

SHIP PRODUCTION COMMITTEE
FACILITIES AND ENVIRONMENTAL EFFECTS
SURFACE PREPARATION AND COATINGS
DESIGN/PRODUCTION INTEGRATION
HUMAN RESOURCE INNOVATION
MARINE INDUSTRY STANDARDS
WELDING
INDUSTRIAL ENGINEERING
EDUCATION AND TRAINING

October 1980
NSRP 0007

THE NATIONAL SHIPBUILDING RESEARCH PROGRAM

Proceedings of the REAPS Technical Symposium

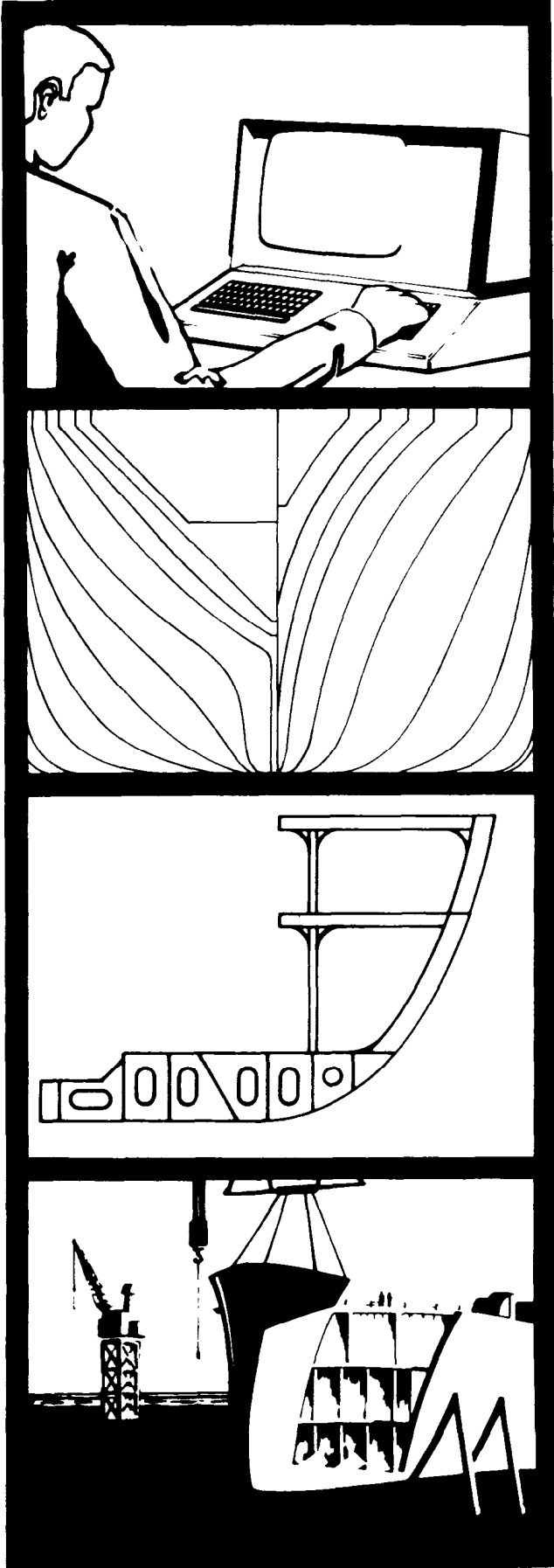
Paper No. 26: An Overview of the Manual and the Computerized "MOST" Work Measurement Systems

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

Report Documentation Page				Form Approved OMB No. 0704-0188	
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 OCT 1980		2. REPORT TYPE N/A		3. DATES COVERED -	
4. TITLE AND SUBTITLE The National Shipbuilding Research Program Proceedings of the IREAPS Technical Symposium Paper No. 26: An Overview of the Manual and the Computerized "MOST" Work Measurement Systems				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Surface Warfare Center CD Code 2230 - Design Integration Tools Building 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:			17. LIMITATION OF ABSTRACT SAR	18. NUMBER OF PAGES 28	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

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.



R ESEARCH
E AND
E NGINEERING
A FOR
A UTOMATION
P AND
P RODUCTIVITY
S IN
SHIPBUILDING

**Proceedings of the
REAPS Technical Symposium
October 14-16, 1980
Philadelphia, Pennsylvania**

**AN OVERVIEW OF THE MANUAL AND THE COMPUTER "MOST" WORK
MEASUREMENT SYSTEMS**

**William M. Yates Jr
Sales Coordinator
H. B. Maynard and Company Inc
Pittsburgh, Pennsylvania**

Mr. Yates has the responsibility for the administration of all company sales information and reports. He aids the sales staff with computer systems configuration and proposal preparation. He also provides presentations and demonstrations of H. B. Maynard and Company services to potential clients as well as interested professional organizations.

Mr. Yates holds a degree in administration from the University of Pittsburgh, and 'is a graduate of Carnegie-Mellon University.

MOST[®] COMPUTER SYSTEMS

**A NEW AUTOMATED
SYSTEM FOR THE ESTABLISHMENT AND
MAINTENANCE OF ENGINEERED LABOR TIME STANDARDS**

H. B. MAYNARD and COMPANY, INC.

INTERNATIONAL MANAGEMENT CONSULTANTS



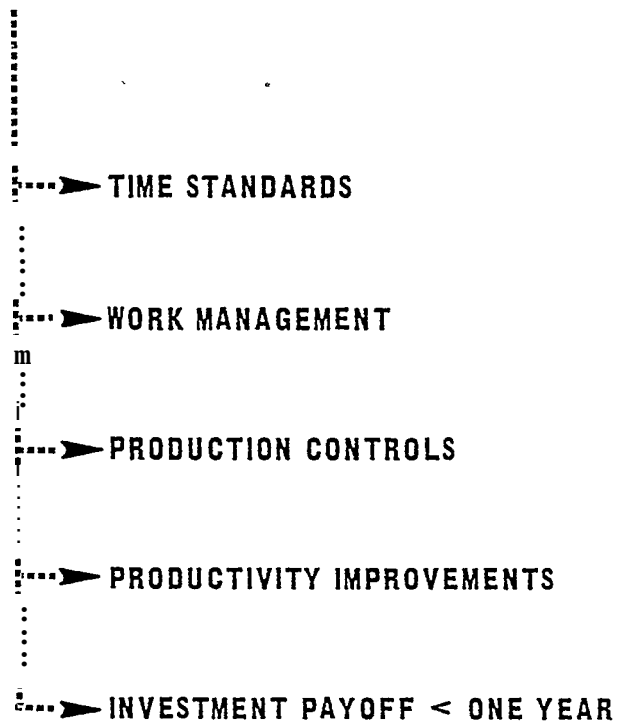
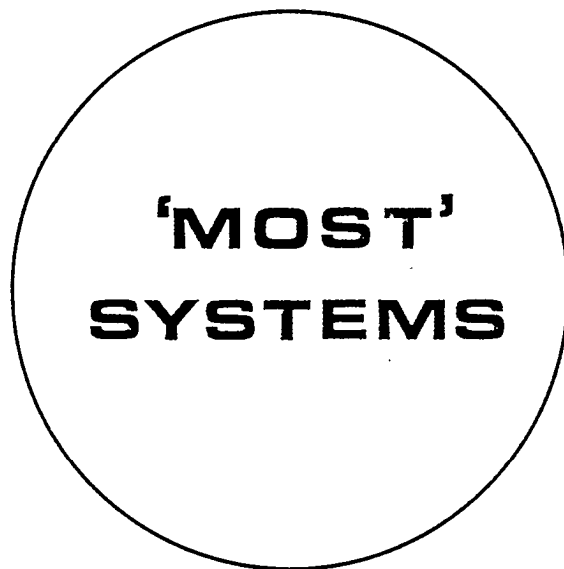


WHY DO WE NEED LABOR TIME STANDARDS?

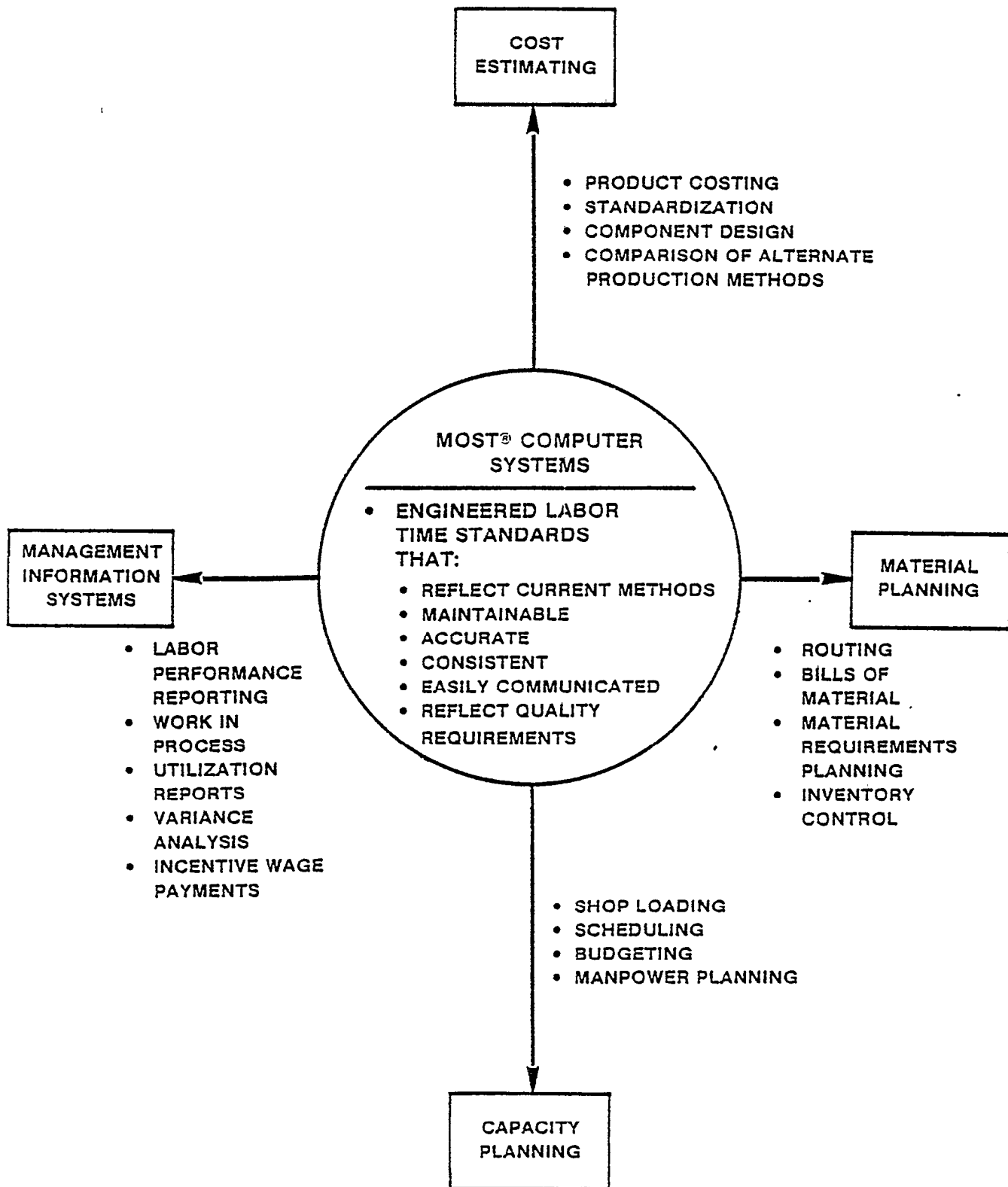
- **SATISFY A BASIC HUMAN CHARACTERISTIC (THE NEED TO KNOW WHAT IS EXPECTED FROM A PERSON)**
- **PLAN AND SCHEDULE LABOR REGARDING TIME AND MANPOWER**
- **CONTROL OUTPUT AND PRODUCTIVITY**
- **CALCULATE PRODUCT AND LABOR COSTS**
- **PAY BY RESULTS**

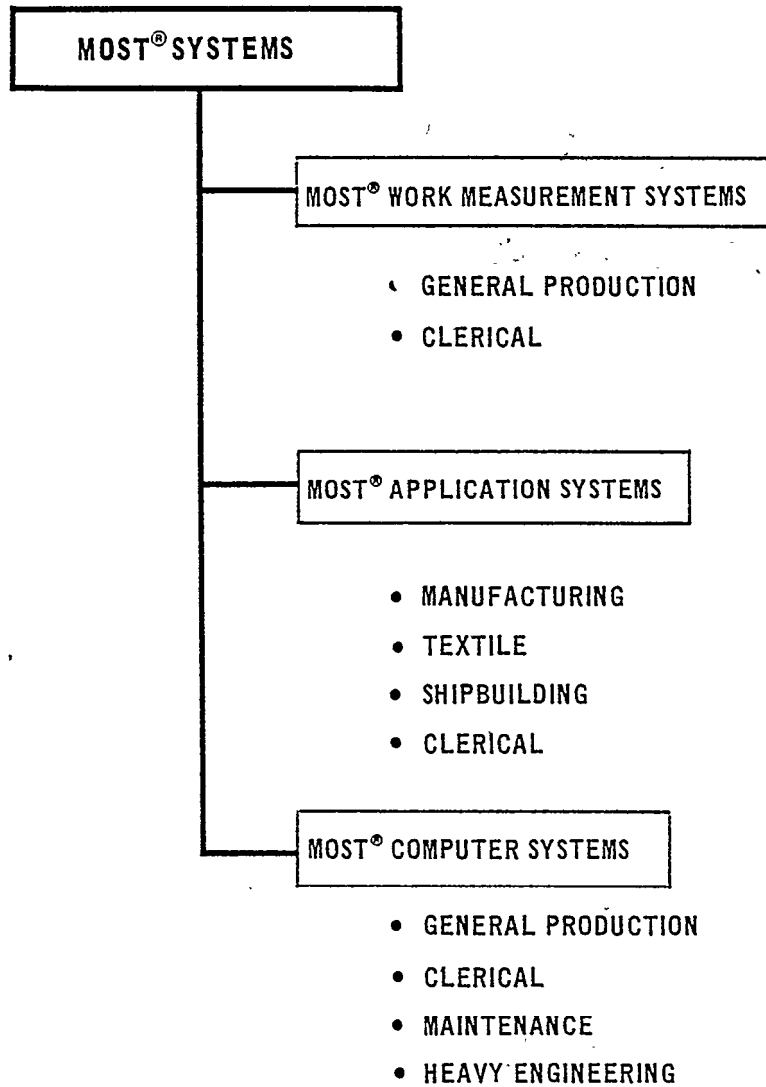
WHAT IS REQUIRED TO CALCULATE AN ENGINEERED TIME STANDARD?

- 1** DOCUMENTATION OF WORK CONDITIONS
- 2** WORK MEASUREMENT TECHNIQUE (MOST)
- 3** SUB-OPERATION DATA DEVELOPMENT
PRINCIPLES AND RULES
- 4** FILING SYSTEM FOR SUB-OPERATION DATA
- 5** CALCULATION FORMATS FOR FINAL TIME
STANDARDS



MOST® COMPUTER SYSTEMS





MOST SYSTEMS FAMILY

'MOST' FEATURES

- UNIVERSAL APPROACH
- FAST TO APPLY
- ADEQUATE ACCURACY
- EASY TO UNDERSTAND AND LEARN
- MINIMUM OF PAPERWORK
- MULTILEVEL SYSTEM
- CONSISTENT RESULTS
- ENCOURAGE METHODS DEVELOPMENT
- OPEN TO SUPPLEMENTS
- ECONOMIC INSTALLATION

MOST[®] COMPUTER SYSTEMS

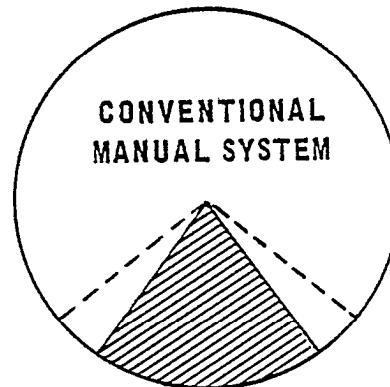
WILL -

- **SIMPLIFY AND ACCELERATE THE DEVELOPMENT AND MAINTENANCE OF TIME STANDARDS**
- **IMPROVE THE PRODUCTIVITY OF THE INDUSTRIAL ENGINEER**
- **MAKE THE INDUSTRIAL ENGINEER'S JOB MORE CHALLENGING AND STIMULATING**
- **GENERATE UNIFORM INFORMATION AND DATA FOR FASTER AND MORE CONSISTENT PRODUCTION PLANNING AND CONTROL**
- **INCREASE THE SAVINGS/COST RATIO FOR THE INDUSTRIAL ENGINEERING FUNCTION AND THE PROFITABILITY FOR THE COMPANY**

**REDUCED MANPOWER
REQUIREMENTS FOR:**

DEVELOPMENT

20%

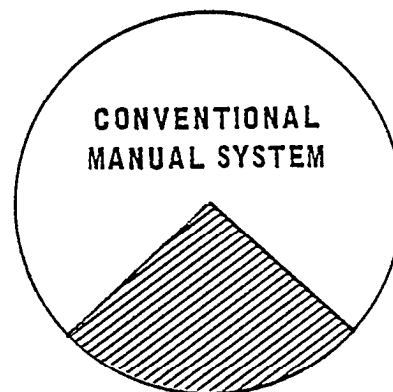


**INCREASE
IN OUTPUT**

> 5 TIMES

APPLICATION

25%



> 4 TIMES

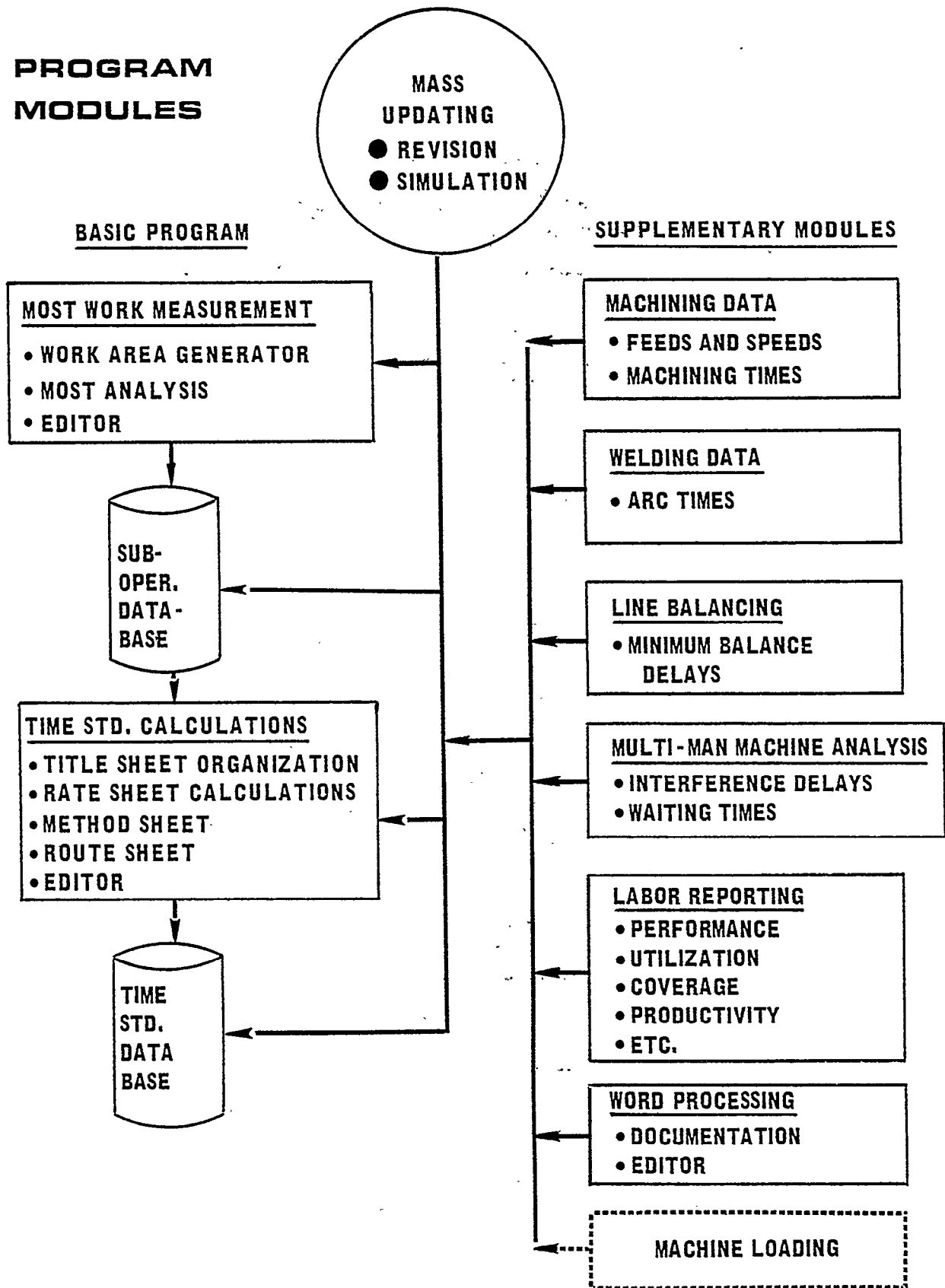
MAINTENANCE

10%

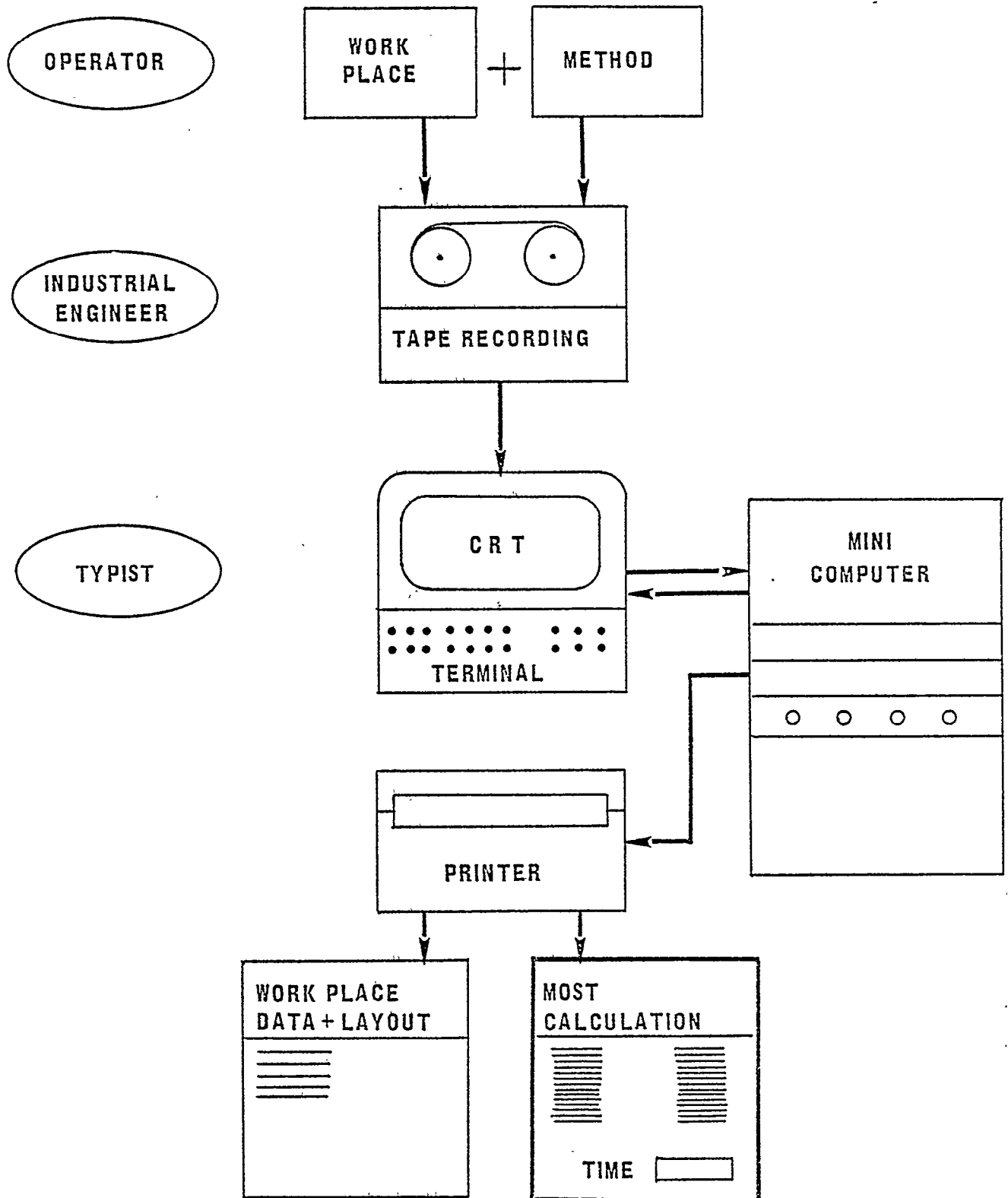


> 10 TIMES

PROGRAM MODULES

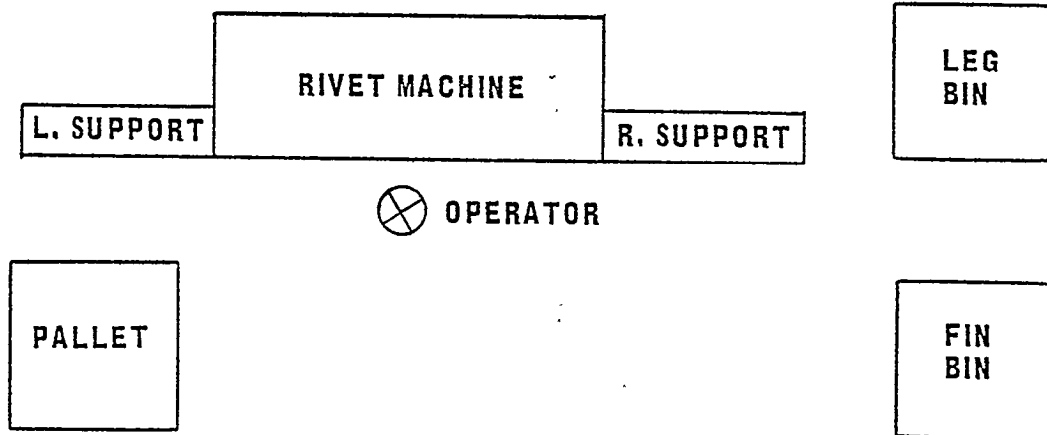


BASIC DATA ENTRY



ANALYSIS EXAMPLE

WORKPLACE: RIVET MACHINE



WORK STATIONS:

RIVET MACHINE	12/6, 6/3
LEFT SUPPORT	8/6, 4/1
RIGHT SUPPORT	16/6, 4/1
PALLET/BEND	8/2, 4/4
LEG BIN	22/6, 4/4
FIN BIN	22/2, 4/4

OPERATOR 15/6

EQUIPMENT:

RIVET MACHINE - PT =.5 SEC.

TOOLS:

NONE

ACTION DISTANCES:

FIN BIN - PALLET	3 STEPS
FIN BIN - R. SUPPORT	2
FIN BIN - L. SUPPORT	2
FIN BIN - RIVET MACH,	2
FIN BIN - LEG BIN	2
PALLET - R. SUPPORT	2
PALLET - L. SUPPORT	2
PALLET - RIVET MACH.	2
PALLET - LEG BIN	2

PARTS/OBJECTS:

PALLET - ANGLES

RIVET MACHINE - RIVET PINS

LEG BIN - LEGS

FASTEN WITH RIVETER

107/1005/2

RIVET 2 LEGS TO CENTER SUPPORT

1	PLACE 1ST LEG TO RIVETPINS AND LEFTSUPPORT		
	A3 B0 G1 A1 B0 F3 A0	1.0	80
2	PLACE ANGLE FROM PALLET TO RIVETPINS F 2		
	A3 B6 G1 A3 B0 F3 A0	2.0	320
3	PUSH FOOTPEDAL FOR RIVETING LEG		
	A1 B0 G1 M1 X1 I0 A0	1.0	40
4	HOLDMOVE ANGLE FROM RIVETMACHINE TO RIGHTSUPPORT		
	A0 B0 G0 A1 B0 F1 A0	1.0	20
5	PLACE 2ND LEG AND ANGLE TO RIVETPINS		
	A1 B0 G1 A1 B0 F3 A0	1.0	60
6	PUSH FOOTPEDAL FOR RIVETING LEG		
	A1 B0 G1 M1 X1 I0 A0	1.0	40
7	HOLDMOVE LEG ASSEMBLY TO FINBIN		
	A0 B0 G0 A3 B0 F1 A0	1.0	40

TOTAL TMU

600

MANUAL HANDLING		
ACTIVITY	SEQUENCE MODEL	SUB-ACTIVITIES
GENERAL MOVE	ABGABPA	A - ACTION DISTANCE B - BODY MOTION G - GAIN CONTROL P - PLACE
CONTROLLED MOVE	ABGMXIA	M - MOVE CONTROLLED X - PROCESS TIME I - ALIGN
TOOL USE	ABGABP ABPA	F - FASTEN L - LOOSEN M - MEASURE R - RECORD S - SURFACE TREAT T - THINK

© H. B. MAYNARD AND COMPANY, INC. 1975

MOST[®] COMPUTER SYSTEMS

FILING PROGRAM CATEGORIES FOR

SUB-OPERATION DATA UNITS

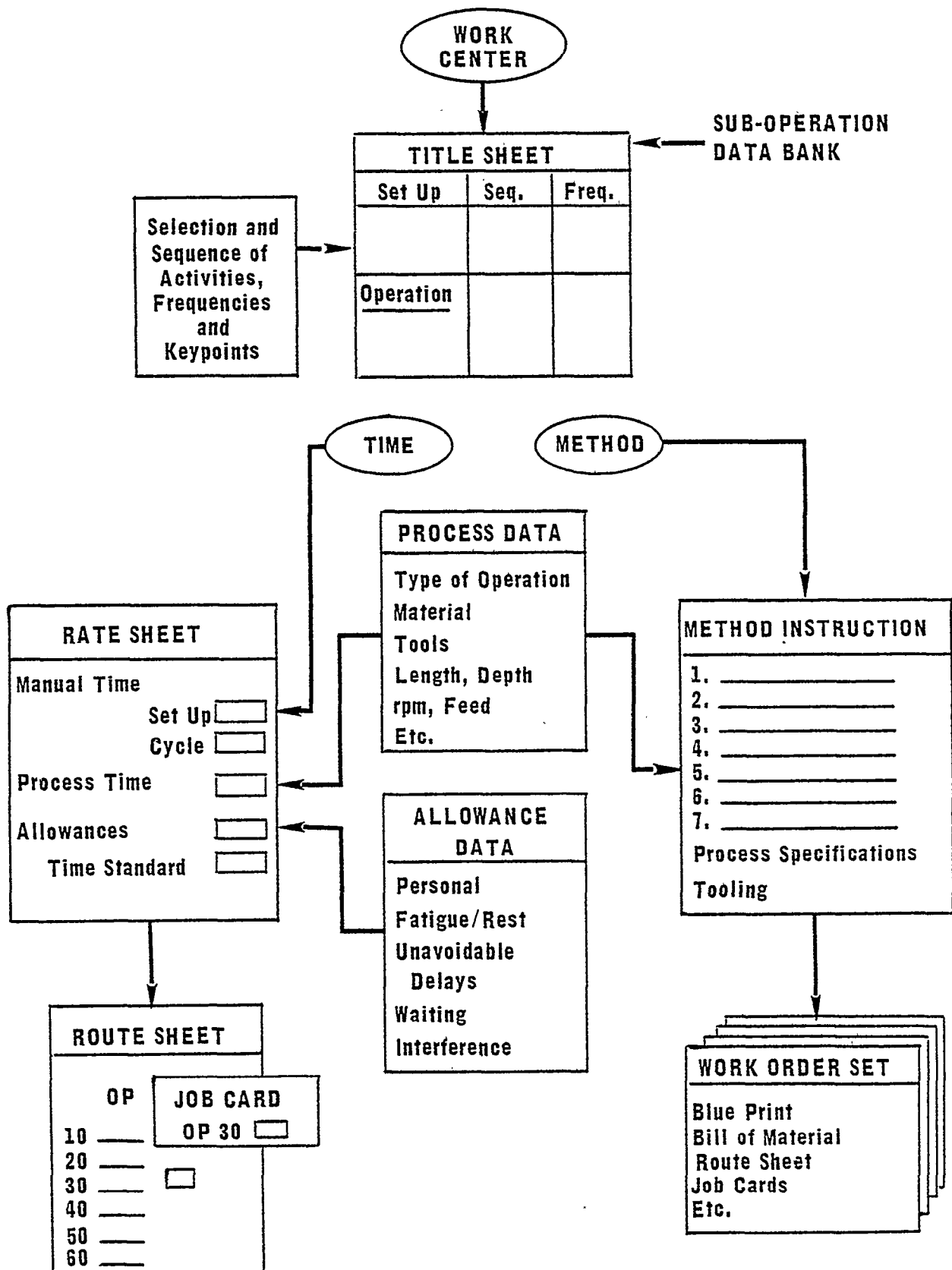
		<u>EXAMPLE</u>
M A J O R C A T E G O R I E S	● ACTIVITY(IES)	EXCHANGE
	● OBJECT(S) / COMPONENT(S) in/on/for	WORKPIECE in
	● EQUIPMENT / PRODUCT with	3-JAW CHUCK with
	● TOOL(S) from/to/at	T-WRENCH at
	● LOCATION	ENGINE LATHE #341
.....		
S U P P L E M E N T A R Y D A T A	● PER unit	PER part
	● OCCURRENCE FREQUENCY GROUP	OFG 2
	● DATE	11/7/77
	● SPECIAL USER CATEGORY(IES)	(APPLICATOR, PLANT, ETC.)
	● CONDITIONS	(RESTRICTIONS, SPECIAL APPLICATIONS, ETC.)

MOST" COMPUTER SYSTEMS

FILING CATEGORIES FOR TIME STANDARDS

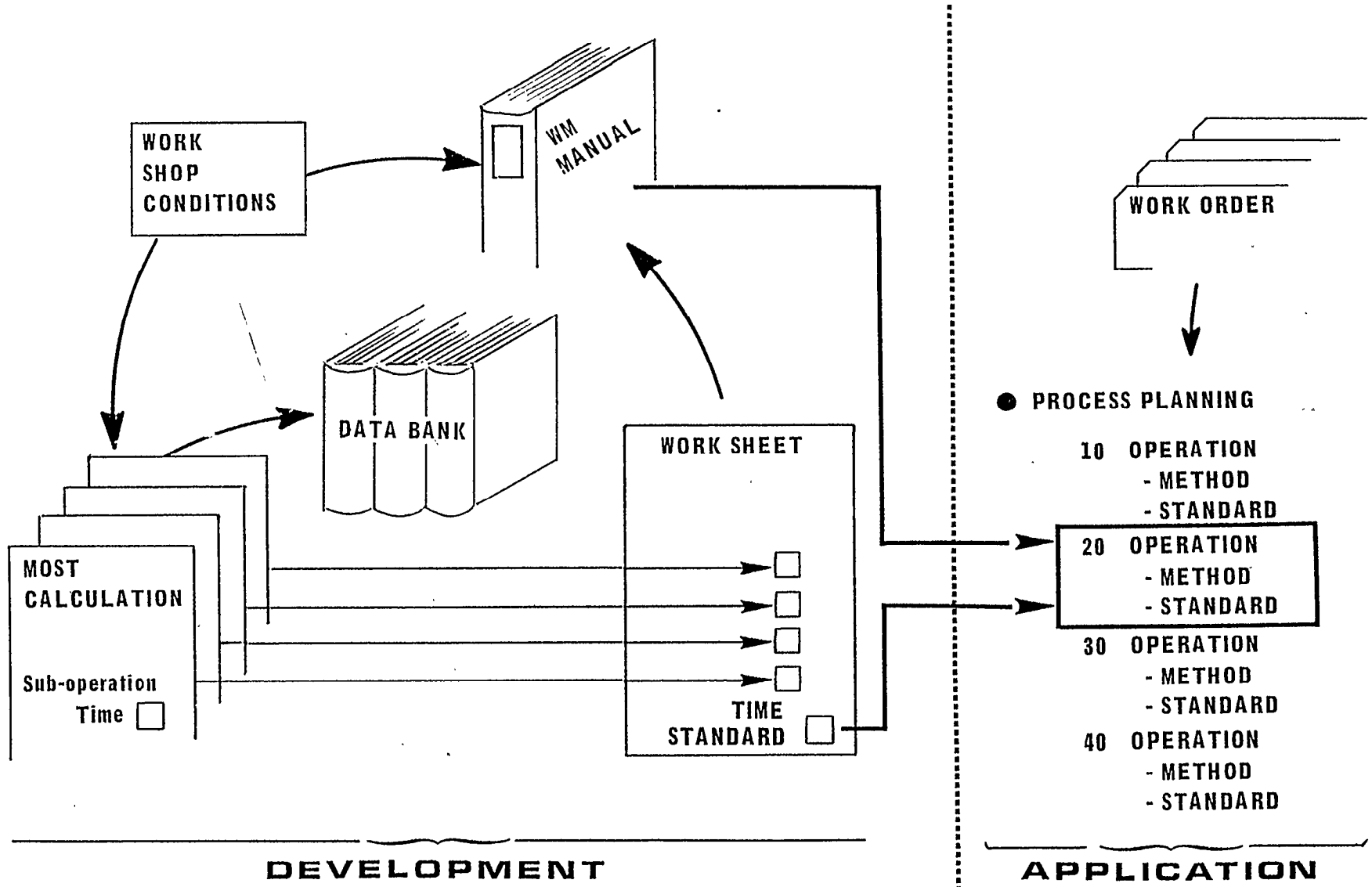
- PRODUCT/SUBASSEMBLY/PART NUMBER
- PRODUCT/SUBASSEMBLY/PART NAME
- COMPONENT CLASSIFICATION NUMBER
- PLANT NUMBER
- DEPARTMENT NUMBER
- COST CENTER NUMBER
- WORK CENTER NUMBER
- BILL OF MATERIAL NUMBER
- ROUTE SHEET NUMBER
- OPERATION NUMBER
- OPERATION NAME

PROCEDURE FOR ESTABLISHING METHODS AND TIME STANDARDS



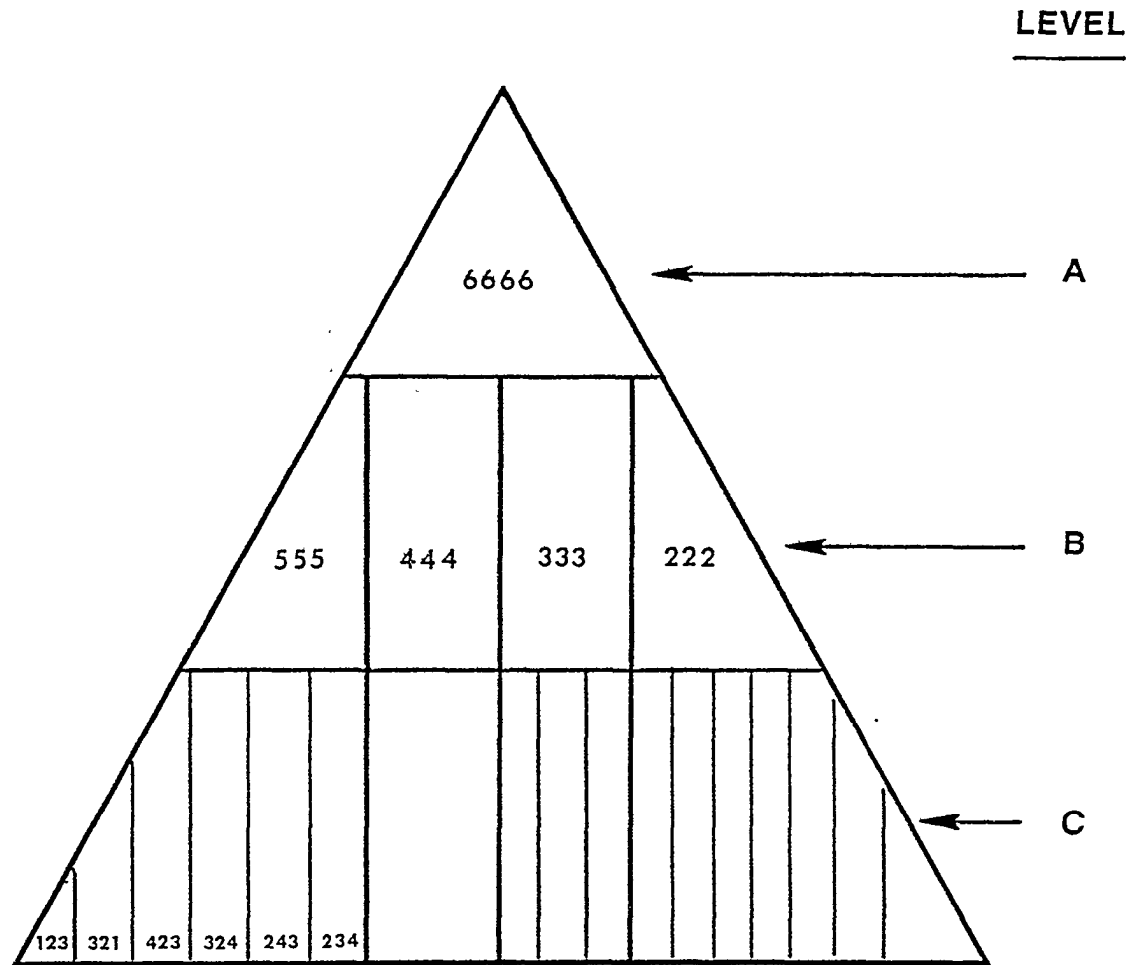
PROCEDURE FOR DEVELOPMENT & APPLICATION OF STANDARDS

585



SHIPBUILDING

MOST@ APPLICATION LEVELS



A - INDIVIDUAL STANDARDS COMBINED FOR WORK PACKAGE
APPLICATION - APPEAR ON THE STANDARDS CALCULATION
SHEET

B - FINAL COMBINED MOST ANALYSES

C - INDIVIDUAL OR COMBINED MOST ANALYSES

**COMPUTER MOST
APPLICATION SHEET
FITTING**

TITLE SHEET LOCATOR NUMBER 4321

MAJOR CATEGORY	NO.	DESCRIPTION	PER	LOCATER NO.
RINGS	1	INSTALL REINFORCEMENT RING	RING	6666
	2	MAKE-UP REINFORCEMENT RING	RING	7777
	3	_____	_____	_____
PLATES	4	MAKE-UP FACE PLATE TO WEB OR SECTION PART	FOOT	9999
	5	_____	_____	_____
	6	_____	_____	_____
	7	_____	_____	_____
	8	_____	_____	_____
_____	_____	_____	_____	_____

LEVEL

0	A		LN	6666	COMB SUB-OPERATION		
				555	MAKE-UP RING	FR	
				444	GRIND	1	
				333	INSTALL RING	1	
0	B	}		222	GRIND	4	
0	C	}					
0	D	}					
0	E	}					
0	F	}					
0	G	}					
0	H	}					
0	I	}					
0	J	}					
0	K	}					
0	L	}					
0	M	}					
0	N	}					
0	O	}					
0	P	}					
0	Q	}					
0	R	}					
0	S	}					
0	T	}					
0	U	}					
0	V	}					
0	W	}					
0	X	}					
0	Y	}					
0	Z	}					

WHY SHOULD YOU USE MOST[®] COMPUTER SYSTEMS?

(1) BECAUSE MOST[®] COMPUTER SYSTEMS CAN:

- **PROVIDE YOU WITH ACCURATE AND CONSISTENT WELL-DOCUMENTED
TIME STANDARDS AND METHODS DESCRIPTIONS**
- **PROVIDE YOU WITH REALISTIC TIME STANDARDS FOR COSTING,
SCHEDULING, MANPOWER PLANNING, PERFORMANCE CONTROL, WAGE
INCENTIVES, ETC., E.G., THE BASIS FOR YOUR "MANUFACTURING
INFORMATION SYSTEM"**
- **PROVIDE YOU WITH EASY-TO-READ METHOD INSTRUCTIONS FOR YOUR
OPERATORS, ROUTE OR PROCESS SHEETS AS WELL AS WORKPLACE
LAYOUTS AND DATA**
- **PROVIDE YOU WITH AN EXTREMELY COST EFFECTIVE SET OF LABOR
TIME STANDARDS WITH SAVINGS OF:**
 - 25% - DEVELOPMENT**
 - 75% - APPLICATION**
 - 90% - MAINTENANCE****COMPARED TO A MANUAL APPLICATION**
- **PROVIDE THE BASIS FOR A COMPREHENSIVE INCENTIVE CORRECTION
PROGRAM WITHIN REASONABLE TIME AND COST**
- **PROVIDE YOUR UNION AND/OR WORKER REPRESENTATIVES WITH FULL
KNOWLEDGE AND PROPER APPLICATION EXPERIENCE TO ENHANCE
THEIR UNDERSTANDING AND INVOLVEMENT IN THE IMPLEMENTATION**
- **PROVIDE THE OPPORTUNITY FOR EITHER A COMPUTERIZED OR A MANUAL
APPLICATION ALIKE**
- **PROVIDE A UNIFORM APPLICATION IN MULTI-PLANT ORGANIZATIONS AS
A RESULT OF YOUR 'CENTRAL COORDINATION AND INSTANT INTERCHANGE-
ABILITY OF COMPUTER STORED DATA**

WHY SHOULD YOU USE MOST[®] COMPUTER SYSTEMS ?

(2) BECAUSE YOU CAN:

- **PRE-SET COMPLETE ENGINEERED TIME STANDARDS INCLUDING MANUAL, PROCESS AND ALLOWANCE TIMES AND KEEP THESE STANDARDS UP-TO-DATE WITH A MINIMUM OF EFFORT**
- **DOCUMENT ALL YOUR WORKSHOP CONDITIONS AND DATA FOR RAPID AND NEAT PRINTING AND UPDATING TO BE USED FOR INSTRUCTIONS AND REFERENCING AS WELL AS THE BASIS FOR FURTHER COMPANY-WIDE DEVELOPMENTS**
- **ADAPT PROGRAM OUTPUT FORMATS TO YOUR PRESENT ESTABLISHED PROCEDURES AND ROUTINES**
- **SIMULATE POSSIBLE PRODUCTIVITY IMPROVEMENT OPPORTUNITIES IN YOUR MANUFACTURING AREAS, A KEY TASK FOR YOUR INDUSTRIAL ENGINEERS**
- **INCREASE YOUR INDUSTRIAL ENGINEERS' OUTPUT AND PRODUCTIVITY AS WELL AS IMPROVE THE QUALITY OF THEIR WORK**
- **ATTRACT NEW AND QUALIFIED INDUSTRIAL ENGINEERING 'CAPACITY AS WELL AS KEEP YOUR COMPETENT INDUSTRIAL ENGINEERING PERSONNEL**
- **INCORPORATE MODERN COMPUTER TECHNOLOGY IN YOUR INDUSTRIAL ENGINEERING DEPARTMENT WITHOUT REQUIRING SOPHISTICATED COMPUTER SKILLS FROM THE USERS**
- **INSTALL A DEDICATED MINI-COMPUTER IN YOUR INDUSTRIAL ENGINEERING DEPARTMENT FOR DIRECT ON-LINE ACCESS AND INTERFACE THE OUTPUT OF COMPLETE TIME STANDARDS WITH EXISTING SOFTWARE PROGRAMS ON YOUR MAIN FRAME COMPUTER**
- **UTILIZE A VARIETY OF ADDITIONAL PROGRAM FEATURES THAT WILL ADVANCE YOUR INDUSTRIAL ENGINEERING AND IMPROVE YOUR OVERALL PRODUCTION PLANNING AND CONTROL**

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