

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

April 1, 1996
NSRP 0506
N6-94-1

THE NATIONAL SHIPBUILDING RESEARCH PROGRAM

World Class U.S. Shipbuilding Standards

Task 2: The Management Plan

Part 1: Trip Report to Odense Steel Shipyard, Lindo, Denmark

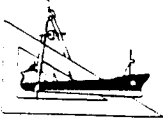
U.S. DEPARTMENT OF THE NAVY
CARDEROCK DIVISION,
NAVAL SURFACE WARFARE CENTER

in cooperation with
National Steel and Shipbuilding Company
San Diego, California

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April 17, 1996

A. W. van DIJK
Odense Steel Shipyard Ltd.
PO Box 176
DK-5100
Odense C. Denmark

Dear Mr. van DIJK:

Enclosed is our final Trip Report report, (incorporating your comments), of our visit with your shipyard. These report replaces your copy of the Draft Trip Report. The discussions and information provided on your World Class Shipbuilding Standards development and management program was constructive and informative.

You will observe that the Attachment (1) section, titled "Index of Odense Steel Shipyard Standards", has been deleted and Attachment (2) has been renumbered to (1), accordingly.

Again, on behalf of all team members, I wish to thank you and all of the people at OSS for your quality time and thorough coverage of the standards and CAD/CAM questions that we asked. Your hospitality was appreciated very much.

All of the team members look forward to seeing you, should opportunity present itself, at future functions involving the World Shipbuilding Community.

Sincerely,

Devens D. Arnett
Director of Engineering

TRIP REPORT

NSRP STANDARDS TEAM VISIT

TO

ODENSE STEEL SHIPYARD Ltd.

LINDO, DENMARK

SEPTEMBER 25-27, 1995

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TRIP REPORT

**Subj Trip Report, NSRP Standards Team Visit to Odense Steel Shipyard
 Ltd, Lindo, Denmark - 9/25-27/95**

**Encl (1) Odense Steel Shipyard Ltd. - Trip Notes
 (2) Aerial Photo of Odense Steel Shipyard Ltd.
 (3) Handout Information on HICADEC/PROMOS and LAN
 (4) NSRP SP6 Project 6-94-1, World Class Shipbuilding Standards,
 Questions and Responses from Odense Steel Shipbuilding Ltd, Lindo,
 Denmark - Dtd 11/10/95**

**Traveled to Odense, Denmark on 22-23 Sept, 1995, to meet other United States
Shipbuilders' representatives for a 3 day visit with Odense Steel Shipyard Ltd (OSS)
personnel to learn about their development and application of standards to the commercial
shipbuilding process**

Team Members:

Phil Lloyd,	NASSCO
Walt Devine,	NASSCO
Raphael Cronin,	NNS
Bobby Joe Griffin,	Avondale Shipyard
Laddie Matherne,	McDermott Shipbuilders
Devens Arnett,	CDI Marine

**The Team has endeavored to present the highlights of what we learned at OSS. Enclosures
(1) through (4) provide further details.**

About the Odense Steel Shipyard Ltd (OSS) and the AP Moller Group

**OSS, located on the island of Funen, was started in 1917 by AP Moller. The original
shipyard was located on a canal in Odense and in 1960, was moved to a newly built, larger
vessel capacity yard in Lindo. The shipyard has remained a private company since
founded 78 years ago, with leadership being assumed by AP Moller's son, Maersk Mc-
Kinney Moller, on the death of his father in 1965. In 1993, Maersk Mc-Kinney Moller
withdrew from the day to day management but remained as Chairman of the Board of the
Shipowning Companies. An aerial view of the OSS Lindo Yard is provided as enclosure (2).**

The shipyard is a company within the AP Moller Group, a world wide organization, which owns many companies and employs 30,000 people, in 200 offices, in over 60 countries. The AP Moller Group's Headquarters is in Copenhagen. The shipyard employs 2800 people - 2400 blue collar, 200 foremen and planners, 150 engineers and designers, 50 administrative. The shipyard acquired the Loksa Shipyard Ltd in Estonia in 1994, as a subsidiary, which presently employs 500 people in the production of hatch covers.

The AP Moller Group's Maersk Shipping Lines owns 150 vessels totaling over 7 million total dead weight tonnage; part of this fleet is 40 tankers totaling over 4 million DWT. Other subsidiaries within the AP Moller group include: oil and gas exploration and production, aviation (Maersk Air), supermarkets, container production facilities, electronic data processing, container ships, drill rigs and so on.

Discussion

OSS's Senior management had significant involvement in our 3 day, fully packed agenda. The principal participants were:

Peter Tang-Jensen	Executive VP Engineering
Torben Anderson	Executive VP Development
AW vanDijk	Standards Group Manager
Frank Gad	Executive VP Commerce and Finance
Erik Kristoffersen	Naval Architect Manager Structural Engineering
Erik Hansen	Manager Machinery Engineering
Arne Henriksen	Coordinator HICADEC Hull Group
Ejgil Norgaard	Naval Architect Systems Manager HICADEC
Ib Kromann	Project Manager - Production
Jens Flarup	General Manager Machinery Design
Hans Jorgen Christensen	Hardware development, Asst to the President
Bjorn Trasbo	Manager Steel/Outfitting

Their Standards Group consists of 2 full time people, manager AW vanDijk and his assistant, serving as administrators of the program. He is directly funded by the Danish Shipbuilding Association, to administer the Association's standards - DVS¹. The Engineering disciplines provide all the required personnel for the technical development, maintenance, Classification Societies' approvals and CAD data base maintenance of the technical configuration of standards. The Standards Group provides the finished product in the correct format for OSS, distributes the standards to the 40-50 standards holders within the shipyard and maintains the central records file of same.

The standards history in Denmark and OSS started 30 years ago with the realization that shipowners wanted to see a standard for ships they were to purchase. They started with a Swedish Standard and began working on a Danish Shipbuilders Standard - the DVS.

1 - Danske Vaerfters Standardiseringsudvalg (DVS)
Shipbuilders Association Standards - Denmark

This was done by the formation of the Danish Shipbuilders Association and the subsequent establishment of 6 technical committees to develop standards. The members were assigned disciplines as follows: outfitting (no engine room or deck house), outfitting (deck house), steel work, electrical, engine room piping, and revisions. The Danish Shipbuilders Association is sponsored by all of Denmark's shipyards - 10 total - each paying a fee proportional to their size. The four major members of the Association are: OSS, Burmeister & Wain, Danyard and Man B&W.

The teams' effort focused on a series of developed questions on standards, which had been provided to OSS prior to our arrival. OSS did an extremely good job of answering these questions. The results are tabulated in matrix form in enclosure (4). We were provided with samples of OSS standards and many other informative handouts.

A significant amount of time was devoted to OSS demonstrating their very sophisticated HICADEC integrated CAD System. Hans Jorgen Christensen - responsible for development and maintenance of computer systems for OSS - presented the overview. The system featured a LAN with 700 pieces of equipment connected - 300 screens, printers and plotters, 150 engineering CAD stations and 250 PC's. The technical support for this area is provided by 12 full time OSS technicians and a manager. They are further supported by 25 people at AP Moller Group subsidiary Maersk Data - the electronic data processing enterprise I mentioned earlier. This network already provides for a paperless pipe fabrication shop and OSS is working towards creating a paperless work place, including shipboard! Enclosure (3) provides a pictorial overview of the OSS HICADEC/PROMOS CAD/CAM systems - (translation not provided for all documents).

The HICADEC System is used to develop the model lines and plate profile data in full. It is then linked to PROMOS System to provide background structure for outfit drawing development. The HICADEC System is used to develop and issue all structural and outfit drawings - including all material selection and quantities.

The HICADEC System controls all cutting and robot welding machines with the requirements being input by design and electronically linked to production. [Steel cutting data uses about 10 GB memory; standards uses about 100 MB. Nesting and other functions are supplemented by a supervisor input at the time of actual work to maximize material. Waste bins observed had minimal size scrap pieces.

Of significant difference to our conventional approach to design was OSS's assignment of the HICADEC design personnel to the production division. Following design completion, they work in the trades as a worker or supervisor in the fabrication and/or installation of their design product. Any problems encountered, resulting from a design development or deficiency, would be corrected in HICADEC by those same people, as applicable to their

assigned discipline. They would then return to production as their normal work assignment. OSS recruits their HICADEC designers from production and trains them in the specific areas necessary for them to accomplish the design work. This single issue is paramount to having the product meet the needs of the customer and at the same time, ensure that it was developed from a manufacturing point of view.

Also of note, was OSS's selection of schedule 40 steel pipe for all systems. Steel pipes requiring protection from the corrosive effects of a product, salt water and etc, are coated with a high quality epoxy paint product. This coating system is expected to be good, in many applications, for the life of the vessel.

Production steel work starts 10 months after contract award and outfit shortly thereafter. OSS is working towards a new goal of 7 months.

Enclosure (4) provides a basic matrix listing questions and responses from the OSS personnel. Additional responses from our Japanese shipyard visits will be added to provide an easy to use comparison format and to assure continuity of questions.

Summary

Although standards played the major role in their prepared material, the OSS's sophisticated approach to shipbuilding was emphasized - from the highly developed integrated HICADEC System design phases to the modern and efficient application of machinery and robots to carry out electronically controlled instructions from HICADEC. Their utilization of skilled personnel - production to design and vice versa - plus their simplification of the material selection, are just representative of the forward thinking philosophy applied at the OSS. We need to pay close attention to these concepts if we are to become competitive in the commercial shipbuilding arena.

OSS intelligently applies standards to satisfy customer quality and design adequacy requirements and also to ensure increased work productivity and proficiencies, necessary for them to remain a World Class Shipyard. They are continually striving to maintain their shipyard as a World Class Shipyard through the application of state of the art design and manufacturing technologies. They believe that building quality into their products to make them last longer and perform better, without excess maintenance, is the best selling feature they can have. The management and workers of OSS are in the business for the long term and it shows.

ODENSE STEEL SHIPYARD Ltd. - TRIP NOTES

(* indicates information duplicated in formal Trip Report, file: odense2.doc)

- Attachments**
- (A) Market Information Handout**
 - (B) Hull CAD/CAM Design Information Handout**
 - (C) Piping and Outfit CAD/CAM Design Information**
 - (D) DVS Standards Organization Handout**

WEDNESDAY 25 OCTOBER, 1995

Peter Tang-Jensen, Executive Vice President of Engineering

- **Welcome to Denmark and the Odense Steel Shipyard Ltd (OSS) at Lindo.**
- **Tom Anderson - responsible for development of shipyard and robotics (plus any other areas of development). Highest concentration of welding robots in the world. 1 operator for 3-7 robots. High quality. [Software system provides for feedback on how robots performed task - i.e., what quality prep did they encounter. Will not perform out of spec work!] robots are Japanese made - by Hitachi.**
- **Ship costs are 65% material.**
- * • **Shipyard is not ISO 9000 certified and does not intend to become so; however, they do apply the principals of ISO 9000.**
- **Robots use "smart" software and have the ability to recognize the joint configuration and select the correct program to use for welding. Eliminates need for many manhours of engineering robot programming.**
- **Willing to sell DVS to USA.**
- **ISO 799 being revised at OSS - USCG provided comments.**

Frank Gad, Executive Vice President of Commerce and Finance

- **Refer to Attachment (A), Market Information Handout.**
- * • **In present location since late 1950's [old shipyard limited to 40K DWT - new yard 650K DWT]. 1000 ton bridge crane, 150 m wide, 90 m high. Shipyard occupies a portion of 100 acres available. 2800 employees [2400 blue collar workers, 200 foreman/planners, 150 engineers/designers, 50 misc.].**
- **Sales history: 1989 - 1.85 BDKKroner, 1994 - 3.4 BDKKroner. Market share: Japan 42%, Europe 24%, Korea 16%.**
- **14 Association of Western European Shipbuilders (AWES) market share: Germany 34%, Denmark 10%, Italy 15%, Netherlands 11%, Spain 8%, Norway 7%, Finland 5%, UK 4%, France 3%, Belgium 2% and Portugal .4%**
- **Most shipyards are subsidized - Denmark shipyards are not. Need Organization for Economic Cooperation and Development (OECD) agreement.**
- **Denmark has 7 large shipyards. OSS has 50% of Denmark's shipyard work and 2.8% of the world market.**
- **World output in MGT: 1975 - 21, 1985 - 15, 1988 - 9, 1994 - 13. [Korea has 32% of market this year.]**

- New yards being built in Germany and Korea - public yards! Korea increasing capacity by 10-20%. OSS encourages OECD agreement.
- OSS is in world's top 3 suppliers of containerships. Other major builders are IHI, Samsung, Hyundai and Hanjin.
- Have produced six 300K DWT double hulled tankers having "clean tank" design for easy stripping/cleaning and reduction of lost cargo (non "pumpable"). Major structure restricted to wing and centerline tanks.
- Currently building first of twelve 85K DWT containerships (for Maersk Shipping).
- OSS has invested \$150M in their yard (made from operations) since 1990's.
- AP Moller Group container factory producing one 40' container box in 15.5 minutes. Just starting reefer box fabrication at one in 2 hours - expect to reduce this time.
- * • Recently purchased Estonia Shipyard is producing hatch covers. Increased employment from 100 to 500 people. (New requirement for Estonia Yard was to commit to a production schedule.)
- AP Moller Group has many companies - most created in 1990's. All profitable.
- Cost structure of a crude carrier. Material 63%, wages 17%, energy/maintenance/depreciation/data processing/etc. 20% (R&D 3%).
- OSS spends ~1% on sales vs. 10% in Japan.
- OSS works towards assembly factory and minimizes sub-contracting whereas, Japanese maximize sub-contractors.
- Material buy for containerships: 37% Denmark, 30% Other European Unions Countries, 27% Japan, 5% Norway and Eastern Europe (each).
- Mitsubishi and Hyundai looking at the cruise ship market. This market is presently predominated by the European shipyards. Market demand in this area expected to continue.
- Denmark produces ~200K bbls of crude per day. This meets Denmark's needs and permits 30% export.
- Cost in hours per CGT for Europe varies from 20-80 with wages across the board ~ equal.
- Automation programming done in design and input to CAD/CAM. Individual program for specific tasks called out by spec and down loaded to robotics/automated functions.
- Frequently use mockups with customer. Found to eliminate lots of debate as to what the requirements were.
- Selected automation is established to do relatively few - but repeatable - functions at each station for efficiency through familiarity vs. many varied functions at every station. Benefits are increased skill levels of workers and minimum set up time as equipment is already present.
- OSS Standards, 9 volumes, 580 standards. Supplemented as necessary by Others' standards. OSS standards are considered production ready details whereas National Shipbuilding Standards are more performance based.
- Visited Steel Fabrication area. Observed plate operations such as: automated painting, electronically controlled plasma cutting, movement, robot welding of

shapes and robot welding of units - all in process with only one or two workers visible at majority of stations.

THURSDAY 26 OCTOBER 1995

- Requested a listing of OSS Standards and representative samples of common use items such as pipe hangers, cableways, ladders and etc.. Copies provided. (Refer to Attachment 2 to Question and Response Matrix - Enclosure (4) to trip report memo, file:odense2.doc, dtd 11/15/95).
- Given a demonstration of OSS CAD/CAM HICADEC/PROMOS Systems.
 - ⇒ All hull lines are entered into HICADEC (both sides of plates are defined; interpolation is not required).
 - ⇒ CAD standards are rules and geometry
 - ⇒ Changes to the model in HICADEC will regenerate model and produce new dimensions on drawings.
 - ⇒ All plate labeling and other markings are driven from HICADEC automatically - eliminating "people" markup errors. All names/numbering have intelligence and tie to a major product. (Refer to Attachment (B), Handout Information on HICADEC)
 - ⇒ Extraction from HICADEC Model for text or dimensioning, etc., provide basis for steel drawings (and background structure for outfit drawings).
 - ⇒ Drawings will not be required for all plates in the future. Data resides in HICADEC and will run the shop system processes directly.
 - ⇒ System for cutting/marking plates identifies changed pieces from original input.
 - ⇒ ~ 20 profile sketches sent to production- those requiring cutting of holes after shaping. All remaining information transmitted electronically to Production Management System.
 - ⇒ HICADEC rules automatically define which path the product flow will use - rule application is checked for completeness.
 - ⇒ In planning stage, manhours for fitting and welding are calculated for each piece. This process permits adjustments to total plan, based on manpower and time for processes.
 - ⇒ Structure (lines, etc.) is first input into HICADEC and is subsequently the basis for input into PROMOS Model - the outfit part of the CAD/CAM system - to provide for the structure background integration into the outfit drawings. Refer to Attachment (C) for PROMOS Piping and Outfit CAD/CAM Information Handout. Changes to the HICADEC Model (structure) are sent once daily to the PROMOS Model and will show up in red in the model.
 - ⇒ Hitachi group is a partner to OSS in the development and use of HICADEC CAM and PROMOS CAM for use in the production robot lines.

- 85K DWT containership has ~ 6500 pipe spools with all but 250 shop welded. The 250 that are field welded may only be tacked shipboard and completed in the shop in cases where the spool has to be removed for coating processes.
- * • The CAD/CAM designer, once the design is complete and released for manufacturing, is routinely reassigned to production as a mechanic or supervisor in his area of design expertise. Problems that surface in production requiring design correction will cause the cognizant production mechanic or supervisor (the one who did the original design) to go back to Design and correct the problem and then resume his production assignment.
- Engineers, at the completion of a design engineering job, are often assigned to an engineering position in another AP Moller Group subsidiary to retain the skill for future new construction ship design work.
- * • New construction ship CAD/CAM design utilizes mechanics and supervisors from production. They are given a refresher training program that focuses on what they need to know in HICADEC or PROMOS to accomplish the design. By utilizing this unique application of skilled people, OSS maximizes the “productivity content” of all design work.
- * • Material selection is kept at the most basic level. For example, all pipe is schedule 40 carbon steel! If the piping will be used for sea water or corrosive products, it is given a high quality epoxy coating. All bolting is steel. All flanges are fabricated at OSS and are of the same design for all systems.
- CAD system uses the diagram to identify type and quantity required for all valves - accomplishes in one operation for all diagrams together. Provides purchasing with early identification of material requirements.
- CAD pipe drawings contain minimal information - only that required for the fabricator (on the screen only in the shop) or installer.

FRIDAY 27 OCTOBER, 1995

Ejgil Norgaard - HICADEC System Manager

- Standards for hull structure are set into database - [standard is a tool used to create correct shape in HICADEC, i.e., to create a hole, HICADEC looks for the standard for the type of hole specified and incorporates geometric requirements into dimensioned shape]. Resulting design has boundary, profile, shape, etc..
- HICADEC automatically recalculates shapes whenever changes are made to the model.

Arne Henriksen - HICADEC Coordinator

- Responsible to provide cutting data to production via HICADEC . Total HICADEC memory required for steelwork is ~ 10 GB. By comparison, all standards occupy ~ 100 MG.

Hans Jorgen Christensen - Hardware Development Manager, Asst to the President

- Responsible to the President for the development and maintenance of all CAD/CAM systems. OSS has 12 people committed to this effort and is further supported by 25 people working for Maersk Data - another AP Moller Group

subsidiary. It is very evident that OSS has and continues to pursue maximum benefits from the use of CAD/CAM state of the art.

- LAN - 700 pieces of attached equipment. 150 CAD/CAM work stations, 250 PC's, 300 screens and printers. (Refer to Enclosure (3) to Trip Report Memo, file: odense2.doc, dtd 11/15/95)
- Working towards a paperless workplace. Have achieved this goal in the pipe fabrication area. Intend to implement even shipboard!
- Engine room is extracted from the model to add required details. Accomplished by dividing into 4 sections to permit proper resolution on the screen. Finished product is saved back into the model daily.
- * • Production Steelwork generally starts 10 months following contract award with Outfitting shortly thereafter. New goal is 7 months.

AW van Dijk - OSS Standards Manager

- AW van Dijk actually works for the DVS, and is responsible for DVS Standards. (He is funded by DVS via OSS.)
- Standards do not exist in finished form in the CAD or any other electronic data base. At present, they have all sketches and some test in the CAD data base.
- All new and revised standards are sent to Mr. Moller for approval. (If no response by 6 weeks, they are issued.)
- need for standards must come from the people who use them.
- * • Need for DVS? 30 years ago, OSS believed they were the "best" qualified builders in the world. They recognized foreign owners need to see a Standard. They started with a Swedish standard and began to produce their own standard.
- * • DVS standards organization consists of 6 separate committees: (Refer to Attachment (D), Handout on DVS Standards Organization)
 - ⇒ Outfitting (not engine room or deckhouse)
 - ⇒ Outfitting (deckhouse)
 - ⇒ Steelwork
 - ⇒ Electrical
 - ⇒ Engine Room Piping
 - ⇒ Revisions
- Goal is no standard greater than 5 years old without a revision - even if just a review for currency.
- 1.6-1.7 M DKK budget - all from shipyards - permits autonomy from government. All 10 Danish shipyards pay in proportion to their product volume and size.

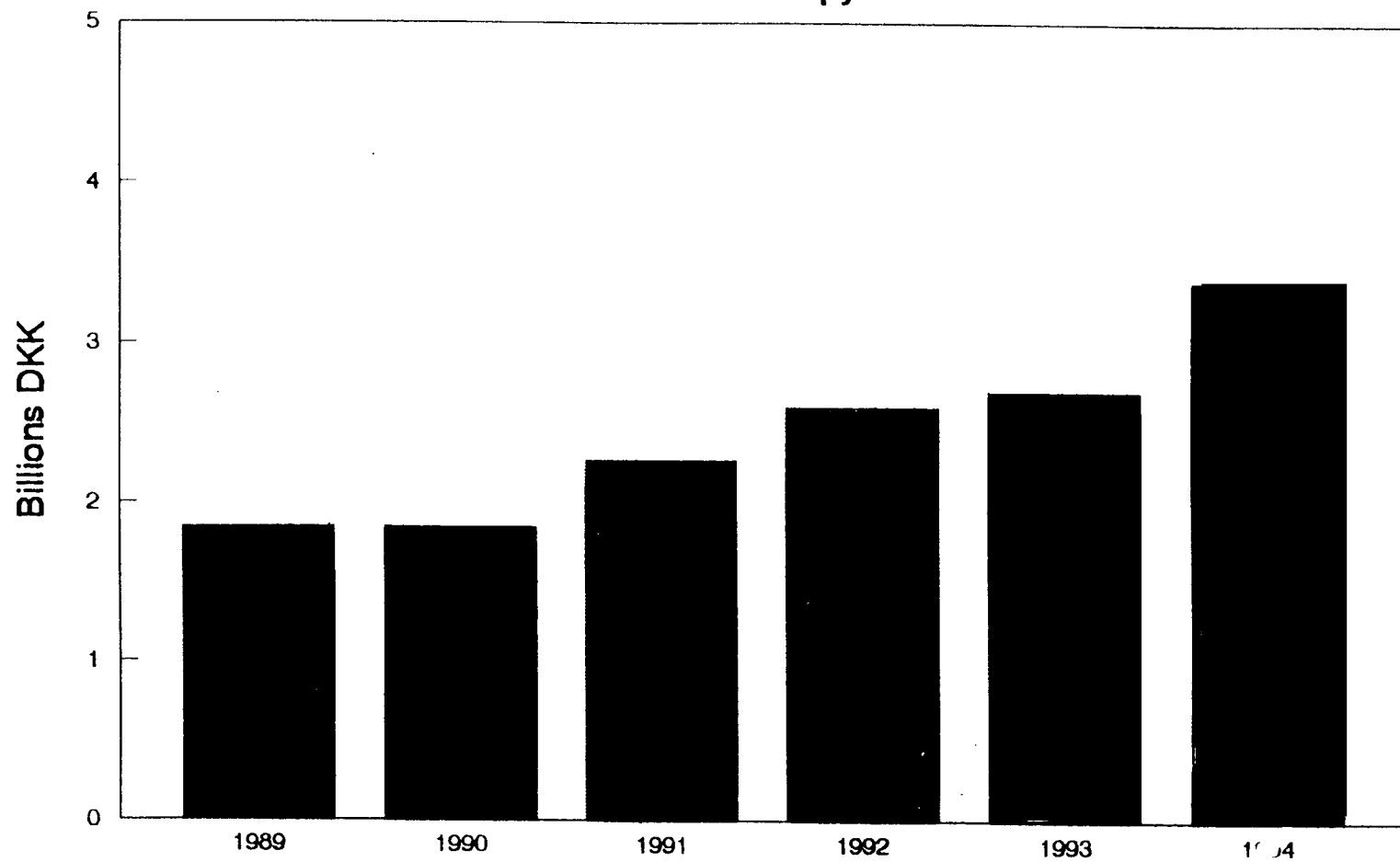
Attachment (A)

Odense Steel Shipyard Ltd.

Market Information Handout

Sales Development

Odense Steel Shipyard Ltd.

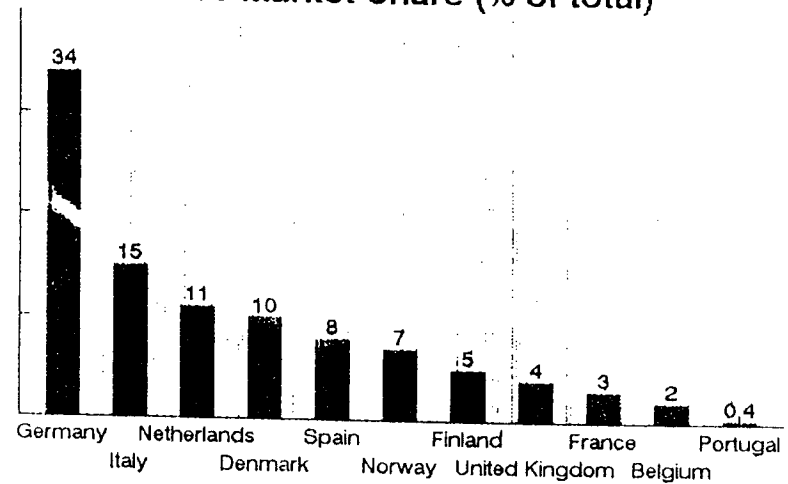


AWES shipbuilding Output in cgt - 1994



- 14 AWES members
- Other Western European nations
- Eastern European nations

Awes Market Share (% of total)

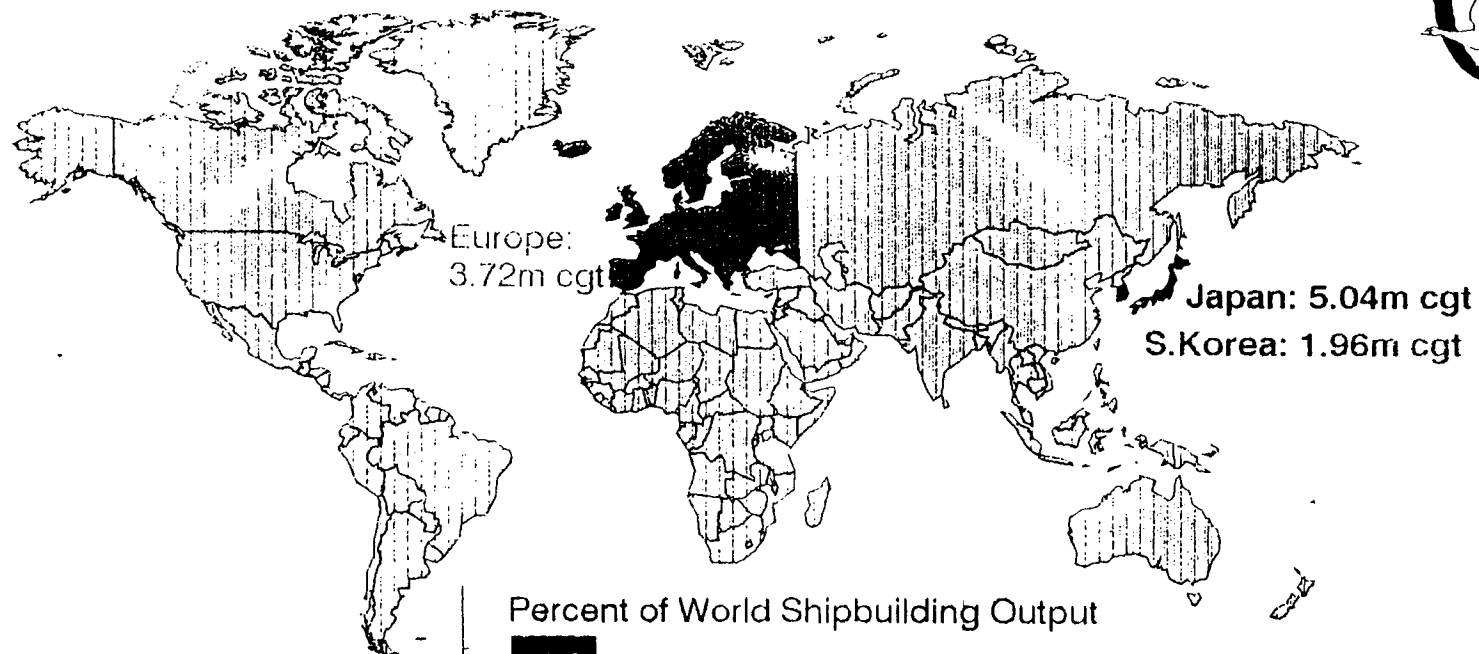


Germany	976,630 cgt
Italy	419,083 cgt
Denmark	303,595 cgt
Spain	230,934 cgt
Netherlands	315,869 cgt
Norway	197,099 cgt
Finland	144,961 cgt
UK	115,695 cgt
France	88,213 cgt
Portugal	16,482 cgt
Belgium	66,019 cgt

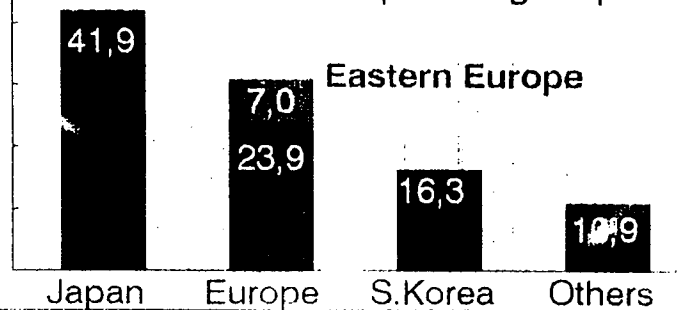
Source: AWES

Major shipbuilding areas

1994: Output in cgt - and market share



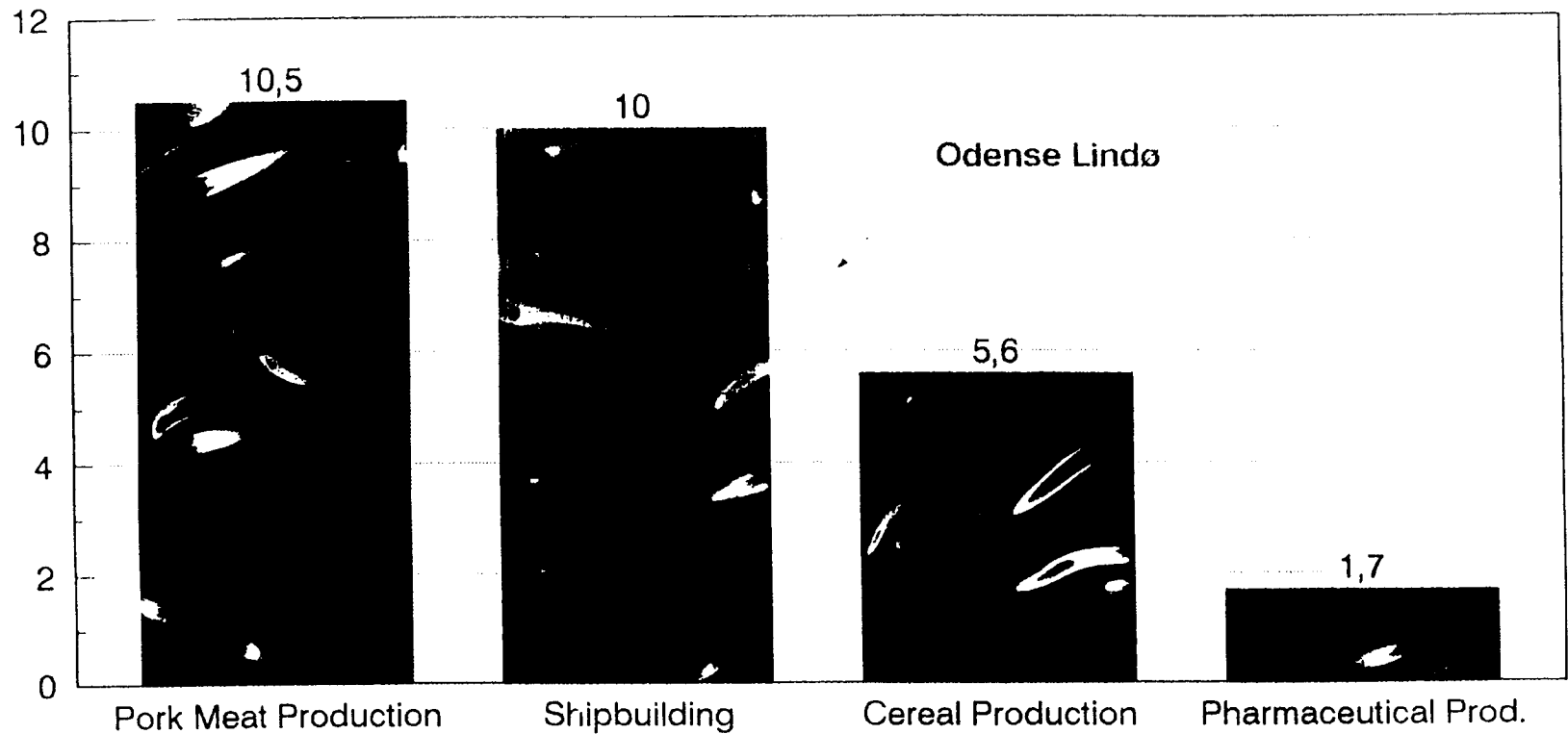
Percent of World Shipbuilding Output



Source: CESA 1995

Danish Market Share of W.European Production in Various Sectors

% of European Market

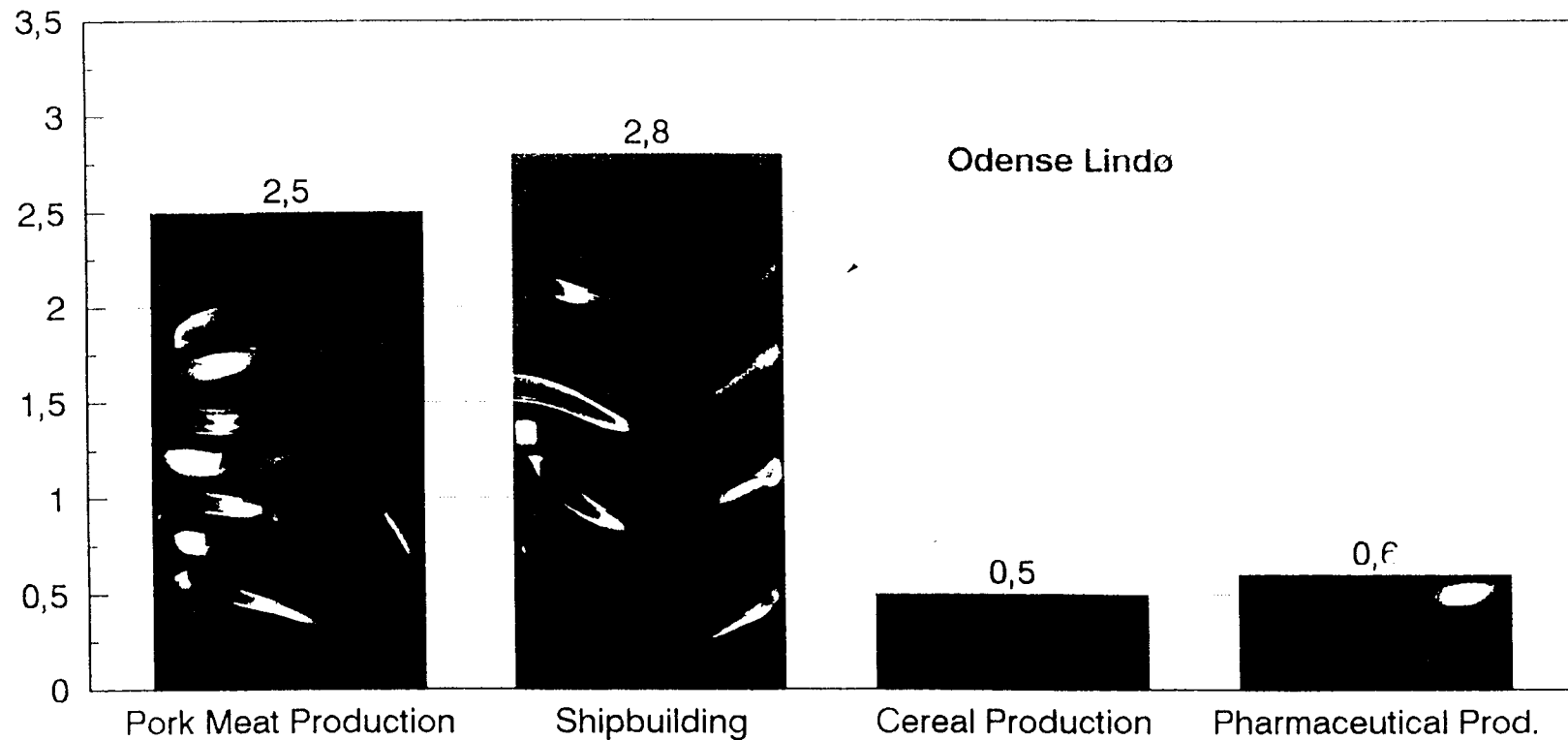


Source: USDA, EFPIA, CESA, Danske Slagterier

proj\95\capship\eutprod DB 95

Danish Market Share of World Production in Various Sectors

% of World Market



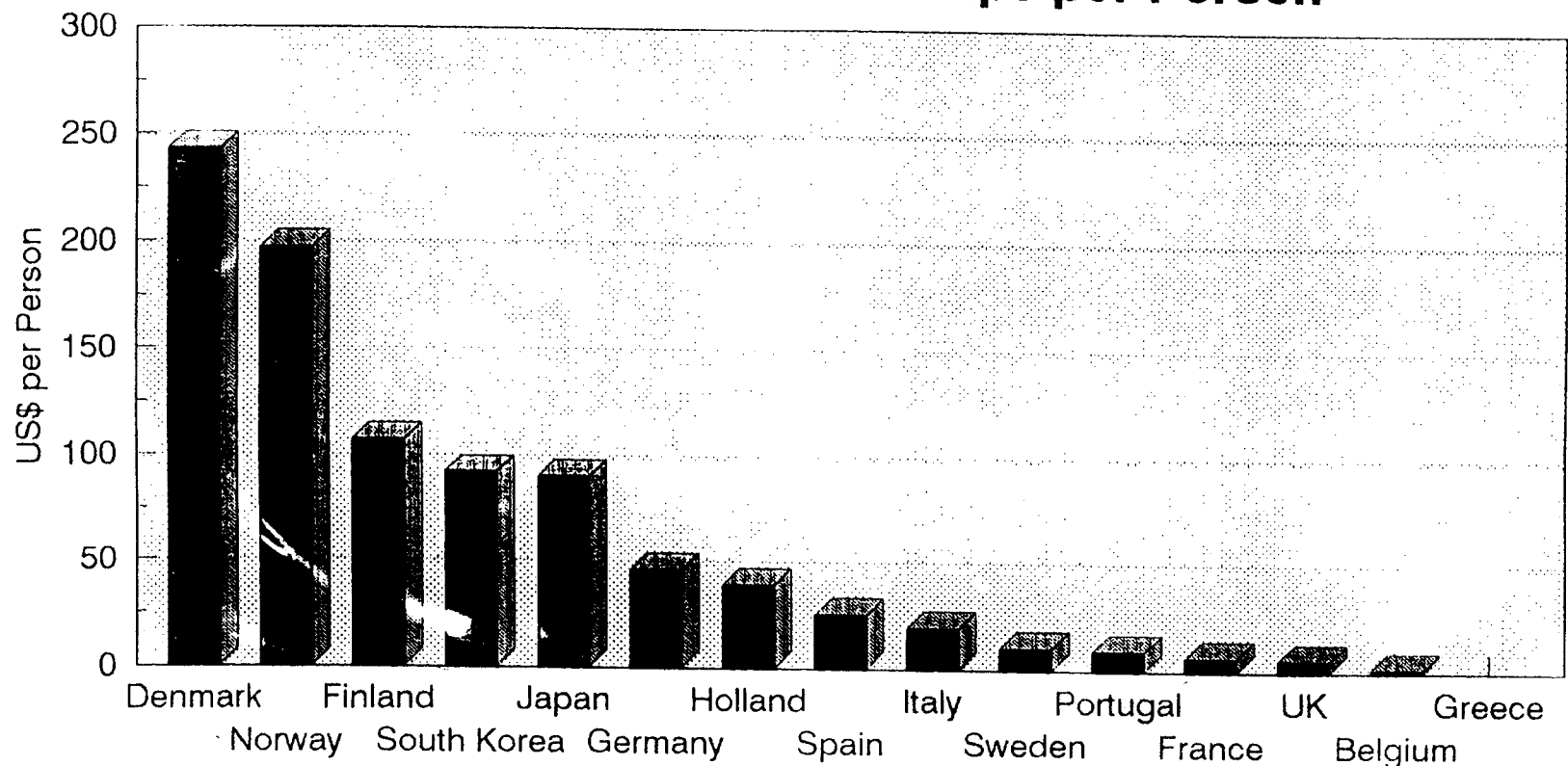
Source: USDA, EFPIA, CESA, Danske Slagterier

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The Shipbuilding Industry's Importance Relative to Population



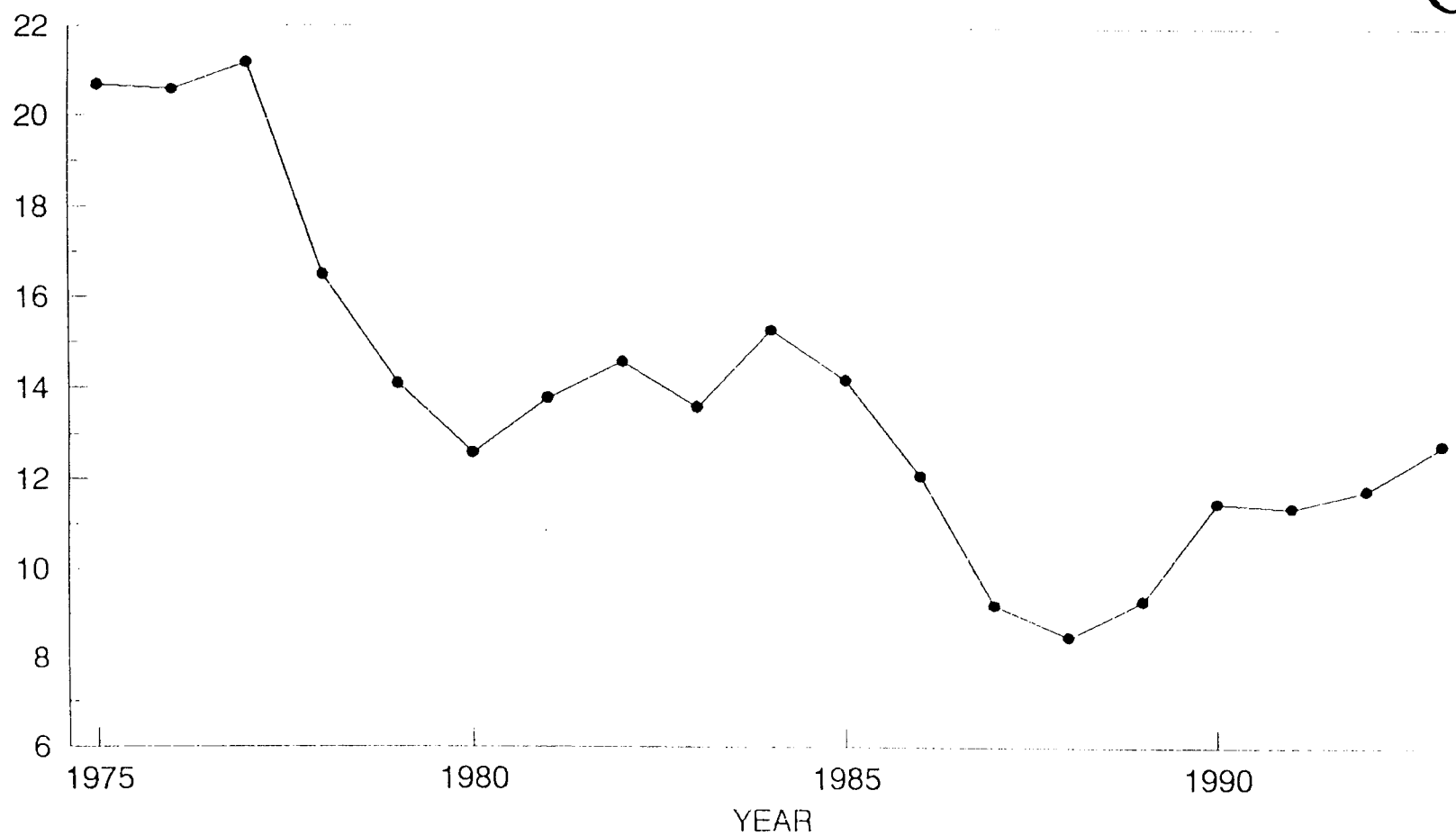
Production Value for New Ships per Person



World Merchant Shipbuilding Output



MILL. CGT



SOURCE : AWES

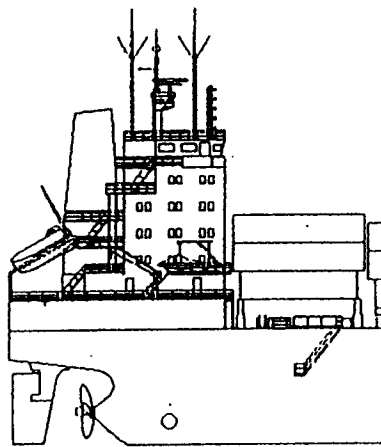
Attachment (B)

Odense Steel Shipyard Ltd.

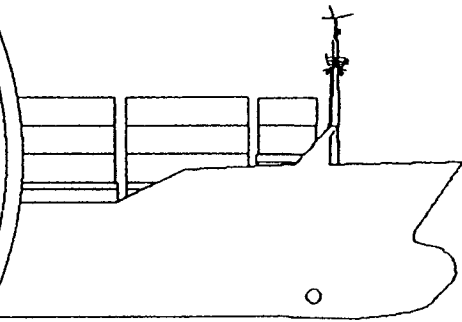
Hull Design Information Handout

**Attachment (B) to
file: ossnotes.doc**

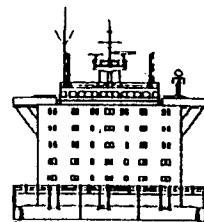
HULL DESIGN



- 1- ● ** START **
- 2- HULL FORM
- 3- PRODUCT MODEL
- 4- PARTS NAME
- 5- ASSEMBLY PLANNING
- 6- PARTS DATA
- 7- MATERIAL NESTING
- 8- OPERATION CODES
- 9- PLANNING /
COST CALCULATION
- 10- ROBOT WELDING

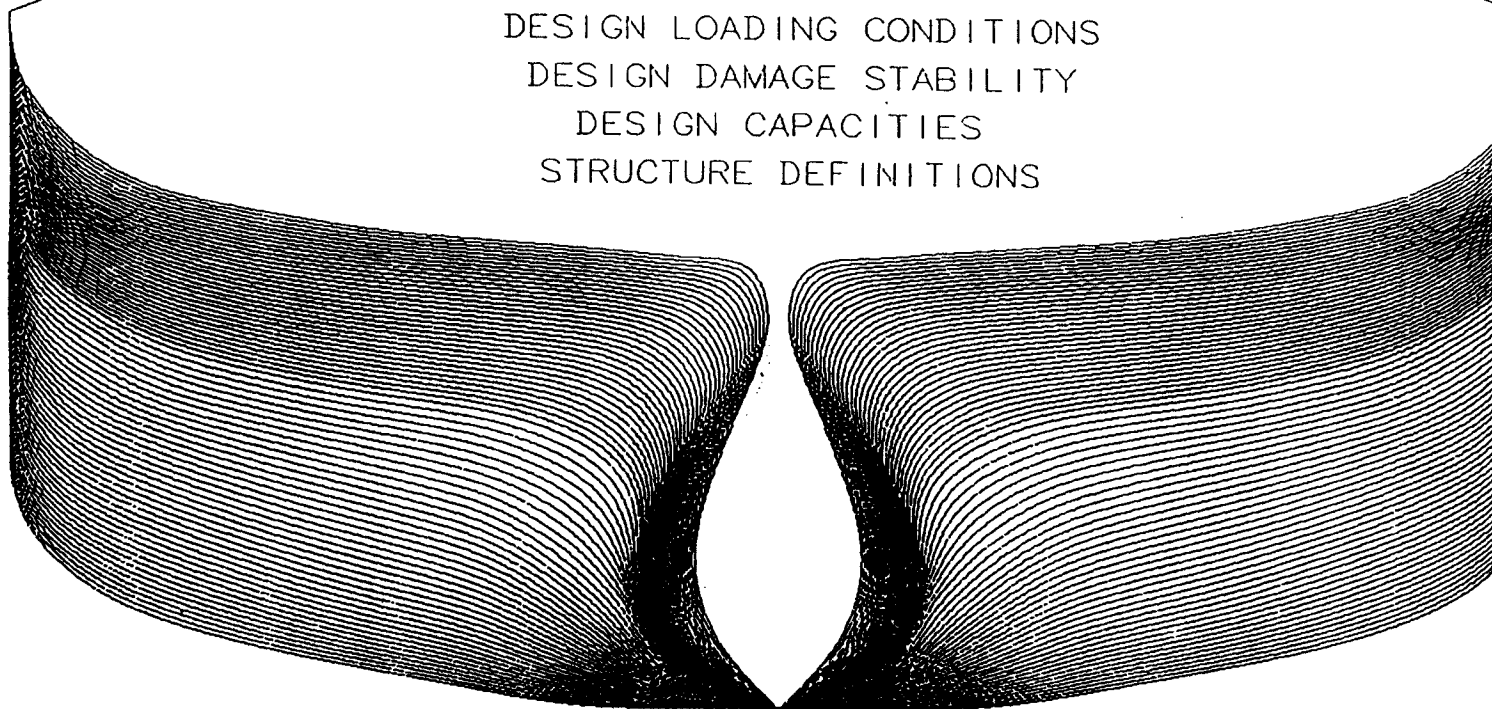


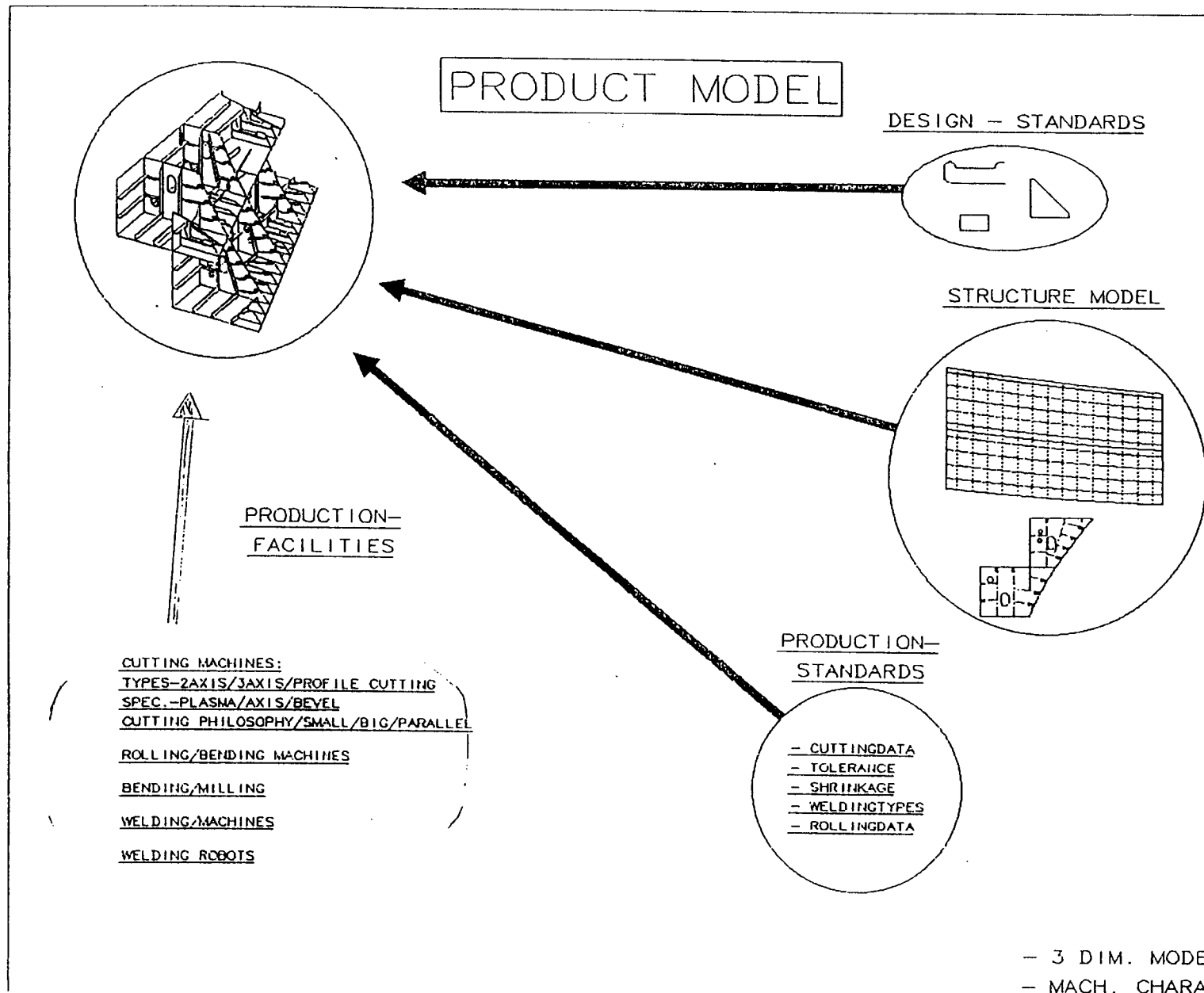
HULL



FORM

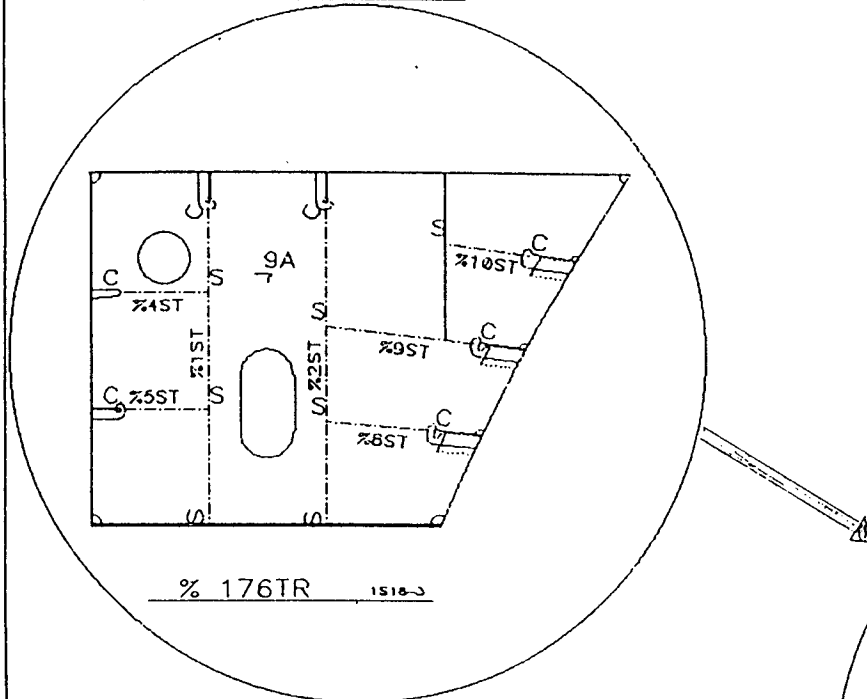
LINESPLAN / MODEL TESTING
DESIGN CALCULATIONS
DESIGN HYDROSTATIC DATA
DESIGN LOADING CONDITIONS
DESIGN DAMAGE STABILITY
DESIGN CAPACITIES
STRUCTURE DEFINITIONS



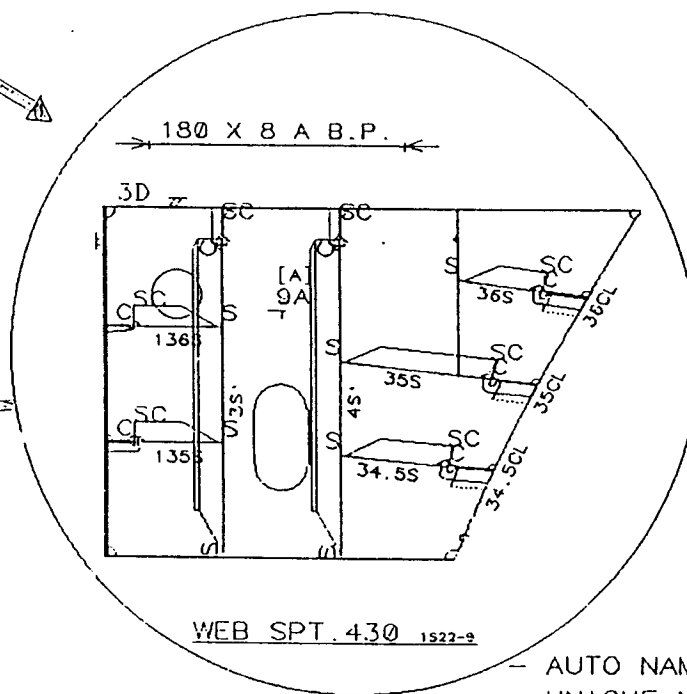


PARTS NAME

MODEL DRAWING



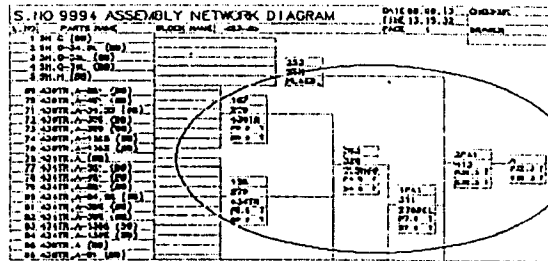
NAME DRAWING



L. NO	PARTS NAME
69	430TR.A-3S' (BB)
70	430TR.A-4S' (BB)
71	430TR.A-34.5S (BB)
72	430TR.A-35S (BB)
73	430TR.A-36S (BB)
74	430TR.A-135S (BB)
75	430TR.A-136S (BB)
76	430TR.A (BB)
77	430TR.A-3S' (BB)
78	430TR.A-4S' (BB)
79	430TR.A-5S' (BB)
80	430TR.A-34.5S (BB)
81	430TR.A-35S (BB)
82	430TR.A-36S (BB)

- AUTO NAM
- UNIQUE N

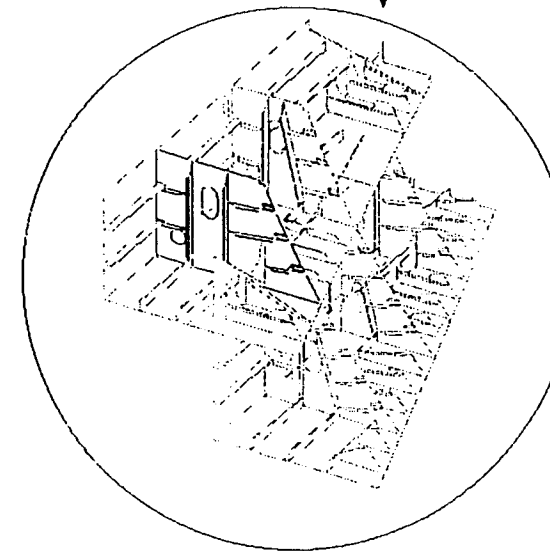
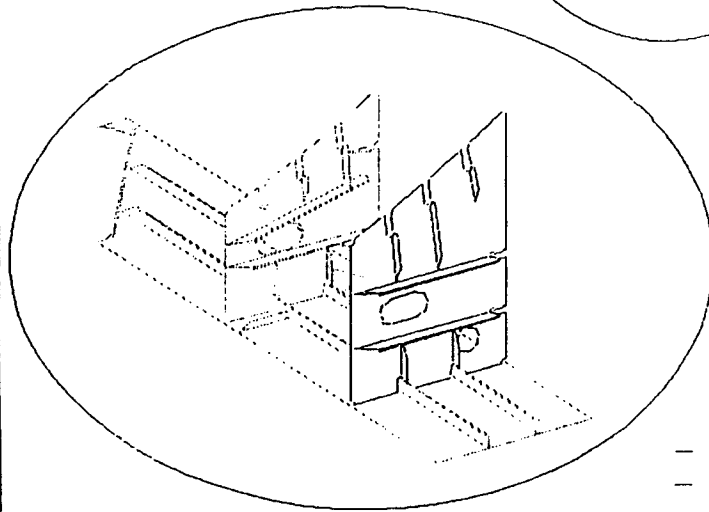
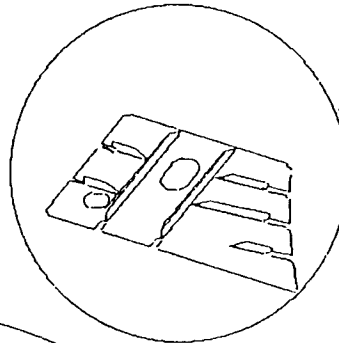
ASSEMBLY PLANNING



1S7
229
430TR
P0.6 T
S0.6 T

2PA1
413
P32.3 T
S32.3 T

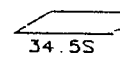
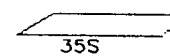
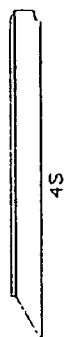
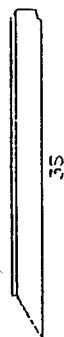
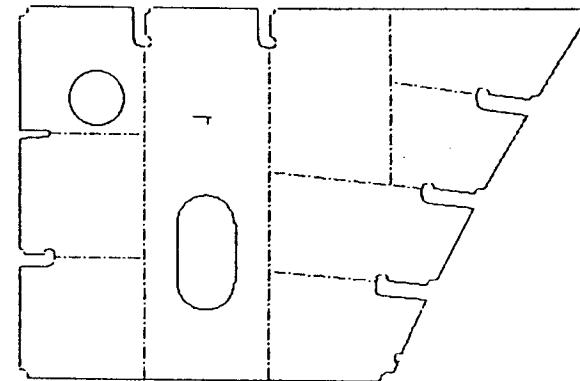
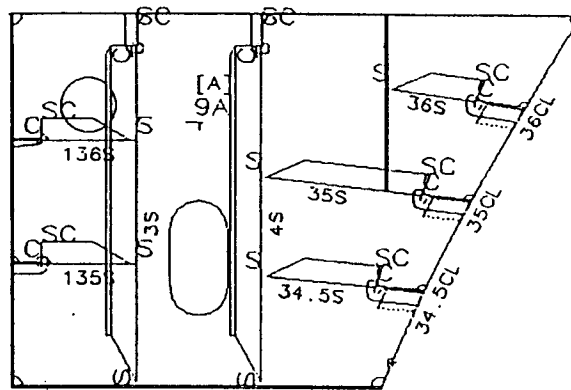
3S3
328
2LBH+W
P4.0 T
S4.0 T



- OPTIMISATION
- LINE PROCESS
- WELDING PROCESS

PARTS DATA

PRODUCT MODEL



— PRODUCT
STANDARD

MATERIAL NESTING

N.C. PLATE CUTTING

PR. METOD	AMT. PL.	Note
IDENTISK BR.		1. DOME FROM WIDER STRIKE UP/AD
SYMETRISK BR.		2. IN 1/2 VIDER BR. STRIKE FOR BAW. EDER
SYB. A	2 AXIS	IN 1/2 VIDER BR. STRIKE FOR STUNG EDER
PROGRAM	E=100000	

QTY	BLOCKET	PARTSNAVN	SIZE	UNIT	QTY	BLOCKET	PARTSNAVN	SIZE	UNIT
07	C27-B2	2D-A	S	U					
09	C27-B2	2D-A	P	I					

PROGRAM	SKID	TIMER	LOT	MAL.	DIMENSION	SP. TAL	SP. TAL	SP. TAL	SP. TAL	SP. TAL	SP. TAL
03006	TEST	278PP340	278P	A000	15.0X23.90X6.990	1	M-M	13.9M	33.9M	2X	09/14/89

M.T.O.

RESTALLINGSLISTE									
QUALITY	LEVERHOLD	VALDENHOLD	LEVERHOLD	VALDENHOLD	QUALITY	LEVERHOLD	VALDENHOLD	LEVERHOLD	VALDENHOLD
Q	OVERHOLD	Q	OVERHOLD	Q	OVERHOLD	Q	OVERHOLD	Q	OVERHOLD
A	TEST	LR			278P				
T	SP	VAL.	VAL.	VAL.	VAL.	VAL.	VAL.	VAL.	VAL.
0	0	0	0	0	0	0	0	0	0
0818	A000	10.0	3.630	12.170	2	5.390			
0828	A000	10.0	3.180	12.180	2	4.932			
0838	A000	10.0	2.630	0.380	3	1.390			
0828	A000	10.0	3.630	0.380	3	1.100			
0838	A000	10.0	3.320	11.370	3	2.100			
0818	A000	10.0	2.340	0.380	1	1.987			
TOTAL AMTAL: 11 18.016									

SKID	BLOCKET	SKITSEIR	INIT	QTY	NCPI
9994	27-8	PI-016			
PARTSNAVN		AMTAL			
120TR-34		1101			
MAX L. = 2361.3					
120 X 10 FB					
WAT. SIZE	SP. TIDE	WAT. SIZE	SP. TIDE	WAT. SIZE	SP. TIDE
A	0	A	0	A	0
STANDARD	STANDARD	STANDARD	STANDARD	STANDARD	STANDARD
154	154	154	154	154	154
154	154	154	154	154	154
154	154	154	154	154	154

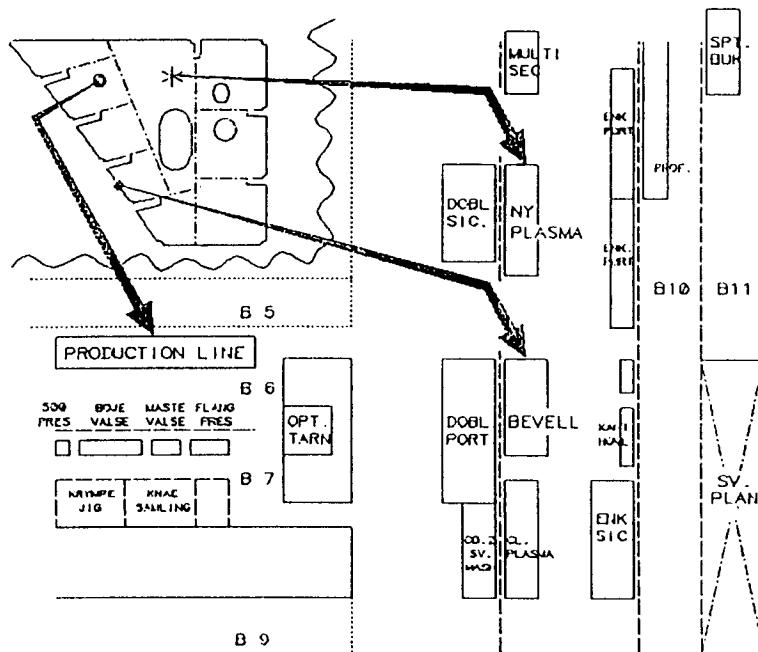
S1 S2 S3 S5 S4

PROFILE CUTTING MACHINE

- MTO
- RFVFI CI

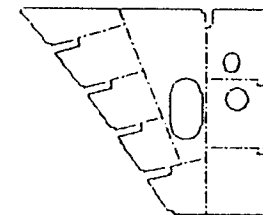
WORK OPERATION

OPERATION CODE



PRODUCTION FACILITIES

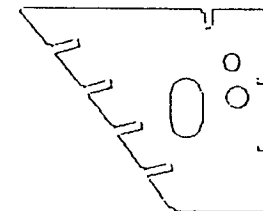
WELDING CODE



- WELD EQUIPMENT
- WELD PROCESS
- VOLUME
- WELD POSITION
- ASSEMBLY LOCATI
- COST

PAINTING CODE

PAINT TYPE / SPECIFICATION



— COST CALCULATIC

PLANNING

S.NO 9994 ASSEMBLY NETWORK DIAGRAM

L.NO	PARTS NAME	BLOCK NAME	<27-B>
10	2D.A (BB)		
11	2D.A-7L (BB)		
12	2D.A-8L (BB)		
13	2D.B (BB)		
14	2D.B-6L (BB)		
15	2D.C (BB)		
16	2D.C-3L (BB)		

DATE 89.09.13	CHECKER
TIME 13.15.32	
PAGE 1	DRAWER

251
210
2.1K
55.1 T

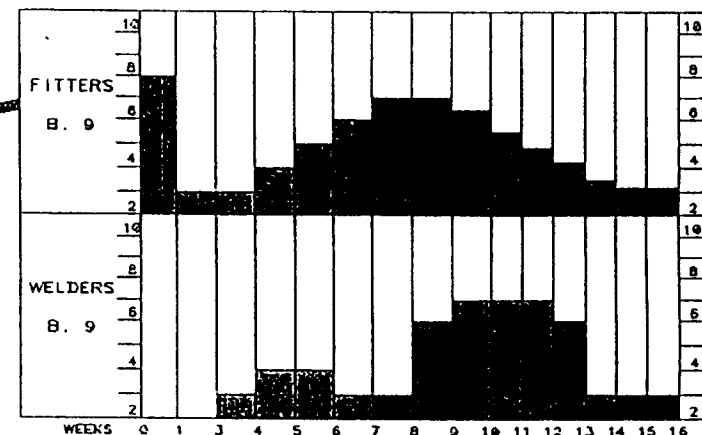
MANHOURS	
FIT.	WELD.
32	20
20	24
30	53
24	17
36	54
82	36
370	240

C-PLANNING

MANED				NOV				DEC				MANHOURS	
UCE				94	94	94	94	94	94	95	95	FIT	WELD
NR	BG	SEKT	P	TEKST									
001126	2278	2	L.SKOP (311)		151							32	20
002126	2278	5	WEB+TV SK. (413)		157	158	159					20	24
003126	2278	2	DELS.L.SK.S/B		351							30	53
004126	2278	2	DELS.L.SK.S/B		352							24	17
005126	2278	4	2 J.DAEK 427-442		251							36	54
006126	2278	2	J.DAEK DELSEKT			252						82	36
008126	2278		2 O/P L-SK/KLD							JPA	370	240	

B-PLANNING

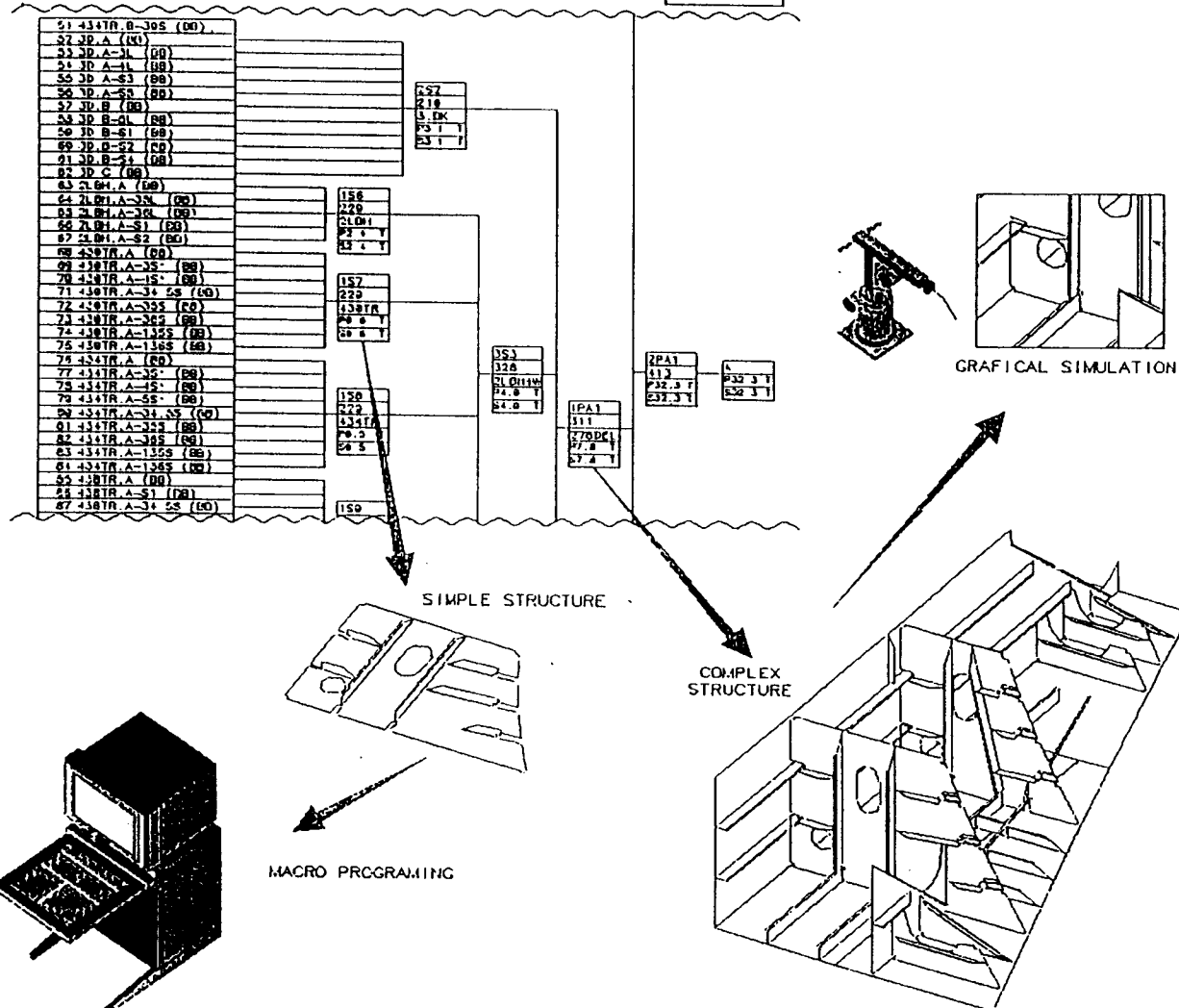
BYGN 126 UDCAVE A. SIDE 01				REF. TIL PLAN			
				89-02-00			
LB	SEKT.GR	BENAVELSE	TEGN	11/12	REV	1/2	NOV
IR	IR		UDB	STAL		REV	841
00	1281	FORSEKIB U/P	037		041		841
00	2278	O/P.L.SK/KLD.S/B	037		041		841
01	1101	BULB	034		030		841



- DIRECT CA
MANHOURS

ROBOT WELDING

S. NO 9994 ASSEMBLY NETWORK DIAGRAM		DATE 09.09.13	CHECKER
L. NO	PARTS NAME	TIME 12.12.32	DRAMER
	DR. COX. 11/14/16	PAGE 1	



Attachment (C)

Odense Steel Shipyard Ltd.

Piping and Outfit CAD/CAM Design

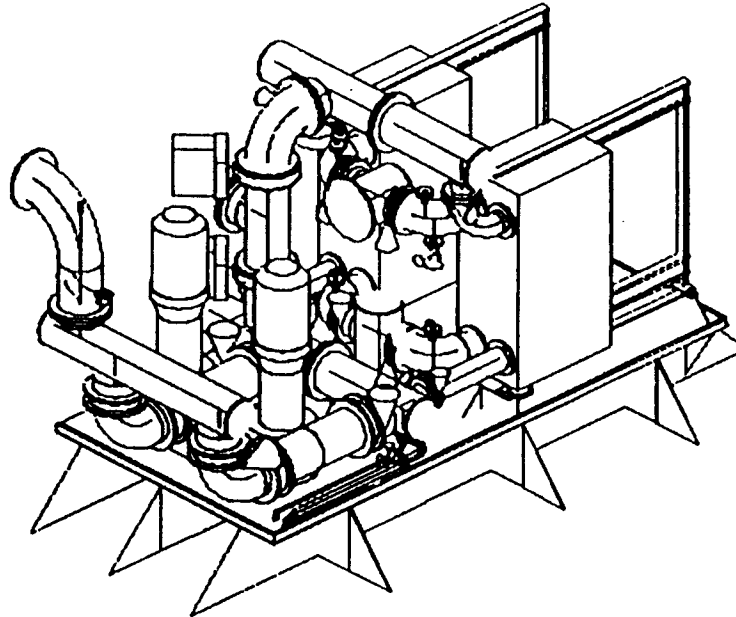
Information Handout

**Attachment (C) to
file: ossnotes.doc**

CAD / CAM

PIPING AND OUTFITTING

SYSTEMS

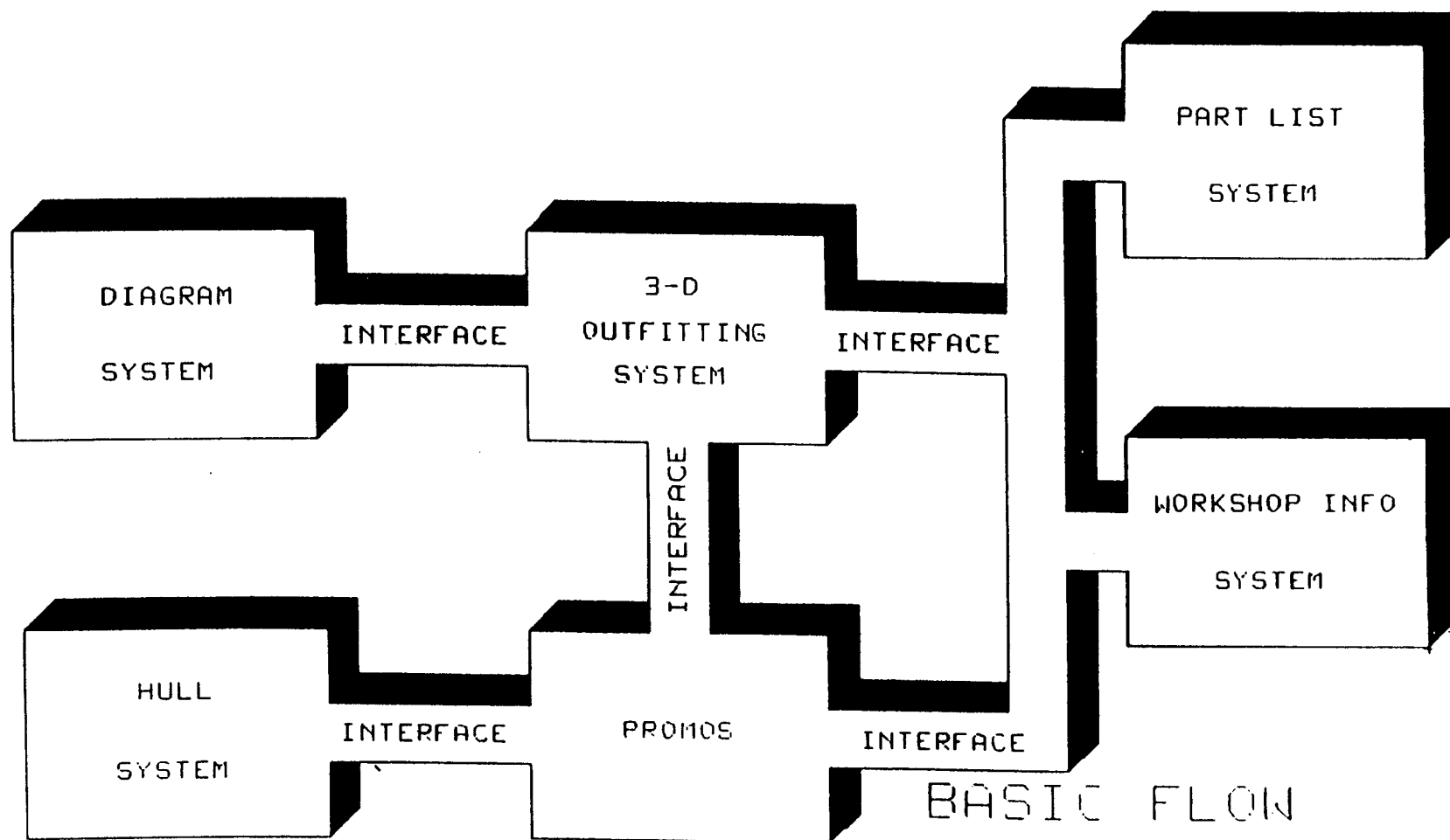


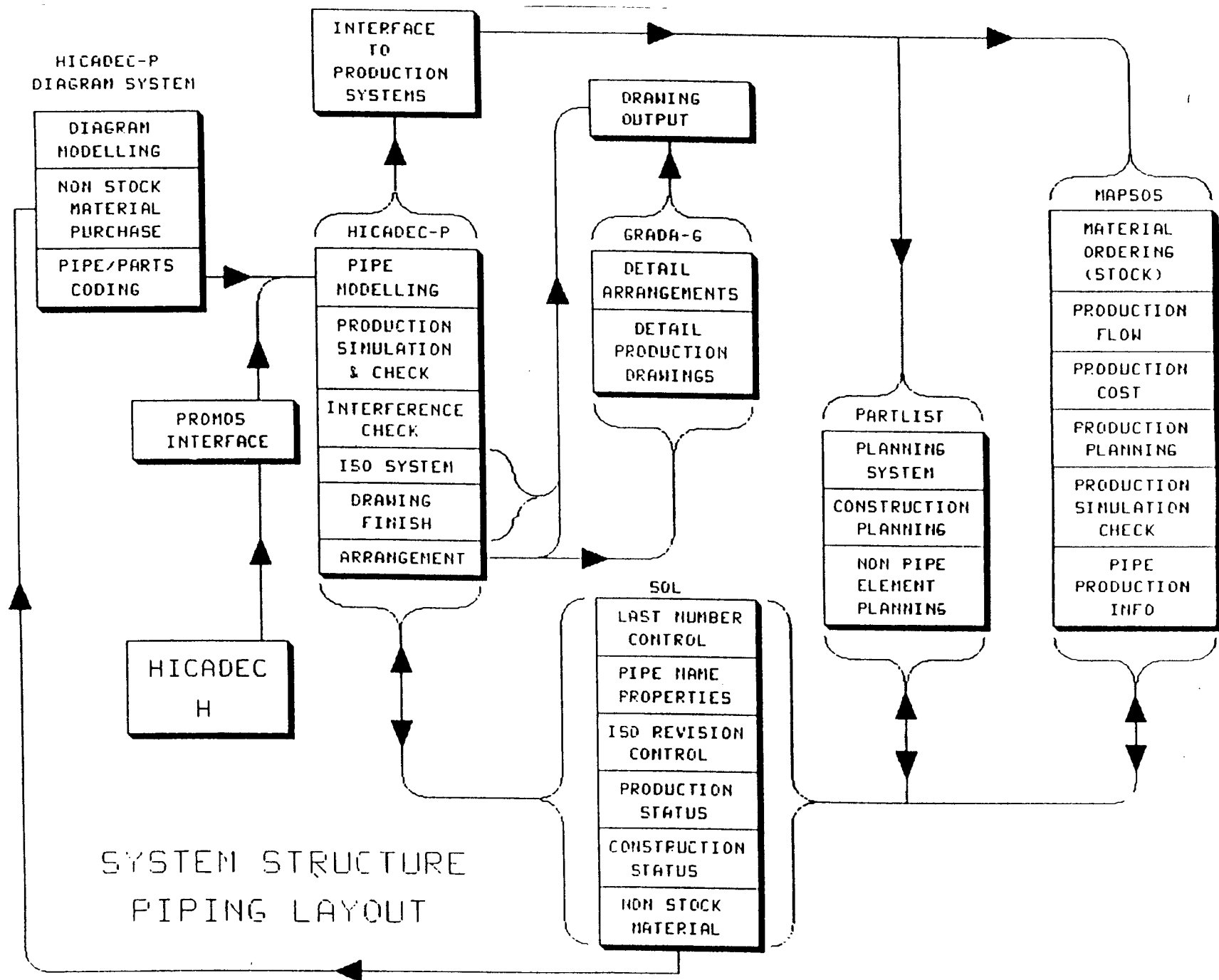
Odense Linde
BRIDGE STEEL ERIKSSON LTD.



Odense Steel Shipyard Ltd.

COMPUTER ENGINEERING





TREATMENT CODES

NO TREATMENT - 00
 NOT GALVANIZED - 10
 NOT GALVANIZED + PRIMER - 11
 NOT GALVANIZED + FINAL COAT - 12
 NOT GALVANIZED + ETC - 13
 NOT GALV. + POLYURETHANE + ETC - 14
 ZINCALCATE - 21
 ZINCALCATE + PRIMER - 22
 ZINCALCATE + EPOXY - 23
 ZINCALCATE + EPOXY (DIP) - 24
 EPOXY PRIMER - 41
 EPOXY PRIMER - 42
 SOLVENTFREE EPOXY - 43
 EPOXY PRIMER - 44
 EPOXY PRIMER - 45
 EPOXY PRIMER - 46
 EPOXY PRIMER - 47
 EPOXY PRIMER - 48
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 EPOXY PRIMER - 98
 EPOXY PRIMER - 99

D DIMENSION CODES
 A - 15
 B - 25
 C - 40
 D - 50
 E - 60
 F - 70
 G - 80
 H - 90
 I - 100
 J - 125
 K - 150
 L - 200
 M - 250
 N - 300
 O - 350
 P - 400
 Q - 450
 R - 500
 S - 550
 T - 600
 U - 650
 V - 700
 W - 750
 X - 800
 Y - 850
 Z - 900

MATERIAL

STEEL PIPES
 DIN 2459/1626 ST37.2
 DIN 2448/1625 ST35

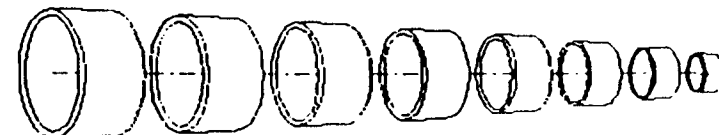
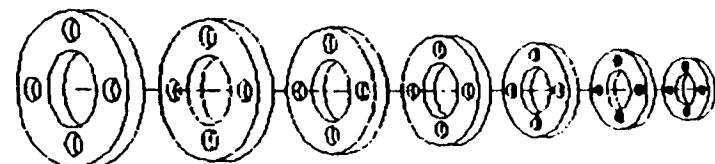
(SLIP-ON FLANGES 053002)

15 21.3 X 3.2
 25 33.7 X 4.0
 40 48.3 X 4.5
 50 60.3 X 5.0
 65 76.1 X 5.6
 80 88.9 X 6.3
 100 114.3 X 7.1
 125 139.7 X 7.6
 150 165.1 X 8.2
 200 219.1 X 9.5
 250 273.1 X 10.8
 300 325.1 X 12.1
 350 355.1 X 13.0
 400 406.1 X 14.0
 450 457.1 X 15.0
 500 508.1 X 16.0
 600 609.1 X 18.0
 650 660.1 X 19.0
 700 711.1 X 20.0
 750 762.1 X 21.0
 800 813.1 X 22.0

TREATMENT		INSIDE	OUTSIDE	CLASS CERT.	PRESS NORM	PIPE CODE	RT NO.
						0PDD1	01
51	51	NONE		NT10		0PDD2	02
60	60	YES		NT16		0PDD3	03
61	60	YES		NT10		0PDD4	04
60	60	NONE		NT10		0PDD5	05
60	60	YES		NT16		0PDD6	06
60	60	YES		NT16		0PDD7	07
51	66	NONE		NT10		0PDD8	08
61	60	NONE		NT10		0PDD9	09
60	60	YES		NT10		0PDD10	10
61	60	NONE		NT16		0PDD11	11
						0PDD12	12
10	11	NONE		NT10		0PDD13	13
10	11	NONE		NT16		0PDD14	14
10	10	NONE		NT10		0PDD15	15
10	10	NONE		NT16		0PDD16	16
51	51	NONE		NT10		0PDD17	17
60	52	YES		NT16		0PDD18	18
51	51	NONE		NT16		0PDD19	19
60	52	NONE		NT10		0PDD20	20
						0PDD21	21
60	51	YES		NT10		0PDD22	22
60	51	YES		NT16		0PDD23	23
51	66	NONE		NT16		0PDD24	24
51	51	NONE		NT16		0PDD25	25
60	51	NONE		NT10		0PDD26	26
60	55	NONE		NT10		0PDD27	27
60	45	NONE		NT10		0PDD28	28
60	51	NONE		NT16		0PDD29	29
60	55	NONE		NT16		0PDD30	30
61	60	YES		NT16		0PDD31	31
60	45	YES		NT16		0PDD32	32
60	60	NONE		NT16		0PDD33	33
						0PDD34	34
51	40	NONE		NT10		0PDD35	35
51	45	NONE		NT10		0PDD36	36
51	45	NONE		NT16		0PDD37	37
51	41	NONE		NT16		0PDD38	38
						0PDD39	39
60	60	YES		NT10		0PDD40	40
						0PDD41	41
10	15	NONE		NT10		0PDD42	42
10	12	NONE		NT16		0PDD43	43
						0PDD44	44
						0PDD45	45
51	45	NONE		NT10		0PDD46	46
51	66	NONE		NT10		0PDD47	47
						0PDD48	48
						0PDD49	49
60	60	NONE		NT10		0PDD50	50
						0PDD51	51
						0PDD52	52
						0PDD53	53
						0PDD54	54
						0PDD55	55
						0PDD56	56
						0PDD57	57
10	10	YES		NT160		0PDD58	58

PIPES DEFINITION

(CATALOGUE)



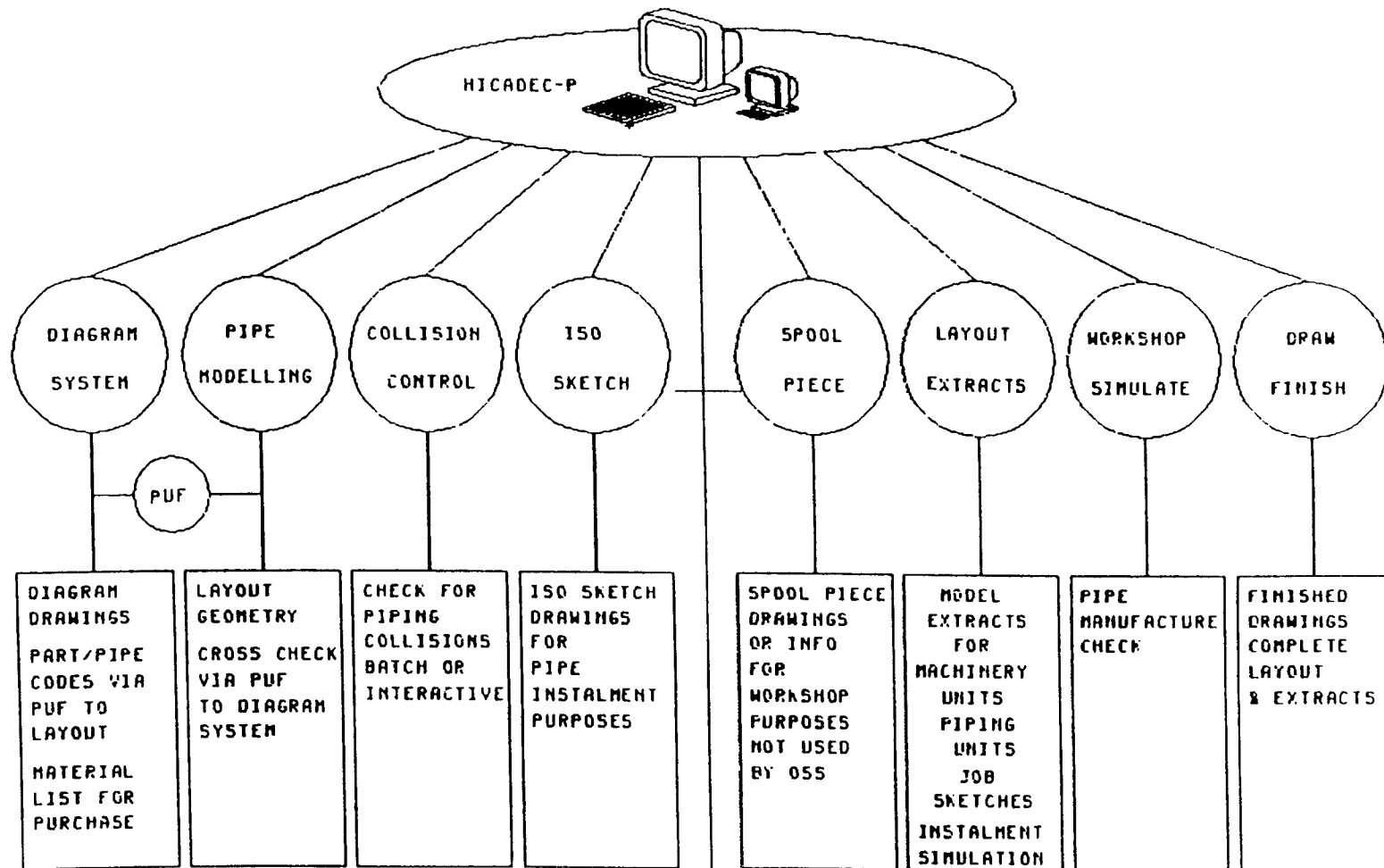
PIPING SYSTEM CODES



PIPE MATERIALS

PAGE 1
 PIPE CODES

HICADEC-P FUNCTIONS & OUTPUTS

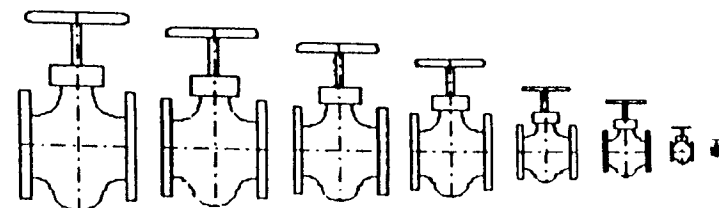


HICADEC-P "CAD" SYSTEM

OSS DEVELOPED "CAM" SYSTEMS

INTERNAL MATERIALS			DESCRIPTION		
ITEM	DISC/SEDE/ BALL/DIAPH.	SEAT/ LINING	CLASS	CONNECTION TYPE	
BODY MATERIAL			INTERNAL		
A	CAST IRON GG-25		01 A A NO	HT10	0VDD1
B	56-CAST IRON GGG-40		02 A C NO	HT10	0VDD2
C	CAST STEEL G3-C25		03 A C YES	HT10	0VDD3
D	FORGED STEEL		04 A F NO	HT10	0VDD4
E	CAST IRON GG-25, RUBBER LINED		05 B A NO	HT10	0VDD5
F	56-CAST IRON GGG-40, RUBBER LINED		06 B A YES	HT10	0VDD6
G	CAST STEEL G3-C25, RUBBER LINED		07 B A NO	HT16	0VDD7
H	BRONZE-RG5		08 B A YES	HT16	0VDD8
I	BRONZE-RG10		09 B B NO	HT10	0VDD9
J	BRONZE-RG5, RUBBER LINED		10 B C NO	HT10	0VDD10
K	BRONZE-RG10, RUBBER LINED		11 B C NO	HT16	0VDD11
L	STAINLESS STEEL AISI 304		12 C A NO	HT16	0VDD12
M	STAINLESS STEEL AISI 304L		13 C A YES	HT16	0VDD13
N	STAINLESS STEEL AISI 316		14 C A YES	HT40	0VDD14
O	STAINLESS STEEL AISI 316L		15 C B YES	HT10	0VDD15
P	BRASS		16 C B YES	HT16	0VDD16
Q	COPPER		17 C C YES	HT40	0VDD17
R	ALUMINIUM BRASS (YORCALBR0)		18 D A NO	HT16	0VDD18
S	CARBON STEEL		19 D A YES	HT40	0VDD19
T	AL. BRONZE		20 H C NO	HT10	0VDD20
			21 H C YES	HT10	0VDD21
			22 H C NO	HT16	0VDD22
			23 H C YES	HT16	0VDD23
			24 I B NO	HT16	0VDD24
			25 I B YES	HT16	0VDD25
			26 I E NO	HT10	0VDD26
			27 I E YES	HT10	0VDD27
			28 I E NO	HT16	0VDD28
			29 I F NO	HT10	0VDD29
			30 I F NO	HT16	0VDD30
			31 H C NO	HT16	0VDD31
			32 I B NO	HT10 (as. at. bolts)	0VDD32
			33 C A NO	HT25	0VDD33
			34 C A YES	HT25	0VDD34
			35 I E NO	HT10 (as. at. bolts)	0VDD35
			36		
			37 H D NO	HT10	0VDD37
			38		
			39		
			40 I E NO	STORZ COUP. HT16	0VDD45
			41		
			42		
			43 H C NO	SCREW 10	0VDD51
			44 H B NO	SCREW 16	0VDD52
			45 I B NO	SCREW 10	0VDD53
			46		
			47		
			48		
			49		
			50		
			51		
			52		
			53		
			54		
			55		
			56		
			57		
			58		

PARTS DEFINITION (CATALOGUE)



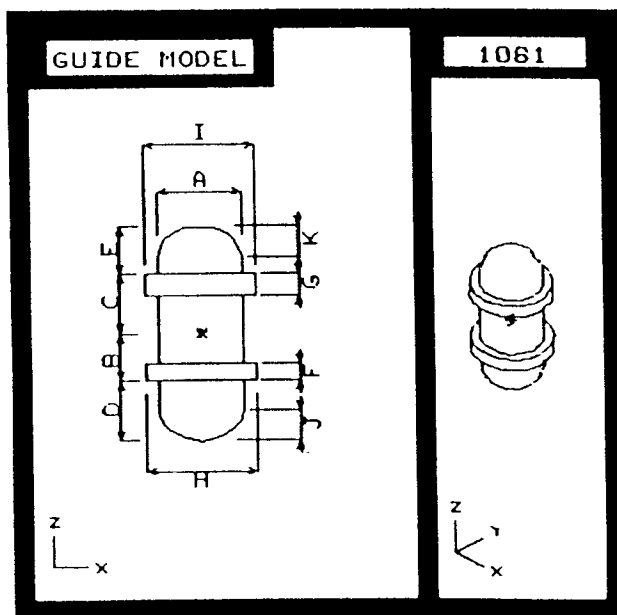
PART RANGE

PART NAMES

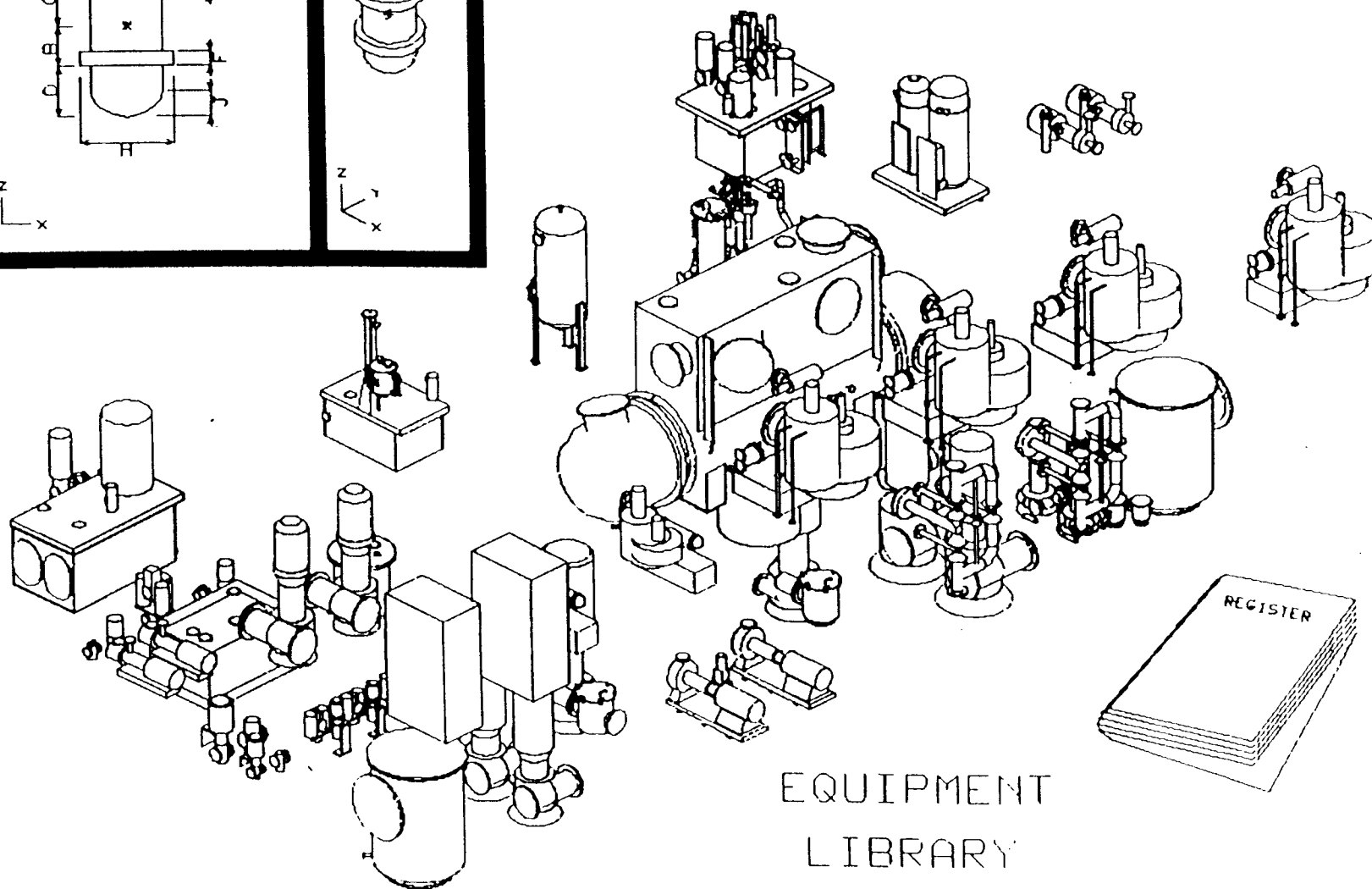


GLOBE VALVE

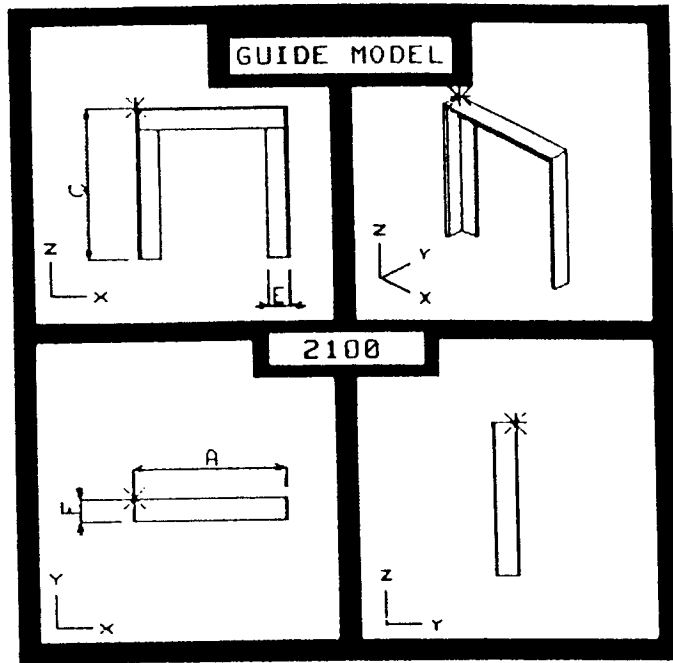
PART NAMES PAGE 9
RANGE 0VDD1 to 0VDD8



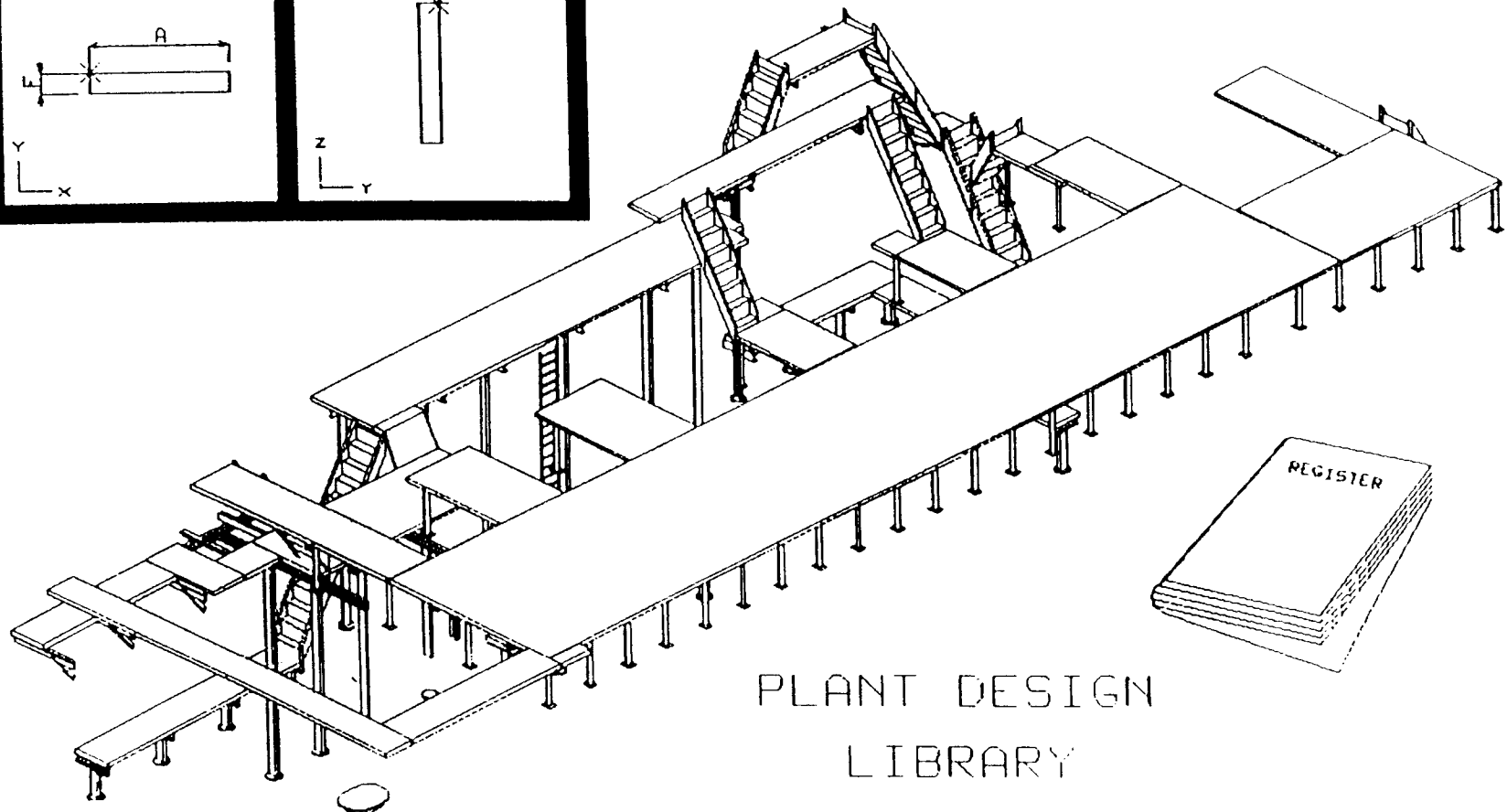
EQUIPMENT MODELLING COMBINATION OF PRIMITIVE FIGURES



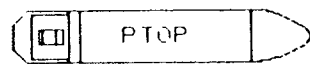
EQUIPMENT
LIBRARY



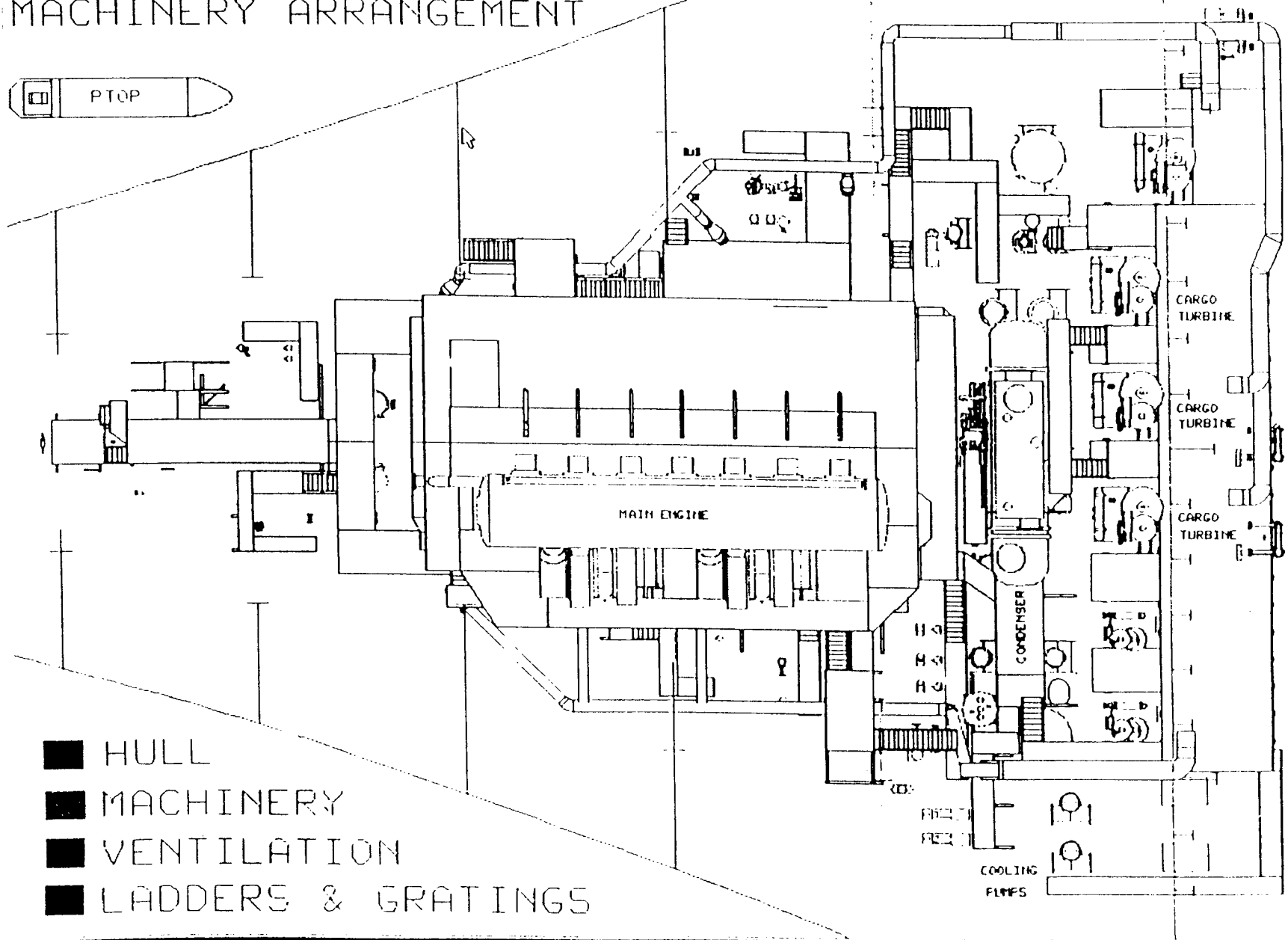
PLANT DESIGN COMBINATION OF PRIMITIVE FIGURES



INITIAL MACHINERY ARRANGEMENT

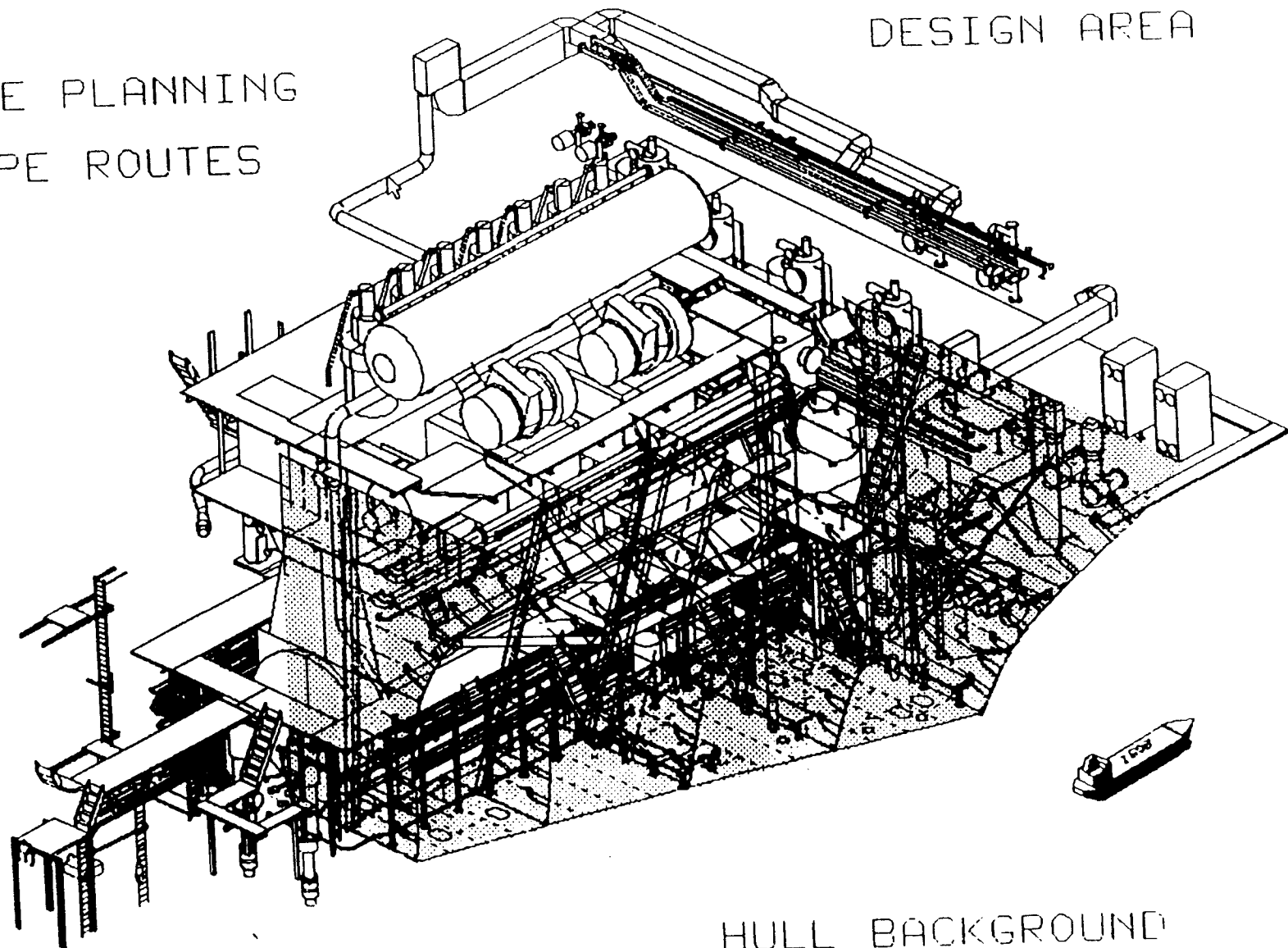


- HULL
- MACHINERY
- VENTILATION
- LADDERS & GRATINGS



PIPE PLANNING
PIPE ROUTES

DESIGN AREA



HULL BACKGROUND

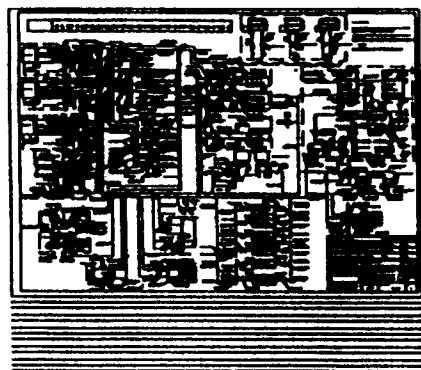
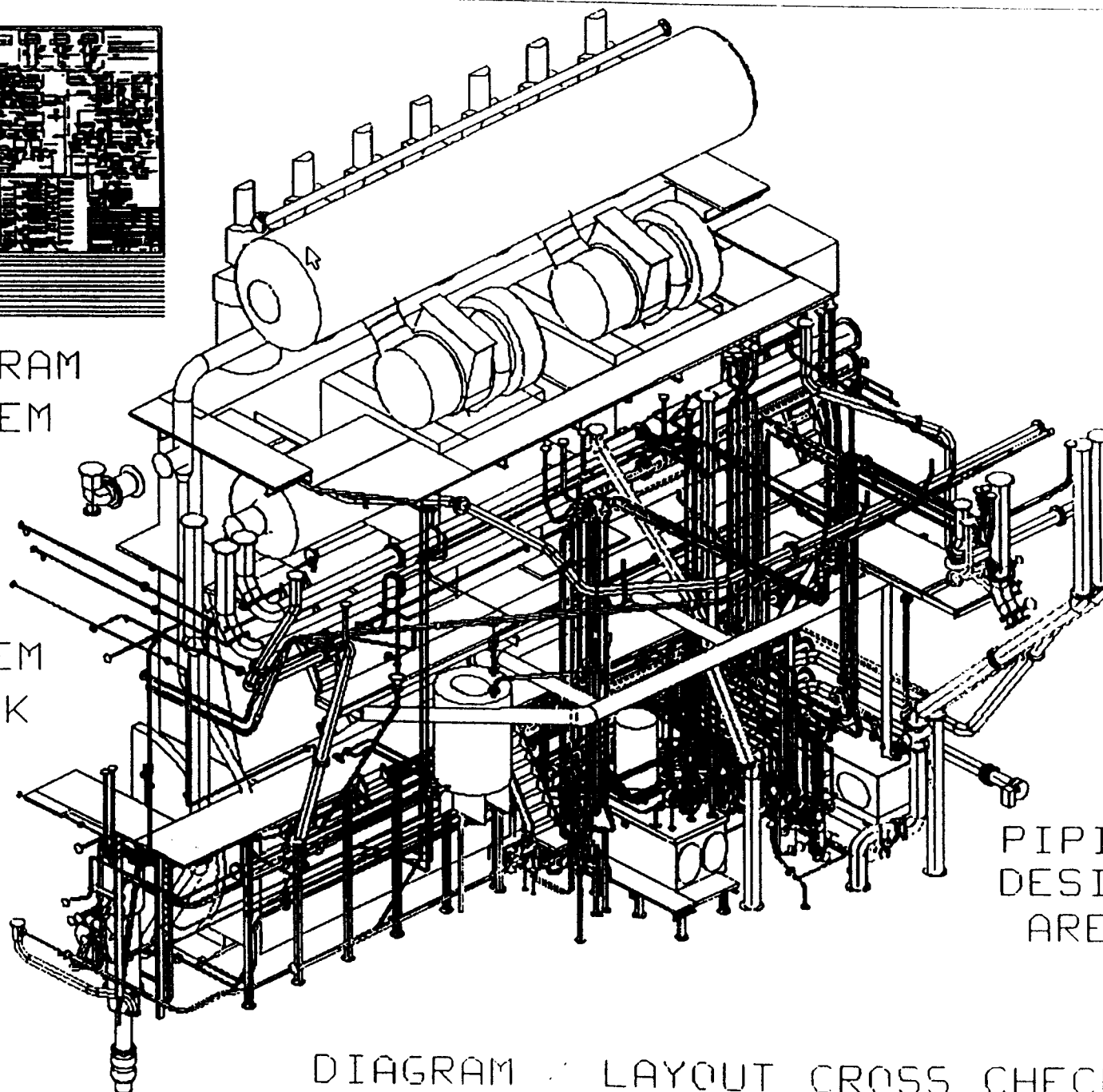


DIAGRAM
SYSTEM

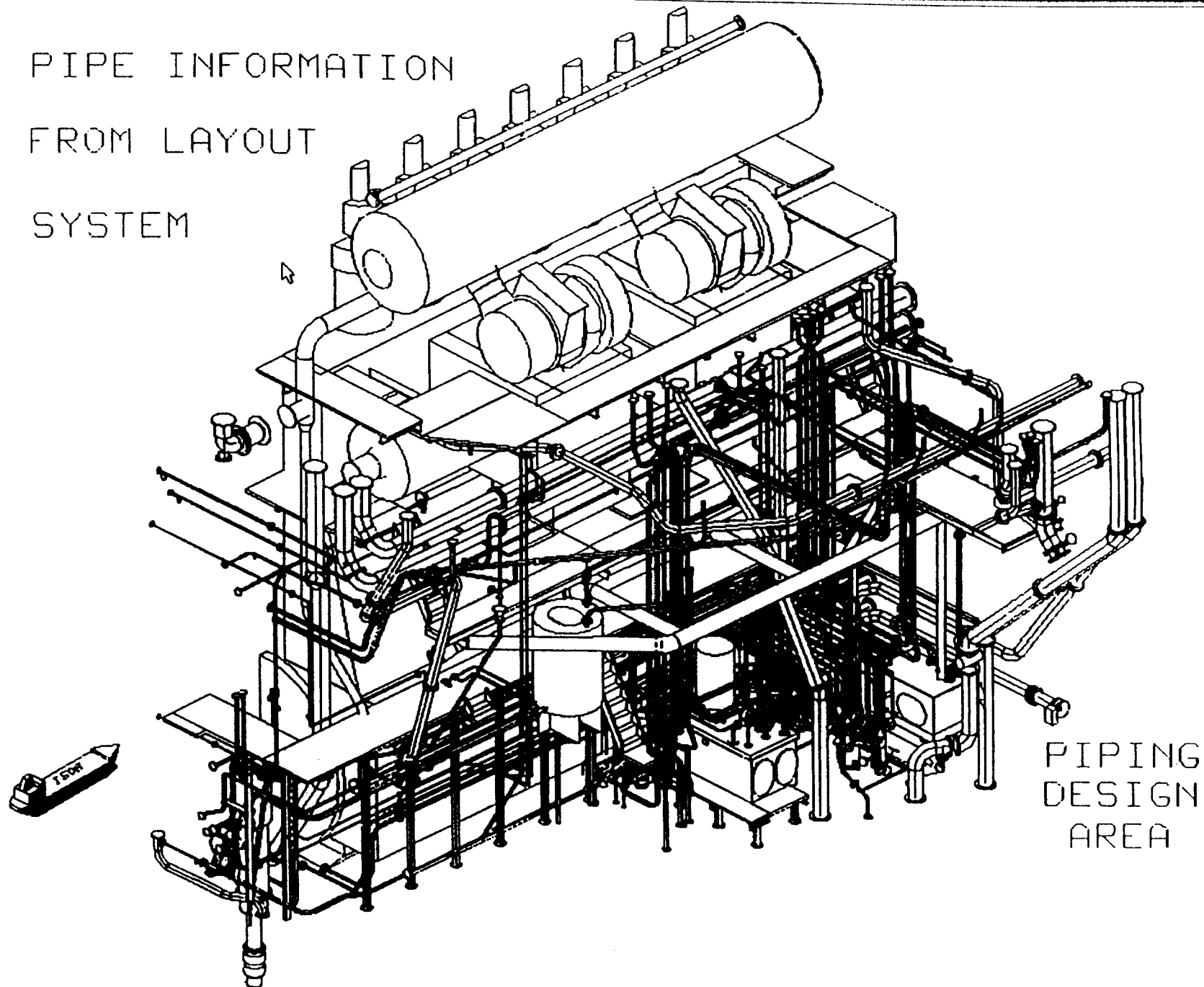
SYSTEM
CHECK



PIPING
DESIGN
AREA

DIAGRAM / LAYOUT CROSS CHECK

PIPE INFORMATION
FROM LAYOUT
SYSTEM



|-----+ GROUP NUMBER = 603 +-----+
 REC-NO SYMBOL LABEL NEXT FORE REFERENCE-CHAIN AUTO IMO FIT

3931	F	1654	1134	0	0	0	0	0	0	0
1134	H	1655	1895	3931	2054	0	0	0	0	1895
1895	P	1655	1896	1134	0	0	0	0	0	1
1896	W	1655	3220	1895	0	0	0	0	-4	0
3220	EL	1654	3221	1896	0	0	0	0	0	0
3221	W	1654	3222	3220	0	0	0	0	-4	0
3222	EL	1654	726	3221	0	0	0	0	0	0
726	W	1653	727	3222	0	0	0	0	-4	0
727	P	1653	728	726	0	0	0	0	0	0
728	W	1653	5125	727	0	0	0	0	-4	0
5125	ES	1593	2580	728	0	0	0	0	0	0
2580	W	1593	2071	5125	0	0	0	0	-4	0
2071	H	1593	2589	2580	729	0	0	0	0	2589
2589	P	1593	2590	2071	0	0	0	0	0	1
2590	F	1593	2591	2589	0	0	0	0	1	0
2591	BN	1593	2592	2590	0	0	0	0	1	0
2592	G	1593	737	2591	0	0	0	0	1	0
737	VC	1593	738	2592	0	0	0	0	0	0
738	G	1593	739	737	0	0	0	0	1	0
739	BN	1593	740	738	0	0	0	0	1	0
740	F	1593	5107	739	0	0	0	0	1	0
5107	ES	1593	732	740	0	0	0	0	0	0
732	W	1593	733	5107	0	0	0	0	-4	0

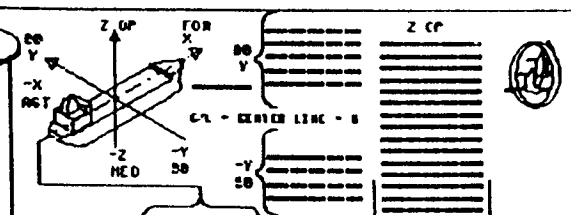
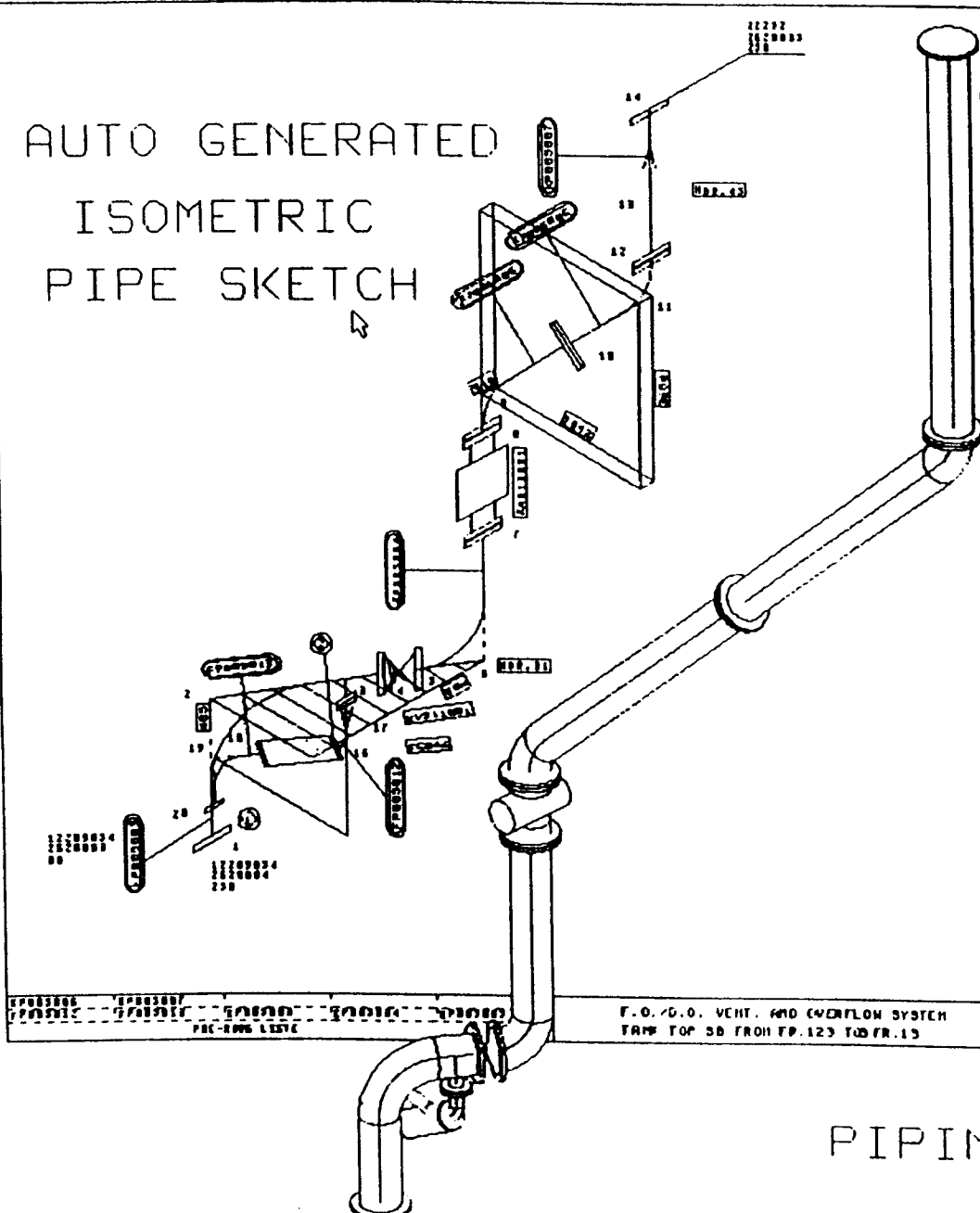
PIPING
DATA

PIPING
DATA

|-----+ GROUP NUMBER = 603 +-----+
 REC-NO SYMBOL LABEL NEXT FORE REFERENCE-CHAIN AUTO IMO FIT

733	P	1593	2202	732	0	0	0	0	0	0
2202	F	1593	2203	733	0	0	0	0	1	0
2203	BN	1593	2204	2202	0	0	0	0	1	0
2204	G	1593	722	2203	0	0	0	0	1	0
722	SG	1593	723	2204	0	0	0	0	0	0
723	G	1593	724	722	0	0	0	0	1	0
724	BN	1593	725	723	0	0	0	0	1	0
725	F	1593	719	724	0	0	0	0	1	0
719	EL	1593	720	725	0	0	0	0	0	0
720	W	1593	721	719	0	0	0	0	-4	0
721	P	1593	4086	720	0	0	0	0	0	0
4086	F	1593	4087	721	0	0	0	0	1	0
4087	BN	1593	4088	4086	0	0	0	0	1	0
4088	G	1593	4089	4087	0	0	0	0	1	0
4089	F	1593	4090	4088	0	0	0	0	0	0
4090	P	1593	4091	4089	0	0	0	0	0	0
4091	W	1593	744	4090	0	0	0	0	-4	0
744	EL	1593	745	4091	0	0	0	0	0	0
745	F	1593	746	744	0	0	0	0	0	0
746	G	1593	747	745	0	0	0	0	1	0
747	BN	1593	748	746	0	0	0	0	1	0
748	F	1593	523	747	0	0	0	0	1	0
523	H	1593	749	748	743	0	0	0	0	749
749	P	1593	750	523	0	0	0	0	0	1

AUTO GENERATED ISOMETRIC PIPE SKETCH



NO.	NO.	NO.	NO.	NO.	NO.
21	1138	1138	1138	1138	1138
20	1138	1138	1138	1138	1138
19	1138	1138	1138	1138	1138
18	1138	1138	1138	1138	1138
17	1138	1138	1138	1138	1138
16	1138	1138	1138	1138	1138
15	1138	1138	1138	1138	1138
14	1138	1138	1138	1138	1138
13	1138	1138	1138	1138	1138
12	1138	1138	1138	1138	1138
11	1138	1138	1138	1138	1138
10	1138	1138	1138	1138	1138
9	1138	1138	1138	1138	1138
8	1138	1138	1138	1138	1138
7	1138	1138	1138	1138	1138
6	1138	1138	1138	1138	1138
5	1138	1138	1138	1138	1138
4	1138	1138	1138	1138	1138
3	1138	1138	1138	1138	1138
2	1138	1138	1138	1138	1138
1	1138	1138	1138	1138	1138

NO.	NO.	NO.	NO.	NO.	NO.
13	21	207	167	167	0
12	20	223	0	0	-213
11	19	003	0	264	-152
10	18	001	0	079	-216
9	17	73	0	54	-17
8	16	207	0	0	-207
7	15	200	0	0	-200
6	14	2247	0	0	2247
5	13	074	0	0	074
4	12	167	0	0	167
3	11	2302	133	-1020	1020
2	10	2304	133	-1020	1027
1	9	167	0	0	167
0	8	000	0	0	000
0	7	000	0	0	000
0	6	000	0	0	000
0	5	000	0	0	000
0	4	000	0	0	000
0	3	000	0	0	000
0	2	000	0	0	000
0	1	000	0	0	000
0	0	000	0	0	000

F.O.D.O. VENT. AND OVERFLOW SYSTEM
TANK TOP SB FROM FR. 123 TO FR. 13

NO. 44.20
DATE 1994/1/19
SYN. NO. L140
NO. 11222
TANK NO. 2620010

PIPING GEOMETRY

OSTK02

P A R T L I S T S Y S T E M

89/08/15

LOOM

P A R T L I S T L I N E - B A S I S D A T A

12:52:26

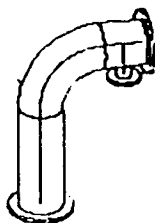
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 SHIP NO: 148 DRAWING : 148-PD2-620
 POS.NO : KP005003 LINE : 000 ALTERED :
 NO.OFF : 001 QUANTITY : 01744 UNITS : MM
 TITLE : PREROR TYPE :
 ORIGIN : 31 IDENT NO.: KP005003 ORDER NO: 00000
 DRG.NO.: 11222 ERECT.DRG: 2620010
 ACCOUNT: 0002620 TOTAL KG.: 000102 SURFACE : IN 00 OUT 45
 OPKO : AA DIMENS : 00250 00000 00000 00000

ERECT.A REGION ACTIV LOC P				M A T E R I A L S T A T U S						
ACTUAL:	1122	227	226 T	INSTALL	FABRI	TO	FROM	IN	OUT	INSTALL
ORIGIN:	1122	227		404	CATED	TREAT	TREAT	STOCK	DATE	FINISH
SERIE:	1122	227	226 T	+WEEKS	31222	40103	40107	40110	40114	40124
				000	LTERM	LOON	DATE	931109	CODE	R

FLOW ST.WEEK ALT. MRK DELIV. PRTIME AREA
 000 B

TIME FAC: +002.75 TOTTIME :+0000002.75 LTERM BATC DATE 931102 CODE N

(PIPE SPOOL)



PART LIST DATA

ANTAL:

BLOK:

RØR:

KP 005003

SKIB: L14B

BLVED EN BOJNING ER ANGIVET FØLGENDE FIRE VÆRDIER :

1) AFSTAND I MM FRA EN REFERENCE KNUDE / REFERENCE KNUDENUMMER

2) ROTATIONSVINKEL I GRADER (+ FOR MED UR, - FOR MOD UR)

3) BOJNINGSVINKEL I GRADER (VENSTRE BOJNING)

4) SPRING (I MM) AF REFERENCE KNUDE EFTER BOJNING)

LAENGDER MELLE KNUDER ER SANDE LAENGDER I MM.

RONTGEN: NEJ

MPI: NEJ

PANONTERING AF STUDS :

KOORDINATER FØR KNUDE(R) 4

NULPUNKT VED KNUDE 3*-->(Y-RETN)

FLANGE
STILLING

2...5

!31.

!(>)

1

FL

3...2

!31.

!(>)

4

FL

1...2

0. !

!

5

FL

3-----4
STUDS: 0. KN.NR. X-ORD Y-ORD Z-ORD
! 90. 4 0 238 0
! 2...1

1075 SB 522 147
1-----2-----3-----5
FLFT 1066/ 1 STUD FLFT
0
90
1067

----- KONTROLNØR FOR KNUDE NR. 5 -----

KNUDE 1 2 5 ANGIVER PLAN *

X-AKSE DANNES AF KNUDE 1 2 *

Y-AKSE I PLAN ; Z-AKSE OPAD *

NULPUNKT VED KNUDE 1 *

X-ORD

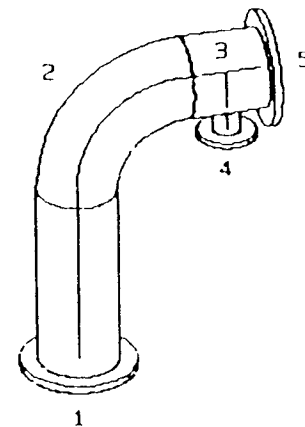
Y-ORD

Z-ORD

1075

669

0

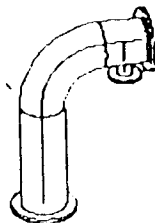


(PIPE SPOOL)

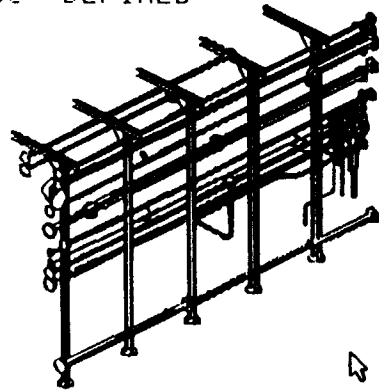
PIPE

WORKSHOP INFORMATION

GEOMETRY



LAYOUT DEFINED



PIPING
UNIT

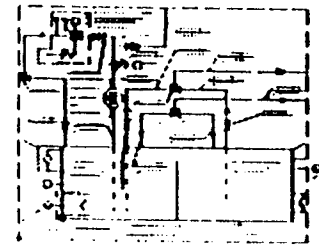
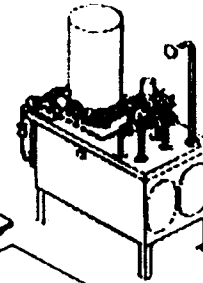
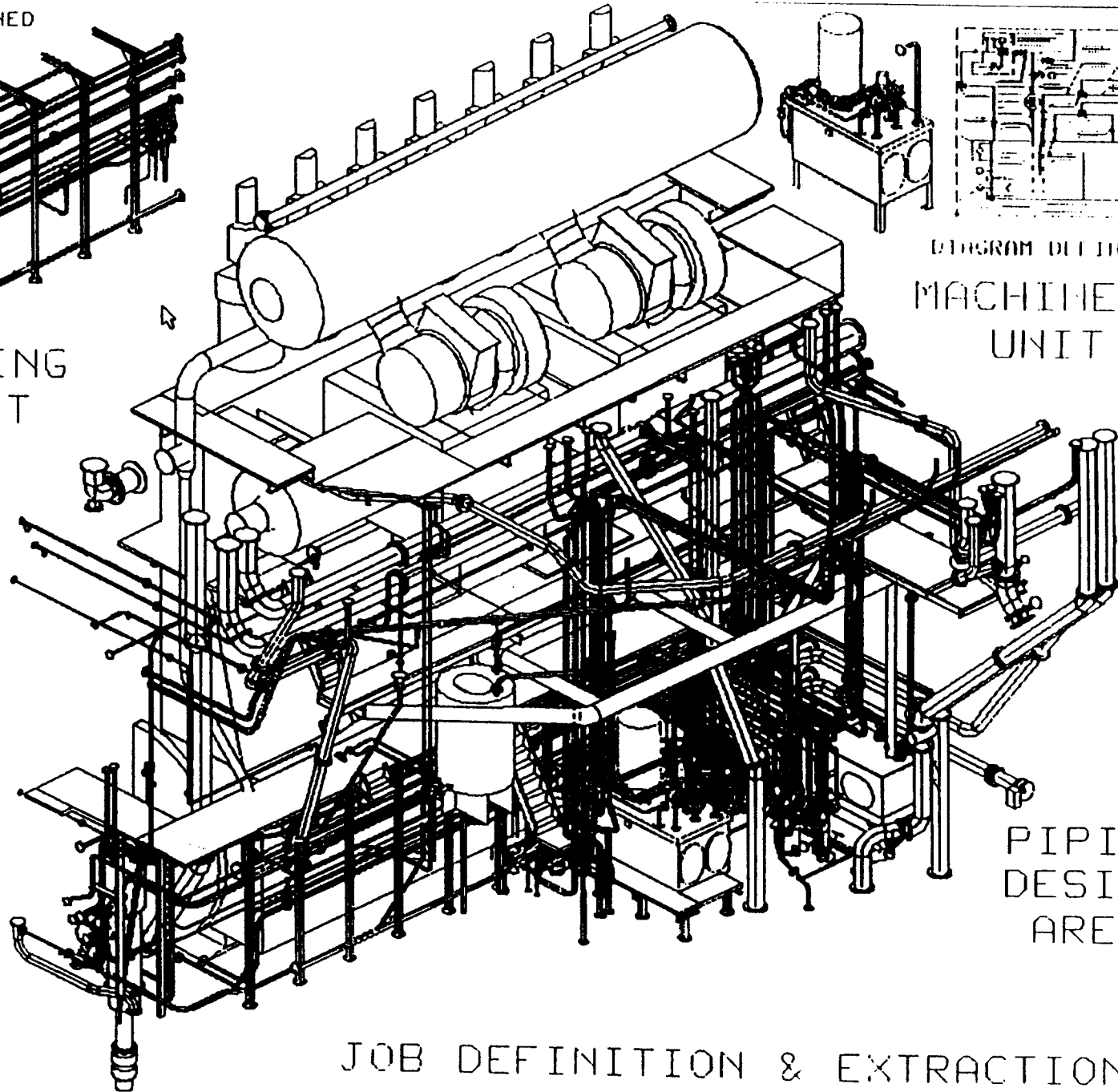
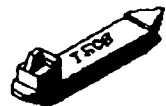


DIAGRAM DEFINED
MACHINERY
UNIT



PIPING
DESIGN
AREA

JOB DEFINITION & EXTRACTION

21/01/94

RAP1 >>>> LISTE FOR KONTROL <<<< (MONT1412)

JOBNR: 47027 OPR. VIA STKSYS. 93090 AFD: 1410 NYB 14B SEKO: 0417 HAK:220 DAK:610 PALLE: 1 VF.ER: LJN

MATERIALESTATUS PR 940114: 0 STK SKIBSVARE I MANKO 0 STK STANDARDVARE I MANKO 31 STK ROR I MANKO

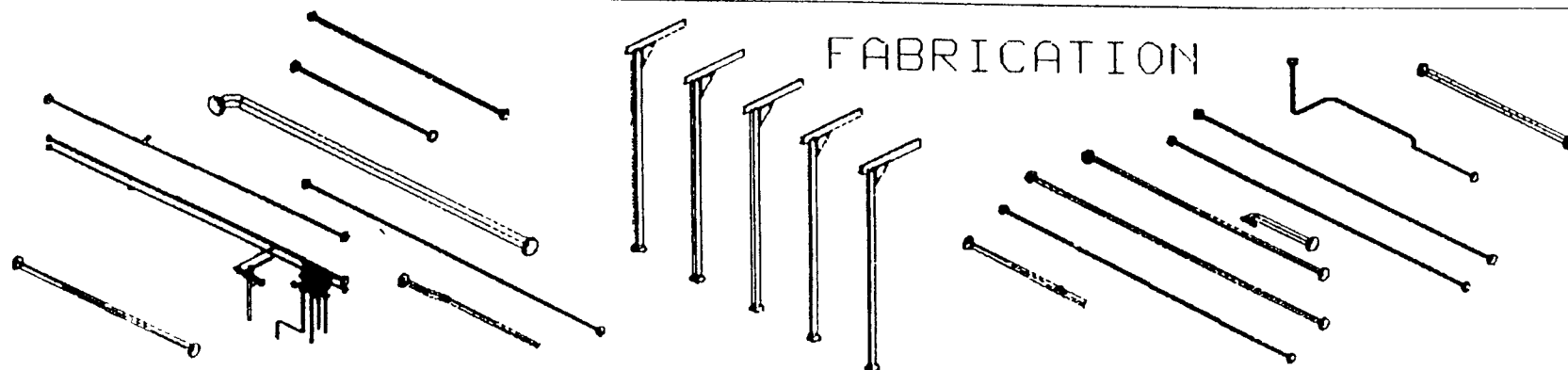
LEV.STED: *10 DATO:

REKVIRERET AF:

DATO:

START PLANLAGT TIL: 940224 SLUT PLANLAGT TIL: 940316 PROD START: PROD SLUT: MONTUGE: 406 OPFLAFD: 1410

TEGN	TOTTID	POSITION	LN	IDENT	BETEGNELSE	DIM	ANT	MGD	EH	MONTTEGN	FK	ORDRE	VAERKTEGN	VGT
14B PD2 102	0.77	CP005051	00	CP005051	PREROR	40	1	6002	NN	2102006	31	00000	11222	34
14B PD2 102	0.77	DP005014	00	DP005014	PREROR	50	1	3937	NN	2102002	31	00000	11222	29
14B PD2 102	0.77	DP005016	00	DP005016	PREROR	50	1	2817	NN	2102004	31	00000	11222	22
14B PD2 102	2.31													85
14B PD2 503	0.86	FP009023	00	FP009023	PREROR	60	1	3072	NN	2503034	31	00000	11222	42
14B PD2 503	0.86	FP009024	00	FP009024	PREROR	60	1	5280	NN	2503035	31	00000	11222	66
14B PD2 503	0.86	FP009041	00	FP009041	PREROR	60	1	3000	NN	2503034	31	00000	11222	41
14B PD2 503	2.58													149
14B PD2 506	0.77	CP009126	00	CP009126	PREROR	40	1	5876	NN	2506023	31	00000	11222	33
14B PD2 506	0.77													33
14B PD2 509	0.77	DP009031	00	DP009031	PREROR	50	1	6000	NN	2509072	31	00000	11222	41
14B PD2 509	0.86	EP009049	00	EP009049	PREROR	65	1	5992	NN	2509073	31	00000	11222	64
14B PD2 509	1.63													105
14B PD2 510	0.77	CP009122	00	CP009122	PREROR	40	1	4843	NN	2510015	31	00000	11222	26
14B PD2 510	0.77	CP009124	00	CP009124	PREROR	40	1	6000	NN	2510018	31	00000	11222	32
14B PD2 510	0.77	CP009125	00	CP009125	PREROR	40	1	6000	NN	2510019	31	00000	11222	32
14B PD2 510	2.31													90



21/01/94

RAP1 ----> LISTE FOR KONTROL (---- (MONT1412)

PAGE 1

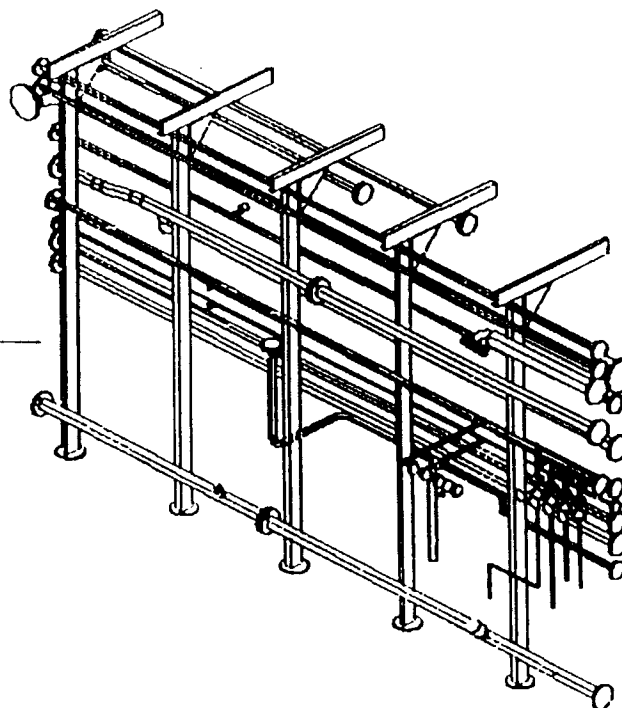
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MATERIALESTATUS PR 940114: 0 STK SKIBSVARE I MANKO 0 STK STANDARDVARE I MANKO 0STK ROR I MANKO

LEV.STED: DATO: REKVIRERET AF: DATO:

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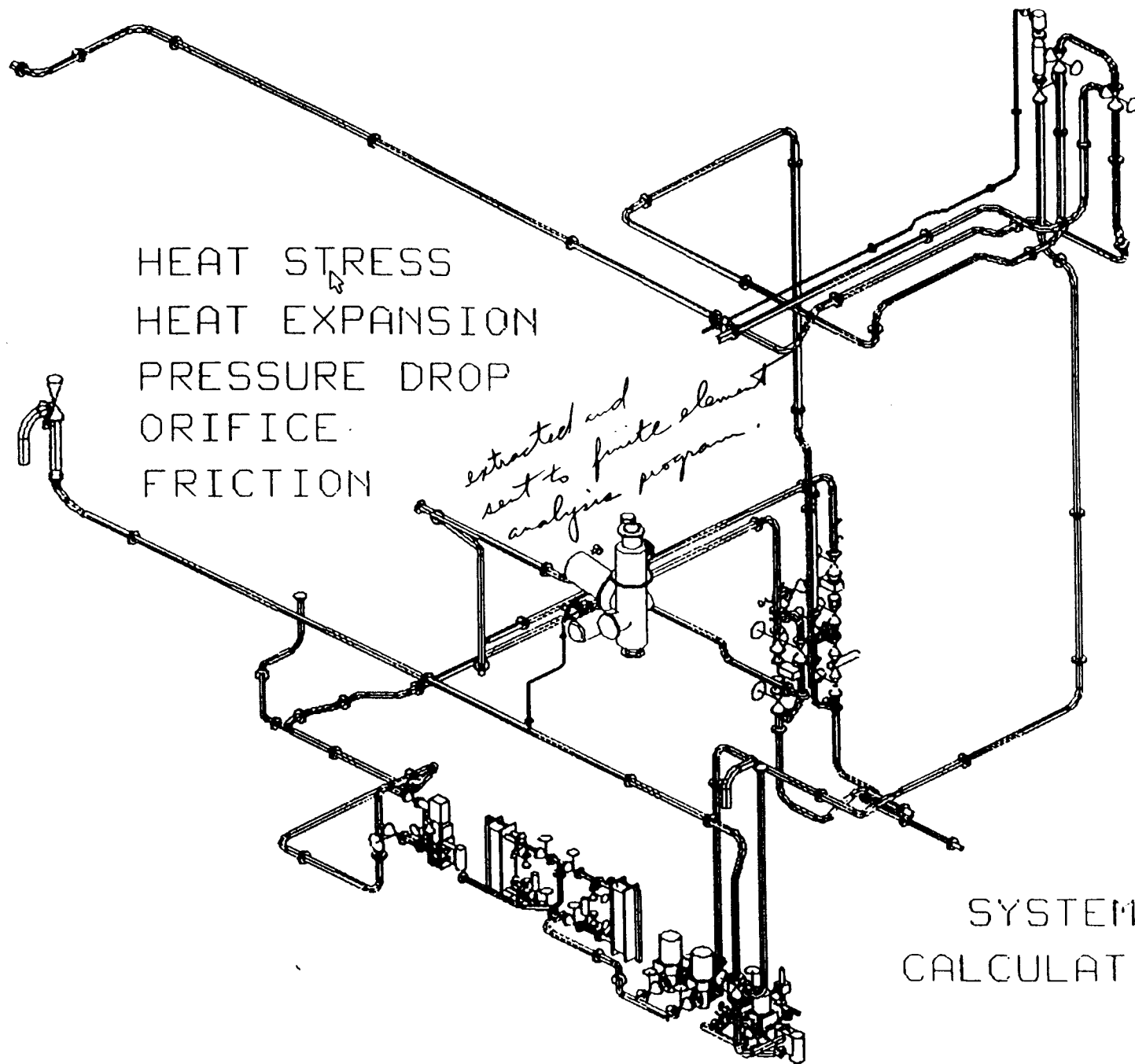
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14B07203514	6.80														0
14B07203515	6.80		0415	00	0415	MONT.RORUNIT	0415	0	1	0	ST	07203515	40	00000	0
14B07203515	6.80														0
14B07203517	6.80		0417	00	0417	MONT.RORUNIT	0417	0	1	0	ST	07203517	40	00000	0
14B07203517	6.80														0
14B07203574	6.80		0474	00	0474	MONT.RORUNIT	0474	0	1	0	ST	07203574	40	00000	0
14B07203574	6.80														0
GRAND TOTAL	27.20														



INSTALLATION

SCHEDULES

0417



Attachment (D)

Odense Steel Shipyard Ltd.

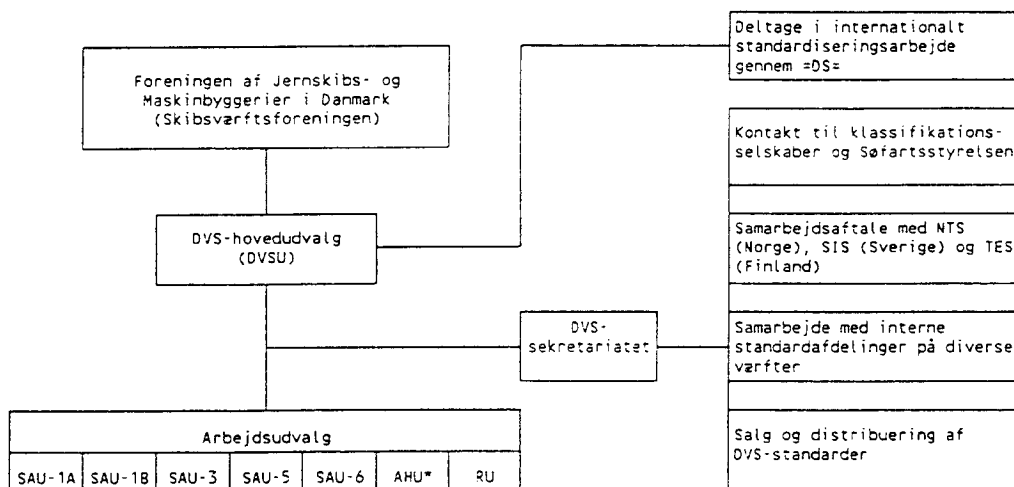
DVS Standards Organization Handout

Danske Værfters Standardiseringsudvalg, DVS Organisation og arbejdsområde

DVS er en organisation oprettet af Skibsværftsforeningen som et led i bestræbelserne på at styrke danske værfters konkurrenceevne.

1. Organisation

DVS's organisation er vist i nedenstående organisationsplan, denne viser også viser DVS's eksterne kontakter.



* Ad hoc-udvalg efter behov

1.1 DVS-hovedudvalget (DVSU)

DVS-hovedudvalg består af repræsentanter for Skibsværftsforeningen, Odense Staalskibsværft A/S, Danyard A/S, Burmeister & Wain Skibsværft A/S og MAN B&W Diesel A/S.

DVS-sekretariatets leder virker som sekretær for DVSU.

Indenfor det af Skibsværftsforeningen godkendte budget fastlægger DVSU retningslinierne for DVS's arbejde, fordeler og prioriterer opgaver til arbejdsudvalgene og godkender nye standarder, inden de udsendes. DVSU er ansvarlig overfor Skibsværftsforeningen for DVS's drift, herunder for overholdelse af budgettet.

Organisation og arbejdsområde

Side 2

1.2 Arbejdsudvalgene

Standardiseringsarbejdet foregår i et antal Standardiserings Arbejdsudvalg (SAU). Endvidere findes et Revisionsudvalg (RU), som holder eksisterende standarder ajour.

Udvalg	Formandskab	Fagområde
SAU-1A	Danyard A/S	Skibsudrustning
SAU-1B	Odense Staalskibsværft A/S	VVS og brandsikring
SAU-3	Danyard A/S	Stålkonstruktioner
SAU-5	Odense Staalskibsværft A/S	El-instrumenteringsteknik
SAU-6	Burmeister & Wain Skibsværft A/S	Maskinudrustning - rør
RU	Burmeister & Wain Skibsværft A/S	Revision af DVS-standarder

DVSU kan yderligere nedsætte ad hoc-udvalg til behandling af specielle emner.

Når en ny sag skal startes i et arbejdsudvalg, udsender sekretariatet indbydelse til Skibsværftsforeningens medlemsværfter med hensyn til at deltage i udvalgets arbejde. Derudover kan et udvalg efter behov supplere sig med ekstern ekspertise, f.eks. fra myndigheder eller leverandører.

DVS-sekretæren deltager i arbejdsudvalgenes møder.

1.3 Sekretariatet

Sekretariatet ledes af en sekretær, der er ansvarlig overfor DVSU for sekretariatets arbejde.

Sekretæren fungerer som sekretær for DVSU og deltager i arbejdsudvalgenes møder.

Sekretariatets arbejdsopgaver :

- redigering og rentegning af oplæg fra arbejdsudvalgene,
- trykning og udsendelse af standarder til kritik, samling af indkommet kritik,
- trykning og udsendelse af færdige standarder,
- salg af standarder, abonnementer,
- varetage eksterne kontakter (se organisationsplan),
- samarbejde med værfternes interne standardafdelinger.

2. Målsætning

Det er DVS's hovedmål at udarbejde DVS-standarder således, at der ved standardernes udarbejdelse, teknisk og økonomisk, tilstræbes en optimal løsning, som tilgodeser rederiers og værfters interesser.

DVS's målsætning, politikker og styringsmodel er i øvrigt fastlagt i DVS 00004.

3. Typer af standarder

DVS lægger hovedvægten på udvikling af standarder med højt teknologisk indhold, herunder standarder for systemudformninger og beregninger. De eksisterende enkle komponentstandarder vil blive holdt ajour, og i det omfang det skønnes formålstjenligt, omformet fra detaljerede produktionsstandarder til ydeevnestandarder (performance standard).

4. Sagsbehandling

Rutiner ved sagsbehandling i forbindelse med udvikling og revision af standarder er beskrevet i DVS 00003.

5. Distribuering af DVS-standarder

DVS-standarder forhandles af sekretariatet dels i løssalg af enkelte standarder, dels som komplette mappesæt.

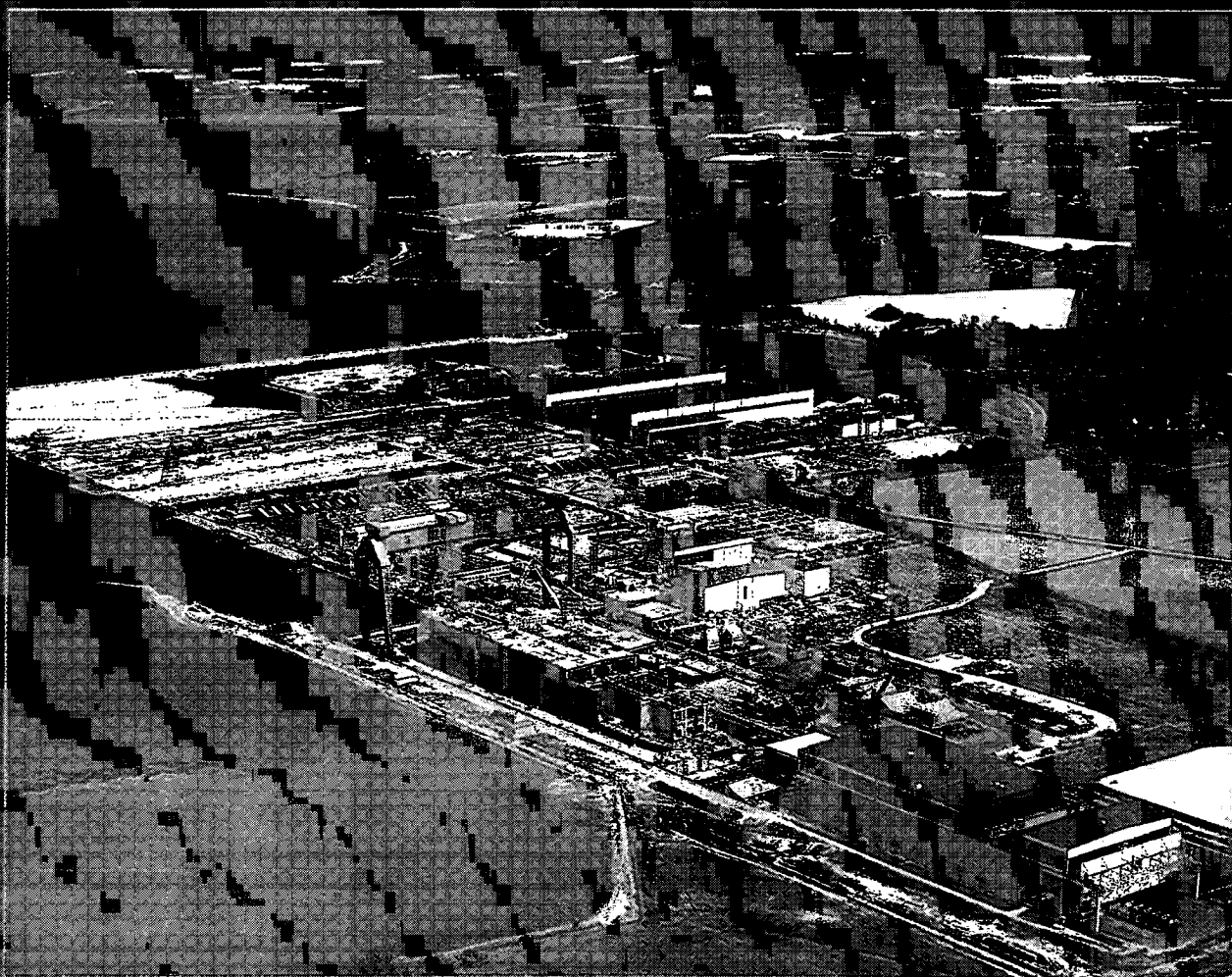
Ved køb af komplet mappesæt tegnes samtidig abonnement på nye og reviderede standarder, som automatisk vil blive tilsendt fra sekretariatet til en favørpris.

Sekretariatet er til disposition med oplysninger om priser etc.

Enclosure (2)

Odense Steel Shipyard Ltd.

Aerial View



Tomorrow's shipbuilding technology



Enclosure (3)

Odense Steel Shipyard Ltd.

Handout Information

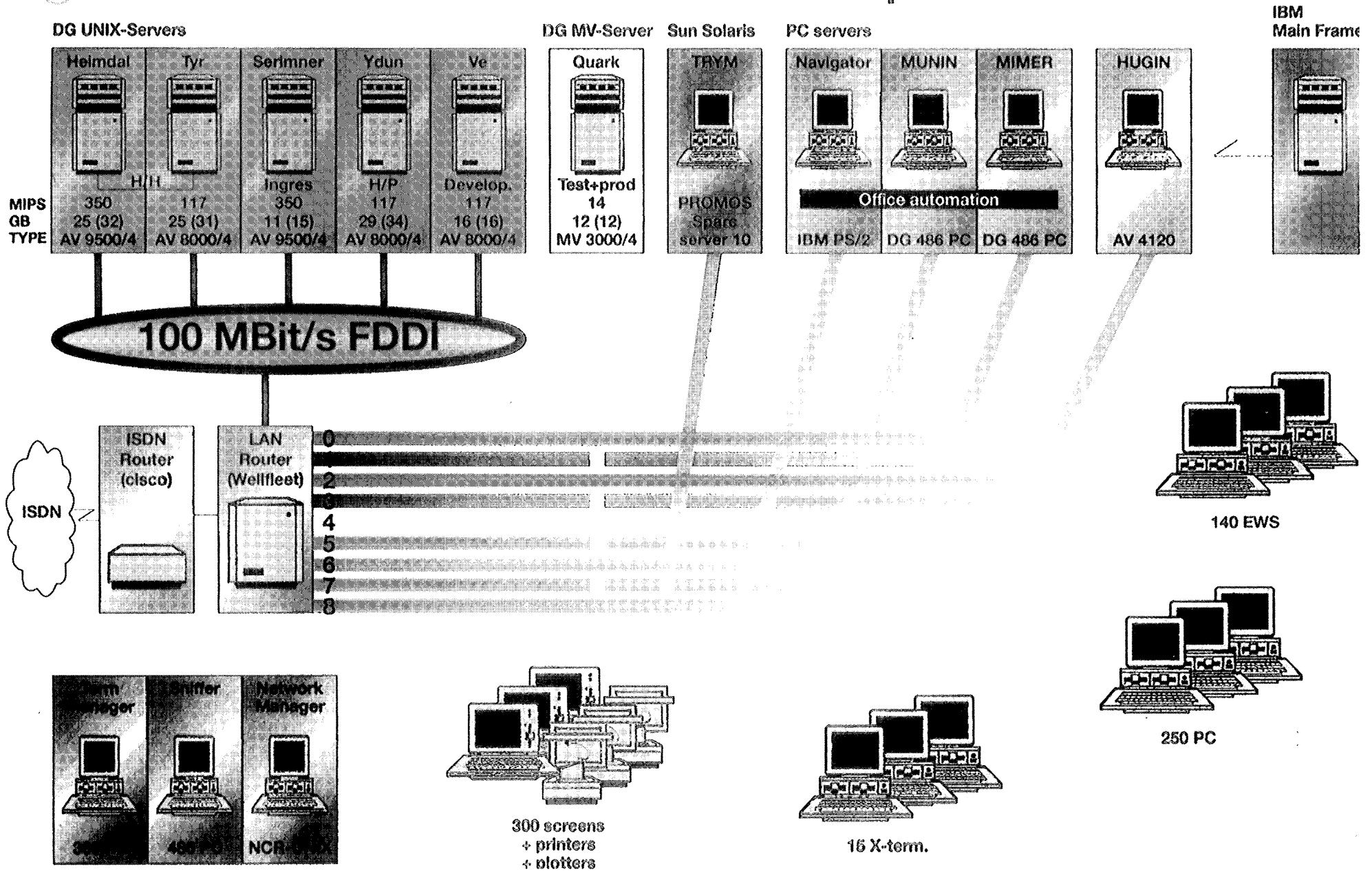
on

HICADEC/PROMOS and LAN

CAD/CAM

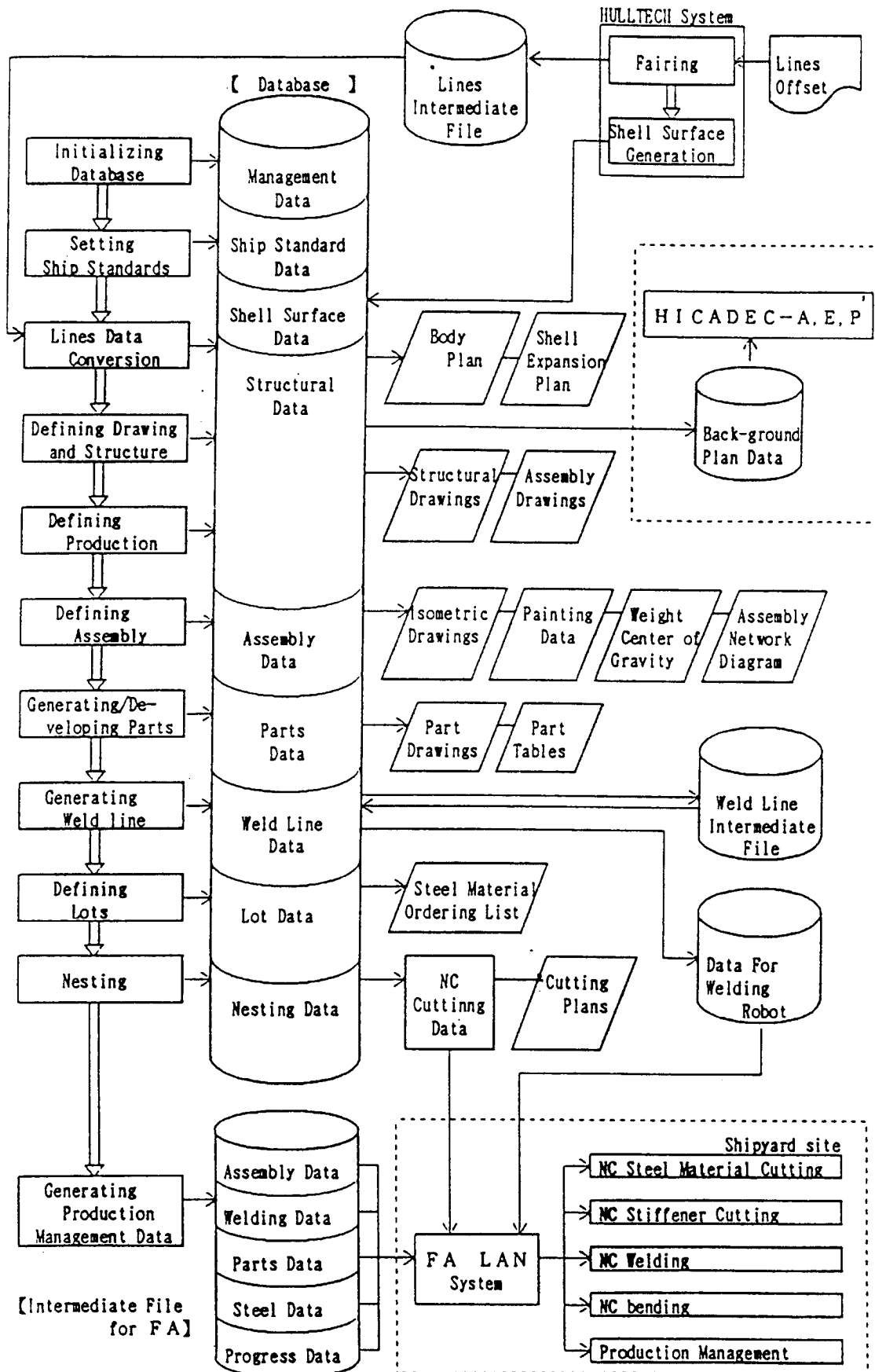


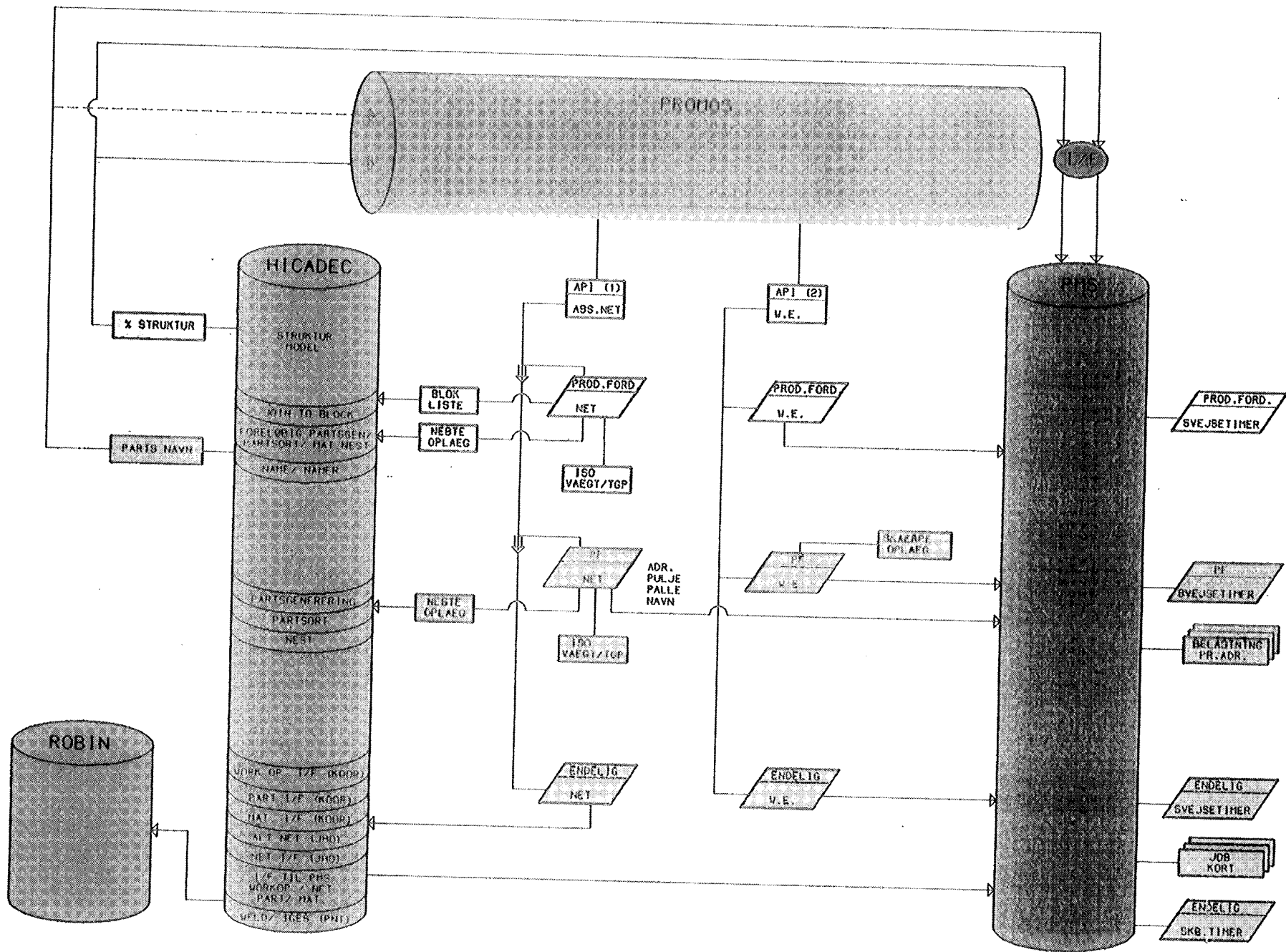
Local Hardware Set Up





HICADEC-H SYSTEM FLOW DIAGRAM





**NSRP SP6 PROJECT 6-94-1, WORLD CLASS SHIPBUILDING STANDARDS
RESPONSE TO QUESTIONS FROM ODENSE STEEL SHIPYARD Ltd., LINDO, DENMARK**

NSRP SP6 PROJECT 6-94-1
WORLD CLASS SHIPBUILDING STANDARDS
QUESTIONS AND RESPONSES FROM
ODENSE STEEL SHIPBUILDING LTD
LINDO, DENMARK

**NSRP SP6 PROJECT 6-94-1, WORLD CLASS SHIPBUILDING STANDARDS
RESPONSE TO QUESTIONS FROM ODENSE STEEL SHIPYARD Ltd., LINDO, DENMARK**

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The following listing of Societies, Regulatory Authorities and Standards Agencies are offered to provide the reader with the agency name, country of origin and their associated abbreviations, which are addressed in this document. Refer to ASTM Standard Guide Listing - ASTM F1547-94, Relevant Standards and Publications for Commercial Shipbuilding, for a more comprehensive listing of standards.

INTERNATIONAL ASSOCIATION OF CLASSIFICATION SOCIETIES (IACS) MEMBER SOCIETIES

Lloyds Register of Shipping (Lloyds) - Great Britain
American Bureau of Shipping (ABS) - United States
Det Norske Veritas (DNV) - Germany
Germanischer Lloyd - Germany
Bureau Veritas - France

REGULATORY AUTHORITIES

United States Coast Guard (USCG)
United States Public Health Service (USPH)
International Maritime Organization (IMO)

INTERNATIONAL STANDARDS ORGANIZATION

International Standards Organization (ISO)

NATIONAL STANDARDS

Deutsches Institut für Normung (DIN) - Germany
American National Standards Institute (ANSI)
British Standards Institute (BSI)
Japan Industry Standard (JIS)
Korea Industry Standard (KIS)

ASSOCIATION STANDARDS

Danske Værfters Standardiseringsudvalg (DVS) - Denmark

NSRP SP6 PROJECT 6-94-1, WORLD CLASS SHIPBUILDING STANDARDS RESPONSE TO QUESTIONS FROM ODENSE STEEL SHIPYARD Ltd., LINDO, DENMARK

SP 6 PROJECT 6-94-1 QUESTIONS	ODENSE STEEL SHIPBUILDING LTD RESPONSE
A1. IDENTIFICATION OF PREDOMINANT STANDARDS	
A1.1 Is an index of Standards applications available for review?	Yes.
A1.2 What is the extent of International, Domestic & Local Shipyard Standards application?	OSS uses their own Standards publication supplemented by DVS or any others that best satisfy requirements.
A2. POPULATION STUDY OF SHIPYARD, TYPES OF COMMERCIAL VESSELS AND ENVIRONMENT EVALUATION QUESTIONS	
A2.1 What has led the shipyard to its current market segment?	AP Moeller Group Shipping Company
A2.2 What type of ships has the shipyard built over the last 25 years?	Principally container ships and tankers.
What are the annual tonnage trends?	No Response
What are the annual ship completions?	Apporximately 3-4 per year
A2.3 Do you carry out ship construction and repair?	Construction - yes. Ship repair - not as a general rule. [Presently repairing the main engine crankshaft on a Maersk containership.]
What is the repair to new construction ratio?	Negligible repair
What is the ratio of Commercial to Navy repair work?	N/A
What is the extent of modularization on new construction and repair work?	Modularization used extensively.
How is modularization applied and integrated on new construction?	No Response
What is the extent of pre-outfitting of blocks prior to erection?	90% range. ER block landed with propeller lineshaft installed.
A2.4 How many ships are currently under construction?	1 ship to be floated out of the graving dock in 3 weeks. Pre-assembly for 2nd of 12 started.
What is the schedule for current and future business?	No Response
How well are schedules met?	They are met.

NSRP SP6 PROJECT 6-94-1, WORLD CLASS SHIPBUILDING STANDARDS

RESPONSE TO QUESTIONS FROM ODENSE STEEL SHIPYARD Ltd., LINDO, DENMARK

SP 6 PROJECT 6-94-1 QUESTIONS	ODENSE STEEL SHIPBUILDING LTD RESPONSE
How does standardization affect construction and schedules?	Enables use of learning curves. Permits accurate construction time periods.
A2.5 What is the size and composition of the current labor force?	
What are the average annual total personnel numbers?	2800
Hourly	2400
Salaried	400
sub contracted	200
How has the level and composition of personnel changed over the last 10 years?	Down from 7000+ in the mid 1980's
What has influenced composition of personnel the most?	Work backlog, technology and automation.
What are the general experience levels of personnel at the yard?	No Response
What is the average employment years of personnel at the yard?	No Response
Hourly	No Response
Salaried	No Response
Subcontracted	No Response
How has the experience level of personnel changed over the last 10 years?	No Response
A2.6 What do you believe is the market position for the worldwide shipbuilding industry?	No Response

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RESPONSE TO QUESTIONS FROM ODENSE STEEL SHIPYARD Ltd., LINDO, DENMARK

SP 6 PROJECT 6-94-1 QUESTIONS	ODENSE STEEL SHIPBUILDING LTD RESPONSE
A2.7 Who are this shipyards major competitors	Japan 42%, Europe 24%, S. Korea 16%, Others 18%
What is your share of the market segment?	2.8% of world market
What are the current market risk areas?	No Response
What are the economic effects?	No Response
A3. SHIPYARD / CLASS SOCIETY STANDARDS AND POPULATION STUDY	
These questions explore the standards bases that are available and used in preference by the Shipyard and Classification Societies.	
A3.1 With your current customer base, which Class Societies are you presently working with?	Principally Lloyds and others where required.
What is your Class Society of choice?	No specific choice. Decided by owner. Have used Lloyds, ABS and DNV.
To what extent do you use ISO standards?	Utilized to extent OSS had a need. Used any number of sources and added yard specific information to suit OSS.
To what extent do you augment Class Society requirements with yard standards (basic proportion only)?	Where needs or practicality dictates. Example, OSS adds ~ 5mm to lineshaft diameter in way of bearings for re-machining over life of vessel. Generally no interest in driving costs higher.
How do you accommodate different customers' needs with respect to Class Societies and Standards applications?	As required by the customer. Changes in material requirements would require a new parameter HICADEC input to allow proper material/component selection from CAD data base.
Do you use a Master set of standards and make minor alterations as necessary?	Yes, deviations to suit customer (at a cost unless in original contract).
Are standards sets based on specific, and limited range of, Customers/Class Societies?	Customer driven.
How are standards and standardization presented to the customer?	Standards used are given to the customer for his signature acknowledgment as part of the contract.
How are standards and standardization incorporated in Ship Specifications?	By a statement in the contract that invokes OSS standards or by specific wording in the contract that describes the standard(s) in full.

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RESPONSE TO QUESTIONS FROM ODENSE STEEL SHIPYARD Ltd., LINDO, DENMARK

SP 6 PROJECT 6-94-1 QUESTIONS	ODENSE STEEL SHIPBUILDING LTD RESPONSE
A3.2 How do you access other Class Societies standards?	OSS has a full set of JIS and DVS standards. They have catalogues only for other standards such as DIN, BIS, etc. The latest revisions for all are available at Denmark's University, on an as need basis.
What is the extent and scope of the Shipyard library?	See A3.2 above.
What is the format of Shipyard Standards?	Refer to attachment (1) for examples of OSS standards.
Does a Shipyard Standards Manual exist and what does it contain?	OSS has developed about 580 standards and compiled them in 9 volumes. They are distributed in full to 40-50 areas in the shipyard.
A3.3 Does the Shipyard library have a standards equivalency cross reference system.	Yes. They have the Japan Maritime Standards Association report that cross references Class Society Standards. OSS would like ISO to adopt and publish this report. Some OSS standards have a reference for its standard of origin - as applicable.
A3.4 To what extent are specific equipment's and other standards pre-approved for use?	Vendors initiate action as necessary.
Are these standards pre-approved?	To some extent , yes - where required and previously approved by Class Societies.
By Regulatory Authorities?	Did not have but believed not a problem.
By Class Societies?	Yes
Are standards contract specific?	In some cases. Driven by the Customer and Class Society specified in the contract.
A3.5 How do you negotiate requirements with the Customer?	Standards are provided for evaluation stage. Detail discussions - Customer to OSS - will be with the technical department responsible (technician level) will follow.
Who negotiates the standard?	See A3.5 above.
Contracts Group?	Produces/collects input from disciplines develop and finalize formal contract.
How does the Standards Group integrate with the negotiation process?	As required, but not as a rule.
A4. ORGANIZATION AND BENEFITS	
The following questions concern the existence of the standards group and are based on a review of the shipyard organization.	
A4.1 Why is the standards group positioned in the organization the way it is?	To enable serving needs across all disciplines and to provide a central control for the formalizing and distribution of standards.
Who does the Standards Group report to?	VP of Engineering

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RESPONSE TO QUESTIONS FROM ODENSE STEEL SHIPYARD Ltd., LINDO, DENMARK

SP 6 PROJECT 6-94-1 QUESTIONS	ODENSE STEEL SHIPBUILDING LTD RESPONSE
Who reports to the Standards Group?	All disciplines - each having responsibility for their own standards. Each discipline has a designated person responsible for standards.
Who are the Standards Group primary customers?	Technical disciplines.
A4.2 When was the Standards Group formed and why.	Formed in 1986 to provide uniform application of standards format and to provide for uniform and controlled distribution of standards information throughout the shipyard.
How did the Standards Group develop and what is the group's history?	Group was much larger - 9 people. currently 2 people.
Where is the Standards Group physically located?	Within the Engineering complex.
What is the charter of the Standards Group?	To coordinate the formal standard for issue upon receipt of the approved standard from Engineering; maintain a central file; provide latest information/issues of issued Class Society standards.
What is the short and long term goal of the Standards Group?	Implementation of the DVS as the only standard for OSS. (DVS is used to some extent by all of Denmark's 10 shipyards and exists as the only standard for 2 of these shipyards.)
A4.3 What are the internal responsibilities of the Standards Group?	Individual disciplines are responsible to negotiate approval of standards as required with Class Societies (usually starting with Lloyds). The Standards Group is responsible to control formal documentation, finalize format and issue.
A4.4 What is the external awareness of the Standards Group to the world class standards?	Very high
Meeting standards?	OSS does a good job at meeting standards. Standards are an integral part of their quality program.
Maintaining standards?	The maintenance of standards is done by the cognizant technical division on an as required basis - "as required" can be identified by anyone.
Developing standards?	New standards are developed by adopting and/or modifying existing standards or by creating a totally new standard with input from all users.
What is the Standards Group accessibility to National and International standards?	The Denmark University maintains current revisions of Class Society and national or association standards and they are readily available upon request.
A4.5 What is the structure of the Standards Group?	
What are the personnel capabilities, skills and educational levels?	Very experienced senior people with desire to work on standards and has the breadth and depth to review with all production affected areas.

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SP 6 PROJECT 6-94-1 QUESTIONS	ODENSE STEEL SHIPBUILDING LTD RESPONSE
What is the cycle of personnel to and from the Standards Group?	Not rotated by any plan - maybe upon request.
What are the specializations of the Standards Group personnel?	Refer A4.3 response.
What is the supervisory level required for the Standards Group?	No Response
What supplementary training is offered/required for the Standards Group?	None. Need to start as a skilled person in area assigned.
What facilities are available to the Standards Group to expedite standards work (e.g., PC, Network system)?	PC's for word processing only. Most all standards are resident in their respective technical departments CAD data base.
A4.6 How are shipyard standards developed?	
What is the standards development process?	Specific disciplines within Engineering develop their own standards and process through the required approval process, starting with Lloyds, and then submit the approved standard to the Standards Group for formal issue and filing.
How are the standards requirements evaluated?	By the originator, by purchasing and by Class Society. (MM Moller has approval option for all standards.
What is the approval process for stds?	See above.
How is shipyard feedback on standards requirements achieved?	New requirements are identified by Engineering or Production.
How is vendor feedback on standards requirements achieved?	Very rare for general purchase items - does occur for performance standards as necessary.
A4.7 How is the Standards Group perceived in the shipyard?	Well accepted because of experience and knowledge.
By upper management?	Important all the way to the Chairman, Mr MM Moller. Ensures consistent quality. Provides basis for negotiations with the customer. Provides for work proficiency.
By internal and external customers	same as above
What is the qualitative value of the Standards Group?	High.

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SP 6 PROJECT 6-94-1 QUESTIONS		ODENSE STEEL SHIPBUILDING LTD RESPONSE	
A.5 STANDARDS DATA BASES			
A5.1 Are Class Society requirements and standards held in a data base?		No, as to the final formal standard. Yes as to individual standards technical content, which are held in the technical disciplines CAD data base.	
A5.2 What is the size and type of the data base?		Approximately 580 (see above A5.1)	
A5.3 How is the data maintained and updated.		On an as needed basis by the cognizant technical department.	
A5.4 Are National and International Standards held in the data base?		No	
A6. PAPER BASED STANDARDS CONFIGURATION			
A6.1 What is the mechanism for distribution?		As a paper product from the Standards Group to 40-50 Standards volumes located throughout the shipyard. "Owners" of these Standards volumes are responsible to incorporate new/updated revisions into their own volumes.	
A6.2 What is the format of Standards and how are they processed?		Format shown in Attachment (1). Processed by numerous methods - manually, CAD and word processors - by the discipline and Standards Group personnel.	
A6.3 How are the standards tied to other engineering or production documents?			
Engineering Drawings?		Integrated into the drawings - by reference entry into the CAD model or by direct insertion onto a production drawing	
Ship Specifications?		Specified in the Contract.	
Production Plans?		Same as Engineering Drawings.	
Check lists?		Standard checks are referenced in the Engineering check lists.	
A7. CAD BASED STANDARDS CONFIGURATION			
A7.1 What is the architecture of standards in cad?		Entered into HICADEC for both Structure and Outfit - is rule based, built in module.	
A7.2 How are standards integrated with CAD based Engineering?			
Catalog data base		In HICADEC P	
Catalog data base with vendor input and format?		no	

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SP 6 PROJECT 6-94-1 QUESTIONS	ODENSE STEEL SHIPBUILDING LTD RESPONSE
Interface between Engineering CAD and standards data base?	General material requirements and dimensions for items such as valves and flanges are incorporated into the data base.
A7.3 How are standards presented to the CAD operator?	
By default?	By default after initial selection.
By selection from accessible data base?	yes
By decision tree?	A decision tree is integrated into HICADEC with technical over-ride where applicable. [OSS purchased a well integrated system and then significantly enhanced it to suit OSS requirements.]
A7.4 How is the engineering bill of material used downstream?	
Material requirements planing (MRP or MAC-PAC)?	yes
Network system?	yes
Manual system?	no
A7.5 How are standards distributed to Computer Aided Manufacturing?	electronically
A7.6 What standards are best incorporated into CAD/CAM?	Manufacturing standards and details (non-performance based)
What are the priorities?	timely
Are those standards stable or dynamic?	stable
Are the standards restrictive?	not restrictive

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RESPONSE TO QUESTIONS FROM ODENSE STEEL SHIPYARD Ltd., LINDO, DENMARK

SP 6 PROJECT 6-94-1 QUESTIONS	ODENSE STEEL SHIPBUILDING LTD RESPONSE
B1. ORGANIZATION IDENTIFICATION	
B1.1 What is the approximate ratio of computers to engineers?	High, 1:1, in the cognizant technical sections - approximately 12 people. None in the Standards Group - 2 people.
B1.2 Are there any subsidiary yards in the company?	Yes, OSS recently acquired a shipyard in Estonia, to build hatch covers. ~ 500 people
B1.3 What is the level of Engineering done in house vs subcontracted?	All Engineering is done in house. [Equipment having performance based standards have engineering done by the vendor, but final review and approval rests with OSS.]
B1.4 What types of engineering are typically subcontracted?	Performance based standards and or contract specified components.
B1.5 What is the awareness/familiarity of contract level designers/engineers in standards details?	High. Integrated in the HICADEC system with utilization triggered by programmed questions.
B1.6 What is awareness/familiarity of production personnel in standards details?	Very high. Production personnel have access to local work stations and often are persons reassigned from Engineering to Production following design completion and at start construction. These same people often return to Engineering to resolve design problems as they become visible in the production cycle.
B1.7 How are make/buy decisions made? Why might they be changed? How are they changed?	Most parts made in house. Engineering evaluations are made, working with Purchasing, for cost effectiveness. May subcontract out to local specialized firms.
B2. STANDARDS INTEGRATION	
B2.1 How are ship specifications categorized/indexed? Are Ship Work Breakdown Schedules (SWBS) used?	OSS Standard (not DVS) 450 page spec. May be modified per customer request.
B2.2 How are system design requirements provided to engineers?	CAD. Build strategy programmed into CAD system.
B2.3 Who is responsible for selection of standards on each contract?	Varies with the standard. Engineer/designer selects hanger type; Dept Head selects material schedule.
B2.4 How are restrictions on use of standards identified?	All standards used are specified in the Production dwgs.

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RESPONSE TO QUESTIONS FROM ODENSE STEEL SHIPYARD Ltd., LINDO, DENMARK

SP 6 PROJECT 6-94-1 QUESTIONS	ODENSE STEEL SHIPBUILDING LTD RESPONSE
B2.5 What type of Manufacturing Resource Planning (MRP) process do you use? This process identifies when quantities of each type of item required to build the ship is required in the shipyard.	Integrated into the Hicadec system schedule (structural and outfit CAD HICADEC/PROMOS.)
B2.6 How do engineers find standards?	CAD and 9 volumes of OSS standards plus utilization of other standards where OSS standards do not satisfy customer needs.
B2.7 How do engineers/designers identify the components they want to use from the standards on their drawings?	Part numbers on standards are identified/input in model.
B2.8 How many contract unique standards does the shipyard have?	Very limited.
B2.9 How are changes to the standards handled?	By cognizant department.
B2.10 How are standards imposed on sub-contractors?	Provided to them in OSS purchase order.
B2.11 How are planning issues handled for standard vs. non-standard parts?	No difference.
B2.12 How are non-standard items identified to replace standard ones?	As needed.
B2.13 How is non-conforming material handled? What amount of non-conforming material is delivered to the yard? How is this prevented?	Limited equipment received. Not an issue
B2.14 What is the level of detail in a composite drawing? How does it identify system components? How does the composite compare to the diagram?	Minimal - On a need to know basis.

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RESPONSE TO QUESTIONS FROM ODENSE STEEL SHIPYARD Ltd., LINDO, DENMARK

SP 6 PROJECT 6-94-1 QUESTIONS	ODENSE STEEL SHIPBUILDING LTD RESPONSE
B2.15 How well integrated are standard vendors (CAD, purchase specifications, vendor furnished information)?	Limited number of vendors. Contact through fax to get missing information.
B3. INTERNAL APPROVAL PROCESSES FOR STANDARDS APPLICATIONS:	
B3.1 Is there a formal process for maintenance of standards?	Individual departments responsible. Must be signed off by purchasing and cog dept.
B4. PREDOMINANT STANDARDS USED BY REGULATORY AND CLASSIFICATION BODIES:	
B4.1 How do our definitions of standard types compare with yours?	Not much difference
B4.2 Do you have other types of standards that you regularly use?	Quality standards and work processes.
B4.3 Do you have standard vendors? If so, who are they?	Yes, manufacturers listed in ship specifications.
B5. REGULATORY AUTHORITY AND CLASSIFICATION BODY APPROVAL PROCESSES:	
B5.1 Which regulatory/classification bodies require approval of the standards?	Lloyds
B5.2 How is regulatory/classification body approval of standards handled?	Responsibility of cognizant department to obtain final approval from Classification society of specification.
B5.3 Which standards must be approved by these bodies?	Identified on standards and also identified by regulatory bodies and class societies integral with their published documents.
B5.4 How do you view ISO 9000 certification?	Do not intend to get certified but do use philosophy as much as practicable.
B6. USE OF SHIPYARD VERSUS STANDARDS ORGANIZATION STANDARDS:	
B6.1 What are most of the shipyard standards based on? ...JIS, ISO?	DVS, DIN
B6.2 How do the shipyard standards compare to other national or international standards?	Very similar, when new standards are needed, OSS will utilize existing standards whenever possible.

NSRP SP6 PROJECT 6-94-1, WORLD CLASS SHIPBUILDING STANDARDS

RESPONSE TO QUESTIONS FROM ODENSE STEEL SHIPYARD Ltd., LINDO, DENMARK

SP 6 PROJECT 6-94-1 QUESTIONS	ODENSE STEEL SHIPBUILDING LTD RESPONSE
B7. FORMAT OF SHIPYARD STANDARDS:	
B7.1 What are the perceived benefits of standards?	Process gets commitment.
B7.2 How are preferred standards identified?	Not identified.
B7.3 How do you identify the following requirements in your standards?	
Engineering selection criteria?	Rely on engineering experience.
Identification on engineering products	Part Numbers
Fabrication information for suppliers?	Copy of standard provided through purchasing.
Fabrication test requirements?	QC handles all testing. Not part of standards.
Installation information for production personnel?	Shown on production fab or installation drawings.
Installation test requirements?	Shop process.
B8.2 What are some recent changes in your standards program?	None significant. Working through DVS tolerances of steelwork plate specs and surface protection.
B8. EXAMPLES OF TYPICAL SHIPYARD STANDARDS:	
B8.1 What are your standards for the following applications?	
Pipe hangers	U bolts built by vendor
Ladders	See Attachment 1
Wireways	See Attachment 1
B8.2 Are these parts built by the yard or by sub-contractors?	Built by yard
B8.3 Are subcontractor's parts specified or does subcontractor build to shipyard requirements?	Both
B8.4 What primary factors influence these designs?	
Internal shipyard processes?	Primarily

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RESPONSE TO QUESTIONS FROM ODENSE STEEL SHIPYARD Ltd., LINDO, DENMARK**

SP 6 PROJECT 6-94-1 QUESTIONS	ODENSE STEEL SHIPBUILDING LTD RESPONSE
National/International Organizations?	May use
Classification Societies?	Where required

ATTACHMENT (1)

- **Examples of Odense Steel Shipyard Standards**

1. Generelt
2. Anvisning for udførelse og opsætning af rørboringer
3. Montering af rørbøjler
4. Afstand mellem rørbøjler og rørboringer

Gælder fra ny serie ovgn. 113.

1. Generelt

1.1 Alle rørboringer skal opsættes i henhold til OS 0501 og 0502 eller efter tegnestuernes tegninger.

1.2 Store rørboringer, som påsvejses styrkekonstruktioner, skal godkendes af ståltegnestuen. Rør fra dn 150, ø D 168.3, og større.

2. Anvisning for udførelse og opsætning af rørboringer

2.1 Almindelige regler :

- det bør altid tilstræbes, at rørene lægges på en sådan måde, at rørboringerne bliver så korte som muligt.
- rørboringer anbringes altid på stæg, bjælker og andre forstærkninger (kraveller eller lign.), hvor dette ikke kan lade sig gøre, anbringes for rør over dn 50, ø D 60.3 doblingsplader.
- rørboringer anbringes altid min. 50 mm fra svejsesømme.
- skal rørboringer påsvejses på faceplade, må den kun anbringes midtover kropplade, max. afvigelse 25 mm til hver side (se skitse side 8).

2.2 Rundstålbojler OS 3176 og (OS 3521).

2.3 Rørholder OS 3188 til rørbøjler OS 3176.

2.4 Pladerørholder OS 3104.

2.5 Ekspansionsstop OS 3107.

2.6 Doblingsplader se OS 0703. Rørboringer for rør mindre eller lig med dn 50, ø D 60.3 kan opsættes uden doblingsplader. På olietæt skot samt vebspant opsættes altid doblingsplader.

2.7 Retningslinier for påsvejsning af mindre konstruktionselementer se OS 0702.

3. Montering af rørbøjler

3.1 Frigående rørbøjler se fig. 1

3.2 Fastspænding se fig. 2, (4) og (5).

4. Afstand mellem rørbøjler og rørboringer

4.1 Afstand mellem rørbøjler og rørboringer se OS 0502 side 1-3.

4.2 Mindre rør (manometerrør osv.) kan fastspændes til større rør, se fig. 3 side 2

Iøvrigt se montageeksempler side 4-9. Grænse for rørstørrelse i viste eks. er dn 300, ø D 323.9
For større rør tegnes og bestilles rørboringer af tegnestuen.

For ophæng uden bøjler se side 10-11, max. dn 150, ø D 168.3.
Note : For lagerføring af standard og materiale se gældende EDB-lagerliste.

Skitse for rundstålbeile

Anvendes for rør dn 15 - 1000, udv. ø D 21.3 - 1016 (stål- og metaller).

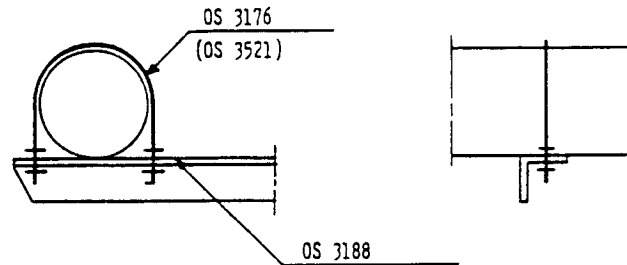


FIG. 1

Fastspændt rør

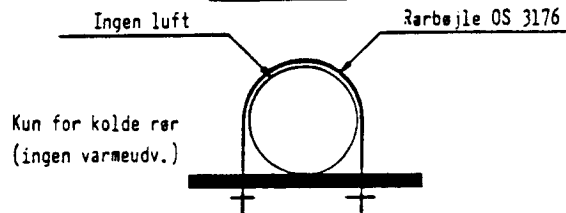


FIG. 2

Anvendes for rør mindre ell. lig med dn 8, ø D 13.5.

- 1) På åbent dæk eller i fugtige rum må der kun anvendes rustfrie slangebånd.

Skitse for rundstålbeile

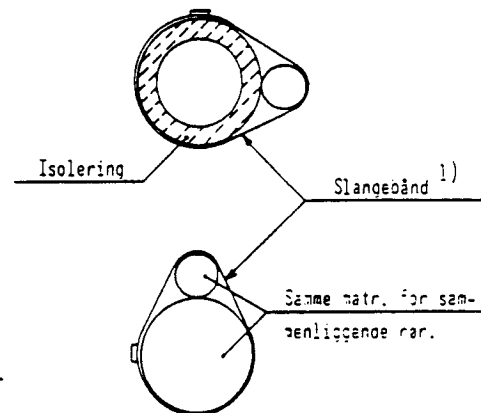


FIG. 3



FIG. 4

Anvendes for rør mindre eller lig med dn 15, ø D 21.3, max. 9 rør sammen.

OBS.: Må kun anvendes til måneometerrør og lign. af blødt kobber. For stive rør, f.eks. hydraulikrør af jernbælt og lign. må der anvendes andre rørophængningsforer, se rørophænger for hydraulikrør OS 3131.

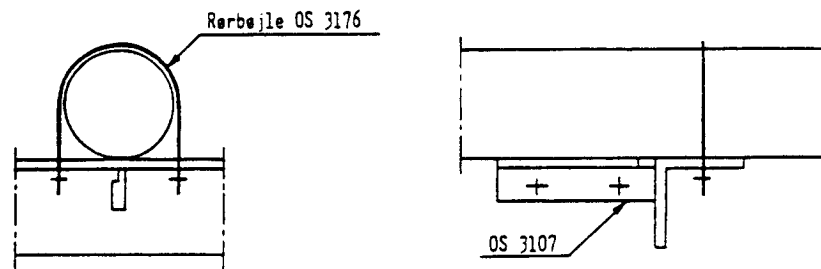


FIG. 5

Fastspændt rør med ekspansionsstop

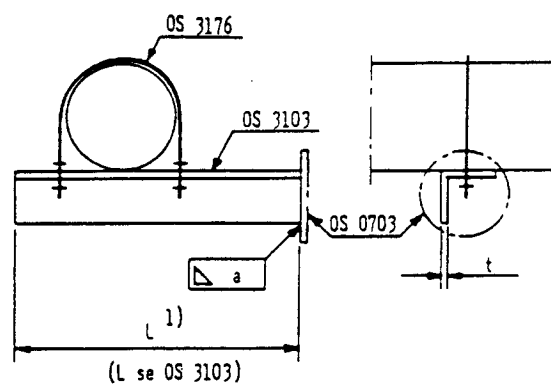


FIG. 6

Rørbøjle t	Svejsning a
5	3
7	3.5
9-10	4.5

Doblingsplade OS 0703			Anvendes til
Diam.	tykk.	Færd. varenr.	— stål osv.
80	8	008051	30 x 30 og 40 x 40
110	10	008064	50 x 50 og 65 x 65
160	12.5	008077	100 x 65
220	14	008080	150 x 75

1) L max. 500 mm. Hvis L er større end 600 mm anvendes fig. 7.

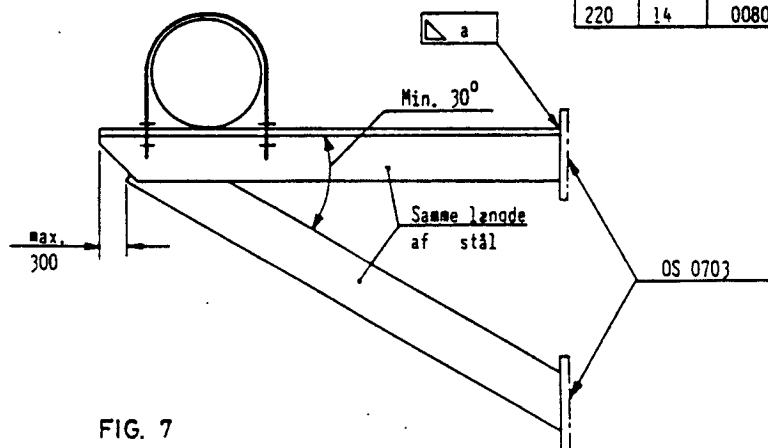


FIG. 7

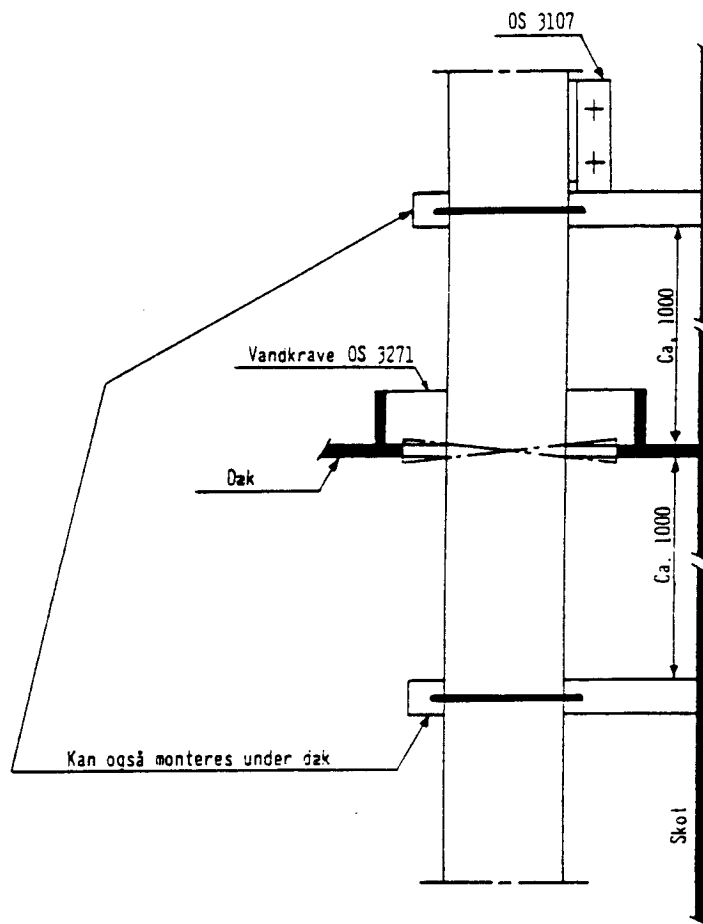


FIG. 8

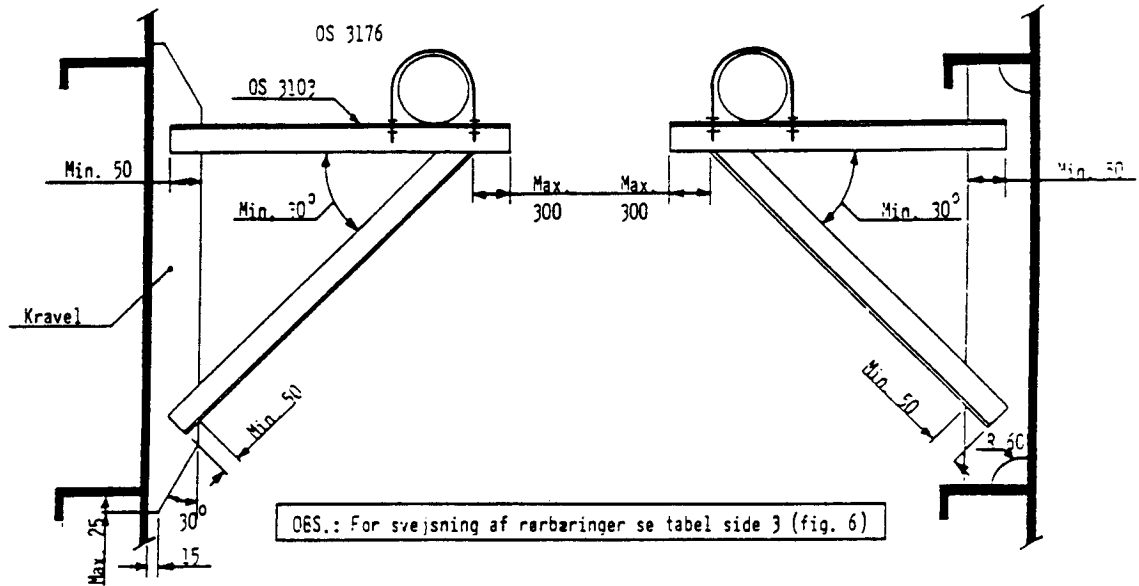


FIG. 9

FIG. 10

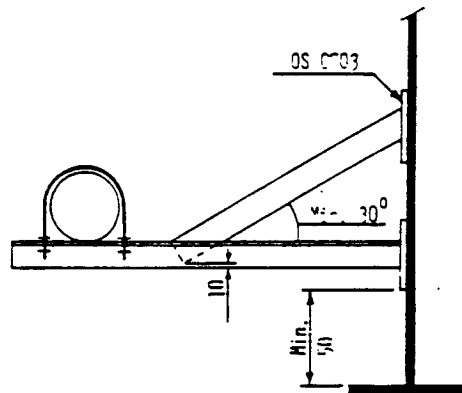


FIG. 11

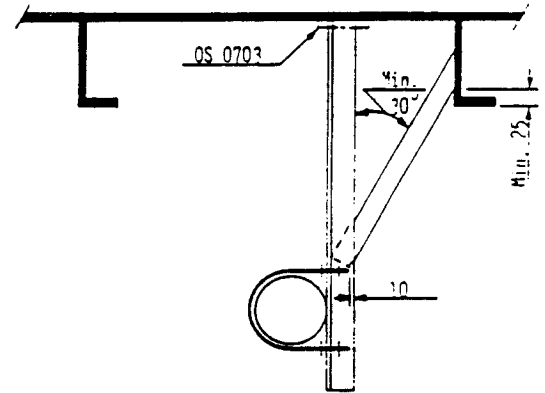


FIG. 12

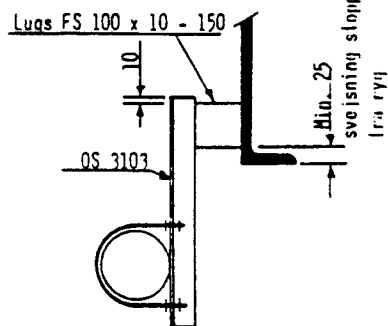


FIG. 13

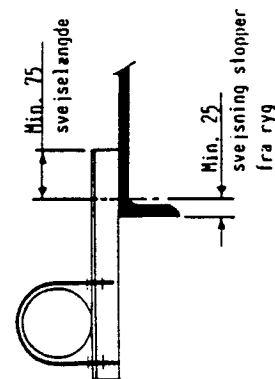


FIG. 14

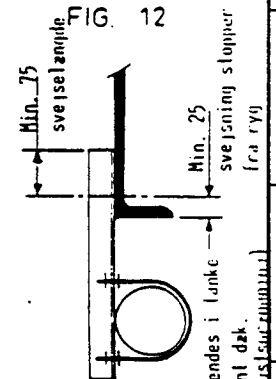
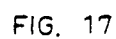
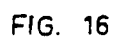
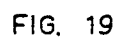


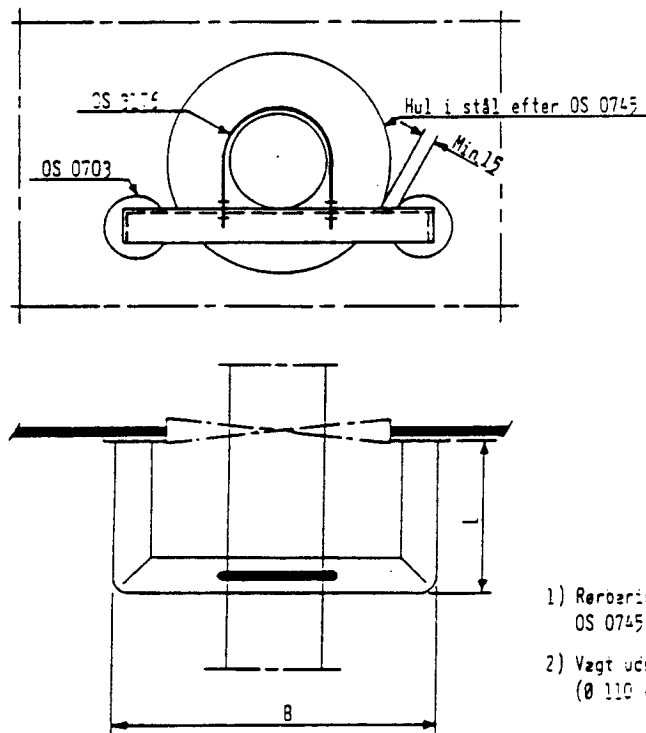
FIG. 15

H3 ikke anvendes i luge
sæl på åbent dak.
(for for rustbeskyttelse)



5) Min. 50.





- 1) Rørbaring udført efter hul i stål OS 0745 (stål og med NT 100)
- 2) Vægt uden coolingsolader.
(Ø 110 = 0.75 kg, Ø 160 = 1.97 kg)

FIG. 20

Rør		Rørbaring 1)						Dobblingsolade OS 0703	
dn	udv. dia.	g	l	udfol. læng.	dia.	matr. v. nr.	vægt kg	g D	for. v. nr.
10 - 20	17.2 - 25.3	210	180	550	30 x 30 x 5	020275	1.32		
20 - 32	23.7 - 42.4	260	230	620	40 x 40 x 5	020291	1.84		
32 - 50	48.3 - 60.3	320	300	700	50 x 50 x 5	020303	2.6-		
65 - 100	76.1 - 114.3	420	410	822	60 x 60 x 8	020329	5.32	110	008064
125 - 150	139.7 - 168.3	520	520	940	65 x 65 x 9	020358	8.10	110	008064
200 - 250	219.1 - 273	700	700	1142	75 x 75 x 8	020374	16.0	160	008077
300 - 450	323.9 - 457.2	900	950	1378	100 x 100 x 10	020415	21.0	160	008077

BES.: For svejsning af rørbaringer se tabel side 3 (fig. 6)

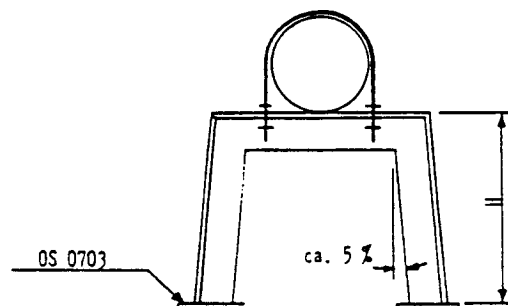


FIG. 21

Buk for enkelt rør (dn 150 - 400, Ø D 168.3 - 406.4). Hvis H er større end 2 x rørets udv. dia. tegnes og bestilles den af tegne-

ANVENDELSE: I TANKE.

Al svejsning min.

5.0

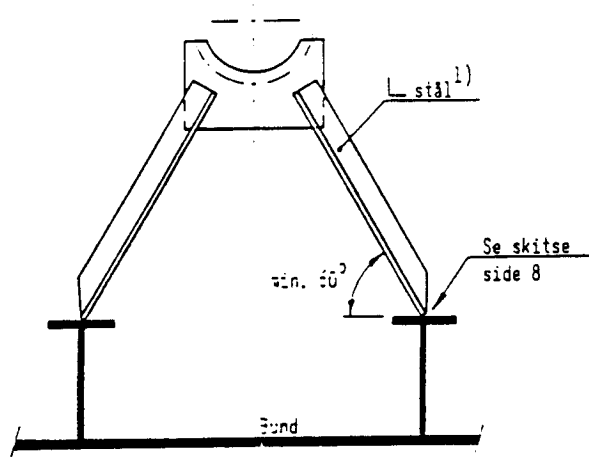


FIG. 25

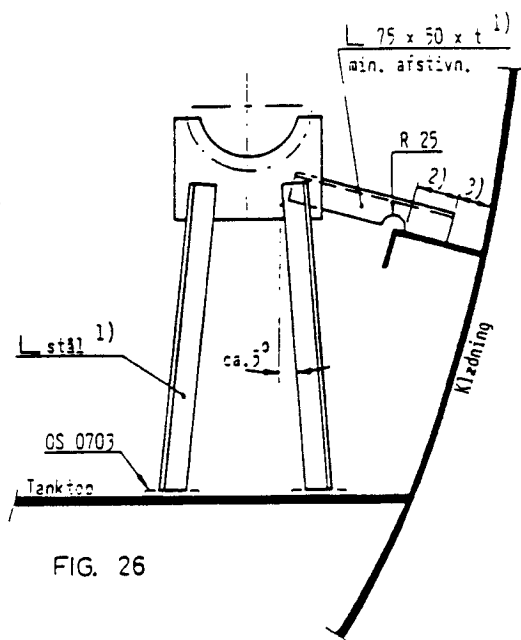


FIG. 26

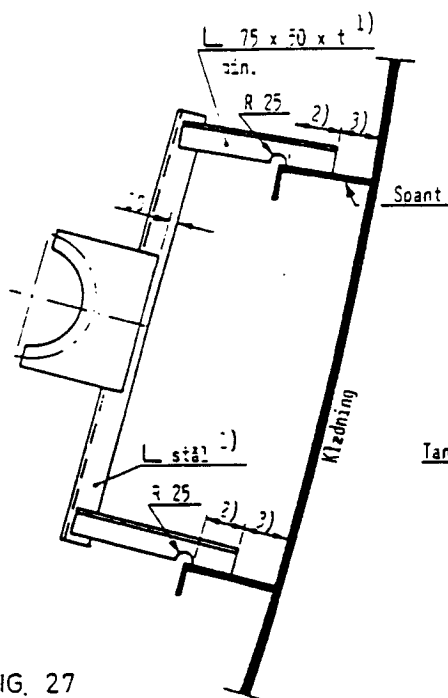


FIG. 27

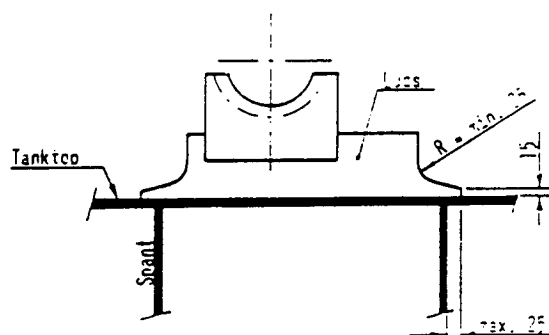


FIG. 28

- 1) $t = \text{min. } 9 \text{ mm}$ i tanke og andre steder, hvor der er fare for kraftig tæring.
- 2) Min. 75.
- 3) Min. 50.

ANVENDELSE: AFLØBSRØR, KABELRØR, LUFT - OG PEJLRØR OSV.

Max. dimension dn 150, Ø D 168.3.
(Sorte rør med muffesamlinger).

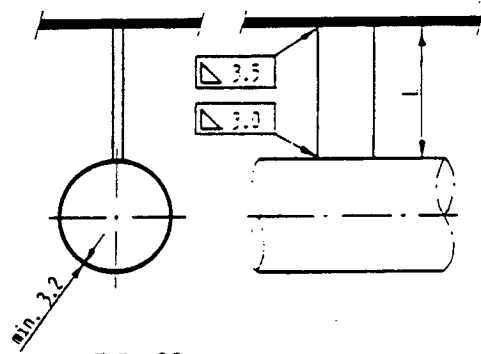


FIG. 29

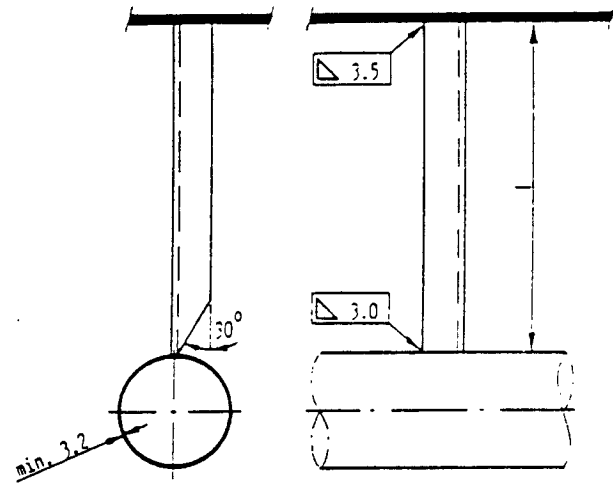


FIG. 30

Ophæng		
Dim.	L max.	matr. varenr.
FS 30 x 5	70	022237
FS 50 x 8	180	022448
L 30 x 30 x 5	350	020275
L 50 x 50 x 5	1000	020303

OS 0703 - kun ved olietat skot

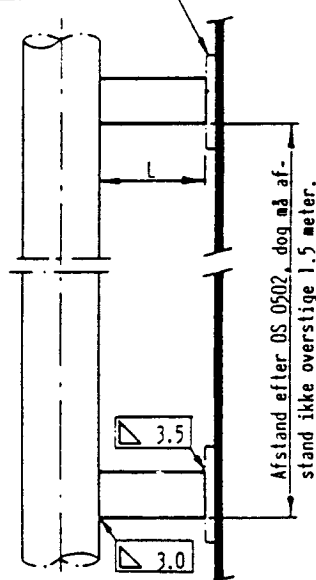


FIG. 31

ANVENDELSE: AFLÆSERRØR, KABELRØR, LUFT- OG PEJLERØR OSV.

Max. dimension dn 150, Ø D 168.3.

(For rør, som bliver varmforzinket, flangesamling)

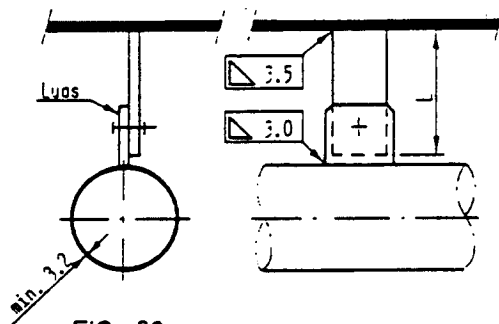


FIG. 32

Ophæng		
Dim.	L. sax.	matr. varenr.
FS 30 x 6	70	022237
FS 50 x 8	160	022448
L 30 x 30 x 5	350	020275
L 50 x 50 x 5	1000	020307

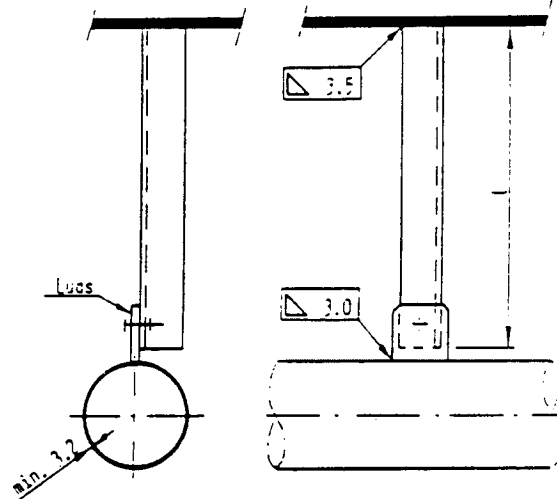


FIG. 33

OS 0703 - kun olietæt skot

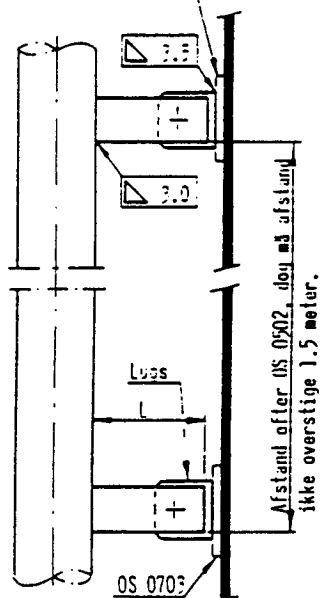
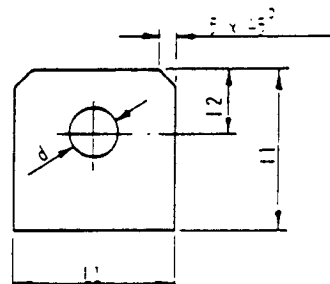


FIG. 34

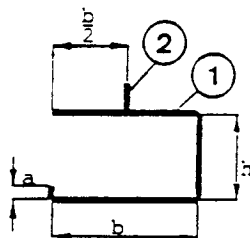
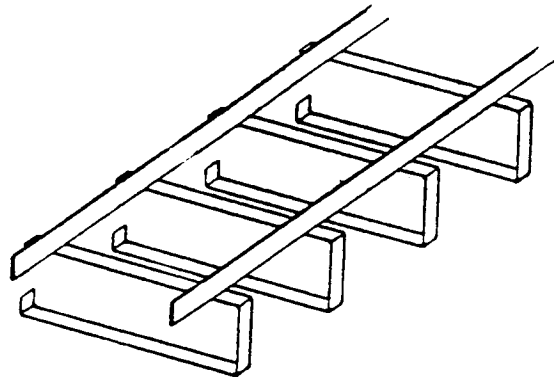
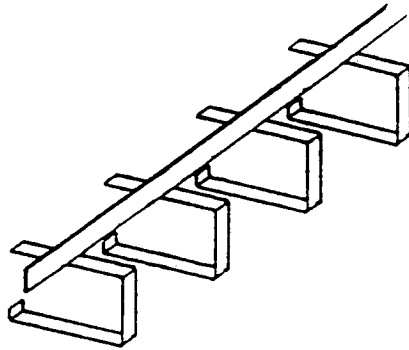
Lugs



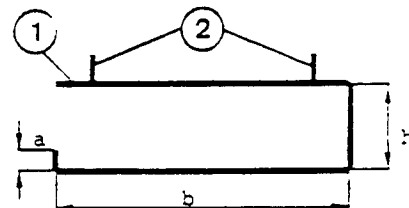
Rør		Lugs					matr. varenr.
dn	Udv. diam.	L1	L2	d	Dimension		
10 - 50	17.2 - 60.3	40	15	11	FS 40 x 6 x 11		022307
65 - 150	76.1 - 168.3	50	20	16	FS 50 x 8 x 16		022448

Satskrue		Fjederskive		Metrik	
Dim.	varenr.	Dim.	varenr.	Dim.	varenr.
M8 x 25	216015	8.2/14.9/1.6	224147	M8	220906
M12 x 30	216038	12.2/21.1/2.1	224156	M12	220912

Reference til : DVS 71002. Kabelbarer fremstilles efter DVS tegning uden ben.



TYPE 1B og 2



TYPE 3B og 4

Størrelse (b x h)	Standardiseret som DVS type	b	h	a	Vægt kg/stk.
100 x 50*	1B	110	50	20	3.40
150 x 50		150			4.10
210 x 50		210			4.50
410 x 50	3B	410	80	30	8.50
310 x 80	4	310			7.90
410 x 80		410			8.90
110 x 110*	2	110	110	30	3.90
210 x 110		210			5.00
310 x 110	4	310			8.00
410 x 110		410			9.10
510 x 110*		510			10.20
610 x 110		610			11.30

Kabelbarerne svejdes på fladstål med indbyrdes afstand : max. 300 mm.

Overfladebehandling :

Se matespecifikation for pågældende skib.

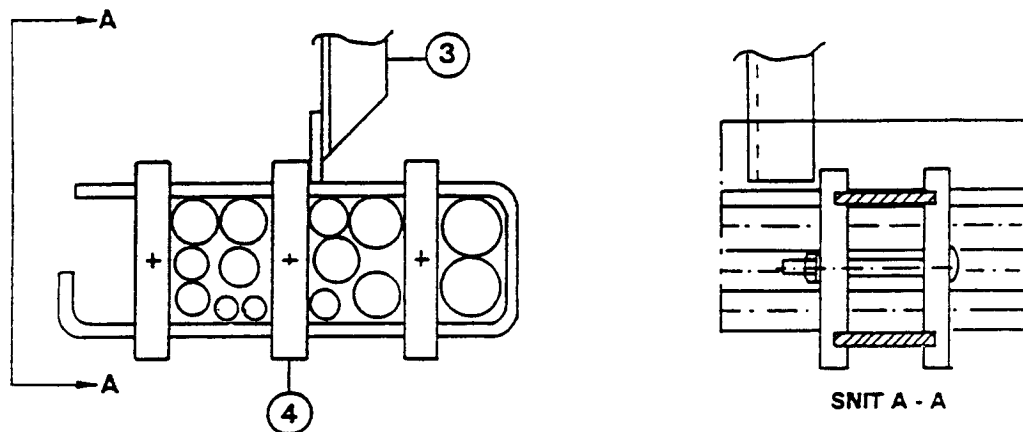
* b ikke DVS, øvrige mål som DVS.

Betegnelse : Benævnelse - OS nr. - TYPE - størrelse - længde

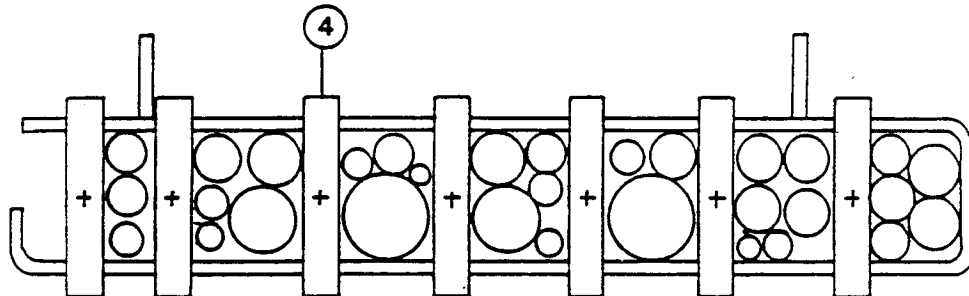
Eksempel 1 : Kabelbarer - OS 7115 - 1 B - 210 x 50 x 200

Eksempel 2 : Kabelbarer - OS 7115 - 4 - 2 x 410 x 110 x 2000

2	Fladstål	1		St. 44-2	FS 40 x 6		022307
1	Bærebøjle	1		St. 44-2	FS 40 x 5		022302
POS.	BEMÆRKNELSE	STK.	KG/stk.	MATR.	TEGN.NR./DIM.	BEMÆRKNINGER	VARENR.



Eksempel 1

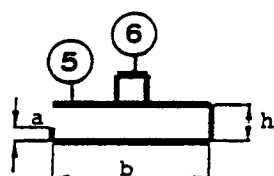


Eksempel 2

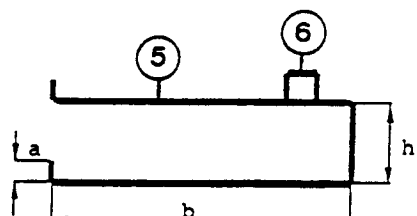
- a) Svejsning 
- b) Kabelbærere type 18 og 2 på dobling monteres direkte på skot eller under dæk uden vinkeljernsbeslag. For type 38 og 4 skal der holdes en afstand på min. 50 mm mellem skibets stål og kabelbærernes fladstål.
- c) For at opnå tilstrækkeligt gode afkølingsforhold må kabelbundter med strømbelastede kabler oplægges af max. 2 sideløbende kabler mellem spændebeslag. Se eksempel 2 ovenfor.
- d) Påsvejsning af kabelbærer. Montageanvisninger : Se OS 0501.

4	Spændebeslag				OS 7117		
3	Vinkeljernsbeslag				Min. < 40x40x5		
POS.	BENÆVNELSE	STK.	KG/stk.	MATR.	TEGN.NR./DIM.	BEMÆRKNINGER	VARENR.

Reference til : DVS 71002. Kabelbærer fremstilles efter DVS tegning.



TYPE 1B og 2



TYPE 3B og 4

Størrelse (b x h)	Standardiseret som DVS type	b	h	a	Vægt kg/stk.
100 x 50*	1B	100	50	20	0,49
150 x 50		150			0,60
210 x 50		210			0,78
410 x 50	3B	410	80	30	1,48
310 x 80	4	310			1,28
410 x 80		410			1,59
110 x 110*	2	110	110	30	0,63
210 x 110		210			0,95
310 x 110	4	310			1,32
410 x 110		410			1,64
510 x 110*		510			1,95
610 x 110		610			2,27

Kabelbærer form G.S. kan udvides med kabelbærer form G.E. (se eksempler side 4). Form G.E. påsvejses enkeltvis.

Kabelbærer form G.E. må aldrig være større end den oven over siddende kabelbærer.

Overfladebehandling :

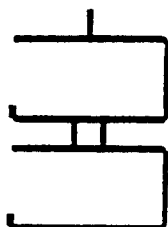
Se målespecifikation for det pågældende skib.

* b ikke DVS, øvrige mål som DVS.

Betegnelse : Benævnelse - OS nr. - TYPE - størrelse

Eksempel : Kabelbærer - OS 7115 - 1B - 210 x 50

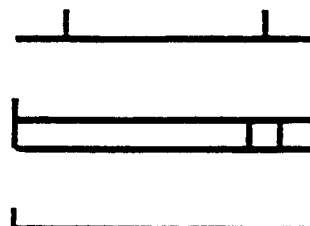
6	Sølestykke	1		St. 44-2	FS 40 x 5 x 40		022302
5	Bærebøjle	1		St. 44-2	FS 40 x 5		022302
POS.	BENÆVNELSE	STK.	KG/stk.	MATR.	TEGN.NR./DIM.	BEMÆRKNINGER	VARENR.



Størrelse 2 x 210 x 110

FIGUR 1

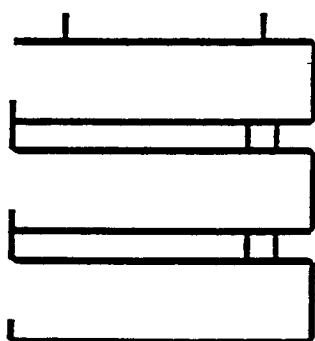
Vægt total : 8.4 kg/m



Størrelse 2 x 410 x 110

FIGUR 2

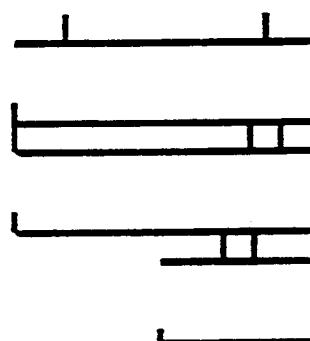
Vægt total : 14.9 kg/m



Størrelse 3 x 410 x 110

FIGUR 3

Vægt total : 20.6 kg/m



Størrelse 2 x 410 x 110 + 1 x 210 x 110

FIGUR 4

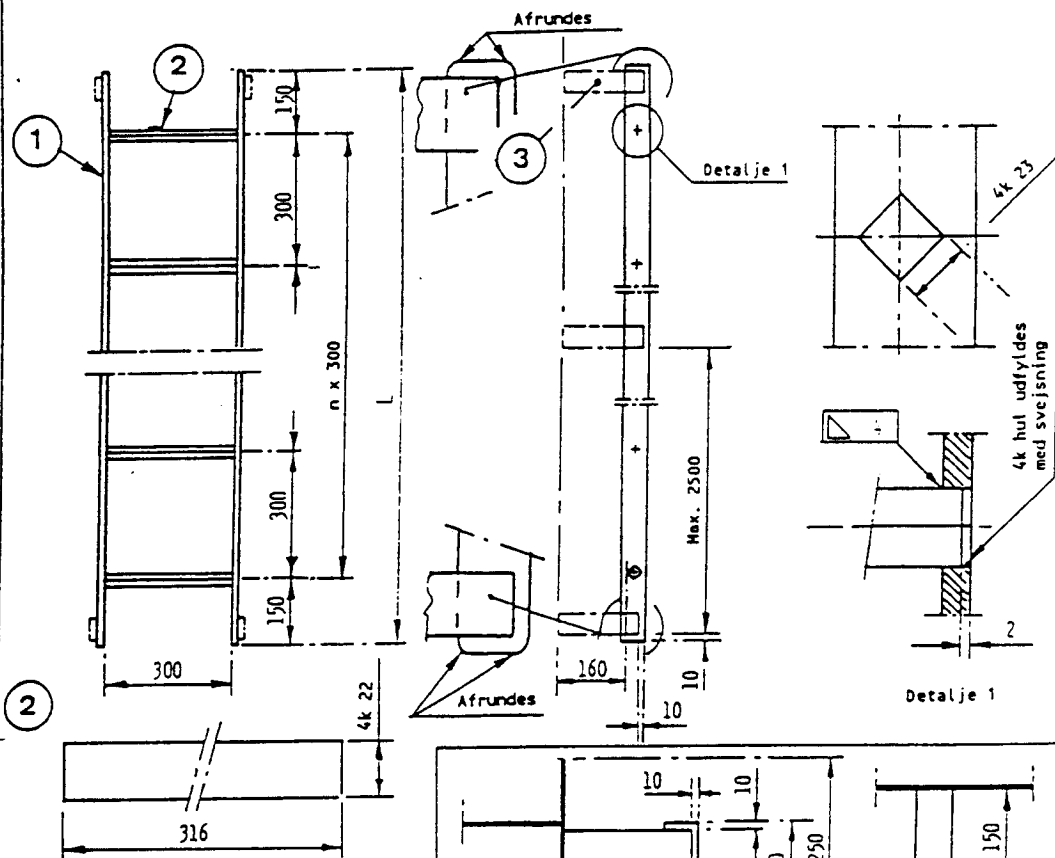
Vægt total : 14.9 kg/m

Generelt :

"Ophængningsbeslag" aftages 50 mm, når kabelbærer varmforzinkes eller får anden overfladebehandling.

OBS! Giftig svejsesøg ved montage.

Specifikation og arbejdsinstruktion : Se side 2.

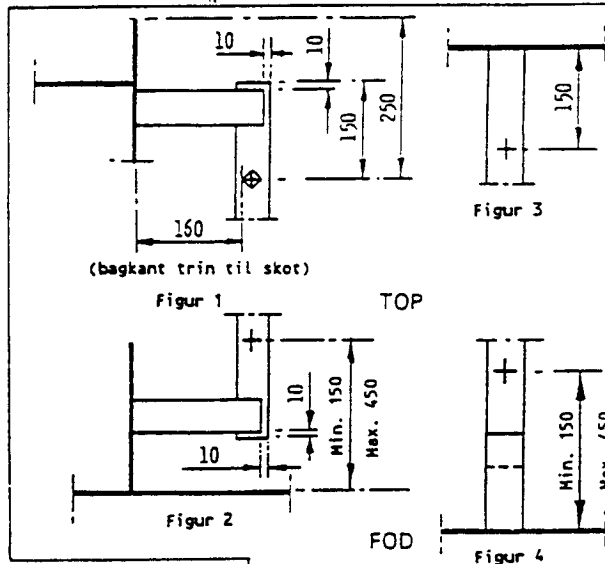


$$\text{Antal trin} = \frac{L}{300}$$

Antal luge pos. 3, min. 4
angives af tegnestuen.

- 3.5 Luge til lejder
5 Lugs til skot o.s.v.

For stallejder : Monteret på mast o.s.v. : Se side 3.
Ved platforme, gennemgangshuller : Se side 5.
Rygbøjler : Se side 4 og 6.



MONTAGEEKSEMPLER

Overlap for lugs 60 mm,
længde af lugs tilpasses.

Betegnelse : Benævnelse - OS nr. - L/Antal trin - Antal lugs - Montage fig. nr. (top/fod)

Eksempel : Stallejder - OS 5020 - 2700/9 - 6 - 1/2

3	Lugs				Se side 3		
2	Trin		1,2	St. 37-2	4k - 22 - 316		034164
1	Vange	2		St. 44-2	FS 55 x 10 - L	4,32 kg/m	022576
POS.	BENÆVNELSE	STK.	KG/stk.	MATR.	TEGN.NR./DIM.	BEMÆRKNINGER	VARENR.

GODKENDT AF:

I OVERENSSTEMMELSE MED:

SPECIFIKATION:

ANVENDELSE:

Master, sømsonposter og dakshuse, hvor der er trænge pladsforhold.

OBS.: 1) Hvor behov nødvendiggør dette, anbringes rygbøjler (arbejdsbøjler), se side 4, angives af tegnestue.

2) Hvor særlige forhold gør sig gældende kan rygbøjle med stænger anvendes, se side 6, angives af tegnestue.

TOLERANCER:

Hvor ikke andet er oplyst udføres standarden i overensstemmelse med OS 0400 grad: 4.

SVEJSNING:

Svejsesignaturer i overensstemmelse med OS 0215.
Fuldsvejsning, hvor ikke andet er oplyst.
Porehuller og slaggeindeslutninger må ikke forekomme.

OVERFLADEBEHANDLING:

I henhold til målespecifikation.

MATERIALEDISPOSITION:

X	Alt materiale er lagerført
	Enkelte materialer købes af tegnestue
	Alle materialer skal købes af tegnestue - Rekv. gældende stykliste

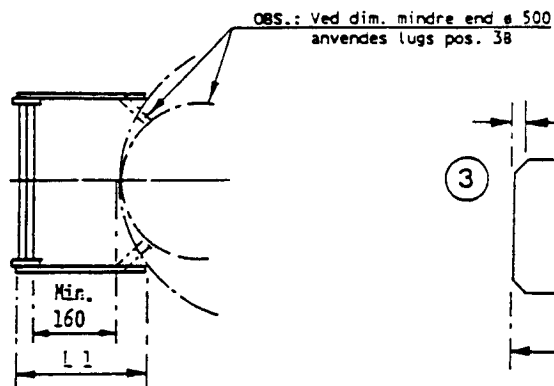
KONTROL:

Vænge længde	Antal trin	Overflade m ²	Vægt total kg 1)
300	1	0,1044	3,63
600	2	0,2088	7,26
900	3	0,3132	11,0
1200	4	0,4176	14,5
1500	5	0,5220	18,2
1800	6	0,6264	21,8
2100	7	0,7309	25,4
2400	8	0,8352	29,0
2700	9	0,9396	32,7
3000	10	1,0440	36,3

1) uden lugs.

LEVERINGSTILSTAND:

Emnet leveres rengjort, uden skarpe kanter, fri for svejsestank, grater, skævheder og lignende.

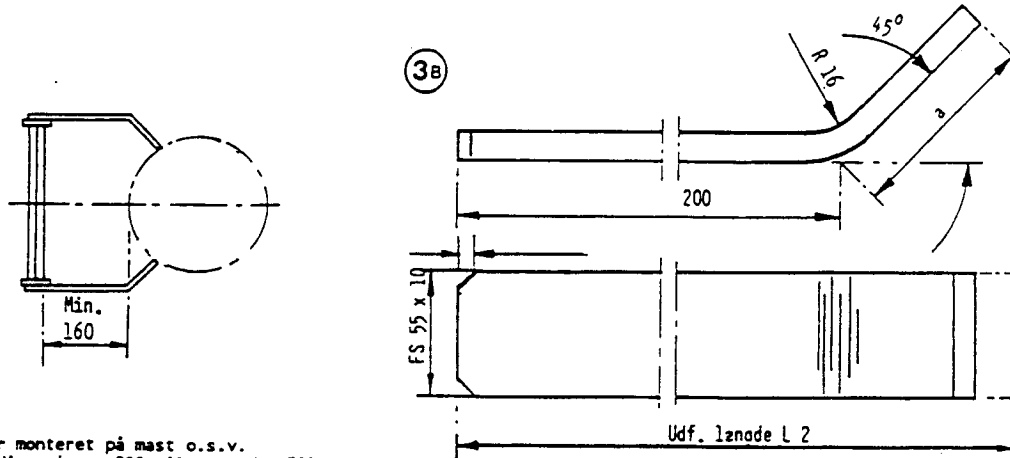


Lejder monteret på mast o.s.v.
Mast dimension fra $\varnothing$ 500 til plant skot.

Mast dimension udvendig $\varnothing$	L ₁	Vægt kg/stk.
500 - 700	255	1,10
700 - 2000	235	1,01
2000 - og større	225	0,97
Plant skot	195	0,84

Betegnelse : Benævnelse - OS nr. L₁

Eksempel : Lugs - OS 5020 - 225



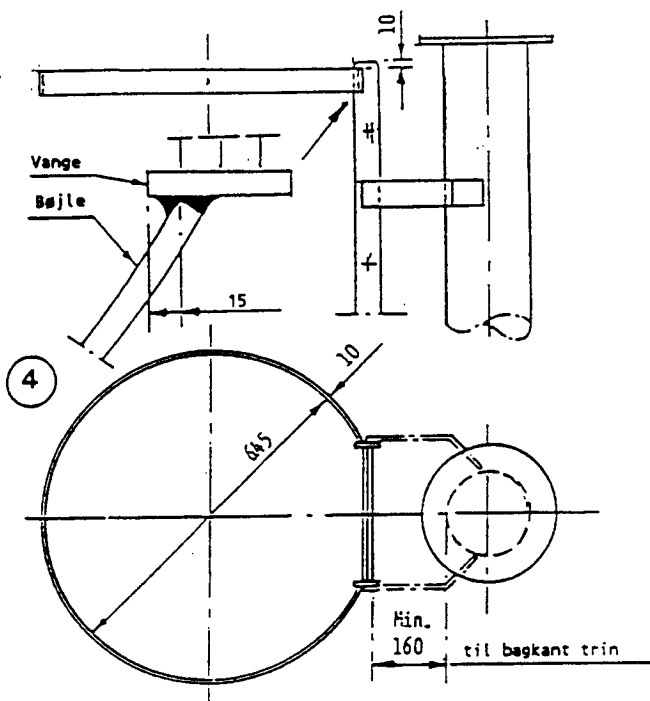
Lejder monteret på mast o.s.v.
Mast dimension $\varnothing$ 200 til og med $\varnothing$ 500.

Mast dimension udvendig $\varnothing$	a	Udført L ₂	Vægt kg/stk.
200 - 250	100	294	1,27
250 - 300	85	279	1,20
300 - 500	75	269	1,16

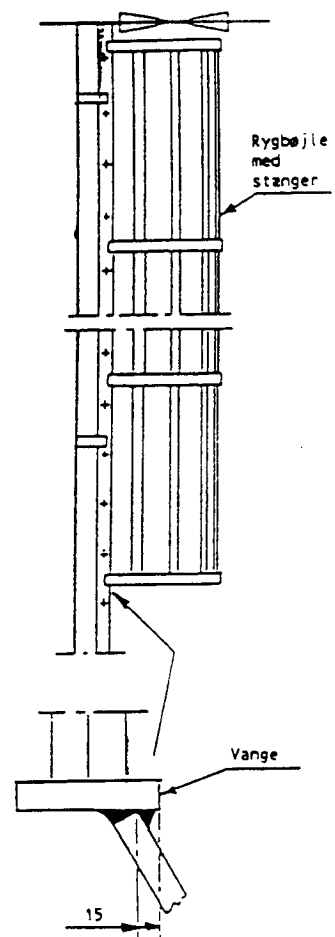
Betegnelse : Benævnelse - OS nr. - L₂

Eksempel : Lugs - OS 5020 - 294

38	Lugs			St. 44-2	FS 55 x 10 - L ₂	L ₂ - se tabel	022576
3	Lugs			St. 44-2	FS 55 - 10 - L ₁	L ₁ - se tabel	022576
POS.	BENÆVNELSE	STK.	KG/stk.	MATR.	TEGM.NR./DIM.	BEMÆRKNINGER	VARENR.



FIGUR 5
TOP



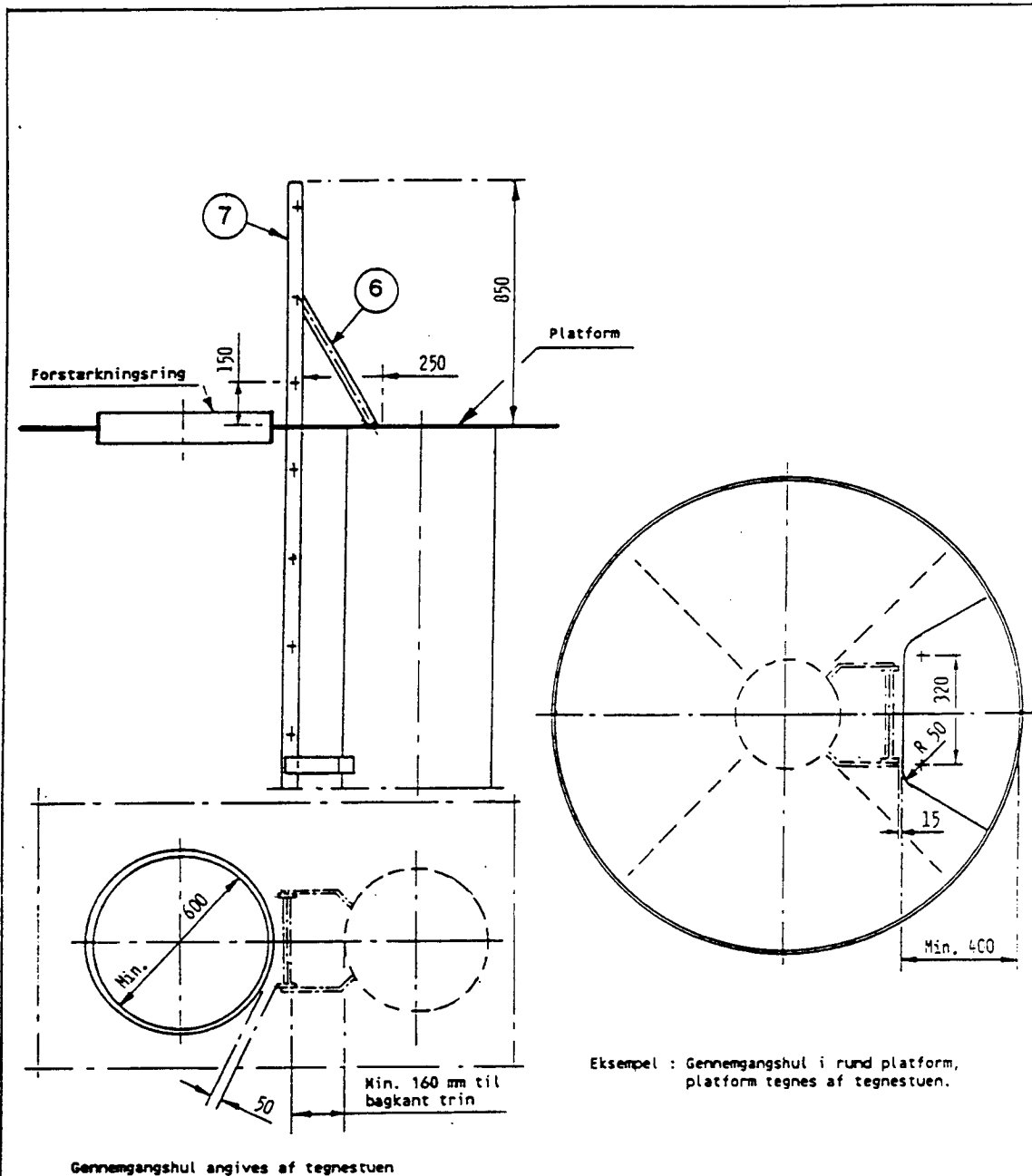
Figur 7

Detaljer for rygbøjler med stænger : Se side 6.

Betegnelse : Benævnelse - OS nr.

Eksempel : Rygbøjle (arbejdsbøjle) - OS 5020

4	Rygbøjle (arbejdsbøjle)	1	4,52	St. 44-2	FS 55 x 10 - 1717		022576
POS.	BENÆVNELSE	STK.	KG/stk.	MATR.	TEGN.NR./DIM.	BEMÆRKNINGER	VARENR.



FIGUR 6
TOP

7	Lejder	1			OS 5020 - 850 - 3		
6	Stræber	2	1,41		OS 5008 - FA		410193
POS.	BENÆVNELSE	STK.	KG/stk.	MATR.	TEGN.NR./DIM.	BEMÆRKNINGER	VARENR.

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