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

June 1978
NSRP 0005

THE NATIONAL SHIPBUILDING RESEARCH PROGRAM

REAPS 5th Annual Technical Symposium Proceedings

Paper No. 8: The Hitachi HICAS System

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

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
JUN 1978	**N/A**	**-**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
The National Shipbuilding Research Program REAPS 5th Annual Technical Symposium Proceedings Paper No. 8: The Hitachi HICAS System	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

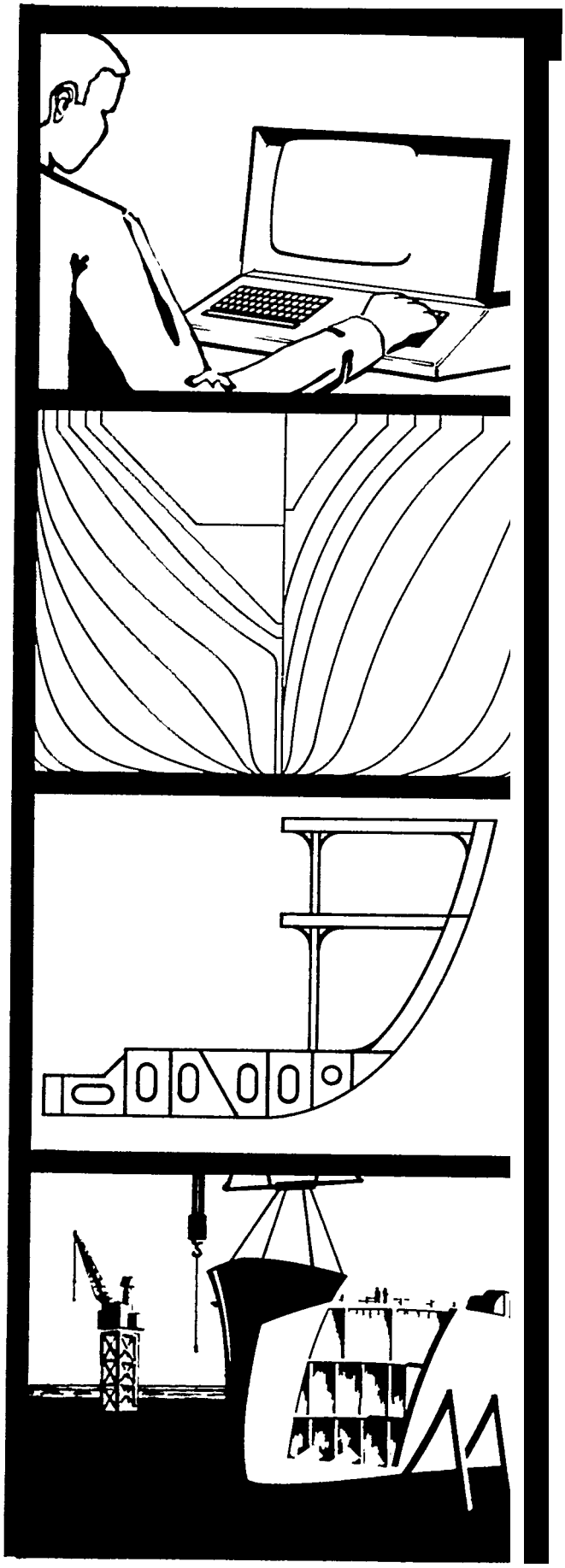
13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**SAR**	**56**	

NSRP-0005



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

Proceedings of the REAPS Technical Symposium

June 27-28,1978

St. Louis, Missouri

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THE HITACHI HICAS SYSTEM

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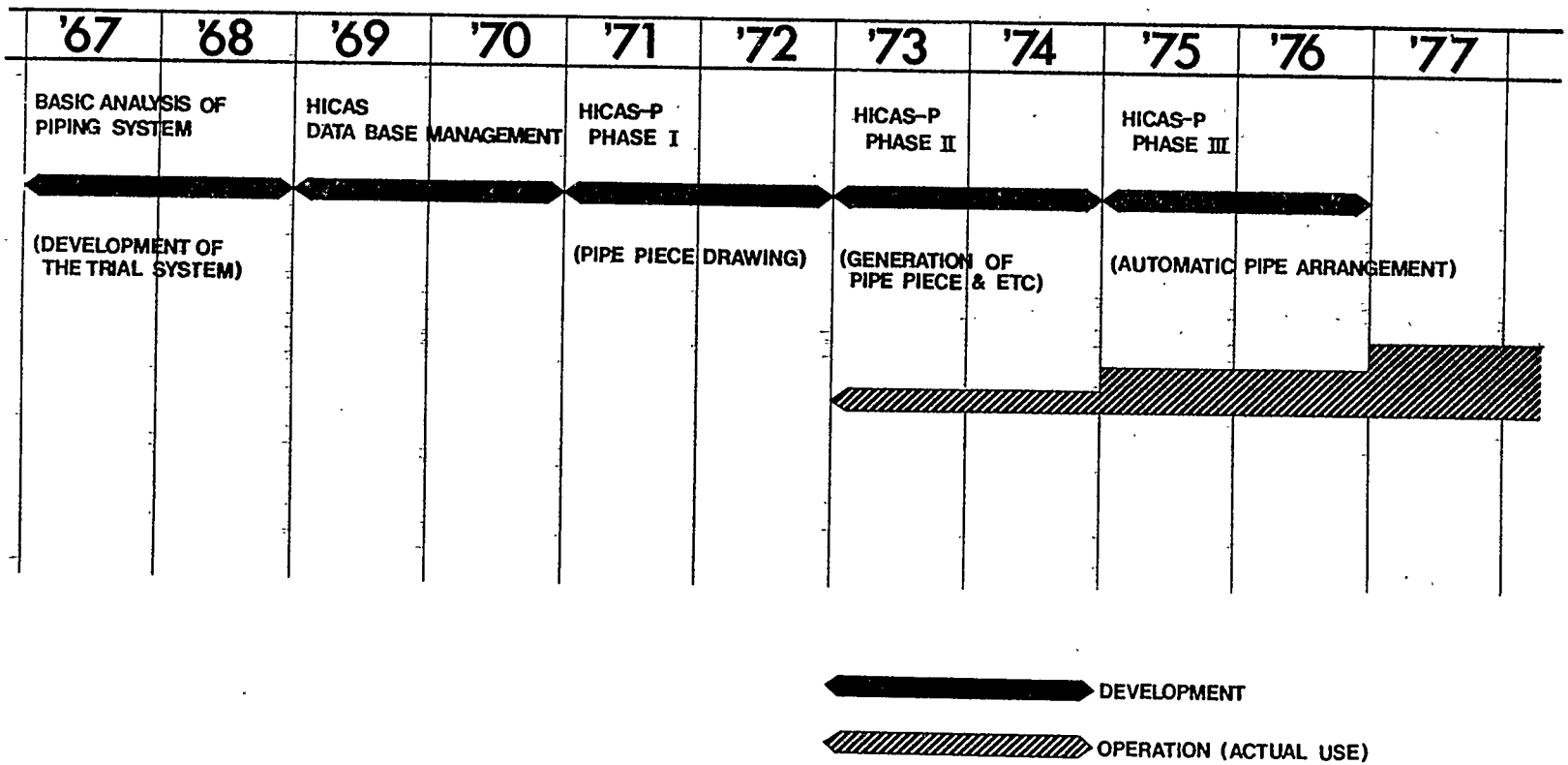
Tokyo, Japan

As Chief of the Applied Engineering section at Hitachi, Mr. Ueda is responsible for several applied engineering systems including a piping design system and an electrical cable system. His past experience involved planning and development of piping design computerization.

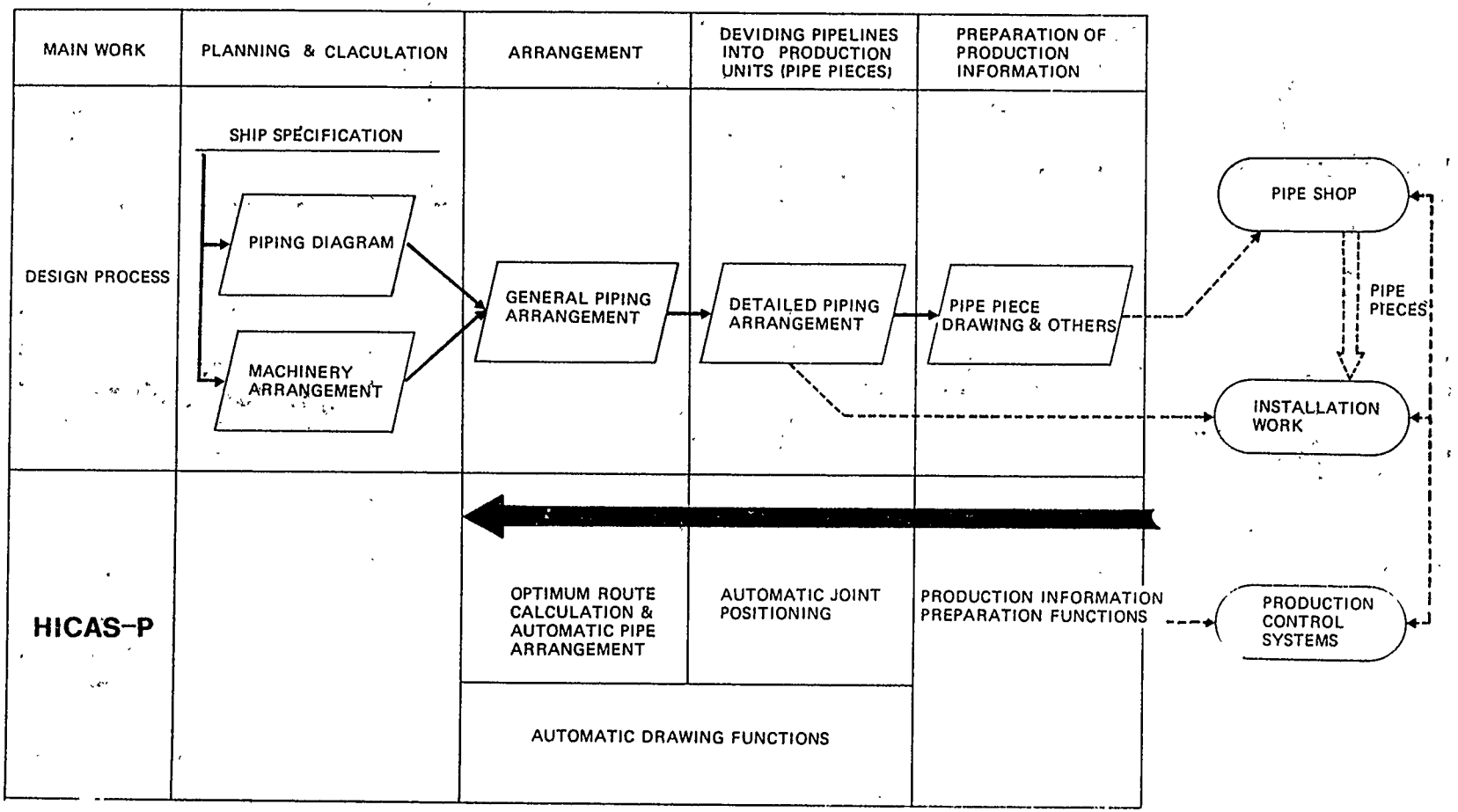
Mr. Ueda attended Osaka Prefecture University, Industrial Engineering Department.

HICAS-P

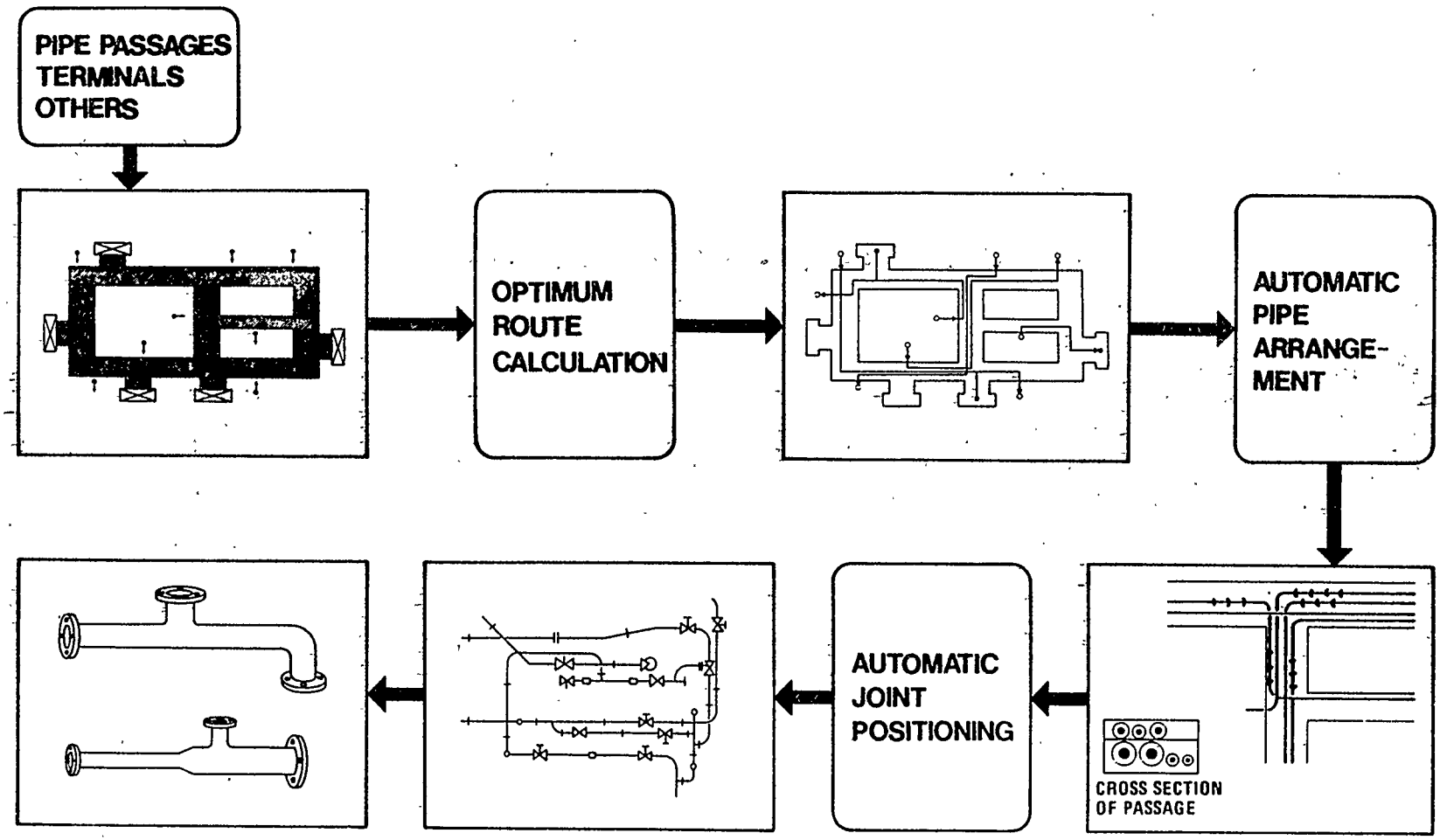
HISTORY



HICAS-P & DESIGN WORK

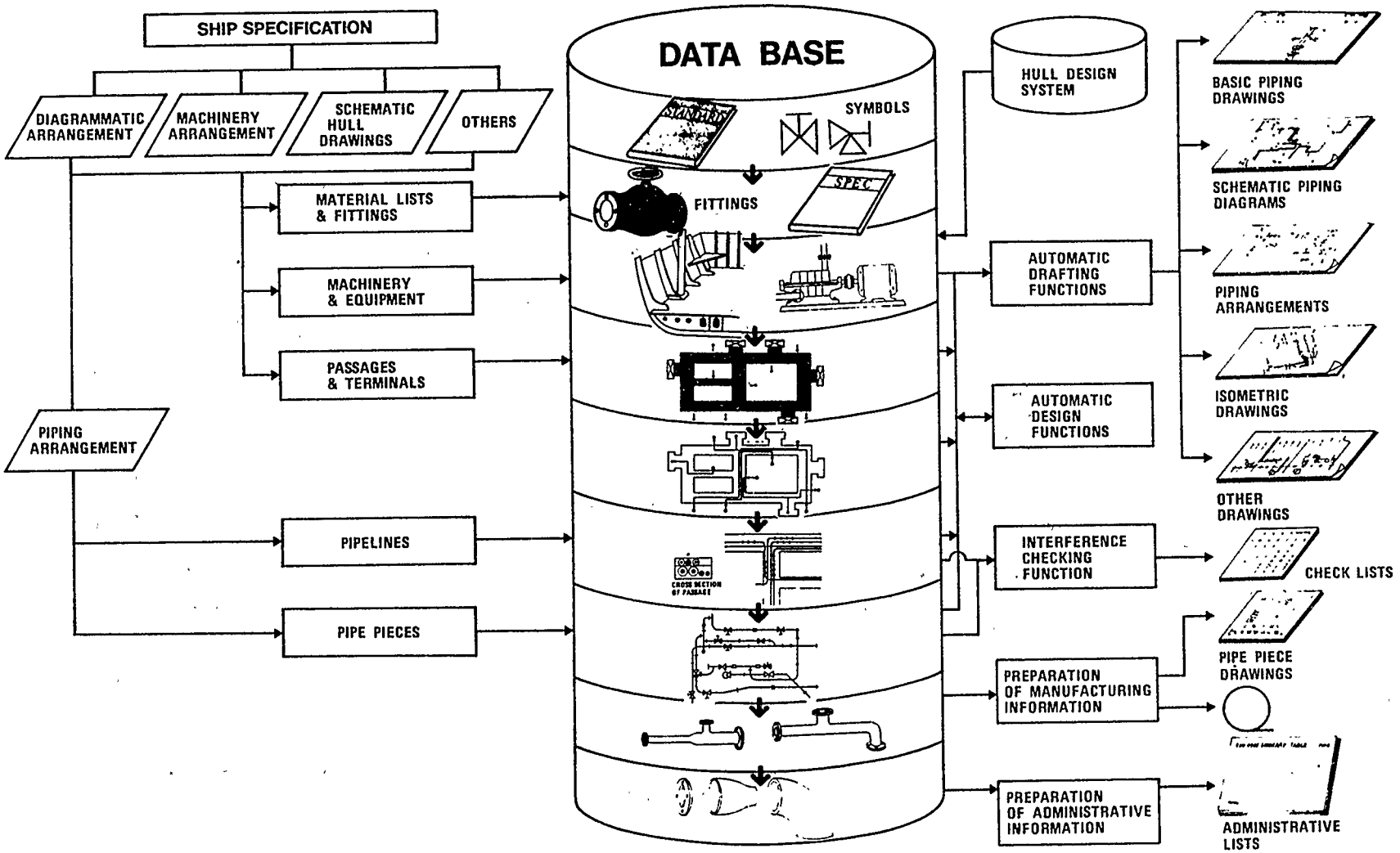


HICAS-P AUTOMATIC DESIGN FUNCTIONS

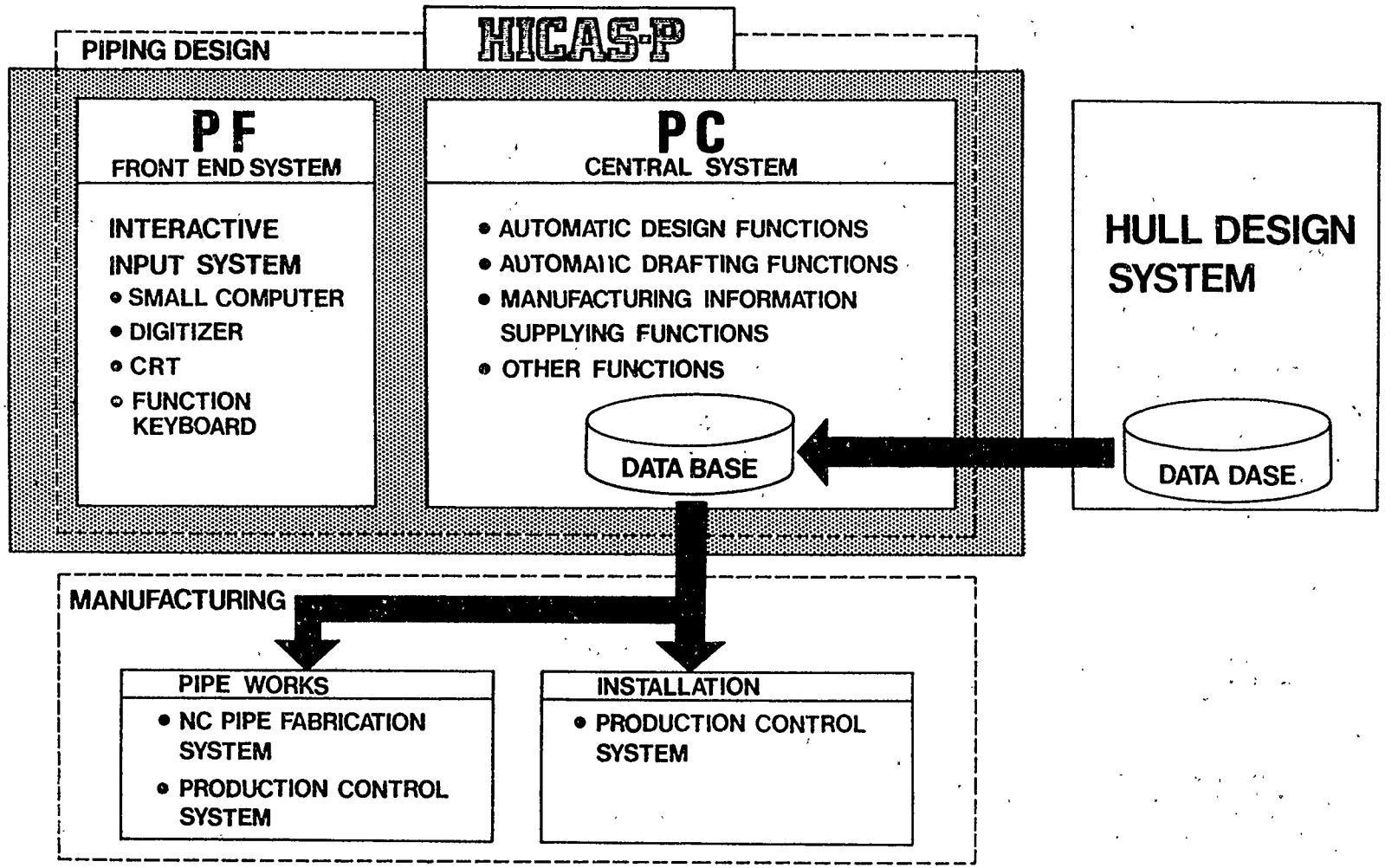


HICAS-P

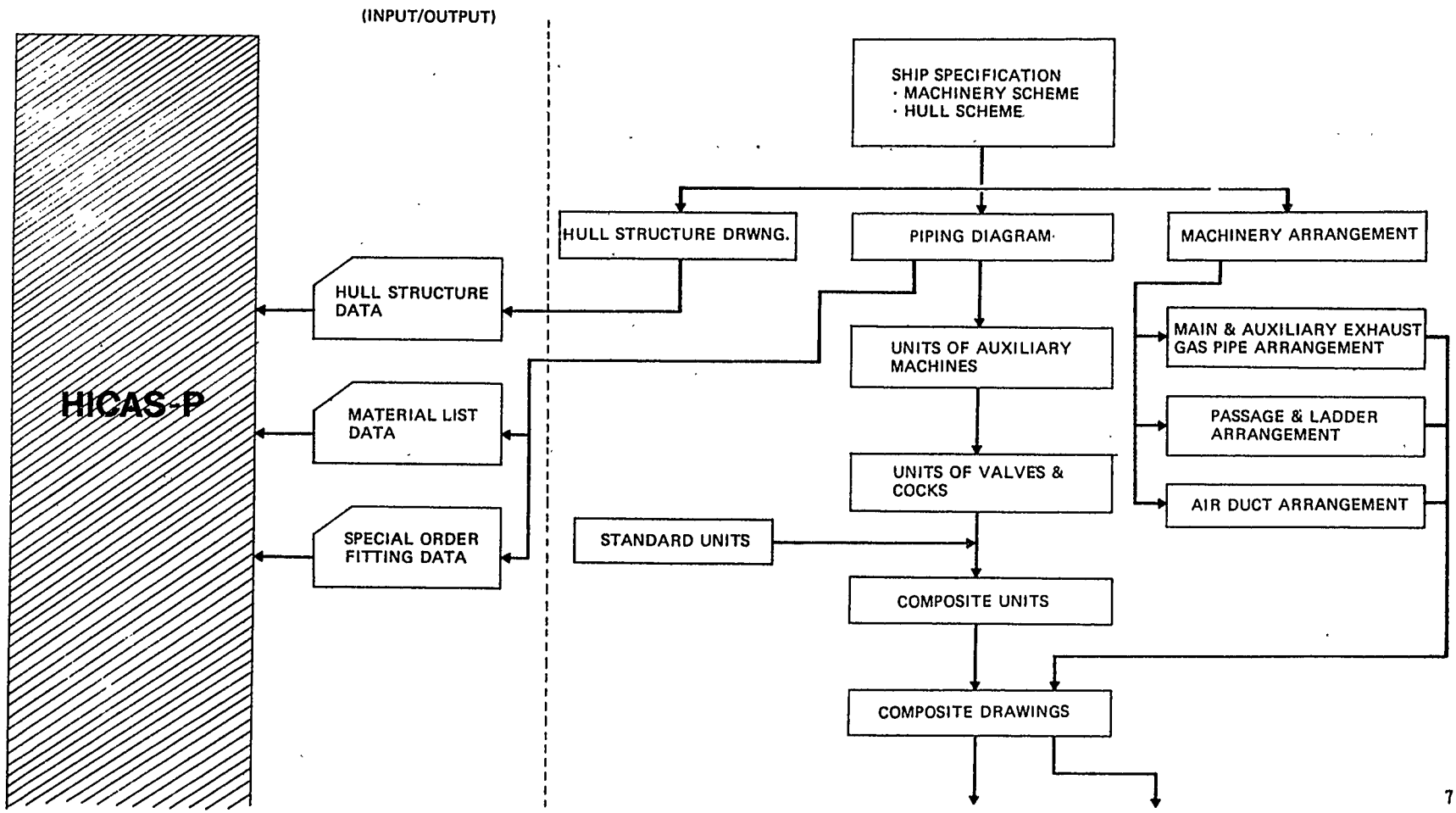
SYSTEM FLOW



HICAS-P SYSTEM COMPOSITION

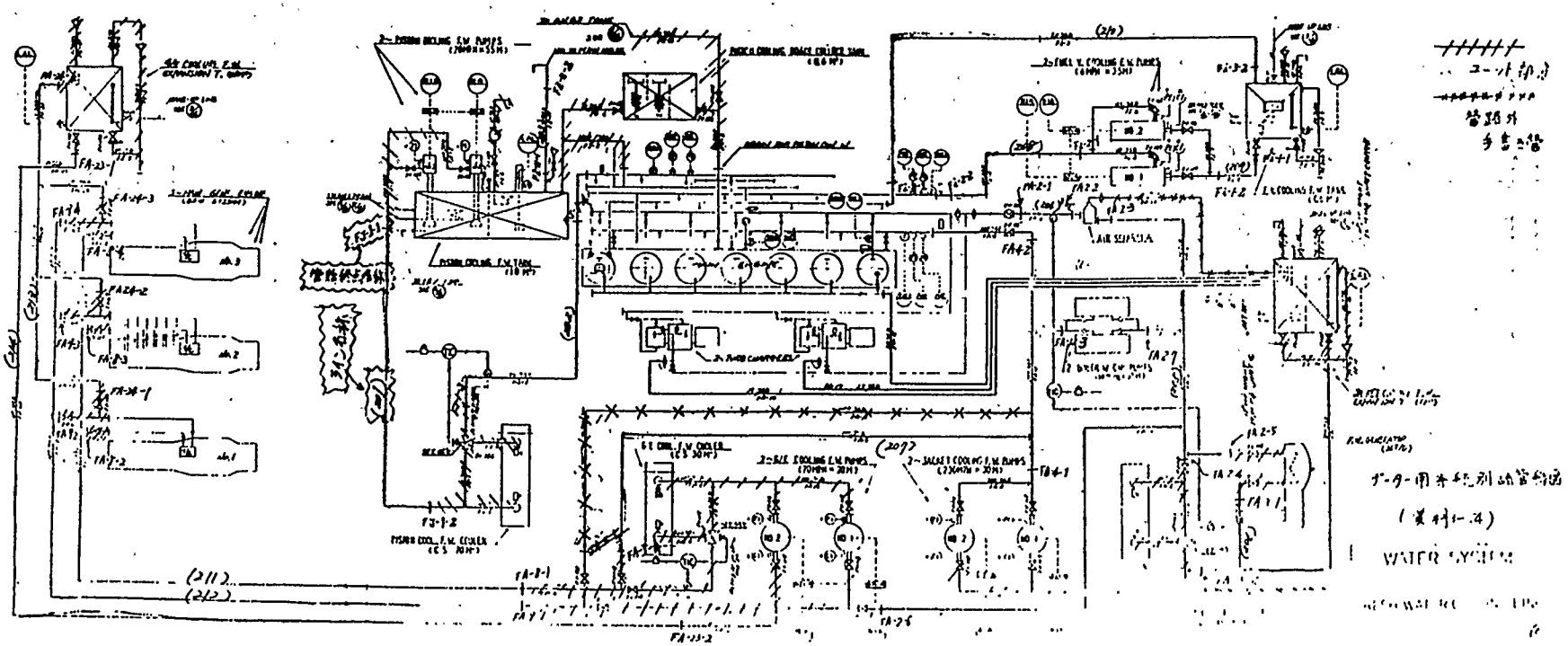


HICAS-P PIPING DESIGN PROCEDURE using HICAS-P
(STEP 1)

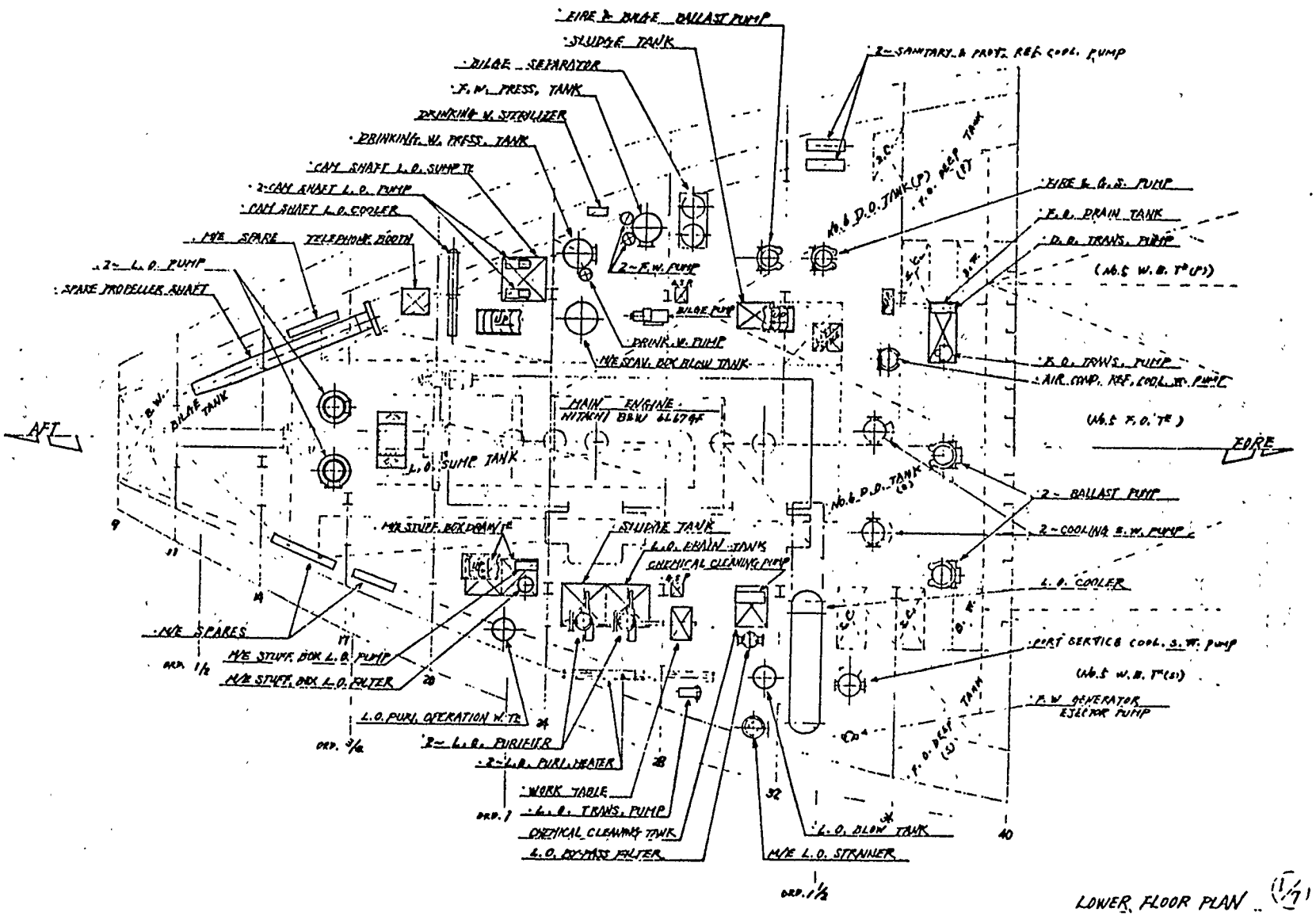


HICAS-P

PIPING DIAGRAM



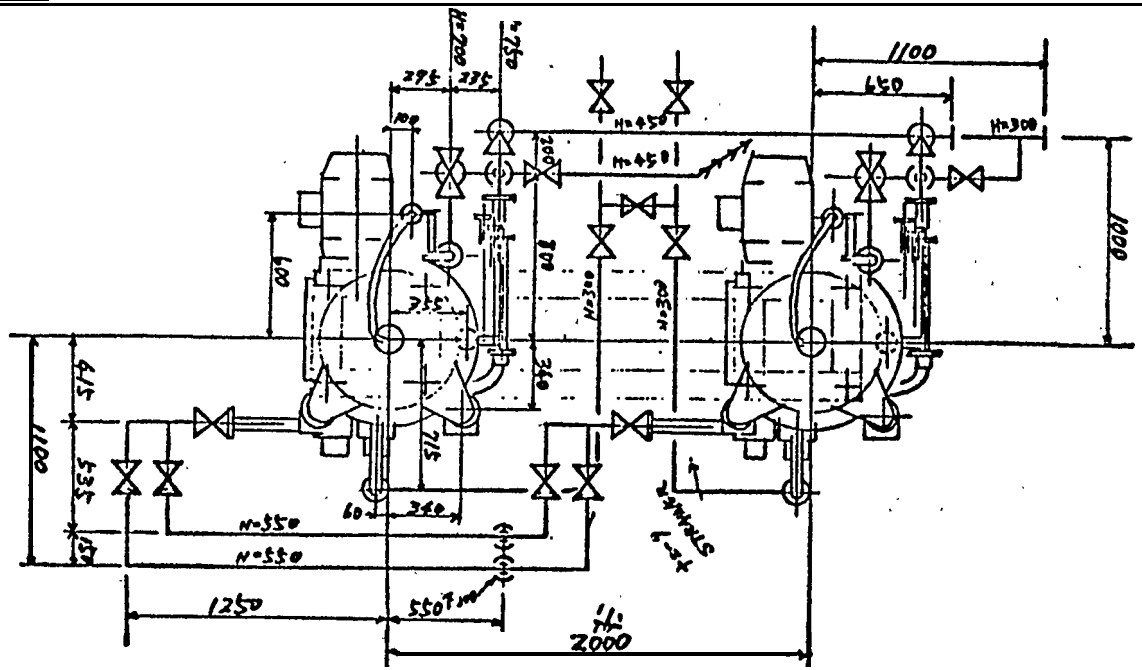
MACHINERY ARRANGEMENT

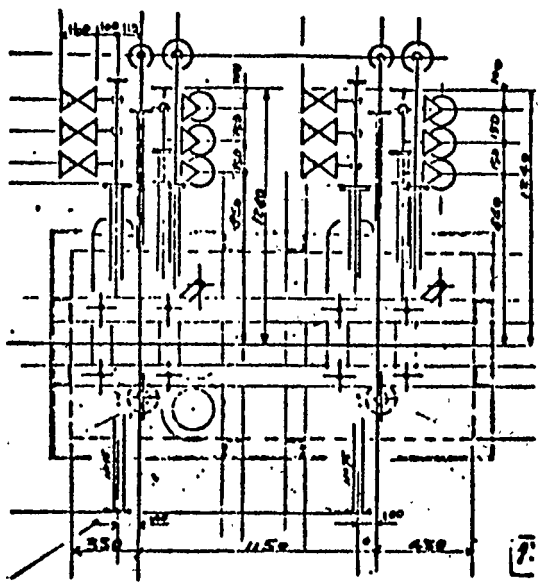


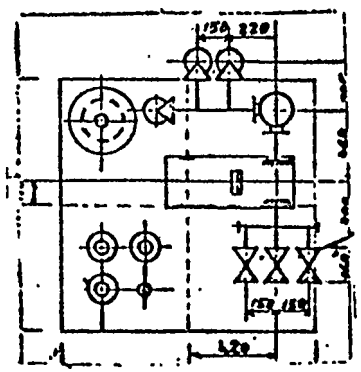
LOWER FLOOR PLAN (1/7)

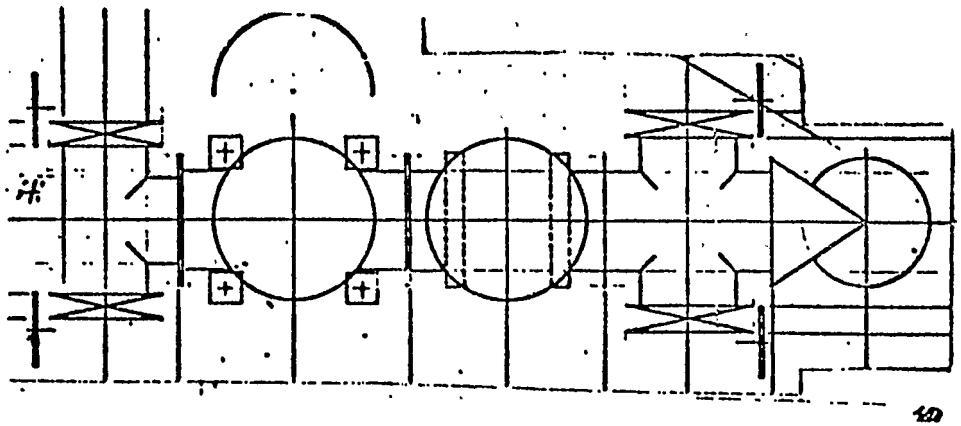
HICAS-P

PIPING UNIT

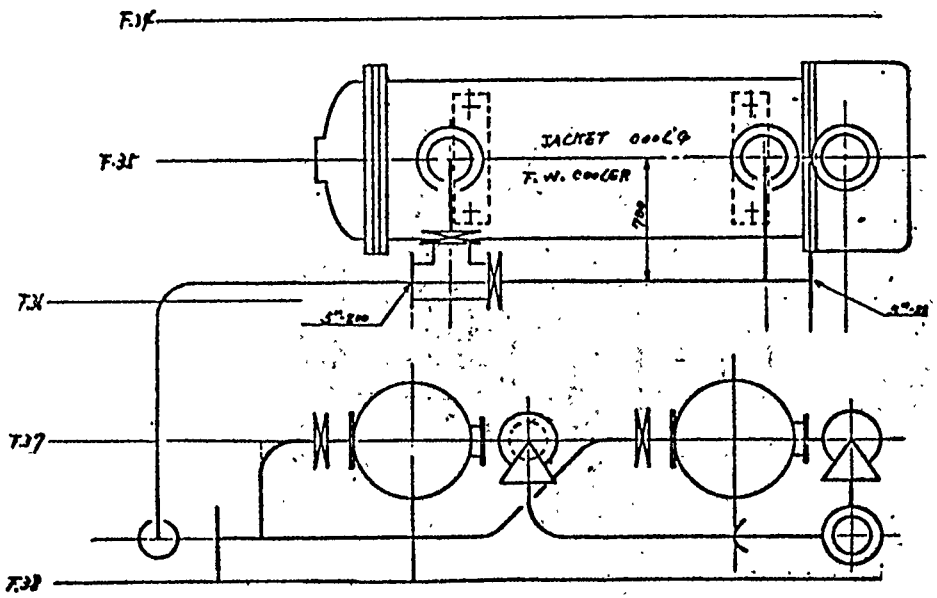


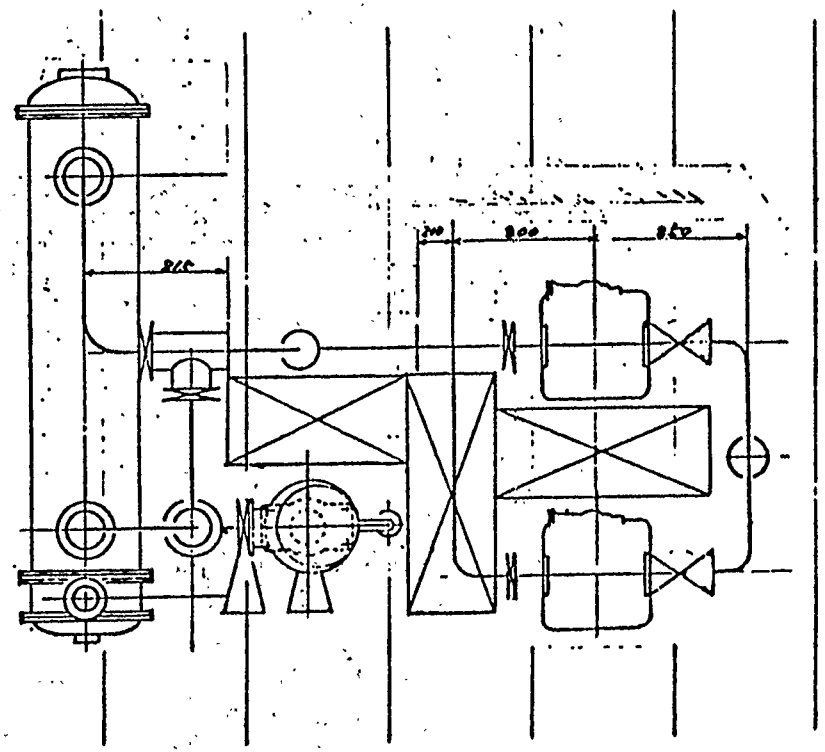






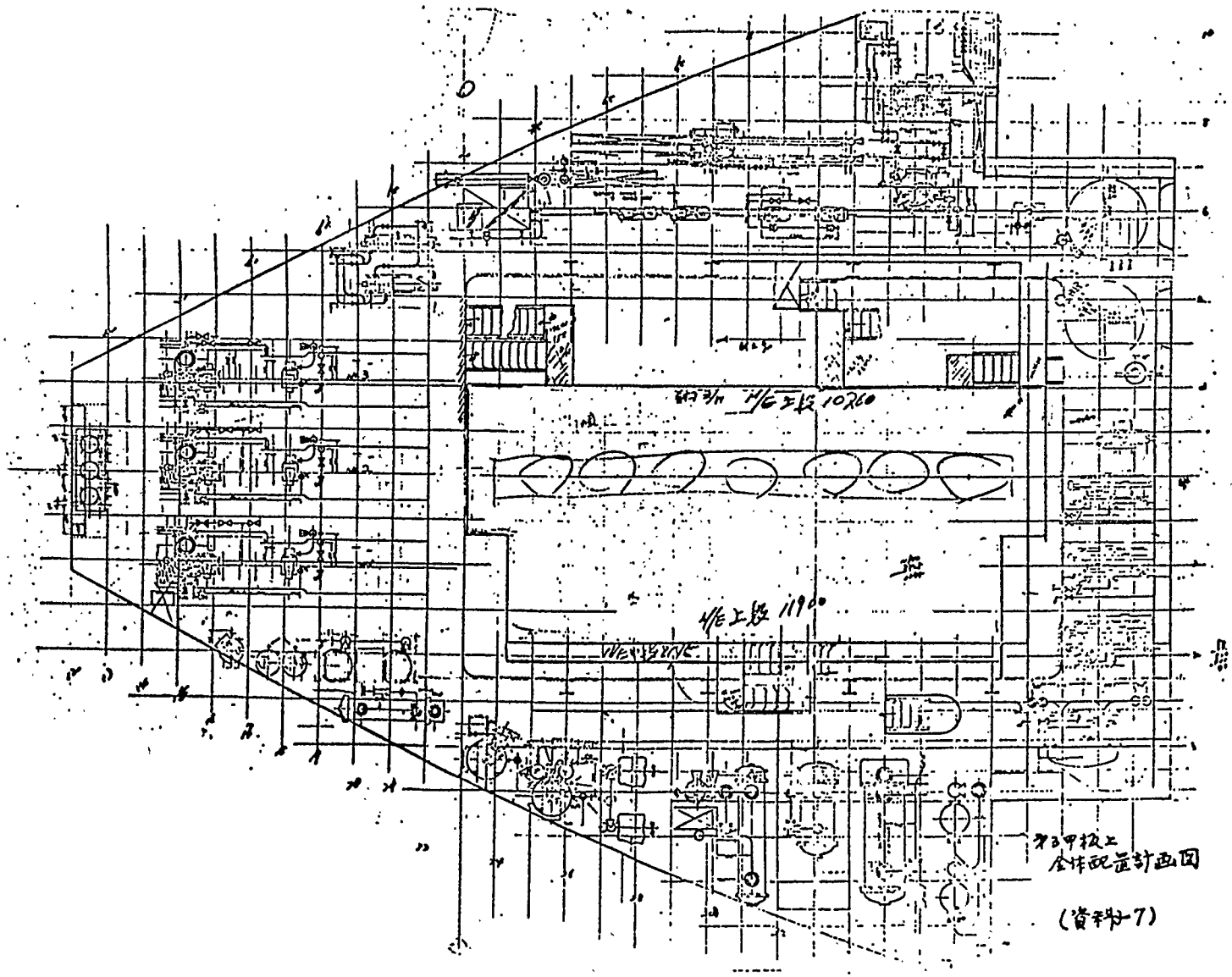
COMPOSITE UNITS





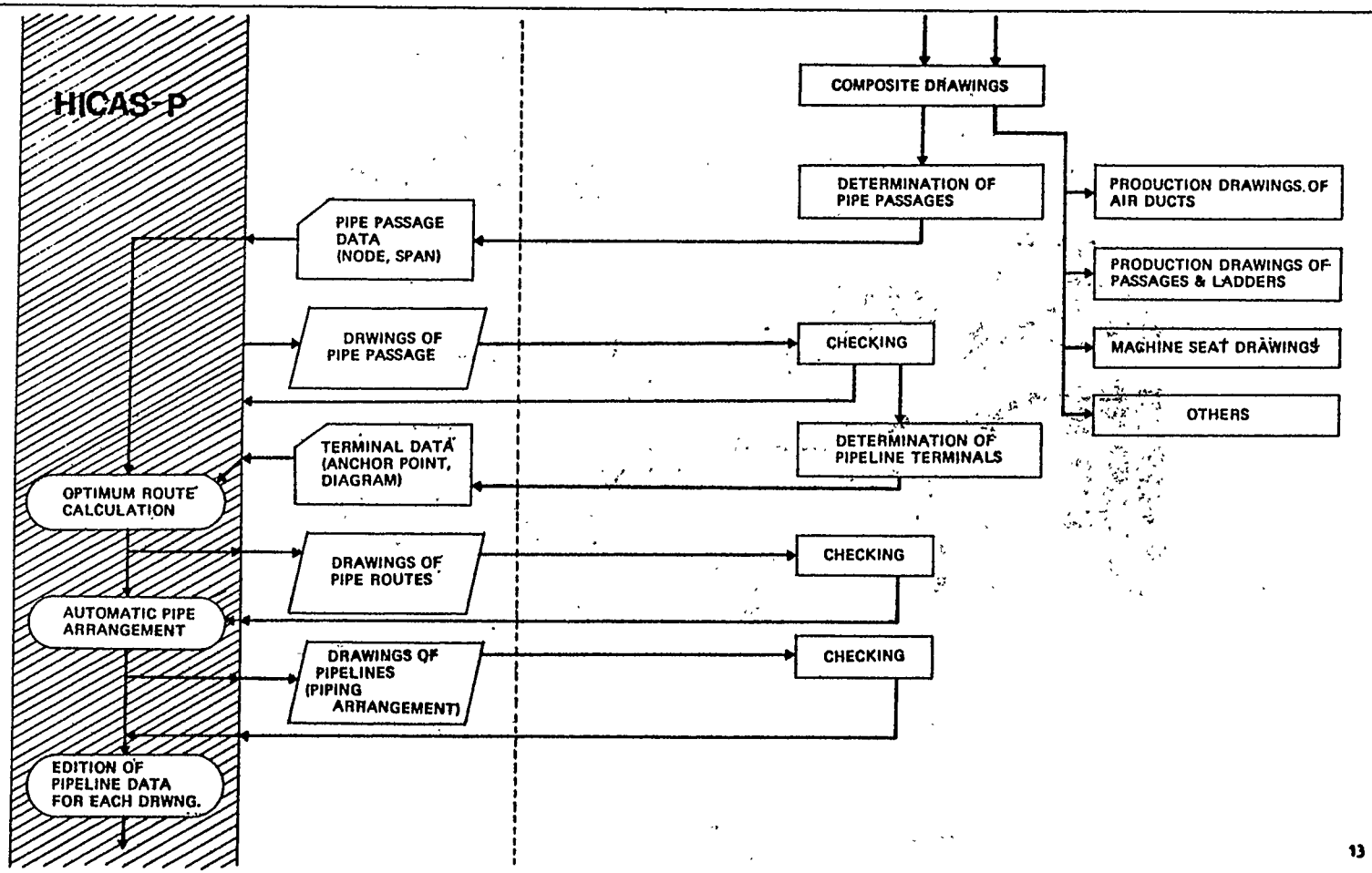
HICAS-P

COMPOSITE DRAWING



HICAS-P

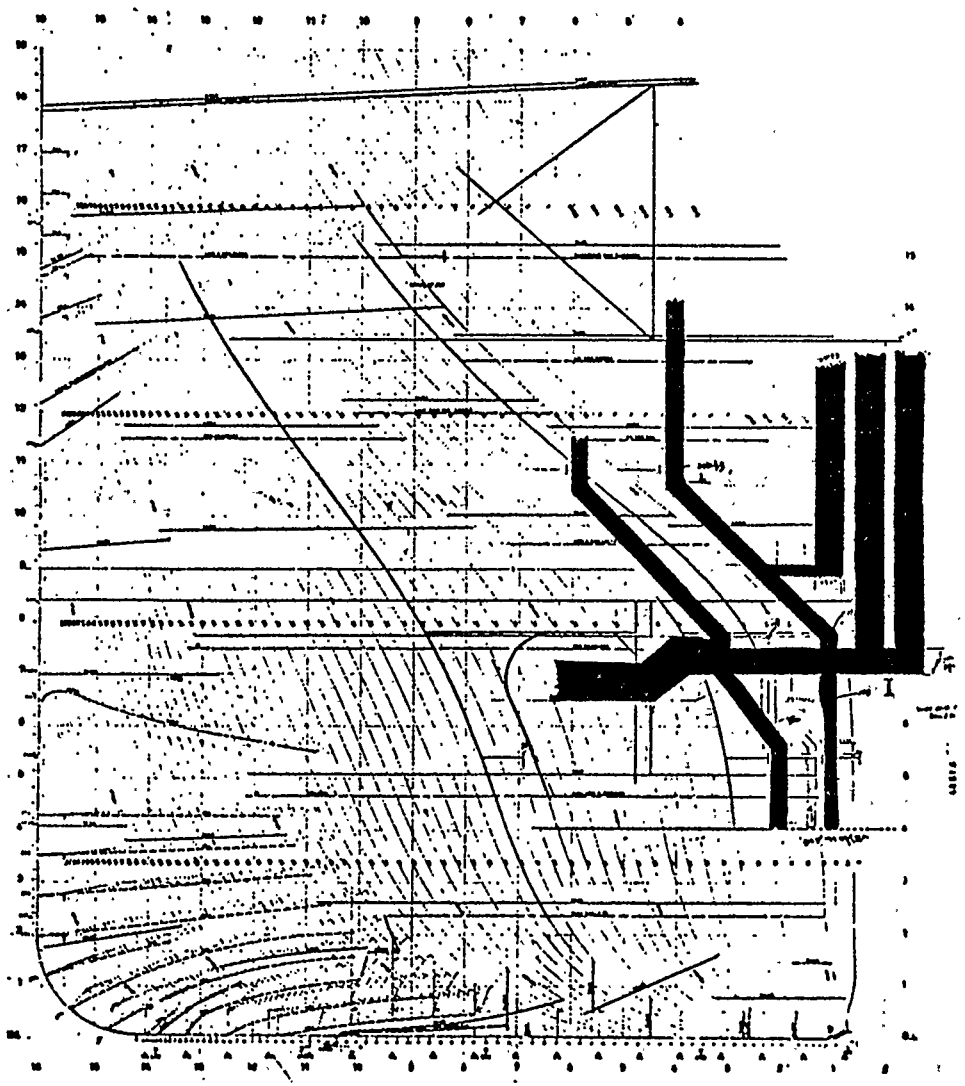
PIPING DESIGN PROCEDURE using HICAS-P
(STEP 2)



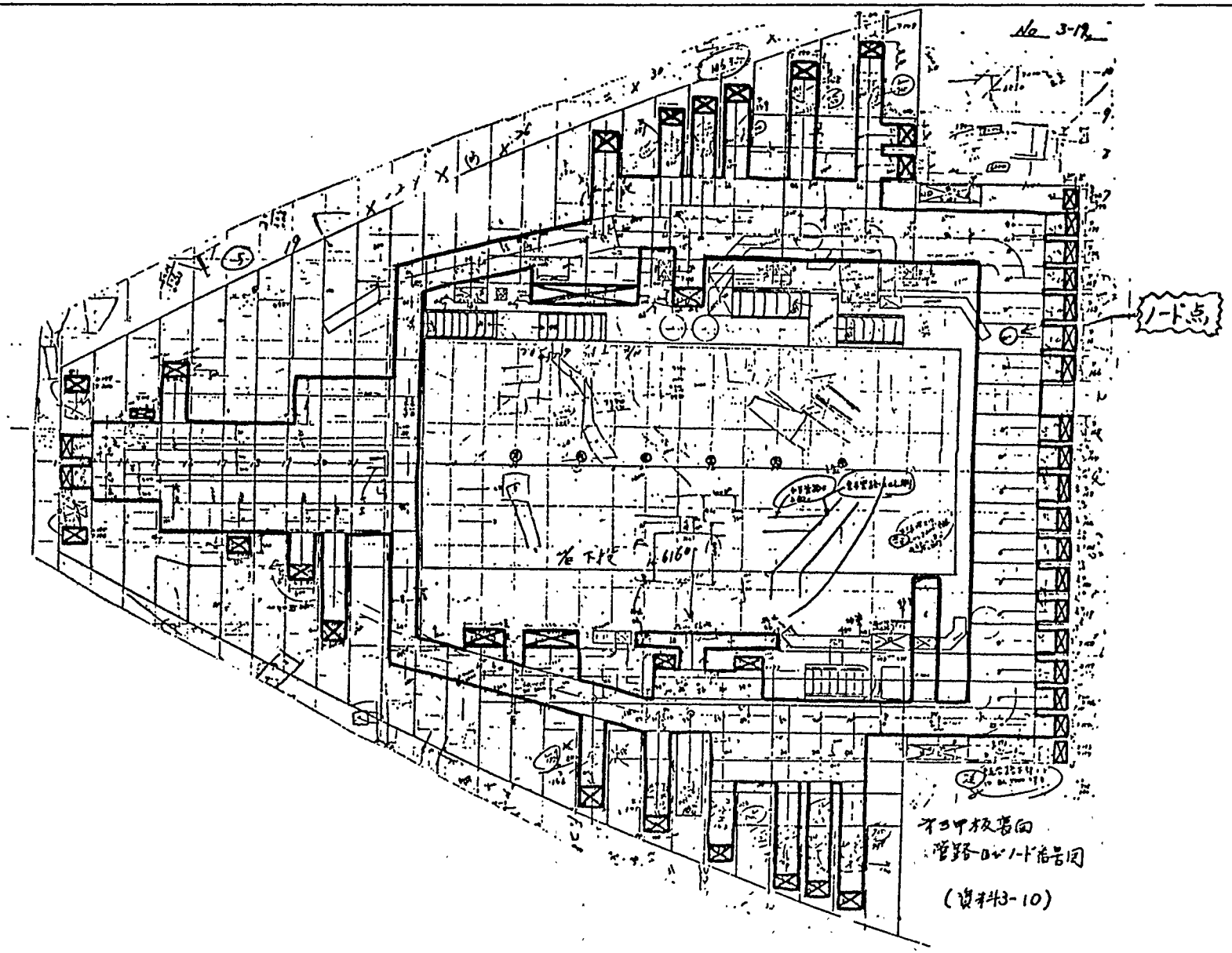
13

HICAS-P

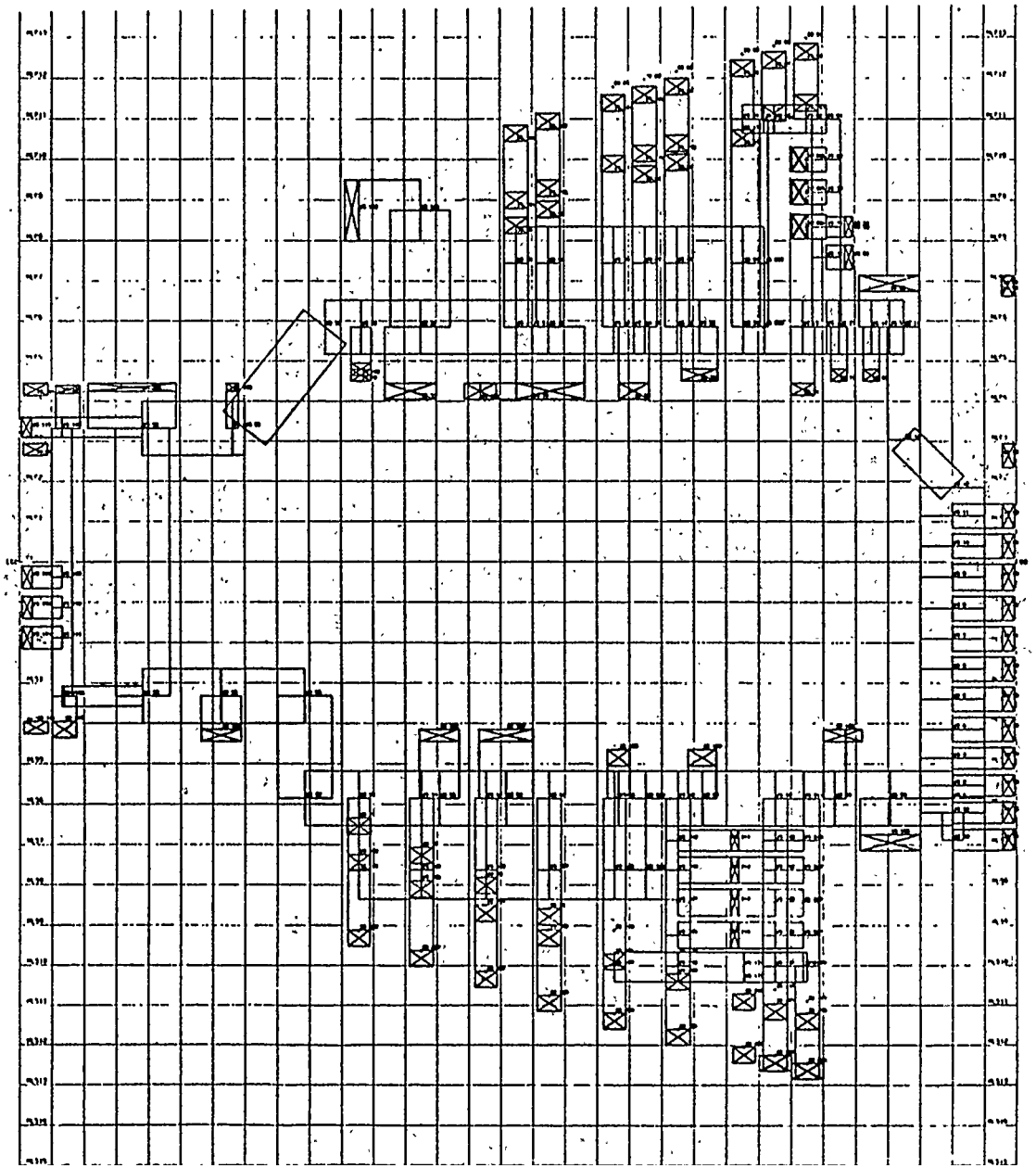
DETERMINATION OF PIPE PASSAGES
(VERTICAL PASSAGES)



HICAS-P DETERMINATION OF PIPE PASSAGES
(HORIZONTAL PASSAGES)

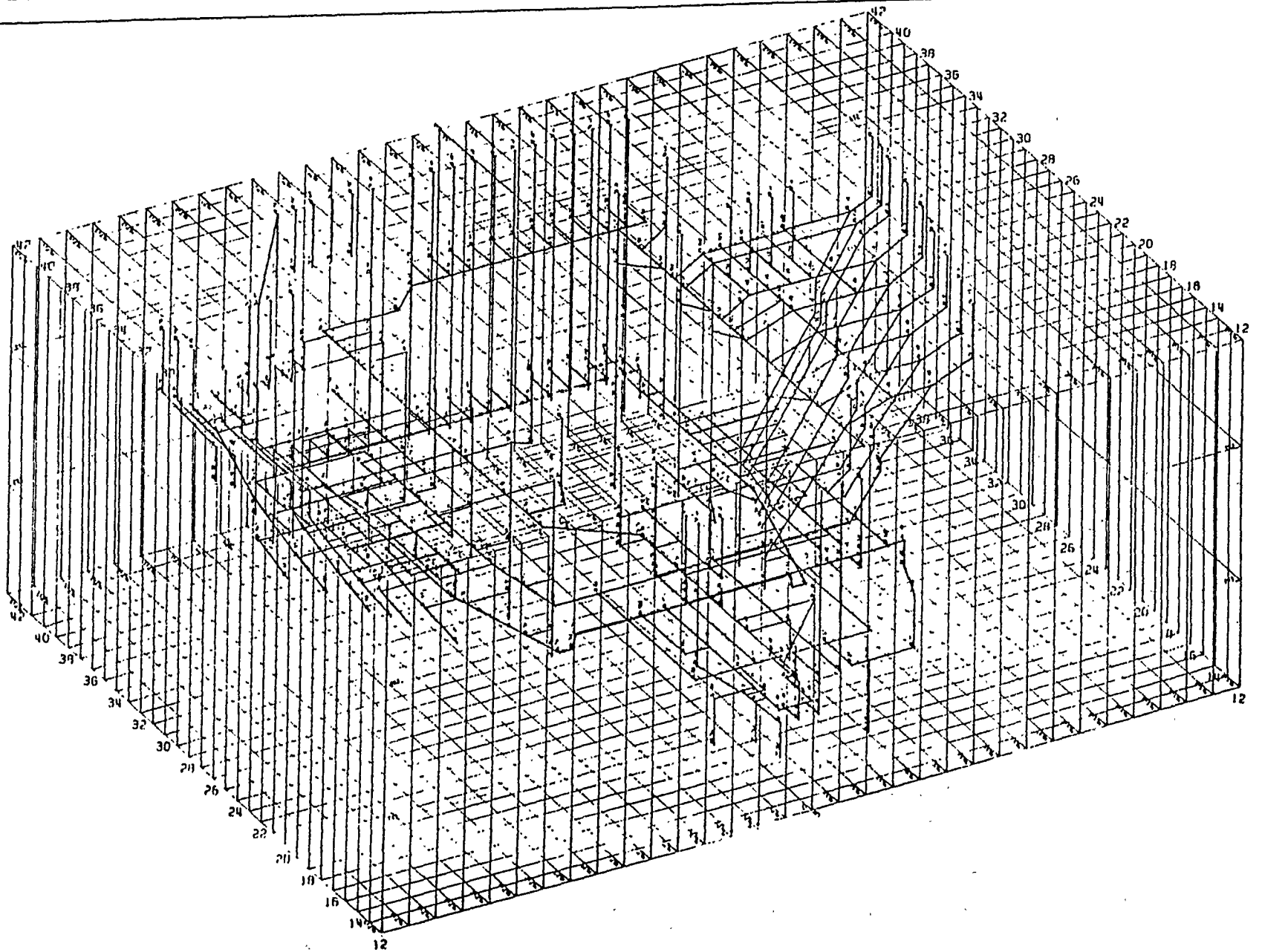


DRAWING OF PIPE PASSAGES
(PLAN)



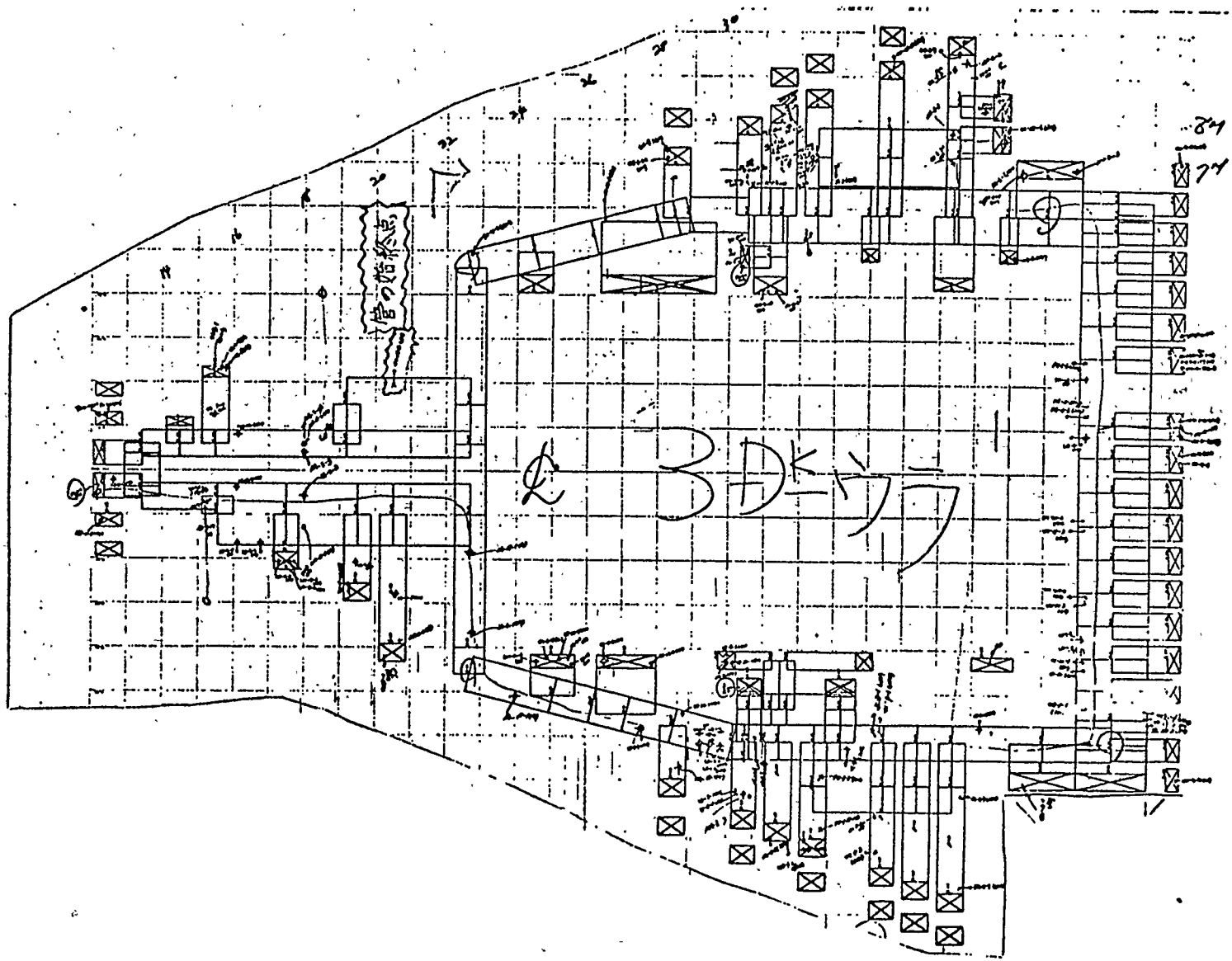
HICAS-P

DRAWING OF PIPE PASSAGES
(ISOMETRIC VIEW)

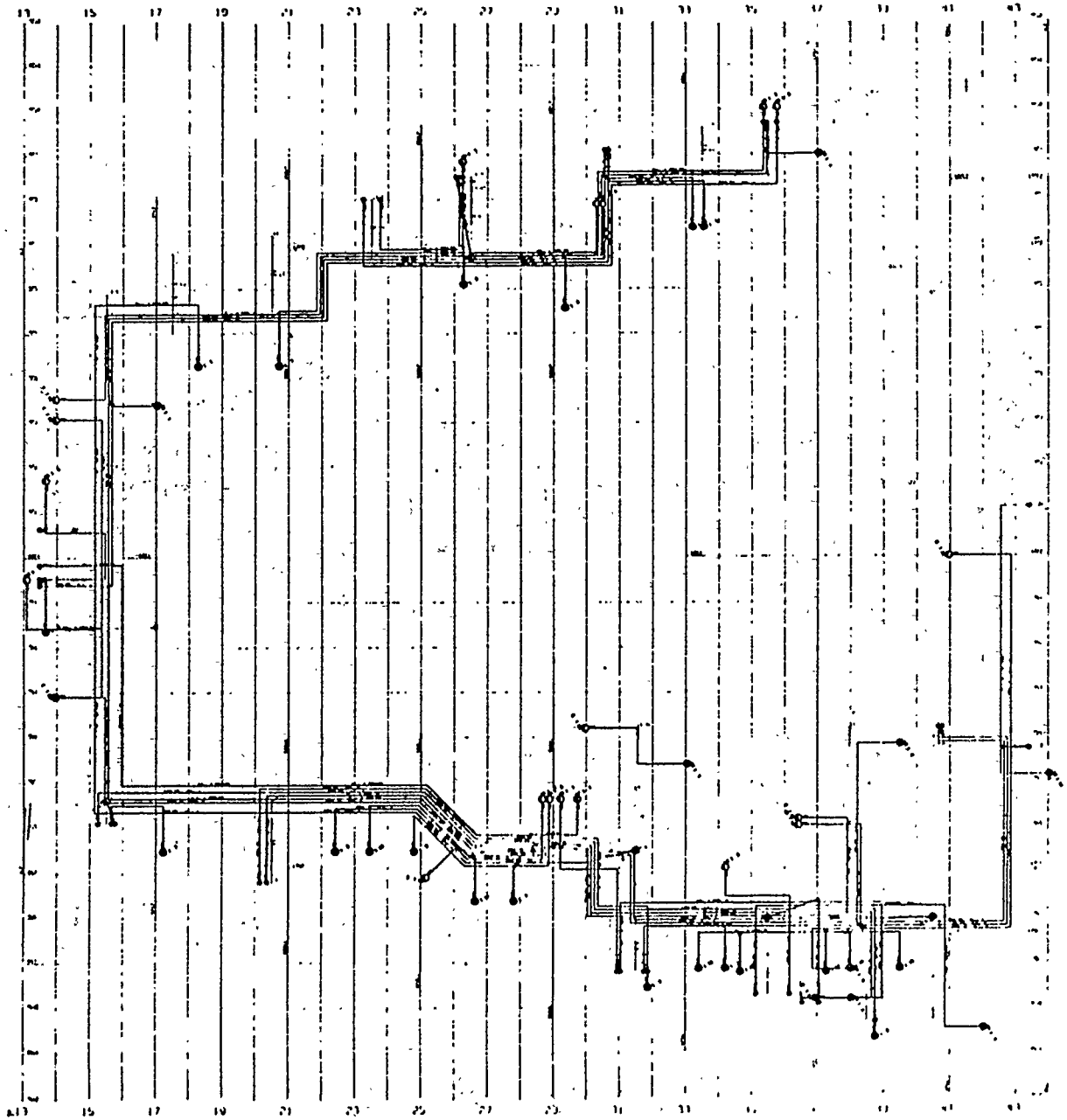


HICAS-P

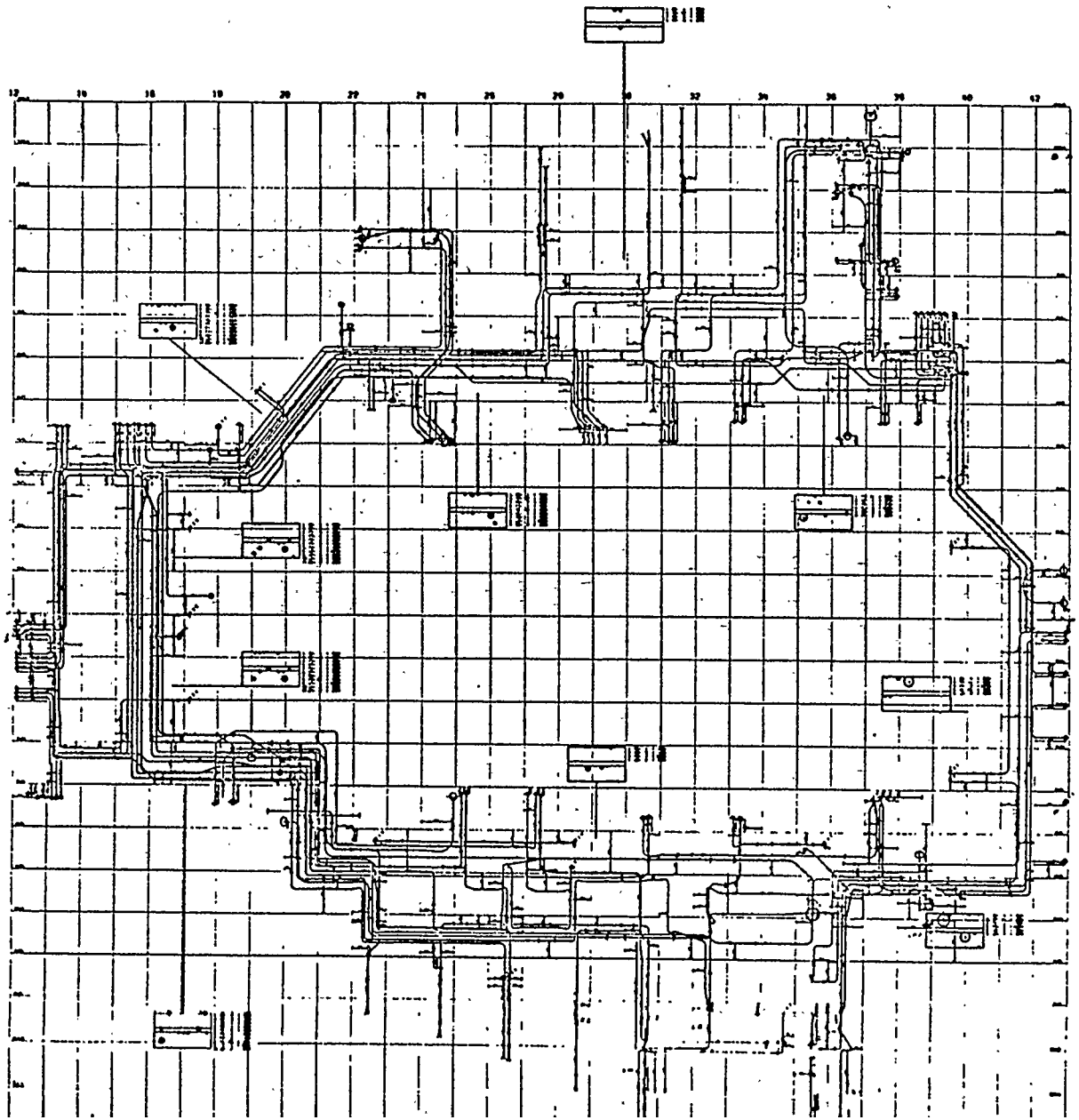
DETERMINATION OF PIPELINE TERMINALS



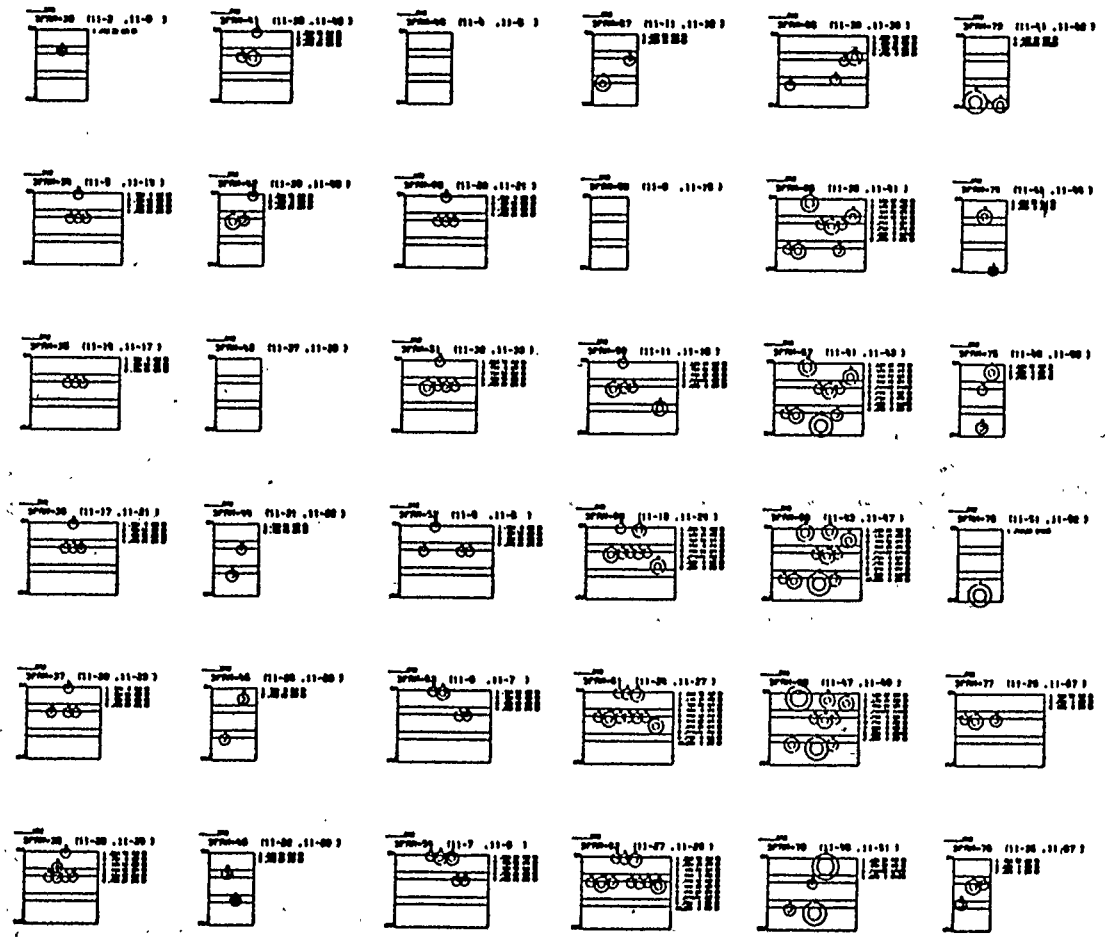
DRAWING OF PIPE ROUTES



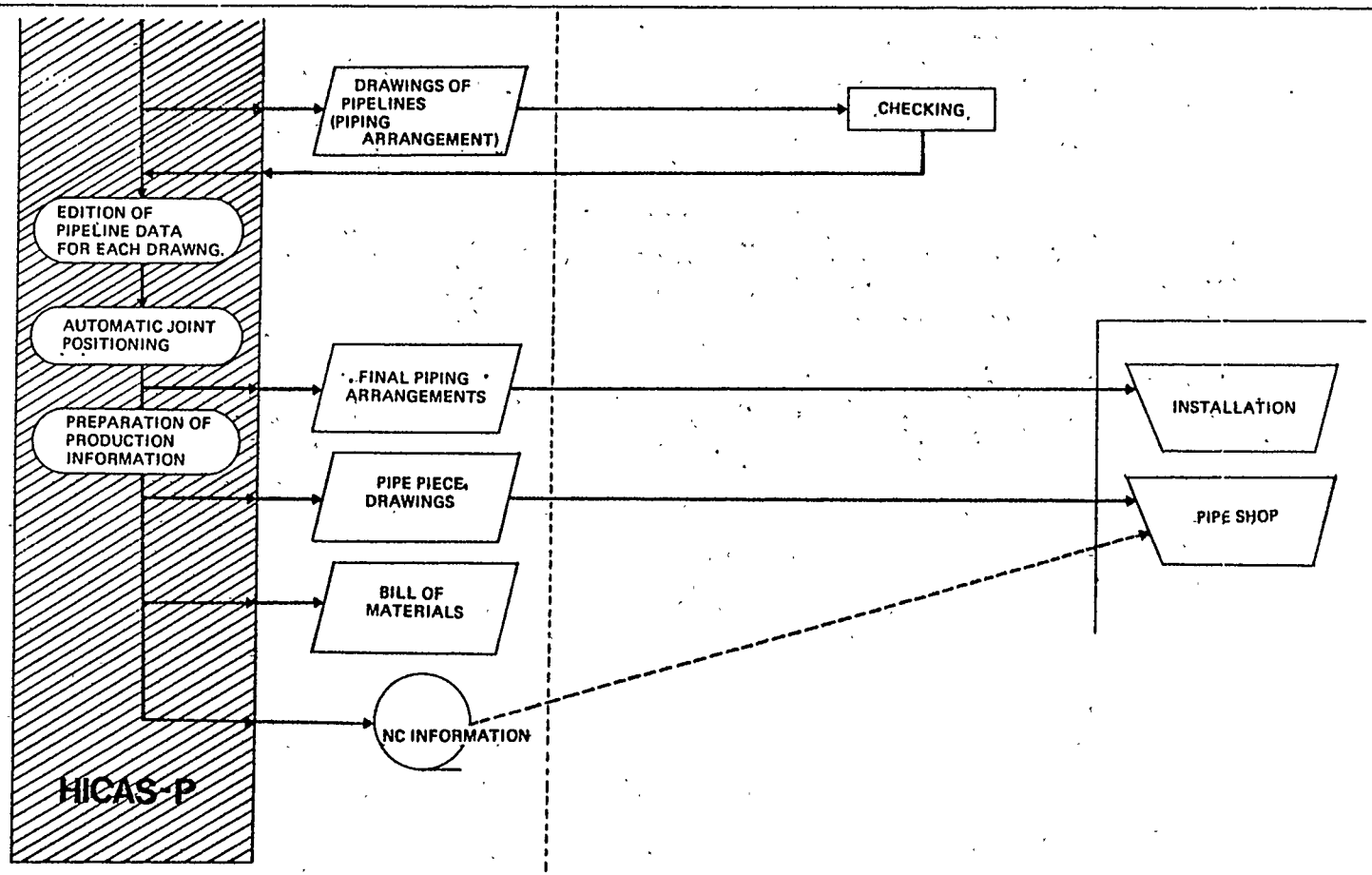
PIPING ARRANGEMENT



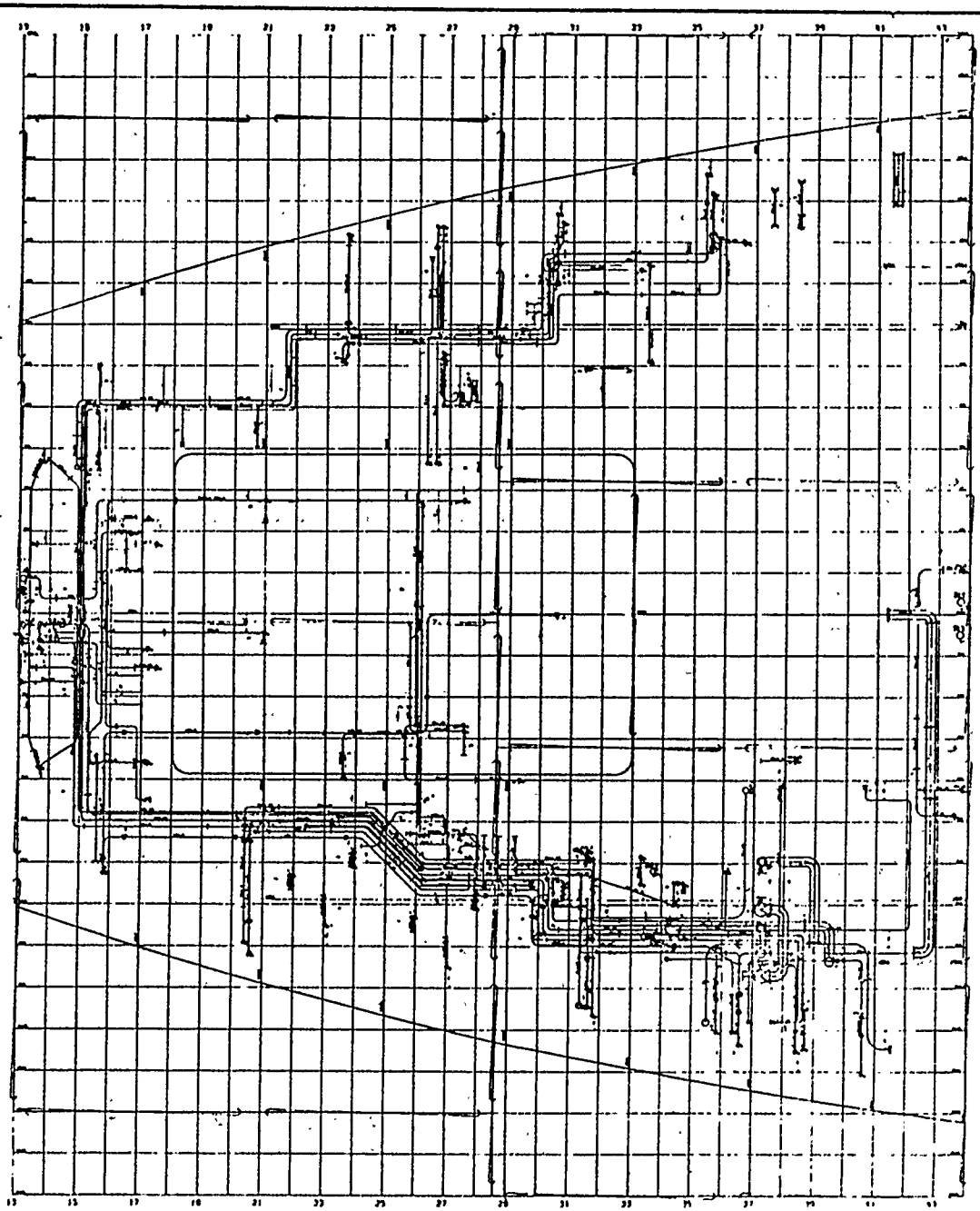
HICAS-P SECTIONAL DRAWINGS OF PIPE PASSAGES



HICAS-P PIPING DESIGN PROCEDURE using HICAS-P
(STEP 3)



FINAL PIPING ARRANGEMENT



HICAS-P

PIPE PIECE DRAWING

S-NO.4484(M) SHEET NO.77A80321(REV-) DATE:76/02/21 PAGE: 47: 1
DIV:M32 BLOCK: UNIT: S-UNIT: STAGE:K

----- <PIPE NO.> ----- -------- < TREATMENT TABLE > ----------

PIPE PIECE NO.	NUMBER	PRESS	X-RAY	PLAT	ANNEAL	IN PAT	OUT PAT
AM- 980 -	1		Z			-	-

PRODUCTION INFORMATION

---------- < MATERIAL TABLE > ---------- -< MANUFACTURING TABLE >-

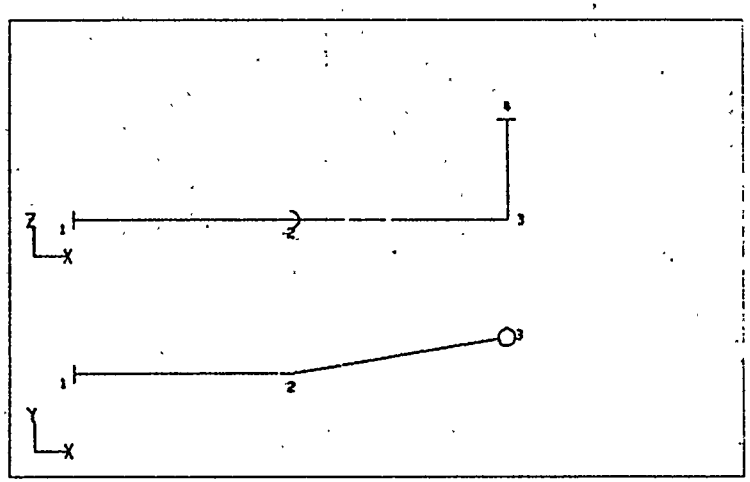
POINT	NAME	ADJ.	MATERIAL	NUM	CUT.L	WELD	FA	M.L	BRANCH
1- 4	JGB- - 25-		SGP-B	1	1421				
4	F - 10- 25-		SS41	1		OK	0.0		
1	F - 10- 25-		SS41	1		OK	9.5		

MATERIAL LIST

---------- < BENDING INFORMATION > ----------

1ST.P	L	NC-L	FA	A	:	L	NC-L	RA	A	:	L	NC-L	RA	A
1	1276	(776)	+ 45.0	90.0	:	610	(473)	-90.0	9.4					

BENDING INFORMATION



SHAPE OF PIPE PIECE (PROJECTIO

---------- < MEASUREMENTS OF PIPE PIECE > ----------

FM	TO	KIND	ANG	OTHER	NAME	X	Y	Z	N	AL&L	MAG.L
-	1	FL			F - 10- 25-						
1-	2	BR	9			600				600	
2-	3	BR	90			600	100			608	
3-	4	FL			F - 10- 25-			278		278	

** TOTAL LENGTH: X= 1200 Y= 100 Z= 278 ***** TOTAL WEIGHT: 6KG *****

MEASUREMENTS OF PIPE PIECE

M: / IC: / ID: / IF: / IN: / IG: / IS: / IE: / IH: /

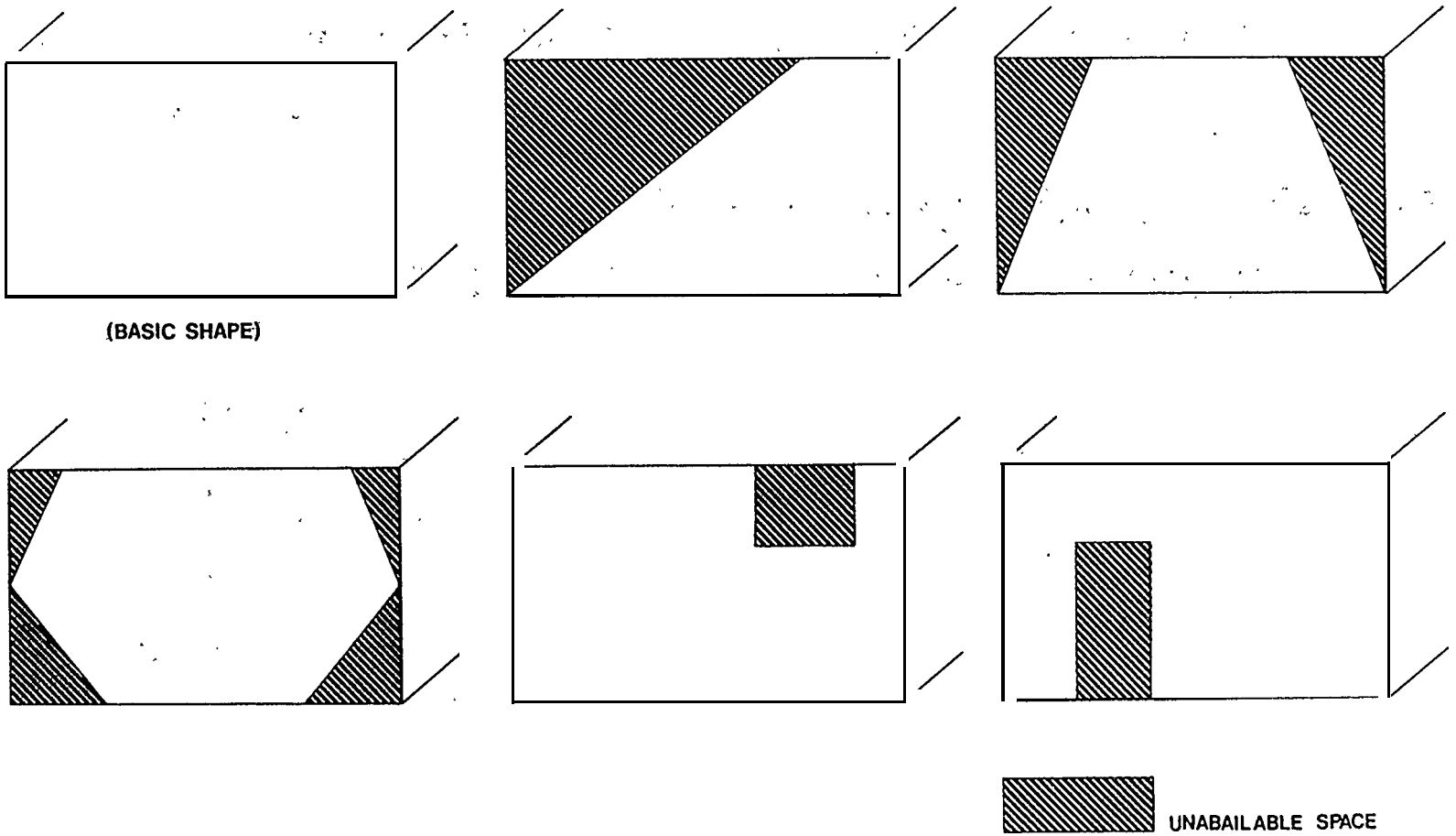
HICAS-P

MAIN FUNCTIONS

- AUTOMATIC DESIGN FUNCTIONS
- AUTOMATIC DRAWING FUNCTIONS
- CHECKING FUNCTIONS
- FUNCTIONS TO SUPPLY VARIOUS LISTINGS
- FUNCTIONS TO SUPPLY PRODUCTION INFORMATION
- FUNCTIONS TO CONNECT WITH OTHER SYSTEMS
- INTERACTIVE INPUT STATION (PF SYSTEM)

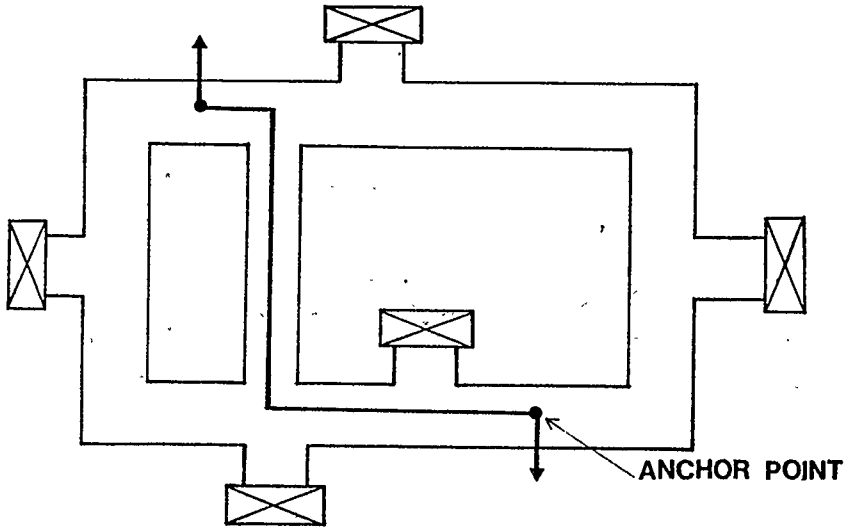
HICAS-P

DEFINITION OF PIPE PASSAGE

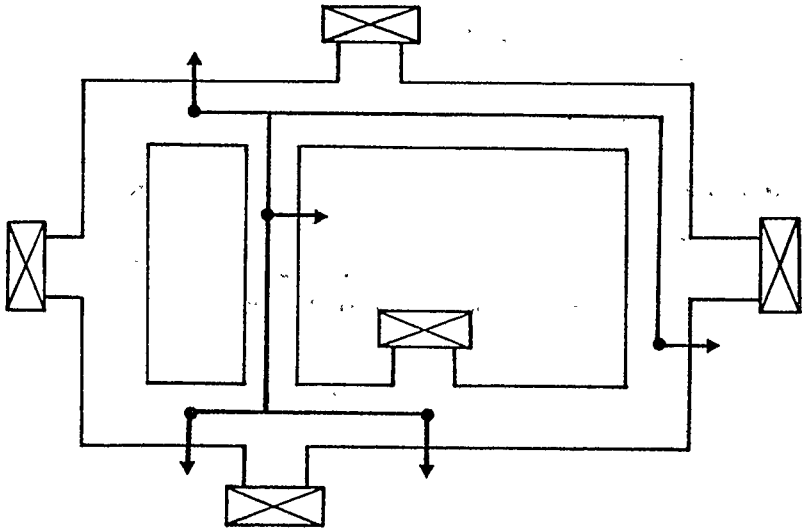


DEFINITION OF PIPING SYSTEM (TERMINALS)

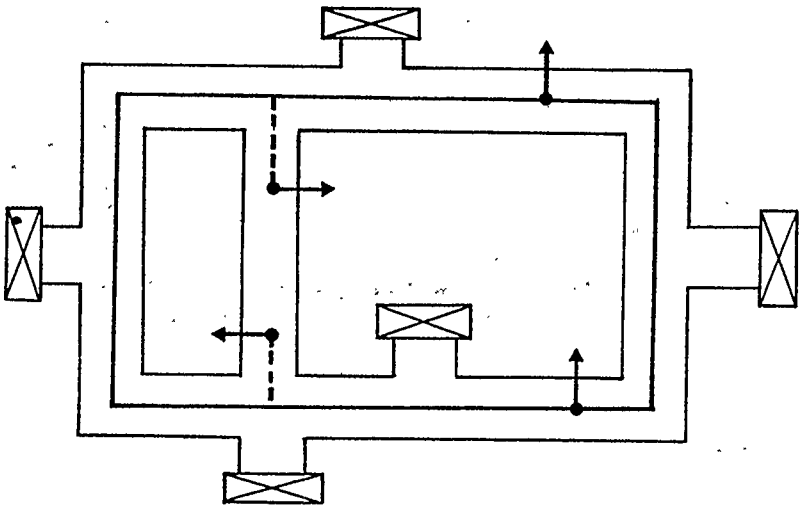
1 ANCHOR POINT—ANCHOR POINT



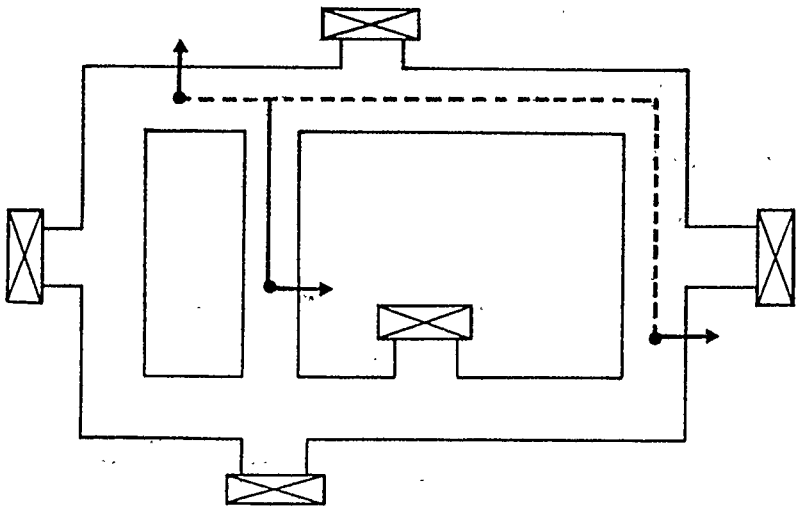
2 GROUPING



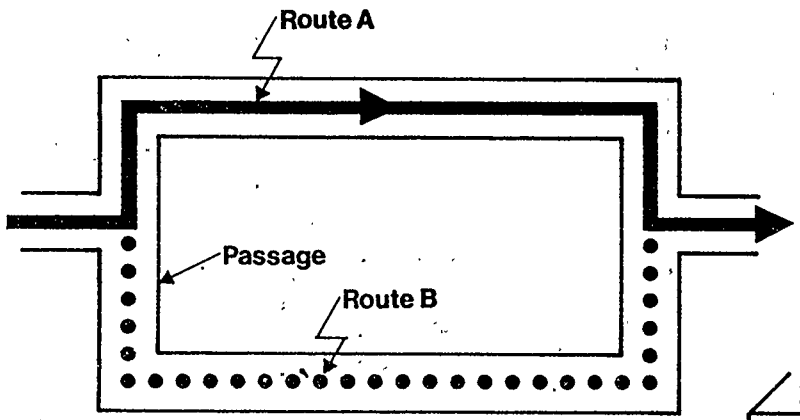
3 RING MAIN

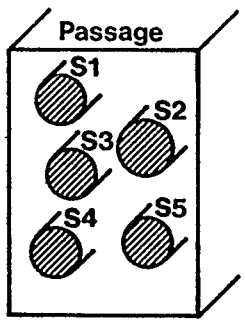


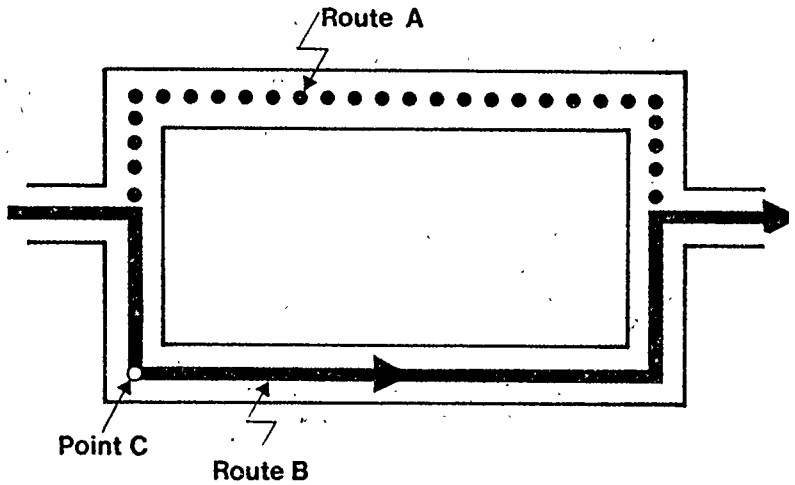
4 ANCHOR POINT—SEQUENCE

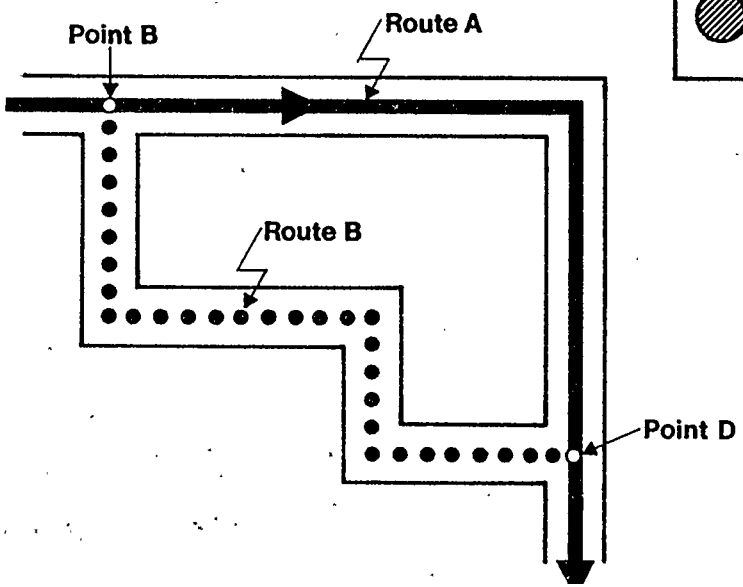


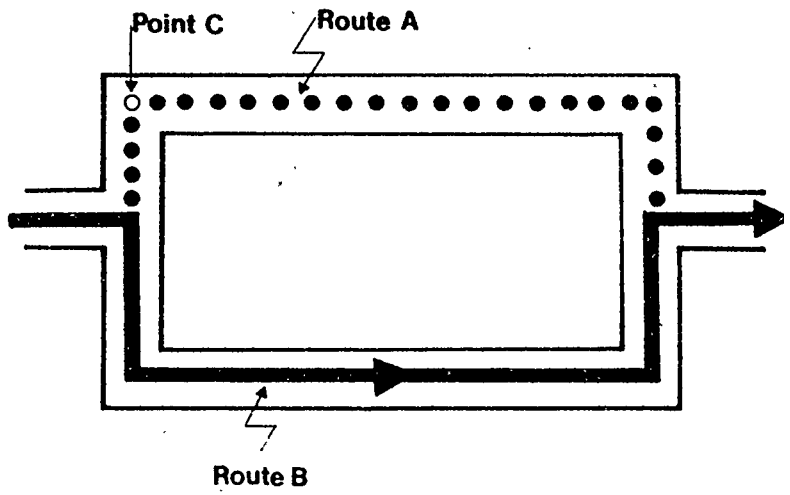
HICAS-P OPTIMUM ROUTE CALCULATION



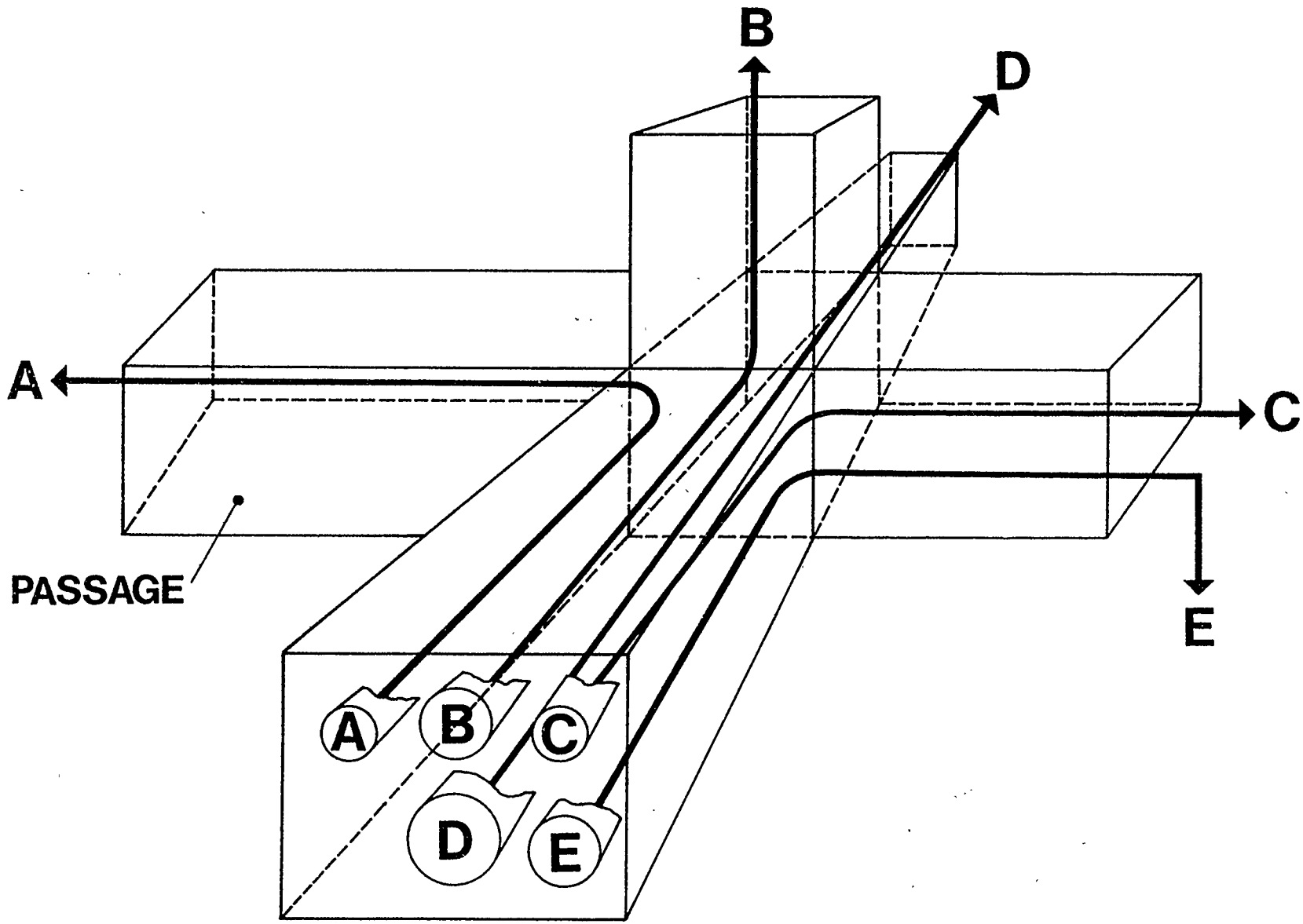




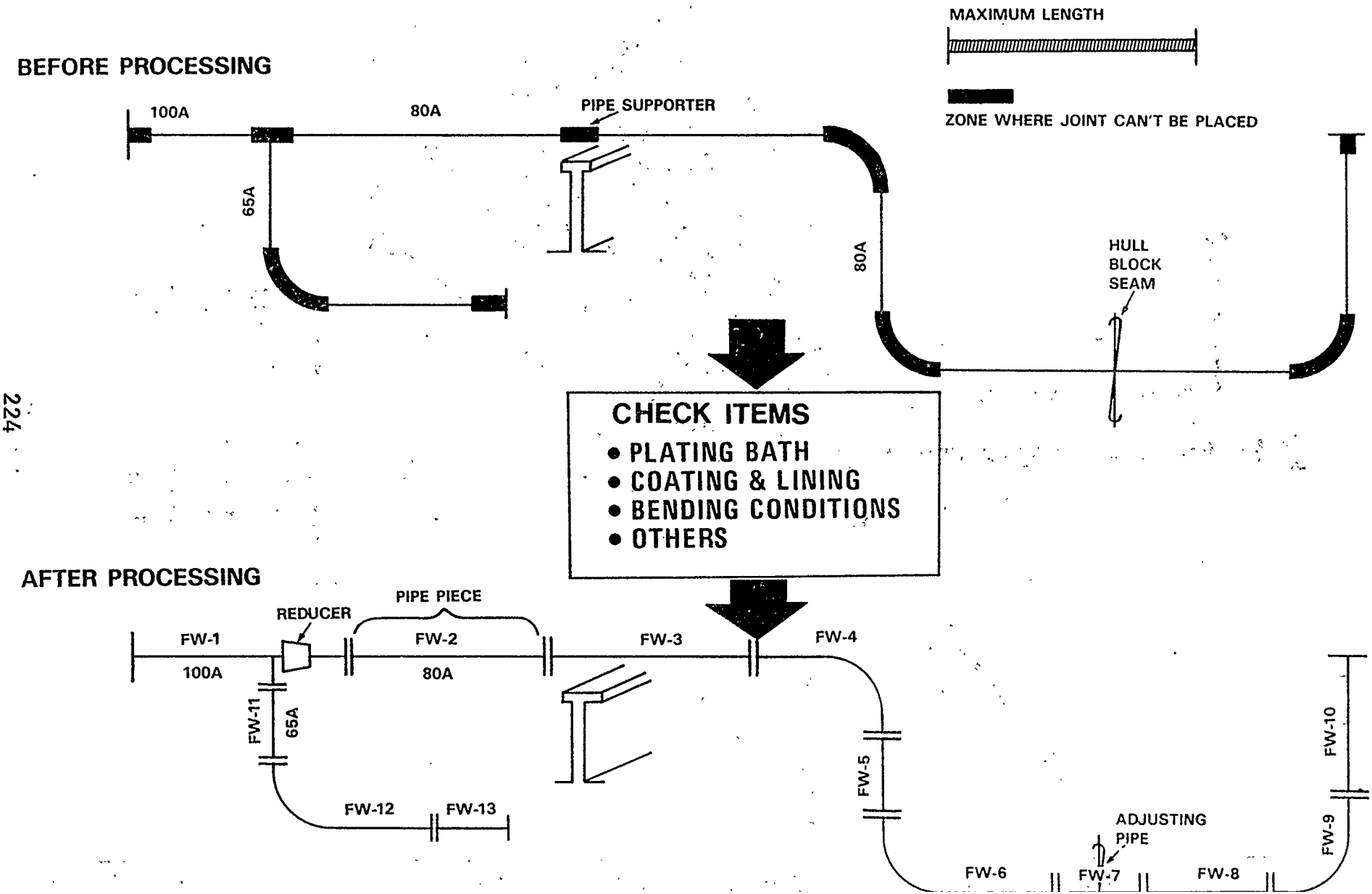




HICAS-P AUTOMATIC PIPE ARRANGEMENT



HICAS-P AUTOMATIC JOINT POSITIONING



HICAS-

AUTOMATIC DRAWING FUNCTION

- SPEC. OF THE DRAWING CAN BE FREELY INDICATED

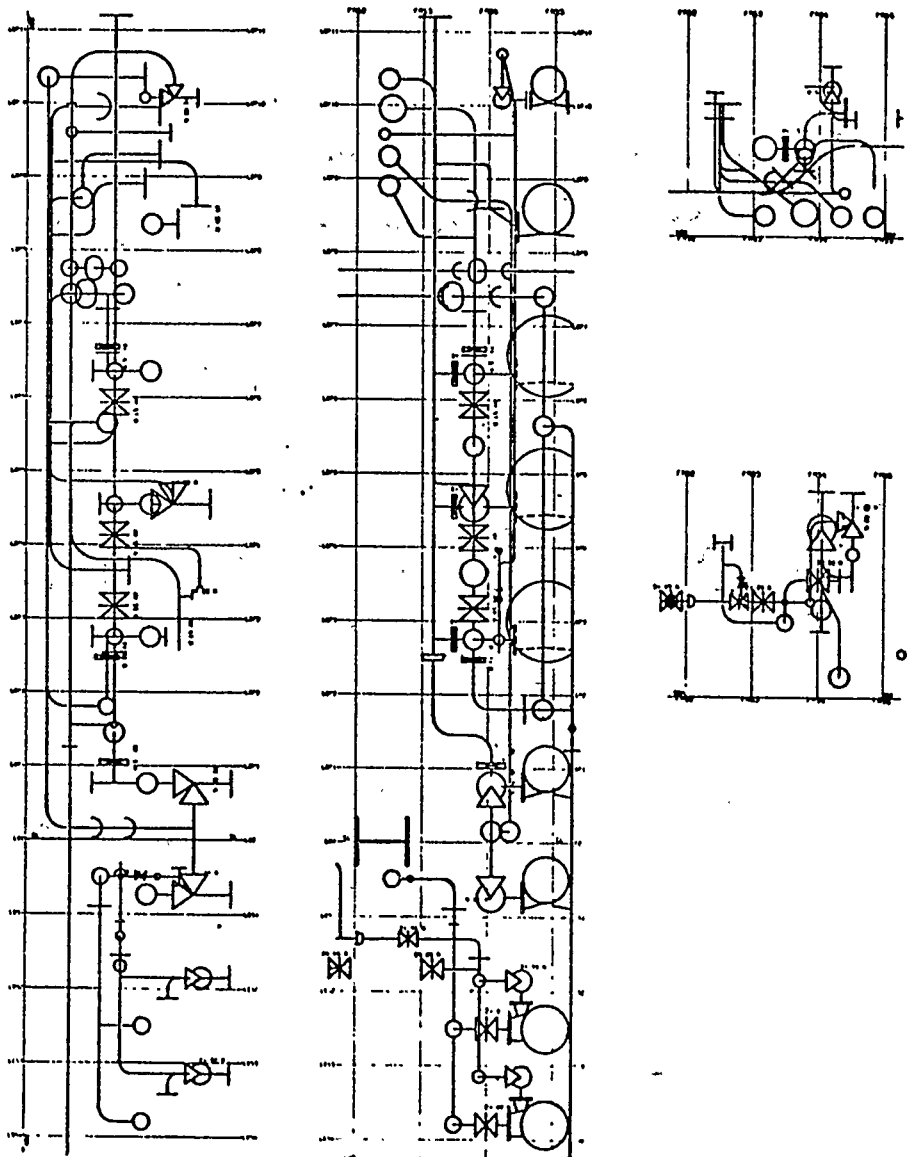
  (VIEW DIRECTION, DRAWING AREA, OBJECT TO BE DRAWN, ETC)

- THE FOLLOWING CAN BE AUTOMATICALLY DRAWN

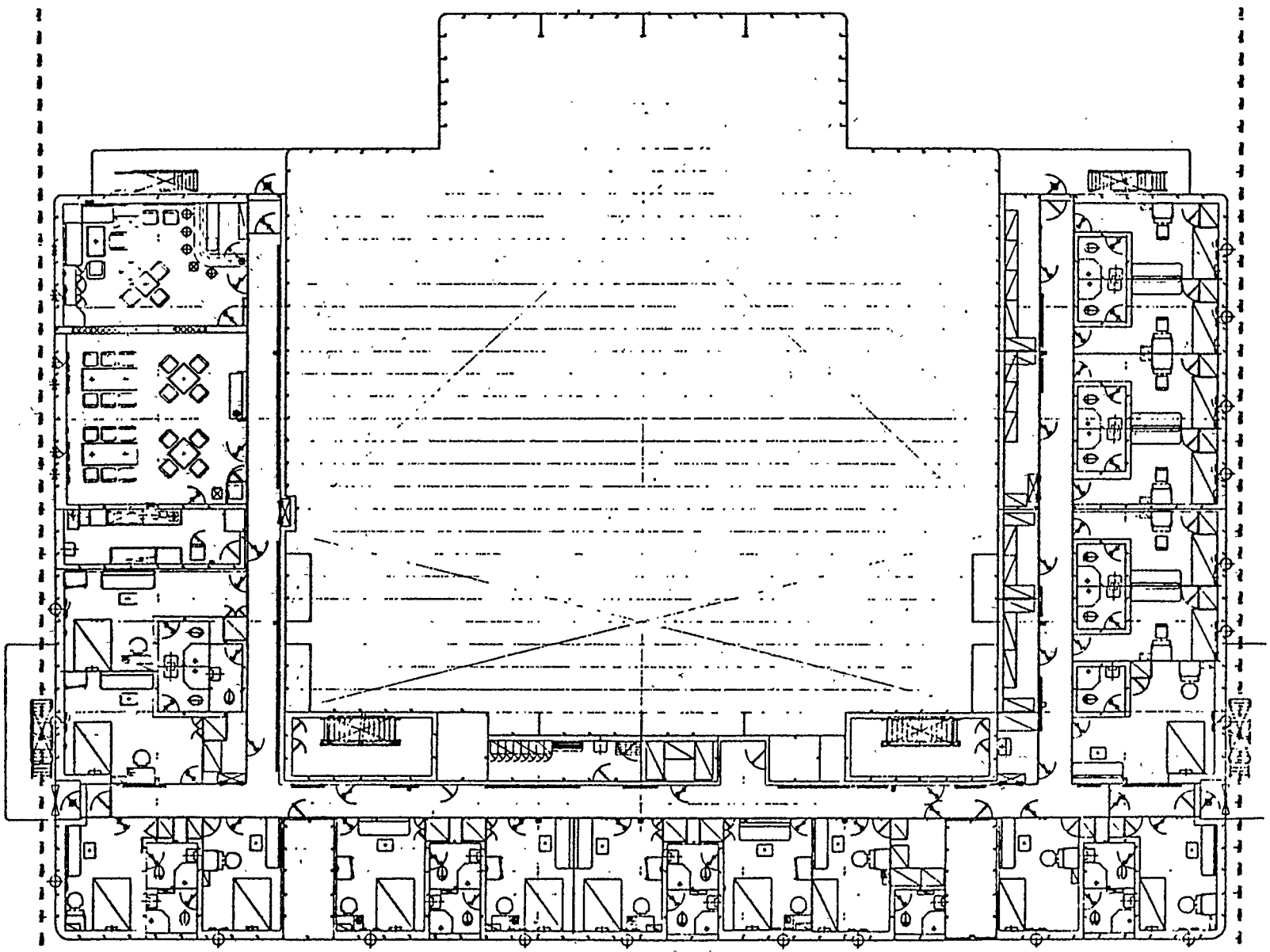
  1. HIDDEN LINE ELIMINATION
  2. RELATIVE POSITION OF PIPELINES FROM HULL STRUCTURE
  3. PIPE PIECE NO., HIGHT OF PIPELINES, DIA. OF PIPES, NAME OF HULL STRUCTURE
  4. OTHERS

HICAS-P

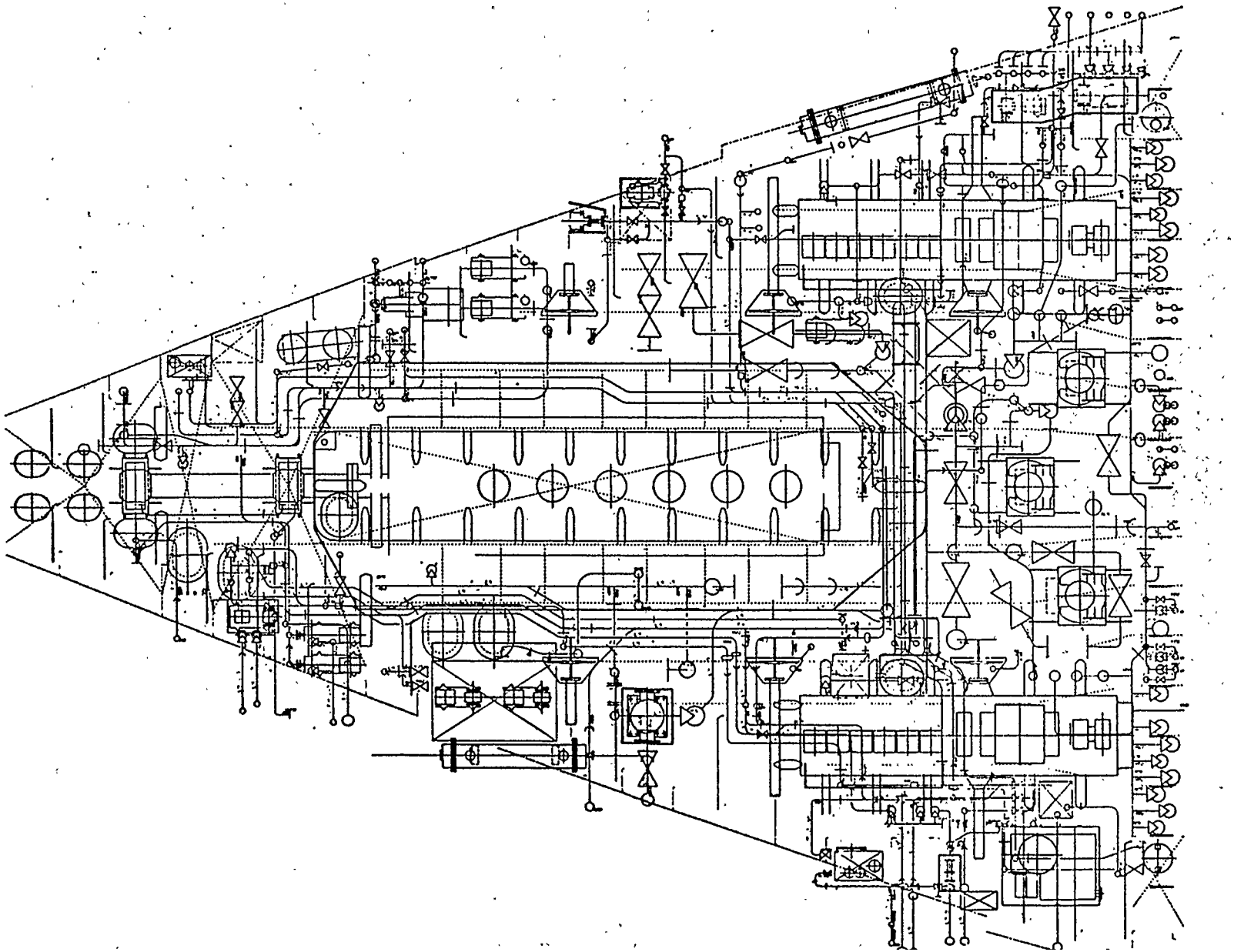
AUTOMATIC DRAWING FUNCTION



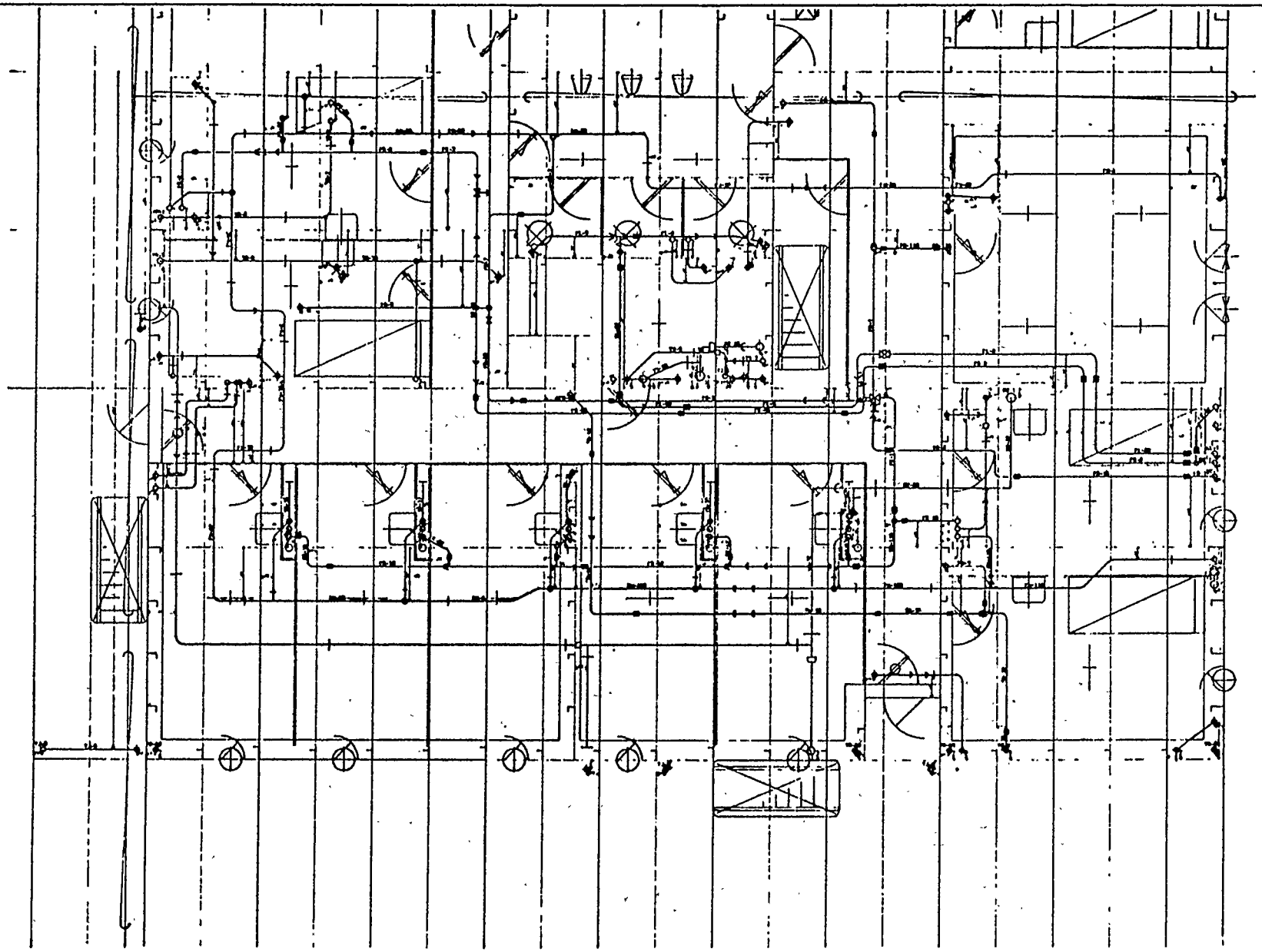
ACCOMMODATION PLAN



HICAS-P PIPING ARRANGEMENT (ENGINE ROOM)

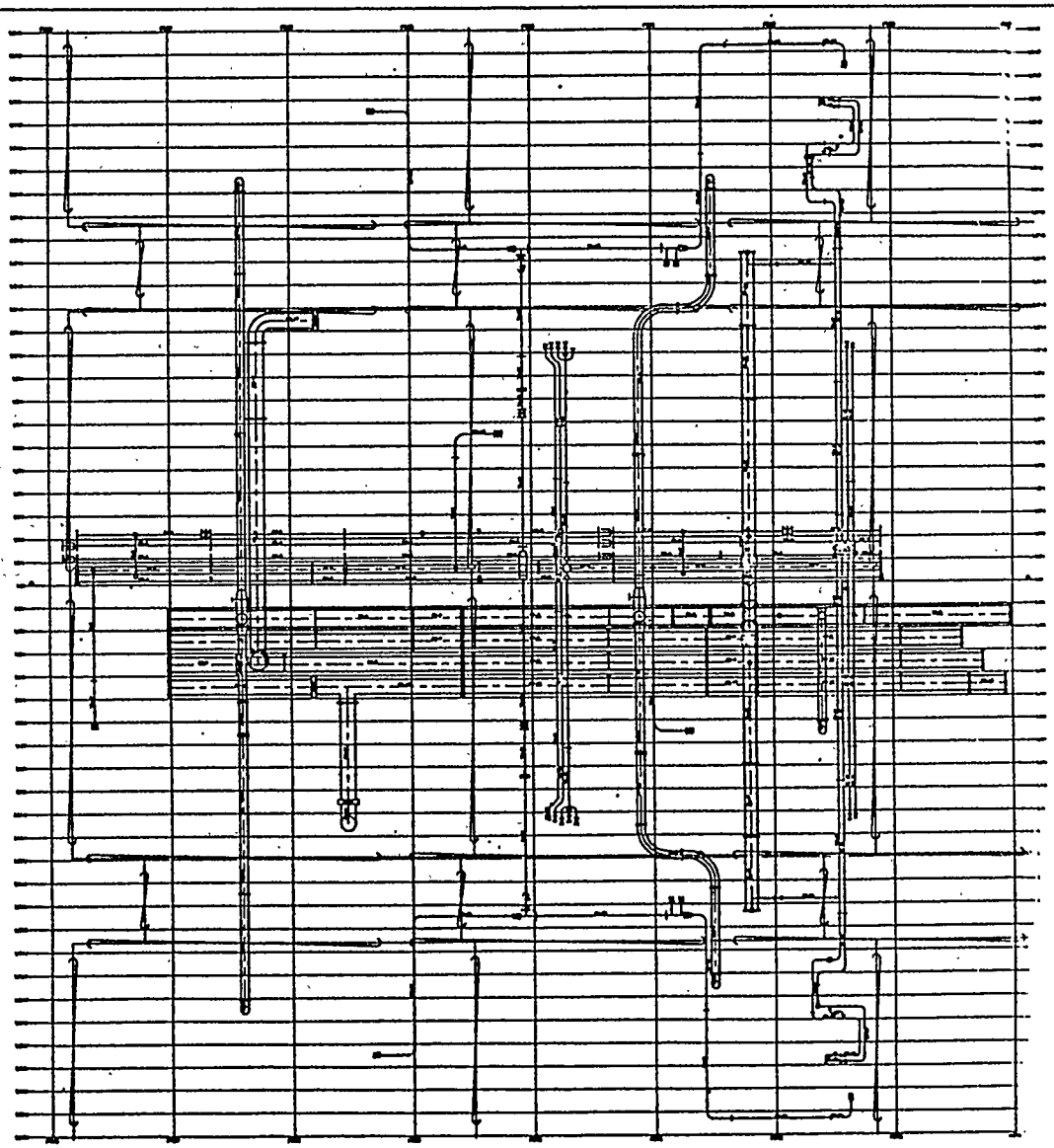


PIPING ARRANGEMENT (ACCOMMODATION)

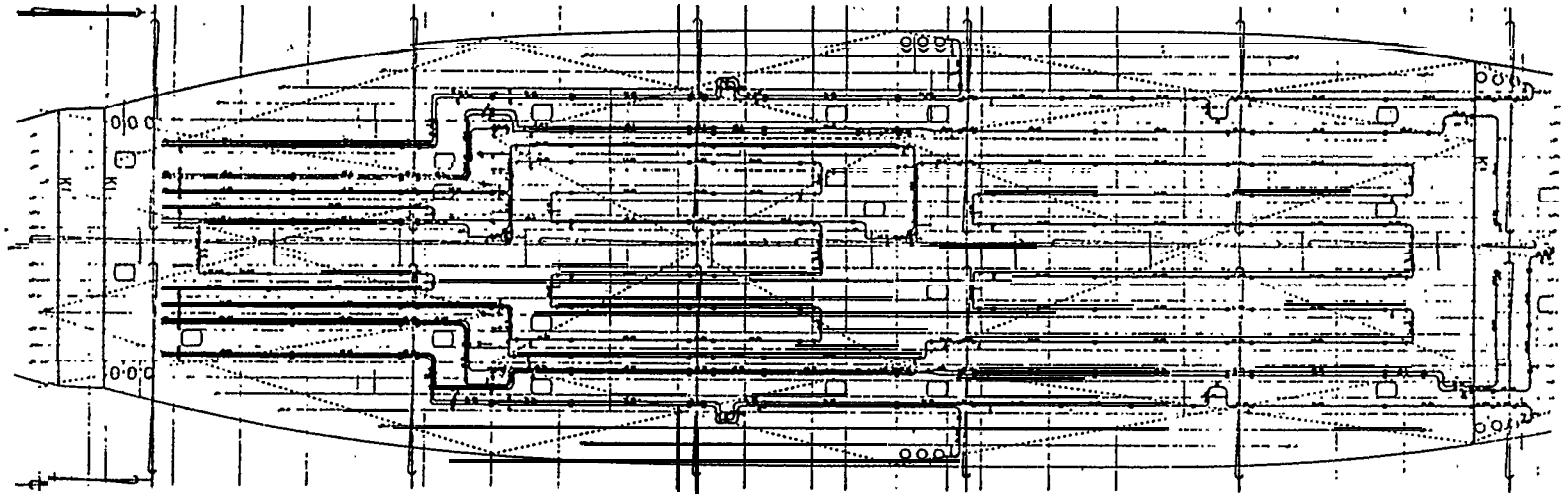


HICAS-P

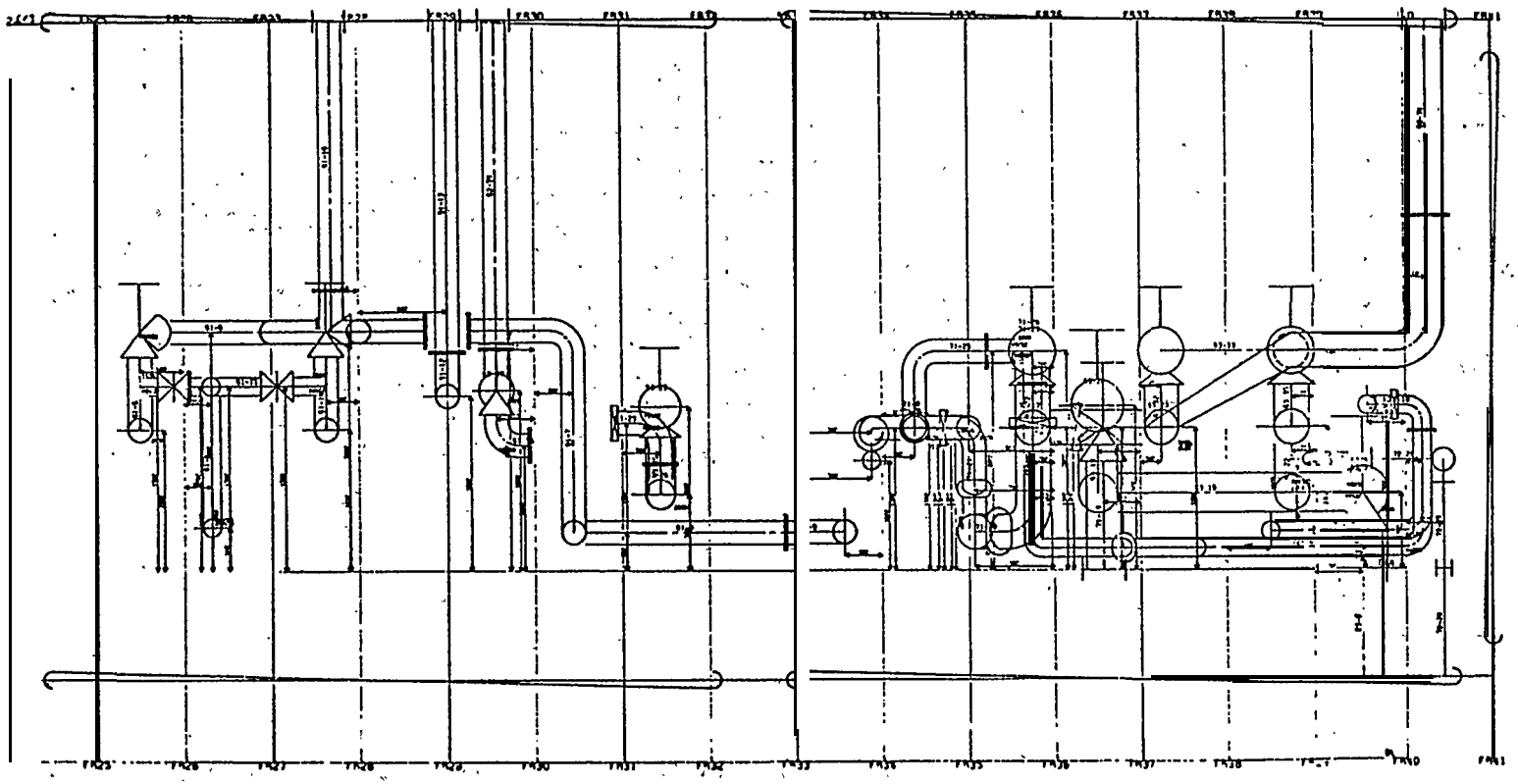
PIPING ARRANGEMENT (ON DECK)



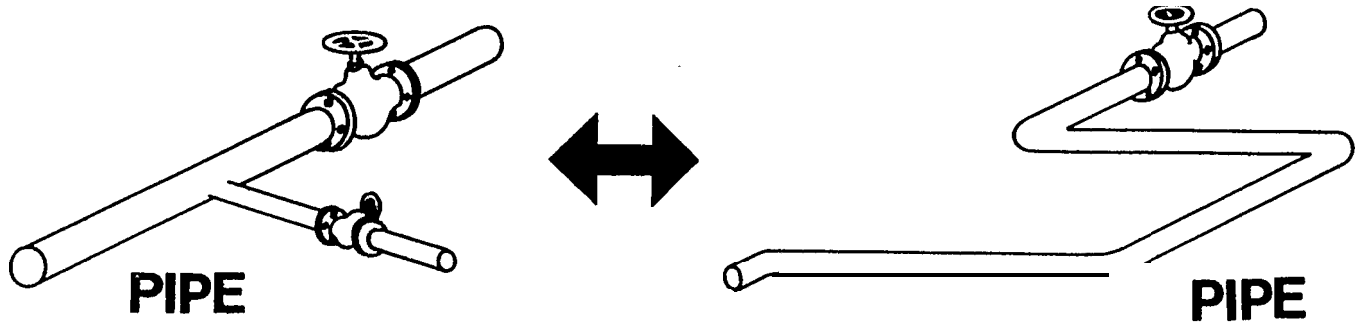
HICAS-P PIPING ARRANGEMENT (IN DOUBLE BOTTOM)

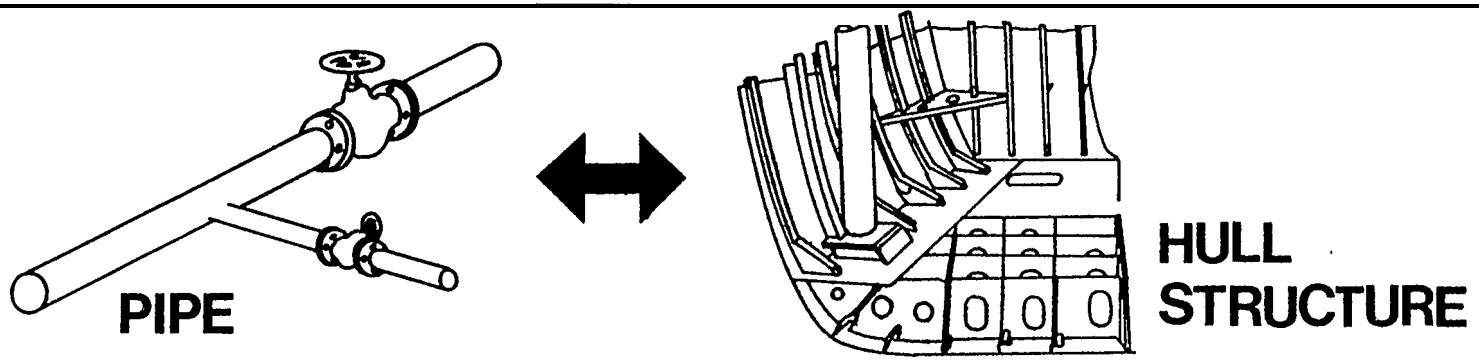


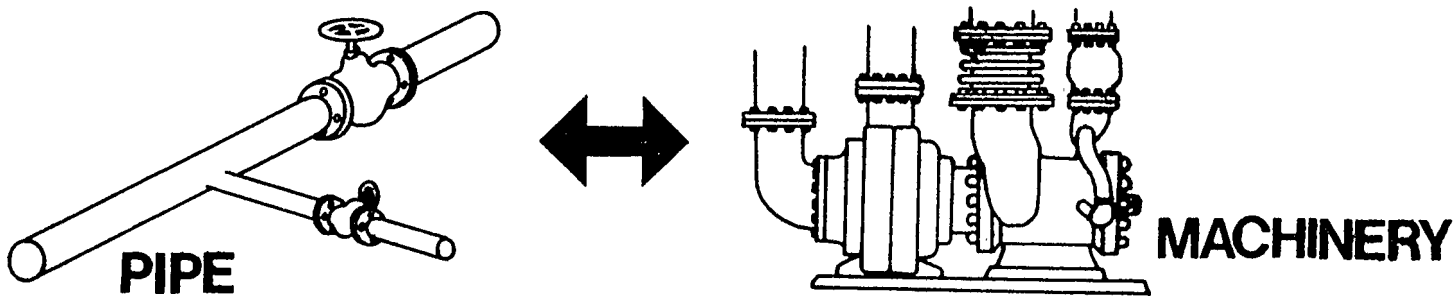
HICAS-P PIPING ARRANGEMENT (ENLARGEMENT, ELEVATION



HICAS-P INTERFERENCE CHECKING FUNCTION







HICAS-P INTERFERENCE CHECK LIST

---------- HICAS-P INTERFERENCE CHECK LIST ----------

** S.NO=4484, SHOP=MA, SHEET NO=77AM6-04, DESIGNER= ** DATE 76/01/29 PAGE 9 **

NO. 33 PIPE TO PIPE (P.NO= 3, P.NO= 163, L.NAME=LI 2 , SEQ= 7) TO (P.NO= 166, P.NO= 167, L.NAME=LI 2 , SEQ= 8)

		A-F:FR28	F	414			A-F:FR28	F	414			A-F:FR26	F	400			A-F:FR26	F	400
	P.NO= 3	P-S:LGS5	P	127	P.NO=	163	P-S:LGS5	P	127	P.NO=	166	P-S:LGS5	P	120	P.NO=	167	P-S:LGS5	P	120
		U-D:DBM	U	357			U-D:DBM	U	507			U-D:DBM	U	1380			U-D:DBM	U	507

********** INTERFERENCE DEPTH= 45 **********

NO. 34 PIPE TO JOINT (P.NO= 9, P.NO= 233, L.NAME=LI 2 , SEQ= 13) TO (P.NO= 170, L.NAME=LI 2 , SEQ= 9, JOINT NAME= FL

		A-F:FR36	A	209			A-F:FR36	A	219			A-F:FR36	A	74	
	P.NO= 9	P-S:LGS8	P	90	P.NO=	233	P-S:LGS8	S	306	P.NO=	170	P-S:LGS8	S	28	
		U-D:DBM	U	317			U-D:DBM	U	317			U-D:DBM	U	330	

********** INTERFERENCE DEPTH= 90 **********

NO. 35 PIPE TO PIPE (P.NO= 171, P.NO= 172, L.NAME=LI 2 , SEQ= 9) TO (P.NO= 184, P.NO= 185, L.NAME=LI 2 , SEQ= 10)

		A-F:FR33	A	116			A-F:FR31	F	269			A-F:FR33	A	120			A-F:FR31	A	41
	P.NO= 171	P-S:LGS7	P	190	P.NO=	172	P-S:LGS6	S	169	P.NO=	184	P-S:LGS7	P	20	P.NO=	185	P-S:LGS6	S	215
		U-D:DBM	U	330			U-D:DBM	U	330			U-D:DBM	U	324			U-D:DBM	U	324

********** INTERFERENCE DEPTH= 43 **********

NO. 36 PIPE TO PIPE (P.NO= 171, P.NO= 172, L.NAME=LI 2 , SEQ= 9) TO (P.NO= 183, P.NO= 184, L.NAME=LI 2 , SEQ= 2)

		A-F:FR33	A	116			A-F:FR31	F	269			A-F:FR36	A	175			A-F:FR32	A	226
	P.NO= 171	P-S:LGS7	P	190	P.NO=	172	P-S:LGS6	S	169	P.NO=	183	P-S:LGS8	S	450	P.NO=	184	P-S:LGS7	P	173
		U-D:DBM	U	330			U-D:DBM	U	330			U-D:DBM	U	324			U-D:DBM	U	324

********** INTERFERENCE DEPTH= 44 **********

HICAS-P PIPE PIECE DRAWING

S-NO.4484(M) SHEET NO.77A80321(REV-1) DATE:76/02/21 PAGE: 47: 1
DIV:M32 BLOCK: UNIT: S-UNIT: STAGE:K

----- <PIPE NO.> ----- -------- < TREATMENT TABLE > ----------

PIPE PIECE NO.	NUMBER	PRESS	X-RAY	PLAT ANNEAL	IN PAT	OUT PAT
AM- 980 -	1		2		-	-

PRODUCTION INFORMATION

---------- < MATERIAL TABLE > ---------- -< MANUFACTURING TABLE >-

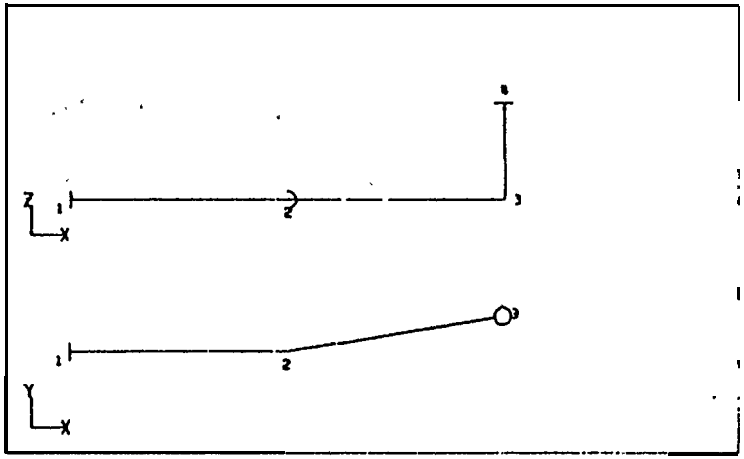
POINT	NAME	ADJ.	MATERIAL	NUM	CUT.L	WELD	FA	M.L	BRANCH
1- 4	JGB- - 25-		SGP-B	1	1421				
4	F - 10- 25-		SS41	1		OK	0.0		
1	F - 10- 25-		SS41	1		OK	9.5		

MATERIAL LIST

---------- < BENDING INFORMATION > ----------

1ST.P	L	NC-L	FA	A	:	L	NC-L	RA	A	:	L	NC-L	RA	A
1	1276	776	+ 45.0	90.0	:	610	473	-90.0	9.4					

BENDING INFORMATION



SHAPE OF PIPE PIECE (PROJECTION)

---------- < MEASUREMENTS OF PIPE PIECE > ----------

FM	TO	KIND	ANG	OTHER	NAME	X	Y	Z	N	AL&LI	MAG.L
-	1	FL			F - 10- 25-						
1-	2	BR	9			600				600	
2-	3	BR	90			600	100			608	
3-	4	FL			F - 10- 25-			278		278	

MM TOTAL LENGTH: X= 1200 Y= 100 Z= 278 MMMMM TOTAL WEIGHT: 6KG MMMMM

MEASUREMENTS OF PIPE PIECE

M: / C: / B: / F: / N: / G: / S: / E: / H: /

VALVE LIST (FOR PURCH. ORDER)

OPERATION M : MANUAL S : SELF OP.
H : HYDRAULIC E : ELECTRIC
PN : PNEUMATIC
RH : REACH ROD + HANDLE
RY : REACH ROD + YOKE

PURCH.ORDER P- 12 4YH-1012 PAGE- 1

SNO 4432
GLOBE & ANGLE VALVE (CAST STEEL)

ALT. MARK	VALVE TYPE	RAT'G (K)	IN.D. (MM)1	MAT'RL	STANDARD	OPERATION	REQ. NO.	VALVE NO.	LOCATION	APPLICATION	WEIGHT (KG)	REMARKS
	GSV	10	100	SC	F7319	M	2	DSV- 2, 3	FWD. SPACE	DK STEAM	44.80	
	GSV	10	50	SC	F7319	M	2	DSV- 8, 9	UPPER DECK	DK STEAM	17.90	
	GSV	10	80	SC	F7319	M	1	DSV- 51	UPPER DECK	DK STEAM	29.80	
	GSV	10	100	SC	F7319	M	9	DSV- 4~ 7 DSV- 47~ 49 DSV- 52, 53	UPPER DECK	DK STEAM	44.80	
	GSV	10	125	SC	F7319	M	1	DSV- 50	UPPER DECK	DK STEAM	69.80	
	GSV	10	200	SC	F7319	M	1	DSV- 37	UPPER DECK	DK STEAM	158.00	
	GSV	10	250	SC	F7319	M	1	DSV- 46	UPPER DECK	DK STEAM	257.00	
	GSV	10	65	SC	F7319	M	2	DSV- 34, 35	AUX. P. RM,	DK STEAM	26.10	
	GSV	10	125	SC	F7319	M	1	DSV- 36	AUX. P. RM,	DK STEAM	69.80	
	GSV	10	100	SC	F7319	M	2	DSV-100,103	AFT. SPACE	DK STEAM	44.80	
	GSV	10	150	SC	F7319	M	2	DEV- 24, 27	MAIN P. RM,	DK EXHAUST	96.30	
	GSV	10	250	SC	F7319	M	3	DSV-125,127 DSV-128	MAIN P. RM,	DK STEAM	257.00	
	GSV	20	100	SC	F7313	M	6	DSV-110,112 DSV-114,115 DSV-117,119	MAIN P. RM,	DK STEAH	62.30	
	GSCV	20	250	SC	F7473	RH	1	SOV-117	MAIN P. RM,	STRIPPER	349.00	
	ASCV	10	50	SC	F7472	M	2	DSV- 62, 63	UPPER DECK	DK STEAM	16.30	
	ASCV	5	300	SC		H	1	WBV-105	MAIN P. RM,	WATER BALLAST	310.00	

HICAS-P TABLE OF PIPE PIECES

-------- HICAS-P TABLE OF CONTENTS --------
(FOR PIPE PIECE DRW.)

**** ZINC PLATING
**** DIVISION=H ; S.NO=0099
**** BOOKLET =9951-422-123

(WEIGHT:KG LENGTH:M) DATE=10/25/77 PAGE= 2

PAGE	PIPE PIECE NO.	NOMINAL -DIA.	ELBOW	LENGTH	TREAT MENT	PAINTING IN OUT	TEST- PRRS	BOSS	BRAN CH	ADJU ST	OUT- ZONE	WEIGHT	REMARKS
1	FW- 1-11-	20	0	1.5	G	R -2 N -	A-150	0	0	ADJUS	HU	3.3	
2	FW- 1-12-	20	0	2.0	G	R -2 N -	A-150	0	1		HU	4.4	
3	FW- 1-13-	15	0	0.8	G	R -2 N -	A-150	0	0		HU	2.1	
4	FW- 1-14-	40	0	2.2	G	R -2 N -	A-150	1	0		HU	9.0	
5	FW- 23-01-	20	2	0.9	G	R -2 -	A-150	0	0		HU	4.3	
6	FW- 23-02-	20	1	0.6	G	R -2 -	A-150	0	0	ADJUS	HU	4.5	
7	FW- 23-03-	15	0	5.0	G	R -2 -	A-150	0	0		HU	6.8	
8	FW- 23-15-	50	0	1.5	G	R -2 -	A-150	1	0		HU	15.1	
9	FW- 23-16-	40	0	0.9	G	R -2 -	A-150	0	0		HU	8.5	
10	FW- 23-17-	40	0	1.6	G	R -2 -	A-150	0	0	GEN	HU	7.9	
11	FW-123-11-	40	0	2.3	G	R -2 N -	A-150	0	1		HU	16.0	
12	FW-123-12-	125	2	1.2	G	R -2 N -	A-150	0	0		HU	125.7	

HICAS-P BILL OF MATERIALS

---------- HICAS-P TABLE OF MATERIALS ----------

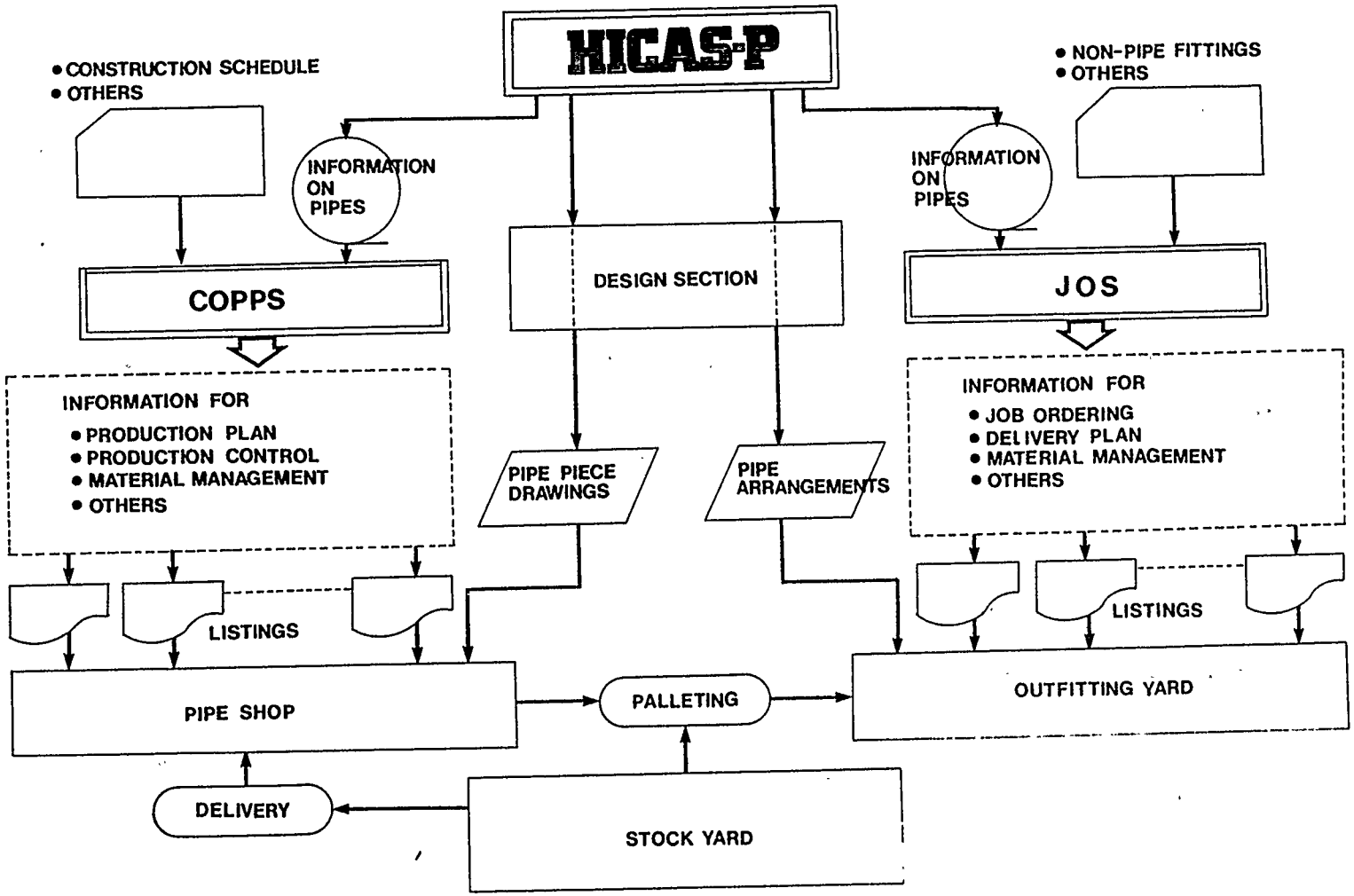
**** DIVISION=H ; S.NO=0099
**** WORKLET =9951-422-123

**** MATERIAL=RAW PIPE

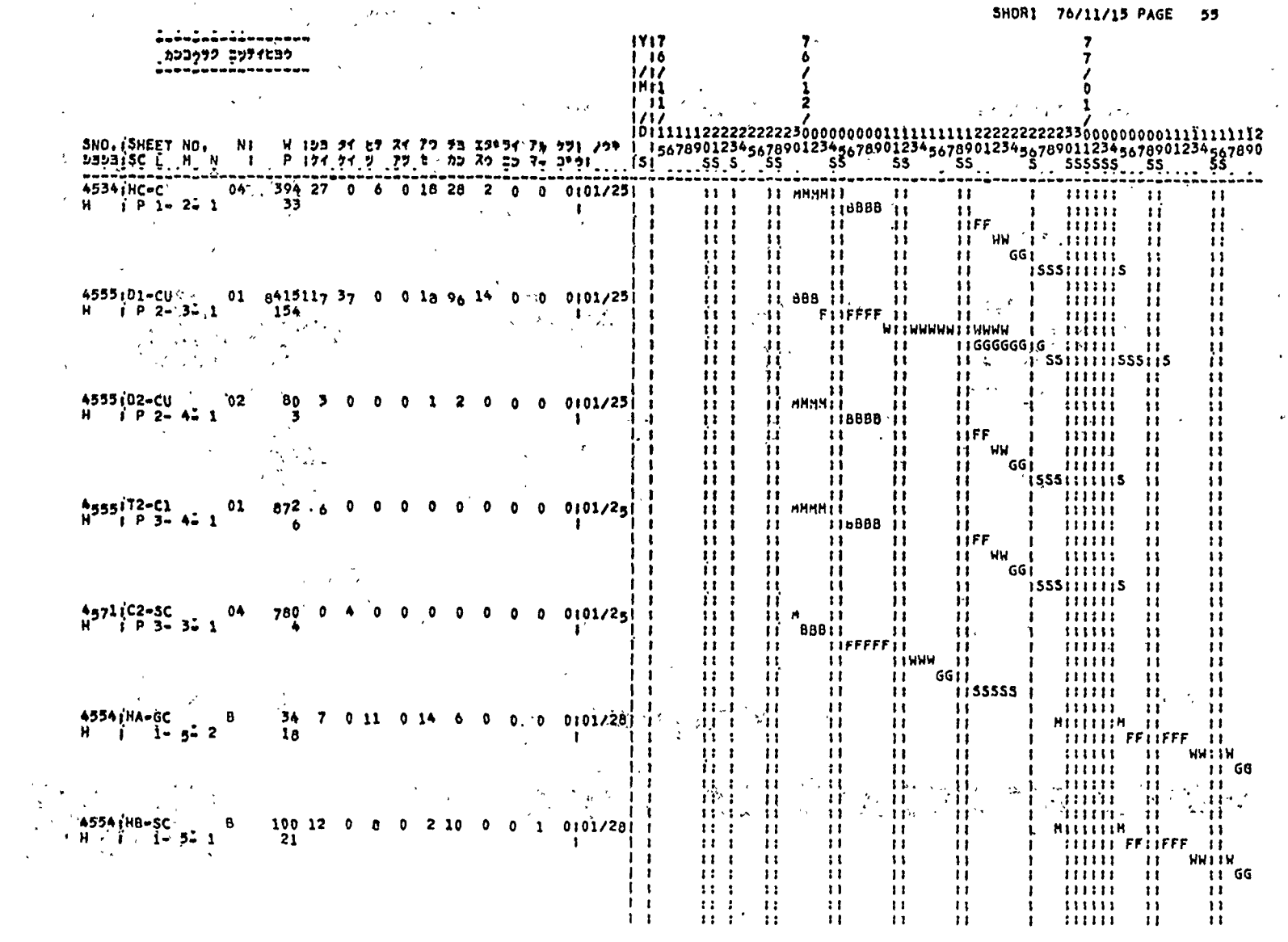
DATE=10/21/77 PAGE= 2

MIS CODE - MATL NAME	DIMENSION	MATERIAL	P. CD		FW	CO											TOTAL LENGTH (M)	TOTAL WEIGHT (KG)
41352-3205	15- 2.8	SGP-E	90		6	0	0	0	0	0	0	0	0	0	0	0	6	8
41352-3206	20- 2.8	SGP-E	90		6	0	0	0	0	0	0	0	0	0	0	0	6	10
41352-3209	40- 3.5	SGP-E	90		9	0	0	0	0	0	0	0	0	0	0	0	9	35
41352-3210	50- 3.8	SGP-E	90		1	0	0	0	0	0	0	0	0	0	0	0	1	5
				TOTAL	22	0	0	0	0	0	0	0	0	0	0	0	22	58
41353-3309	40- 3.7	ABG-2-S #40	11		0	13	0	0	0	0	0	0	0	0	0	0	13	52
41353-3310	50- 3.9	ABG-2-S #40	11		0	11	0	0	0	0	0	0	0	0	0	0	11	55
41353-3311	65- 5.2	ABG-2-S #40	11		0	1	0	0	0	0	0	0	0	0	0	0	1	9
41353-3315	125- 6.6	ABG-2-S #40	11		2	0	0	0	0	0	0	0	0	0	0	0	2	43
				TOTAL	2	25	0	0	0	0	0	0	0	0	0	0	27	164
				G.TOTAL LENG	24	25	0	0	0	0	0	0	0	0	0	0	49	
				WT	101	121	0	0	0	0	0	0	0	0	0	0		222

HICAS-P ADMINISTRATIVE INFORMATION SYSTEM



SCHEDULE OF PIPE PIECE FABRICATION



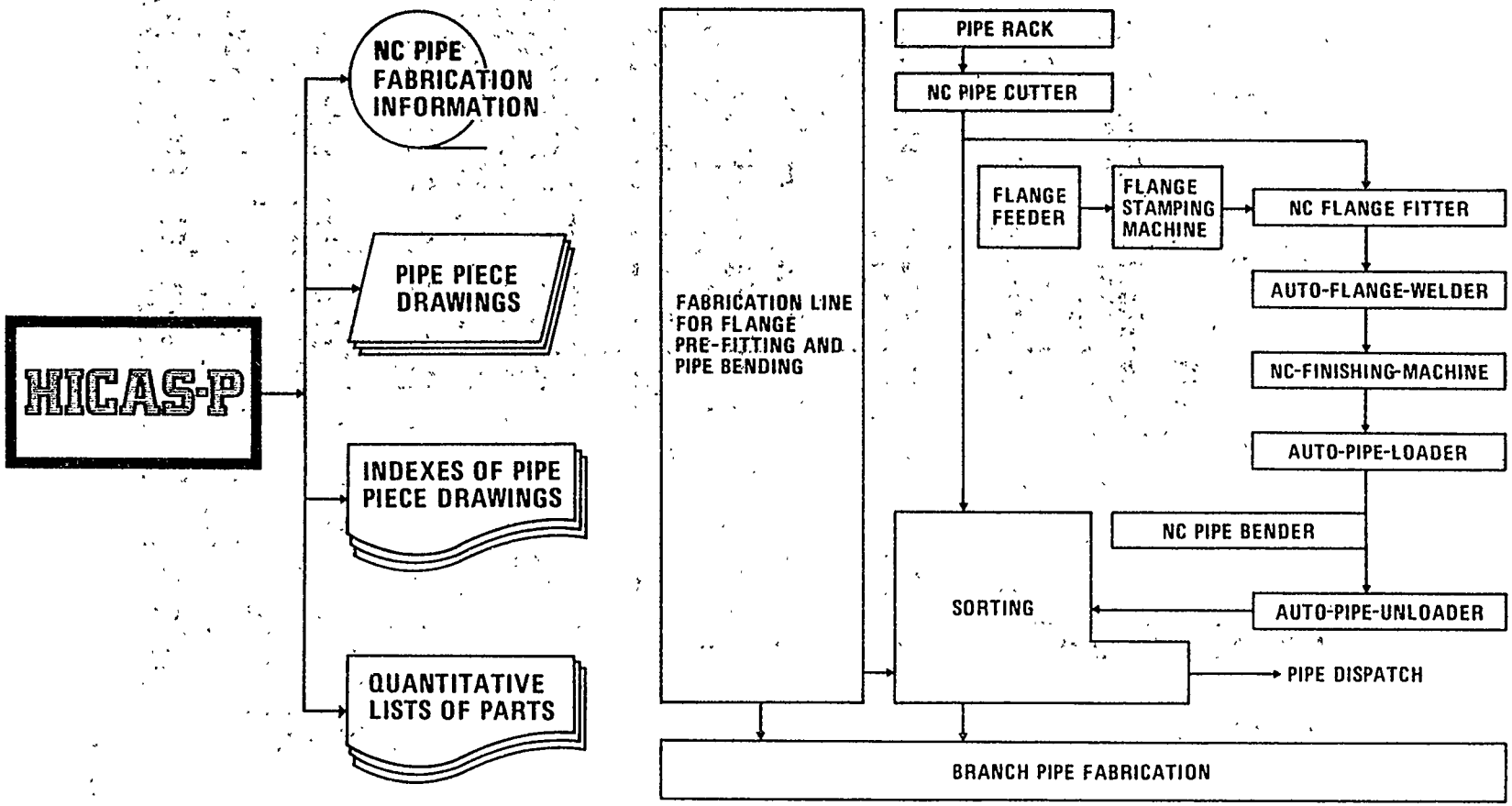
PIPE CUTTING PLAN

ﾅｲﾗｸ ｶｯﾃｨﾝｸﾞﾌﾟﾗﾝ

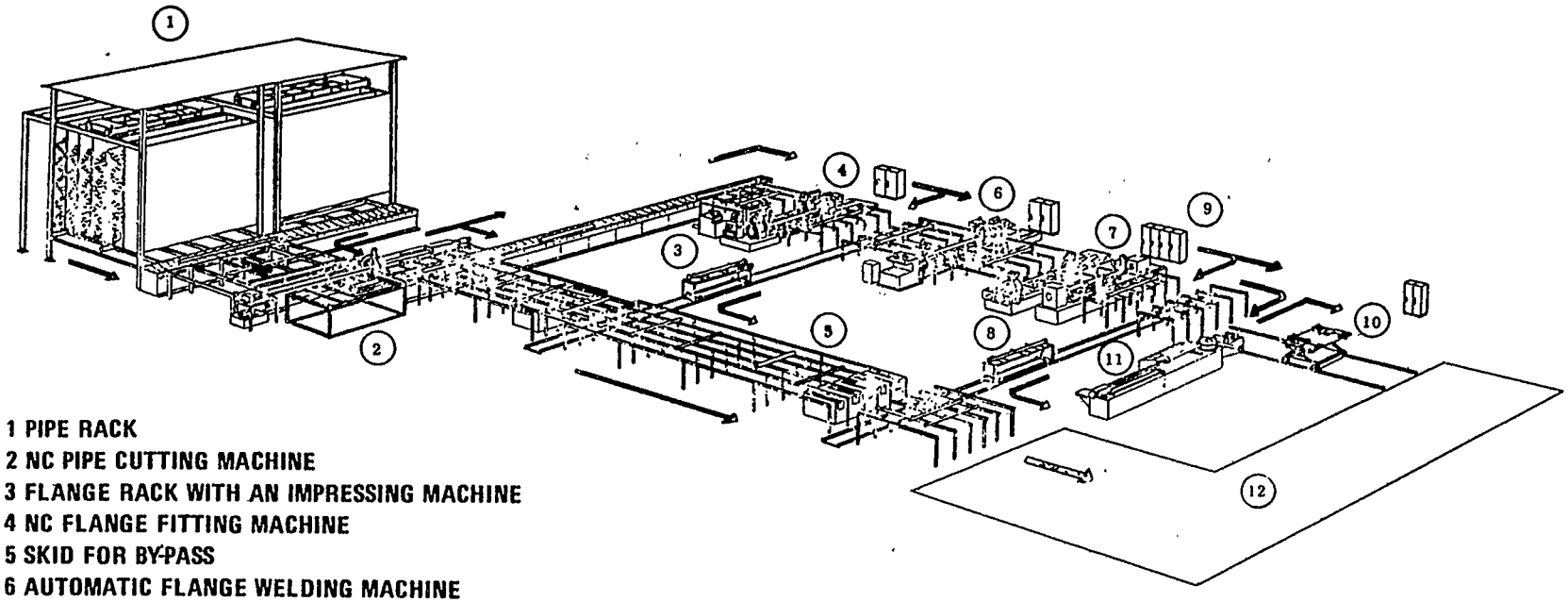
ｶｺｳﾛｯﾄ : L1-01-010 ｼﾖﾘﾋﾞ : 76/04/27

ｾﾝﾊﾞﾝ	ｶﾝｻﾞｲ	ｼｭﾙｲｶﾀｼｷ ｺｰﾄﾞ					M	ｶﾝﾌﾞｺﾞｳ	ｾｲﾊﾞﾝ	ﾃｲｼﾔｸ	ｶｲｻｷ	ﾅｶﾞｻ	ｻﾞﾝｻﾞｲ	ﾊｻﾞｲ	ｼﾖｳｹｲ
14484	JE4-	- 50-	0.0	0.0	STPG38-E	E 40	B	ISA- 30- -	HU-AC	5500		617			
14484	JE4-	- 50-	0.0	0.0	STPG38-E	E 40	B	ISA- 2- -	HU-AC	5500		617			
14484	JE4-	- 50-	0.0	0.0	STPG38-E	E 40	B	ISA- 1- -	HU-AC	5500		917			
14484	JE4-	- 50-	0.0	0.0	STPG38-E	E 40	B	ISA- 29- -	HU-AC	5500		917	2412		1
14484	JE4-	- 40-	0.0	0.0	STPG38-E	E 40	S	ISA- 44- -	HU-AC	5500		1092			
14484	JE4-	- 40-	0.0	0.0	STPG38-E	E 40	S	ISA- 17- -	HU-AC	5500		1092			
14484	JE4-	- 40-	0.0	0.0	STPG38-E	E 40	B	ISA- 18- -	HU-AC	5500	V 1	1253			
14484	JE4-	- 40-	0.0	0.0	STPG38-E	E 40	B	ISA- 43- -	HU-AC	5500	V 1	536			
14484	JE4-	- 40-	0.0	0.0	STPG38-E	E 40	B	ISA- 45- -	HU-AC	5500		677		815	1
14484	JGE-	- 40-	48.6	3.5	SGP-E	E	B	IRA- 3- -	HU-AC	5500		1392			
14484	JGE-	- 40-	48.6	3.5	SGP-E	E	B	IRA- 4- -	HU-AC	5500		822	3276		1
14484	JE4-	- 32-	0.0	0.0	STPG38-E	E 40	B	ISA- 25- -	HU-AC	5500		806	4689		
14484	JE4-	- 32-	0.0	0.0	STPG38-E	E 40	B	ISA- 52- -	HU-AC	5500		806			
14484	JE4-	- 32-	0.0	0.0	STPG38-E	E 40	B	ISA- 28- -	HU-AC	5500	V 1	835			
14484	JE4-	- 32-	0.0	0.0	STPG38-E	E 40	B	ISA- 27- -	HU-AC	5500		1384			
14484	JE4-	- 32-	0.0	0.0	STPG38-E	E 40	B	ISA- 54- -	HU-AC	5500	V 1	1086			
14484	JE4-	- 32-	0.0	0.0	STPG38-E	E 40	B	ISA- 26- -	HU-AC	5500		1134		220	2
14484	JE4-	- 25-	0.0	0.0	STPG38-E	E 40	B	ISA- 48- -	HU-AC	5500		535			
14484	JE4-	- 25-	0.0	0.0	STPG38-E	E 40	B	ISA- 6- -	HU-AC	5500	V 1	501	4449		
14484	JE4-	- 25-	0.0	0.0	STPG38-E	E 40	B	ISA- 35- -	HU-AC	5500		1015			
14484	JE4-	- 25-	0.0	0.0	STPG38-E	E 40	B	ISA- 47- -	HU-AC	5500		545			
14484	JE4-	- 25-	0.0	0.0	STPG38-E	E 40	B	ISA- 9- -	HU-AC	5500		810			
14484	JE4-	- 25-	0.0	0.0	STPG38-E	E 40	B	ISA- 34- -	HU-AC	5500	V 1	843			
14484	JE4-	- 25-	0.0	0.0	STPG38-E	E 40	B	ISA- 33- -	HU-AC	5500	V 1	951			
14484	JE4-	- 25-	0.0	0.0	STPG38-E	E 40	B	ISA- 5- -	HU-AC	5500	V 1	951		340	
14484	JE4-	- 25-	0.0	0.0	STPG38-E	E 40	B	ISA- 10- -	HU-AC	5500	V 1	1546			
14484	JE4-	- 25-	0.0	0.0	STPG38-E	E 40	B	ISA- 7- -	HU-AC	5500		1168			
14484	JE4-	- 25-	0.0	0.0	STPG38-E	E 40	B	ISA- 19- -	HU-AC	5500		1118			
14484	JE4-	- 25-	0.0	0.0	STPG38-E	E 40	B	ISA- 23- -	HU-AC	5500		1025			
14484	JE4-	- 25-	0.0	0.0	STPG38-E	E 40	B	ISA- 22- -	HU-AC	5500		585		28	3
14484	JGE-	- 25-	34.0	3.2	SGP-E	E	B	IYD- 4- -	HU-AC	5500	V 1	1095			
14484	JGE-	- 25-	34.0	3.2	SGP-E	E	B	IYD- 8- -	HU-AC	5500	V 2	751			
14484	JGE-	- 25-	34.0	3.2	SGP-E	E	B	IYD- 5- -	HU-AC	5500	V 1	721	2898		1
TOTAL															9

HICAS-P TYPICAL FLOW OF NC PIPE FABRICATION SYSTEM

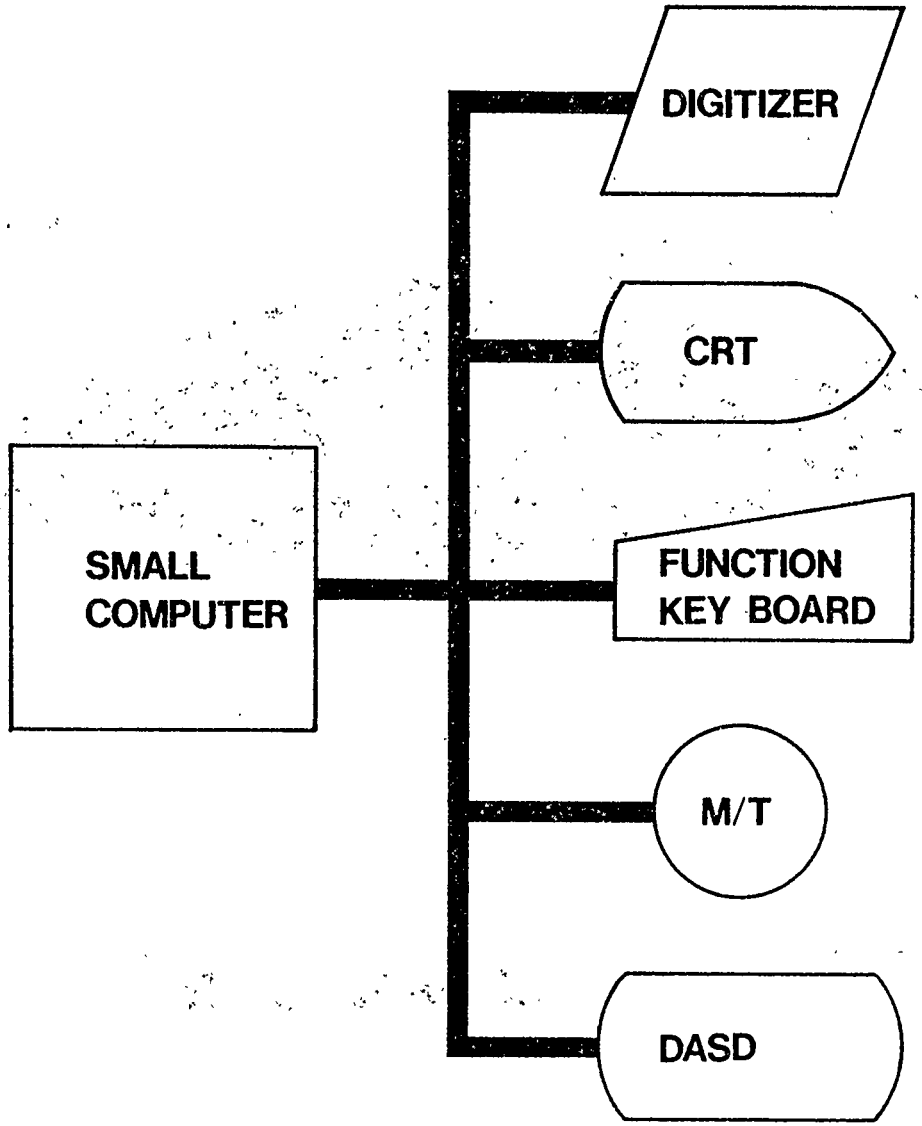


NC PIPE SHOP

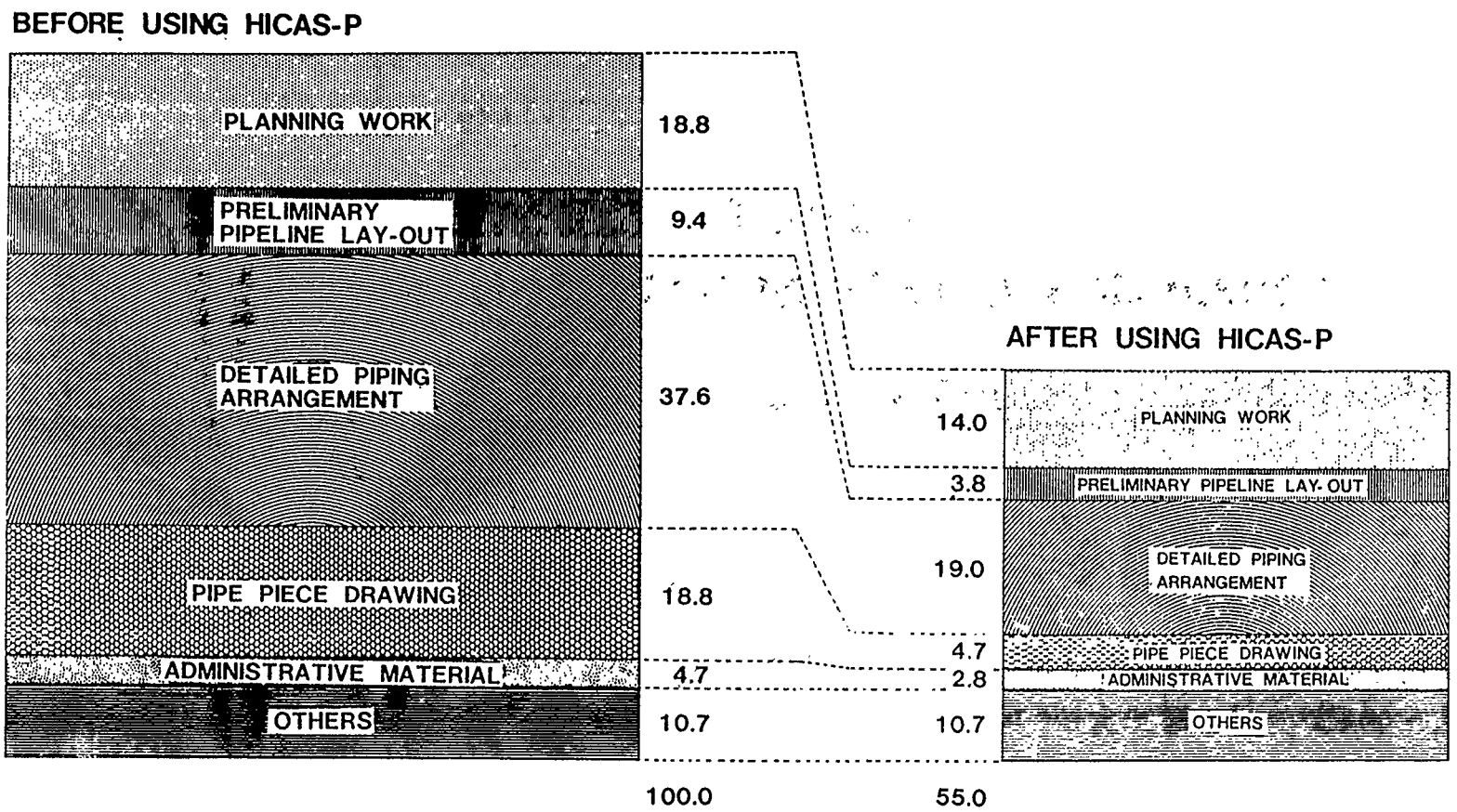


1 PIPE RACK
2 NC PIPE CUTTING MACHINE
3 FLANGE RACK WITH AN IMPRESSING MACHINE
4 NC FLANGE FITTING MACHINE
5 SKID FOR BY-PASS
6 AUTOMATIC FLANGE WELDING MACHINE
7 NC PIPE FINISHING MACHINE
8 DOLLY FOR BY-PASS
9 CONTROLLER
10 PIPE UNLOADING DOLLY
11 NC PIPE BENDER
12 SORTING STAGE

HICAS-P PF HARDWARE CONFIGURATION



HICAS-P HIGH EFFICIENCY



EFFECT

- REDUCTION OF PIPING DESIGN TERM
- PREVENTION OF ERRORS IN DESIGN & MANUFACTURE
- NOT WANTED SKILLED PIPING DESIGNER
- INFORMATION SUPPLY FOR PIPING CONTROL SYSTEM
- OTHERS