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SPARDIS--A SHIPYARD PRODUCTION
AND CONTROL SYSTEM

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INTRODUCTION

SPARDIS provides NASSCO with a tool to use one of its most valuable resources - information. SPARDIS is designed to provide various levels of management with the information they need to better perform their function. It is intended that the task of providing this information be accomplished with the least amount of paper work. To do this, all of the SPARDIS information is in the form of on-line, real time, data inquiry and update. Data is collected, updated and maintained for the system through a network of communications terminals. These terminals are located where data is originated, the system user area. The communications terminals are located throughout the shipyard at strategic locations for both inquiry and update. Responsibility for data input is placed in the area organizationally responsible for its creation and maintenance. The teleprocessing system permits decisions to be made based on the latest information available. As a management tool for planning and scheduling SPARDIS provides:

- .Explicit Schedule and instructions to make parts, assemble components install. equipment, etc.

- .Management reports including:

- Status of items in the manufacturing cycle
- Work behind schedule
- Progress to date against the schedule
- Status of inventory items needed
- Definition of future work

- Projection of material requirements.
- Consolidation of work load by operation.
- Control of the in-process inventories.
- A consistent part-task identification method.
- Engineering progress record.

I SPARDIS

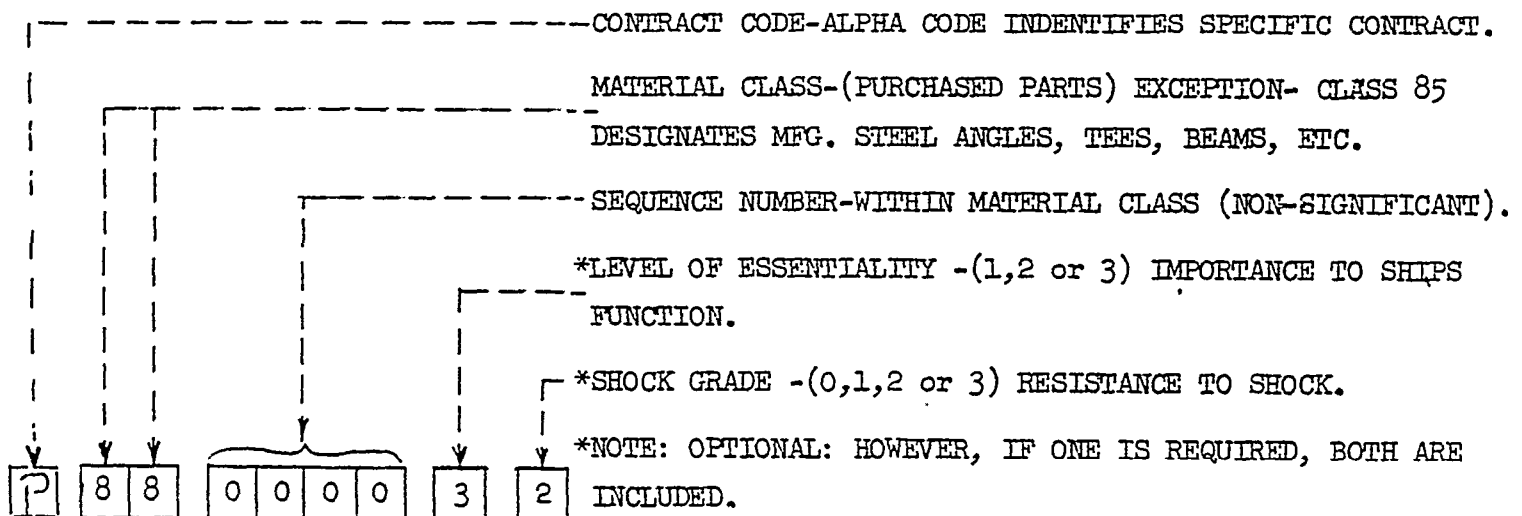
SPARDIS is an acronym for Scheduling Planning And Reporting Data Information System. It is a tool designed to assist in the scheduling and planning associated with the construction of ships. The system is designed to permit visibility of this planning at various levels. It permits a high level overview as to the status of large sections of the ship as well as visibility down to the smallest part.

SPARDIS is designed to use a numbering system as the key to the information base. This numbering system is used throughout the shipyard so that a number assigned to a part is the same number used by Engineering, Material, and Production. The number associated with a part becomes its name and this name is always used to identify the part. There are two basic classes of numbers used in SPARDIS. One is the Material Code Number which is the number used to identify raw stock. The other is the Manufactured Piece Number.

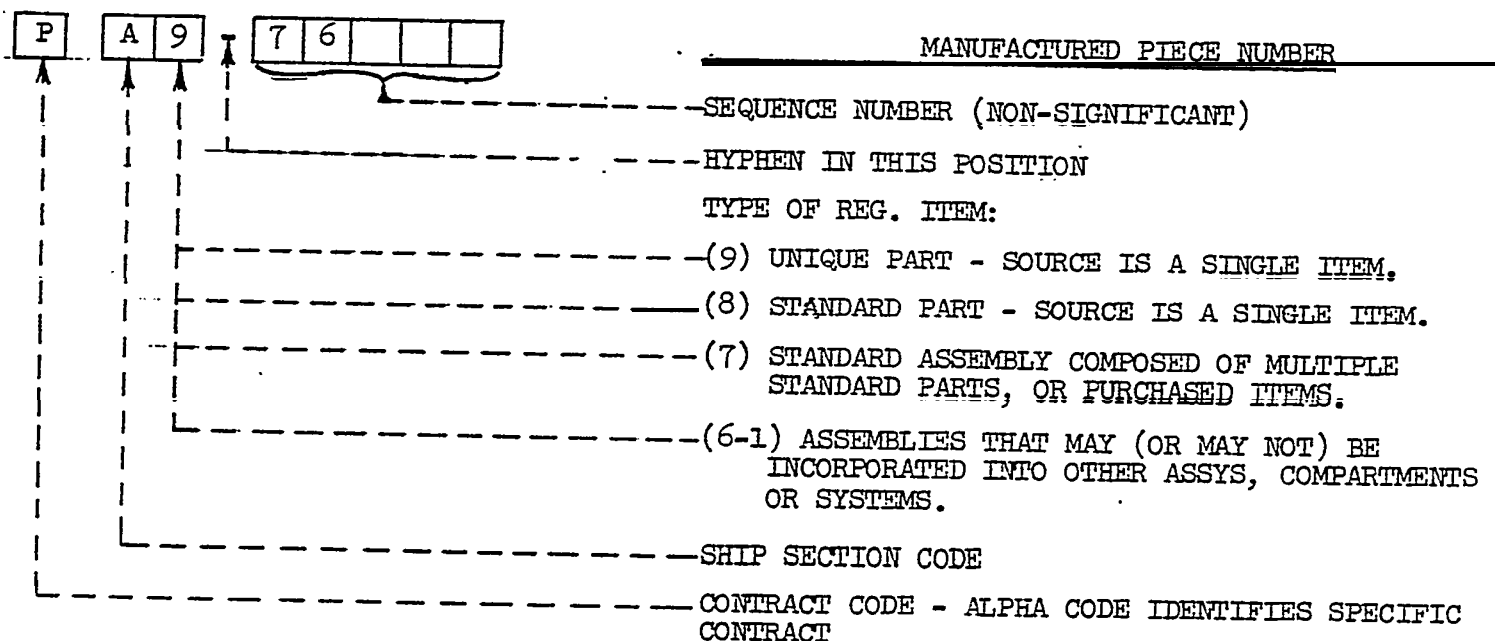
Except for the contract code assigned, the Material Code Number is completely numeric. It takes the form of either six or eight numeric digits. The first two characters indicate the material class (e.g. 01 is Pipe, 82 Steel, etc.) The next four characters indicate the specific commodity and size. If present, the last two digits represent the level of essentiality and shock grade.

MATERIAL CODE NUMBER

FOR PURCHASED PARTS



The other numbering format is for the manufactured Piece Number. This is distinguished from the Material code Number by the presence of an alphabetical letter in the first position following the contract code. The rest of the characters are always numeric. The first position, which is alphabetic, denotes in which Ship Section or general area of the ship the item is used. The second position, which is numeric, denotes the level of importance to the parent assembly or task. The remaining characters of the piece number are filled first with a hyphen for consistent spacing, and a series of from one to five numeric characters. These numeric characters to the right of the hyphen, bear no significance to the part number, except that they tend to be sequentially assigned. Thus they are termed "non-significant but sequential". In order to separate part and assembly numbers pertaining to one group of ships from numbers designated for another group, an alpha-character has been imposed preceding the first position of the piece number. SPARDIS further analyzes a piece number by distinguishing parts from assemblies and tasks by use of the piece numbering system. A part (being an item which is fabricated exclusively from a single source item) is designated by either a number "8" or "9" found in the "level" position of the part number. An assembly (being the joining in some manner of two or more parts) is designated by the number 7 thru 1 depending on the level of structure it is on the ship. SPARDIS says "the smaller the number in the 'level' position of an item number, the greater significance this item has in the total structure." For example, an A6 assembly, is of greater significance than an A8 part, and an A3 assembly, is of greater significance than the A6 assembly and so on. The ship section codes and the "level" indicators are described further on the following pages.



NASSCO MANUFACTURED PART NUMBERING SYSTEM

Ship Section Identification:

All part, assembly, system, compartment, task and event numbers are prefixed with an alphabetical character to indicate the appropriate group within Engineering or Production planning responsible for their assignment. The ship section numbers are as follows:

<u>ALPHA CHARACTER</u>	<u>RESPONSIBLE GROUP</u>	<u>DESCRIPTION</u>
A	HULL ENGINEERING	HULL STRUCTURE
B	HULL ENGINEERING	FOUNDATIONS
C	HULL ENGINEERING	HULL FITTINGS
D	HULL ENGINEERING	CARPENTRY
E	(OPEN)	(OPEN)
F	(OPEN)	(OPEN)
G	HULL ENGINEERING	RIGGING
H	HULL ENGINEERING	SCIENTIFIC (WAYS)
J	(OPEN)	(OPEN)
K	ELEC. ENGINEERING	POWER & LIGHTING
L	(OPEN)	(OPEN)
M	ELEC. ENGINEERING	ELECTRICAL STANDARDS
N	ELEC. ENGINEERING	ELECTRICAL
Q	PROD. PLANNING	NASSCO STANDARD PARTS (ALL SHIPS ALL CONTRACTS)
P	MACHINERY ENGINEERING	PIPING
R	MACHINERY ENGINEERING	VMACHINERY
S	MACHINERY ENGINEERING	MACHINERY
T	MACHINERY ENGINEERING	MACHINERY
V	MACHINERY ENGINEERING	VENTILATION
W	MACHINERY ENGINEERING	SPEC. ITEMS
	PROD. PLANNING	
X	PROD. PLANNING	COMPARTMENTATION, MAJOR TASK/EVENT
Y	PROD. PLANNING	COMPARTMENTATION
Z	(OPEN)	(OPEN)

Manufacturing "Level" Numbers:

The "level" indicator denotes the level of importance to the parent *assembly* or task, not necessarily its position in the network. The manufacturing 'level' indicators are as follows:

<u>LEVEL</u>	<u>ASSIGNEE</u>	<u>DESCREPTION</u>
1	PRODUCTION PLANNING	A SPECIFIC TASK OR EVENT, AREA OF THE SHIP, OR SYSTEM NUMBER
2	PRODUCTION	A UNIQUE ERECTION ASSEMBLY CONSISTING OF TWO OR MORE PARTS AND/OR TWO OR MORE 6, 5, 4, OR 3 LEVEL ASSEMBLIES THAT ERECT DIRECTLY INTO THE HULL
3	PRODUCTION PLANNING	A UNIQUE ASSEMBLY CONSISTING OF TWO OR MORE PARTS AND/OR TWO OR MORE 6, 5, 4, OR 3 LEVEL ASSEMBLIES THAT NEXT ASSEMBLE INTO ANOTHER (3 or 2 LEVEL) ASSEMBLY.
4	PRODUCTION PLANNING	A UNIQUE ASSEMBLY CONSISTING OF TWO OR MORE PARTS AND/OR TWO OR MORE 6, 5, OR 4 LEVEL ASSEMBLIES THAT NEXT ASSEMBLE INTO ANOTHER (4,3, OR 2 LEVEL) ASSEMBLY.
5	PRODUCTION PLANNING	A UNIQUE ASSEMBLY CONSISTING OF TWO OR MORE PARTS AND/OR TWO OR MORE 6 OR 5 LEVEL ASSEMBLIES THAT NEXT ASSEMBLE INTO ANOTHER (5, 4, 3, OR 2 LEVEL) ASSEMBLY.
6	PRODUCTION PLANNING	A UNIQUE ASSEMBLY CONSISTING OF TWO OR PARTS THAT NEXT ASSEMBLE INTO ANOTHER (6, 5, 4, 3, OR 2 LEVEL) ASSEMBLY.
7	ENGINEERING - PRODUCTION	A STANDARD MINUFACTURED ASSEMBLY HAVING SUFFICIENT REQUIREMENTS TO JUSTIFY STAND-ARDIZATION AND BATCH-MANUFACTURE. COMPLETE INTERCHANGEABILITY IS MANDATORY.
8	ENGINEERING	A STANDARD MANUFACTURED PART HAVING STANDARDIZATION AND BATCH-MANUFACTURE. COMPLETE INTERCHANGEABILITY IS MANDATORY.
9	ENGINEERING	A UNIQUE MANUFACTURED PART HAVING A LIMITED REQUIREMNT TO THE EXTENT THAT A STANDARD CANNOT BE JUSTIFIED.

STANDARD PARTS & ASSEMBLIES

An 8 "level" part in the SPARDIS System is defined as:

"A standard manufactured part having standardization and batch-manufacture. Complete interchangeability is mandatory."

Similarly a 7 "level" assembly is defined as:

"A standard manufactured assembly having sufficient requirements to justify standardization and batch-manufacture. Complete interchangeability is mandatory."

The intent of the 7 & 8 "levels" in the SPARDIS numbering system is to account for those parts and assemblies that are used in sufficient quantity that it is economical to batch manufacture them. Confusion often arises due to the many interpretations possible for the term "batch manufacture". Let us examine some of the criteria which must be considered for something that is to be "batch manufactured" in an attempt to clarify some of this confusion.

One of the first things to consider is that an item, in order to be considered a standard, must be relatively small. This is true because we want to handle the material in groups of parts rather than one-at-a-time. Therefore one of the things we must consider is the ability to handle the material economically.

Complete interchangeability is also required because we want to be able to manufacture a group of these parts for inventory and withdraw them as necessary for use. Another thing to consider then is the set-up time to manufacture certain items. Let us take, as an example, a ladder which requires a jig to be set-up. It is more economical to make several ladders at one time with one set-up than to **set up the jig everytime a ladder is required.** **Assemblies such as ladders are not the only items to consider for set-up time.** Any part that requires a template could be considered in this category. Every time a part is manufactured that requires a template, someone has to locate the template, bring it to the material, lay it out, and then produce the part. If this is done several times with a single template the cost will be correspondingly high. Therefore set-up time does become part of our criteria.

Let us discuss a part of the criteria which has produced much confusion and attempt to clarify it. How do we determine, based on the number of parts required, what we should classify as a standard? If a part or assembly is used only once on a hull, it is, by definition, unique and therefore cannot be considered for a standard. We might be tempted to say that if a part is used more than once it should be a standard. This might make the decision process quite simple, but it would not be adequate for production needs. We must first determine if the two or more parts are used in more than one assembly. For example, let us assume that we require ten flat bar stiffeners for a foundation. Let us further assume that these flat bar stiffeners are all identical and are only used in this one foundation. In this case since there is only one demand for the parts, the foundation, we would consider these stiffeners unique. This is true because they will be totally consumed on one assembly. If, however, the same ten stiffeners were used in more than one assembly, let's assume five in one foundation and five in another, we would consider these stiffeners standard parts. We have, then, derived another part of our criteria. In order for a part to be considered a standard it must be used in more than one assembly on a hull.

Using the criteria we have developed we can now formulate several questions which can be used to test a given part to see if we should call it a standard.

1. Is the part/assembly small enough to be handled and stored easily?
2. Is there more than one part/assembly required?
3. Are the parts/assemblies used in more than one assembly?
4. Does that set-up time warrant producing more than one at a time?

If the answers to these questions-were all "yes", then we have determined that this part/assembly should be classified a standard.

If we are to be able to produce several parts/assemblies at any given time we will require some knowledge of when we are going to manufacture them and ensure that the raw material is available. We *must* ensure there is sufficient material on hand to produce our standards in economical groups or lots. In order to do this both Engineering and Planning must be involved. Engineering must determine the total requirements for the standard and their approximate locations so that Planning can determine when to manufacture the standards and in what quantities. This information, once developed, can be used to determine what raw materials are required and when they should be purchased. It is important that total requirements are determined so that we do not over-manufacture a part.

If all of these criteria are used properly "batch manufacturing" can produce significant cost savings to the shipyard.

11 MASTER FILES

The information database that defines the plan for the task of putting together the thousands of parts in a ship, is designed to functionally define the elements of that plan. These functional elements are the structure, description, routing and schedule. In fact, SPARDIS has as its base, four master files which allow the proper definition of these elements. Let us examine each of these elements and their associated files and content to better understand how the information is maintained.

The Description File contains the definitions of what the part assembly is. It allows the user to give meaning to the name given to a part. For example:

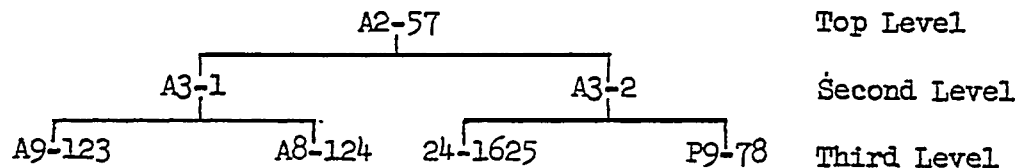
P9-1234 Pipe, Sch 40, 4" X 8' - 0"

The description File can also be used to define a task. For example:

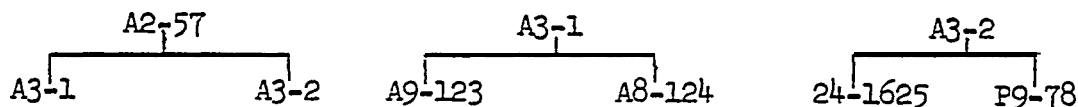
P2-250 Complete installation of innerbottom piping
fr. 78-85 CL.

In other words the Description File contains the definition of parts, assemblies, or tasks. Each part, assembly or task in the plan is defined in the Description File.

The Structure File defines what pieces are required to go together to produce the next level of assembly. That is, it is a "goesinto" type of definition. The Structure File defines what parts, assemblies or tasks go together to form new assembly or task. This type of an arrangement of parts is also known as a hierarchical arrangement or a bill-of-material. In building the Structure File, the top level-task (parent) will have secondary level tasks or "component-parts" attached to it. The structure created till be a single, top level task (assembly) with a horizontal string of component parts (referred to as the second level). To add parts vertically to the structure, the second level is considered the parent task and attached to it are its component parts (now becoming the third level of the original task or assembly). This procedure is repeated until the structure is complete. The following illustration will clarify the complete concept. Take the following structure:



This structure can be broken down into separate single-level structures as follows:



This is the method used to enter the structure into SPARDIS. The Structure File defines what "goes into" the next level as well as what raw material is required to manufacture the associated parts.

The Structure File is the networking capability within the SPARDIS System. As will be seen, the network can be time phased to produce data for material requirements planning (MRZ) and other useful management tools. One area of confusion often arises when discussing the SPARDIS piece numbering system and the Structure File. That is, the "level" number in the piece number as opposed to the level in the hierarchy. The "level" indicator has no relation to a components position in the structure file. It is merely an indication of the complexity of the component.

The Routing File defines where operations are to take place to manufacture each level of the structure. We define the operations by assigning work stations which are the places operations will be performed to produce the defined levels of the structure. In order to produce these parts and assemblies, time must be allocated to each operation so that a previous operation is completed prior to beginning the next and so on. In other words, component items must be routed through each designated operation in such a manner as to be completed in time to become part of the next assembly level. In order to accurately accomplish this the phasing, SPARDIS uses Lead Days, or a number of planned work days to complete a given task at a particular operation. These operations are performed at designated work stations and each work station is assigned the number of lead days necessary to accomplish the task. Consequently, if we add up the number of Lead Days for each operation, we will see the total number of lead days necessary to complete the individual task.

As items in SPARDIS are routed, each work station must be made aware of what specifically is required at that operation. To accomplish this, there is a group of numeric instruction codes set up with their verbal meaning contained in the Description File. As an item is routed, the work stations are assigned an instruction number. Based on what is required at that work station, a number is picked from the Description File that applies to that requirement. This "Instruction Code" is placed in the Routing File with the applicable work station and lead days, to provide detail instructions for the planned production of a given item.

The Schedule File defines when the major tasks or assemblies must be complete in order to produce the ship in an orderly fashion. A single calendar date for each major network or structured task is placed in the Schedule File. These dates, one for each major task, taken collectively form the sequence in which the ship is to be built. This date, referred to as the base date or Work Authorized and Released date, is used to determine other key dates for each major task. These key dates are also carried in the Schedule File for monitoring progress against each major task individually. Each major task scheduled in the Schedule File then contains its own set of key dates. These dates are for the following functions:

PRODUCTION

Material Requisition

Material Receipt

Lofting Complete

Work Authorized & Released

Sub-Assembly (Shop) Complete

Erection (Installation) Complete

Fitting

Welding

Inspection

Also tracked within SPARDIS are key dates for both Engineering and Specification Material ordering. These are:

ENGINEERING

Drawing Start thru Approval

Actual Submittal Dates

Actual Performance Dates

Actual Approval Dates

Schedule Dates - Navy (Vendor Information thru issue)

Actual Dates - Navy (Vendor Informtion thru % Complete)

MATERIAL ORDERING

Inquiry Information

Vendor Plans

Purchasing Information

Schedule Delivery

Promised Delivery

Actual Delivery

SUMMARY

These four files, (Description, Schedule, Structure, and Routing) form the Data Base of defined tasks that must be accomplished in order to build ships to specification, schedule and cost limits. These "Master Files" are the planning base from which work is released and monitored throughout the shipyard. All the subsequent information in SPARDIS is created from the Description, Structure, Routing and Schedule Files.

III WA/R FILE

To provide the information that is necessary to actually produce the components, the Work Authorized and Released (WA/R) File is created. Periodically, a parameter date (some date into the future) is selected. Using this date all major tasks or assemblies that fall within this parameter are selected from the Schedule File. These major task numbers are then used as keys to the Structure File. In turn each component of the associated structure is collected. These new keys in turn are used to select the associated routing and lead days from the Routing File. Since we started with a date from the Schedule File when the task *or* assembly must be complete, and we found what the components of the assembly are, and the operations and the number of days to perform each operation, we can compute schedule *start* and complete dates for each operation of each component of the structure. This process is called a parts explosion or more commonly a "Chase". This procedure produces the WA/R File.

The WA/R File is the base from which an analysis of Material Requirements is made. It is the file from which shop order documentation is produced to fabricate or assemble components. Actual progress of the various components is reported in this file. Therefore, at any time during the production phase of a part or assembly, inquiry can be made to determine the actual status and location of a given item.

SUPPLEMENTARY FILES

In addition to the five files which have been described (Description, Structure, Routing, Schedule, and Work Authorized/Released) there are an additional set of Supplementary files which are created and maintained from these for ease of use of the teleprocessing system. These are:

Inventory Status and Multiple Location

Detail Requirements by Date

WA/R Cross Index

Parts Cross Index (Structure)

Source Item Cross Index (WA/R)

MWR Cross Index (Shop Order)

Inventory Status/Multiple Location File

An Inventory Status Record is created for all common and nested parts. This record contains the primary location of the item and the quantity on hand at that location. It also lists the total (to date) quantities required, ordered, received, issued, staged (obligated), and a cumulative on hand total (*total on hand quantity*). In addition, there are other quantity fields that are used in specific processing, such as the Economic Lot Order size, a preliminary estimate of the total quantity required for a contract; and an Adjustment quantity to maintain a record of quantities known to be *lost or* erroneously used.

The Multiple Location Record is used to contain the secondary locations for items stored in more than one location. This record has the capability of holding five (5) locations (in addition to the primary location in the Inventory Status Record) and carries an on hand quantity for each location. This provides for a total of six location fields within the SPARDIS inventory system.

Detail Requirements by Date File

After the WA/R data is generated, those requirements flagged as "standard" or "common" (nested), in other words "Inventory items", are extracted. A Detail Requirement Record is established which reflects the date and quantity of the item required. The use of additional processing steps relating to the Detail Requirements File, determines those items that have not been manufactured to support a specified date. This is accomplished by allocating the ordered and released quantity in the Inventory Status to the requirements that exist in the Detail Requirements File in date sequence. When the ordered quantity allocated to requirements is insufficient, additional parts are released to the WA/R File in economic lot order size, as found recorded in the Inventory Status Record.

This process results in establishing the quantities of Inventory Items to be made with a positive date for completion. The same process that creates the WA/R file at the time of Chase is utilized to extract the manufacturing instruction necessary to make the Standard and Common Parts.

WA/R Cross Index File

The WA/R Cross Index File is created by extracting data from the Work Authorized/Released File and sorting it in next assembly sequence. The associated displays indicate the status of work complete and locations of the next assembly structure for a given assembly's number as it is currently shown in the WA/R File.

Parts Cross Index File

The Parts Cross Index File and its associated on-line, real time display, indicates all places that requirements exist for a given material code, part number, or assembly piece number. Data is removed from the Structure File and is sorted in source item reference number sequence. Any updates to the Structure File, are automatically reflected in the Parts Cross Index File.

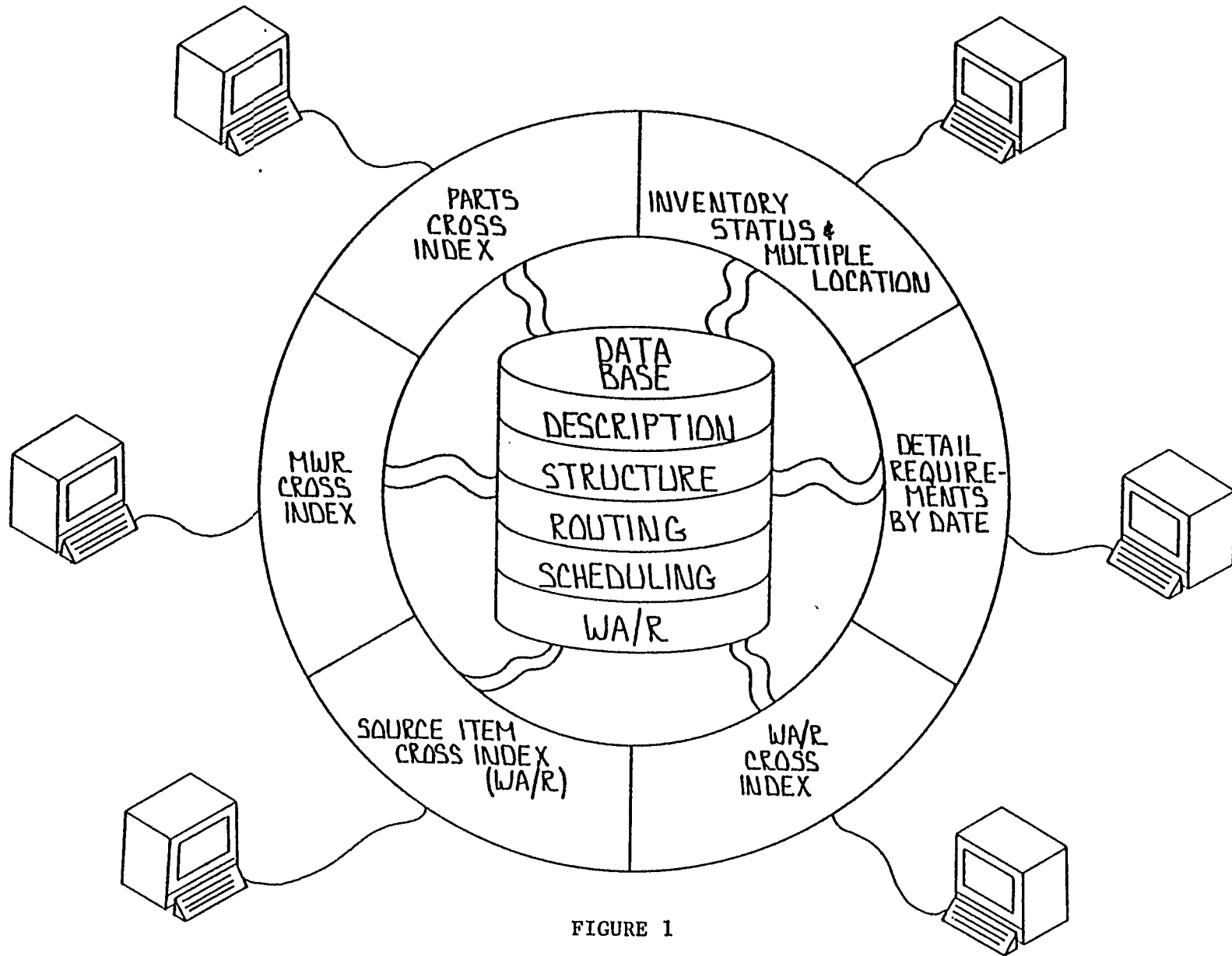
Source Item Cross Index File

The Source Item Cross Index File is compiled from data extracted from the WA/R file and is sorted in required date sequence. The associated display shows "where it is used" information pertaining to both raw material source items (for parts) and line item sources (for assemblies). Information displayed is real time and reflects only those records currently contained in the WA/R file.

MWR Cross Index File

The Material Withdrawal Request Cross Index File is used for requesting the issue of purchased material from the warehouse. Its major key is its MWR number which is the same as the Shop Order number used in our Shop Order number to list all purchase items necessary to produce a given task. These items are then ordered through the MWR System using the Shop Order number as the key.

Figure 1 is an illustration of the use of these supplementary files for ease of access to the data base. These files are developed to permit efficient use of the teleprocessing system for the user.



SPARDIS Application

Using the basic concepts discussed, let us examine how we can apply these concepts to control the massive task of building a ship. To do this we must provide management with the visibility to the initial planning effort and later to the actual production progress.

We *must* provide:

- 1) Definitions of the boundaries of tasks and events precisely.
- 2) A list of major tasks that combine many "erection units" into a single event or task.
- 3) As early as possible, material requirement information to ensure accurate material requirements planning (MRP) data.
- 4) A data base from which we can extract the data necessary for actual progress vs. the plan.

Utilizing the Description File we establish a list of key events or tasks which define the major measuring posts that must be passed in order to complete the ship. The SPARDIS keys or numbers for these tasks begin with "X1-". The numbers and their definitions are developed by Production Planning in conjunction with the production supervision. Examples of some of the types of events used are:

X1-1 Land main turbine.

X1-2 Complete installation of boat davits and their associated winches and equipment.

X1-7 Complete installation of pump room package prior to erection of 30' flat.

These events are then scheduled in relation to the major milestones such as keel, launch and delivery. The schedules for the major tasks are input into the Schedule File. The Schedule File then contains a set of event related completion dates which taken collectively, form the sequence in which the ship is to be built.

The defined tasks or events now form one level of our hierarchical arrangement. Continuing, we develop the supporting tasks in order to further define the component *structure* of the major task. Production Planning begins by defining these assemblies or packages of work in the Description File. These lower level components are generally prefixed by an "X1-" or "X2". For example let us call one of these lower level components A2-65 which we will define as the structural unit "Innerbottom unit 6" port to 29' off CL stbd., C-D-E3 stks, girders, transverse floors, frame 71 to 6" aft of frame 85 starboard". This unit which is part of the pump room is then structured as a component of the event which it will support. All other components of the event are also defined and structured. These components form another level in our hierarchy.

Each of these components becomes the parent assembly and their component structures are added until the raw material components are reached. In this manner we have created a multi-level hierarchical arrangement of components beginning with the highest level monitoring post.

Let us examine one of these major tasks to better understand the data base we are creating. We will use as our example:

X1-7 Complete installation of pump room package prior to erection of the 30' flat.

Figure 2 is an illustration of where the pump room is located in the ship. It consists of the supporting structure as well as the major pump room components. The structure of this package can be simplified by looking only at the major components. This structure will take the following form:
STRUCTURE OF X1-7:

<u>LINE</u>	<u>COMPONENT</u>	<u>DESCRIPTION</u>
01	A2-35	BOTTOM SHELL PLATING
02	A2-64	INNERBOTTOM - PORT
03	A1-65	INNERBOTTOM - STBD W/PIPING
04	A2-129	TRANSVERSE BHD FR 71 PORT
05	A2-130	TRANSVERSE BED FR 71 STBD
06	P2-30	PIPING THROUGH TANK TOP
07	P2-22	PUMP ROOM PIPING TANK TOP TO 30' FLAT
08	A2-157	LONG'L BHD PORT
09	A2-152	SIDE SHELL
10	A2-159	TRANSVERSE BHD FR 80 STBD
11	A2-160	LONG'L BHD STBD
12	A2-158	TRANSVERSE BHD FR 80 PORT
13	W2-21	BUTTERWORTH HEATER & DRATIN COOLER

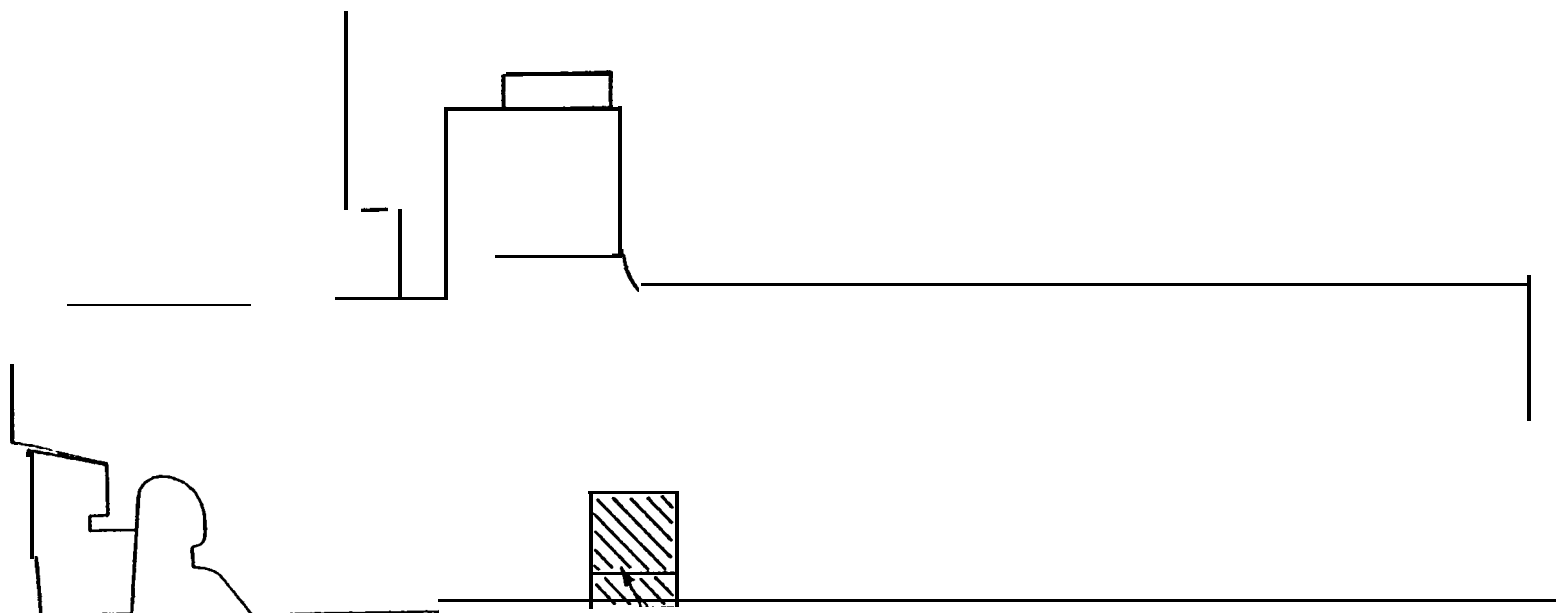
Each of these components in turn have their own structural components. For example A1-65 has as its components:
STRUCTURE OF A1-65:

<u>LINE</u>	<u>COMPONENT</u>	<u>DESCRIPTION</u>
01	A2-65	INNERBOTTOM - STBD
02	P2-20	INNERBOTTOM PIPING

These in turn have their own component structures. This process is continued in a "top down" planning sequence until the lowest level component is reached. In this manner we have formed a detail network of the events leading up to the completion of the task. You will note that the component number has no relation to its position or level in the structure.

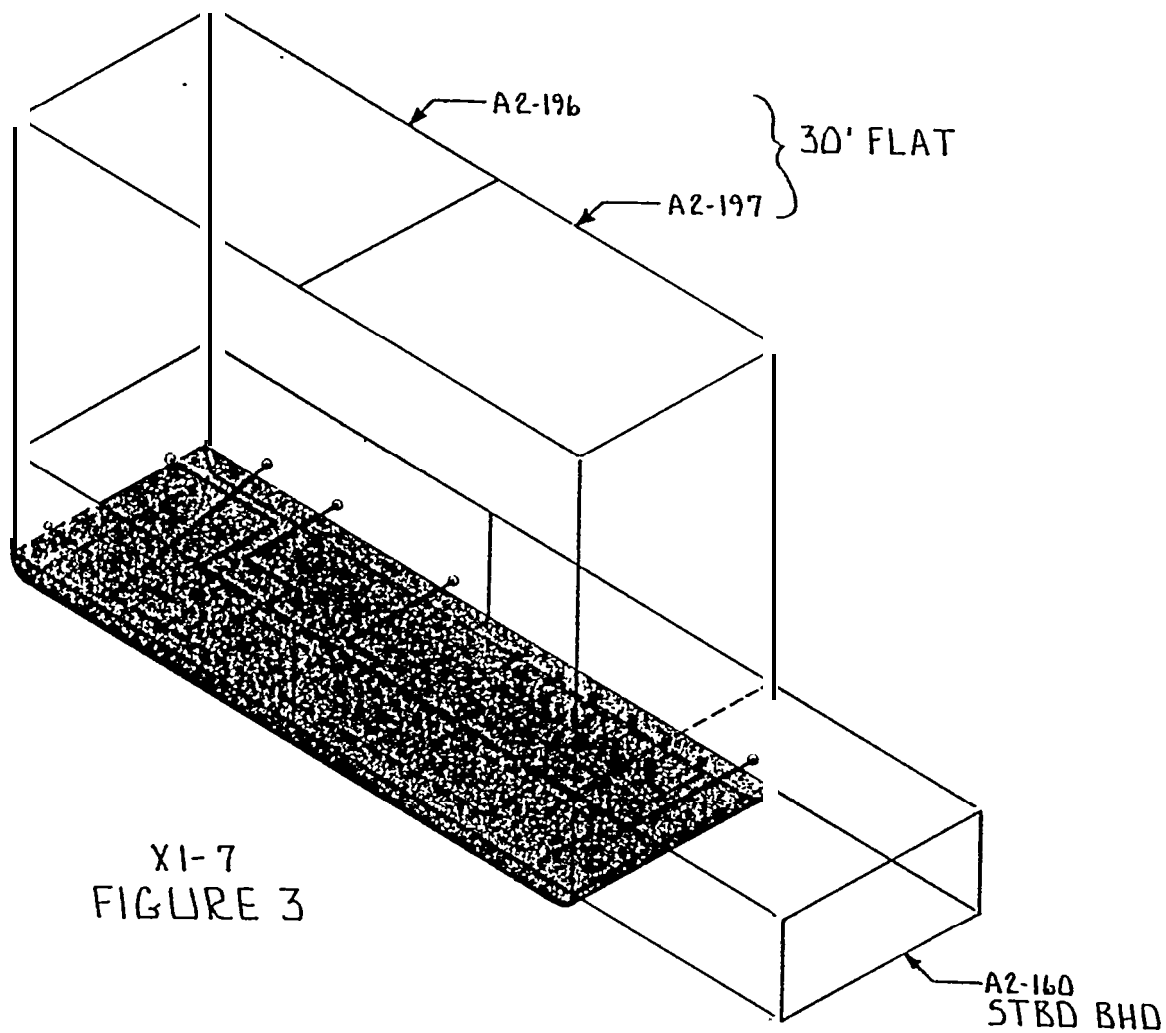
Figures 3 through 7 are given for illustration of the concept.

Each of these components is described, structured, and routed in the SPARDIS System. Routinely the four master files (Description, Schedule,



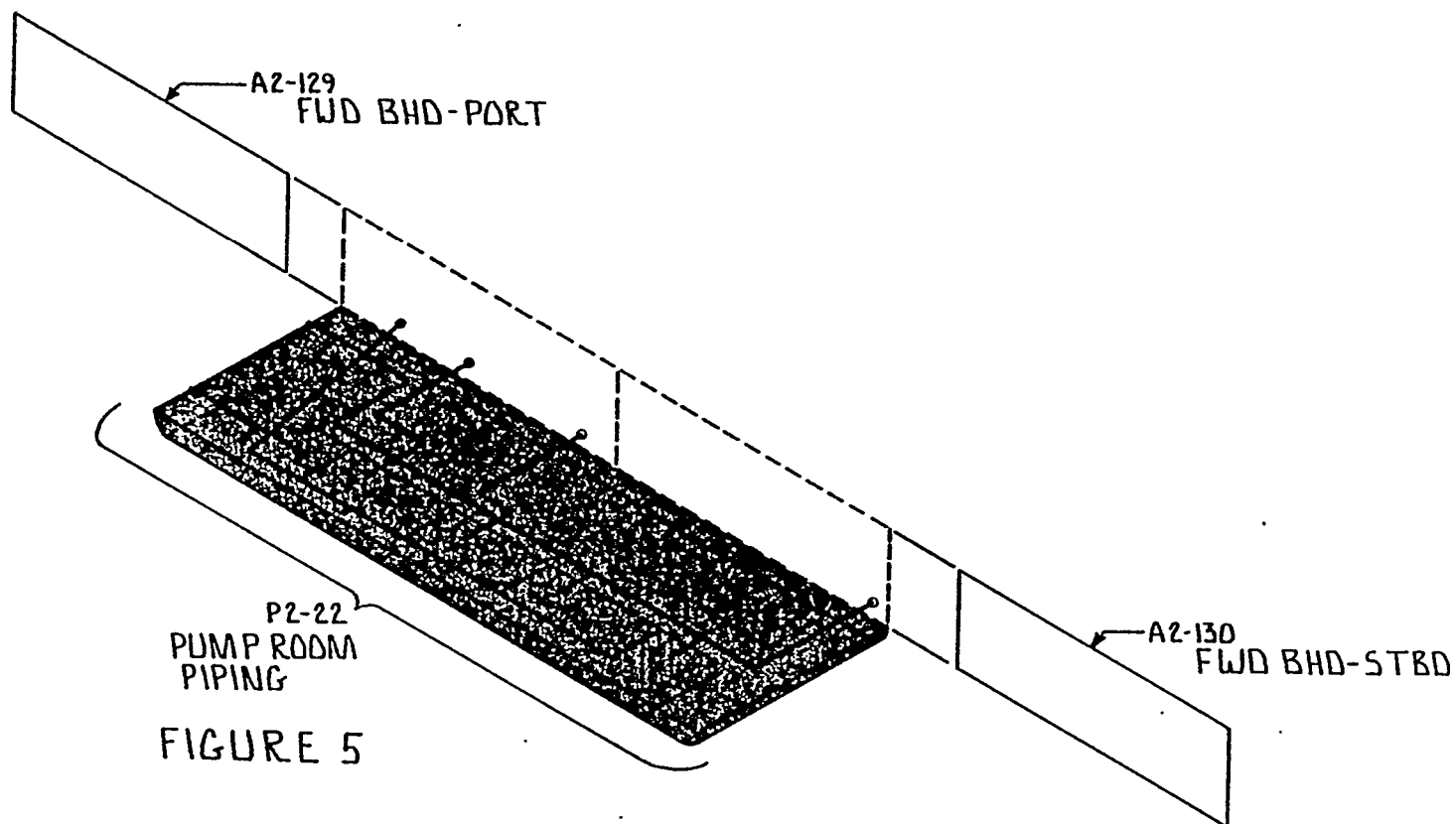
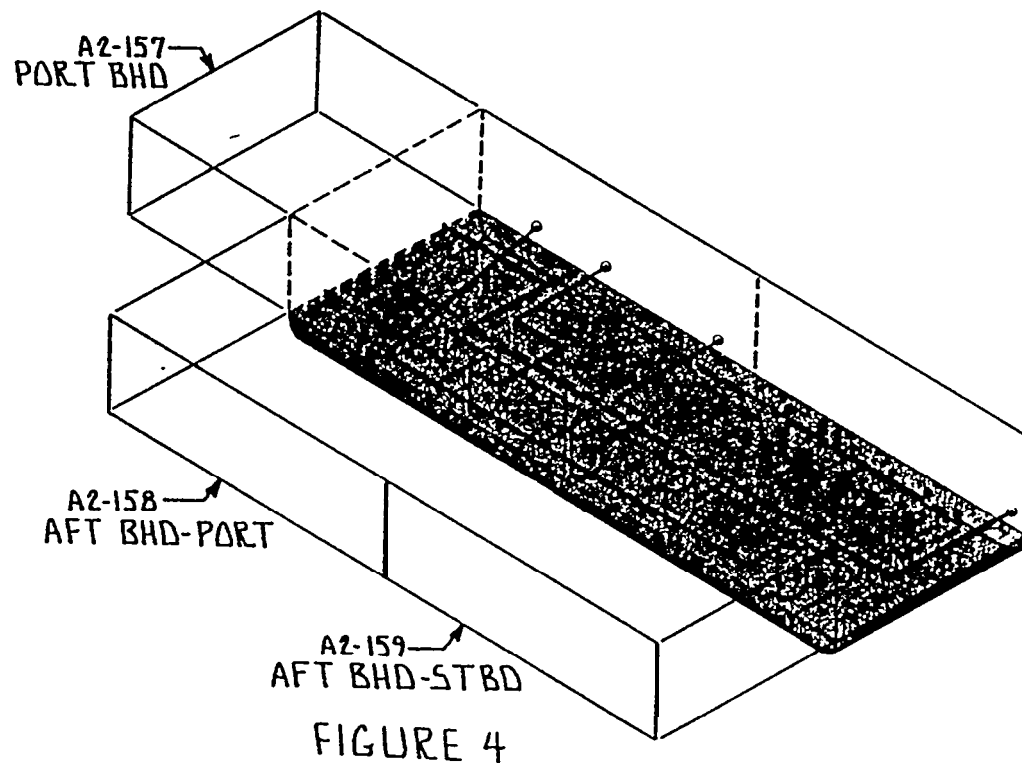
XI-7
PUMP ROOM PACKAGE

FIGURE 2



XI-7
FIGURE 3

A2-160
STBD BHD



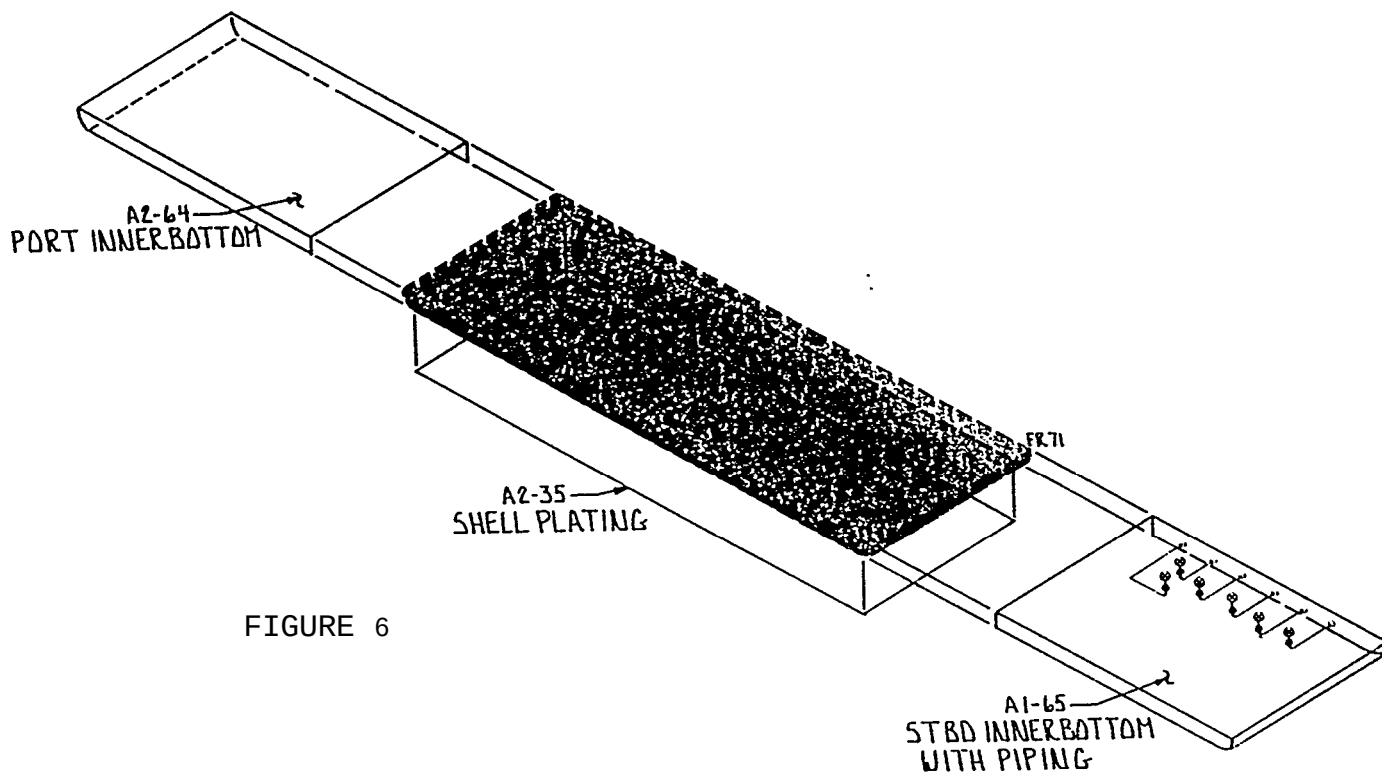


FIGURE 6

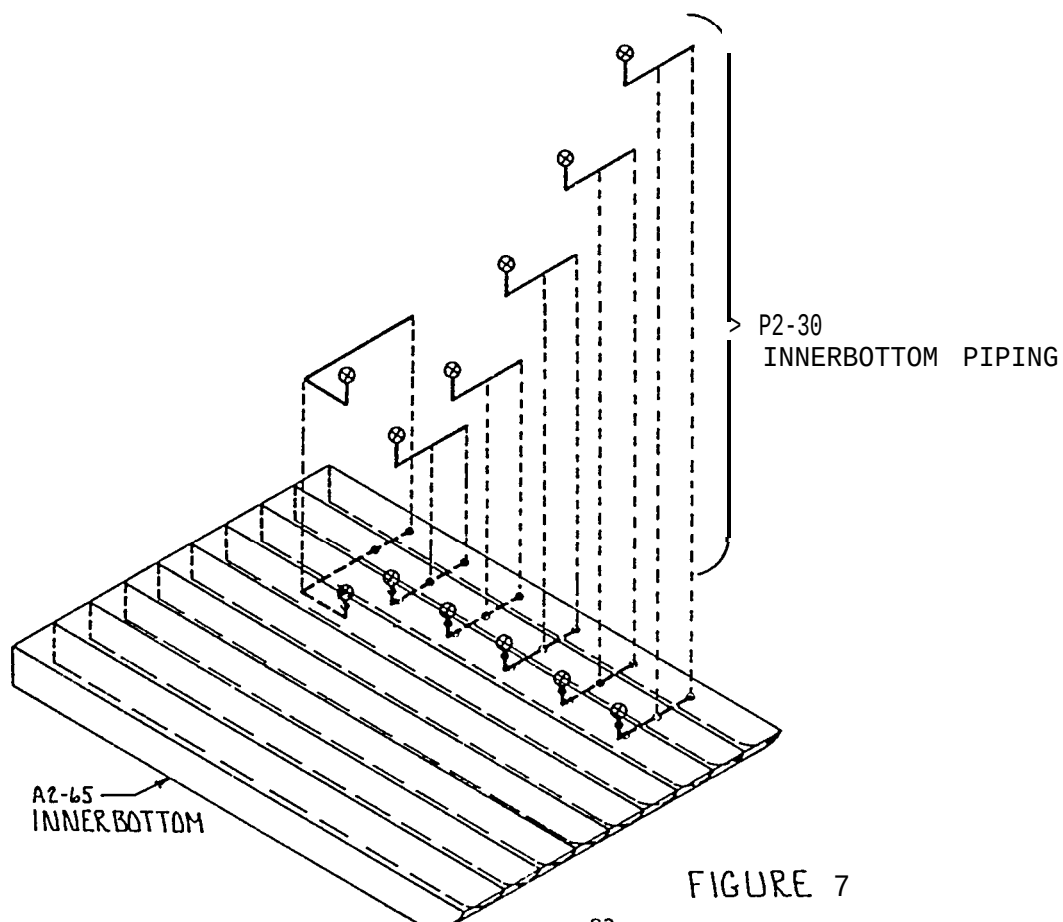


FIGURE 7

Structure, Routing) are combined through a parts explosion or chase process. This allows a scheduled start and completion date to be applied to the network.

This new set of data, called the Work Authorized/Released File, is used to examine material availability. To do this the WA/R data set is compared to the inventory *and* purchase order files and exception reports are generated. These exception reports are used by the purchasing department for expediting material to ensure material availability. Weekly, a portion of this WA/R data set is used to prepare detail production information to construct the ship. This information is in a special form called shop orders. A shop order is prepared for each level of the structure and is used both as an authorization for work and as a progressing tool in the shipyard. Data is maintained in the WA/R File *as-to* the actual status of components, with their location, in real time. This data is routinely entered into the system via remote terminals which are strategically placed throughout the shipyard. Status and progress information is available to anyone in the shipyard by a simple inquiry on one of these terminals.

SHOP ORDER SYSTEM

The Shop Order provides 2 means of authorizing production to produce a component in the shipyard. The shop order is a computer generated document which provides the necessary information to accomplish a single task. It is a tool which allows shipyard management to allocate the resources necessary to accomplish specific tasks. The shop order documents are tied directly to the withdrawal of purchased components as will be shown later.

The shop order system has three primary components (See Figure 8) :

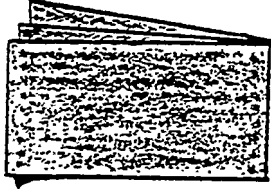
- 1) shop Order - a printed document providing the *necessary* information to accomplish a single task. The shop order card is a three-part snap-out form, 8 1/2 x 5 1/2 inches in size. The first sheet of the set is a yellow light-weight original, the second sheet is a green light-weight carbon copy and the third sheet is a heavy card stock carbon copy.
- 2) Work Station Schedule Log - a printed document which provides a list of shop orders for a specific work station, in date order. The work station schedule log is printed on standard computer paper 8 1/2 x 14 inches.
- 3) Teleprocessing System - a system of communication lines and terminals used to communicate with the Spardis system. These terminals are used for both inquiry and updating of the work in process. This permits the user to make decisions in his dynamic environment based on the latest information available. His decision making is aided in the knowledge of the latest status information as well as knowing where to go to get a part or assembly.

Weekly, as part of the chase or parts explosion process, shop orders are printed for work which has been authorized by Production Planning. A separate shop order is printed for each operation for each level of the network. That is, each work station that is to perform work on a specific component receives its own shop order. The shop orders are bundled, by work station, by scheduled start date, with the appropriate Work Station Schedule Log. As shop orders are printed, a number is attached to the shop order and its corresponding WA/R File *record*. This number is used in ordering purchased material from the warehouses as well as for filing purposes. The number is non-significant.

The work station schedule log is designed for use by the production foreman. It lists all work to be started on a specific day and indicates when each shop order must be completed to support the next level of events in the network. Space is provided for any annotations desired by the foreman.

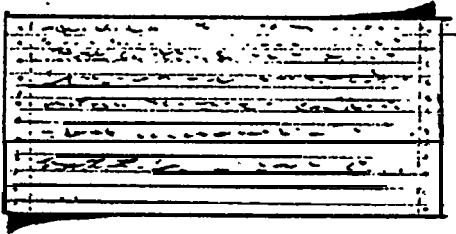
The shop order provides detailed instructions to clearly define the planned task. However, space is provided on the shop order form for the foreman to indicate any additional operations that must be performed.

The Shop Order System Consists of:



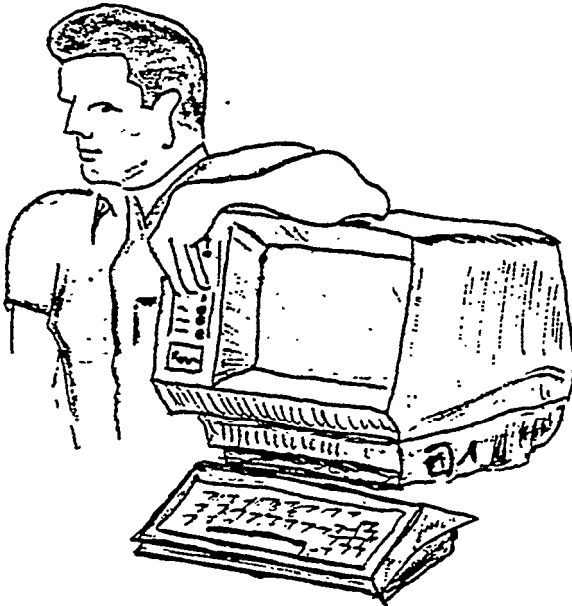
SHOP ORDER

Three part snap-out form
with carbons



WORK STATION SCHEDULE LOG

Foreman 's listing of jobs per
Work Station per day.



TELEPROCESSING SYSTEM (CRT)
Informational inquiry and
Work Station Update.

AND YOU -----THE USER

FIGURE 8

When the operations indicated have been performed the three copies of the shop order are used as follows:

- 1) Yellow - turned in to the Production Control Department to indicate the task is complete. In turn the corresponding WA/R File record is updated showing when the work was accomplished.
- 2) Green - shipping document, a traveler attached to the component to get it to its next work station; or discarded if the task level has been reached.
- 3) Heavy Card Stock - returned to the foreman so that he may update his records. If additional operations were required the form is returned to Production Planning so that the corresponding records can be corrected for any subsequent releases. It becomes a feed back document.

The shop orders are used throughout the shipyard and are the instrument by which material is progressed through its fabrication, assembly and installation cycles. Figure 9 is a diagram of the use of the shop orders. Figures 10 & 11 are examples of shop orders and work station schedule logs, respectively.

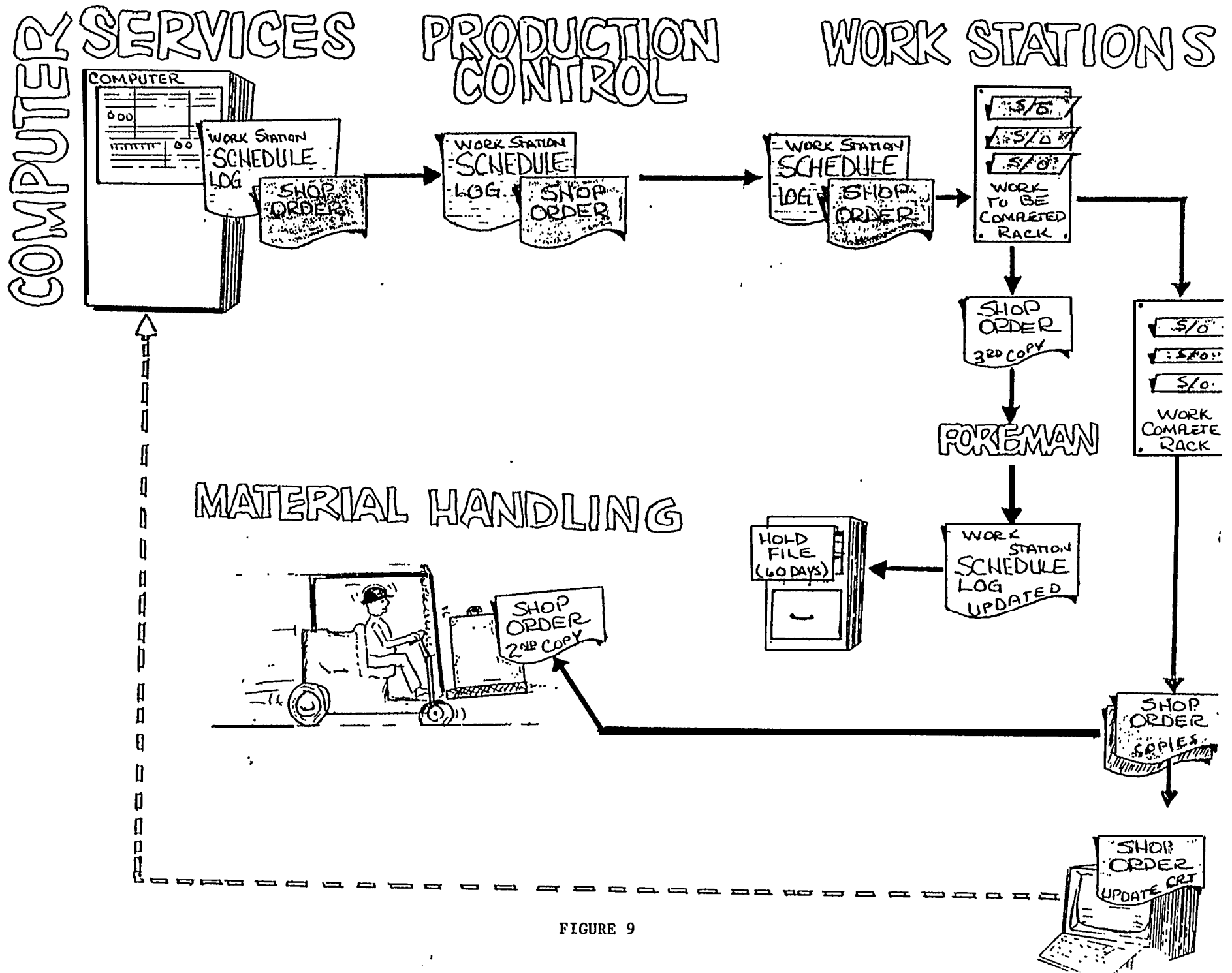


FIGURE 9

PURPOSE: To provide a printed hard-copy document that authorizes and releases to Production the information necessary to accomplish a specific task at a specific Work Station.	SCOPE: Details instructions for the steps required in the fabrication of Parts & Assemblies & the performance of tasks. The SHOP ORDER authorizes Production to accomplish work.	FREQUENCY: Daily, from 360-3 Transmittal Form & following a Final Change.	REPORT Number: S6127 Title: SHOP ORDER
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HUP ORD 302611-2 **W/S 025 14 ATFN ROLLS (AT SOUTH END OF RAISED SLAB) S6127
VG 398-100-009- - - HULL 398 PRI/OP 001 SIB/DP 033. START DATE 04/27/6
EF R A9-2073 REL 001 LNE 000 CKCD 2089 QTY EMPLOC (SEE INST) WEIGHT (4.7) TONS
/A R A3-239 DESC. PL 26-775X110-1/2-X36-00
/A R A2-106 REMARKS:
NSTL/D TO W-2PC (W10-J4). 6 HULL SETS 3 FR-01-1/4, 02-1/2, 02-3/4
03-1/4, 04-1/2 CKS (R15-1-5) (TIME CHARGE NO 6398-100-009-1001)
1 CD REF HQ REL QTY USE MS DESCRIPTION/REMARKS
2 026043 1 EA AN PL 26-775X112X450

(ADDITIONAL OPERATIONS)

SHOP ORD 302609-6 **W/S 035 JIG AREA - PLATEN FABRICATION SUB-ASSEMBLY S6127
DWG 398-100-009-4A - 02-B HULL 398 PRI/OP 000 SUB/DP 035. START DATE 05/07/6
REF R A2-106 REL 001 LNE 000 CKCD 1020 QTY TEMPLOC (ASSEMBLY)
N/A R A2-106 DESC. SIDE SHELL, G-H-J-K-L-M STRAKES, WITH VERTICAL WEIGHT (1 - 01TON)
P/A R A2-106 REMARKS: 10" AFT 01 TO 10" AFT 04. PORT.
INSTASSEMBLY AS PER DETAILS ON DRAWING.

LNE	CD	REF	NO.	UI	QTY	DESCRIPTION	TIME CHARGE NO
001	A3-239	EA			1	SIDE SHELL PLATING ASSY- FRAMES 01 TO 04. PORT.	398-100-009-06B-02-1
002	A4-203	EA			1	VERTICAL WEB FRAME, ON SIDE SHELL, FRAME 02. PORT. STIFFS AFT.	398-100-009-10A-03-1
003	A4-204	EA			1	VERTICAL WEB FRAME, ON SIDE SHELL, FRAME 03. PORT. STIFFS AFT.	398-100-009-11A-03-0
004	A4-205	EA			1	VERTICAL WEB FRAME, ON SIDE SHELL, FRAME 04. PORT. STIFFS AFT.	398-100-009-11A-03-1
005	2-A9-2129	EA			1	AN 7"X4"X7/16"X35"-03"	398-100-009
006	2-A9-2131	EA			1	AN 7"X4"X7/16"X35"-03"	398-100-009
007	2-A9-2133	EA			1	AN 8"X4"X1/2"X35"-03"	398-100-009
008	2-A9-2135	EA			1	AN 8"X4"X1/2"X35"-03"	398-100-009
009	2-A9-2137	EA			1	AN 9"X4"X1/2"X35"-03"	398-100-009
010	6-A9-2139	EA			1	AN 10"X4"X1/2"X35"-03"	398-100-009

CONTINUED

Sample of SPARDIS computer-generated SHOP ORDER card for a unique, individual Part number. Actual size of card: 8-1/2" x 5-1/2".

Sample of SPARDIS computer-generated SHOP ORDER card for an Assembly Work Station. Actual size of card: 8-1/2" x 5-1/2".

① **SHOP ORD** - Computer-assigned SHOP ORDER identification number.
W/S - 3-digit Work Station & description of Work Station.
START DATE - The scheduled work date that the fabrication of Reference Number should commence.

② **DWG** - The specific blueprint (Drawing) & location that Reference Number can be viewed.
HULL - The NASSCO-assigned Hull number.
PRI/OP - Indicates the previous operation or Work Station that the Reference Number was shipped from.
SUB/OP - This field indicates all subsequent Work Station(a) that the Reference Number must progress through before completion of this Level.

③ **REF** - Identifies the Hull Code & the SPARDIS Reference Number (Piece Number) identification.
REL - Indicates the Release Number of the Reference Number.
LNE - Specifies the Line Item within the Reference Number's structural matrix for the specific Release indicated.
CKCD - Computer-assigned Check Code. This Code is intended to negate improper updates (such as a number transposition) by personnel entering on-line updating.
Q T Y - Indicates the quantity of the Reference Number required for this particular Release Number.

(Continued on next page)

PURPOSE: To provide printed hard-copy document that authorizes and releases to Production the Information necessary to accomplish specific task at a specific Work Station.	SCOPE: Details instructions for the steps required in the fabrication of Parts & Assemblies & the performance of tasks. The SHOP ORDER authorize production to accomplish work.	FREQUENCY: Daily, from 360-3 Transmittal Form & following Final Chase.	REPORT Number: S6127 Title: SHOP ORDER
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SHOP ORD 382611-2 00W/S 025 PLATEN ROLLS 1AT SOUTH END OF RAISED SLABS S6127
VE 398-100-009- HULL 308 PRI/DP 001 SUB/DP 035: START DATE 04/27/74

EF R A9-2073 REL 001 LNE 000 CKCD 2009 QTY TEMPLC (SEE INSTN) WEIGHT 1 4.71TONS
/A R A3-239 DESL PL 26-775X118-1/2X36-00
/A R A2-106 REMARKS:

INSTL'D TO W-2PC (W18-14), 6 RULL SETS 3 FR-81-1/4, 82-82-1/2, 82-3/
83-1/4, 84-12 CKE (R18-1-3) (TIME CHARGE NO 6398-100-009-100)

1 CD REF NO REL QTY UI NS DESCRIPTION/REMARKS
2 826043 1 EA AH PL 26-775X122X159

(ADDITIONAL OPERATIONS)

SHOP ORD 382609-6 00W/S 025 JIG AREA - PLATEN FABRICATION SUB-ASSEMBLY S6127
DVG 398-100-009-0A - 02-B HULL 398 PRI/DP 000 SUB/DP 035: START DATE 05/07/74

REF R A2-106 REL 001 LNE 000 CKCD 3029 QTY TEMPLC (ASSEMBLY) WEIGHT 1 0.01TONS
N/A R A2-106 DESC: SIDE SHELL C-H-J-K-L-M STRAKES, WITH VERTICAL
F/A R A2-106 REMARKS: 18"APT 81 TO 18"APT 84, PORT.
INSTL'ASSEMBLY AS PER DETAIL ON DRAWING

LNE	CD	REF NO.	UI	QTY	DESCRIPTION	TIME CHARGE NO 6398-100-009- DRAWING
001	A3-239	EA		1	SIDE SHELL PLATING ASSEMBLY FRAMES 81 TO 84, PORT.	398-100-009-068-02-A
002	A4-203	EA		1	VERTICAL WEB FRAME ON SIDE SHELL FRAME 82, PORT. STIFFS APT.	398-100-009-10A-03-A
003	A4-204	EA		1	VERTICAL WEB FRAME ON SIDE SHELL FRAME 83, PORT. STIFFS APT.	398-100-009-11A-03-A
004	A4-205	EA		1	VERTICAL WEB FRAME ON SIDE SHELL FRAME 84, PORT. STIFFS APT.	398-100-009-11A-03-B
005	2-A9-2129	EA		1	AN 7"x4"x7/16"x35"-03"	398-100-009
006	2-A9-2131	EA		1	AN 7"x4"x7/16"x35"-03"	398-100-009
007	2-A9-2133	EA		1	AN 8"x4"x1/2"x35"-03"	398-100-009
008	2-A9-2135	EA		1	AN 8"x4"x1/2"x35"-03"	398-100-009
009	2-A9-2137	EA		1	AN 8"x4"x1/2"x35"-03"	398-100-009
010	6-A9-2139	EA		1	AS 10"x4"x1/2"x75X35"-03"	398-100-009
011					(SEE 009)	

CONTINUED

Sample of SPARDIS computer-generated SHOP ORDER card for a unique, individual Part number. Actual size of card: 8-1/2" x 5-1/2".

(Continued from last page)

TEMPLC - Template Location: Specifies the storage location of MOLD LOFT-prepared Layout & fabrication templates. On the above sample, the word ASSEMBLY indicates that all of the component Parts have already been laid-out & fabricated, thus the function of this Assembly Work Station 035 is to weld all of the components & parts (tabulated in Detail ⑤ above) together to produce the structurally complete modular component Reference Number R A2-106.

WEIGHT - TONS - Indicates the accumulated weight (short tons) of all of the individual Parts for Level 1 Assemblies and for Levels 3 through 7. This weight factor does not include the weight of weld or other joining medium. On a Part Level, only the weight of the Part itself is shown. This field also assists Riggers in assignment of proper Transportation equipment when movement of a Part or Assembly is pending.

N/A - Indicates the Next Assembly to which the Reference Number is destined. On the above right-hand sample for R A2-106, both the Next & Final Assembly reflects self-finisization because this Unit is a Level 1 Erection Sequence. The left-hand sample for R A9-2073 indicate R A3-239 as its Next Assembly; subsequently R A3-239 moves to R A2-106 and will become an integral part of R A2-106.

DESC - This field describes the Reference Number.

INS - Details exact fabrication/handling instructions for Reference Number.

TIME CHARGE No. - Labor charge reference to be entered on workers' time cards for charging the various Trades' time to the Specified Hull.

FIGURE 10 (Page 2 of 3 pages)

(Continued on next page)

Purposes:	SCOPE:	FREQUENCY:	REPORT Number: S6127
To provide a printed hard-copy document that authorizes and releases to Production the information necessary to accomplish a specific task at a specific Work Station.	Details instructions for the steps required in the fabrication of Parts & Assemblies & the performance of tasks. The SHOP ORDER authorizes Production to accomplish work,	Daily, from 360-3 Transmittal Form & following a Final Chase.	Title: SHOP ORDER

HOP ORD 302611-2 44W/S 025 PLATEN ROLLS (AT SOUTH END OF RAISED SLAB) S6127
 VG 398-100-009- HULL 398 PRI/OP 001 SUB/OP 035 START DATE 04/27/66
 EF R A9-2073 REL 001 LNE 000 CKCD 2089 QTY TEMPLOC (SEE INST) WEIGHT (4.7)TON7
 /A R A3-239 DESC. PL 26-775#X115-1/2-X35-03
 /A R A2-106 REMARKS2
 NSTSL/D TO V-2PC (W10-14). 4 HULL SETS 2 FR-01-1/4-02-02-1/2-02-3/
 .03-1/4-04-12 C/S (R14-1-51) (TIME CHARGE NO 6398-100-009-100)
 I CD REF NO REL QTY UI AS DESCRIPTION/REMARKS
 2 826043 1 EA AH PL 26-775#X122X450 (ADDITIONAL OPERATIONS)

1 SHOP ORD 302609-8 44W/S 035 JIG AREA - PLATEN FABRICATION SUB-ASSEMBLY S6127
 2 HULL 398-100-009-6A - 02-8 HULL 398 PRI/OP 000 SUB/OP 035 START DATE 05/07/66
 3 REF R A2-106 REL 001 LNE 000 CKCD 1020 QTY 1 TEMPLOC (ASSEMBLY)
 4 N/A R A2-106 DESC. SIDE SHELL, G-H-J-K-L-N STRAKES, WITH VERTICAL WEIGHT (4.0)TON7
 P/A R A2-106 REMARKS: 10AFT 01 TO 10AFT 04, PORT.
 INSTASSEMBLE AS PER DETAILS ON DRAWING.
 LNE CD REF NO. UI QTY DESCRIPTION (TIME CHARGE NO 6398-100-009-
 001 A3-239 EA 1 SIDE SHELL PLATING ASSY. DRAWING)
 FRAMES 01 TO 04, PORT.
 002 A4-203 EA 1 VERTICAL WEB FRAME, ON SIDE SHELL. 398-100-009-060-02-0
 FRAME 02, PORT. STIFFS AFT.
 003 A4-204 EA 1 VERTICAL WEB FRAME, ON SIDE SHELL. 398-100-009-10A-03-0
 FRAME 03, PORT. STIFFS AFT.
 004 A4-205 EA 1 VERTICAL WEB FRAME, ON SIDE SHELL. 398-100-009-11A-03-0
 FRAME 04, PORT. STIFFS AFT.
 005 2-A9-2129 EA 1 AN 7"x4"x7/16"x35"-03" 398-100-009-11A-03-0
 398-100-009
 5 006 2-A9-2131 EA (SIS #89) 398-100-009
 1 AN 7"x4"x7/16"x35"-03"
 007 2-A9-2133 EA (SIS #89) 398-100-009
 1 AN 8"x4"x1/2"x35"-03"
 008 2-A9-2135 EA (SIS #89) 398-100-009
 1 AN 8"x4"x1/2"x35"-03"
 009 2-A9-2137 EA (SIS #89) 98-100-009
 1 AN 9"x4"x1/2"x35"-03"
 010 6-A9-2139 EA (SIS #89) 398-100-009
 1 AD 10"x4"x1/4"-75X35"-03"
 6 1
 7 1
 CONTINUED

Sample of SPARDIS computer-generated SHOP ORDER card for a unique, individual Part number. Actual size of card: 8-1/2" x 5-1/2".

Sample of SPARDIS computer-generated SHOP ORDER card for an Assembly Work Station. Actual size of card: 8-1/2" x 5-1/2".

- 5 LNE - Specifies the Line Item within the Reference Number's internal structure (Detail (3) above).
 CD - Indicates the Source Item Material Code identification number which specifies NASSCO'S method of material acquisition.
 REF NO - For Level 1 Assemblies, this field lists the Parts, other Assemblies, or components that are structured into Ref. No. (Detail (3) above).
 For a Part Level, this field specifies the material Source Item Code number required to produce the Part.
 UI - Unit of Issue: This 2-digit alpha field establishes the Source Item Code measurement/qty factor: Example: EA - a complete entity.
 LF - linear footage.
 QTY - The quantity of that particular Line Item Reference Number required for the Level 1 Reference No. (Detail (3) above).
 DESC - Details the Assembly description or specifies the physical dimension of the Line Item Reference Number.
 DWG - Indicates the specific blueprint (Drawing) & location on the blueprint which the Line Item may be viewed.
 6 (SIS #89) - Refers to a separate document "Supplemental Instruction Sheet" that more fully defines special or complex fabrication data.
 7 CONTINUED - Alerts the user that the next Line Item of structure is continued on the next SHOP ORDER card.

END

PURPOSE: To provide a computer-generated printed document for Production Foremen which tabulates complete daily scheduled tasks for each Work Station under his supervision - for projecting maximum utilization of facilities.	SCOPE: Two-fold: (1) Provides a composite tabulation of the daily scheduled tasks for individual Work Stations, listing Start & Complete dates. (2) By issuing the Log to Foremen several work-days in advance, maximum utilization of available manpower, equipment & machine-loading can be realized.	FREQUENCY: Daily.	REPORT Number: S6134 Title: WORK STATION SCHEDULE LOG
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0134	DATE PREPARED 05-09-70	WORK STATION SCHEDULE LOG										025	N/A	WORK START DATE 06-10-6	06-10-6	
UI	QTY	REV	SOURCE	ITEM	QTY	N/A	F/A	PRI	OP	COMPLETE	DATE					
UI	QTY	REV	SOURCE	ITEM	QTY	N/A	F/A	PRI	OP	COMPLETE	DATE					
05257-7	389	A9-6106	002			EA	021402	1	A2-406	A2-406	001	06-14-6				
05259-3	309	A9-6107	002			EA	021402	1	A2-407	A2-407	001	06-14-6				
05281-7	300	A9-6095	002			EA	021458	1	A3-620	A2-485	001	06-14-6				
05294-0	300	A9-6096	002			EA	021458	1	A3-621	A2-406	001	06-14-6				
END																

① DATE PREPARED - The date that the computer produced this print-out.

② 025 - Indicates the Work Station for which this Log is issued.

③ START DATE - The scheduled Start Date for all items listed on Log.

④ S/O - Designates the SHOP ORDER number for this Release of Ref. No.

HULL - Indicates the Hull Number applicable for Release of Ref. No.
REF NO. - The SPARDIS Reference Number identification.
REL - The Release control number for Reference.

⑤ (Bracketed fields) - These fields provide space for Production Foremen to manually enter his planning data regarding assignment of manpower, facilities, etc.

⑥ UI - Unit of Issue: The Ref. No.'s quantity/measurement factor.

QTY. REV. - Quantity of Reference No. required & Revision of Ref. No.
SOURCE STOCK - Indicates the Material Source required to produce Ref. No.
ITEM QTY - Specifies the quantity of Source Stock to produce Ref. No.

⑦ N/A - Indicates the Next Assembly of Reference No.

⑧ F/A - Indicates the Final Assembly of the Next Assy.

⑨ PRI OP - Indicates the previous Work Station of Ref. No.

⑩ COMPLETE DATE - Specifies the scheduled completion date of Reference Number.

END

FIGURE 11

Material Withdrawal Request (MWR)

The material withdrawal request system is a method by which purchased material is withdrawn from warehouses by production. It also provides a means by which the material requirements established in the SPARDIS system may be analyzed against total shipyard inventory and outstanding purchase orders.

The data in the MWR system is developed by extracting purchased material requirements from the WA/R File. These requirements, which are time phased, are first compared to the inventory on hand. This comparison begins by allocating the material on-hand to the requirements until the total on-hand quantity is consumed. At this point the Purchase Order File is examined and any outstanding purchase orders for the commodity are compared to the required quantities and their corresponding required dates. In this manner a set of data is generated from which a series of reports is created. Among these reports is an analysis of outstanding requirements by vendor, by commodity and by the production "work package" (SPARDIS assembly). These reports form the basis of the material requirements planning (MRP) tools incorporated into the SPARDIS System.

The second phase of the MWR system deals with the actual withdrawal of material. As has been stated previously, this portion of the system is tied directly to the Shop Order. In developing shop orders for printing following a chase or parts explosion, a cross index to the WA/R file is developed. This cross index is developed for use of the teleprocessing system as a means of access to the WA/R data via the shop order number. The data being accessed, by way of the shop order number, is the same data as appears on the shop order. As part of the production process the production foreman examines his shop orders to determine which assemblies require purchased material. When he determines he is ready to proceed with the construction of an assembly, he simply requests the issue of material through the teleprocessing system. This request is then analyzed in relation to the material on-hand as described previously. The material is then obligated to the requested end-use and a withdrawal ticket printed by the computer. The withdrawal tickets are printed in such a manner that a group of commodities for a single assembly are printed by warehouse location. That is, if materials for a given assembly are located in more than one warehouse, then a separate ticket for each warehouse is printed. Separate documents are also prepared to allow for the staging or kitting of components from several warehouses. This permits the delivery of purchased components as a complete package of material to the appropriate work station, rather than the work station receiving a group of material from several warehouses and having to sort through the material to get the components they require for a specific job. This system is designed to permit a minimum amount of work-in-process and maximize the use of the data available for MRP. Since issues from the warehouse can be recorded in real-time, via the teleprocessing system, the inventory records tend to be more accurate than with "batch" systems.

Examples of several reports are presented in figures 12 thru 14. Figure 12 is a sample of one of the material analysis reports depicting commodities for which the material on-hand will be exceeded. Figure 13 is a sample of a material analysis report showing the assemblies scheduled that will be impacted by material shortages. Figure 14 is an example of an MWR ticket.

PURPOSE: To provide a "tool" to review the planned processes for filling material requirements & to assist in material purchases, expediting and production release decisions.	SCOPE: Exception report, listing those commodities for which the inventory on-hand is less than the requirements from the Chase process.	FREQUENCY: Daily, and following the Preliminary & Final Chases.	REPORT Number: M1628 Title: MATERIAL SHORTAGE REPORT
---	---	---	---

1	2											5	6	7	8	9	
M1628 DAILY - MATERIAL SHORTAGES REPORT - 1/3 04/13/76 05127 PAGE 15																	

MATERIAL CODE	DESCRIPTION / SIZE	DATE	ON HAND ACT	PROJ	CT	ON ORDER	ITEM SN	QTY	S / O	HKL REF NO	REL F / A	REL QTY
59-00-0853	STAT.OP.REMOTE.STOW#9879-RHMS 1" (R.TPI),STOW -517-16		0			0						
	PRIORITY-P	04-23-5	2-			2-	M			210965	393 R3-81	001 R2-63 001 2
	PRIORITY-P	04-23-5	9-			9-	M			210989	393 R3-103	001 R2-74 001 7
	PRIORITY-P	04-29-5	11-			11-	M			205037	393 R3-83	001 R2-64 001 2
	PRIORITY-P	04-29-5	25-			25-	M			205070	393 R3-87	001 R2-66 001 14
	PRIORITY-P	04-29-5	27-			27-	M			205095	393 R3-101	001 R2-73 001 2
		02-05-6	27-			20-	M R03198	001	7			
		02-05-6	27-			18-	M R03207	001	2			
		02-05-6	27-			16-	M R03284	001	2			
		02-05-6	27-			14-	M R03287	001	2			
		02-05-6	27-			0	M R03525	002	14			
		02-05-6	27-			1	M R03791	007	1			
59-00-0854	STAT.OP.REMOTE.STOW#9879-RHMS 1" (R.TPI),STOW -534-16		8			8						
	OBLIGATED-X	04-24-5	6			6	M			210924	393 R3-69	001 R2-53 001 2
	OBLIGATED-X	03-04-6	4			4	M			908764	393 R3-87	800 R3-87 800 2
	OBLIGATED-X	03-04-6	0			0	M			908765	393 R3-50	800 R3-50 800 4
	PRIORITY-P	03-04-6	2-			2-	M			908766	393 R3-41	800 R3-41 800 2
		02-05-6	2-			0	M R02871	004	2			
		02-05-6	2-			1	M R03832	001	1			

① **MATL CODE** - NASSCO-assigned material identification number. The 3rd & 4th digits represent the Level of Essentiality and Shock Grade and are used primarily for piping, valves - but are also applicable to certain other highly specialized commodities that require specific written certification by U.S. Governmental agencies or other regulatory entities.

② **DESC/SIZE** - Detailed description of Material Code.

③ **(Prioritized issue)** - Indicates the current "priority of issue precedence" for those items most critically needed by Production. At the discretion of a Production Foreman, those items deemed most urgent to Production and thus should be given priority issue precedence over other items can be so flagged directly on-line (via CRT Display SEL/YEL) thus modifying the issue sequencing order. The term OBLIGATED indicates that a Material Withdrawal Request (MWR) has been printed, but material has not been issued.

④ **DATE** - The scheduled date that the material is required for installation into an Assembly - or - the Promised Date for the Purchase Order.

⑤ **ON HAND:** **ACT** - The actual on-hand inventory quantity of Material Code that is currently in a NASSCO warehouse or storage area, and reduced by the required amount.
PROJ - Anticipated on-hand inventory qty of Material Code - if the on-order quantity is actually received when due or promised.

⑥ **CT** - NASSCO-assigned Contract identification code.

(Continued on next page)

PURPOSE: To provide a "tool" to review the planned processes for filling material requirements & to assist in material purchases, expediting and production release decision.

SCOPE: Exception report, listing those commodities for which the inventory on-hand is less than the requirements from the Chase process

FREQUENCY:
Daily, and following the Preliminary & Final Chases.

REPORT Number: H 1 6 2 8Title: MATERIAL SHORTAGE REPORT

DAILY - MATERIAL SHORTAGES REPORT - 1/3										04/13/76 05:27		PAGE 1							
MATL CODE	DESCRIPTION / SIZE	DATE	ON HAND ACT	PROJ	T	PO NO	ITM	SN	QTY	S	7	0	HUL	REF NO	REL	F	A	REL	QTY
59-00-0853	STAT.OP.REMOTE.STOW#9879-RHMS 1" (8 TPI),STOW -517-16																		
	PRIORITY-P	04-23-5	2-	0	2-	M			210965	393	R3-81	001	R2-63	001				2	
	PRIORITY-P	04-23-5	9-	0	9-	M			210989	393	R3-103	001	R2-74	001				7	
	PRIORITY-P	04-29-5	11-	11-	M				205037	393	R3-83	001	R2-64	001				2	
	PRIORITY-P	04-29-5	25-	25-	M				205070	393	R3-87	001	R2-66	001				14	
	PRIORITY-P	04-29-5	27-	27-	M				205095	393	R3-101	001	R2-73	001				2	
		02-05-6	27-	20-	M	R03198	001		7										
		02-05-6	27-	18-	M	R03207	001		2										
		02-05-6	27-	16-	M	R03284	001		2										
		02-05-6	27-	14-	M	R03287	001		2										
		02-05-6	27-	0	M	R03525	002		14										
		02-05-6	27-	1	M	R03791	007		1										
59-00-0854	STAT.OP.REMOTE.STOW#9879-RHMS 1" (16 TPI),STOW -534-16																		
	OBLIGATED-X	04-24-5	6	6	M				210924	393	R3-59	001	R2-53	001				2	
	OBLIGATED-X	03-04-6	4	4	M				908764	393	R3-87	800	R3-87	800				2	
	OBLIGATED-X	03-04-6	0	0	M				908765	393	R3-50	800	R3-50	800				4	
	PRIORITY-P	03-04-6	2-	2-	M				908766	393	R3-41	800	R3-41	800				2	
		02-05-6	2-	0	M	R02871	004		2										
		02-05-6	2-	1	M	R03832	001		1										

- ⑦ **ON ORDER:** Details all pending NASSCO Purchase Orders for Material Code:
PO NO - NASSCO Purchase Order number.
ITM - The Item (or Line) number on the Purchase Order that the Material Code appears.
SN - Multiple-shipment designator (01, 02, 03, etc.). Used when a vendor promises to ship specified qtls of the Material Code on different dates.
QTY - The quantity of Material Code ordered on the Purchase Order.
- ⑧ **(Date & Time)** - The actual date and time that this particular computer print-out was made.

(Continued on next page)

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FIGURE 12 (Page 3 of 3 pages)

PURPOSE: To identify Assemblies which contain material shortages - so that they may be rescheduled, if necessary, by Production Planning.

SCOPE: Exception report, listing Assemblies which contain commodities for which the inventory on-hand is less than the total requirements for that commodity.

FREQUENCY:
Daily, and
following the
Preliminary &
Final Chases.

REPORT Number: M1630

Title: ASSEMBLIES WITH MATERIAL SHORTAGES

M1630 ASSEMBLIES WITH MATERIAL SHORTAGES - DAILY 04/13/76 05:33 PAGE 35															
C	HULL	F / A	REL	N / A	REL	REF	REL	S / O	S	MTL CODE	QTY	DT REQ	W/S	NXT W/S	
V	388	B2-23	001	B2-23	001	B2-23	001	339851	2	98-00-0150	1	01-20-6	101	030	P-SHORT
V	388	B2-24	001	B2-24	001	B2-24	001	339855	2	98-00-0150	1	01-20-6	101	030	P-SHORT
V	388	B2-36	001	B2-36	001	B2-36	001	318708	2	98-00-1600	1	12-31-5	101	030	P-SHORT
V	388	B2-387	001	B2-387	001	B2-387	001	355773	4	50-00-0680	16	02-23-6	101	030	SHORTAGE
									2	51-00-0578	16	02-23-6	101	030	
									4	55-00-0107	16	02-23-6	101	030	
									2	98-00-0300	2	02-23-6	101	030	
V	388	B2-82	001	B2-82	001	B2-82	001	355804	2	98-00-3050	1	02-23-6	101	030	P-SHORT
V	388	C2-222	800	C2-222	800	C2-222	800	988948	4	50-00-0834	8	03-17-6	101	112	SHORTAGE
V	388	C2-368	001	C2-368	001	C2-368	001	369839	2	94-00-0080	3	03-31-6	101	112	SHORTAGE
									2	94-00-0055	3	03-31-6	101	112	SHORTAGE
V	388	C8-1069	001	C8-1069	001	C8-1069	001	393734	2	83-00-7978	1	05-04-6	002	077	SHORTAGE
V	388	K2-168	001	K2-168	001	K2-168	001	371794	2	98-00-5017	12	03-29-6	101	471	SHORTAGE

- ① C = NASSCO-assigned Contract identification code.
HULL = NASSCO-assigned Hull identification number.
F / A = Indicates the Final Assembly for which the material is destined.
REL = Specifies the Release Number of the Final Assembly for which the material has been allocated.
- ② N / A = Indicates the Next Assembly for which the material is destined.
REL = The Release Number of the Next Assembly for which the material has been allocated.
- ③ REF = The Reference Item that appears on the Shop Order number.
REL = The Release Number of the Reference Item that is printed on the Shop Order.
S / O = The Shop Order number containing the Reference Item detailing.
- ④ S = Denotes the Source Item Material Code number which specifies NASSCO's method of material acquisition.
MTL CODE = NASSCO-assigned Material Code identification number.
QTY = Specifies the quantity of Material Code required for Reference Number.
DT REQ = Indicates the date that the Material Code must be delivered to Production.
- ⑤ (Date & Time) = The actual date and time that this particular computer print-out was made.
- ⑥ W/S = Specifies the issuing Work Station that the Material Code is to be shipped from.
NXT W/S = Indicates the next Work Station or Assembly area that the Reference Item is destined.
- ⑦ (Shortage flags) = This field indicates whether or not an item has a potential shortage based on the material analysis (see REPORT M1628). The word SHORTAGE indicates a potential shortage; the word P-SHORT indicates a potential shortage that has been selected for high issue priority.

END

FIGURE 13

PURPOSE: To provide a printed hard-copy document that authorizes issue of purchased components to Production.	SCOPE: Assures control of both the issue and in-house delivery point of all components.	FREQUENCY: Daily.	REPORT Number: <u>MWR</u> Title: <u>MATERIAL WITHDRAWAL REQUEST</u>
---	---	---------------------------------	--

① HSE P
② MATERIAL WITHDRAWAL REQUEST
③ AREA: A
④ SHOP ORDER 376524-5 CD 1

⑤ RMG:100-027
REF NO:A9-10065
REL:001
REQ'D:04-19-76
HULL:388
PGE:01-01

⑥ TA:072
LOC:PLT SHOP PRE-FAB: STEEL PLATE (6 PLT C/F).
INV TYPE:INV STA

⑦	ISS	REQ	UI	PCE	MARK	MAT'L	CODE	DESCRIPTION	LOC.
	1	EA	02-0593	02-00-0593	PL	A		15.3#X115X246	

⑧	CONTR	REFERENCE	REL	LNE	CK	MATL	PREP
	V	A9-10065	001	000	140	B-B	

⑨ CTL APPROVED _____
⑩ DATE _____

⑪ *LAST PAGE - END OF PACKAGE*

⑫ MWR PRINT DATE 03/28/76
ISS'D _____
DATE _____
REC'D _____
DATE _____

① WISE - Specifies the Warehouse/Storage facility that will issue the Material Code (Piece Mark).

② AREA - Designated the in-house delivery point that the Warehouse will ship the Material Code (Piece Mark).

③ SHOP ORDER - The MWR SHOP ORDER control number.

④ CD - Card Code Check Digit. A computer-generated Check Code - intended to negate an improper on-line update.

⑤ DRWG - The blueprint (Drawing) that the Reference Number can be viewed.

REF NO. - NASSCO-assigned Reference Number identification.

REL - The Release control number for Reference Number.

REQ - Date that the Reference Number is required at Production.

HULL - NASSCO-assigned Hull identification code.

PCE - Indicates the number of contiguous pages and sets constituting this complete MWR: The first 2 digits = Page number; the second 2 digits = Set number.

⑥ STA - The Work station that the Material Code (Piece Mark) is to be shipped to.

LOC - Description of the receiving Work Station.

INV TYPE - Specifies the category or type of NASSCO'S Material Control Inventory system.

⑦ ISS - This "blank" field is used by the issuing Work Station to manually write-in the actual quantity of Material Code (Piece Mark) issued; the manually entered qty is then updated on-line for accounting/inventory control.

REQ - Indicated the qty of Material Code (Piece Mark) that is required to produce the Reference Number.

UI - Unit of Issue. The Piece Mark's measurement/qty factor

PCE MARK - Piece Mark: The Material Code Number assigned to the Piece being issued.

FIGURE 14 (Page 1 of 2 pages)

PURPOSE: To provide a printed hard-copy document that authorizes issue of purchased components to Production.	scope Assured control of both the issue and in-house delivery point of all components.	FREQUENCY: Daily.	REPORT Number: <u>MWR</u> TITLE <u>MATERIAL WITHDRAWAL REQUEST</u>
---	--	---------------------------------	---

①
②
③
④

WHSE P MATERIAL WITHDRAWAL REQUEST AREA: A SHOP ORDER 376524-5 CD 1

⑤ → DRWG:100-027 REF NO:A9-10065 REL:001 REQ'D:04-19-76 HULL:388 PGE:01-01

⑥ → STA:072 LOC:PLT SHQP PRE-FAB: STEEL PLATE (6 PLT C/F). INV TYPE:INV STA

⑦ {	ISS. REQ. UT PCE MARK	MAT'L CODE	DESCRIPTION	LOC.
	1 EA 82-0593	82-00-0593 PL A	15.3#X115X246	

⑧ {	CONTR	REFERENCE NO.	REL NO.	LNE NO.	CK. CODE	MATL PREP	
	V	A9-10065	001	000	140	B-B	

⑨ → MCTL APPROVED _____ DATE _____ *LAST PAGE - END OF PACKAGE* ← ⑪

⑩ → MWR PRINT DATE 03/28/76 ISS'D _____ DATE _____ REC'D _____ DATE _____ ⑫

⑦ (Continued)

MAT'L CODE = NASSCO-assigned 10-digit material identification code.

DESCRIPTION = Detailed description of the Material Code.

LOC = Indicates the storage location of the Material Code in the Warehouse or storage facility.

⑧ CONTR = NASSCO-assigned Contract identification symbol.

REFERENCE NO. = SPARDIS Reference Number identification.

REL NO. = The Release control number for Reference Number.

LNE NO. = Line Item Number of the Reference Number's structure.

CK. CODE = A computer-generated Check Code to insure that on-line updating of Warehouse issuance of the Piece Mark material for the proper Contract & Reference Number is correct.

MATL PREP = Material Preparation Code: Symbols define the special type of raw material surface preparation (cleaning, paint, etc.) that must be made before issuance of the Piece Mark to the first receiving Work Station.

⑨ MCTL APPROVED = The Material Control Department must manually verify and authorize issuance and proper assignment of Material Code(s) indicated on each MWR prior to forwarding the MWR to the issuing Warehouse or storage facility.

⑩ MWR PRINT DATE = The date that the computer printed the MWR.

ISS'D / DATE = The name of employee in the Warehouse that issued the material & the date of issue.

⑪ LAST PAGE ... = Indicates that this is the last Page of this MWR SHOP ORDER Number.

⑫ REC'D / DATE = The name of employee at the delivery point or receiving area for this particular Warehouse shipment.

END

FIGURE 14 (Page 2 of 2 pages)

SUMMARY

SPARDIS is a tool for planning and controlling the shipbuilding task. It is designed to permit management the visibility to one of the company's greatest resources, information. It allows management the ability to make intelligent decisions based on the latest status of the shipyard. It permits long range planning to be accomplished as well as the everyday detail release of work for the shipyard. To accomplish this SPARDIS uses a common data base concept. The common data base consists of five data files:

Description

Structure

Routing

Schedule

and created from these is the

Work Authorized/Released

The WA/R File generates reports for management and is used to release work to the shipyard. All other files in the SPARDIS System are generated from these "Master Files" for ease of access to this data base through the **teleprocessing system.**

As work is completed in the shipyard the data base is user updated on line, via remote terminals to provide:

Component history

Accurate audit trail

Completion status

Storage location (s)

In addition to the teleprocessing, system, management reports are generated in a routine manner. The types of reports generated are:

operational

Analysis

Exception

Additionally special reports are available on a request basis.

The concept of the SPARDIS teleprocessing system is that:

All files are on-line for data retrieval

Minimum of hard copy output

Principle method of data input

Data transmittal form optional as a back-up

Records are created in batch mode, data input and updated on-line.

Security feature of the teleprocessing system are established by allowing only certain terminals access to updating capability. Also certain check codes are created to ensure the proper record within a file is updated as well as the proper individual is performing the update. As part of the back-up system a series of transaction logs are maintained. The teleprocessing system in use at NASSCO has an average access time of between 5 and 10 seconds.

It should be re-emphasized that SPARDIS is nothing more than a tool. It is the user of the tool that allows the company to build ships in today's competitive shipbuilding environment.

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