



Westinghouse
Electric Corporation

Energy Systems

Box 355
Pittsburgh Pennsylvania 15230-0355

AW-93-420

February 23, 1993

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

ATTENTION: MR. R. W. BORCHARDT

APPLICATION FOR WITHHOLDING PROPRIETARY
INFORMATION FROM PUBLIC DISCLOSURE

SUBJECT: COMPONENT AND PIPING DRAWINGS FOR THE SPES-2 FACILITY IN
SUPPORT OF THE AP600 DESIGN

Dear Mr. Borchardt:

The application for withholding is submitted by Westinghouse Electric Corporation ("Westinghouse") pursuant to the provisions of paragraph (b)(1) of Section 2.790 of the Commission's regulations. It contains commercial strategic information proprietary to Westinghouse and customarily held in confidence.

The proprietary material for which withholding is being requested is identified in the proprietary version of the subject report. In conformance with 10CFR Section 2.790, Affidavit AW-93-420 accompanies this application for withholding setting forth the basis on which the identified proprietary information may be withheld from public disclosure.

Accordingly, it is respectfully requested that the subject information which is proprietary to Westinghouse be withheld from public disclosure in accordance with 10CFR Section 2.790 of the Commission's regulations.

Correspondence with respect to this application for withholding or the accompanying affidavit should reference AW-93-420 and should be addressed to the undersigned.

Very truly yours,

P. J. Liparulo / for

N. J. Liparulo, Manager
Nuclear Safety And Regulatory Activities

/nja

cc: M. P. Siemien Office of the General Counsel, NRC
L. Barnett NRC (12H5)

0607A

9303020251 930223
PDR ADOCK 05200003
A PDR

COPYRIGHT NOTICE

The reports transmitted herewith each bear a Westinghouse copyright notice. The NRC is permitted to make the number of copies of the information contained in these reports which are necessary for its internal use in connection with generic and plant-specific reviews and approvals as well as the issuance, denial, amendment, transfer, renewal, modification, suspension, revocation, or violation of a license, permit, order, or regulation subject to the requirements of 10 CFR 2.790 regarding restrictions on public disclosure to the extent such information has been identified as proprietary by Westinghouse, copyright protection notwithstanding. With respect to the non-proprietary versions of these reports, the NRC is permitted to make the number of copies beyond those necessary for its internal use which are necessary in order to have one copy available for public viewing in the appropriate docket files in the public document room in Washington, D.C. and in local public document rooms as may be required by NRC regulations if the number of copies submitted is insufficient for this purpose. The NRC is not authorized to make copies for the personal use of members of the public who make use of the NRC public document rooms. Copies made by the NRC must include the copyright notice in all instances and the proprietary notice if the original was identified as proprietary.

PROPRIETARY INFORMATION NOTICE

Transmitted herewith are proprietary and/or non-proprietary versions of documents furnished to the NRC in connection with requests for generic and/or plant specific review and approval.

In order to conform to the requirements of 10CFR 2.790 of the commission's regulation concerning the protection of proprietary information so submitted to the NRC, the information which is proprietary in the proprietary versions is contained within brackets and where the proprietary information has been deleted in the non-proprietary versions on the brackets remain, the information that was contained within brackets and where the proprietary information has been deleted in the non-proprietary versions only the brackets remain, the information that was contained within the brackets in the proprietary versions having been deleted. The justification for claiming the information so designated as proprietary is indicated in both versions by means of lower case letters (a) through (f) contained within parentheses located as a superscript immediately following the brackets enclosing each item of information being identified as proprietary or in the margin opposite such information. These lower case letters refer to the types of information Westinghouse customarily holds in confidence identified in Section (4)(ii)(a) through (4)(ii)(f) of the affidavit accompanying this transmittal pursuant to 10CFR2.790(b)(1).

AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA:

ss

COUNTY OF ALLEGHENY:

Before me, the undersigned authority, personally appeared Peter J. Morris, who, being by me duly sworn according to law, deposes and says that he is authorized to execute this Affidavit on behalf of Westinghouse Electric Corporation ("Westinghouse") and that the averments of fact set forth in this Affidavit are true and correct to the best of his knowledge, information, and belief:

Peter J. Morris

Peter J. Morris, Manager

Strategic Safety and Regulatory Issues

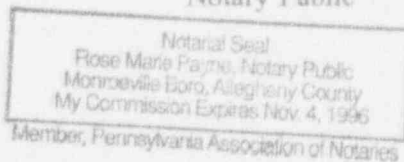
Sworn to and subscribed

before me this 23 day

of February, 1993

Rose Marie Payne

Notary Public



- (1) I am Manager, Strategic Safety and Regulatory Issues, in the Nuclear and Advanced Technology Division, of the Westinghouse Electric Corporation and as such, I have been specifically delegated the function of reviewing the proprietary information sought to be withheld from public disclosure in connection with nuclear power plant licensing and rulemaking proceedings, and am authorized to apply for its withholding on behalf of the Westinghouse Energy Systems Business Unit.
- (2) I am making this Affidavit in conformance with the provisions of 10CFR Section 2.790 of the Commission's regulations and in conjunction with the Westinghouse application for withholding accompanying this Affidavit.
- (3) I have personal knowledge of the criteria and procedures utilized by the Westinghouse Energy Systems Business Unit in designating information as a trade secret, privileged or as confidential commercial or financial information.
- (4) Pursuant to the provisions of paragraph (b)(4) of Section 2.790 of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld.
 - (i) The information sought to be withheld from public disclosure is owned and has been held in confidence by Westinghouse.
 - (ii) The information is of a type customarily held in confidence by Westinghouse and not customarily disclosed to the public. Westinghouse has a rational basis for determining the types of information customarily held in confidence by it and, in that connection, utilizes a system to determine when and whether to hold certain types of information in confidence. The application of that system and the substance of that system constitutes Westinghouse policy and provides the rational basis required.

Under that system, information is held in confidence if it falls in one or more of several types, the release of which might result in the loss of an existing or potential competitive advantage, as follows:

- (a) The information reveals the distinguishing aspects of a process (or component, structure, tool, method, etc.) where prevention of its use by any of Westinghouse's competitors without license from Westinghouse constitutes a competitive economic advantage over other companies.
- (b) It consists of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.), the application of which data secures a competitive economic advantage, e.g., by optimization or improved marketability.
- (c) Its use by a competitor would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing a similar product.
- (d) It reveals cost or price information, production capacities, budget levels, or commercial strategies of Westinghouse, its customers or suppliers.
- (e) It reveals aspects of past, present, or future Westinghouse or customer funded development plans and programs of potential commercial value to Westinghouse.
- (f) It contains patentable ideas, for which patent protection may be desirable.

There are sound policy reasons behind the Westinghouse system which include the following:

- (a) The use of such information by Westinghouse gives Westinghouse a competitive advantage over its competitors. It is, therefore, withheld from disclosure to protect the Westinghouse competitive position.
- (b) It is information which is marketable in many ways. The extent to which such information is available to competitors diminishes the Westinghouse ability to sell products and services involving the use of the information.

- (c) Use by our competitor would put Westinghouse at a competitive disadvantage by reducing his expenditure of resources at our expense.
 - (d) Each component of proprietary information pertinent to a particular competitive advantage is potentially as valuable as the total competitive advantage. If competitors acquire components of proprietary information, any one component may be the key to the entire puzzle, thereby depriving Westinghouse of a competitive advantage.
 - (e) Unrestricted disclosure would jeopardize the position of prominence of Westinghouse in the world market, and thereby give a market advantage to the competition of those countries.
 - (f) The Westinghouse capacity to invest corporate assets in research and development depends upon the success in obtaining and maintaining a competitive advantage.
- (iii) The information is being transmitted to the Commission in confidence and, under the provisions of 10CFR Section 2.790, it is to be received in confidence by the Commission.
- (iv) The information sought to be protected is not available in public sources or available information has not been previously employed in the same original manner or method to the best of our knowledge and belief.
- (v) Enclosed is Letter ET-NRC-93-3825, February 1993, being transmitted by Westinghouse Electric Corporation (W) letter and Application for Withholding Proprietary Information from Public Disclosure, N. J. Liparulo (W), to Mr. R. W. Borchardt, Office of NRR. The proprietary information as submitted for use by Westinghouse Electric Corporation is in response to questions concerning the AP600 plant and the associated design certification application and is expected to be applicable in other licensee submittals in response to certain NRC requirements for justification of licensing advanced nuclear power plant designs.

This information is part of that which will enable Westinghouse to:

- (a) Demonstrate the design and safety of the AP600 Passive Safety Systems.
- (b) Establish applicable verification testing methods.
- (c) Design Advanced Nuclear Power Plants that meet NRC requirements.
- (d) Establish technical and licensing approaches for the AP600 that will ultimately result in a certified design.
- (e) Assist customers in obtaining NRC approval for future plants.

Further this information has substantial commercial value as follows:

- (a) Westinghouse plans to sell the use of similar information to its customers for purposes of meeting NRC requirements for advanced plant licenses.
- (b) Westinghouse can sell support and defense of the technology to its customers in the licensing process.

Public disclosure of this proprietary information is likely to cause substantial harm to the competitive position of Westinghouse because it would enhance the ability of competitors to provide similar advanced nuclear power designs and licensing defense services for commercial power reactors without commensurate expenses. Also, public disclosure of the information would enable others to use the information to meet NRC requirements for licensing documentation without purchasing the right to use the information.

The development of the technology described in part by the information is the result of applying the results of many years of experience in an intensive Westinghouse effort and the expenditure of a considerable sum of money.

In order for competitors of Westinghouse to duplicate this information, similar technical programs would have to be performed and a significant manpower effort, having the requisite talent and experience, would have to be expended for developing analytical methods and receiving NRC approval for those methods.

Further the deponent sayeth not.

Enclosure 3

Information Package

SPES (3-loop 312 Simulation)

- Steam Generator
- Pump
- Power Channel

Contents

o	Table 3.2/2, Volume comparison between SPES and PWR-PUN	Page 1
o	Table 3.3.4/1, Primary recirculation pump characteristics	Page 2
o	Table 3.3.4/2, Nominal data of the pump sealing system	Page 3
o	Table 3.3.6/1, Steam generator tube bundle data	Page 4
o	Table 3.3.6/2, Steam generator U-tube bundle geometric data	Page 5
o	Table 3.3.6/3, U-tubes measured elevations	Page 6
o	Table 3.4.1/1, Steam generator general data	Page 7
o	Table 3.4.1/2, Steam generator thermal/hydraulic data	Page 8
o	Table 3.4.1/3, Steam generator volumes, cross flow areas and weights	Page 9
o	Table 3.4.2/1, Secondary piping system general data	Page 10
o	Table 3.4.2/2, Secondary piping system characteristics	Page 11
o	Figure 3.3.1/6, Detail of core support plate	Page 14
o	Figure 3.3.2/1, Power channel rod detail	Page 15
o	Figure 3.3.2/2, Rod bundle spacer detail	Page 16
o	Figure 3.3.4/1, Primary recirculation pump cross section	Page 17
o	Figure 3.3.4/2, Primary recirculation pump H-Q characteristics	Page 18
o	Figure 3.3.4/3, Pump speed-flowrate theoretical curves	Page 19
o	Figure 3.3.4/4, Primary pump mechanical seal arrangement	Page 20

February 19, 1993

Note this table is for SPES (3-loop 312 simulation)

	SPES volume (dm3)	PWR volume (m3)
PRIMARY SIDE	633	270.06
Cold legs	20	9.14
Power channel *	257	108.96
. downcomer (upper head bypass included)	47	20.31
. lower plenum	58	25.12
. core (core bypass included)	52	22.26
. upper plenum	51	20.49
. upper head	49	20.77
Hot legs	40	9.41
Steam generator primary sides *	148	80.89
Pump suction	51	11.61
Pumps	13	6.80
Pressurizer (surge line and spray line included)	105	43.26
SECONDARY SIDE	1163	507.7
Steam generators *		
. downcomers	263	91.95
. risers	298	123.48
. upper plena	126	53.75
. steam separators	66	28.19
. steam domes	410	210.33

for 3 pumps

* including inlet and outlet nozzles

TABLE 3.2/2 - Volume comparison between SPES and PWR-PUN

3

- design pressure, MPa	20
- design temperature, °K	638
- nominal conditions	
. suction pressure, MPa	15.3
. temperature, °K	564
. capacity, Kg/s	10.6
. head, m	77
. rotational speed, rad/s	335
. rated torque, Nm	59.7
. power, KW	20
. efficiency, %	40
. NPSHr, m	2.6
- speed regulation range, rad/s	-628,+628
- maximum power, KW	50
- suction diameter, mm	66.7
- discharge diameter, mm	66.7
- inside fluid volume, dm ³	4.3
- global inertia, Kg·m ²	3.5

TABLE 3.3.4/1 - Primary recirculation pump characteristics

- Flushing fluid	demineralized water
	(pH 8)
- flowrate, Kg/s	0,083
- injection pressure, MPa	16,3
- DP across the seal, MPa	
. inner	0,5 *
. intermediate	14,3
. outer	1,5
- seal leakage, Kg/s	
. inner	0 **
. intermediate	0,001
. outer	0 ***
- seal pv, MPa m/s	
. inner	5
. intermediate	140
. outer	15

* such a value is kept automatically constant even during primary pressure transient

** with a DP across the seal less than 7 MPa

*** with a DP across the seal less than 2 MPa

TABLE 3.3.4/2 - Nominal data of the pump sealing system (referred to a single pump)

8

W

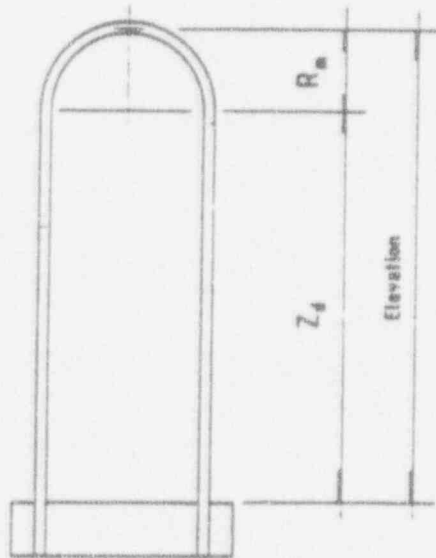
- design pressure, MPa	20.0
- design temperature, °K	638
- number of U-tubes	13
- array	SQUARE
- pitch, mm	24.89
- outer diameter, mm	17.46
- thickness, mm	1.02
- tube average length, mm	16742
- tube active average length, mm	16564
- straight tube average length, mm	8210
- elevation of longest tube, mm *	8323
- elevation of shortest tube, mm *	8153
- elevation of 7 grids (upper edge), mm	1115, 2230, 3345, 4460
	5575, 6690, 7805
- inlet plenum + outlet plenum volume, dm3	7.43
- heat transfer area referred to ID, m2	10.43
- heat transfer area referred to OD, m2	11.81
- primary cross flow area (mm2)	2428
- secondary cross flow area (mm2) **	12127
- tube material	ASTM SB163 Inconel 600

* The upper edge of the tube sheet is considered as reference elevation zero.

** Bundle zone free of grid spacer and cold/hot zone diaphragm

TABLE 3.3.6/1 - Steam generator tube bundle data

Tube	R_a (mm)	Z_d (mm)	L_a (mm)	Elevation (mm)
1	21.5	8132	16331	8153
2	21.5	8132	16331	8153
3	30.4	8157	16409	8187
4	52.8	8182	16529	8234
5	52.8	8207	16579	8259
6	42.4	8231	16596	8273
7	42.4	8231	16596	8273
8	42.4	8231	16596	8273
9	42.4	8231	16596	8273
10	42.4	8231	16596	8273
11	67.3	8256	16724	8323
12	67.3	8256	16724	8323
13	67.3	8256	16724	8323



$$L_a = 2Z_d + \pi R_a$$

SG tube arrangement

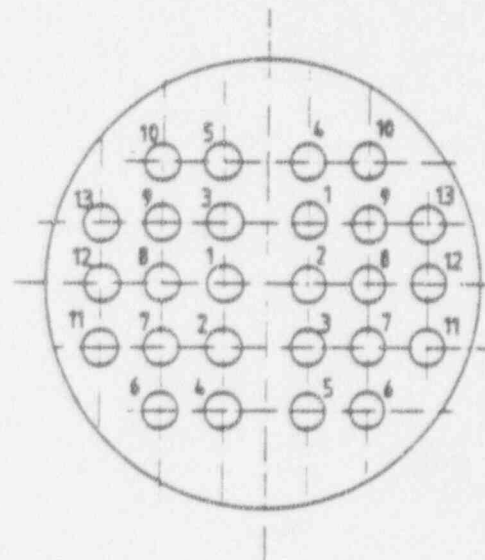


TABLE 3.3.6/2 - Steam generator U-tube bundle geometrical data

tube	design	measured elevation		
	elevation (mm)	(mm)		
		<u>SG-1</u>	<u>SG-2</u>	<u>SG-3</u>
1	8153	8120	8120	8115
2	8153	8120	8120	8115
3	8187	8185	8180	8185
4	8234	8230	8230	8225
5	8259	8250	8245	8245
6	8273	8270	8270	8265
7	8273	8270	8270	8265
8	8273	8270	8270	8265
9	8273	8270	8270	8265
10	8273	8270	8270	8265
11	8323	8325	8320	8315
12	8323	8325	8320	8315
13	8323	8325	8320	8315

TABLE 3.3.6/3 - U-tubes measured elevations (referred to tube sheet upper edge)

- design pressure, MPa	20
- design temperature, °K	638
- U-tubes number	13
- tube average length, m	16.7
- heat exchange surface, m ² (referred to OD)	11.8
- overall height, m	15.594
- secondary fluid volume, dm ³	387
- nozzle ID, mm	
. feed line	38.1
. steam line	73.7
. inlet/outlet plena	66.6
- elevation, m	
. primary plena bottom	2.340
. primary plena top	2.559
. tube sheet top	2.648
. separator inlet	13.255
. separator outlet	16.313
. feedwater nozzle	14.352
. steam line nozzle	17.768
- materials	
. primary plena, tube sheet	ASTM-SA 182 F 304
. lower vessel	ASTM-SA 106 Gr B
. intermediate vessel (sep. side)	ASTM-SA 204 Gr C
. upper vessel (steam dome)	ASTM-SA 204 Gr B
. loose flanges	ASTM-SA 105
. separator, dryers	AISI 304
. fillers	Nickel plated

TABLE 3.4.1/1 - Steam generator general data

88

7

- primary side		
. fluid	subcooled water	
. pressure, MPa		15.5
. flowrate, Kg/s		10.6
. coolant inlet temperature, °K		599
- secondary side		
. fluid	water/two phase mixture/steam	
. pressure, MPa		6.7
. feedwater flowrate, Kg/s		1.21
. feedwater temperature, °K		500
. nominal level, m (ref. to tube sheet top)		12.75
. heat removal capacity, KW		2165
. PORV set pressure, MPa		7.8
. safety valve set pressure, MPa		8.5
. PORV discharge flow-rate (7.8 MPa, x=1), Kg/s		0.24*
. SV discharge flow-rate (8.5 MPa, x=1), Kg/s		1.72**

* theoretical data with ID orifice = 5.2 mm

** theoretical data ID orifice = 13.3 mm

TABLE 3.4.1/2 - Steam generator thermalhydraulic data

STEAM GENERATOR CHARACTERISTICS

description	elevation mm	internals	cross section mm ²	volume dm ³	weight Kg
feed water nozzle	14352-14352	/	1146	0.20	2.5
thorus	14314-14390	/	833	0.40	1.2
j-nozzle	14390-14419	/	283	0.01	0.1
annular downcomer	16253-14463	/	14162	54.88	283 (vessel)
	14463-13648		4656 (sep. duct) 15695 (thorus zone) 20043		177.5 (loose flanges)
	13648-13523		20043/15495		
tubular downcomer	13523-13265		15495		
	13312-2677	/	1452x2	32.06	421
riser	2648-4878	tubes/fillers	11773	141.30	1456.5
		spacers/diaphragm	4408 (spacer)		
	4878-10974	tubes/fillers	12127		
		spacers	4408 (spacer)		
	10974-13255	fillers/ butterfly valve	18048 (fillers) 23527 18385		
separator	13255-16313	/	7088	21.92	40
steam dome	16313-17768	dryers	149872	136.79	524 (vessel) 53.7 (dryer)
TOTAL				387.56	2960

TABLE 3.4.1/3 - Steam generator volumes, cross flow areas and weights.

line	tag	inside diameter (mm)	outside diameter (mm)	length (mm)	volume (dm ³)	line connection	pipe material
main steam lines	MSL 1/2/3	73.7	88.9	19625	82.17	SG 1/2/3,MSL 0	ASTM A 106 Gr
main steam header	MSL 0	97.2	114.3	28862	215.67	MSL 1/2/3,BV-004A	ASTM A 106 Gr
steam dump	SDL	59.0	73	26242	71.74	MSL 0,BV-004B	ASTM A 106 Gr
feedwater lines	FWL 1/2/3	38.1	48.3	4869	5.55	SG,FWL-0	ASTM A 106 Gr
feedwater line header	FWL 0	49.2	60.3	24937	47.45	FWL 1/2/3,HE 2	ASTM A 106 Gr
preheater line	PHL	49.2	60.3	7741	14.72	MSL 0,HE 2	ASTM A 106 Gr
preheater bypass	BP 03	24.3	33.4	16109	7.48	FWL 0,FWL 0	ASTM A 106 Gr
emergency feedwater lines	EFWL 1/2/3	13.9	21.3	3029	0.46	EFWL 0,FWL 1/2/3	ASTM A 106 Gr
emergency feedwater header	EFWL 0	13.9	21.3	29529	4.46	FP 1,EFWL 1/2/3	ASTM A 106 Gr

TABLE 3.4.2/1 - Secondary piping system general data

4

0

MAIN STEAM LINES

From SG nozzle to MSIV

from MSIV to main steam header

- tube size/sch	3" sch 80	3 " sch 80
- lenght, mm	7815	11810
- cross section area, mm2	4261	4261
- inner volume, dm3	31.84	50.33
- ID surface area, m2	1.756	2.733
- OD surface area, m2	2.536	3.416
- metal weight, Kg	183	
curve number/type		
MSL-1	3/90 LR	4/90 LR
	1/45 LR	
MSL-2	5/90 LR	4/90 LR
MSL-3	4/90 LR	4/90 LR
	1/45 LR	

MAIN STEAM HEADER

(from MSL connections to stop valve)

- tube size/sch	4" sch 80
- lenght, mm	28862
- cross section area, mm2	7417
- inner volume, dm3 (*)	215.67
- ID surface area, m2	8.813
- OD surface area, m2	10.405
- metal weight, Kg	665
- curve number/type	6/90 LR
	2/45 LR

(*) the value includes the volume of preheater line from MSL 0 to isolation valve

TABLE 1.1.2/2 - Secondary piping system characteristics

8/11

STEAM DUMP

(from MSL 0 to isolation valve)

- tube size/sch	2"1/2 sch 80
- length, mm	26242
- cross section area, mm2	2734
- inner volume, dm3	71.74
- ID surface area, m2	4.864
- OD surface area, m2	6.119
- metal weight, Kg	311.2
- curve number/type	7/90 LR
	1/15 LR

PREHEATER LINE

- tube size/sch	2" sch 80
- length, mm	7741
- cross section, mm2	1901

FEEDWATER HEADER

- tube size/sch	2" sch 80
- length, mm	24937
- cross section, mm2	1901

FEEDWATER LINES (from isolation valve to SG nozzle)

- tube size/sch	1 1/2 sch 80
- lenght, mm	4869
- cross section area, mm2	1140
- inner volume, dm3	5.55
- ID surface area, m2	0.583
- OD surface area, m2	0.911
- metal weight, Kg	42.2
- curve number/type	q
. FWL 1	3/90 LR
	1/45 LR
. FWL 2	2/90 LR
	1/45 LR
. FWL 3	1/90 LR
	1/50 LR

```

PREHEATER BYPASS

```

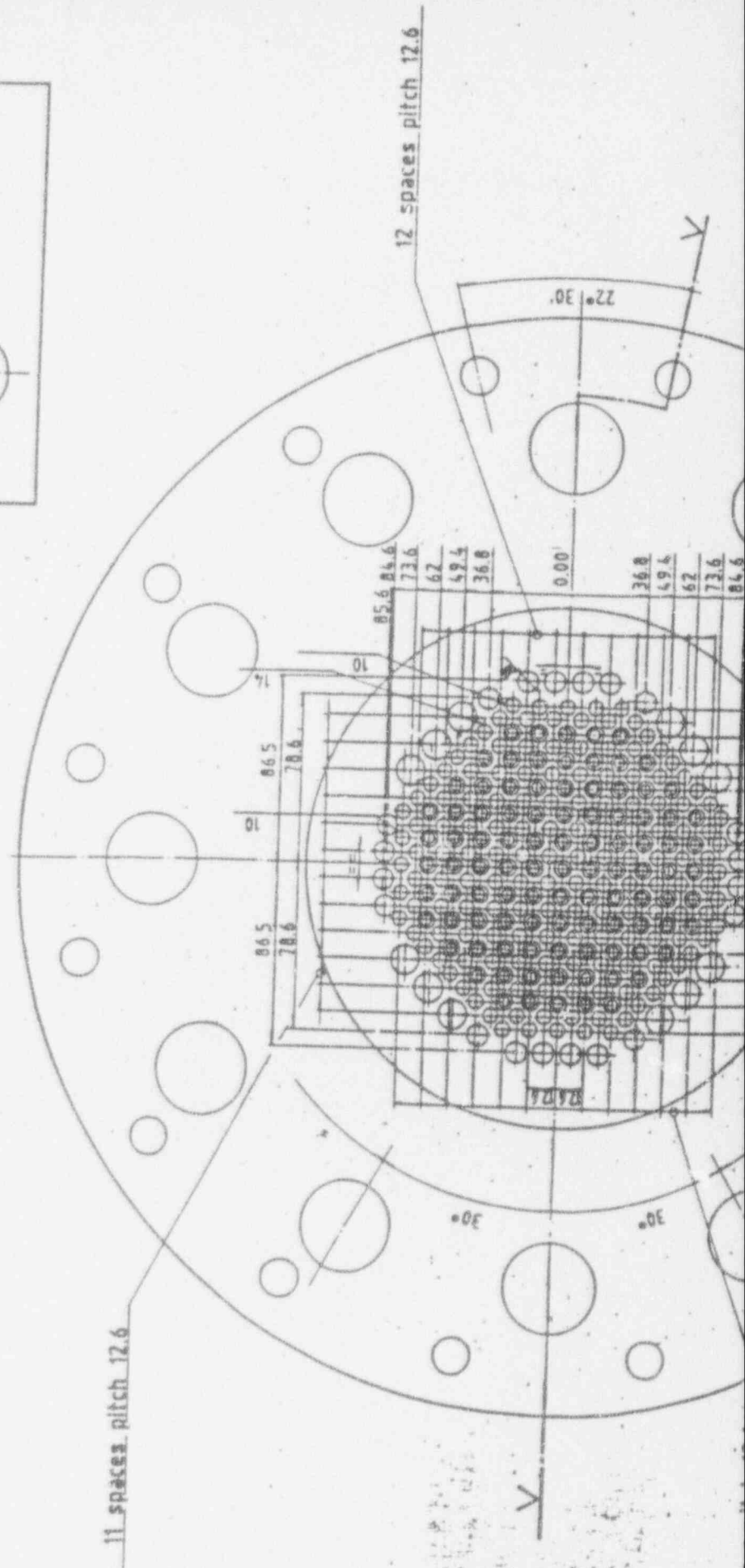
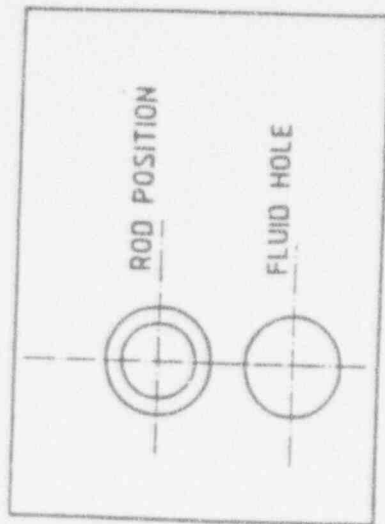
- tube size/sch	1" sch 80
- length, mm	16109
- cross section, mm2	464

EMERGENCY FEED WATER SYSTEM

tube size / sch	1 1/2" sch 80	} not for
length, mm		
. header (total)	29529	
. header (up to stop valve)	14307	
. branches	3029	
cross section, mm ²	151	

{ not applicable
for SPES-2

~~74~~ 13



9303020251-01

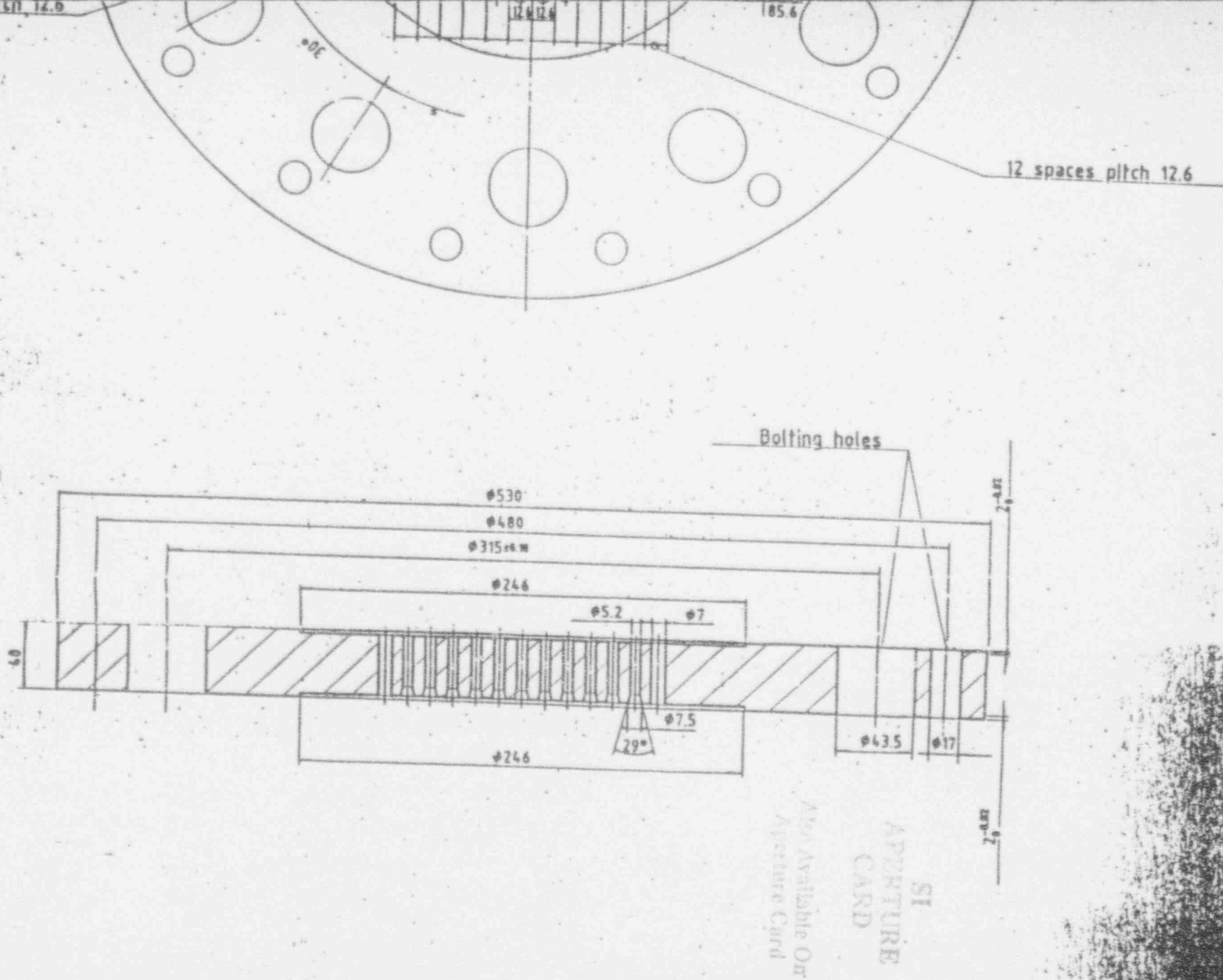


Fig.3.3.1/6 - Detail of core support plate

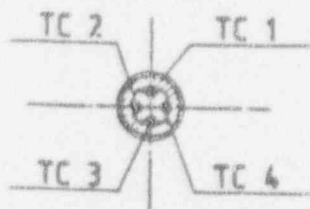
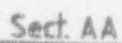


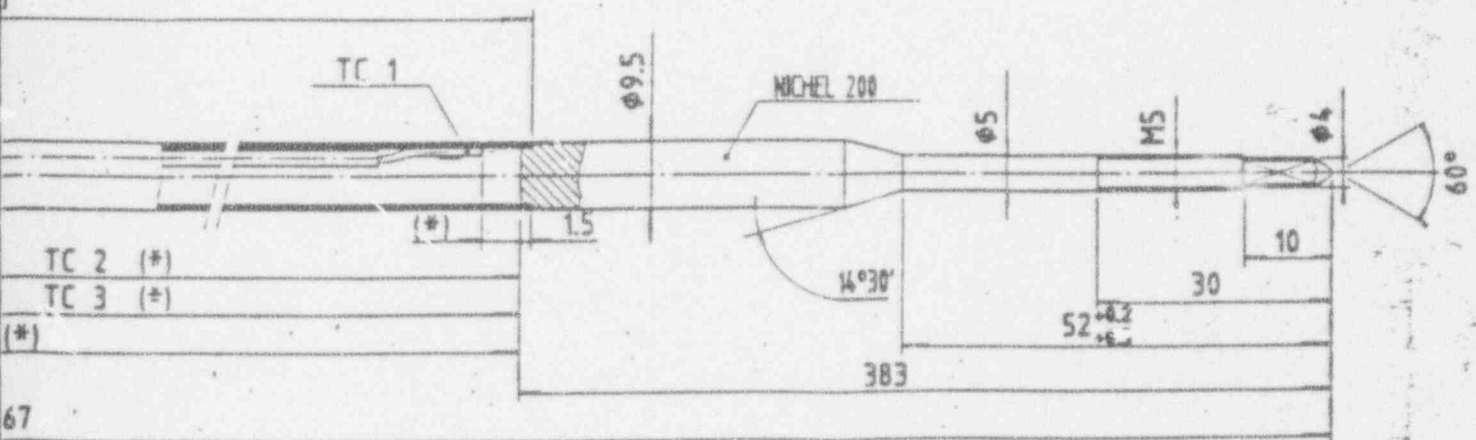
Fig.3.3.2A

SI
APERTURE
CARD

Also Available On
Aperture Card

OD=9.5 ID=7.9

ID=7.5



(*) - see fig. 3.3.2/3

Y1 - Power channel rod detail

9303020251-02

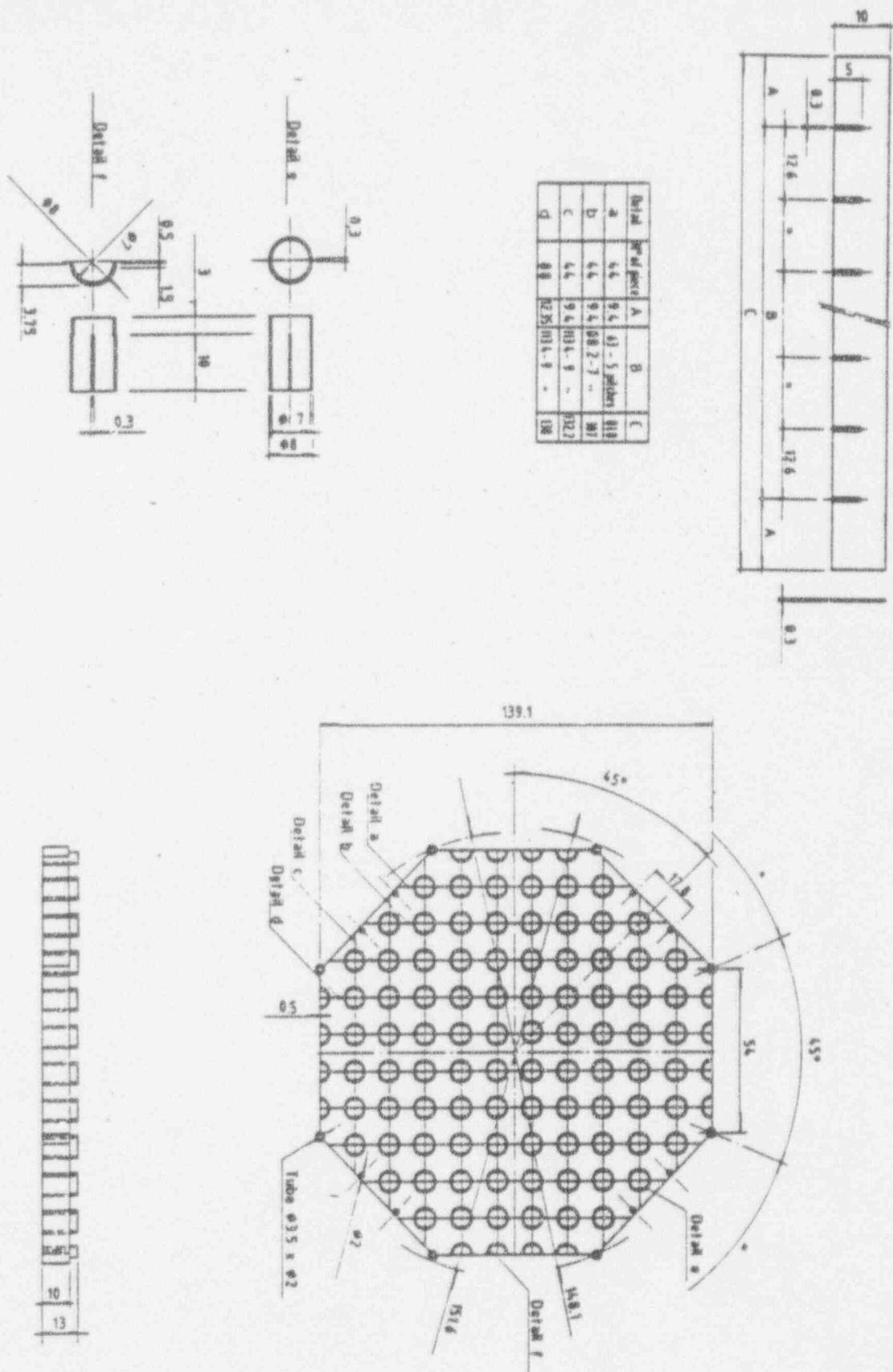
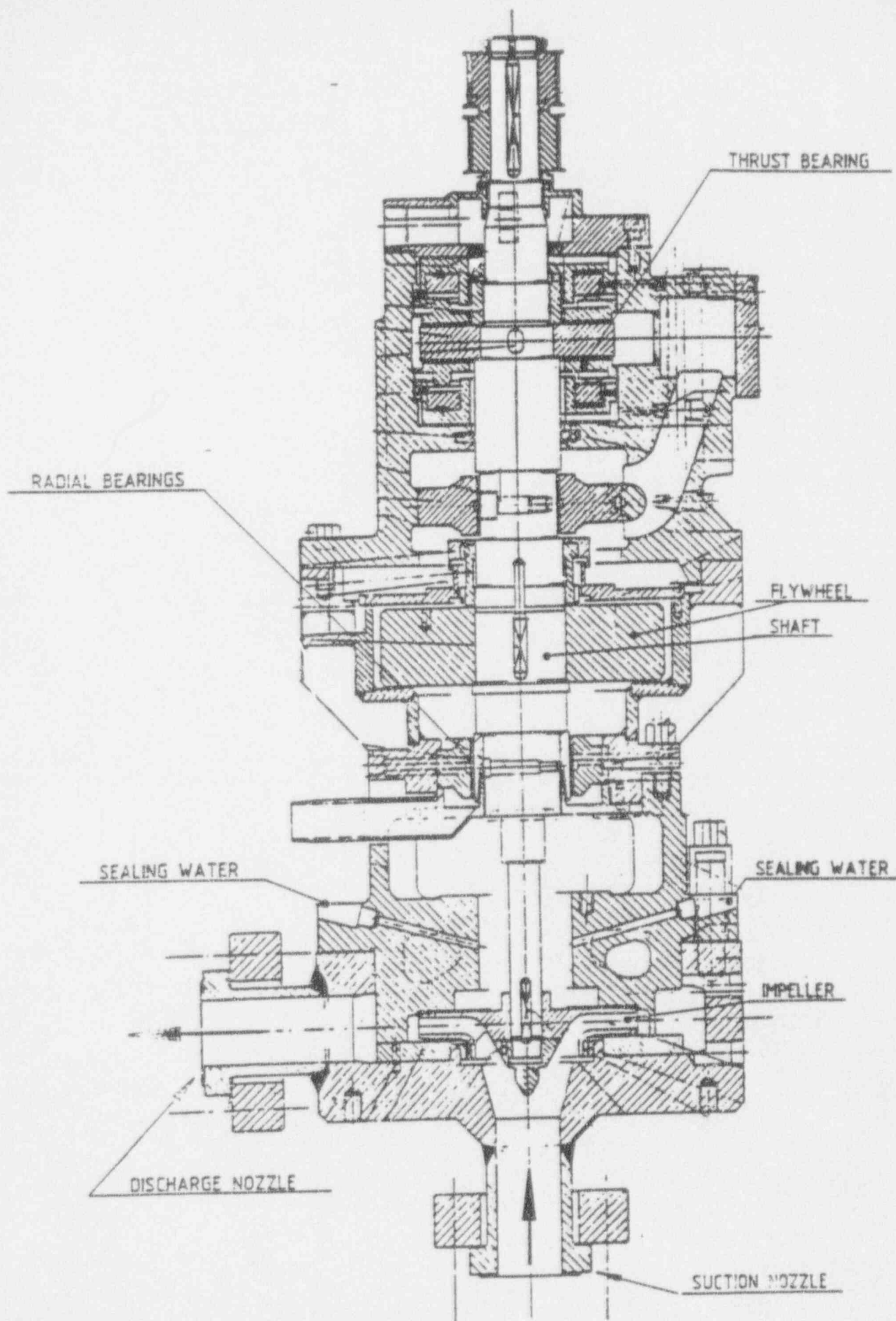


Fig. 3.3.2/2 - Rod bundle spacer detail



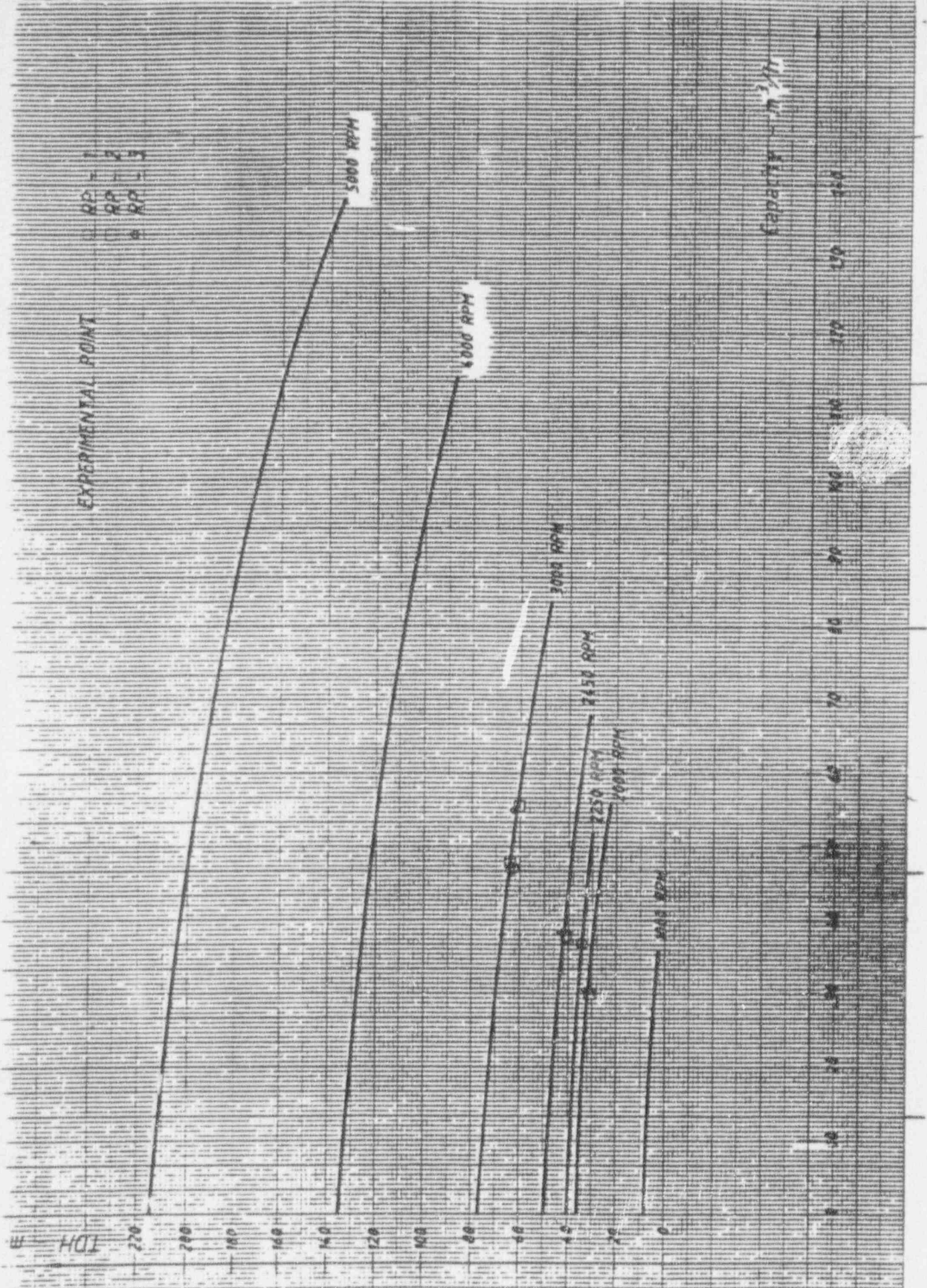


Fig. 3.3.4/2 - Primary recirculation pump H-Q characteristics

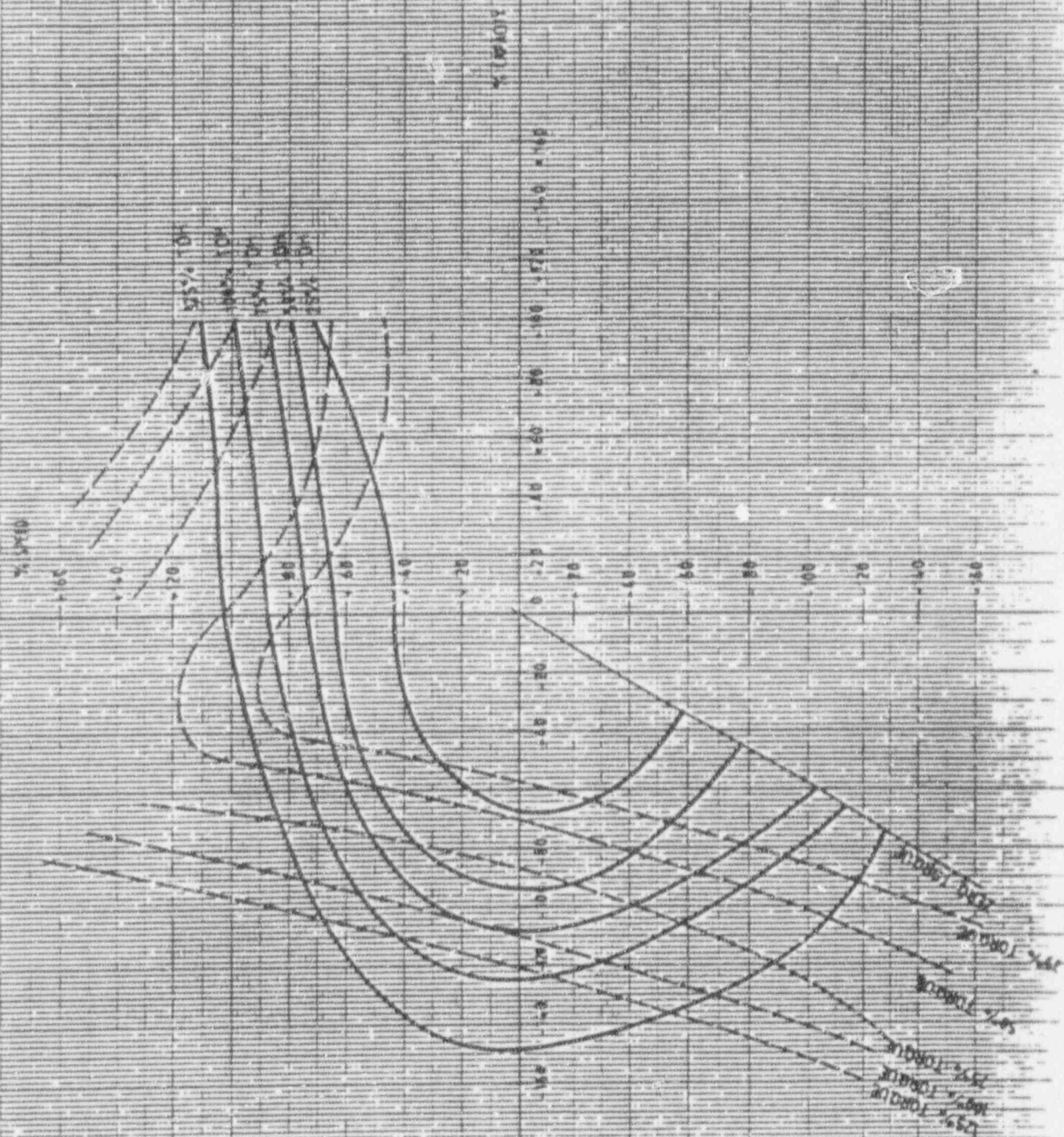


Fig 3.3.4/3 - Pump speed-flowrate theoretical curves

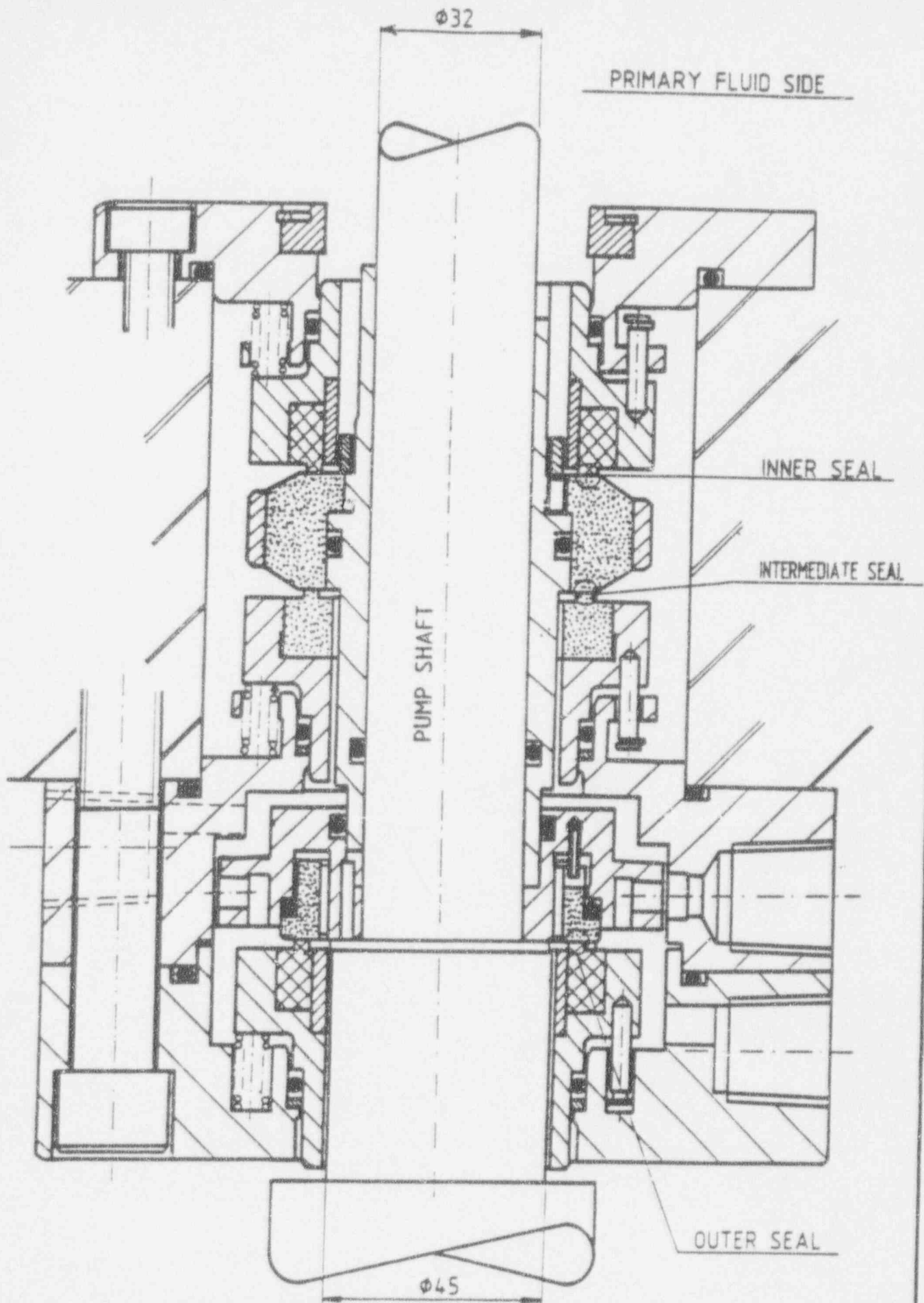


Fig. 3.3.4/4 - Primary pump mechanical seal arrangement