tr>
<td>Sta4 Layout Person.2</td>
<td>1</td>
<td>357.1651833</td>
<td>66</td>
<td>151.163212</td>
<td>0.901000</td>
<td>0.675750</td>
<td>0.00</td>
<td>46.83</td>
</tr>
<tr>
<td>Sta4 Layout Person.2</td>
<td>2</td>
<td>714.3303667</td>
<td>132</td>
<td>151.163212</td>
<td>0.901000</td>
<td>0.675750</td>
<td>0.00</td>
<td>46.83</td>
</tr>
<tr>
<td>Sta5 Stiffener Fitter.1</td>
<td>1</td>
<td>357.3363167</td>
<td>72</td>
<td>247.598500</td>
<td>1.187000</td>
<td>0.909191</td>
<td>0.00</td>
<td>83.54</td>
</tr>
<tr>
<td>Sta5 Stiffener Fitter.2</td>
<td>1</td>
<td>357.3363167</td>
<td>72</td>
<td>247.598500</td>
<td>1.187000</td>
<td>0.909191</td>
<td>0.00</td>
<td>83.54</td>
</tr>
<tr>
<td>Sta5 Stiffener Fitter.3</td>
<td>1</td>
<td>357.3363167</td>
<td>72</td>
<td>247.598500</td>
<td>1.187000</td>
<td>0.909191</td>
<td>0.00</td>
<td>83.54</td>
</tr>
<tr>
<td>Sta5 Stiffener Fitter.4</td>
<td>1</td>
<td>357.3363167</td>
<td>72</td>
<td>247.598500</td>
<td>1.187000</td>
<td>0.909191</td>
<td>0.00</td>
<td>83.54</td>
</tr>
<tr>
<td>Sta5 Stiffener Fitter</td>
<td>4</td>
<td>1429.345267</td>
<td>288</td>
<td>247.598500</td>
<td>1.187000</td>
<td>0.909191</td>
<td>0.00</td>
<td>83.54</td>
</tr>
<tr>
<td>Sta6 DartIV Operator.1</td>
<td>1</td>
<td>357.4329333</td>
<td>72</td>
<td>211.600750</td>
<td>1.528000</td>
<td>1.170383</td>
<td>0.00</td>
<td>71.55</td>
</tr>
<tr>
<td>Sta6 DartIV Operator.2</td>
<td>1</td>
<td>357.4329333</td>
<td>72</td>
<td>211.600750</td>
<td>1.528000</td>
<td>1.170383</td>
<td>0.00</td>
<td>71.55</td>
</tr>
<tr>
<td>Sta6 DartIV Operator</td>
<td>2</td>
<td>714.8658667</td>
<td>144</td>
<td>211.600750</td>
<td>1.528000</td>
<td>1.170383</td>
<td>0.00</td>
<td>71.55</td>
</tr>
<tr>
<td>Sta7 Web Fitter.1</td>
<td>1 357.6558833</td>
<td>131 155.471962 1.513015 1.592155 0.00</td>
<td>95.83</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta7 Web Fitter.2</td>
<td>1 357.6558833</td>
<td>131 155.471962 1.513015 1.592155 0.00</td>
<td>95.83</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta7 Web Fitter.3</td>
<td>1 357.6558833</td>
<td>131 155.471962 1.513015 1.592155 0.00</td>
<td>95.83</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta7 Web Fitter.4</td>
<td>1 357.6558833</td>
<td>131 155.471962 1.513015 1.592155 0.00</td>
<td>95.83</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta7 Web Fitter.5</td>
<td>1 357.6558833</td>
<td>131 155.471962 1.513015 1.592155 0.00</td>
<td>95.83</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta7 Web Fitter.6</td>
<td>1 357.6558833</td>
<td>131 155.471962 1.513015 1.592155 0.00</td>
<td>95.83</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta7 Web Fitter</td>
<td>6 2145.9353</td>
<td>786 155.471962 1.513015 1.592155 0.00</td>
<td>95.83</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.1</td>
<td>1 357.8131333</td>
<td>75 237.004573 2.467307 1.933268 0.00</td>
<td>83.66</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.2</td>
<td>1 357.8131333</td>
<td>75 237.004573 2.467307 1.933268 0.00</td>
<td>83.66</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.3</td>
<td>1 357.8131333</td>
<td>75 237.004573 2.467307 1.933268 0.00</td>
<td>83.66</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.4</td>
<td>1 357.8131333</td>
<td>75 237.004573 2.467307 1.933268 0.00</td>
<td>83.66</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.5</td>
<td>1 357.8131333</td>
<td>75 237.004573 2.467307 1.933268 0.00</td>
<td>83.66</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.6</td>
<td>1 357.8131333</td>
<td>75 237.004573 2.467307 1.933268 0.00</td>
<td>83.66</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.7</td>
<td>1 357.8131333</td>
<td>75 237.004573 2.467307 1.933268 0.00</td>
<td>83.66</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.8</td>
<td>1 357.8131333</td>
<td>75 237.004573 2.467307 1.933268 0.00</td>
<td>83.66</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder</td>
<td>8 2862.505067</td>
<td>600 237.004573 2.467307 1.933268 0.00</td>
<td>83.66</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.1</td>
<td>1 357.85335</td>
<td>72 246.952903 2.839000 2.174553 0.00</td>
<td>83.76</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.2</td>
<td>1 357.85335</td>
<td>72 246.952903 2.839000 2.174553 0.00</td>
<td>83.76</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.3</td>
<td>1 357.85335</td>
<td>72 246.952903 2.839000 2.174553 0.00</td>
<td>83.76</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.4</td>
<td>1 357.85335</td>
<td>72 246.952903 2.839000 2.174553 0.00</td>
<td>83.76</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.5</td>
<td>1 357.85335</td>
<td>72 246.952903 2.839000 2.174553 0.00</td>
<td>83.76</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.6</td>
<td>1 357.85335</td>
<td>72 246.952903 2.839000 2.174553 0.00</td>
<td>83.76</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.7</td>
<td>1 357.85335</td>
<td>72 246.952903 2.839000 2.174553 0.00</td>
<td>83.76</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.8</td>
<td>1 357.85335</td>
<td>72 246.952903 2.839000 2.174553 0.00</td>
<td>83.76</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder</td>
<td>8 2862.8268</td>
<td>576 246.952903 2.839000 2.174553 0.00</td>
<td>83.76</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>forklift.1</td>
<td>1 357</td>
<td>111 0.475090 0.475288 0.000000 0.00</td>
<td>0.49</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One Sided Welder</td>
<td>1 357</td>
<td>78 274.615385 0.000000 0.000000 0.00</td>
<td>100.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PL415 Stiffener Press</td>
<td>1 357</td>
<td>72 248.696444 0.073592 0.055585 0.00</td>
<td>83.62</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DartIV Welder</td>
<td>1 357</td>
<td>72 213.038014 0.070493 0.053245 0.00</td>
<td>71.63</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spider Gantry Nol</td>
<td>1 357</td>
<td>72 274.143079 0.072427 0.056583 0.00</td>
<td>85.76</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spider Gantry No2</td>
<td>1 357</td>
<td>72 249.719569 0.072333 0.054415 0.00</td>
<td>83.96</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transfer car</td>
<td>1 550.01315</td>
<td>557 39.652131 0.110590 1.028212 0.00</td>
<td>67.11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**RESOURCE STATES BY PERCENTAGE**

<table>
<thead>
<tr>
<th>Resource Name</th>
<th>Scheduled Hours</th>
<th>% In Use</th>
<th>% To Use</th>
<th>% To Park</th>
<th>% Idle</th>
<th>% Down</th>
</tr>
</thead>
<tbody>
<tr>
<td>crane500</td>
<td>357</td>
<td>47.87</td>
<td>0.04</td>
<td>0.00</td>
<td>52.09</td>
<td>0.00</td>
</tr>
<tr>
<td>Stal Plate Fitters.1</td>
<td>357</td>
<td>76.38</td>
<td>0.38</td>
<td>0.16</td>
<td>23.07</td>
<td>0.00</td>
</tr>
<tr>
<td>Stal Plate Fitters.2</td>
<td>357</td>
<td>76.38</td>
<td>0.38</td>
<td>0.16</td>
<td>23.07</td>
<td>0.00</td>
</tr>
<tr>
<td>Stal Plate Fitters</td>
<td>714</td>
<td>76.38</td>
<td>0.38</td>
<td>0.16</td>
<td>23.07</td>
<td>0.00</td>
</tr>
<tr>
<td>Sta2 Deck Socket Welders.1</td>
<td>357</td>
<td>0.00</td>
<td>0.14</td>
<td>0.14</td>
<td>99.72</td>
<td>0.00</td>
</tr>
<tr>
<td>Position</td>
<td>Hours</td>
<td>Average</td>
<td>Confidence</td>
<td>High</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>-------</td>
<td>---------</td>
<td>------------</td>
<td>------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td>Sta2 Deck Socket Welders.2</td>
<td>357</td>
<td>0.00</td>
<td>0.14</td>
<td>0.14</td>
<td>99.72</td>
<td></td>
</tr>
<tr>
<td>Sta2 Deck Socket Welders.3</td>
<td>357</td>
<td>0.00</td>
<td>0.14</td>
<td>0.14</td>
<td>99.72</td>
<td></td>
</tr>
<tr>
<td>Sta2 Deck Socket Welders.4</td>
<td>357</td>
<td>0.00</td>
<td>0.14</td>
<td>0.14</td>
<td>99.72</td>
<td></td>
</tr>
<tr>
<td>Sta2 Deck Socket Welders</td>
<td>1428</td>
<td>0.00</td>
<td>0.14</td>
<td>0.14</td>
<td>99.72</td>
<td></td>
</tr>
<tr>
<td>Sta2 Deck Socket Fitters.1</td>
<td>357.01025</td>
<td>0.00</td>
<td>0.14</td>
<td>0.14</td>
<td>99.71</td>
<td></td>
</tr>
<tr>
<td>Sta2 Deck Socket Fitters.2</td>
<td>357.01025</td>
<td>0.00</td>
<td>0.14</td>
<td>0.14</td>
<td>99.71</td>
<td></td>
</tr>
<tr>
<td>Sta2 Deck Socket Fitters</td>
<td>714.0205</td>
<td>0.00</td>
<td>0.14</td>
<td>0.14</td>
<td>99.71</td>
<td></td>
</tr>
<tr>
<td>Sta3 OSW Operator.1</td>
<td>357.2222</td>
<td>99.56</td>
<td>0.22</td>
<td>0.22</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Sta3 OSW Operator.2</td>
<td>357.2222</td>
<td>99.56</td>
<td>0.22</td>
<td>0.22</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Sta3 OSW Operator</td>
<td>714.4444</td>
<td>99.56</td>
<td>0.22</td>
<td>0.22</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>Sta4 Layout Person.1</td>
<td>357.1651833</td>
<td>46.56</td>
<td>0.28</td>
<td>0.28</td>
<td>52.89</td>
<td></td>
</tr>
<tr>
<td>Sta4 Layout Person.2</td>
<td>357.1651833</td>
<td>46.56</td>
<td>0.28</td>
<td>0.28</td>
<td>52.89</td>
<td></td>
</tr>
<tr>
<td>Sta4 Layout Person</td>
<td>714.3303667</td>
<td>46.56</td>
<td>0.28</td>
<td>0.28</td>
<td>52.89</td>
<td></td>
</tr>
<tr>
<td>Sta5 Stiffener Fitter.1</td>
<td>357.3363167</td>
<td>83.15</td>
<td>0.39</td>
<td>0.40</td>
<td>16.06</td>
<td></td>
</tr>
<tr>
<td>Sta5 Stiffener Fitter.2</td>
<td>357.3363167</td>
<td>83.15</td>
<td>0.39</td>
<td>0.40</td>
<td>16.06</td>
<td></td>
</tr>
<tr>
<td>Sta5 Stiffener Fitter.3</td>
<td>357.3363167</td>
<td>83.15</td>
<td>0.39</td>
<td>0.40</td>
<td>16.06</td>
<td></td>
</tr>
<tr>
<td>Sta5 Stiffener Fitter.4</td>
<td>357.3363167</td>
<td>83.15</td>
<td>0.39</td>
<td>0.40</td>
<td>16.06</td>
<td></td>
</tr>
<tr>
<td>Sta5 Stiffener Fitter</td>
<td>1429.345267</td>
<td>83.15</td>
<td>0.39</td>
<td>0.40</td>
<td>16.06</td>
<td></td>
</tr>
<tr>
<td>Sta6 DartIV Operator.1</td>
<td>357.4329333</td>
<td>71.04</td>
<td>0.51</td>
<td>0.51</td>
<td>27.94</td>
<td></td>
</tr>
<tr>
<td>Sta6 DartIV Operator.2</td>
<td>357.4329333</td>
<td>71.04</td>
<td>0.51</td>
<td>0.51</td>
<td>27.94</td>
<td></td>
</tr>
<tr>
<td>Sta6 DartIV Operator</td>
<td>714.8658667</td>
<td>71.04</td>
<td>0.51</td>
<td>0.51</td>
<td>27.94</td>
<td></td>
</tr>
<tr>
<td>Sta7 Web Fitter.1</td>
<td>357.6558833</td>
<td>94.91</td>
<td>0.92</td>
<td>0.82</td>
<td>3.36</td>
<td></td>
</tr>
<tr>
<td>Sta7 Web Fitter.2</td>
<td>357.6558833</td>
<td>94.91</td>
<td>0.92</td>
<td>0.82</td>
<td>3.36</td>
<td></td>
</tr>
<tr>
<td>Sta7 Web Fitter.3</td>
<td>357.6558833</td>
<td>94.91</td>
<td>0.92</td>
<td>0.82</td>
<td>3.36</td>
<td></td>
</tr>
<tr>
<td>Sta7 Web Fitter.4</td>
<td>357.6558833</td>
<td>94.91</td>
<td>0.92</td>
<td>0.82</td>
<td>3.36</td>
<td></td>
</tr>
<tr>
<td>Sta7 Web Fitter.5</td>
<td>357.6558833</td>
<td>94.91</td>
<td>0.92</td>
<td>0.82</td>
<td>3.36</td>
<td></td>
</tr>
<tr>
<td>Sta7 Web Fitter.6</td>
<td>357.6558833</td>
<td>94.91</td>
<td>0.92</td>
<td>0.82</td>
<td>3.36</td>
<td></td>
</tr>
<tr>
<td>Sta7 Web Fitter</td>
<td>2145.9353</td>
<td>94.91</td>
<td>0.92</td>
<td>0.82</td>
<td>3.36</td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.1</td>
<td>357.8131333</td>
<td>82.80</td>
<td>0.86</td>
<td>0.87</td>
<td>15.47</td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.2</td>
<td>357.8131333</td>
<td>82.80</td>
<td>0.86</td>
<td>0.87</td>
<td>15.47</td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.3</td>
<td>357.8131333</td>
<td>82.80</td>
<td>0.86</td>
<td>0.87</td>
<td>15.47</td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.4</td>
<td>357.8131333</td>
<td>82.80</td>
<td>0.86</td>
<td>0.87</td>
<td>15.47</td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.5</td>
<td>357.8131333</td>
<td>82.80</td>
<td>0.86</td>
<td>0.87</td>
<td>15.47</td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.6</td>
<td>357.8131333</td>
<td>82.80</td>
<td>0.86</td>
<td>0.87</td>
<td>15.47</td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.7</td>
<td>357.8131333</td>
<td>82.80</td>
<td>0.86</td>
<td>0.87</td>
<td>15.47</td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.8</td>
<td>357.8131333</td>
<td>82.80</td>
<td>0.86</td>
<td>0.87</td>
<td>15.47</td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder</td>
<td>2862.505067</td>
<td>82.80</td>
<td>0.86</td>
<td>0.87</td>
<td>15.47</td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.1</td>
<td>357.85335</td>
<td>82.81</td>
<td>0.95</td>
<td>0.95</td>
<td>15.28</td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.2</td>
<td>357.85335</td>
<td>82.81</td>
<td>0.95</td>
<td>0.95</td>
<td>15.28</td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.3</td>
<td>357.85335</td>
<td>82.81</td>
<td>0.95</td>
<td>0.95</td>
<td>15.28</td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.4</td>
<td>357.85335</td>
<td>82.81</td>
<td>0.95</td>
<td>0.95</td>
<td>15.28</td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.5</td>
<td>357.85335</td>
<td>82.81</td>
<td>0.95</td>
<td>0.95</td>
<td>15.28</td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.6</td>
<td>357.85335</td>
<td>82.81</td>
<td>0.95</td>
<td>0.95</td>
<td>15.28</td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.7</td>
<td>357.85335</td>
<td>82.81</td>
<td>0.95</td>
<td>0.95</td>
<td>15.28</td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.8</td>
<td>357.85335</td>
<td>82.81</td>
<td>0.95</td>
<td>0.95</td>
<td>15.28</td>
<td></td>
</tr>
<tr>
<td>Entity</td>
<td>Location</td>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>---------------------------------</td>
<td>-----------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stal0 Welder</td>
<td>2862.8268</td>
<td>82.81</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>forklift</td>
<td>357 0.25</td>
<td>0.95</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One Sided Welder</td>
<td>357 100.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PL415 Stiffener Press</td>
<td>357 83.60</td>
<td>0.02</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DartIV Welder</td>
<td>357 71.61</td>
<td>0.02</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spider Gantry No1</td>
<td>405 85.74</td>
<td>0.02</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spider Gantry No2</td>
<td>357 83.94</td>
<td>0.02</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transfer car</td>
<td>550.01315</td>
<td>66.93</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### FAILED ARRIVALS

<table>
<thead>
<tr>
<th>Entity</th>
<th>Location</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>profile</td>
<td>profile staging original</td>
<td>0</td>
</tr>
<tr>
<td>plate cut</td>
<td>plate transfer carl</td>
<td>0</td>
</tr>
<tr>
<td>deck sockets</td>
<td>deck socket staging original</td>
<td>0</td>
</tr>
<tr>
<td>web</td>
<td>Web Staging</td>
<td>0</td>
</tr>
</tbody>
</table>

### ENTITY ACTIVITY

<table>
<thead>
<tr>
<th>Entity</th>
<th>Total Exits</th>
<th>Current Quantity</th>
<th>Current Minutes</th>
<th>Average Minutes</th>
<th>Average Minutes</th>
<th>Average Minutes</th>
<th>Average Minutes</th>
<th>Average Minutes</th>
<th>Average Minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>System</td>
<td>In Move</td>
<td>Wait For</td>
<td>Operation</td>
<td>Blocked</td>
<td></td>
<td></td>
</tr>
<tr>
<td>profile</td>
<td>55</td>
<td>65</td>
<td>14381.656982</td>
<td>46.710618</td>
<td>0.000000</td>
<td>0.000000</td>
<td>14334.946364</td>
<td></td>
<td></td>
</tr>
<tr>
<td>plate cut</td>
<td>275</td>
<td>38</td>
<td>5817.978684</td>
<td>32.120193</td>
<td>475.807949</td>
<td>4351.872764</td>
<td>958.177778</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ent panel line</td>
<td>55</td>
<td>7</td>
<td>5339.904855</td>
<td>0.000000</td>
<td>124.302345</td>
<td>4292.672764</td>
<td>922.929745</td>
<td></td>
<td></td>
</tr>
<tr>
<td>deck sockets</td>
<td>56</td>
<td>0</td>
<td>0.992000</td>
<td>0.992000</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>web</td>
<td>55</td>
<td>1</td>
<td>373.545800</td>
<td>6.779582</td>
<td>366.766218</td>
<td>0.000000</td>
<td>0.000000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### ENTITY STATES BY PERCENTAGE

<table>
<thead>
<tr>
<th>Entity</th>
<th>In Move</th>
<th>Wait For</th>
<th>In Operation</th>
<th>Blocked</th>
</tr>
</thead>
<tbody>
<tr>
<td>profile</td>
<td>0.32</td>
<td>0.00</td>
<td>0.00</td>
<td>99.68</td>
</tr>
<tr>
<td>plate cut</td>
<td>0.55</td>
<td>8.18</td>
<td>74.80</td>
<td>16.47</td>
</tr>
<tr>
<td>Ent panel line</td>
<td>0.00</td>
<td>2.33</td>
<td>80.39</td>
<td>17.28</td>
</tr>
<tr>
<td>deck sockets</td>
<td>100.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>
### VARIABLES

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total Changes</th>
<th>Average Per Change</th>
<th>Minimum Value</th>
<th>Maximum Value</th>
<th>Current Value</th>
<th>Average Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>v NoOf Panels completed</td>
<td>55</td>
<td>756.772291</td>
<td>5</td>
<td>60</td>
<td>60</td>
<td>32.4059</td>
</tr>
<tr>
<td>v total time</td>
<td>55</td>
<td>756.772291</td>
<td>26.4362</td>
<td>52.9235</td>
<td>27.1237</td>
<td>34.747</td>
</tr>
<tr>
<td>v cycle time</td>
<td>55</td>
<td>756.772291</td>
<td>6.14656</td>
<td>10.3467</td>
<td>6.14656</td>
<td>6.85593</td>
</tr>
<tr>
<td>v nof stiffners</td>
<td>55</td>
<td>754.988945</td>
<td>144</td>
<td>1024</td>
<td>1024</td>
<td>586.633</td>
</tr>
<tr>
<td>v nof webs</td>
<td>55</td>
<td>751.650109</td>
<td>42</td>
<td>372</td>
<td>372</td>
<td>209.901</td>
</tr>
<tr>
<td>v total footage</td>
<td>166</td>
<td>251.289470</td>
<td>22200</td>
<td>232300</td>
<td>232300</td>
<td>128159</td>
</tr>
<tr>
<td>v nof plates</td>
<td>277</td>
<td>150.548032</td>
<td>60</td>
<td>337</td>
<td>337</td>
<td>199.296</td>
</tr>
<tr>
<td>v nof panels per shift</td>
<td>55</td>
<td>756.772291</td>
<td>0.773193</td>
<td>1.30154</td>
<td>1.30154</td>
<td>1.18063</td>
</tr>
<tr>
<td>v PanelWIP</td>
<td>110</td>
<td>378.386145</td>
<td>7</td>
<td>8</td>
<td>7</td>
<td>7.06888</td>
</tr>
</tbody>
</table>
Resource States

In Use  Travel To Use  Idle  Down

Name
Sta9_Welder.8
Sta9_Welder
Sta10_Welder.1
Sta10_Welder.2
Sta10_Welder.3
Sta10_Welder.4
Sta10_Welder.5
Sta10_Welder.6
Sta10_Welder.7
Sta10_Welder.8
Sta10_Welder
forktruck
One_Sided_Welder
PL415_Stiffener_Press
DartIV_Welder
Spider_Gantry_No1
Spider_Gantry_No2
Transfer_car
Single Capacity Location States

Name
Sta2_Deck_Sockets
Sta3_One_Sided_Welding
Sta4_Manual_Layout
Sta5_Stiffener_Fitting
Sta6_Stiffener_Welding
Sta7_Web_Fitting_1
Sta8_Web_Fitting_2
Sta9_Weld_Out_1
Sta10_Weld_Out_2
Sta11_Load_Out
DETAILED PERFORMANCE STATISTICS FOR THE
"MOST LIKELY OPERATING CONDITION" PANEL LINE MODEL
General Report
Output from C:\ProMod4\models\Simulation Models\Latest AsIs\jeff.MOD
Date: May/19/1998    Time: 02:49:32 PM

Scenario : Model Parameters
Replication : 1 of 1
Warmup Time : 96 hr
Simulation Time : 840 hr

LOCATIONS

<table>
<thead>
<tr>
<th>Location Name</th>
<th>Scheduled Hours</th>
<th>Capacity</th>
<th>Total Entries</th>
<th>Average Minutes Per Entry</th>
<th>Average Contents</th>
<th>Maximum Contents</th>
<th>Current Contents</th>
<th>% Util</th>
</tr>
</thead>
<tbody>
<tr>
<td>St41 Plate Fitting</td>
<td>744</td>
<td>5</td>
<td>214</td>
<td>508.660794</td>
<td>2.43847</td>
<td>5</td>
<td>4</td>
<td>48.77</td>
</tr>
<tr>
<td>St22 Deck Sockets</td>
<td>357</td>
<td>1</td>
<td>42</td>
<td>1.082000</td>
<td>0.0021257</td>
<td>1</td>
<td>0</td>
<td>0.21</td>
</tr>
<tr>
<td>St33 One Sided Welding</td>
<td>357</td>
<td>1</td>
<td>43</td>
<td>384.127744</td>
<td>0.771125</td>
<td>1</td>
<td>0</td>
<td>77.11</td>
</tr>
<tr>
<td>St44 Manual Layout</td>
<td>357</td>
<td>1</td>
<td>43</td>
<td>178.120023</td>
<td>0.357571</td>
<td>1</td>
<td>1</td>
<td>35.76</td>
</tr>
<tr>
<td>St55 Stiffener Fitting</td>
<td>357</td>
<td>1</td>
<td>43</td>
<td>323.386256</td>
<td>0.649188</td>
<td>1</td>
<td>0</td>
<td>64.92</td>
</tr>
<tr>
<td>St66 Stiffener Welding</td>
<td>357</td>
<td>1</td>
<td>44</td>
<td>268.326955</td>
<td>0.551185</td>
<td>1</td>
<td>1</td>
<td>55.12</td>
</tr>
<tr>
<td>St77 Web Fitting 1</td>
<td>357</td>
<td>1</td>
<td>43</td>
<td>186.317744</td>
<td>0.374027</td>
<td>1</td>
<td>0</td>
<td>37.40</td>
</tr>
<tr>
<td>St88 Web Fitting 2</td>
<td>357</td>
<td>1</td>
<td>43</td>
<td>184.684349</td>
<td>0.370748</td>
<td>1</td>
<td>1</td>
<td>37.07</td>
</tr>
<tr>
<td>St99 Weld Out 1</td>
<td>357</td>
<td>1</td>
<td>43</td>
<td>324.837465</td>
<td>0.652101</td>
<td>1</td>
<td>0</td>
<td>65.21</td>
</tr>
<tr>
<td>St10 Weld Out 2</td>
<td>357</td>
<td>1</td>
<td>44</td>
<td>316.075523</td>
<td>0.649268</td>
<td>1</td>
<td>1</td>
<td>64.93</td>
</tr>
<tr>
<td>St11 Load Out</td>
<td>357</td>
<td>1</td>
<td>43</td>
<td>0.000000</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0.00</td>
</tr>
</tbody>
</table>

LOCATION STATES BY PERCENTAGE (Multiple Capacity)

<table>
<thead>
<tr>
<th>Location Name</th>
<th>Scheduled Hours</th>
<th>% Empty</th>
<th>% Partially</th>
<th>% Occupied</th>
<th>% Full</th>
<th>% Down</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stal Plate Fitting</td>
<td>744</td>
<td>6.91</td>
<td>93.07</td>
<td>0.02</td>
<td>0.00</td>
<td></td>
</tr>
</tbody>
</table>

LOCATION STATES BY PERCENTAGE (Single Capacity/Tanks)
<table>
<thead>
<tr>
<th>Resource Description</th>
<th>Units</th>
<th>Scheduled Hours</th>
<th>Number Of Times Used</th>
<th>Average Minutes Per Usage</th>
<th>Average Minutes Travel To Use</th>
<th>Average Minutes Travel To Park</th>
<th>% Blocked In Travel</th>
<th>% Util</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sta2 Deck Sockets</td>
<td>357</td>
<td>0.00</td>
<td>0.00</td>
<td>99.79</td>
<td>0.21</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Sta3 One Sided Welding</td>
<td>357</td>
<td>76.97</td>
<td>0.00</td>
<td>22.89</td>
<td>0.15</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Sta4 Manual Layout</td>
<td>357</td>
<td>35.58</td>
<td>0.00</td>
<td>64.24</td>
<td>0.18</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Sta5 Stiffener Fitting</td>
<td>357</td>
<td>64.66</td>
<td>0.00</td>
<td>35.08</td>
<td>0.26</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Sta6 Stiffener Welding</td>
<td>357</td>
<td>54.81</td>
<td>0.00</td>
<td>44.88</td>
<td>0.31</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Sta7 Web Fitting 1</td>
<td>357</td>
<td>37.04</td>
<td>0.00</td>
<td>62.60</td>
<td>0.37</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Sta8 Web Fitting 2</td>
<td>357</td>
<td>36.56</td>
<td>0.00</td>
<td>62.93</td>
<td>0.52</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Sta9 Weld Out 1</td>
<td>357</td>
<td>64.72</td>
<td>0.00</td>
<td>34.79</td>
<td>0.49</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Sta10 Weld Out 2</td>
<td>357</td>
<td>64.36</td>
<td>0.00</td>
<td>35.07</td>
<td>0.57</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Sta11 Load Out</td>
<td>357</td>
<td>0.00</td>
<td>0.00</td>
<td>100.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Resource</td>
<td>Scheduled</td>
<td>% In Use</td>
<td>% Travel To Use</td>
<td>% Travel To Park</td>
<td>% Idle</td>
<td>% Down</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>-----------</td>
<td>---------</td>
<td>----------------</td>
<td>-----------------</td>
<td>-------</td>
<td>-------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>crane500</td>
<td>357</td>
<td>37.01</td>
<td>0.03</td>
<td>0.00</td>
<td>62.96</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta7 Web Fitter.1</td>
<td>103</td>
<td>1.69</td>
<td>1.570579</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta7 Web Fitter.2</td>
<td>103</td>
<td>1.69</td>
<td>1.570579</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta7 Web Fitter.3</td>
<td>103</td>
<td>1.69</td>
<td>1.570579</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta7 Web Fitter.4</td>
<td>103</td>
<td>1.69</td>
<td>1.570579</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta7 Web Fitter.5</td>
<td>103</td>
<td>1.69</td>
<td>1.570579</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta7 Web Fitter.6</td>
<td>103</td>
<td>1.69</td>
<td>1.570579</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta7 Web Fitter</td>
<td>6</td>
<td>1.69</td>
<td>1.570579</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.1</td>
<td>60</td>
<td>2.47</td>
<td>1.813902</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.2</td>
<td>60</td>
<td>2.47</td>
<td>1.813902</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.3</td>
<td>60</td>
<td>2.47</td>
<td>1.813902</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.4</td>
<td>60</td>
<td>2.47</td>
<td>1.813902</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.5</td>
<td>60</td>
<td>2.47</td>
<td>1.813902</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.6</td>
<td>60</td>
<td>2.47</td>
<td>1.813902</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.7</td>
<td>60</td>
<td>2.47</td>
<td>1.813902</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.8</td>
<td>60</td>
<td>2.47</td>
<td>1.813902</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder</td>
<td>8</td>
<td>2.47</td>
<td>1.813902</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.1</td>
<td>54</td>
<td>2.83</td>
<td>2.017184</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.2</td>
<td>54</td>
<td>2.83</td>
<td>2.017184</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.3</td>
<td>54</td>
<td>2.83</td>
<td>2.017184</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.4</td>
<td>54</td>
<td>2.83</td>
<td>2.017184</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.5</td>
<td>54</td>
<td>2.83</td>
<td>2.017184</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.6</td>
<td>54</td>
<td>2.83</td>
<td>2.017184</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.7</td>
<td>54</td>
<td>2.83</td>
<td>2.017184</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.8</td>
<td>54</td>
<td>2.83</td>
<td>2.017184</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder</td>
<td>8</td>
<td>2.83</td>
<td>2.017184</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>forklift</td>
<td>357</td>
<td>0.475</td>
<td>0.000000</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One Sided Welder</td>
<td>357</td>
<td>0.475</td>
<td>0.000000</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PL415 Stiffener Press</td>
<td>357</td>
<td>0.067627</td>
<td>0.049817</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DartIV Welder</td>
<td>357</td>
<td>0.06725</td>
<td>0.052878</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spider Gantry No1</td>
<td>357</td>
<td>0.069051</td>
<td>0.050866</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spider Gantry No2</td>
<td>357</td>
<td>0.075453</td>
<td>0.052618</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transfer car</td>
<td>357</td>
<td>0.114</td>
<td>0.000000</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RESOURCE STATES BY PERCENTAGE

<table>
<thead>
<tr>
<th>Resource Name</th>
<th>Scheduled Hours</th>
<th>% In Use</th>
<th>% Travel To Use</th>
<th>% Travel To Park</th>
<th>% Idle</th>
<th>% Down</th>
</tr>
</thead>
<tbody>
<tr>
<td>crane500</td>
<td>357</td>
<td>37.01</td>
<td>0.03</td>
<td>0.00</td>
<td>62.96</td>
<td>0.00</td>
</tr>
<tr>
<td>Sta7 Plate Fitters.1</td>
<td>357</td>
<td>59.15</td>
<td>0.31</td>
<td>0.10</td>
<td>40.43</td>
<td>0.00</td>
</tr>
<tr>
<td>Sta7 Plate Fitters.2</td>
<td>357</td>
<td>59.15</td>
<td>0.31</td>
<td>0.10</td>
<td>40.43</td>
<td>0.00</td>
</tr>
<tr>
<td>Sta7 Plate Fitters.3</td>
<td>714</td>
<td>59.15</td>
<td>0.31</td>
<td>0.10</td>
<td>40.43</td>
<td>0.00</td>
</tr>
<tr>
<td>Sta2 Deck Socket Welders.1</td>
<td>357</td>
<td>0.00</td>
<td>0.11</td>
<td>0.11</td>
<td>99.79</td>
<td>0.00</td>
</tr>
<tr>
<td>Position</td>
<td>Code</td>
<td>Hours</td>
<td>Rate</td>
<td>OT</td>
<td>Total Rate</td>
<td></td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-------</td>
<td>-------</td>
<td>--------</td>
<td>------</td>
<td>------------</td>
<td></td>
</tr>
<tr>
<td>Sta2 Deck Socket Welders.2</td>
<td>357</td>
<td>0.00</td>
<td>0.11</td>
<td>0.11</td>
<td>99.79</td>
<td></td>
</tr>
<tr>
<td>Sta2 Deck Socket Welders.3</td>
<td>357</td>
<td>0.00</td>
<td>0.11</td>
<td>0.11</td>
<td>99.79</td>
<td></td>
</tr>
<tr>
<td>Sta2 Deck Socket Welders.4</td>
<td>357</td>
<td>0.00</td>
<td>0.11</td>
<td>0.11</td>
<td>99.79</td>
<td></td>
</tr>
<tr>
<td>Sta2 Deck Socket Welders</td>
<td>1428</td>
<td>0.00</td>
<td>0.11</td>
<td>0.11</td>
<td>99.79</td>
<td></td>
</tr>
<tr>
<td>Sta2 Deck Socket Fitters.1</td>
<td>357</td>
<td>0.00</td>
<td>0.11</td>
<td>0.11</td>
<td>99.79</td>
<td></td>
</tr>
<tr>
<td>Sta2 Deck Socket Fitters.2</td>
<td>357</td>
<td>0.00</td>
<td>0.11</td>
<td>0.11</td>
<td>99.79</td>
<td></td>
</tr>
<tr>
<td>Sta2 Deck Socket Fitters</td>
<td>714</td>
<td>0.00</td>
<td>0.11</td>
<td>0.11</td>
<td>99.79</td>
<td></td>
</tr>
<tr>
<td>Sta3 OSW Operator.1</td>
<td>357.1717</td>
<td>76.88</td>
<td>0.17</td>
<td>0.17</td>
<td>22.78</td>
<td></td>
</tr>
<tr>
<td>Sta3 OSW Operator.2</td>
<td>357.1717</td>
<td>76.88</td>
<td>0.17</td>
<td>0.17</td>
<td>22.78</td>
<td></td>
</tr>
<tr>
<td>Sta3 OSW Operator</td>
<td>714.3434</td>
<td>76.88</td>
<td>0.17</td>
<td>0.17</td>
<td>22.78</td>
<td></td>
</tr>
<tr>
<td>Sta4 Layout Person.1</td>
<td>357.0750833</td>
<td>35.55</td>
<td>0.20</td>
<td>0.20</td>
<td>64.05</td>
<td></td>
</tr>
<tr>
<td>Sta4 Layout Person.2</td>
<td>357.0750833</td>
<td>35.55</td>
<td>0.20</td>
<td>0.20</td>
<td>64.05</td>
<td></td>
</tr>
<tr>
<td>Sta4 Layout Person</td>
<td>714.1501667</td>
<td>35.55</td>
<td>0.20</td>
<td>0.20</td>
<td>64.05</td>
<td></td>
</tr>
<tr>
<td>Sta5 Stiffener Fitter.1</td>
<td>357.3363167</td>
<td>64.51</td>
<td>0.33</td>
<td>0.33</td>
<td>34.83</td>
<td></td>
</tr>
<tr>
<td>Sta5 Stiffener Fitter.2</td>
<td>357.3363167</td>
<td>64.51</td>
<td>0.33</td>
<td>0.33</td>
<td>34.83</td>
<td></td>
</tr>
<tr>
<td>Sta5 Stiffener Fitter.3</td>
<td>357.3363167</td>
<td>64.51</td>
<td>0.33</td>
<td>0.33</td>
<td>34.83</td>
<td></td>
</tr>
<tr>
<td>Sta5 Stiffener Fitter.4</td>
<td>357.3363167</td>
<td>64.51</td>
<td>0.33</td>
<td>0.33</td>
<td>34.83</td>
<td></td>
</tr>
<tr>
<td>Sta5 Stiffener Fitter</td>
<td>1429.345267</td>
<td>64.51</td>
<td>0.33</td>
<td>0.33</td>
<td>34.83</td>
<td></td>
</tr>
<tr>
<td>Sta6 DartIV Operator.1</td>
<td>357.2292</td>
<td>54.72</td>
<td>0.36</td>
<td>0.37</td>
<td>44.55</td>
<td></td>
</tr>
<tr>
<td>Sta6 DartIV Operator.2</td>
<td>357.2292</td>
<td>54.72</td>
<td>0.36</td>
<td>0.37</td>
<td>44.55</td>
<td></td>
</tr>
<tr>
<td>Sta6 DartIV Operator</td>
<td>714.4584</td>
<td>54.72</td>
<td>0.36</td>
<td>0.37</td>
<td>44.55</td>
<td></td>
</tr>
<tr>
<td>Sta7 Web Fitter.1</td>
<td>357.5689</td>
<td>73.33</td>
<td>0.81</td>
<td>0.78</td>
<td>25.07</td>
<td></td>
</tr>
<tr>
<td>Sta7 Web Fitter.2</td>
<td>357.5689</td>
<td>73.33</td>
<td>0.81</td>
<td>0.78</td>
<td>25.07</td>
<td></td>
</tr>
<tr>
<td>Sta7 Web Fitter.3</td>
<td>357.5689</td>
<td>73.33</td>
<td>0.81</td>
<td>0.78</td>
<td>25.07</td>
<td></td>
</tr>
<tr>
<td>Sta7 Web Fitter.4</td>
<td>357.5689</td>
<td>73.33</td>
<td>0.81</td>
<td>0.78</td>
<td>25.07</td>
<td></td>
</tr>
<tr>
<td>Sta7 Web Fitter.5</td>
<td>357.5689</td>
<td>73.33</td>
<td>0.81</td>
<td>0.78</td>
<td>25.07</td>
<td></td>
</tr>
<tr>
<td>Sta7 Web Fitter.6</td>
<td>357.5689</td>
<td>73.33</td>
<td>0.81</td>
<td>0.78</td>
<td>25.07</td>
<td></td>
</tr>
<tr>
<td>Sta7 Web Fitter</td>
<td>2145.4134</td>
<td>73.33</td>
<td>0.81</td>
<td>0.78</td>
<td>25.07</td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.1</td>
<td>357.7023833</td>
<td>64.40</td>
<td>0.68</td>
<td>0.69</td>
<td>34.22</td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.2</td>
<td>357.7023833</td>
<td>64.40</td>
<td>0.68</td>
<td>0.69</td>
<td>34.22</td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.3</td>
<td>357.7023833</td>
<td>64.40</td>
<td>0.68</td>
<td>0.69</td>
<td>34.22</td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.4</td>
<td>357.7023833</td>
<td>64.40</td>
<td>0.68</td>
<td>0.69</td>
<td>34.22</td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.5</td>
<td>357.7023833</td>
<td>64.40</td>
<td>0.68</td>
<td>0.69</td>
<td>34.22</td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.6</td>
<td>357.7023833</td>
<td>64.40</td>
<td>0.68</td>
<td>0.69</td>
<td>34.22</td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.7</td>
<td>357.7023833</td>
<td>64.40</td>
<td>0.68</td>
<td>0.69</td>
<td>34.22</td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder.8</td>
<td>357.7023833</td>
<td>64.40</td>
<td>0.68</td>
<td>0.69</td>
<td>34.22</td>
<td></td>
</tr>
<tr>
<td>Sta9 Welder</td>
<td>2861.619067</td>
<td>64.40</td>
<td>0.68</td>
<td>0.69</td>
<td>34.22</td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.1</td>
<td>357.5204833</td>
<td>64.13</td>
<td>0.70</td>
<td>0.71</td>
<td>34.45</td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.2</td>
<td>357.5204833</td>
<td>64.13</td>
<td>0.70</td>
<td>0.71</td>
<td>34.45</td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.3</td>
<td>357.5204833</td>
<td>64.13</td>
<td>0.70</td>
<td>0.71</td>
<td>34.45</td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.4</td>
<td>357.5204833</td>
<td>64.13</td>
<td>0.70</td>
<td>0.71</td>
<td>34.45</td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.5</td>
<td>357.5204833</td>
<td>64.13</td>
<td>0.70</td>
<td>0.71</td>
<td>34.45</td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.6</td>
<td>357.5204833</td>
<td>64.13</td>
<td>0.70</td>
<td>0.71</td>
<td>34.45</td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.7</td>
<td>357.5204833</td>
<td>64.13</td>
<td>0.70</td>
<td>0.71</td>
<td>34.45</td>
<td></td>
</tr>
<tr>
<td>Sta10 Welder.8</td>
<td>357.5204833</td>
<td>64.13</td>
<td>0.70</td>
<td>0.71</td>
<td>34.45</td>
<td></td>
</tr>
</tbody>
</table>
Sta10 Welder  2860.163867  64.13  0.70  0.71  34.45  0.00  
forktruck  357  0.19  0.19  0.00  99.63  0.00  
One Sided Welder  357  77.08  0.03  0.03  22.86  0.00  
PL415 Stiffener Press  357  64.88  0.02  0.02  35.09  0.00  
DartIV Welder  357  55.10  0.02  0.02  44.86  0.00  
Spider Gantry No1  357  65.19  0.02  0.02  34.77  0.00  
Spider Gantry No2  357  64.91  0.02  0.02  35.05  0.00  
Transfer car  357  18.28  0.00  1.09  80.63  0.00  

FAILED ARRIVALS

<table>
<thead>
<tr>
<th>Entity</th>
<th>Location</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name</td>
<td>Failed</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>profile</td>
<td>profile staging original</td>
<td>0</td>
</tr>
<tr>
<td>plate cut</td>
<td>plate transfer carl</td>
<td>0</td>
</tr>
<tr>
<td>deck sockets</td>
<td>deck socket staging original</td>
<td>0</td>
</tr>
<tr>
<td>web</td>
<td>Web Staging</td>
<td>0</td>
</tr>
</tbody>
</table>

ENTITY ACTIVITY

<table>
<thead>
<tr>
<th>Entity Name</th>
<th>Total Exits</th>
<th>Quantity In System</th>
<th>Current Minutes</th>
<th>Average In Move Minutes</th>
<th>Average Wait For Res, etc. Minutes</th>
<th>Average Logic Minutes</th>
<th>Average Operation Minutes</th>
<th>Average Blocked</th>
</tr>
</thead>
<tbody>
<tr>
<td>profile</td>
<td>42</td>
<td>51</td>
<td>14508.915310</td>
<td>1.359429</td>
<td>0.000000</td>
<td>0.000000</td>
<td>14507.555881</td>
<td></td>
</tr>
<tr>
<td>plate cut</td>
<td>215</td>
<td>25</td>
<td>4864.955726</td>
<td>21.758651</td>
<td>527.291377</td>
<td>4315.905698</td>
<td>0.000000</td>
<td></td>
</tr>
<tr>
<td>Ent panel line</td>
<td>43</td>
<td>4</td>
<td>4231.986930</td>
<td>0.000000</td>
<td>15.281233</td>
<td>4216.705698</td>
<td>0.000000</td>
<td></td>
</tr>
<tr>
<td>deck sockets</td>
<td>42</td>
<td>1</td>
<td>984.553190</td>
<td>0.992000</td>
<td>0.000000</td>
<td>0.000000</td>
<td>983.561190</td>
<td></td>
</tr>
<tr>
<td>web</td>
<td>43</td>
<td>1</td>
<td>536.975860</td>
<td>0.041000</td>
<td>536.934860</td>
<td>0.000000</td>
<td>0.000000</td>
<td></td>
</tr>
</tbody>
</table>

ENTITY STATES BY PERCENTAGE

<table>
<thead>
<tr>
<th>Entity Name</th>
<th>% In Move Logic</th>
<th>% Wait For Res, etc.</th>
<th>% In Operation</th>
<th>% Blocked</th>
</tr>
</thead>
<tbody>
<tr>
<td>profile</td>
<td>0.01</td>
<td>0.00</td>
<td>0.00</td>
<td>99.99</td>
</tr>
<tr>
<td>plate cut</td>
<td>0.45</td>
<td>10.84</td>
<td>88.71</td>
<td>0.00</td>
</tr>
<tr>
<td>Ent panel line</td>
<td>0.00</td>
<td>0.36</td>
<td>99.64</td>
<td>0.00</td>
</tr>
<tr>
<td>deck sockets</td>
<td>0.10</td>
<td>0.00</td>
<td>0.00</td>
<td>99.90</td>
</tr>
<tr>
<td>Variable</td>
<td>Total Changes</td>
<td>Average Minutes Per Change</td>
<td>Minimum Value</td>
<td>Maximum Value</td>
</tr>
<tr>
<td>---------------------------</td>
<td>---------------</td>
<td>----------------------------</td>
<td>---------------</td>
<td>---------------</td>
</tr>
<tr>
<td>v NoopPanels completed</td>
<td>43</td>
<td>964.975256</td>
<td>3</td>
<td>46</td>
</tr>
<tr>
<td>v total time</td>
<td>43</td>
<td>964.975256</td>
<td>23.5969</td>
<td>49.327</td>
</tr>
<tr>
<td>v cycle time</td>
<td>43</td>
<td>964.975256</td>
<td>7.9955</td>
<td>13.966</td>
</tr>
<tr>
<td>v nof stiffners</td>
<td>42</td>
<td>985.231333</td>
<td>112</td>
<td>784</td>
</tr>
<tr>
<td>v nof webs</td>
<td>43</td>
<td>964.602395</td>
<td>30</td>
<td>288</td>
</tr>
<tr>
<td>v total footage</td>
<td>129</td>
<td>323.052473</td>
<td>15700</td>
<td>179100</td>
</tr>
<tr>
<td>v nof plates</td>
<td>213</td>
<td>195.774742</td>
<td>41</td>
<td>254</td>
</tr>
<tr>
<td>v nof panels per shift</td>
<td>43</td>
<td>964.975256</td>
<td>0.57282</td>
<td>1.00056</td>
</tr>
<tr>
<td>v PanelWIP</td>
<td>85</td>
<td>488.163953</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Resource States

In Use  |  Idle  |  Down

Name

crane500
Sta1_Plate_Fitters.1
Sta1_Plate_Fitters.2
Sta1_Plate_Fitters
Sta2_Deck_Socket_Welders.1
Sta2_Deck_Socket_Welders.2
Sta2_Deck_Socket_Welders.3
Sta2_Deck_Socket_Welders.4
Sta2_Deck_Socket_Welders
Sta2_Deck_Socket_Fitters.1
Sta2_Deck_Socket_Fitters.2
Sta2_Deck_Socket_Fitters
Sta3_OSW_Operator.1
Sta3_OSW_Operator.2
Sta3_OSW_Operator
Sta4_Layout_Person.1
Sta4_Layout_Person.2
Sta4_Layout_Person
Sta5_Stiffener_Fitter.1
Sta5_Stiffener_Fitter.2
Resource States

Name
Sta5_Stiffener_Fitter.3
Sta5_Stiffener_Fitter.4
Sta5_Stiffener_Fitter
Sta6_DartIV_Operator.1
Sta6_DartIV_Operator.2
Sta6_DartIV_Operator
Sta7_Web_Fitter.1
Sta7_Web_Fitter.2
Sta7_Web_Fitter.3
Sta7_Web_Fitter.4
Sta7_Web_Fitter.5
Sta7_Web_Fitter.6
Sta7_Web_Fitter
Sta9_Welder.1
Sta9_Welder.2
Sta9_Welder.3
Sta9_Welder.4
Sta9_Welder.5
Sta9_Welder.6
Sta9_Welder.7
Resource States

Name
Sta9_Welder.8
Sta9_Welder
Sta10_Welder.1
Sta10_Welder.2
Sta10_Welder.3
Sta10_Welder.4
Sta10_Welder.5
Sta10_Welder.6
Sta10_Welder.7
Sta10_Welder.8
Sta10_Welder
forktruck
One_Sided_Welder
PL415_Stiffener_Press
DartIV_Welder
Spider_Gantry_No1
Spider_Gantry_No2
Transfer_car
Single Capacity Location States

Name
Sta2_Dock_Sockets
Sta3_One_Sided_Welding
Sta4_Manual_Layout
Sta5_Stiffener_Fitting
Sta6_Stiffener_Welding
Sta7_Web_Fitting_1
Sta8_Web_Fitting_2
Sta9_Weld_Out_1
Sta10_Weld_Out_2
Sta11_Load_Out
### LOCATIONS

<table>
<thead>
<tr>
<th>Location</th>
<th>Scheduled Hours</th>
<th>Capacity</th>
<th>Total Entries</th>
<th>Average Minutes Per Entry</th>
<th>Average Contents</th>
<th>Maximum Contents</th>
<th>Current Contents</th>
<th>% Util</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roller Table Position 1</td>
<td>425</td>
<td>1</td>
<td>85</td>
<td>292.604212</td>
<td>0.975614</td>
<td>1</td>
<td>1</td>
<td>97.56</td>
</tr>
<tr>
<td>Roller Table Position 2</td>
<td>425</td>
<td>1</td>
<td>85</td>
<td>293.119247</td>
<td>0.977064</td>
<td>1</td>
<td>1</td>
<td>97.71</td>
</tr>
<tr>
<td>Roller Table Position 3</td>
<td>473</td>
<td>1</td>
<td>86</td>
<td>323.315930</td>
<td>0.979745</td>
<td>1</td>
<td>1</td>
<td>97.97</td>
</tr>
<tr>
<td>Roller Table Position 4</td>
<td>425</td>
<td>1</td>
<td>86</td>
<td>289.941942</td>
<td>0.977911</td>
<td>1</td>
<td>1</td>
<td>97.79</td>
</tr>
<tr>
<td>Roller Table Position 5</td>
<td>487</td>
<td>1</td>
<td>88</td>
<td>287.628136</td>
<td>0.866231</td>
<td>1</td>
<td>1</td>
<td>86.62</td>
</tr>
<tr>
<td>Roller Table Position 6</td>
<td>446</td>
<td>1</td>
<td>88</td>
<td>297.268250</td>
<td>0.977564</td>
<td>1</td>
<td>1</td>
<td>97.76</td>
</tr>
<tr>
<td>Roller Table Position 7</td>
<td>439</td>
<td>1</td>
<td>88</td>
<td>292.483943</td>
<td>0.977167</td>
<td>1</td>
<td>1</td>
<td>97.72</td>
</tr>
<tr>
<td>Roller Table Position 8</td>
<td>432</td>
<td>1</td>
<td>88</td>
<td>288.009489</td>
<td>0.97781</td>
<td>1</td>
<td>1</td>
<td>97.78</td>
</tr>
<tr>
<td>Roller Table Position 9</td>
<td>549</td>
<td>1</td>
<td>85</td>
<td>341.252059</td>
<td>0.880584</td>
<td>1</td>
<td>1</td>
<td>88.06</td>
</tr>
<tr>
<td>Roller Table Position 10</td>
<td>425</td>
<td>1</td>
<td>88</td>
<td>282.552716</td>
<td>0.975084</td>
<td>1</td>
<td>1</td>
<td>97.51</td>
</tr>
<tr>
<td>Roller Table Position 11</td>
<td>439</td>
<td>1</td>
<td>90</td>
<td>280.829633</td>
<td>0.959555</td>
<td>1</td>
<td>1</td>
<td>95.96</td>
</tr>
<tr>
<td>Roller Table Position 12</td>
<td>480</td>
<td>1</td>
<td>85</td>
<td>291.731906</td>
<td>0.861014</td>
<td>1</td>
<td>1</td>
<td>86.10</td>
</tr>
<tr>
<td>Roller Table Position 13</td>
<td>487</td>
<td>1</td>
<td>87</td>
<td>328.147552</td>
<td>0.970301</td>
<td>1</td>
<td>1</td>
<td>97.70</td>
</tr>
<tr>
<td>Roller Table Position 14</td>
<td>432</td>
<td>1</td>
<td>87</td>
<td>283.909816</td>
<td>0.952938</td>
<td>1</td>
<td>1</td>
<td>95.29</td>
</tr>
<tr>
<td>Roller Table Position 15</td>
<td>425</td>
<td>1</td>
<td>87</td>
<td>284.325931</td>
<td>0.970053</td>
<td>1</td>
<td>1</td>
<td>97.01</td>
</tr>
<tr>
<td>Roller Table Position 16</td>
<td>446</td>
<td>1</td>
<td>87</td>
<td>299.681103</td>
<td>0.9743</td>
<td>1</td>
<td>1</td>
<td>97.43</td>
</tr>
<tr>
<td>Roller Table Position 17</td>
<td>439.0125333</td>
<td>1</td>
<td>88</td>
<td>287.473057</td>
<td>0.960399</td>
<td>1</td>
<td>1</td>
<td>96.04</td>
</tr>
<tr>
<td>Roller Table Position 18</td>
<td>446</td>
<td>1</td>
<td>88</td>
<td>291.091705</td>
<td>0.957252</td>
<td>1</td>
<td>1</td>
<td>95.73</td>
</tr>
<tr>
<td>Roller Table Position 19</td>
<td>480</td>
<td>1</td>
<td>87</td>
<td>322.930287</td>
<td>0.975519</td>
<td>1</td>
<td>1</td>
<td>97.55</td>
</tr>
<tr>
<td>Roller Table Position 20</td>
<td>508</td>
<td>1</td>
<td>88</td>
<td>334.337102</td>
<td>0.965278</td>
<td>1</td>
<td>1</td>
<td>96.53</td>
</tr>
<tr>
<td>Table10 Position 1</td>
<td>432.0009667</td>
<td>1</td>
<td>113</td>
<td>217.668088</td>
<td>0.948937</td>
<td>1</td>
<td>1</td>
<td>94.89</td>
</tr>
<tr>
<td>Table10 Position 2</td>
<td>425.02505</td>
<td>1</td>
<td>112</td>
<td>216.185625</td>
<td>0.949465</td>
<td>1</td>
<td>1</td>
<td>94.95</td>
</tr>
<tr>
<td>Table10 Position 3</td>
<td>549</td>
<td>1</td>
<td>112</td>
<td>283.029429</td>
<td>0.962334</td>
<td>1</td>
<td>1</td>
<td>96.23</td>
</tr>
<tr>
<td>Table10 Position 4</td>
<td>494</td>
<td>1</td>
<td>110</td>
<td>257.488073</td>
<td>0.95559</td>
<td>1</td>
<td>1</td>
<td>95.56</td>
</tr>
<tr>
<td>Table10 Position 5</td>
<td>494</td>
<td>1</td>
<td>111</td>
<td>255.85018</td>
<td>0.958176</td>
<td>1</td>
<td>1</td>
<td>95.82</td>
</tr>
<tr>
<td>Table10 Position 6</td>
<td>425.0114167</td>
<td>1</td>
<td>112</td>
<td>215.729473</td>
<td>0.947492</td>
<td>1</td>
<td>1</td>
<td>94.75</td>
</tr>
<tr>
<td>Table10 Position 7</td>
<td>425</td>
<td>1</td>
<td>109</td>
<td>222.703394</td>
<td>0.951948</td>
<td>1</td>
<td>1</td>
<td>95.19</td>
</tr>
<tr>
<td>Table10 Position 8</td>
<td>432</td>
<td>1</td>
<td>110</td>
<td>223.737327</td>
<td>0.949503</td>
<td>1</td>
<td>1</td>
<td>94.95</td>
</tr>
</tbody>
</table>
### LOCATION STATES BY PERCENTAGE (Multiple Capacity)

<table>
<thead>
<tr>
<th>Location</th>
<th>Scheduled Hours</th>
<th>% Empty</th>
<th>% Partially Occupied</th>
<th>% Fully Occupied</th>
<th>% Down</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profile Skip Tub</td>
<td>826</td>
<td>3.49</td>
<td>96.14</td>
<td>0.37</td>
<td>0.00</td>
</tr>
<tr>
<td>Table10 Skip Tub</td>
<td>812</td>
<td>2.11</td>
<td>97.52</td>
<td>0.37</td>
<td>0.00</td>
</tr>
<tr>
<td>Flatbar Skip Tub</td>
<td>833</td>
<td>2.40</td>
<td>97.04</td>
<td>0.56</td>
<td>0.00</td>
</tr>
<tr>
<td>ProfileIn</td>
<td>833</td>
<td>0.20</td>
<td>99.80</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>PTABLETEAMIN</td>
<td>425</td>
<td>100.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>ProfileStorage</td>
<td>425</td>
<td>91.74</td>
<td>8.26</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>ProfileStorage2</td>
<td>425</td>
<td>100.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>ProfileOut</td>
<td>826</td>
<td>2.56</td>
<td>97.44</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>FlatbarOut</td>
<td>833</td>
<td>0.91</td>
<td>99.09</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>RBeamOut</td>
<td>812</td>
<td>3.79</td>
<td>96.21</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>TBeamOut</td>
<td>819</td>
<td>9.21</td>
<td>90.79</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>FlatbarIn</td>
<td>833</td>
<td>0.13</td>
<td>99.87</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>FlatbarStorage</td>
<td>425</td>
<td>95.39</td>
<td>4.61</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>FlatbarStorage2</td>
<td>425</td>
<td>100.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>TBeamIn</td>
<td>833</td>
<td>0.59</td>
<td>99.41</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>TBeamStorage</td>
<td>425</td>
<td>92.79</td>
<td>7.21</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>TBeamStorage2</td>
<td>425</td>
<td>100.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>FrameBender</td>
<td>425</td>
<td>100.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>OutgoingPileForProfile</td>
<td>425</td>
<td>100.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>ScrapBinOut1</td>
<td>425</td>
<td>99.76</td>
<td>0.24</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>ScrapBinOut2</td>
<td>425</td>
<td>99.63</td>
<td>0.37</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>ScrapOut</td>
<td>425</td>
<td>99.60</td>
<td>0.40</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>ShearStaging</td>
<td>826</td>
<td>10.98</td>
<td>89.02</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>IronWorkerStaging</td>
<td>729</td>
<td>11.22</td>
<td>88.78</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Bldg2OutStaging</td>
<td>708</td>
<td>20.66</td>
<td>79.34</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>GeneralStorage</td>
<td>771.0353</td>
<td>11.36</td>
<td>88.64</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>FlatbarToShear</td>
<td>826</td>
<td>1.14</td>
<td>98.86</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>FlatbarToBevel</td>
<td>508</td>
<td>71.00</td>
<td>29.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>FlatbarToDeburr</td>
<td>639</td>
<td>27.11</td>
<td>72.89</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Location</td>
<td>Scheduled Hours</td>
<td>Operation %</td>
<td>Setup %</td>
<td>Idle %</td>
<td>Waiting %</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------</td>
<td>-------------</td>
<td>--------</td>
<td>--------</td>
<td>-----------</td>
</tr>
<tr>
<td>BevelToDeburr</td>
<td>432</td>
<td>90.95</td>
<td>9.05</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>IronWorkerOut</td>
<td>833</td>
<td>1.48</td>
<td>98.52</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>ShearOut</td>
<td>833</td>
<td>2.43</td>
<td>97.57</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>BevelOut</td>
<td>501</td>
<td>71.86</td>
<td>28.14</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

LOCATION STATES BY PERCENTAGE (Single Capacity/Tanks)

<table>
<thead>
<tr>
<th>Location Name</th>
<th>Scheduled Hours</th>
<th>Operation %</th>
<th>Setup %</th>
<th>Idle %</th>
<th>Waiting %</th>
<th>Blocked %</th>
<th>Down %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roller Table Position 1</td>
<td>425</td>
<td>92.64</td>
<td>0.00</td>
<td>2.44</td>
<td>4.92</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 2</td>
<td>425</td>
<td>93.07</td>
<td>0.00</td>
<td>2.29</td>
<td>4.38</td>
<td>0.25</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 3</td>
<td>473</td>
<td>83.35</td>
<td>0.00</td>
<td>2.03</td>
<td>14.14</td>
<td>0.49</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 4</td>
<td>425</td>
<td>92.72</td>
<td>0.00</td>
<td>2.21</td>
<td>4.69</td>
<td>0.38</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 5</td>
<td>487</td>
<td>81.20</td>
<td>0.00</td>
<td>13.38</td>
<td>5.38</td>
<td>0.04</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 6</td>
<td>446</td>
<td>88.39</td>
<td>0.00</td>
<td>2.24</td>
<td>9.27</td>
<td>0.10</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 7</td>
<td>439</td>
<td>90.07</td>
<td>0.00</td>
<td>2.28</td>
<td>7.61</td>
<td>0.03</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 8</td>
<td>432</td>
<td>91.60</td>
<td>0.00</td>
<td>2.22</td>
<td>6.08</td>
<td>0.10</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 9</td>
<td>549</td>
<td>71.70</td>
<td>0.00</td>
<td>11.94</td>
<td>16.21</td>
<td>0.15</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 10</td>
<td>425</td>
<td>92.92</td>
<td>0.00</td>
<td>2.49</td>
<td>4.48</td>
<td>0.10</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 11</td>
<td>439</td>
<td>89.41</td>
<td>0.00</td>
<td>4.04</td>
<td>6.54</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 12</td>
<td>480</td>
<td>81.79</td>
<td>0.00</td>
<td>13.90</td>
<td>4.27</td>
<td>0.03</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 13</td>
<td>487</td>
<td>80.78</td>
<td>0.00</td>
<td>2.30</td>
<td>16.75</td>
<td>0.17</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 14</td>
<td>432</td>
<td>90.50</td>
<td>0.00</td>
<td>4.71</td>
<td>4.77</td>
<td>0.02</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 15</td>
<td>425</td>
<td>92.04</td>
<td>0.00</td>
<td>2.99</td>
<td>4.92</td>
<td>0.04</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 16</td>
<td>446</td>
<td>87.73</td>
<td>0.00</td>
<td>2.57</td>
<td>9.66</td>
<td>0.05</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 17</td>
<td>439.0125333</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roller Table Position 18</td>
<td>446</td>
<td>87.78</td>
<td>0.00</td>
<td>4.27</td>
<td>7.80</td>
<td>0.14</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 19</td>
<td>480</td>
<td>81.69</td>
<td>0.00</td>
<td>2.45</td>
<td>15.82</td>
<td>0.04</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 20</td>
<td>508</td>
<td>76.79</td>
<td>0.00</td>
<td>3.47</td>
<td>19.34</td>
<td>0.40</td>
<td>0.00</td>
</tr>
<tr>
<td>Table10 Position 1</td>
<td>432.0009667</td>
<td>89.43</td>
<td>0.00</td>
<td>5.11</td>
<td>5.46</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Table10 Position 2</td>
<td>425.02505</td>
<td>89.81</td>
<td>0.00</td>
<td>5.05</td>
<td>5.14</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Table10 Position 3</td>
<td>549</td>
<td>69.41</td>
<td>0.00</td>
<td>3.77</td>
<td>26.82</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Table10 Position 4</td>
<td>494</td>
<td>76.20</td>
<td>0.00</td>
<td>4.44</td>
<td>19.36</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Table10 Position 5</td>
<td>494</td>
<td>76.23</td>
<td>0.00</td>
<td>4.18</td>
<td>19.59</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Table10 Position 6</td>
<td>425.0114167</td>
<td>89.76</td>
<td>0.00</td>
<td>5.25</td>
<td>4.99</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Table10 Position 7</td>
<td>425</td>
<td>87.84</td>
<td>0.00</td>
<td>4.81</td>
<td>7.36</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Table10 Position 8</td>
<td>432</td>
<td>86.64</td>
<td>0.00</td>
<td>5.05</td>
<td>8.31</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Table10 Position 9</td>
<td>494</td>
<td>75.83</td>
<td>0.00</td>
<td>5.16</td>
<td>19.01</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Flatbar Area Position 1</td>
<td>439</td>
<td>79.01</td>
<td>0.00</td>
<td>9.15</td>
<td>11.79</td>
<td>0.05</td>
<td>0.00</td>
</tr>
<tr>
<td>Flatbar Area Position 2</td>
<td>501</td>
<td>69.52</td>
<td>0.00</td>
<td>10.68</td>
<td>19.64</td>
<td>0.16</td>
<td>0.00</td>
</tr>
<tr>
<td>Flatbar Area Position 3</td>
<td>432.0112667</td>
<td>78.73</td>
<td>0.00</td>
<td>8.08</td>
<td>13.10</td>
<td>0.09</td>
<td>0.00</td>
</tr>
<tr>
<td>Flatbar Area Position 4</td>
<td>487</td>
<td>71.73</td>
<td>0.00</td>
<td>19.89</td>
<td>8.32</td>
<td>0.06</td>
<td>0.00</td>
</tr>
<tr>
<td>Flatbar Area Position 5</td>
<td>487.00245</td>
<td>71.19</td>
<td>0.00</td>
<td>9.10</td>
<td>19.54</td>
<td>0.17</td>
<td>0.00</td>
</tr>
<tr>
<td>Resource Name</td>
<td>Units</td>
<td>Scheduled Hours</td>
<td>Number Of Times Used</td>
<td>Average Minutes Per Usage</td>
<td>Average Minutes Travel To Use</td>
<td>Average Minutes Travel To Park</td>
<td>% Blocked In Travel</td>
</tr>
<tr>
<td>--------------------</td>
<td>-------</td>
<td>----------------</td>
<td>----------------------</td>
<td>---------------------------</td>
<td>-------------------------------</td>
<td>-------------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>PLayoutCrew.1</td>
<td>1</td>
<td>427.0234667</td>
<td>249</td>
<td>75.442936</td>
<td>5.044328</td>
<td>4.585753</td>
<td>0.00</td>
</tr>
<tr>
<td>PLayoutCrew.2</td>
<td>1</td>
<td>426.5666833</td>
<td>236</td>
<td>74.9575627</td>
<td>4.579504</td>
<td>4.125050</td>
<td>0.00</td>
</tr>
<tr>
<td>PLayoutCrew.3</td>
<td>1</td>
<td>426.6214833</td>
<td>224</td>
<td>73.480607</td>
<td>4.646581</td>
<td>4.210906</td>
<td>0.00</td>
</tr>
<tr>
<td>PLayoutCrew.4</td>
<td>1</td>
<td>426.1467</td>
<td>197</td>
<td>78.140650</td>
<td>4.391106</td>
<td>3.898830</td>
<td>0.00</td>
</tr>
<tr>
<td>PLayoutCrew.5</td>
<td>1</td>
<td>425.7150167</td>
<td>174</td>
<td>78.612736</td>
<td>4.535582</td>
<td>4.013990</td>
<td>0.00</td>
</tr>
<tr>
<td>PLayoutCrew.6</td>
<td>1</td>
<td>425.6770167</td>
<td>172</td>
<td>72.151163</td>
<td>4.713285</td>
<td>4.094369</td>
<td>0.00</td>
</tr>
<tr>
<td>PLayoutCrew.7</td>
<td>1</td>
<td>425.7144833</td>
<td>144</td>
<td>76.388889</td>
<td>4.380708</td>
<td>3.710718</td>
<td>0.00</td>
</tr>
<tr>
<td>PLayoutCrew.8</td>
<td>1</td>
<td>425.9600333</td>
<td>127</td>
<td>78.031496</td>
<td>4.662921</td>
<td>3.870529</td>
<td>0.00</td>
</tr>
<tr>
<td>PLayoutCrew.9</td>
<td>1</td>
<td>425.6414333</td>
<td>95</td>
<td>76.842105</td>
<td>4.615726</td>
<td>3.623917</td>
<td>0.00</td>
</tr>
<tr>
<td>PLayoutCrew.10</td>
<td>1</td>
<td>425.5292</td>
<td>84</td>
<td>76.428571</td>
<td>4.665429</td>
<td>3.562691</td>
<td>0.00</td>
</tr>
<tr>
<td>PLayoutCrew.11</td>
<td>1</td>
<td>425.7638167</td>
<td>69</td>
<td>75.942529</td>
<td>4.655000</td>
<td>3.381000</td>
<td>0.00</td>
</tr>
<tr>
<td>PLayoutCrew.12</td>
<td>1</td>
<td>425.1811</td>
<td>43</td>
<td>78.139955</td>
<td>4.297995</td>
<td>2.710014</td>
<td>0.00</td>
</tr>
<tr>
<td>PLayoutCrew.13</td>
<td>1</td>
<td>425.02805</td>
<td>25</td>
<td>84.000000</td>
<td>3.894040</td>
<td>1.908843</td>
<td>0.00</td>
</tr>
<tr>
<td>PLayoutCrew.14</td>
<td>1</td>
<td>425.1002</td>
<td>14</td>
<td>89.285714</td>
<td>4.125357</td>
<td>1.443875</td>
<td>0.00</td>
</tr>
<tr>
<td>PLayoutCrew.15</td>
<td>1</td>
<td>425</td>
<td>8</td>
<td>106.250000</td>
<td>3.654500</td>
<td>0.859882</td>
<td>0.00</td>
</tr>
<tr>
<td>PLayoutCrew.16</td>
<td>1</td>
<td>425</td>
<td>5</td>
<td>64.000000</td>
<td>3.795600</td>
<td>0.612194</td>
<td>0.00</td>
</tr>
<tr>
<td>PLayoutCrew.17</td>
<td>1</td>
<td>425</td>
<td>2</td>
<td>85.000000</td>
<td>7.134500</td>
<td>0.509607</td>
<td>0.00</td>
</tr>
<tr>
<td>PLayoutCrew.18</td>
<td>1</td>
<td>425</td>
<td>1</td>
<td>50.000000</td>
<td>7.149000</td>
<td>0.264778</td>
<td>0.00</td>
</tr>
<tr>
<td>PLayoutCrew.19</td>
<td>1</td>
<td>425</td>
<td>1</td>
<td>50.000000</td>
<td>7.015000</td>
<td>0.259815</td>
<td>0.00</td>
</tr>
<tr>
<td>PLayoutCrew.20</td>
<td>1</td>
<td>425</td>
<td>1</td>
<td>50.000000</td>
<td>6.932000</td>
<td>0.256741</td>
<td>0.00</td>
</tr>
<tr>
<td>PLayoutCrew</td>
<td>20</td>
<td>8511.668683</td>
<td>1871</td>
<td>76.155677</td>
<td>4.616923</td>
<td>3.630203</td>
<td>0.00</td>
</tr>
<tr>
<td>PBurnCrew.1</td>
<td>1</td>
<td>426.2077333</td>
<td>144</td>
<td>156.724653</td>
<td>3.143006</td>
<td>2.777911</td>
<td>0.00</td>
</tr>
<tr>
<td>PBurnCrew.2</td>
<td>1</td>
<td>426.2304333</td>
<td>145</td>
<td>153.779883</td>
<td>3.023738</td>
<td>2.657224</td>
<td>0.00</td>
</tr>
<tr>
<td>PBurnCrew.3</td>
<td>1</td>
<td>426.2649833</td>
<td>142</td>
<td>152.745810</td>
<td>2.879761</td>
<td>2.539913</td>
<td>0.00</td>
</tr>
<tr>
<td>Resource</td>
<td>Scheduled</td>
<td>% In Use</td>
<td>% Travel</td>
<td>Travel %</td>
<td>Travel To Park</td>
<td>Idle %</td>
<td>Down %</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-----------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>----------------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>TPaintCrew.8</td>
<td>1 425.0738</td>
<td>14</td>
<td>23.214286</td>
<td>1.002000</td>
<td>0.170308</td>
<td>0.00</td>
<td>1.33</td>
</tr>
<tr>
<td>TPaintCrew.9</td>
<td>1 425.0413167</td>
<td>1</td>
<td>25.000000</td>
<td>2.479000</td>
<td>0.095346</td>
<td>0.00</td>
<td>0.11</td>
</tr>
<tr>
<td>TPaintCrew</td>
<td>9 3833.0132</td>
<td>1017</td>
<td>24.371976</td>
<td>1.247796</td>
<td>2.054278</td>
<td>0.00</td>
<td>11.33</td>
</tr>
<tr>
<td>FLayoutCrew</td>
<td>1 425.38055</td>
<td>465</td>
<td>46.126875</td>
<td>1.046598</td>
<td>1.111114</td>
<td>0.00</td>
<td>85.95</td>
</tr>
<tr>
<td>FLayoutCrew.2</td>
<td>1 425.2070333</td>
<td>444</td>
<td>46.705523</td>
<td>1.039705</td>
<td>1.109685</td>
<td>0.00</td>
<td>83.09</td>
</tr>
<tr>
<td>FLayoutCrew.3</td>
<td>1 425.3541</td>
<td>418</td>
<td>47.516156</td>
<td>1.126830</td>
<td>1.163000</td>
<td>0.00</td>
<td>79.67</td>
</tr>
<tr>
<td>FLayoutCrew.4</td>
<td>1 425.3227833</td>
<td>370</td>
<td>48.859700</td>
<td>0.953027</td>
<td>0.968736</td>
<td>0.00</td>
<td>72.22</td>
</tr>
<tr>
<td>FLayoutCrew.5</td>
<td>1 425.2750333</td>
<td>320</td>
<td>50.765625</td>
<td>0.975794</td>
<td>1.010419</td>
<td>0.00</td>
<td>64.89</td>
</tr>
<tr>
<td>FLayoutCrew.6</td>
<td>1 425.2781667</td>
<td>251</td>
<td>51.812749</td>
<td>0.902976</td>
<td>0.899393</td>
<td>0.00</td>
<td>51.85</td>
</tr>
<tr>
<td>FLayoutCrew.7</td>
<td>1 425.1135</td>
<td>170</td>
<td>55.936471</td>
<td>0.747359</td>
<td>0.770006</td>
<td>0.00</td>
<td>37.78</td>
</tr>
<tr>
<td>FLayoutCrew.8</td>
<td>1 425.1241667</td>
<td>88</td>
<td>58.125000</td>
<td>0.855034</td>
<td>0.744890</td>
<td>0.00</td>
<td>20.35</td>
</tr>
<tr>
<td>FLayoutCrew.9</td>
<td>1 425.9405833</td>
<td>21</td>
<td>65.714286</td>
<td>0.967333</td>
<td>0.483667</td>
<td>0.00</td>
<td>5.49</td>
</tr>
<tr>
<td>FLayoutCrew</td>
<td>9 3827.054983</td>
<td>2547</td>
<td>49.226655</td>
<td>0.994669</td>
<td>1.016613</td>
<td>0.00</td>
<td>55.71</td>
</tr>
<tr>
<td>FBurnCrew.1</td>
<td>1 425.70935</td>
<td>292</td>
<td>60.909897</td>
<td>1.612483</td>
<td>1.623603</td>
<td>0.00</td>
<td>71.47</td>
</tr>
<tr>
<td>FBurnCrew.2</td>
<td>1 425.5169667</td>
<td>241</td>
<td>61.093685</td>
<td>1.631382</td>
<td>1.585335</td>
<td>0.00</td>
<td>59.21</td>
</tr>
<tr>
<td>FBurnCrew.3</td>
<td>1 425.3889</td>
<td>189</td>
<td>61.887926</td>
<td>1.526233</td>
<td>1.534351</td>
<td>0.00</td>
<td>46.96</td>
</tr>
<tr>
<td>FBurnCrew.4</td>
<td>1 425.3026333</td>
<td>135</td>
<td>65.333333</td>
<td>1.539640</td>
<td>1.424429</td>
<td>0.00</td>
<td>35.38</td>
</tr>
<tr>
<td>FBurnCrew.5</td>
<td>1 425.1278</td>
<td>83</td>
<td>70.361446</td>
<td>1.703145</td>
<td>1.385892</td>
<td>0.00</td>
<td>23.45</td>
</tr>
<tr>
<td>FBurnCrew.6</td>
<td>1 425.0955333</td>
<td>34</td>
<td>71.764706</td>
<td>1.695882</td>
<td>0.977288</td>
<td>0.00</td>
<td>9.79</td>
</tr>
<tr>
<td>FBurnCrew.7</td>
<td>1 425.</td>
<td>9</td>
<td>82.222222</td>
<td>1.163333</td>
<td>0.317273</td>
<td>0.00</td>
<td>2.94</td>
</tr>
<tr>
<td>FBurnCrew.8</td>
<td>1 425.</td>
<td>0</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>FBurnCrew.9</td>
<td>1 425.</td>
<td>0</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Furnace.1</td>
<td>9 3827.141183</td>
<td>983</td>
<td>63.119111</td>
<td>1.596898</td>
<td>1.404243</td>
<td>0.00</td>
<td>27.70</td>
</tr>
<tr>
<td>Carrier</td>
<td>1 425.</td>
<td>836</td>
<td>2.980105</td>
<td>0.617500</td>
<td>0.546431</td>
<td>0.00</td>
<td>11.79</td>
</tr>
<tr>
<td>Crane 600</td>
<td>1 425.1255167</td>
<td>9989</td>
<td>0.785194</td>
<td>0.283236</td>
<td>0.518838</td>
<td>0.00</td>
<td>41.84</td>
</tr>
<tr>
<td>Crane 590</td>
<td>1 425.1941567</td>
<td>8952</td>
<td>1.649164</td>
<td>0.192049</td>
<td>0.382035</td>
<td>0.00</td>
<td>64.61</td>
</tr>
<tr>
<td>Truck</td>
<td>1 425.</td>
<td>117</td>
<td>3.143641</td>
<td>1.143641</td>
<td>0.000000</td>
<td>0.00</td>
<td>1.97</td>
</tr>
<tr>
<td>Forktruck</td>
<td>1 425.2395667</td>
<td>766</td>
<td>3.178279</td>
<td>1.210995</td>
<td>0.877724</td>
<td>0.00</td>
<td>13.19</td>
</tr>
<tr>
<td>ShearCrane</td>
<td>1 425.06295</td>
<td>1481</td>
<td>2.309000</td>
<td>0.175000</td>
<td>0.442824</td>
<td>0.00</td>
<td>14.42</td>
</tr>
</tbody>
</table>

RESOURCES STATES BY PERCENTAGE
| LayoutCrew_9 | 425.6414333 | 28.58 | 1.72  | 1.72  | 67.98 | 0.00 |
| LayoutCrew_10 | 425.5292 | 25.15 | 1.53  | 1.53  | 71.78 | 0.00 |
| LayoutCrew_11 | 425.7638167 | 20.51 | 1.26  | 1.26  | 76.97 | 0.00 |
| LayoutCrew_12 | 425.1811 | 13.17 | 0.73  | 0.73  | 85.36 | 0.00 |
| LayoutCrew_13 | 425.02805 | 8.23  | 0.38  | 0.38  | 91.00 | 0.00 |
| LayoutCrew_14 | 425.1002 | 4.90  | 0.23  | 0.23  | 94.65 | 0.00 |
| LayoutCrew_15 | 425 | 3.33  | 0.11  | 0.11  | 96.44 | 0.00 |
| LayoutCrew_16 | 425 | 1.25  | 0.07  | 0.07  | 98.60 | 0.00 |
| LayoutCrew_17 | 425 | 0.67  | 0.06  | 0.06  | 99.22 | 0.00 |
| LayoutCrew_18 | 425 | 0.20  | 0.03  | 0.03  | 99.75 | 0.00 |
| LayoutCrew_19 | 425 | 0.20  | 0.03  | 0.03  | 99.75 | 0.00 |
| LayoutCrew_20 | 425 | 0.20  | 0.03  | 0.03  | 99.75 | 0.00 |
| LayoutCrew | 8511.668683 | 27.90 | 1.70  | 1.70  | 68.70 | 0.00 |
| PBurnCrew_1 | 426.2077333 | 88.25 | 1.77  | 1.77  | 82.21 | 0.00 |
| PBurnCrew_2 | 426.2304333 | 87.19 | 1.71  | 1.71  | 93.38 | 0.00 |
| PBurnCrew_3 | 426.2649833 | 84.81 | 1.60  | 1.60  | 12.00 | 0.00 |
| PBurnCrew_4 | 426.28975 | 82.37 | 1.52  | 1.52  | 14.59 | 0.00 |
| PBurnCrew_5 | 425.8279167 | 81.61 | 1.22  | 1.22  | 15.96 | 0.00 |
| PBurnCrew_6 | 425.8510833 | 79.25 | 1.36  | 1.36  | 18.03 | 0.00 |
| PBurnCrew_7 | 425.9002833 | 79.36 | 1.35  | 1.35  | 17.94 | 0.00 |
| PBurnCrew_8 | 426.13515 | 74.73 | 1.36  | 1.36  | 22.55 | 0.00 |
| PBurnCrew_9 | 425.9827833 | 72.85 | 1.24  | 1.24  | 24.66 | 0.00 |
| PBurnCrew_10 | 426.1393 | 71.13 | 1.49  | 1.49  | 25.88 | 0.00 |
| PBurnCrew_11 | 425.8141833 | 68.12 | 1.19  | 1.19  | 29.51 | 0.00 |
| PBurnCrew_12 | 425.66545 | 67.77 | 1.28  | 1.28  | 29.68 | 0.00 |
| PBurnCrew_13 | 425.8121 | 66.65 | 1.08  | 1.08  | 31.20 | 0.00 |
| PBurnCrew_14 | 425.6405667 | 63.78 | 1.00  | 1.00  | 34.23 | 0.00 |
| PBurnCrew_15 | 426.0361333 | 58.17 | 1.32  | 1.32  | 39.19 | 0.00 |
| PBurnCrew_16 | 425.66645 | 51.15 | 0.89  | 0.89  | 47.06 | 0.00 |
| PBurnCrew_17 | 425.8013833 | 43.16 | 0.72  | 0.72  | 55.39 | 0.00 |
| PBurnCrew_18 | 425.5161333 | 31.73 | 0.53  | 0.53  | 67.21 | 0.00 |
| PBurnCrew_19 | 425.2622833 | 21.52 | 0.31  | 0.31  | 77.86 | 0.00 |
| PBurnCrew_20 | 425.0093333 | 6.94  | 0.14  | 0.14  | 92.79 | 0.00 |
| PBurnCrew | 8517.073433 | 64.04 | 1.15  | 1.15  | 33.65 | 0.00 |
| TFittingCrew_1 | 425.61145 | 60.58 | 2.98  | 2.98  | 33.45 | 0.00 |
| TFittingCrew_2 | 425.66405 | 53.09 | 2.79  | 2.79  | 41.33 | 0.00 |
| TFittingCrew_3 | 425.4810667 | 48.89 | 2.35  | 2.35  | 46.41 | 0.00 |
| TFittingCrew_4 | 425.3424 | 36.68 | 1.66  | 1.66  | 60.00 | 0.00 |
| TFittingCrew_5 | 425.2097 | 23.52 | 1.14  | 1.14  | 74.19 | 0.00 |
| TFittingCrew_6 | 425 | 6.35  | 0.29  | 0.29  | 93.08 | 0.00 |
| TFittingCrew_7 | 425 | 2.82  | 0.13  | 0.13  | 96.91 | 0.00 |
| TFittingCrew_8 | 425 | 2.12  | 0.13  | 0.13  | 97.61 | 0.00 |
| TFittingCrew_9 | 425 | 0.47  | 0.03  | 0.03  | 99.46 | 0.00 |
| TFittingCrew | 3827.308667 | 26.07 | 1.28  | 1.28  | 71.37 | 0.00 |
| TWeldingCrew_1 | 425.8309167 | 59.63 | 3.16  | 3.16  | 34.06 | 0.00 |
| TWeldingCrew.2 | 426.1512167 | 53.40 | 3.18 | 3.18 | 40.24 | 0.00 |
| TWeldingCrew.3 | 425.5822833 | 48.76 | 2.83 | 2.83 | 45.58 | 0.00 |
| TWeldingCrew.4 | 425.4785333 | 35.81 | 1.89 | 1.89 | 60.40 | 0.00 |
| TWeldingCrew.5 | 425.4119833 | 23.51 | 1.65 | 1.65 | 73.19 | 0.00 |
| TWeldingCrew.6 | 425.1368667 | 7.76 | 0.38 | 0.38 | 91.47 | 0.00 |
| TWeldingCrew.7 | 425.0724167 | 2.82 | 0.19 | 0.19 | 96.80 | 0.00 |
| TWeldingCrew.8 | 425 | 1.89 | 0.15 | 0.15 | 97.82 | 0.00 |
| TWeldingCrew.9 | 425 | 0.24 | 0.01 | 0.01 | 99.74 | 0.00 |
| TWeldingCrew | 3828.664217 | 26.00 | 1.49 | 1.49 | 71.01 | 0.00 |
| TPaintCrew.1 | 426.5644 | 22.11 | 1.40 | 0.37 | 76.13 | 0.00 |
| TPaintCrew.2 | 426.559 | 18.66 | 1.05 | 0.37 | 79.93 | 0.00 |
| TPaintCrew.3 | 426.3903167 | 14.36 | 0.60 | 0.33 | 84.71 | 0.00 |
| TPaintCrew.4 | 426.1704 | 13.69 | 0.66 | 0.27 | 85.38 | 0.00 |
| TPaintCrew.5 | 426.0269167 | 11.65 | 0.48 | 0.24 | 87.63 | 0.00 |
| TPaintCrew.6 | 425.8959667 | 11.94 | 0.57 | 0.21 | 87.28 | 0.00 |
| TPaintCrew.7 | 425.2910833 | 3.14 | 0.14 | 0.07 | 96.65 | 0.00 |
| TPaintCrew.8 | 425.0738 | 1.27 | 0.06 | 0.02 | 98.65 | 0.00 |
| TPaintCrew.9 | 425.0413167 | 0.10 | 0.01 | 0.01 | 99.88 | 0.00 |
| TPaintCrew | 3833.0132 | 10.78 | 0.55 | 0.21 | 88.46 | 0.00 |
| FLayoutCrew.1 | 425.38055 | 84.04 | 1.91 | 1.91 | 12.15 | 0.00 |
| FLayoutCrew.2 | 425.2070333 | 81.28 | 1.81 | 1.81 | 15.10 | 0.00 |
| FLayoutCrew.3 | 425.3541 | 77.82 | 1.85 | 1.85 | 18.48 | 0.00 |
| FLayoutCrew.4 | 425.3227833 | 70.84 | 1.38 | 1.38 | 26.40 | 0.00 |
| FLayoutCrew.5 | 425.2750333 | 63.66 | 1.23 | 1.23 | 33.88 | 0.00 |
| FLayoutCrew.6 | 425.2778167 | 50.97 | 0.89 | 0.89 | 47.26 | 0.00 |
| FLayoutCrew.7 | 425.1135 | 37.28 | 0.50 | 0.50 | 61.72 | 0.00 |
| FLayoutCrew.8 | 425.1241667 | 20.05 | 0.29 | 0.29 | 79.36 | 0.00 |
| FLayoutCrew.9 | 425 | 5.41 | 0.08 | 0.08 | 94.43 | 0.00 |
| FBurnCrew.1 | 3827.054983 | 54.60 | 1.10 | 1.10 | 43.19 | 0.00 |
| FBurnCrew.1 | 425.70935 | 69.63 | 1.84 | 1.84 | 26.68 | 0.00 |
| FBurnCrew.2 | 425.5169667 | 57.67 | 1.54 | 1.54 | 39.25 | 0.00 |
| FBurnCrew.3 | 425.3889 | 45.83 | 1.13 | 1.13 | 51.91 | 0.00 |
| FBurnCrew.4 | 425.3026333 | 34.56 | 0.82 | 0.82 | 63.80 | 0.00 |
| FBurnCrew.5 | 425.1278 | 22.90 | 0.55 | 0.55 | 76.00 | 0.00 |
| FBurnCrew.6 | 425.0955333 | 9.57 | 0.23 | 0.23 | 89.98 | 0.00 |
| FBurnCrew.7 | 425 | 2.90 | 0.04 | 0.04 | 97.02 | 0.00 |
| FBurnCrew.8 | 425 | 0.00 | 0.00 | 0.00 | 100.00 | 0.00 |
| FBurnCrew.9 | 425 | 0.00 | 0.00 | 0.00 | 100.00 | 0.00 |
| FBurnCrew | 3827.141183 | 27.02 | 0.68 | 0.68 | 71.61 | 0.00 |
| Carrier | 425 | 9.77 | 2.02 | 0.59 | 87.61 | 0.00 |
| Crane 600 | 425.1255167 | 30.75 | 11.10 | 2.93 | 55.22 | 0.00 |
| Crane 590 | 425.19415 | 57.87 | 6.74 | 1.72 | 33.67 | 0.00 |
| Truck | 425 | 1.44 | 0.52 | 0.00 | 98.03 | 0.00 |
| Forktruck | 425.2395667 | 9.54 | 3.65 | 2.52 | 84.29 | 0.00 |
| ShearCrane | 425.06295 | 13.41 | 1.02 | 2.61 | 82.96 | 0.00 |
### FAILED ARRIVALS

<table>
<thead>
<tr>
<th>Entity</th>
<th>Location</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBlock</td>
<td>ProfileStorage</td>
<td>110</td>
</tr>
<tr>
<td>CBlock</td>
<td>FlatbarStorage</td>
<td>336</td>
</tr>
<tr>
<td>CBlock</td>
<td>TBeamStorage</td>
<td>224</td>
</tr>
</tbody>
</table>

### ENTITY ACTIVITY

<table>
<thead>
<tr>
<th>Entity</th>
<th>Total Exits</th>
<th>Current Quantity</th>
<th>In System</th>
<th>In Move</th>
<th>Wait For Res, etc.</th>
<th>In Operation</th>
<th>Blocked</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profile</td>
<td>4123</td>
<td>631</td>
<td>10476.720978</td>
<td>38.898463</td>
<td>387.967461</td>
<td>410.154065</td>
<td>9639.700989</td>
</tr>
<tr>
<td>Flatbar</td>
<td>4608</td>
<td>1346</td>
<td>7314.005296</td>
<td>73.407934</td>
<td>677.152189</td>
<td>220.302370</td>
<td>6343.142802</td>
</tr>
<tr>
<td>TBeam</td>
<td>1102</td>
<td>75</td>
<td>10352.120356</td>
<td>38.694982</td>
<td>197.916079</td>
<td>972.309606</td>
<td>9143.199689</td>
</tr>
<tr>
<td>RtBeam</td>
<td>0</td>
<td>459</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scrap</td>
<td>1092</td>
<td>6</td>
<td>524.091607</td>
<td>10.452898</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scrap2</td>
<td>900</td>
<td>12</td>
<td>705.859780</td>
<td>13.911968</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scrap3</td>
<td>1050</td>
<td>7</td>
<td>548.327615</td>
<td>10.810085</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CarrierBlock</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>nothing</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBlock</td>
<td>600</td>
<td>2</td>
<td>25.755150</td>
<td>25.755150</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
</tr>
<tr>
<td>ScrapBin</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFflatbar</td>
<td>17885</td>
<td>124</td>
<td>976.320200</td>
<td>65.126582</td>
<td>468.085436</td>
<td>24.032541</td>
<td>419.075641</td>
</tr>
</tbody>
</table>

### ENTITY STATES BY PERCENTAGE

<table>
<thead>
<tr>
<th>Entity</th>
<th>In Move Logic</th>
<th>Wait For Res, etc.</th>
<th>In Operation</th>
<th>Blocked</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profile</td>
<td>0.37</td>
<td>3.70</td>
<td>3.91</td>
<td>92.01</td>
</tr>
<tr>
<td>Flatbar</td>
<td>1.00</td>
<td>9.26</td>
<td>3.01</td>
<td>86.73</td>
</tr>
<tr>
<td>TBeam</td>
<td>0.37</td>
<td>1.91</td>
<td>9.39</td>
<td>88.32</td>
</tr>
<tr>
<td>Scrap</td>
<td>1.99</td>
<td>98.01</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Scrap2</td>
<td>1.97</td>
<td>98.03</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Scrap3</td>
<td>1.97</td>
<td>98.03</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Variable Name</td>
<td>Total Changes</td>
<td>Average Minutes Per Change</td>
<td>Minimum Value</td>
<td>Maximum Value</td>
</tr>
<tr>
<td>----------------------------</td>
<td>---------------</td>
<td>---------------------------</td>
<td>---------------</td>
<td>--------------</td>
</tr>
<tr>
<td>v TotalProfilesArrived</td>
<td>984</td>
<td>48.239792</td>
<td>0</td>
<td>984</td>
</tr>
<tr>
<td>v TotalFlatbarsArrived</td>
<td>2426</td>
<td>19.585580</td>
<td>0</td>
<td>2426</td>
</tr>
<tr>
<td>v TotalTBeamsArrived</td>
<td>757</td>
<td>62.731407</td>
<td>0</td>
<td>757</td>
</tr>
<tr>
<td>v TotalProfilesProcessed</td>
<td>981</td>
<td>48.402087</td>
<td>0</td>
<td>981</td>
</tr>
<tr>
<td>v TotalFlatbarsProcessed</td>
<td>912</td>
<td>52.059214</td>
<td>0</td>
<td>912</td>
</tr>
<tr>
<td>v TotalTBeamsProcessed</td>
<td>741</td>
<td>64.126588</td>
<td>0</td>
<td>741</td>
</tr>
<tr>
<td>v TotalProfilesProduced</td>
<td>4074</td>
<td>11.655812</td>
<td>0</td>
<td>4074</td>
</tr>
<tr>
<td>v TotalFlatbarsProduced</td>
<td>11494</td>
<td>4.134310</td>
<td>0</td>
<td>11494</td>
</tr>
<tr>
<td>v TotalTBeamsProduced</td>
<td>990</td>
<td>47.996470</td>
<td>0</td>
<td>990</td>
</tr>
<tr>
<td>v PBatchSize</td>
<td>100</td>
<td>470.401000</td>
<td>0</td>
<td>16</td>
</tr>
<tr>
<td>v FBatchSize</td>
<td>300</td>
<td>156.800000</td>
<td>0</td>
<td>16</td>
</tr>
<tr>
<td>v TBatchSize</td>
<td>200</td>
<td>235.200000</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>v Counter</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v PScrap</td>
<td>981</td>
<td>48.406429</td>
<td>0</td>
<td>981</td>
</tr>
<tr>
<td>v FScrap</td>
<td>912</td>
<td>52.067229</td>
<td>0</td>
<td>912</td>
</tr>
<tr>
<td>v TScrap</td>
<td>1056</td>
<td>45.000069</td>
<td>0</td>
<td>1056</td>
</tr>
<tr>
<td>v PPerUnit</td>
<td>100</td>
<td>470.401000</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>v FPerUnit</td>
<td>305</td>
<td>154.229508</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>v TPerUnit</td>
<td>200</td>
<td>235.200000</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>v PPerUnitBatch</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v FPerUnitBatch</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v TPerUnitBatch</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v PTotal</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v FTotal</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v TTotal</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v TotalFToShear</td>
<td>1505</td>
<td>31.568660</td>
<td>0</td>
<td>1505</td>
</tr>
<tr>
<td>v TotalShearProduced</td>
<td>8411</td>
<td>5.649715</td>
<td>0</td>
<td>8411</td>
</tr>
<tr>
<td>v Count</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v ProfileWIP</td>
<td>1045</td>
<td>45.424837</td>
<td>0</td>
<td>923</td>
</tr>
<tr>
<td>v TBeamWIP</td>
<td>812</td>
<td>58.482358</td>
<td>0</td>
<td>702</td>
</tr>
<tr>
<td>v FlatBarWIP</td>
<td>2546</td>
<td>18.662458</td>
<td>0</td>
<td>2306</td>
</tr>
<tr>
<td>v ProfileFlowTime</td>
<td>61</td>
<td>775.257787</td>
<td>0</td>
<td>3537.66</td>
</tr>
<tr>
<td>v TBeamFlowTime</td>
<td>55</td>
<td>863.032873</td>
<td>0</td>
<td>3518.94</td>
</tr>
<tr>
<td>v FlatBarFlowTime</td>
<td>120</td>
<td>394.281208</td>
<td>0</td>
<td>7186.5</td>
</tr>
</tbody>
</table>
Resource States

In Use  Travel To Use  Idle  Down

0%  25%  50%  75%  100%

Name
PLayoutCrew
PBurnCrew.1
PBurnCrew.2
PBurnCrew.3
PBurnCrew.4
PBurnCrew.5
PBurnCrew.6
PBurnCrew.7
PBurnCrew.8
PBurnCrew.9
PBurnCrew.10
PBurnCrew.11
PBurnCrew.12
PBurnCrew.13
PBurnCrew.14
PBurnCrew.15
PBurnCrew.16
PBurnCrew.17
PBurnCrew.18
PBurnCrew.19
Single Capacity Location States

Name
Table10_Position_1
Table10_Position_2
Table10_Position_3
Table10_Position_4
Table10_Position_5
Table10_Position_6
Table10_Position_7
Table10_Position_8
Table10_Position_9
Flatbar_Area_Position_1
Flatbar_Area_Position_2
Flatbar_Area_Position_3
Flatbar_Area_Position_4
Flatbar_Area_Position_5
Flatbar_Area_Position_6
Flatbar_Area_Position_7
Flatbar_Area_Position_8
Flatbar_Area_Position_9
Bulldozer
Bulldozer2
Single Capacity Location States

Name
Table
Table2
Shear
IronWorker
BevelStation
DeburrStation
DETAILED PERFORMANCE STATISTICS FOR THE
"MOST LIKELY OPERATING CONDITION"
PROFILE FABRICATION AREA MODEL
## LOCATIONS

<table>
<thead>
<tr>
<th>Location Name</th>
<th>Scheduled Hours</th>
<th>Capacity</th>
<th>Total Entries</th>
<th>Average Minutes Per Entry</th>
<th>Average Contents</th>
<th>Maximum Contents</th>
<th>Current Contents</th>
<th>% Util</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roller Table Position 1</td>
<td>453</td>
<td>1</td>
<td>94</td>
<td>275.439681</td>
<td>0.952588</td>
<td>1</td>
<td>1</td>
<td>95.26</td>
</tr>
<tr>
<td>Roller Table Position 2</td>
<td>549</td>
<td>1</td>
<td>92</td>
<td>316.901620</td>
<td>0.885093</td>
<td>1</td>
<td>1</td>
<td>88.51</td>
</tr>
<tr>
<td>Roller Table Position 3</td>
<td>487</td>
<td>1</td>
<td>93</td>
<td>308.805086</td>
<td>0.98285</td>
<td>1</td>
<td>1</td>
<td>98.28</td>
</tr>
<tr>
<td>Roller Table Position 4</td>
<td>425.0036167</td>
<td>1</td>
<td>90</td>
<td>278.218589</td>
<td>0.98194</td>
<td>1</td>
<td>1</td>
<td>98.19</td>
</tr>
<tr>
<td>Roller Table Position 5</td>
<td>432</td>
<td>1</td>
<td>89</td>
<td>285.528831</td>
<td>0.980404</td>
<td>1</td>
<td>1</td>
<td>98.04</td>
</tr>
<tr>
<td>Roller Table Position 6</td>
<td>446</td>
<td>1</td>
<td>92</td>
<td>285.583152</td>
<td>0.981825</td>
<td>1</td>
<td>1</td>
<td>98.18</td>
</tr>
<tr>
<td>Roller Table Position 7</td>
<td>439.0065667</td>
<td>1</td>
<td>94</td>
<td>271.096734</td>
<td>0.967453</td>
<td>1</td>
<td>1</td>
<td>96.75</td>
</tr>
<tr>
<td>Roller Table Position 8</td>
<td>480</td>
<td>1</td>
<td>91</td>
<td>310.903813</td>
<td>0.98237</td>
<td>1</td>
<td>1</td>
<td>98.24</td>
</tr>
<tr>
<td>Roller Table Position 9</td>
<td>425</td>
<td>1</td>
<td>90</td>
<td>278.604056</td>
<td>0.983308</td>
<td>1</td>
<td>1</td>
<td>98.33</td>
</tr>
<tr>
<td>Roller Table Position 10</td>
<td>446</td>
<td>1</td>
<td>90</td>
<td>291.910956</td>
<td>0.981763</td>
<td>1</td>
<td>1</td>
<td>98.18</td>
</tr>
<tr>
<td>Roller Table Position 11</td>
<td>432.0055667</td>
<td>1</td>
<td>90</td>
<td>282.132522</td>
<td>0.979614</td>
<td>1</td>
<td>1</td>
<td>97.96</td>
</tr>
<tr>
<td>Roller Table Position 12</td>
<td>425</td>
<td>1</td>
<td>90</td>
<td>277.773922</td>
<td>0.980379</td>
<td>1</td>
<td>1</td>
<td>98.04</td>
</tr>
<tr>
<td>Roller Table Position 13</td>
<td>439</td>
<td>1</td>
<td>92</td>
<td>280.688413</td>
<td>0.980385</td>
<td>1</td>
<td>1</td>
<td>98.04</td>
</tr>
<tr>
<td>Roller Table Position 14</td>
<td>446</td>
<td>1</td>
<td>92</td>
<td>280.443913</td>
<td>0.964157</td>
<td>1</td>
<td>1</td>
<td>96.42</td>
</tr>
<tr>
<td>Roller Table Position 15</td>
<td>446</td>
<td>1</td>
<td>92</td>
<td>280.087239</td>
<td>0.962931</td>
<td>1</td>
<td>1</td>
<td>96.29</td>
</tr>
<tr>
<td>Roller Table Position 16</td>
<td>432</td>
<td>1</td>
<td>93</td>
<td>271.575688</td>
<td>0.974404</td>
<td>1</td>
<td>1</td>
<td>97.44</td>
</tr>
<tr>
<td>Roller Table Position 17</td>
<td>494</td>
<td>1</td>
<td>89</td>
<td>326.724258</td>
<td>0.981055</td>
<td>1</td>
<td>1</td>
<td>98.11</td>
</tr>
<tr>
<td>Roller Table Position 18</td>
<td>494</td>
<td>1</td>
<td>90</td>
<td>318.038178</td>
<td>0.965703</td>
<td>1</td>
<td>1</td>
<td>96.57</td>
</tr>
<tr>
<td>Roller Table Position 19</td>
<td>432.0095167</td>
<td>1</td>
<td>92</td>
<td>271.011826</td>
<td>0.961904</td>
<td>1</td>
<td>1</td>
<td>96.19</td>
</tr>
<tr>
<td>Roller Table Position 20</td>
<td>446</td>
<td>1</td>
<td>89</td>
<td>293.663730</td>
<td>0.976751</td>
<td>1</td>
<td>1</td>
<td>97.68</td>
</tr>
<tr>
<td>Table10 Position 1</td>
<td>446</td>
<td>1</td>
<td>111</td>
<td>228.158045</td>
<td>0.946395</td>
<td>1</td>
<td>1</td>
<td>94.64</td>
</tr>
<tr>
<td>Table10 Position 2</td>
<td>446.0105167</td>
<td>1</td>
<td>109</td>
<td>232.479477</td>
<td>0.946923</td>
<td>1</td>
<td>1</td>
<td>94.69</td>
</tr>
<tr>
<td>Table10 Position 3</td>
<td>439</td>
<td>1</td>
<td>110</td>
<td>225.689145</td>
<td>0.942514</td>
<td>1</td>
<td>1</td>
<td>94.25</td>
</tr>
<tr>
<td>Table10 Position 4</td>
<td>501</td>
<td>1</td>
<td>110</td>
<td>259.812000</td>
<td>0.950743</td>
<td>1</td>
<td>1</td>
<td>95.07</td>
</tr>
<tr>
<td>Table10 Position 5</td>
<td>425</td>
<td>1</td>
<td>109</td>
<td>223.084661</td>
<td>0.953578</td>
<td>1</td>
<td>1</td>
<td>95.36</td>
</tr>
<tr>
<td>Table10 Position 6</td>
<td>432</td>
<td>1</td>
<td>110</td>
<td>225.418373</td>
<td>0.956637</td>
<td>1</td>
<td>1</td>
<td>95.66</td>
</tr>
<tr>
<td>Table10 Position 7</td>
<td>446</td>
<td>1</td>
<td>109</td>
<td>232.596009</td>
<td>0.94742</td>
<td>1</td>
<td>1</td>
<td>94.74</td>
</tr>
<tr>
<td>Table10 Position 8</td>
<td>446.0147</td>
<td>1</td>
<td>109</td>
<td>236.590266</td>
<td>0.963658</td>
<td>1</td>
<td>1</td>
<td>96.37</td>
</tr>
<tr>
<td>Table 10 Position 9</td>
<td>480</td>
<td>1</td>
<td></td>
<td>109</td>
<td>253.222963</td>
<td>0.958379</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Flatbar Area Position 1</td>
<td>446.0087333</td>
<td>1</td>
<td>215</td>
<td>117.267781</td>
<td>0.942155</td>
<td>1</td>
<td>1</td>
<td>94.22</td>
</tr>
<tr>
<td>Flatbar Area Position 2</td>
<td>549.0212667</td>
<td>1</td>
<td>214</td>
<td>146.925636</td>
<td>0.954489</td>
<td>1</td>
<td>1</td>
<td>95.45</td>
</tr>
<tr>
<td>Flatbar Area Position 3</td>
<td>508.0088333</td>
<td>1</td>
<td>209</td>
<td>138.940780</td>
<td>0.952695</td>
<td>1</td>
<td>1</td>
<td>95.27</td>
</tr>
<tr>
<td>Flatbar Area Position 4</td>
<td>508</td>
<td>1</td>
<td>224</td>
<td>125.687509</td>
<td>0.923688</td>
<td>1</td>
<td>1</td>
<td>92.37</td>
</tr>
<tr>
<td>Flatbar Area Position 5</td>
<td>501</td>
<td>1</td>
<td>245</td>
<td>116.081861</td>
<td>0.94611</td>
<td>1</td>
<td>1</td>
<td>94.61</td>
</tr>
<tr>
<td>Flatbar Area Position 6</td>
<td>501</td>
<td>1</td>
<td>237</td>
<td>117.311941</td>
<td>0.924915</td>
<td>1</td>
<td>1</td>
<td>92.49</td>
</tr>
<tr>
<td>Flatbar Area Position 7</td>
<td>563</td>
<td>1</td>
<td>230</td>
<td>137.982670</td>
<td>0.939491</td>
<td>1</td>
<td>1</td>
<td>93.95</td>
</tr>
<tr>
<td>Flatbar Area Position 8</td>
<td>508</td>
<td>1</td>
<td>217</td>
<td>133.375373</td>
<td>0.949556</td>
<td>1</td>
<td>1</td>
<td>94.96</td>
</tr>
<tr>
<td>Flatbar Area Position 9</td>
<td>460.0183667</td>
<td>1</td>
<td>228</td>
<td>112.608886</td>
<td>0.93021</td>
<td>1</td>
<td>1</td>
<td>93.02</td>
</tr>
<tr>
<td>Profile Skip Tub</td>
<td>826</td>
<td>25</td>
<td>1023</td>
<td>491.447076</td>
<td>10.19339</td>
<td>25</td>
<td>3</td>
<td>40.78</td>
</tr>
<tr>
<td>Table 10 Skip Tub</td>
<td>826</td>
<td>25</td>
<td>1023</td>
<td>556.353187</td>
<td>11.484</td>
<td>25</td>
<td>3</td>
<td>45.94</td>
</tr>
<tr>
<td>Flatbar Skip Tub</td>
<td>833</td>
<td>25</td>
<td>790</td>
<td>760.478995</td>
<td>12.0204</td>
<td>25</td>
<td>15</td>
<td>48.08</td>
</tr>
<tr>
<td>ProfileIn</td>
<td>833</td>
<td>999999</td>
<td>1600</td>
<td>9533.15269</td>
<td>305.183</td>
<td>586</td>
<td>564</td>
<td>0.03</td>
</tr>
<tr>
<td>TABLETBEMIN</td>
<td>425</td>
<td>999999</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>ProfileStorage</td>
<td>425</td>
<td>999999</td>
<td>100</td>
<td>40.983200</td>
<td>0.160718</td>
<td>2</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>ProfileStorage2</td>
<td>425</td>
<td>999999</td>
<td>63</td>
<td>0.000000</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>ProfileOut</td>
<td>826</td>
<td>999999</td>
<td>3779</td>
<td>507.028425</td>
<td>38.6614</td>
<td>129</td>
<td>57</td>
<td>0.00</td>
</tr>
<tr>
<td>FlatbarOut</td>
<td>778</td>
<td>999999</td>
<td>3063</td>
<td>507.628388</td>
<td>33.309</td>
<td>128</td>
<td>34</td>
<td>0.00</td>
</tr>
<tr>
<td>RTBeamOut</td>
<td>826</td>
<td>999999</td>
<td>1023</td>
<td>861.048979</td>
<td>17.7735</td>
<td>44</td>
<td>37</td>
<td>0.00</td>
</tr>
<tr>
<td>TBeamOut</td>
<td>826</td>
<td>999999</td>
<td>977</td>
<td>226.496020</td>
<td>4.46502</td>
<td>18</td>
<td>5</td>
<td>0.00</td>
</tr>
<tr>
<td>FlatbarIn</td>
<td>833</td>
<td>999999</td>
<td>3712</td>
<td>11981.357554</td>
<td>889.852</td>
<td>1719</td>
<td>1693</td>
<td>0.09</td>
</tr>
<tr>
<td>FlatbarStorage</td>
<td>425</td>
<td>999999</td>
<td>300</td>
<td>12.386803</td>
<td>0.145727</td>
<td>6</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>FlatbarStorage2</td>
<td>425.0073833</td>
<td>999999</td>
<td>49</td>
<td>0.000000</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>TBeamIn</td>
<td>833</td>
<td>999999</td>
<td>1200</td>
<td>8955.644671</td>
<td>215.021</td>
<td>424</td>
<td>412</td>
<td>0.02</td>
</tr>
<tr>
<td>TBeamStorage</td>
<td>425</td>
<td>999999</td>
<td>200</td>
<td>32.587700</td>
<td>0.25559</td>
<td>4</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>TBeamStorage2</td>
<td>432</td>
<td>999999</td>
<td>126</td>
<td>0.000000</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>FrameBender</td>
<td>425</td>
<td>999999</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Bulldozer</td>
<td>425</td>
<td>1</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Bulldozer2</td>
<td>425</td>
<td>1</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>OutgoingPileForProfile</td>
<td>425</td>
<td>999999</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>ScrapBinOut1</td>
<td>425</td>
<td>25</td>
<td>41</td>
<td>1.600000</td>
<td>0.00257255</td>
<td>1</td>
<td>0</td>
<td>0.01</td>
</tr>
<tr>
<td>ScrapBinOut3</td>
<td>425</td>
<td>25</td>
<td>40</td>
<td>2.241000</td>
<td>0.00351529</td>
<td>1</td>
<td>0</td>
<td>0.01</td>
</tr>
<tr>
<td>ScrapBinOut2</td>
<td>425</td>
<td>25</td>
<td>31</td>
<td>2.619000</td>
<td>0.00318388</td>
<td>1</td>
<td>0</td>
<td>0.01</td>
</tr>
<tr>
<td>ScrapOut</td>
<td>425</td>
<td>999999</td>
<td>112</td>
<td>0.000000</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Table</td>
<td>425</td>
<td>1</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Table2</td>
<td>425</td>
<td>1</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>ShearStaging</td>
<td>736</td>
<td>999999</td>
<td>48</td>
<td>922.657708</td>
<td>1.00289</td>
<td>2</td>
<td>1</td>
<td>0.00</td>
</tr>
<tr>
<td>Shear</td>
<td>425.0276833</td>
<td>1199</td>
<td>1199</td>
<td>15.411059</td>
<td>0.724575</td>
<td>1</td>
<td>1</td>
<td>72.46</td>
</tr>
<tr>
<td>IronWorkerStaging</td>
<td>812</td>
<td>999999</td>
<td>68</td>
<td>2696.691735</td>
<td>3.76386</td>
<td>9</td>
<td>5</td>
<td>0.00</td>
</tr>
<tr>
<td>IronWorker</td>
<td>425</td>
<td>1</td>
<td>1009</td>
<td>22.619944</td>
<td>0.89504</td>
<td>1</td>
<td>1</td>
<td>89.50</td>
</tr>
<tr>
<td>BevelStation</td>
<td>425</td>
<td>1</td>
<td>1200</td>
<td>5.000000</td>
<td>0.235294</td>
<td>1</td>
<td>0</td>
<td>23.53</td>
</tr>
<tr>
<td>DeburrStation</td>
<td>425</td>
<td>1</td>
<td>8375</td>
<td>2.000000</td>
<td>0.656863</td>
<td>1</td>
<td>0</td>
<td>65.69</td>
</tr>
<tr>
<td>Bldg2OutStaging</td>
<td>647</td>
<td>999999</td>
<td>8375</td>
<td>41.789406</td>
<td>9.01562</td>
<td>34</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>GeneralStorage</td>
<td>633</td>
<td>999999</td>
<td>335</td>
<td>255.489967</td>
<td>2.25353</td>
<td>5</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Location</td>
<td>Scheduled Hours</td>
<td>% Empty</td>
<td>% Occupied</td>
<td>% Full</td>
<td>% Down</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------</td>
<td>---------</td>
<td>------------</td>
<td>--------</td>
<td>--------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FlatbarToShear</td>
<td>826</td>
<td>999999</td>
<td>1220</td>
<td>500.972852</td>
<td>12.3323</td>
<td>27</td>
<td>20</td>
<td>0.00</td>
</tr>
<tr>
<td>FlatbarToBevel</td>
<td>460</td>
<td>999999</td>
<td>48</td>
<td>171.190208</td>
<td>0.297722</td>
<td>2</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>FlatbarToDeburr</td>
<td>619</td>
<td>999999</td>
<td>287</td>
<td>105.536840</td>
<td>0.815538</td>
<td>2</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>BevelToDeburr</td>
<td>439</td>
<td>999999</td>
<td>48</td>
<td>86.220042</td>
<td>0.157121</td>
<td>1</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>IronWorkerOut</td>
<td>826</td>
<td>999999</td>
<td>3796</td>
<td>178.743837</td>
<td>13.6907</td>
<td>32</td>
<td>21</td>
<td>0.00</td>
</tr>
<tr>
<td>ShearOut</td>
<td>833</td>
<td>999999</td>
<td>4617</td>
<td>133.734325</td>
<td>12.354</td>
<td>32</td>
<td>17</td>
<td>0.00</td>
</tr>
<tr>
<td>BevelOut</td>
<td>460</td>
<td>999999</td>
<td>1200</td>
<td>85.889167</td>
<td>3.73431</td>
<td>25</td>
<td>0</td>
<td>0.00</td>
</tr>
</tbody>
</table>

LOCATION STATES BY PERCENTAGE (Multiple Capacity)
<table>
<thead>
<tr>
<th>Location Name</th>
<th>Location</th>
<th>Operation</th>
<th>Setup</th>
<th>Idle</th>
<th>Waiting</th>
<th>Blocked</th>
<th>Down</th>
</tr>
</thead>
<tbody>
<tr>
<td>BevelToDeburr</td>
<td></td>
<td>439</td>
<td>84.29</td>
<td>15.71</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>IronWorkerOut</td>
<td></td>
<td>826</td>
<td>4.60</td>
<td>95.40</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>ShearOut</td>
<td></td>
<td>833</td>
<td>2.31</td>
<td>97.69</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>BevelOut</td>
<td></td>
<td>460</td>
<td>71.04</td>
<td>28.96</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
</tbody>
</table>

LOCATION STATES BY PERCENTAGE (Single Capacity/Tanks)

<table>
<thead>
<tr>
<th>Location Name</th>
<th>Location</th>
<th>Scheduled Hours</th>
<th>Operation</th>
<th>Setup</th>
<th>Idle</th>
<th>Waiting</th>
<th>Blocked</th>
<th>Down</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roller Table Position 1</td>
<td></td>
<td>453</td>
<td>81.39</td>
<td>0.00</td>
<td>4.74</td>
<td>13.84</td>
<td>0.04</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 2</td>
<td></td>
<td>549</td>
<td>68.16</td>
<td>0.00</td>
<td>11.49</td>
<td>20.31</td>
<td>0.04</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 3</td>
<td></td>
<td>487</td>
<td>79.37</td>
<td>0.00</td>
<td>1.72</td>
<td>18.92</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 4</td>
<td></td>
<td>425.0036167</td>
<td>87.81</td>
<td>0.00</td>
<td>1.81</td>
<td>10.38</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 5</td>
<td></td>
<td>432</td>
<td>88.14</td>
<td>0.00</td>
<td>1.96</td>
<td>9.87</td>
<td>0.03</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 6</td>
<td></td>
<td>446</td>
<td>85.51</td>
<td>0.00</td>
<td>1.82</td>
<td>12.55</td>
<td>0.12</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 7</td>
<td></td>
<td>439.0065667</td>
<td>85.33</td>
<td>0.00</td>
<td>3.25</td>
<td>11.40</td>
<td>0.02</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 8</td>
<td></td>
<td>480</td>
<td>79.03</td>
<td>0.00</td>
<td>1.76</td>
<td>19.17</td>
<td>0.04</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 9</td>
<td></td>
<td>425</td>
<td>90.01</td>
<td>0.00</td>
<td>1.67</td>
<td>8.32</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 10</td>
<td></td>
<td>446</td>
<td>84.84</td>
<td>0.00</td>
<td>1.82</td>
<td>13.32</td>
<td>0.02</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 11</td>
<td></td>
<td>432.0055667</td>
<td>87.18</td>
<td>0.00</td>
<td>2.04</td>
<td>10.64</td>
<td>0.14</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 12</td>
<td></td>
<td>425</td>
<td>90.12</td>
<td>0.00</td>
<td>1.96</td>
<td>7.86</td>
<td>0.05</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 13</td>
<td></td>
<td>439</td>
<td>86.44</td>
<td>0.00</td>
<td>1.96</td>
<td>11.47</td>
<td>0.13</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 14</td>
<td></td>
<td>446</td>
<td>84.87</td>
<td>0.00</td>
<td>3.58</td>
<td>11.49</td>
<td>0.05</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 15</td>
<td></td>
<td>446</td>
<td>83.56</td>
<td>0.00</td>
<td>3.71</td>
<td>12.59</td>
<td>0.15</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 16</td>
<td></td>
<td>432</td>
<td>86.95</td>
<td>0.00</td>
<td>2.56</td>
<td>10.44</td>
<td>0.05</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 17</td>
<td></td>
<td>494</td>
<td>76.44</td>
<td>0.00</td>
<td>1.89</td>
<td>21.52</td>
<td>0.14</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 18</td>
<td></td>
<td>494</td>
<td>76.13</td>
<td>0.00</td>
<td>3.43</td>
<td>20.32</td>
<td>0.12</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 19</td>
<td></td>
<td>432.0095167</td>
<td>87.60</td>
<td>0.00</td>
<td>3.81</td>
<td>8.43</td>
<td>0.16</td>
<td>0.00</td>
</tr>
<tr>
<td>Roller Table Position 20</td>
<td></td>
<td>446</td>
<td>84.52</td>
<td>0.00</td>
<td>2.32</td>
<td>13.13</td>
<td>0.03</td>
<td>0.00</td>
</tr>
<tr>
<td>Table10 Position 1</td>
<td></td>
<td>446</td>
<td>84.53</td>
<td>0.00</td>
<td>5.36</td>
<td>10.11</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Table10 Position 2</td>
<td></td>
<td>446.0105167</td>
<td>83.79</td>
<td>0.00</td>
<td>5.31</td>
<td>10.90</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Table10 Position 3</td>
<td></td>
<td>439</td>
<td>85.21</td>
<td>0.00</td>
<td>5.75</td>
<td>9.04</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Table10 Position 4</td>
<td></td>
<td>501</td>
<td>74.65</td>
<td>0.00</td>
<td>4.93</td>
<td>20.43</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Table10 Position 5</td>
<td></td>
<td>425</td>
<td>87.63</td>
<td>0.00</td>
<td>4.64</td>
<td>7.72</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Table10 Position 6</td>
<td></td>
<td>432</td>
<td>86.61</td>
<td>0.00</td>
<td>4.34</td>
<td>9.05</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Table10 Position 7</td>
<td></td>
<td>446</td>
<td>83.37</td>
<td>0.00</td>
<td>5.26</td>
<td>11.37</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Table10 Position 8</td>
<td></td>
<td>446.0147</td>
<td>83.61</td>
<td>0.00</td>
<td>3.63</td>
<td>12.76</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Table10 Position 9</td>
<td></td>
<td>480</td>
<td>77.60</td>
<td>0.00</td>
<td>4.16</td>
<td>18.23</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Flatbar Area Position 1</td>
<td></td>
<td>446.0087333</td>
<td>73.88</td>
<td>0.00</td>
<td>5.78</td>
<td>20.24</td>
<td>0.10</td>
<td>0.00</td>
</tr>
<tr>
<td>Flatbar Area Position 2</td>
<td></td>
<td>549.0212667</td>
<td>60.19</td>
<td>0.00</td>
<td>4.55</td>
<td>35.26</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Flatbar Area Position 3</td>
<td></td>
<td>508.0083833</td>
<td>64.54</td>
<td>0.00</td>
<td>4.73</td>
<td>30.73</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Flatbar Area Position 4</td>
<td></td>
<td>508</td>
<td>64.78</td>
<td>0.00</td>
<td>7.63</td>
<td>27.44</td>
<td>0.15</td>
<td>0.00</td>
</tr>
<tr>
<td>Flatbar Area Position 5</td>
<td></td>
<td>501</td>
<td>67.90</td>
<td>0.00</td>
<td>5.39</td>
<td>26.61</td>
<td>0.10</td>
<td>0.00</td>
</tr>
<tr>
<td>Resource</td>
<td>Units</td>
<td>Scheduled Hours</td>
<td>Number Of Times Used</td>
<td>Average Minutes Per Usage</td>
<td>Average Minutes Travel To Use</td>
<td>Average Minutes Travel To Park</td>
<td>% Blocked In Travel</td>
<td>% Util</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------</td>
<td>-----------------</td>
<td>----------------------</td>
<td>---------------------------</td>
<td>------------------------------</td>
<td>-------------------------------</td>
<td>---------------------</td>
<td>------------</td>
</tr>
<tr>
<td>PLayoutCrew.1</td>
<td>427.0412167</td>
<td>308</td>
<td>69.329575</td>
<td>4348016</td>
<td>3716178</td>
<td>0.00</td>
<td>88.63</td>
<td></td>
</tr>
<tr>
<td>PLayoutCrew.2</td>
<td>427.00735</td>
<td>290</td>
<td>71.684148</td>
<td>4756405</td>
<td>4443271</td>
<td>0.00</td>
<td>86.60</td>
<td></td>
</tr>
<tr>
<td>PLayoutCrew.3</td>
<td>426.4813667</td>
<td>299</td>
<td>67.727201</td>
<td>4431209</td>
<td>4073427</td>
<td>0.00</td>
<td>83.84</td>
<td></td>
</tr>
<tr>
<td>PLayoutCrew.4</td>
<td>426.6936833</td>
<td>284</td>
<td>69.104680</td>
<td>530343</td>
<td>4081508</td>
<td>0.00</td>
<td>81.72</td>
<td></td>
</tr>
<tr>
<td>PLayoutCrew.5</td>
<td>426.6055833</td>
<td>266</td>
<td>72.177677</td>
<td>383398</td>
<td>3935576</td>
<td>0.00</td>
<td>79.61</td>
<td></td>
</tr>
<tr>
<td>PLayoutCrew.6</td>
<td>426.6173</td>
<td>264</td>
<td>70.027784</td>
<td>402123</td>
<td>3965064</td>
<td>0.00</td>
<td>76.83</td>
<td></td>
</tr>
<tr>
<td>PLayoutCrew.7</td>
<td>426.27515</td>
<td>244</td>
<td>68.838143</td>
<td>4526715</td>
<td>3655308</td>
<td>0.00</td>
<td>70.08</td>
<td></td>
</tr>
<tr>
<td>PLayoutCrew.8</td>
<td>298.672165</td>
<td>1955</td>
<td>69.752751</td>
<td>4482284</td>
<td>3993551</td>
<td>0.00</td>
<td>81.05</td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.1</td>
<td>425.9434667</td>
<td>162</td>
<td>141.197969</td>
<td>2808883</td>
<td>2382718</td>
<td>0.00</td>
<td>91.28</td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.2</td>
<td>425.9895167</td>
<td>151</td>
<td>150.425755</td>
<td>3015238</td>
<td>2459317</td>
<td>0.00</td>
<td>90.65</td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.3</td>
<td>426.2721</td>
<td>150</td>
<td>149.819900</td>
<td>2887533</td>
<td>2561043</td>
<td>0.00</td>
<td>89.56</td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.4</td>
<td>426.1085667</td>
<td>145</td>
<td>150.025952</td>
<td>3004772</td>
<td>2626491</td>
<td>0.00</td>
<td>86.79</td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.5</td>
<td>426.4497167</td>
<td>150</td>
<td>146.351947</td>
<td>3105599</td>
<td>2756209</td>
<td>0.00</td>
<td>87.64</td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.6</td>
<td>425.7713</td>
<td>143</td>
<td>149.796930</td>
<td>2772636</td>
<td>2490171</td>
<td>0.00</td>
<td>85.40</td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.7</td>
<td>425.8666333</td>
<td>144</td>
<td>149.768354</td>
<td>2612951</td>
<td>2175184</td>
<td>0.00</td>
<td>85.88</td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.8</td>
<td>425.8871833</td>
<td>144</td>
<td>142.767396</td>
<td>2762194</td>
<td>2435210</td>
<td>0.00</td>
<td>82.01</td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.9</td>
<td>425.7375667</td>
<td>135</td>
<td>152.833785</td>
<td>2591222</td>
<td>2210394</td>
<td>0.00</td>
<td>82.14</td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.10</td>
<td>425.4464167</td>
<td>141</td>
<td>132.051936</td>
<td>3279972</td>
<td>2723797</td>
<td>0.00</td>
<td>74.58</td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.11</td>
<td>426.03565</td>
<td>122</td>
<td>151.179025</td>
<td>2942270</td>
<td>2596812</td>
<td>0.00</td>
<td>73.56</td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.12</td>
<td>426.0427167</td>
<td>120</td>
<td>141.500000</td>
<td>3237237</td>
<td>2710696</td>
<td>0.00</td>
<td>67.96</td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.13</td>
<td>425.7144667</td>
<td>114</td>
<td>141.315789</td>
<td>2659278</td>
<td>2346653</td>
<td>0.00</td>
<td>64.27</td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.14</td>
<td>425.3841333</td>
<td>95</td>
<td>151.894737</td>
<td>2596611</td>
<td>2128754</td>
<td>0.00</td>
<td>57.50</td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.15</td>
<td>425.3922167</td>
<td>82</td>
<td>171.585366</td>
<td>2505768</td>
<td>1896981</td>
<td>0.00</td>
<td>55.93</td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.16</td>
<td>425.7702167</td>
<td>64</td>
<td>163.593750</td>
<td>3365985</td>
<td>2544759</td>
<td>0.00</td>
<td>41.84</td>
<td></td>
</tr>
<tr>
<td>Resource</td>
<td>Scheduled Hours</td>
<td>% In Use</td>
<td>% Travel To Use</td>
<td>% Travel To Park</td>
<td>% Idle</td>
<td>% Down</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------</td>
<td>----------------</td>
<td>----------</td>
<td>-----------------</td>
<td>------------------</td>
<td>--------</td>
<td>--------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PBurnCrew</td>
<td>425.5537333</td>
<td>55</td>
<td>3.648564</td>
<td>2.477420</td>
<td>0.00</td>
<td>33.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PBurnCrew</td>
<td>7240.3647</td>
<td>2117</td>
<td>2.903915</td>
<td>2.455197</td>
<td>0.00</td>
<td>73.54</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TTFittingCrew.1</td>
<td>425.9568667</td>
<td>355</td>
<td>3.010880</td>
<td>2.500660</td>
<td>0.00</td>
<td>82.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TTFittingCrew.2</td>
<td>425.9561167</td>
<td>345</td>
<td>3.120764</td>
<td>2.537267</td>
<td>0.00</td>
<td>80.93</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TTFittingCrew.3</td>
<td>426.0770167</td>
<td>342</td>
<td>3.134020</td>
<td>2.669761</td>
<td>0.00</td>
<td>79.93</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TWeldingCrew</td>
<td>1277.99</td>
<td>1042</td>
<td>3.087566</td>
<td>2.571184</td>
<td>0.00</td>
<td>81.24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TWeldingCrew.1</td>
<td>426.1444333</td>
<td>352</td>
<td>3.266421</td>
<td>3.233468</td>
<td>0.00</td>
<td>82.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TWeldingCrew.2</td>
<td>425.8762667</td>
<td>342</td>
<td>2.915601</td>
<td>3.053618</td>
<td>0.00</td>
<td>80.47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TWeldingCrew.3</td>
<td>426.30235</td>
<td>342</td>
<td>3.671743</td>
<td>3.470007</td>
<td>0.00</td>
<td>80.38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TWeldingCrew</td>
<td>1278.32305</td>
<td>1036</td>
<td>3.284023</td>
<td>3.255141</td>
<td>0.00</td>
<td>81.24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TPaintCrew.1</td>
<td>426.37875</td>
<td>492</td>
<td>3.598537</td>
<td>3.181731</td>
<td>0.00</td>
<td>53.79</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TPaintCrew.2</td>
<td>426.4662667</td>
<td>507</td>
<td>3.569694</td>
<td>3.838929</td>
<td>0.00</td>
<td>55.73</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TPaintCrew.3</td>
<td>852.8450167</td>
<td>999</td>
<td>3.583899</td>
<td>3.282712</td>
<td>0.00</td>
<td>54.76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLayoutCrew.1</td>
<td>425.4579</td>
<td>411</td>
<td>1.156223</td>
<td>0.968184</td>
<td>0.00</td>
<td>87.92</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLayoutCrew.2</td>
<td>425.4537833</td>
<td>399</td>
<td>1.124741</td>
<td>1.030581</td>
<td>0.00</td>
<td>85.46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLayoutCrew.3</td>
<td>425.3453</td>
<td>376</td>
<td>1.080966</td>
<td>0.996793</td>
<td>0.00</td>
<td>81.91</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLayoutCrew.4</td>
<td>425.2455833</td>
<td>354</td>
<td>1.079155</td>
<td>1.033121</td>
<td>0.00</td>
<td>77.89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLayoutCrew.5</td>
<td>425.20435</td>
<td>320</td>
<td>1.080556</td>
<td>1.056179</td>
<td>0.00</td>
<td>69.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLayoutCrew.6</td>
<td>425.3548667</td>
<td>262</td>
<td>1.201198</td>
<td>1.036580</td>
<td>0.00</td>
<td>58.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLayoutCrew</td>
<td>2552.061783</td>
<td>2122</td>
<td>1.118242</td>
<td>1.019172</td>
<td>0.00</td>
<td>76.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FBurnCrew.1</td>
<td>425.663</td>
<td>301</td>
<td>1.673536</td>
<td>1.525032</td>
<td>0.00</td>
<td>85.98</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FBurnCrew.2</td>
<td>425.8457167</td>
<td>288</td>
<td>1.637553</td>
<td>1.610556</td>
<td>0.00</td>
<td>83.35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FBurnCrew.3</td>
<td>425.53505</td>
<td>270</td>
<td>1.517230</td>
<td>1.425272</td>
<td>0.00</td>
<td>77.71</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carrier</td>
<td>1277.043765</td>
<td>859</td>
<td>1.612165</td>
<td>1.525289</td>
<td>0.00</td>
<td>82.35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crane 600</td>
<td>425.1966167</td>
<td>9744</td>
<td>0.786746</td>
<td>0.287476</td>
<td>0.00</td>
<td>41.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crane 590</td>
<td>425.15435</td>
<td>8100</td>
<td>1.646995</td>
<td>0.203352</td>
<td>0.00</td>
<td>58.76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Truck</td>
<td>425</td>
<td>112</td>
<td>3.110973</td>
<td>1.110973</td>
<td>0.00</td>
<td>1.85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forktruck</td>
<td>425.150161</td>
<td>766</td>
<td>3.079731</td>
<td>1.115329</td>
<td>0.00</td>
<td>12.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ShearCrane</td>
<td>425.0451667</td>
<td>1199</td>
<td>2.309000</td>
<td>0.175000</td>
<td>0.00</td>
<td>11.68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LayoutCrew</td>
<td>2986.72165</td>
<td>76.10</td>
<td>4.95</td>
<td>2.88</td>
<td>16.07</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>------------</td>
<td>-------</td>
<td>------</td>
<td>------</td>
<td>-------</td>
<td>------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.1</td>
<td>425.9434667</td>
<td>89.50</td>
<td>1.78</td>
<td>1.62</td>
<td>7.09</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.2</td>
<td>425.9895167</td>
<td>88.87</td>
<td>1.78</td>
<td>1.58</td>
<td>7.77</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.3</td>
<td>426.2712</td>
<td>87.87</td>
<td>1.69</td>
<td>1.63</td>
<td>8.81</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.4</td>
<td>426.1085667</td>
<td>85.09</td>
<td>1.70</td>
<td>1.67</td>
<td>11.53</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.5</td>
<td>426.4497167</td>
<td>85.80</td>
<td>1.84</td>
<td>1.76</td>
<td>10.60</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.6</td>
<td>425.7713</td>
<td>83.85</td>
<td>1.55</td>
<td>1.54</td>
<td>13.06</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.7</td>
<td>425.8666333</td>
<td>84.40</td>
<td>1.47</td>
<td>1.35</td>
<td>12.78</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.8</td>
<td>425.8871833</td>
<td>80.45</td>
<td>1.56</td>
<td>1.54</td>
<td>16.45</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.9</td>
<td>425.7375667</td>
<td>80.77</td>
<td>1.37</td>
<td>1.34</td>
<td>16.52</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.10</td>
<td>426.4464167</td>
<td>72.77</td>
<td>1.81</td>
<td>1.68</td>
<td>23.74</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.11</td>
<td>426.03565</td>
<td>72.15</td>
<td>1.40</td>
<td>1.35</td>
<td>25.09</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.12</td>
<td>426.0427167</td>
<td>66.43</td>
<td>1.53</td>
<td>1.46</td>
<td>30.58</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.13</td>
<td>425.7144667</td>
<td>63.07</td>
<td>1.20</td>
<td>1.14</td>
<td>34.59</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.14</td>
<td>425.3841333</td>
<td>56.54</td>
<td>0.97</td>
<td>0.95</td>
<td>41.55</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.15</td>
<td>425.3922167</td>
<td>55.13</td>
<td>0.81</td>
<td>0.77</td>
<td>43.30</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.16</td>
<td>426.7702167</td>
<td>40.98</td>
<td>0.86</td>
<td>0.83</td>
<td>57.33</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PBurnCrew.17</td>
<td>425.5537333</td>
<td>32.31</td>
<td>0.79</td>
<td>0.79</td>
<td>66.12</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PBurnCrew</td>
<td>7240.3647</td>
<td>72.12</td>
<td>1.42</td>
<td>1.35</td>
<td>25.11</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFittingCrew.</td>
<td>425.9568667</td>
<td>78.65</td>
<td>4.22</td>
<td>2.76</td>
<td>14.38</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFittingCrew.</td>
<td>425.9561167</td>
<td>76.70</td>
<td>4.24</td>
<td>3.01</td>
<td>16.06</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFittingCrew.</td>
<td>426.0770167</td>
<td>75.72</td>
<td>4.20</td>
<td>3.20</td>
<td>16.88</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TFittingCrew.</td>
<td>1277.99</td>
<td>77.02</td>
<td>4.22</td>
<td>2.99</td>
<td>15.77</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TWeldingCrew.1</td>
<td>426.1444333</td>
<td>78.35</td>
<td>4.52</td>
<td>3.92</td>
<td>13.21</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TWeldingCrew.2</td>
<td>425.8762667</td>
<td>76.56</td>
<td>3.91</td>
<td>3.13</td>
<td>16.39</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TWeldingCrew.3</td>
<td>426.30235</td>
<td>75.47</td>
<td>4.91</td>
<td>3.76</td>
<td>15.86</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TWeldingCrew</td>
<td>1278.32305</td>
<td>76.79</td>
<td>4.45</td>
<td>3.60</td>
<td>15.15</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TPaintCrew.1</td>
<td>426.37875</td>
<td>46.87</td>
<td>6.92</td>
<td>0.32</td>
<td>45.89</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TPaintCrew.2</td>
<td>426.4662667</td>
<td>48.66</td>
<td>7.07</td>
<td>0.34</td>
<td>43.93</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TPaintCrew</td>
<td>852.8450167</td>
<td>47.76</td>
<td>7.00</td>
<td>0.33</td>
<td>44.91</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLayoutCrew.1</td>
<td>425.4579</td>
<td>86.05</td>
<td>1.87</td>
<td>1.12</td>
<td>10.97</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLayoutCrew.2</td>
<td>425.4537833</td>
<td>83.69</td>
<td>1.77</td>
<td>1.29</td>
<td>13.25</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLayoutCrew.3</td>
<td>425.3453</td>
<td>80.31</td>
<td>1.60</td>
<td>1.19</td>
<td>16.90</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLayoutCrew.4</td>
<td>425.2455833</td>
<td>76.38</td>
<td>1.50</td>
<td>1.14</td>
<td>20.98</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLayoutCrew.5</td>
<td>425.20435</td>
<td>68.40</td>
<td>1.36</td>
<td>1.13</td>
<td>29.12</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLayoutCrew.6</td>
<td>425.3548667</td>
<td>57.02</td>
<td>1.23</td>
<td>0.97</td>
<td>40.78</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLayoutCrew</td>
<td>2552.061783</td>
<td>75.31</td>
<td>1.55</td>
<td>1.14</td>
<td>22.00</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FBurnCrew.1</td>
<td>425.663</td>
<td>83.96</td>
<td>2.02</td>
<td>0.94</td>
<td>13.08</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FBurnCrew.2</td>
<td>425.8457167</td>
<td>81.46</td>
<td>1.89</td>
<td>1.01</td>
<td>15.65</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FBurnCrew.3</td>
<td>425.53505</td>
<td>76.06</td>
<td>1.65</td>
<td>0.76</td>
<td>21.53</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FBurnCrew</td>
<td>1277.043767</td>
<td>80.49</td>
<td>1.85</td>
<td>0.90</td>
<td>16.75</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carrier</td>
<td>425.0245167</td>
<td>9.82</td>
<td>2.03</td>
<td>0.59</td>
<td>87.56</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crane 600</td>
<td>425.1966167</td>
<td>30.05</td>
<td>10.98</td>
<td>3.22</td>
<td>55.75</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crane 590</td>
<td>425.154355</td>
<td>52.30</td>
<td>6.46</td>
<td>2.10</td>
<td>39.14</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Truck</td>
<td>425.1.37</td>
<td>0.49</td>
<td>0.00</td>
<td>98.15</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entity</td>
<td>Quantity</td>
<td>Current Minutes</td>
<td>Average Minutes</td>
<td>Average Minutes</td>
<td>Average Minutes</td>
<td>Average Minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>----------</td>
<td>----------------</td>
<td>----------------</td>
<td>----------------</td>
<td>----------------</td>
<td>----------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forktruck</td>
<td>425.1601</td>
<td>9.25</td>
<td>3.35</td>
<td>2.43</td>
<td>84.98</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ShearCrane</td>
<td>425.0451667</td>
<td>10.86</td>
<td>0.82</td>
<td>2.12</td>
<td>86.21</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**FAILED ARRIVALS**

<table>
<thead>
<tr>
<th>Entity</th>
<th>Location</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBlock</td>
<td>ProfileStorage</td>
<td>110</td>
</tr>
<tr>
<td>CBlock</td>
<td>FlatbarStorage</td>
<td>336</td>
</tr>
<tr>
<td>CBlock</td>
<td>TBeamStorage</td>
<td>224</td>
</tr>
</tbody>
</table>

**ENTITY ACTIVITY**

<table>
<thead>
<tr>
<th>Entity</th>
<th>Total Exits</th>
<th>In System</th>
<th>Current Minutes</th>
<th>Average In</th>
<th>Average In Move</th>
<th>Average Wait For</th>
<th>Average Res, etc.</th>
<th>Average Operation</th>
<th>Average Blocked</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profile</td>
<td>3785</td>
<td>629</td>
<td>9750.116521</td>
<td>20.660293</td>
<td>486.441894</td>
<td>395.785739</td>
<td>8847.228595</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flatbar</td>
<td>4278</td>
<td>1756</td>
<td>12131.355064</td>
<td>29.755174</td>
<td>695.453528</td>
<td>228.081048</td>
<td>11178.065314</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TBeam</td>
<td>1098</td>
<td>51</td>
<td>8995.878367</td>
<td>36.019358</td>
<td>238.412751</td>
<td>931.486778</td>
<td>7789.959480</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RTBeam</td>
<td>0</td>
<td>424</td>
<td>440.830055</td>
<td>7.262192</td>
<td>433.567863</td>
<td>0.000000</td>
<td>0.000000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scrap</td>
<td>1137</td>
<td>3</td>
<td>499.624094</td>
<td>6.709440</td>
<td>492.914654</td>
<td>0.000000</td>
<td>0.000000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scrap2</td>
<td>775</td>
<td>15</td>
<td>724.340874</td>
<td>18.308977</td>
<td>706.031897</td>
<td>0.000000</td>
<td>0.000000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scrap3</td>
<td>1000</td>
<td>23</td>
<td>499.624094</td>
<td>6.709440</td>
<td>492.914654</td>
<td>0.000000</td>
<td>0.000000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CarrierBlock</td>
<td>0</td>
<td>0</td>
<td>25.846642</td>
<td>25.846642</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>nothing</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CBlock</td>
<td>600</td>
<td>5</td>
<td>25.846642</td>
<td>25.846642</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ScrapBin</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFlatbar</td>
<td>18285</td>
<td>41</td>
<td>1053.997520</td>
<td>16.248427</td>
<td>397.044845</td>
<td>23.990484</td>
<td>616.713764</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ENTITY STATES BY PERCENTAGE**

<table>
<thead>
<tr>
<th>Entity</th>
<th>In Move</th>
<th>Wait For</th>
<th>In Operation</th>
<th>Blocked</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profile</td>
<td>0.21</td>
<td>4.99</td>
<td>4.06</td>
<td>90.74</td>
</tr>
<tr>
<td>Flatbar</td>
<td>0.25</td>
<td>5.73</td>
<td>1.88</td>
<td>92.14</td>
</tr>
<tr>
<td>TBeam</td>
<td>0.40</td>
<td>2.65</td>
<td>10.35</td>
<td>86.59</td>
</tr>
<tr>
<td>Scrap</td>
<td>1.65</td>
<td>98.35</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>
Scrap2  2.53  97.47  0.00  0.00
Scrap3  1.34  98.66  0.00  0.00
CBlock  100.00  0.00  0.00  0.00
SFlatbar  1.54  37.67  2.28  58.51

VARIABLES

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Total Changes</th>
<th>Average Minutes Per Change</th>
<th>Minimum Value</th>
<th>Maximum Value</th>
<th>Current Value</th>
<th>Average Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>v TotalProfilesArrived</td>
<td>1036</td>
<td>45.840807</td>
<td>0</td>
<td>1036</td>
<td>1036</td>
<td>541.717</td>
</tr>
<tr>
<td>v TotalFlatbarsArrived</td>
<td>2019</td>
<td>23.535809</td>
<td>0</td>
<td>2019</td>
<td>2019</td>
<td>1093.93</td>
</tr>
<tr>
<td>v TotalTBeamsArrived</td>
<td>788</td>
<td>60.289123</td>
<td>0</td>
<td>788</td>
<td>788</td>
<td>420.238</td>
</tr>
<tr>
<td>v TotalProfilesProcessed</td>
<td>1028</td>
<td>46.205815</td>
<td>0</td>
<td>1028</td>
<td>1028</td>
<td>533.59</td>
</tr>
<tr>
<td>v TotalFlatbarsProcessed</td>
<td>790</td>
<td>60.060815</td>
<td>0</td>
<td>790</td>
<td>790</td>
<td>426.732</td>
</tr>
<tr>
<td>v TotalTBeamsProcessed</td>
<td>776</td>
<td>61.118832</td>
<td>0</td>
<td>776</td>
<td>776</td>
<td>409.09</td>
</tr>
<tr>
<td>v TotalProfilesProduced</td>
<td>3779</td>
<td>12.570866</td>
<td>0</td>
<td>3779</td>
<td>3779</td>
<td>1938.84</td>
</tr>
<tr>
<td>v TotalFlatbarsProduced</td>
<td>11438</td>
<td>4.153179</td>
<td>0</td>
<td>11438</td>
<td>11438</td>
<td>5699.78</td>
</tr>
<tr>
<td>v TotalTBeamsProduced</td>
<td>977</td>
<td>48.625969</td>
<td>0</td>
<td>977</td>
<td>977</td>
<td>500.143</td>
</tr>
<tr>
<td>v PBatchSize</td>
<td>100</td>
<td>470.401000</td>
<td>0</td>
<td>16</td>
<td>16</td>
<td>15.8476</td>
</tr>
<tr>
<td>v FBatchSize</td>
<td>300</td>
<td>156.800000</td>
<td>0</td>
<td>16</td>
<td>16</td>
<td>15.8476</td>
</tr>
<tr>
<td>v TBatchSize</td>
<td>200</td>
<td>235.200000</td>
<td>0</td>
<td>6</td>
<td>6</td>
<td>5.94286</td>
</tr>
<tr>
<td>v Counter</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v PScrap</td>
<td>1028</td>
<td>46.212784</td>
<td>0</td>
<td>1028</td>
<td>1028</td>
<td>533.425</td>
</tr>
<tr>
<td>v FScrap</td>
<td>790</td>
<td>60.085659</td>
<td>0</td>
<td>790</td>
<td>790</td>
<td>426.444</td>
</tr>
<tr>
<td>v TScrap</td>
<td>1023</td>
<td>46.365817</td>
<td>0</td>
<td>1023</td>
<td>1023</td>
<td>526.257</td>
</tr>
<tr>
<td>v PPerUnit</td>
<td>102</td>
<td>461.177451</td>
<td>0</td>
<td>12</td>
<td>4</td>
<td>4.74285</td>
</tr>
<tr>
<td>v FPerUnit</td>
<td>303</td>
<td>155.247525</td>
<td>0</td>
<td>11</td>
<td>6</td>
<td>4.8</td>
</tr>
<tr>
<td>v TPerUnit</td>
<td>200</td>
<td>235.200000</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>1.71429</td>
</tr>
<tr>
<td>v PPerUnitBatch</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v FPerUnitBatch</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v TPerUnitBatch</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v PTotals</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v ETotals</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v TTotal</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v TotalToFShear</td>
<td>1220</td>
<td>38.948317</td>
<td>0</td>
<td>1220</td>
<td>1220</td>
<td>658.867</td>
</tr>
<tr>
<td>v TotalShearProduced</td>
<td>8375</td>
<td>5.672127</td>
<td>0</td>
<td>8375</td>
<td>8375</td>
<td>4109.21</td>
</tr>
<tr>
<td>v Count</td>
<td>0</td>
<td>0.000000</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>v ProfileWIP</td>
<td>1099</td>
<td>43.213900</td>
<td>0</td>
<td>973</td>
<td>973</td>
<td>508.989</td>
</tr>
<tr>
<td>v TBeamWIP</td>
<td>837</td>
<td>56.759652</td>
<td>0</td>
<td>739</td>
<td>739</td>
<td>394.3</td>
</tr>
<tr>
<td>v FlatBarWIP</td>
<td>2145</td>
<td>22.153286</td>
<td>0</td>
<td>1893</td>
<td>1893</td>
<td>1029.01</td>
</tr>
<tr>
<td>v ProfileFlowTime</td>
<td>63</td>
<td>750.613429</td>
<td>0</td>
<td>3747.15</td>
<td>221.597</td>
<td>339.199</td>
</tr>
<tr>
<td>v TBeamFlowTime</td>
<td>49</td>
<td>964.209327</td>
<td>0</td>
<td>3564.74</td>
<td>267.798</td>
<td>232.168</td>
</tr>
</tbody>
</table>
Resource States

<table>
<thead>
<tr>
<th>Name</th>
<th>In Use</th>
<th>Travel In Use</th>
<th>Idle</th>
<th>Down</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLayoutCrew.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLayoutCrew.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLayoutCrew.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLayoutCrew</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FBurnCrew.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FBurnCrew.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FBurnCrew.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FBurnCrew</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carrier</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crane_600</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crane_590</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Truck</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forktruck</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ShearCrane</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Single Capacity Location States

Name
Roller_Table_Position_1
Roller_Table_Position_2
Roller_Table_Position_3
Roller_Table_Position_4
Roller_Table_Position_5
Roller_Table_Position_6
Roller_Table_Position_7
Roller_Table_Position_8
Roller_Table_Position_9
Roller_Table_Position_10
Roller_Table_Position_11
Roller_Table_Position_12
Roller_Table_Position_13
Roller_Table_Position_14
Roller_Table_Position_15
Roller_Table_Position_16
Roller_Table_Position_17
Roller_Table_Position_18
Roller_Table_Position_19
Roller_Table_Position_20
Single Capacity Location States

Name
Table10_Position_1
Table10_Position_2
Table10_Position_3
Table10_Position_4
Table10_Position_5
Table10_Position_6
Table10_Position_7
Table10_Position_8
Table10_Position_9
Flatbar_Area_Position_1
Flatbar_Area_Position_2
Flatbar_Area_Position_3
Flatbar_Area_Position_4
Flatbar_Area_Position_5
Flatbar_Area_Position_6
Flatbar_Area_Position_7
Flatbar_Area_Position_8
Flatbar_Area_Position_9
Bulldozer
Bulldozer2
Single Capacity Location States

Name
Table
Table2
Shear
IronWorker
BevelStation
DeburrStation
Additional copies of this report can be obtained from the National Shipbuilding Research and Documentation Center:

http://www.nsnet.com/docctr/

Documentation Center
The University of Michigan
Transportation Research Institute
Marine Systems Division
2901 Baxter Road
Ann Arbor, MI 48109-2150

Phone: 734-763-2465
Fax: 734-763-4862
E-mail: Doc.Center@umich.edu