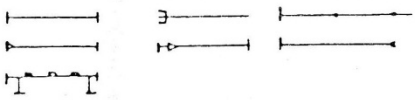
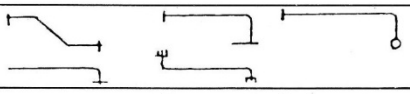
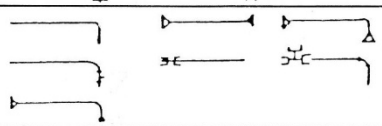
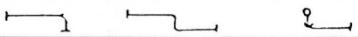
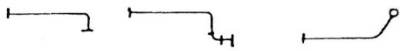
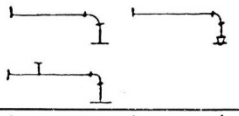
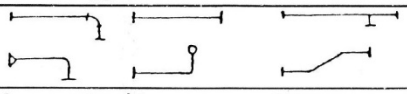
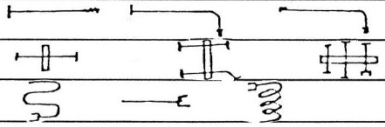
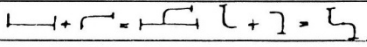
APPENDIX A

LEVEL	PIPE PIECE JOINING ←→ / PIPE PIECE ASSEMBLY ←→ / PIPE FABRICATION ←→					
AREA	MATERIAL	X-RAY OR NIL	MAIN OR BRANCH	BORE	STRAIGHT OR BENT	LENGTH
SUB-AREA	STEEL	NIL	MAIN	SMALL	STRAIGHT	
					BENT	
				MEDIUM	STRAIGHT	SHORT
						LONG**
					BENT*	
				LARGE	STRAIGHT	SHORT
						LONG**
					BENT*	
			BRANCH			
		X-RAY				
	NONFERROUS					
	PVC					
	OTHER					

Problem *Area* subdivisions for Pipe Fabrication, Pipe Piece Assembly, and Pipe Piece Joining Levels only. Blank spaces indicate that no further subdivision exists. *Medium and large bore pipe pieces to be bent can be assigned the same *area* subdivision. **Similarly, long, medium and large bore pipe pieces can be assigned the same *area* subdivision.

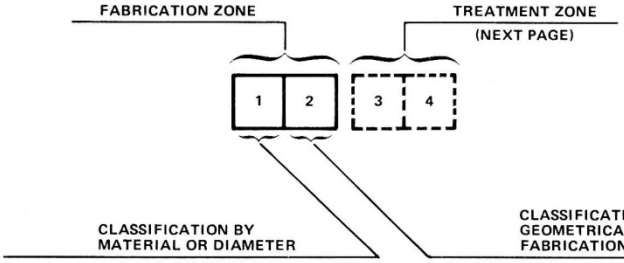
TYPICAL CLASSIFICATIONS FOR PIPE-PIECE FAMILY MANUFACTURING (PPFM)			
PPFM NO.	PIPE PIECE CLASSIFICATIONS		SKETCH OR REMARKS
01	Straight	≦ 50 mm	
04	↓	≦ 200 mm	
07	↓	≧ 250 mm	
11	Bent After Fabrication	≦ 50 mm	
14	↓	65 ∼ 200 mm	
21	Radiographic Tested	(Total Insp.)	
24		(Sampling Insp.)	
25	Hydrostatic Tested	≧ 40 kg/cm²	
27	↓	< 40 kg/cm²	
31	Plastic		
34	Bent By Heating		
41	Bent Before Fabrication	≦ 50 mm	
44	↓	65 ∼ 200 mm	
51	Assembled	≦ 50 mm	
54	↓	≦ 200 mm	
57	↓	≧ 250 mm	
61	Special Coating	- Lining	
69	↓	- Galvanizing	
71	Threaded		
77	Penetrations		
81	Heating Coils		
84	Stainless Steel		
87	Non-ferrous		
90	Urgent	(M)*	
91	Molded and adjusted		
92			
93	Aluminum brass pipes	(M)	
95	Unit Assembled		
96	Long-term**	(M) - Equivalent to PPFM No. 21, 24, 27 & 61	
97	Cast Steel		
99	General	(M) - Except for PPFM No. 96	
00	Molded and adjusted	(M)	

* (M) designates manually prepared pipe-piece drawings.

** Requires longer than average time.

QUANTITIES OF PIPE PIECES BY FAMILIES FOR A 60,000 DWT TANKER

PPFM NO.	DIAMETERS IN MILLIMETERS																								SUB-TOTALS
	8	10	15	20	25	32	40	50	65	80	100	125	150	200	250	300	350	400	450	500	550	600	650	700	
01			183	16	256	21	289	200																	965
04									160	72	173	123	161	70											759
07															100	23	16	34	47	41	45		3		309
11			264	21	285	20	227	111																	928
14									46	31	48	16	16												157
21										34	27	2	6												69
24			19	2	33		4	13																	71
25					1		2	8																	11
27			29	2	4		59	12	10		5	7		2	18										148
31			5		3	9	76	108	45	9	38														293
34							2		4	1	4	8	4	5	22	6	6		2						64
41			199	32	310	36	342	221																	1,140
44									152	82	137	89	81	43											584
51			2	1	20	1	44	76																	144
54									56	36	95	59	74	68											388
57															57	34	17	13	18	11	10	3	3		166
61					61	1	53	46	42	12	88	35	52	30	27	8	5	2	16	1	4				483
69					94		45	18	23	50	56	20	12	16	47										381
81							43	196																	239
87		29	227	24	101	4	293	2																	680
90	20	40												4		2		3							69
91			83	13	111	16	146	94	57	57	118	63	46	25	35	6	14	7	2	2			1		896
93		2																							2
95			19	1	18		12	13	4	1	7	8	8	7	13	1	1	7		17	1				138
96							4	5		1	1														11
99		16	28	27	5	1	4		7	1	1	10		3	12	7	11	16	10	8	19	1	2	5	194
																							TOTAL		9,289

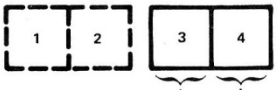


CLASSIFICATION BY MATERIAL OR DIAMETER

NO.	CONTENTS
1	STEEL PIPE $\phi < 1''$
2	STEEL PIPE (AUTOMATIC LINE) $1'' \leqslant \phi \leqslant 10''$
3	STEEL PIPE (AUTOMATIC CUTTING) $1'' \leqslant \phi \leqslant 10''$
4	STEEL PIPE (MANUAL LINE) $1'' \leqslant \phi \leqslant 10''$
5	STEEL PIPE $\phi > 10''$
6	NON–FERROUS PIPE
7	
8	
9	
0	MODEL PIPE

CLASSIFICATION BY GEOMETRICAL SHAPE OR FABRICATION METHOD

NO.	CONTENTS
1	STRAIGHT PIPE
2	STRAIGHT PIPE (A) *1
3	PIPE BENT BY NC BENDER
4	PIPE BENT BY NC BENDER (A) *1
5	PIPE BENT BY COLD BENDER
6	PIPE BENT BY COLD BENDER (A) *1
7	PREFABRICATED PIPE
8	SECTOR PIPE
9	HOT BENDING PIPE
0	BRANCH PART



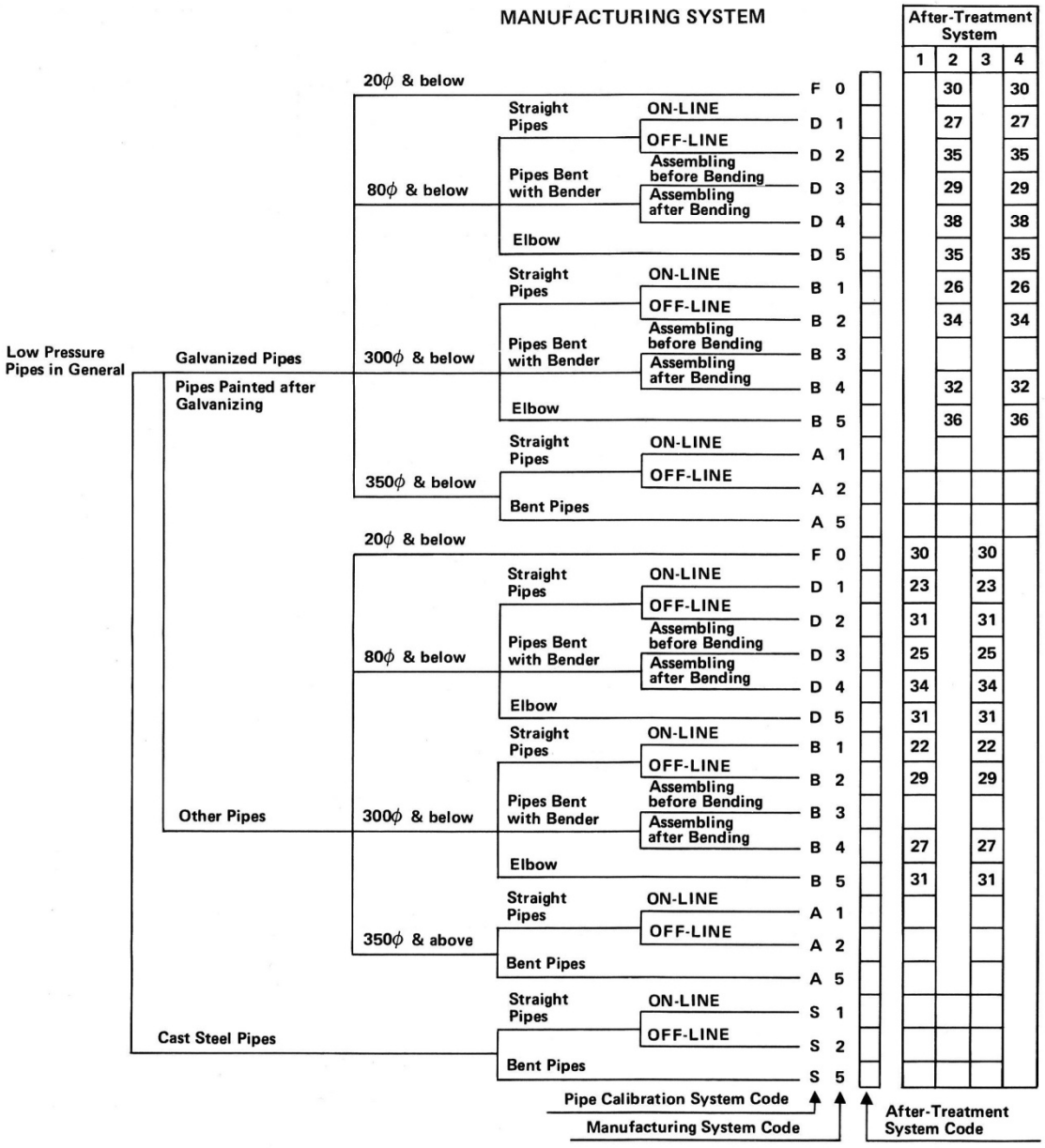
1ST STAGE TREATMENT

NO.	CONTENTS
1	HIGH PRESSURE PIPE WITH X–RAY TEST
2	HIGH PRESSURE PIPE WITHOUT X–RAY TEST
3	PICKLING
4	SAND BLASTING
5	GALVANIZING
6	BORING
7	
8	
9	
0	NO TREATMENT

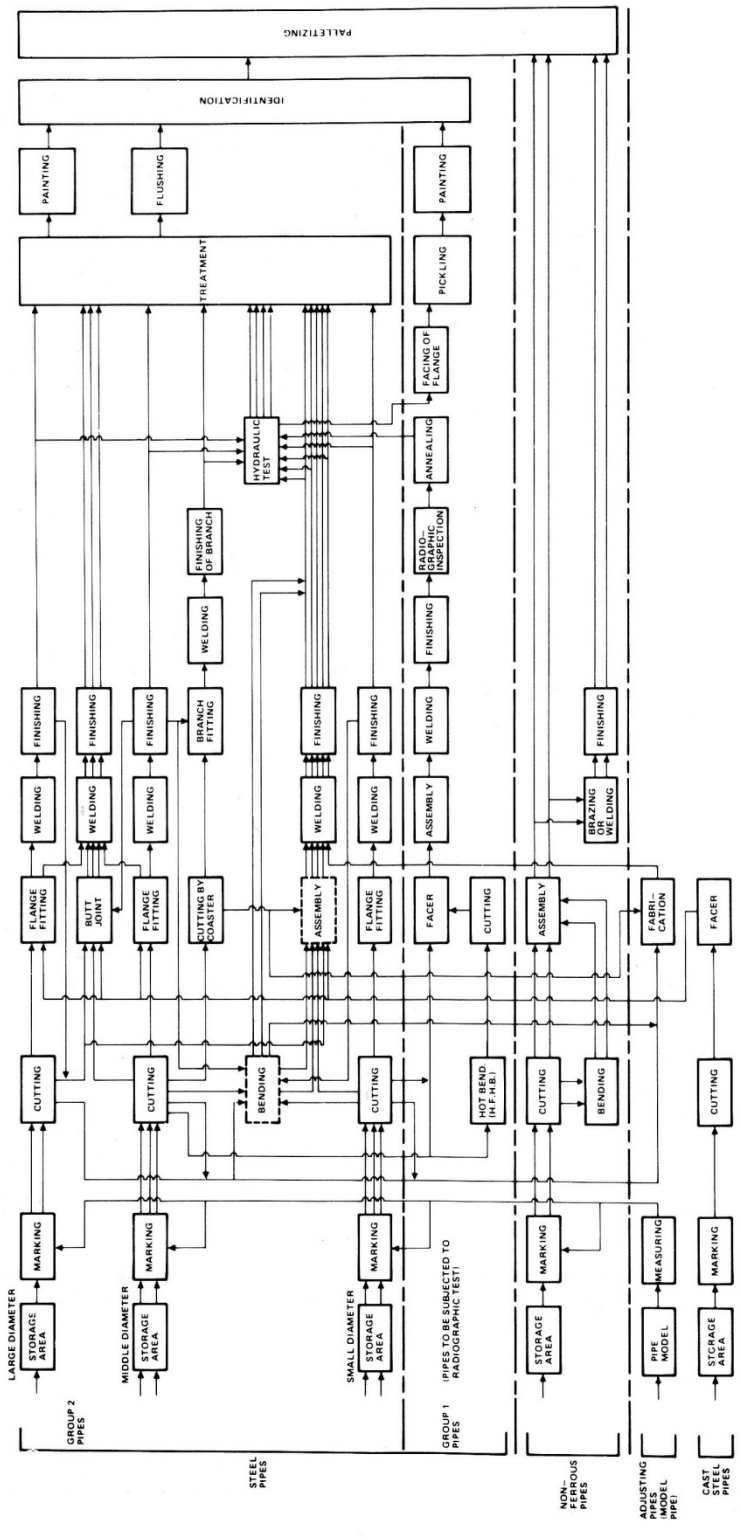
2ND STAGE TREATMENT

NO.	CONTENTS
1	PAINT (AL.)
2	PAINT (E.)
3	PICKLING → PAINT AL.
4	SAND BLAST → PAINT AL.
5	BORING → PAINT AL.
6	BORING → PAINT E.
7	BORING
8	PRESSURE TEST → PAINT E.
9	
0	NO TREATMENT

Example of codes for Pipe Piece Family Manufacturing (PPFM).



Typical decision logic table for use by designers to determine pipe-piece families. The table can be applied in computer aided design systems to automatically generate pipe-piece family identifiers. This table was developed for a pipe-fabrication shop in a European shipyard which features an automated production line in addition to manual work stations, hence the terms "on-line", "off-line".



Pipe fabrication flow in a manual pipe-shop which employs PPFM.

APPENDIX C

Middle Term Load Scheme

Line No.:															Date	Page
Week	Ship No.	MLF No.	P.P. Family	P.P. Q'ty	Cutting date	Cutting time	Bending date	Bending time	Fitting date	Fitting time	Welding date	Welding time	Grinding date	Grinding time	Total time	

Weekly Load Input Schedule

Week	3rd/Feb.									4th/Feb.				1st/Mar.				2nd/Mar.			
Dept.	Machinery					Deck				Mach.		Deck		Mach.		Deck		Mach.		Deck	
P.P.		E.D.P.S.		ADD.			E.D.P.S.		ADD.	E.D.P.S.		ADD.		E.D.P.S.		ADD.		E.D.P.S.		ADD.	
Family	Shops	Q'ty	Hr	Q'ty	Hr	Shops	Q'ty	Hr	Q'ty	Hr	Q'ty	Hr	Q'ty	hr	Q'ty	Hr	Q'ty	Hr	Q'ty	Hr	Q'ty	Hr	Q'ty	Hr

Weekly Load Input Schedule

Week / Output Class / Quantity / Shops	3rd/Feb.													
	M.ADD		M.MANU		D.ADD		D.MANU		M.EDPS		M.EDPS		Total	
	Q'ty	Hr	Q'ty	Hr	Q'ty	Hr	Q'ty	Hr	Q'ty	Hr	Q'ty	Hr	Q'ty	Hr

APPENDIX D

Subcontracting Expense Calculation

Subcontractor: Ship No. Date:

Pallet No.	Family	Quantity	Weight	Completion Date	Pallet Required Date	Man-minutes all work less welding	Man-minutes welding	Manufacturing Price	Auxiliary Material Price	Man-minutes broken down by marking, cutting, assembling, bending and finishing

TOTAL

Plus Transportation Costs

Branch Pipe List

Line No.	Starting Date	Main pipe dia.	Branch pipe dia.	Material quality	Class of ship	Fit. degree of branch	Cutting Length	Pipe end fittings (flange, etc.)	Swing of flange bolt position	Length of branch	Welding edge preparation	Coating	Ship No.	MLF No.	P.P. No.	Ordering No.

MLF Organized to Facilitate Palletizing

Ship No.: MLF No. Pallet Required Date:

Line No.	Ordering No.	Fitting, Welding Condition, Shape	Diameter, Quality	Length	P.P. No.	Assembly Date	Completion Date	Weight	Paint	Pallet Date	Family	Inner Surface Area	System

Pipe-piece Surface Treatment Scheme

Treat. Code	Ship No.	Finish. Week	Inside Area	Outside Area	P.P. Q'ty	P.P. Weight

Pipe Piece Coating Scheme

Ship No.:	Week:

Coating Code	Inside Area	Outside Area	P.P. Q'ty	P.P. Weight

Group I Pipe-piece List

Ordering No.	Ship No.	MLF No.	P.P. No.	Pipe dia.	Testing pressure	Coating	Weight	P.P. family	Comments	Class of ship	Sign for loose flange	Inside area of P.P.

Material Issue Order

Store

Delivery Date