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BUTLER,W.R. Licensing Branch 2

SUBJECT: Forwards reactor pressure vessel internals steam dryer rept summarizing indications found during Unit 1 refueling outage,per request.Indications will not impact safe operation of facility.Related info encl.

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MAY 14 1985

Director of Nuclear Reactor Regulation
Attention: Mr. W. R. Butler, Chief
Licensing Branch No. 2
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, DC 20555

SUSQUEHANNA STEAM ELECTRIC STATION
RPV INTERNALS/STEAM DRYER REPORT
ER 100450 FILE 841-2, 203-11, 203-10
PLA-2471

Dear Mr. Butler:

In response to a request from Warren Hazelton, we submit the attached report summarizing the indications found during the Unit 1 First Refueling Outage and their dispositions. We have concluded that none of the indications impact safe operation of Susquehanna.

Also attached are copies of information requested by Mr. Hazelton in a site meeting on April 9, 1985. Please call if you have any questions on the attached.

For your information, Unit 1 will restart in early to mid-June.

Very truly yours,

W E Barberich for

N. W. Curtis
Vice President-Engineering & Construction-Nuclear

Enclosures (2)

cc: M. J. Campagnone NRC
R. H. Jacobs NRC

A001
1/1

Enclosure 1

RPV INTERNALS/STEAM DRYER

REPORT

1. INTRODUCTION

During inservice inspections (ISI) of internal components of the Susquehanna Unit No. 1 reactor vessel in Spring 1985, several visual indications were observed. The purpose of this report is to present results of the evaluation of indications observed in the steam dryer, steam dryer support bracket, core spray spargers, feedwater spargers, IRM/SRM instrument dry tubes, top guide, and in addition, jet pumps set screw gap sizes.

2. SUMMARY

2.1 STEAM DRYER SUPPORT BRACKET:

One of four dryer support brackets was found to be cracked during the Unit 1 first refueling outage. The bracket crack has been determined to be caused by fatigue. The bracket has been replaced with a similar component, however, the method of loading the bracket has been modified so as to significantly reduce the stresses. Instrumentation consisting of strain gages, differential pressure transducers, and accelerometers will be installed for the purpose of investigating the causative load during the next operational cycle. The observed defect represents no significant impact on plant safety.

2.2 STEAM DRYER:

Three groups of indications were discovered on the Unit 1 steam dryer during the first refueling outage visual inspection. The first group included four crack-like indications on the dryer hoods which subsequent liquid penetrant testing proved to be not relevant/non-existent.

The second group included the vane bank tie rod washer-nuts. The tie rod washer nuts were covered by welded capture plates to prevent the generation of small loose parts.

The third group of indications is located on the dryer support ring. They have been determined to be IGSCC cracks which have a maximum probable depth of 1/4 inch. Six of these cracks have been measured for depth by non-destructive techniques and will be trended for crack growth rates during the next operational cycle. Furthermore, analysis has been performed which, based on conservative crack depth growth assumptions, proves that no adverse safety or operational consequences arise from operating with the observed cracks in the Unit 1 dryer.

2.3 CORE SPRAY SPARGER

Initial inservice inspections (ISI) of the core spray spargers revealed one indication in the C sparger and one indication in the D sparger. Because the weld area had been ground, it is not possible to tell whether the indications are in the weld, base metal, or heat affected zone (HAZ). As a result of subsequent ISI the indication in the C sparger was considered to be a non-relevant surface scratch or

grind mark. The indication in the D sparger may also be a surface scratch or grind mark. However, because of the crack-like appearance of the lower 0.25" of the indication (the entire indication is about 0.75" long) and the fact that cracks have been observed in other BWR core spray spargers, the indication in the D sparger is conservatively assumed to be a crack herein. Cracking has not been confirmed by means other than visual examination. The most likely mechanism for the observed crack in the "D" sparger is IGSCC due to cold work from pipe bending and grinding. Possible additional contributors are weld HAZ sensitization and residual weld stresses.

Results of evaluations indicate that the observed crack in the D sparger will have no effect on the structural or hydraulic integrity of the sparger even during core spray injection. The observed crack would not be expected to produce loose parts or adversely affect the LOCA analysis. As a result, no corrective action is required at this time.

2.4 FEEDWATER SPARGER

In service inspections (ISI) of the feedwater sparger revealed one axial indication in flow nozzle 14 of the A sparger. The indication starts in the flow nozzle elbow and extends through the adaptor and possibly into the header pipe.

A possible cause for initiation of the observed indication in flow nozzle 14A is high cycle fatigue due to thermal cycling in the sparger flow nozzles during low flow conditions. Indications have not been confirmed by means other than visual exam. It is conservatively assumed for analytical purposes to be a crack.

The results of the analyses indicate that a crack in a flow nozzle is not likely to propagate significantly into the sparger pipe.

Based on the evaluations presented in this report, it is concluded that no corrective action is required at this time.

2.5 TOP GUIDE

Visual inspections revealed a crack-like indication at top guide grid location 36-41 and surface irregularities at several other grid locations. These indications were not confirmed by means other than visual inspection. The cause of this potential crack is not known. An analysis was performed to determine the critical flaw sizes for the fast fracture of the beams under the worst postulated loading conditions.

Based upon the analysis, the critical crack size in the highest stressed region of the top guide is conservatively estimated to be in excess of 3". Even if total crack propagation throughout the ligament occurs, it does not pose any safety concerns.

In addition, a non-irradiated top guide at Hope Creek was video inspected by the ISI team and revealed indications similar to those observed at Susquehanna. These indications were dye-penetrant tested and found to be non-cracks.

Based upon the fracture mechanics evaluation and Hope Creek information, it is concluded that no corrective action is required at this time.

2.6 SRM/IRM INSTRUMENT DRY TUBES

Three of the twelve dry tubes were examined. All of the examined dry tubes are intact. There are no detectable bends or offsets in any of the examined tubes. The three dry tubes are at core locations 16-13, 16-21, and 24-37. All three dry tubes have several small faint indications. All of the indications are in the non- pressure boundary portion of the dry tubes similar to those at other reactors.

Only one dry tube (16-13) has a long indication and it is less severe than those observed at several other reactors.

Based upon analyses performed by GE, the SRMs and IRMs can continue to function even with a 360° through wall crack of the dry tubes, because the two pieces will be held in functional alignment by support from the adjacent fuel bundles. Also, the support provided by the fuel bundles will prevent adverse safety consequences from loose pieces in the unlikely event the dry tube becomes completely severed.

Based on this evaluation, Susquehanna Unit 1 can be operated for at least one additional fuel cycle with the existing dry tubes with no adverse impact on safety.

2.7 JET PUMP GAPS

The gaps between the restrainer bracket adjusting screws and the mixer on ten jet pumps were examined using a camera and video recording equipment.

The examination resulted in observable gaps at five of the twenty set screw positions (2 set screws per jet pump). The largest gap was measured to be 0.026 inches wide. Four remaining gaps were obviously smaller and therefore were not measured.

An analysis performed by GE concludes that during normal balanced flow operation, unbalanced flow, and transient conditions, jet pump vibration levels would be acceptable for gaps no larger than 0.030". During single loop operation, jet pump vibration levels are acceptable if the gaps are no larger than 0.030 inches and the pump speed is limited to 80% of rated speed.

The observed gaps at Susquehanna Unit 1 are within the experience base of other reactors and do not pose any restrictions during normal two recirculation pump operation.

2.8 REACTOR WATER CHEMISTRY:

It is known that the BWR water chemistry environment, even with good impurity control, is aggressive enough to produce IGSCC of stainless steels under suitable material conditions and stresses. However, impurity control can slow the initiation and propogation of cracking. The control of impurities over the first cycle of SSES Unit 1 has been good. Average conductivities at power were reduced to levels consistent with BWROG guidelines during the first third of the cycle and have remained there. Chemistry should not have been an excessively aggravating contributor to IGSCC.

3. DISCUSSION

3.1 STEAM DRYER SUPPORT BRACKET:

3.1.1 Component Description: The support bracket is one of four short rectangular projections from the interior of the RPV that support the steam dryer. They are 3x5x11 inch forgings, full penetration welded to Inconel pads about 10 feet below the closure flange at azimuth 4°, 94°, 184°, and 274°. (See Figure 3.A-1)

3.1.2 Indications: Remote underwater video viewing first revealed indications of cracking in the 184° bracket. On the top of the block near the RPV wall, a single indication crossed the 3" width of the block following the contour of the weld prep. On each side, the indication continued downward moving away from the RPV wall in a circular arc with center near the upper interior corner of the block. Fig. 3.A-2 shows the configuration of the indications. This indication was confirmed by local VT, PT, UT, and by physical separation of a portion during the bracket removal. The other three brackets were examined by remote VT, local VT, and PT with no indications.

3.1.3 Material: The brackets are constructed of forged blocks of Alloy 600 Inconel. Prior to welding, the blocks were mill annealed at 1700°F and machined. The pad on the RPV is an alloy 182 Inconel weld butter. The block is joined to the pad by SMAW groove welding 1½" deep from both sides. The root pass was by GTAW, back ground to sound metal. The bevel angle was 25°. No post weld heat treatment was applied.

3.1.4 Causes of Indications:

The metallurgical analysis in the following section shows that the bracket failed by a fatigue mechanism. Since the initiation sites were found on the side surfaces of the bracket, the stresses had to be highest there. This implies that a flexural load was applied to the part in a horizontal direction. Vertical forces were also present, however a failure due to purely vertical forces, such as would be caused by lifting and dropping of the dryer on the bracket should

have initiated cracks on the upper surface. No such initiation sites were found. Since no stress corrosion cracking was found, the mode of failure is fatigue.

Examination of the failed bracket on the upper surface showed that the support ring was in direct contact with the edge of the bracket farthest from the reactor wall. This was different from the other three brackets which showed contact with the seismic block attached to the support ring. The point of application of the load on the failed bracket was 80% farther away from the crack initiation edge than was the load application point on the unbroken bracket diametrically opposed to it. This bracket, as well as the 94°, and 274° brackets, would most likely see the same forcing conditions as the broken bracket, but because of the point of load application, the moment applied to the weld would be only 56% of the moment at the same weld in the broken bracket and the stress would be significantly less than the failure stress.

An estimation of the expected life can be approximated by using the material fatigue curve and the estimated cycles to failure from the metallurgical analysis. The fatigue design curve from the B&PV code Sec. III Div. 1 Appendices, 1983 ed. shows that in the lower stress regime, small stress reductions produce large increases in expected life (cycles to failure). Thus, the new arrangement should provide a lifetime equal to the life of the plant with sufficient margin and certainly in excess of the duration of the next fuel cycle.

3.1.5 Evaluation of Indications:

Three different samples were removed from the support bracket which were sent subsequently to GE's Vallecitos Nuclear Facility for metallurgical examination.

Sample 'A' was taken from the center front left hand corner of the bracket at the termination point of the crack. The fracture surface was found to be typical transgranular fatigue with a small amount of plastic deformation at the termination point of the crack. No gross plastic deformation was observed in the area nor was there any branching or intergranular cracking evident.

Sample 'B' was taken from the center of the lower right surface crack. Again, transgranular fatigue was observed to be the mode of crack propagation with beach marking evident and proceeding from right to left across the surface of the fracture. This means that the initiation point was closer to the reactor wall than where the sample was taken.

Sample 'C' was taken from the top portion of the bracket including the point of closest approach of the cracks to the vessel wall overlay. This was a large sample extending the full 3 inch width of the bracket and including both weld metal and bracket base metal. The fracture surface showed evidence

of 3 major cracking planes. Two planes originated at the right surface and one from the left surface of the bracket. On the one crack plane from the upper right fracture it was evident that the crack origination point was in weld metal. The characteristic thumbnail print of a fatigue initiation site was present and beach markings of slow irregular fatigue crack growth and river patterns of fast crack growth were also present. The fatigue crack initiation point was about 3/4 inch below the upper right corner of the bracket. Termination of the crack was in the center of the bracket at the point of closest approach to the vessel wall overlay.

The other two cracks were also characterized as fatigue as they showed the same fracture morphology as the fracture described above. It was not evident however exactly where the origination points of these cracks were located. The crack originating on the left surface of the bracket could have originated anywhere from the upper corner to below the lowest edge of the sample (about 1"). All three cracks terminated in the center of the bracket.

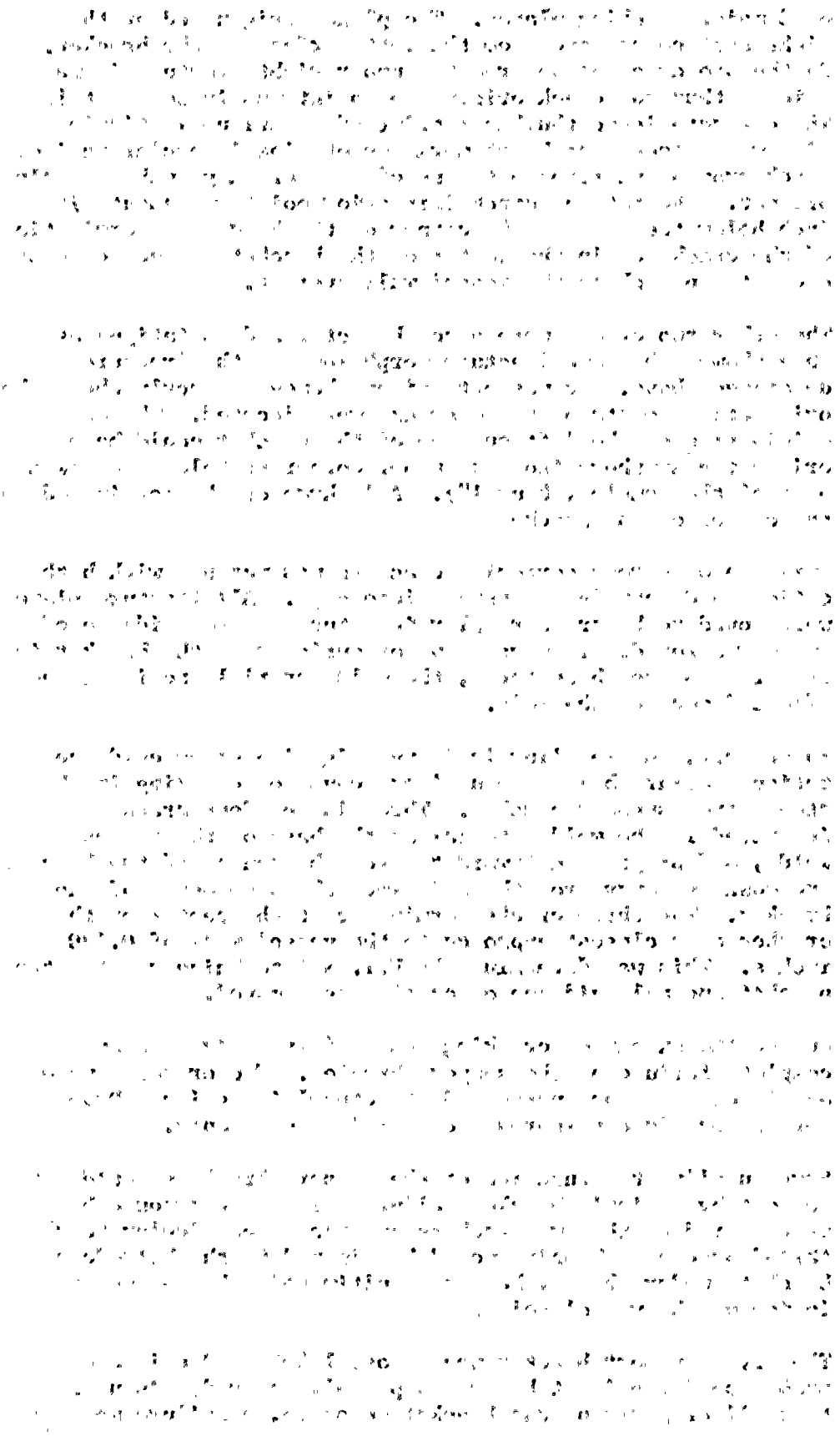
Evidence of stress corrosion cracking was pursued with both optical and scanning electron microscopy. All fracture planes were found to be transgranular in nature and no evidence of IGSCC was found. This was true of surfaces of the bracket in the areas of the base metal, the weld material and in the heat affected zone of the weld.

In summary, the metallurgical investigation gives evidence of fatigue failure being the ultimate cause of cracking in the steam dryer support bracket. Three independent cracks initiated in the weld material at the base of the fillet welds, and progressed inward towards the center of the bracket and down and away from the weld into the base metal of the bracket. The three cracks terminated at the center of the bracket at a closest approach to the vessel wall of 0.130 inches. This was determined by U.T. NDE techniques after the bracket and all evidence of cracks was removed.

Due to the extent of cracking, the safety analysis assumed complete failure of the support bracket. Two criteria were examined; loose parts and structural integrity. Dryer performance is considered a commercial issue only.

Structurally, the function of the support brackets would not be lost by a single bracket failure. The weight would be transferred to the two brackets on axis perpendicular to the failed bracket. Tipping would be limited by the hold-down brackets under the RPV head and, ultimately, by the skirt inside of the vessel below.

The dryer support bracket would most likely wedge into a stable position if it became completely severed. Assuming that all or parts of the bracket separate, a failure mode and



effect analysis was performed that showed potential for damage to feedwater spargers, core spray piping or jet pumps. The damage would be detectable and in the absence of an independent failure, no safety function would be lost.

The actual failure of a bracket would quite likely be detected during power operations. Susquehanna has a loose parts detection system which would effectively detect the presence of migrating loose parts. In addition, the condenser hotwell is regularly sampled for Na-24 concentration which is indicative of moisture carryover.

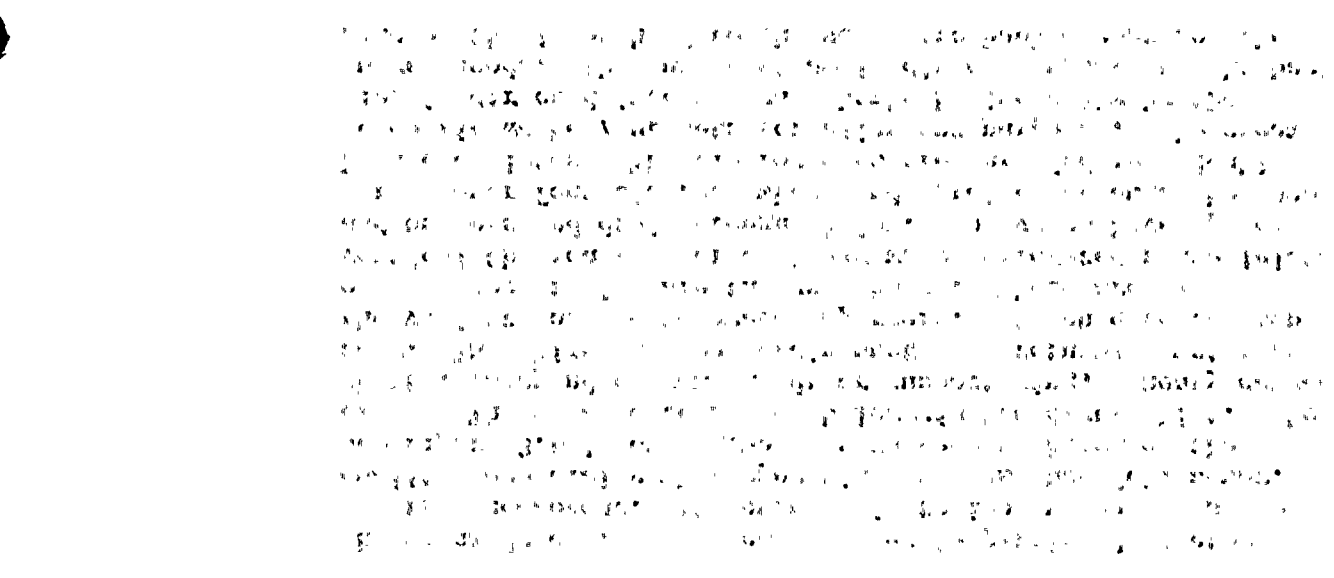
3.1.6 Corrective Action:

The dryer support bracket at 184° cracked due to fatigue, probably caused by a horizontal reversing load. The other three brackets' fatigue life were not significantly impacted because the load application point was closer to the RPV wall. The dryer will be instrumented before it is placed back into service in order to aid in investigating the source of the loading. In order to preclude the recurrence of bracket cracking during the next fuel cycle, the point of load application at the 184° bracket was moved by grinding out interference with the dryer support ring such that the seismic block bears the weight. The weld pad was carefully prepared for installation of the new bracket and the final surface was examined by VT, UT, PT, and etching for soundness of the material. The final thickness of the inconel weld pad was .130 inches which precipitated the use of special welding techniques in the repair. The new support bracket is identical to the original in every way except the bevel angle on the weld prep was increased to 45° to facilitate rewelding.

3.2 STEAM DRYER:

3.2.1 Component Description:

The steam dryer is a non-code, non-safety-related reactor internal component. Its purpose is to improve outlet steam quality, especially when operating at less than full power. See Figure 3.B-1 for a general arrangement sketch of the dryer. The steam enters from below via the dryer skirt. The skirt is suspended from the dryer support ring, a heavy curved beam. The skirt has four drain ducts for returning water to the vicinity of the feedwater spargers. Attached to the top of the support ring are the vane banks. There are six vertical Chevron type dryer banks with perforated plate inlets and outlets and drain troughs below. The vanes have spacers strung over four tie rods whose ends project through the vane bank end plates. The tie rod ends are threaded into double eccentric washer/nut sets for alignment purposes. The steam flow is directed into the vane banks horizontally by the curved hoods. The outlet steam is directed upward by the back side of the inlet hood to the next vane bank except for the



two central banks which face each other. Various deck plates fill the gaps between the circular support beam and the rectangular hoods. There are four lifting rods attached to the support ring with threaded eyes on top. These interface with the hold down lugs under the RPV head in an earthquake or a postulated mainsteam line break. The support ring is an assembly of two semicircular beams with a 3½ x 9½ inch cross-section joined into a circle by bolting to curved backing beams at azimuth 0° and 180°. The ends of the half circles remain separated to provide a gap for the installation guide rods in the RPV. At azimuth 4°, 94°, 184°, and 274°, seismic lugs are welded to the rings to support the weight of the dryer without rocking and to provide lateral restraint in an earthquake.

3.2.2 Indications:

Remote video examination was used to identify indications in the 1984 repair area of the hood at azimuth 40°, the vane bank end plate at azimuth 0°, the dryer support ring at many locations, and the tie rod washer/nut sets.

The indications on the hoods, both the 1984 repair area and the end plate at 0° azimuth were examined by PT. There were no relevant indications as a result of this examination.

The washer/nuts appeared to be damaged based on the remote video examination and have been repaired by welding capture plates over all washer/nut sets.

The indications in the support ring were confirmed by PT. None of the indications progress into hood or deck plate attachment welds. Figures 3.B-2 show the approximate locations of a representative sample of relevant indications.

3.2.3 Material:

The entire dryer is constructed of Type 304 stainless steel sheets and plates. The dryer support ring is a 3½ x 9½ inch rectangular beam that is rolled into the semicircular shape and machined to square it. The heat treatment consisted of annealing of the bar prior to rolling. No heat treatment was applied post forming.

3.2.4 Causes of Indications:

Ten areas of the support ring and dryer hood welds were photographed at the time of the P.T. examinations to record the location of the indications. No cracking was revealed in any of the welded plates, but many cracks were found on the support ring itself. All of the photographed indications were within 3/4" of a weld and the one metallurgical sample tested, taken near the weld, showed mild sensitization (precipitation of carbides). Because of the close association of the cracks

with welds, it is implied that both the residual stresses near the weld and the heat affected zone contributed to the cracking phenomena. Although 3/4" is farther from a weld than one normally considers a sensitized zone, it may have been close enough to be sensitized along with the fact that the material was in a cold worked state; i.e. it was formed into a ring after solution heat treatment.

3.2.5 Evaluation of indications:

The steam dryer support ring exhibited indications on the vertical surface, the corners and the upper (and lower) horizontal surfaces. A metallurgical boat sample was obtained from each of these three surfaces and analyzed by both light and scanning electron microscopy for fracture morphology and other characteristics.

Sample	Position	Distance from Corner	Crack Depth
Vertical Surface	225°	0.6"	0.231"
Corner	210°	0.0"	0.167"
Upper Surface	47°	0.7" (3/8" from weld)	0.160"

The depth of each crack was determined by grinding out the sample area until a dye penetrant exam did not reveal the presence of a crack. Metallographic evidence showed that each of the cracks was IGSCC in nature. Hardness tests were performed on the metallographic samples taken from the ring. The samples showed surface hardening which is indicative of cold working during manufacture. There was no evidence of fatigue failure. There was some evidence of a very shallow layer of transgranular cracking on the surface.

Only the sample taken from the top surface of the ring showed evidence of sensitization. This was determined on revealing the carbide precipitates by an Oxalic acid etch. One of the remaining two samples was given an E.P.R. test to measure the sensitization and the results showed this material not to be sensitized. The ring was solution annealed and the carbon content is 0.056% so it is likely that the sensitization only appears in or near the heat affected zones of the welds and not in the bulk of the ring.

While the cracks near the surface showed oxidation, the IGSCC cracks deeper in the metal did not exhibit oxidation products and therefore they were considered to be fresh and actively growing. Edax analysis of the surface contaminants did not reveal any unusual elements; only those of the base metal and the P.T. examination materials.

In summary, the ring cracking is basically IGSCC in nature with a small amount of transgranular cracking which was very

shallow. It is peculiar that only the ring itself is cracking and not any of the remaining 304 stainless steel plates welded to the ring or the rest of the dryer. This may indicate that the material is more susceptible to crack initiation by IGSCC due to high residual manufacturing stress and deformation than the remainder of the dryer.

The cracks in their existing state are not large enough to have any significant affect on structural integrity. Based on a conservative estimate of crack growth rate, the cracks will remain too small to affect integrity throughout the next fuel cycle. Therefore, there is no impact on safety.

3.2.6 Corrective Action:

We believe the stresses that contributed to the IGSCC cracks in the dryer support ring are due to manufacture and the operating stresses are very low. We expect to see very little crack growth during the coming fuel cycle. In order to prove this, six crack areas have been identified by punch marks and non-destructively tested for depth. The depth readings are all less than 1/4" which is consistent with the cracks in the boat samples. At the next refueling outage, these will be measured again and appropriate action taken.

3.3 CORE SPRAY SPARGERS

3.3.1 Component Description:

The Susquehanna Unit 1 core spray spargers are shown in Figures 3 C-1 and 3 C-2. There are two independent core spray spargers; an upper sparger with bottom mounted nozzles and a lower sparger with top-mounted nozzles. Each sparger consists of two approximately 180^{o} sparger halves. Each sparger half (A, B, C, and D) consists of two 4" Schedule 40 header pipes (sparger arms) welded to a 6" schedule 40 inlet pipe (junction box). The junction box is welded to the upper shroud via the seal ring. The sparger arms are supported by brackets welded to the upper shroud at two locations in addition to the support at the inlet pipe.

3.3.2 Indications:

A remote underwater TV examination of the accessible portions of the core spray spargers and corresponding internal piping was performed. Two indications were found. A 1/4"-3/8" indication was found in the "C" Sparger at 187^{o}. (Figure 3 C-3) The location of the surface indication was possibly in the heat affected zone of the left sparger arm to junction box weld. Also, a 3/4" indication was found on the "D" Sparger at 172°. (Figure 3 C-4) The location of this indication was possibly in the heat affected zone of the right sparger arm to junction box weld. Cleaning of the affected areas was performed after which the "C" Sparger indication was

determined to be a non-relevant surface scratch or grind mark. Only the "D" Sparger indication remained relevant after cleaning. The indication found on the "D" Core Spray Sparger was dispositioned to be a "crack" by the NDE Level III inspector. It was very tight with a width characterized as less than 0.001 inch. This dimension was obtained by placing several wires next to the indication and making an optical comparison.

3.3.3 Material:

The core spray spargers are as welded Type 304L stainless steel with a maximum carbon content of 0.019 percent. During fabrication and installation, it is noted that the 4" Schedule 40 sparger arms were cold bent to the required radius and that one or more of the sparger halves would have been cold sprung.

3.3.4 Causes of Indications:

The most likely mechanism for the initiation of the observed crack is intergranular stress corrosion cracking (IGSCC) due to cold work from pipe bending and grinding. Such cold work can significantly increase the susceptibility of Type 304L stainless steel to IGSCC. Possible additional contributors to IGSCC are weld HAZ sensitization and residual weld stresses. In addition, previous observed cracking in BWR core spray spargers has been attributed to IGSCC.

3.3.5 Evaluation of Indications:

Evaluations of the core spray sparger crack have been performed by PP&L and our consultants. The analyses address structural and hydraulic integrity, loose parts, and the effect on LOCA analyses. The results of the analyses are presented below.

The analyses indicate that the observed crack in the "D" sparger will have no effect on the structural or hydraulic integrity of the sparger. The analyses addressed potential sources of stress resulting from fabrication, installation, normal operation, and operation during a postulated LOCA. There are no significant primary loads on the core spray spargers during normal operation or core spray injection. Secondary thermal stresses are not a concern for a few cycles. Residual stresses from fabrication and installation vary from tension to compression. Thus, crack arrest would be expected as the crack propagates into the compression zone. An analysis which bounds the effects of core spray sparger cracks indicates that the effect on core cooling is negligible. Because sparger structural integrity has been demonstrated, loose parts are unlikely. However, loose parts analysis has been performed. The conclusion is that the probability of unacceptable flow blockage of a fuel assembly or for unacceptable control rod interference is negligible. The

potential for corrosion or other chemical reaction with reactor materials is essentially zero since the sparger material is designed for in-vessel use. Loose parts are not expected to cause damage to the other RPV internals.

A bounding calculation of the limiting LOCA with approved Appendix K licensing model but with CCFL breakdown input based on large scale tests results in a maximum PCT of approximately 1400°F (800° F margin to licensing limit of 2200°F). No credit for steam cooling or the improved decay heat correlation which would further reduce the PCT are included in this calculation.

3.3.6 Corrective Action:

It is concluded that Susquehanna Unit 1 can safety operate in the present condition and no corrective actions are warranted at this time.

3.4 FEEDWATER SPARGER INDICATIONS

3.4.1 Component Descriptions:

The SSES Feedwater Sparger design consists of six sparger headers each containing 18 top mounted welded nozzles. A nozzle consists of a 90° elbow welded to an adaptor (Figure 3 D-1). The spargers are supported at each end by end brackets that are pinned to support lugs welded to the inside diameter of the reactor vessel.

3.4.2 Indications:

During inservice inspection of the spargers, an indication was seen in the area of nozzle #14 on "A" sparger (30° azimuth) using remote visual examination. The indication can be characterized as running axially to the two nozzle welds with its upper limit just beyond the elbow to adaptor circumferential weld and lower limit on the sparger arm appearing to branch out in a faint starburst pattern between nozzles 13 and 14 (See Fig. 3 D-2). From the video tapes it is not possible to see the indication going through the elbow to adaptor weld but the indications in the elbow and adaptor appear to line up on opposite sides of the weld.

3.4.3 Material:

The fabricated sparger assembly is type 304 stainless steel in the solution heat treated condition. The headers are 6" schedule 80S pipe.

3.4.4 Causes of Indications:

Cracks have been observed in a similar feedwater sparger at one other plant and the cause has been attributed to high

cycle fatigue due to thermal cycling during low flow conditions. However, the previous cracking has been oriented circumferentially with respect to the welds and in spargers that were not solution heat treated. If a crack exists, the cause of crack initiation is uncertain. The magnitude of thermal loads necessary to initiate a crack would likely have resulted in a more severe crack. In addition, we would have expected to see indications on other nozzles. Therefore the possibility that the indication is the result of the growth of a pre-existing material defect in the base metal or a weld cannot be ruled out.

3.4.5 Evaluation of Indications:

As a conservative measure, the indication has been evaluated as if it were a crack.

Since there are no primary loads on the spargers, fatigue crack propagation can only occur due to a thermal gradient. Such a thermal gradient is present only during low flow conditions. The thermal stresses in the sparger pipe would be expected to be much lower than in the flow nozzles. The result is that a crack in a flow nozzle is not likely to propagate significantly into the sparger pipe. The GE analysis has conservatively concluded that crack growth over the next ten month fuel cycle will not exceed 0.5 in. The critical crack size, calculated at 6 inches, will not be exceeded even if a conservative 2 inch crack is assumed to exist on the sparger.

Also, field operating experience with the older GE sparger design having flow holes rather than nozzles has shown that cracks in the sparger headers tend not to propagate around the pipe.

Because continued sparger structural integrity has been demonstrated, loose parts are not expected. However, GE has performed a loose parts safety evaluation and determined that there are no safety concerns with postulated loose parts.

3.4.6 Corrective Action:

The Level III inspector contracted by PP&L for in-vessel visual examinations has dispositioned the indication as non-relevant and PP&L concurs with this disposition.

No corrective actions are currently planned for the feedwater spargers.

3.5 TOP GUIDE

3.5.1 Component Descriptions

The top guide assembly consists of a network of interlocking beams which form a highly redundant gridlike structure (Figure 3 E). In the areas of interest, particularly the central high fluence regions, there are no welds present. The purpose of the top guide is to provide lateral support to the upper end of the fuel bundles.

3.5.2 Indications:

During inservice inspection of reactor internals components, nineteen top guide grid locations were examined using remote video equipment. Several grid locations exhibited an irregularly contoured crud-like surface deposit. Particular attention was focused on grid location (X-36, Y-41) where a crack-like indication was seen in the central portion of the beam away from the ligaments. Surface conditioning was performed resulting in apparent removal of part of the indication and the remainder appeared faint.

3.5.3 Material:

The top guide is made from type 304 stainless steel in the solution heat treated condition.

3.5.4 Causes of Indications:

The exact nature and cause of the indication at (X-36, Y-41) is unknown. The loading on the top guide during normal operation produces negligible stresses in the beams and therefore IGSCC is not expected to occur because of the negligible loading, the fact that the material is solution heat treated and that there are no welds present in the areas of interest.

3.5.5 Evaluation of Indications:

A fracture mechanics analysis of the top guide was performed assuming a through wall crack. The analysis is based on a fracture toughness associated with a maximum accumulated fluence of $4.5X10^{20}$ nvt at the lower edge of the beams which is essentially at the top of active fuel. Faulted event loading conditions were used since they represent the worst case loads. The analysis concludes that the critical crack size in the highest stressed location of the top guide, i.e., in the bottom beam cutout region of the ligaments is in excess of 3 inches. Furthermore, even if total crack propagation of an entire ligament occurs, it would not pose any safety concerns due to the highly redundant design of the top guide.

In order to establish a baseline against which the various surface phenomena could be compared, a similar examination was performed on the unused Hope Creek 2 top guide. While the Hope Creek top guide is not structurally identical, it is of similar design using the same material and fabrication processes that were used for the SSES top guide. The Hope Creek top guide video examination revealed under magnification a large number of surface indications. The surface condition appeared to be similar to that of the SSES top guide except for a shiny appearance rather than a dull crud-like appearance. The contracted Level III inspector acknowledged the similarity of the surfaces but noted that the relative severity of the indications on the two structures could not be compared due to illumination differences. Nine Hope Creek top guide areas exhibiting various indications were dye penetrant examined and no relevant indications were found.

3.5.6 Corrective Action:

Based on the fact that top guide loads are negligible during normal operation and based on the similarity between the observed indications in the SSES and Hope Creek top guides, PP&L does not consider it likely that the observed indication represents a crack. It is likely to be a non-relevant surface irregularity enhanced by the crud-like deposit. If a crack is present, it is less than the calculated critical crack size and does not constitute a safety concern. Therefore, no corrective action is planned.

3.6 SRM/IRM DRY TUBES

3.6.1 Indications:

A remote underwater TV examination of three of the 12 dry tubes in Susquehanna Unit 1 was performed. The three dry tubes were at core locations 16-13, 16-21, and 24-37. All of the examined dry tubes were intact. The inspection revealed very fine circumferential indications in the non-pressure boundary portion of the dry tubes. All of the observed indications are in the tube and the shaft (Figure 3 F-1). No indications were observed in the adapter, guide plug or primary pressure boundary. The indications were barely visible with the longest being approximately 75% of the circumference in length on the dry tube at location 16-13. (Figure 3 F-2). The indications on the dry tubes were dispositioned as non-relevant by an NDE Level III examiner.

3.6.2 Material:

The dry tubes are Type 304 stainless steel which has been solution annealed.

3.6.3 Cause of Indications:

The cause of the observed indications in the SRM/IRM dry tubes is most likely irradiation assisted stress corrosion cracking (IASCC). Cracking due to IASCC has been seen at several other plants resulting in dry tube replacement.

3.6.4 Evaluation of Indications:

Although the indications were non-relevant, a backup analysis was performed which conservatively assumed that a 360° through wall crack existed in the SRM/IRM dry tubes. The analysis addressed the following consequences of cracks in dry tubes: loose parts, breach of pressure boundary, functional and structural performance. The results of the analysis are presented below.

The analysis showed that there is no possibility for the generation of undetected loose parts during fuel loading and there are no safety concerns for loose parts postulated to occur during operation. The support provided by the fuel bundles will prevent adverse safety consequences from loose parts.

In the unlikely event that a crack would initiate and propagate through the pressure boundary, a small leak would develop. The resulting leakage is not significant to safety. It was shown through an Appendix K evaluation that leaks of this magnitude would result in a peak cladding temperature (PCT) of less than or equal to 1000°F, which is much less than our licensing basis.

The SRMs and IRMs can perform their intended function even with a maximum offset of the dry tubes due to a 360° through wall crack because the two parts will be held in functional alignment by support from the adjacent fuel bundles. Therefore, there would be no effect on the insertion or removal of SRMs or IRMs.

There are two possible structural effects of cracked dry tubes; seismic performance and effect on flow induced vibration. A 360° through wall crack in a dry tube will not affect the ability of the fuel bundles to support the cracked dry tube during a seismic event. In addition, operation of a dry tube with a postulated 360° through wall crack will not cause any damage to the surrounding fuel channels nor further degrade the dry tube due to the fact that SRM/IRM dry tube vibration is primarily caused by small levels of fuel channel motion. The wear from this small movement is not a concern.

3.6.5 Corrective Action:

Based upon the above evaluation, Susquehanna Unit 1 can be operated for at least one additional fuel cycle with the existing dry tubes with no impact on safety.

3.7 JET PUMP GAP:

3.7.1 Examination:

A remote underwater TV examination of the area between the jet pump wedge and restrainer screws and the jet pump mixing assembly on 10 jet pumps was performed. (Figure 3 G) This examination was performed to determine if gaps were present between the wedge or adjusting screws and the mixing assembly.

The results of the inspection revealed one readily visible gap between the vessel-side adjusting screw and the mixing assembly of Jet Pump #15. Using a taper gauge and a dial indicator, the gap was conservatively measured to be 0.026in.

3.7.2 Cause:

The most probable cause for the gap found in Jet Pump #15 was the implementation of an installation instruction to reduce the preload on the jet pump beam bolt assemblies. The inlet mixer had probably been slightly misaligned during the implementation of this instruction.

3.7.3 Evaluation:

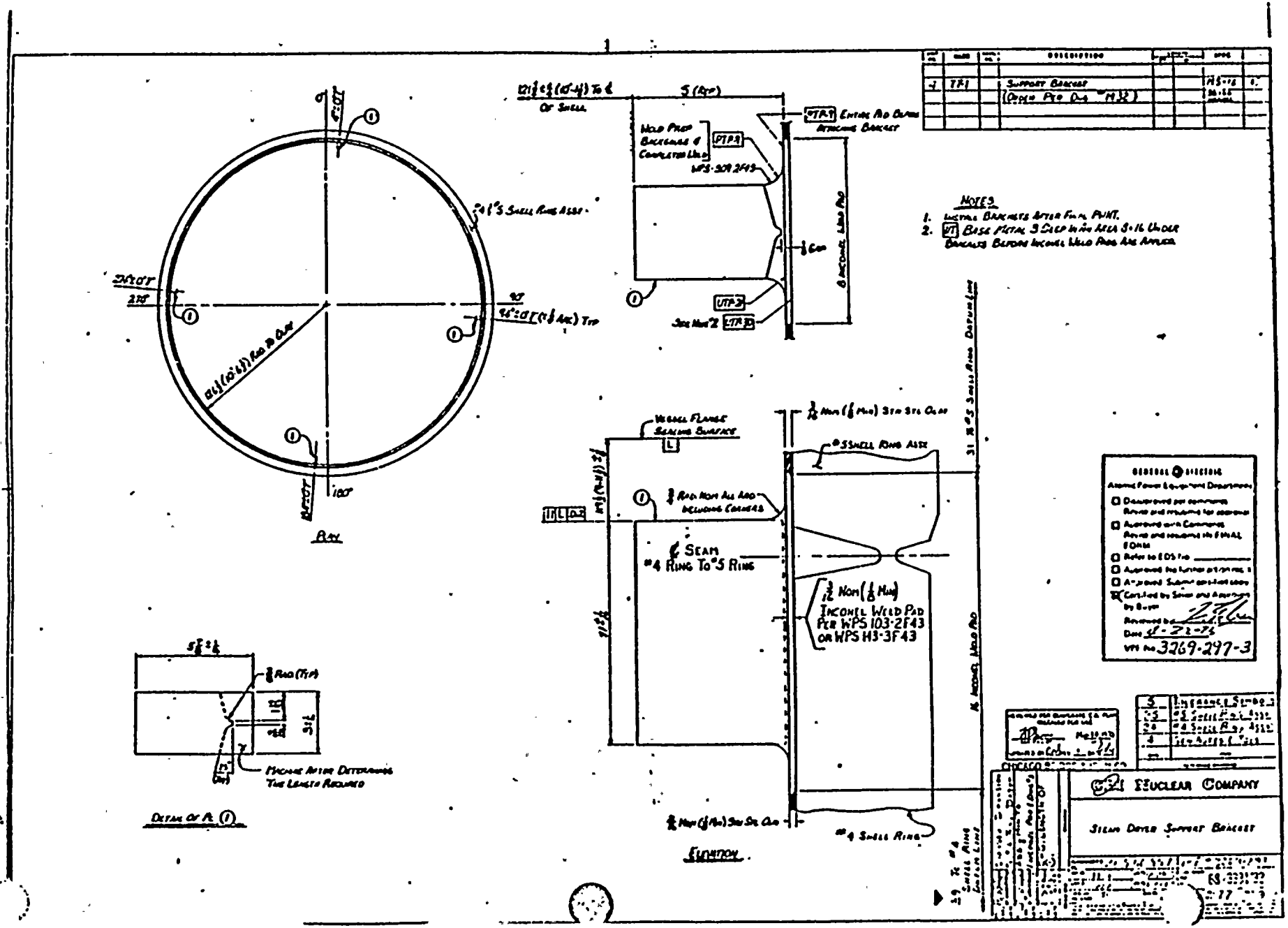
Analysis by GE has shown that a gap less than 0.030in. is acceptable. The analysis assumed normal operating conditions with balanced recirculation loop flow and a maximum gap of 0.030in. at the RPV side adjusting screw. Analysis has shown that jet pump vibration levels would be acceptable for gaps less than 0.030in. during unbalanced flow and transient conditions. In addition, during single loop operation, jet pump vibration levels are acceptable if the gaps are less than 0.030in. and the pump speed is limited to 80% of rated speed.

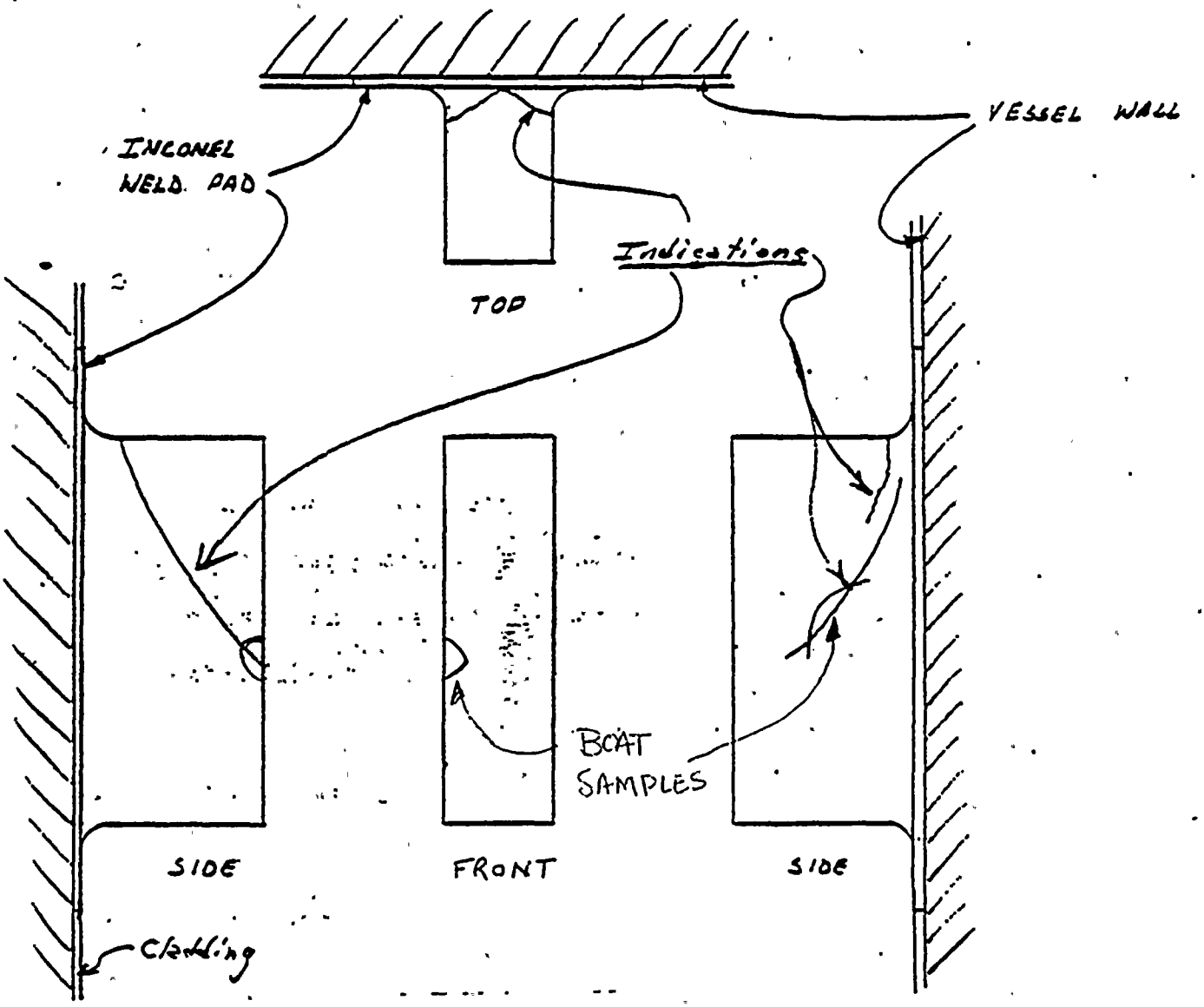
3.7.4 Corrective Action:

No corrective action is currently planned for the jet pump gap. Based on our analysis, Susquehanna Unit 1 can continue operation.

sjd/e109i:mg

FIGURE 3 A-1


NOTES
1. WELDING BRACKETS AFTER FINAL PAINT.
2. BASE PAINT 3 COATS IN THE AREA 5" IN UNDER BRACKETS BEFORE INCONEL WELD PADS ARE APPLIED
Inconel Weld Pad
Seam #4 Ring To #5 Ring
#5 Shell Ring
#4 Shell Ring
Plan
Elevation
Detail of A (1)
Machine After Determining The Length Required
Steam Dryer Support Bracket

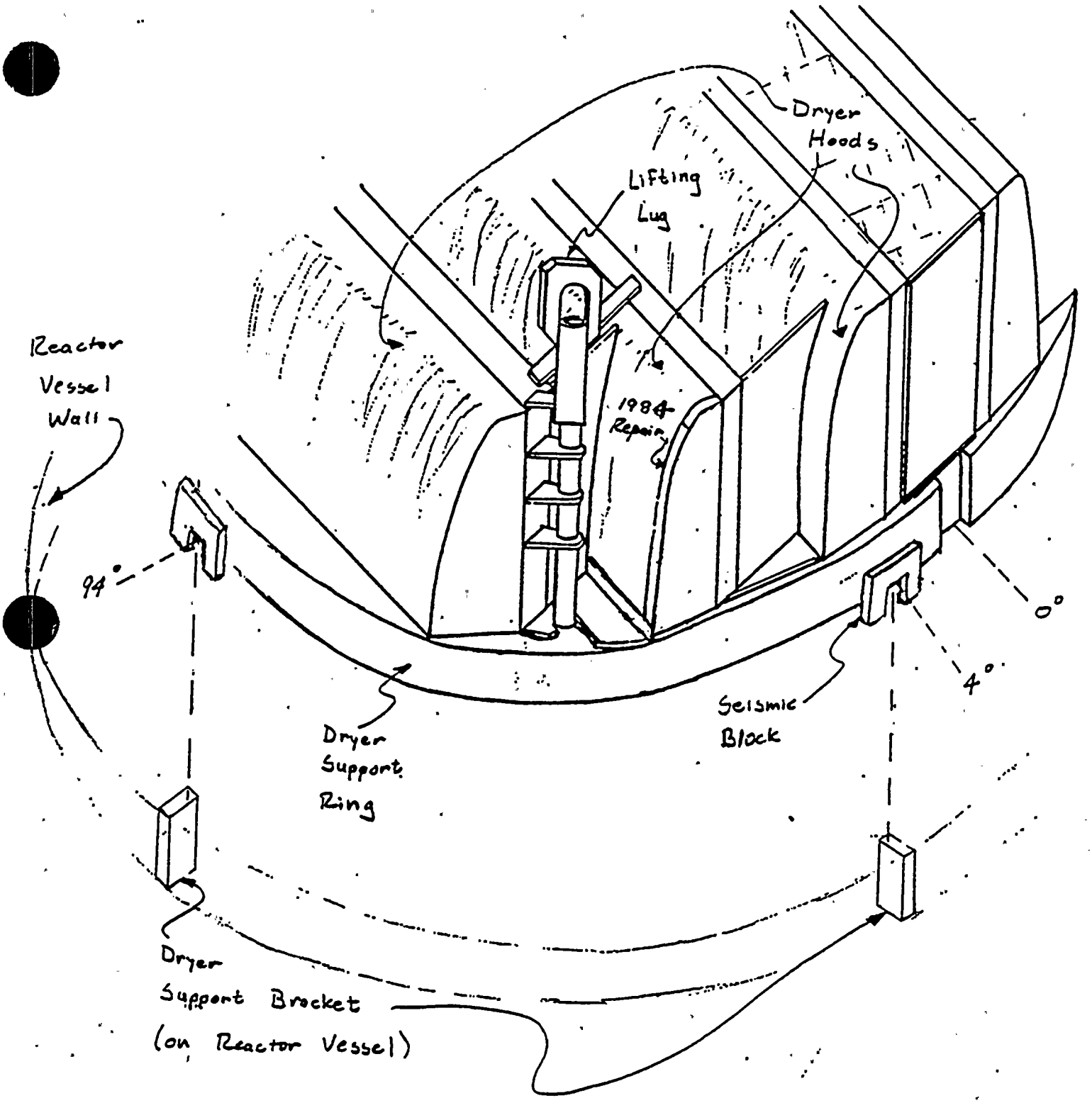


SUSQUEHANNA UNIT 1 DRYER SUPPORT BRACKET

INDICATIONS IN BRACKET AT 184° AZIMUTH

(FROM CTS VIDEOTAPE SSES-ISI-41, 3/2/85,)

FIGURE 3 A-2



SUSQUEHANNA UNIT 1 STEAM DRYER AND SUPPORT BRACKETS - SCHEMATIC

FIGURE 3 B-1

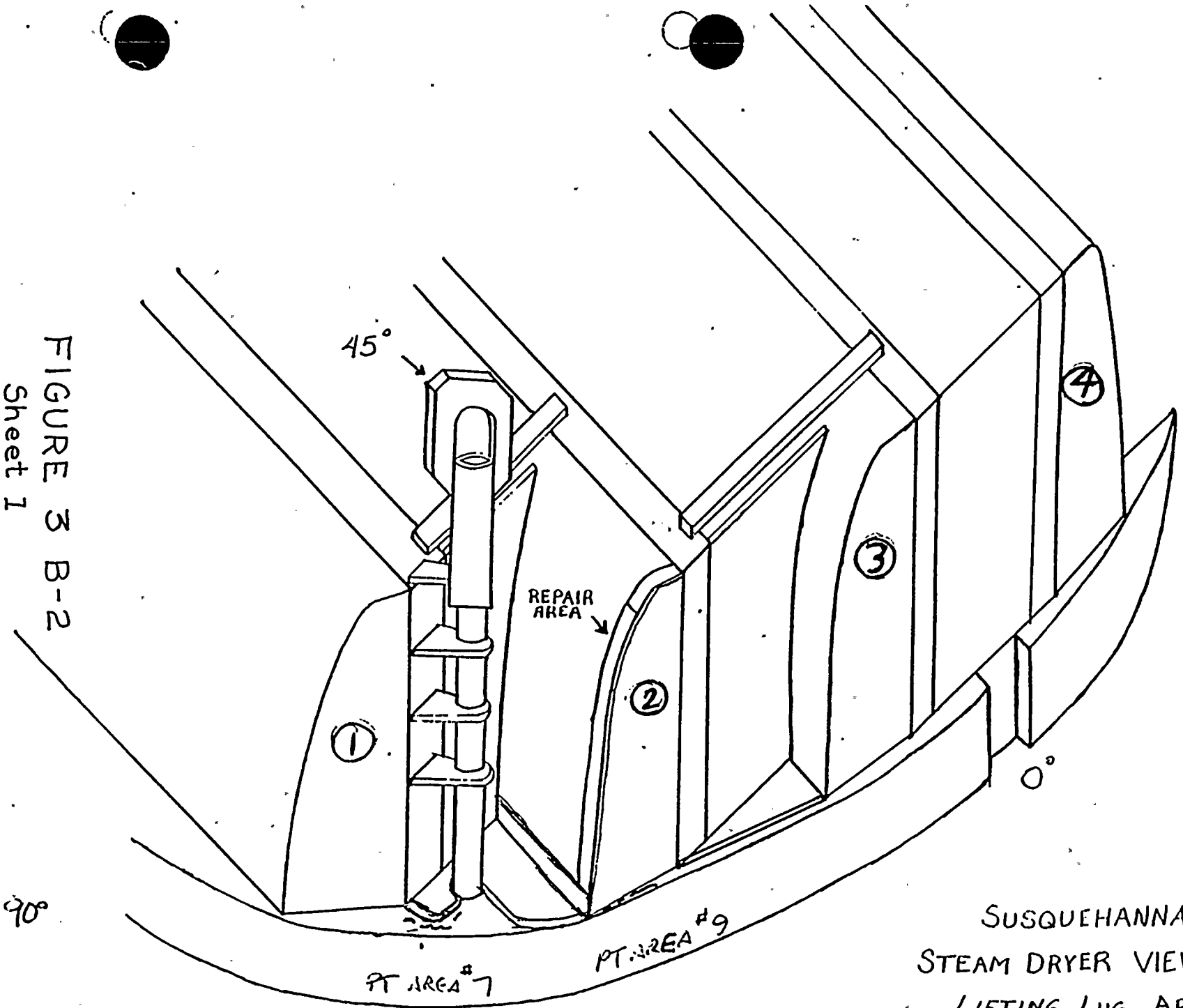


FIGURE 3 B-2
Sheet 1

SUSQUEHANNA UNIT 1
STEAM DRYER VIEW @ 45°
LIFTING LUG AREA
FEB. 25, 1985

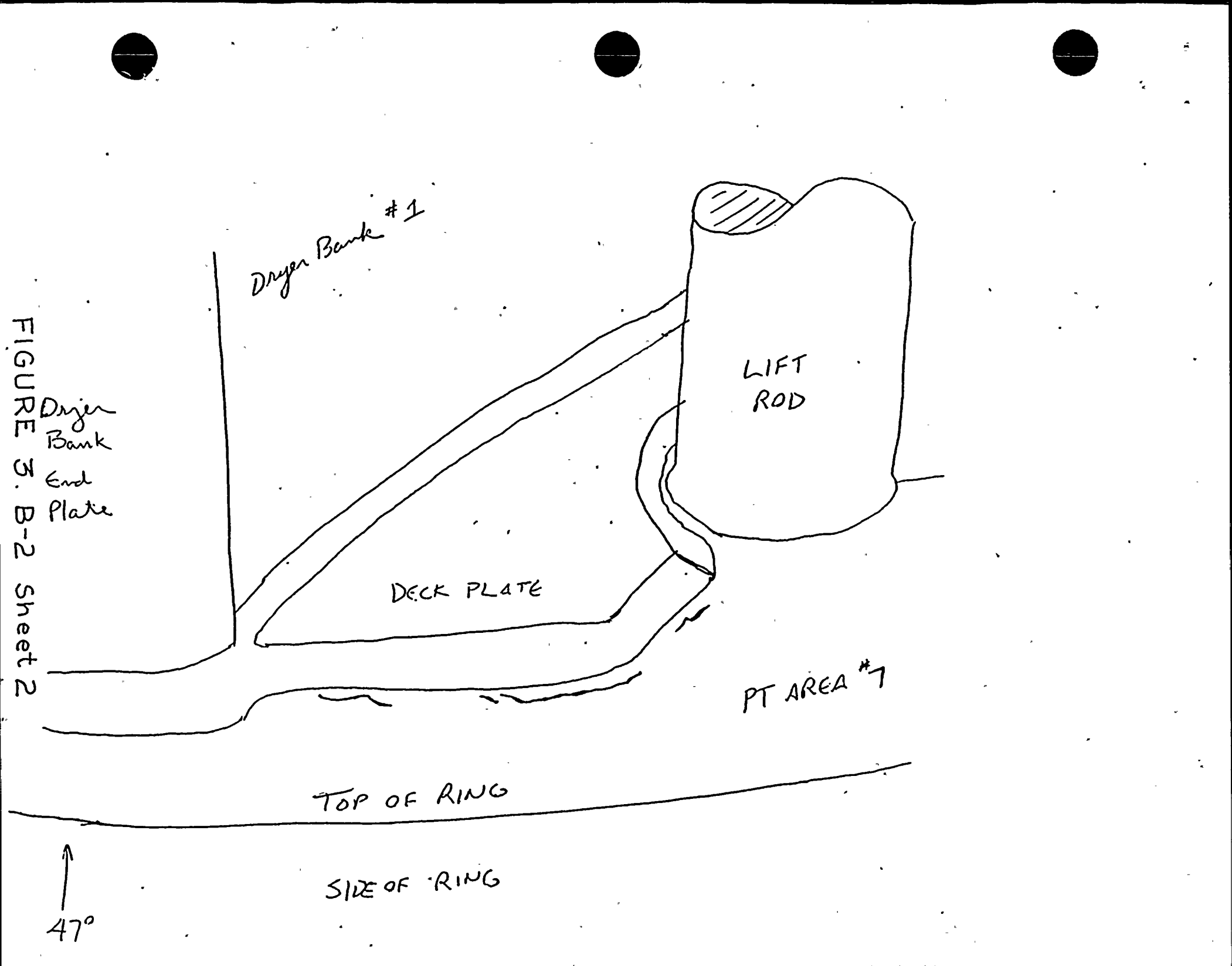


FIGURE 3. B-2 Sheet 2

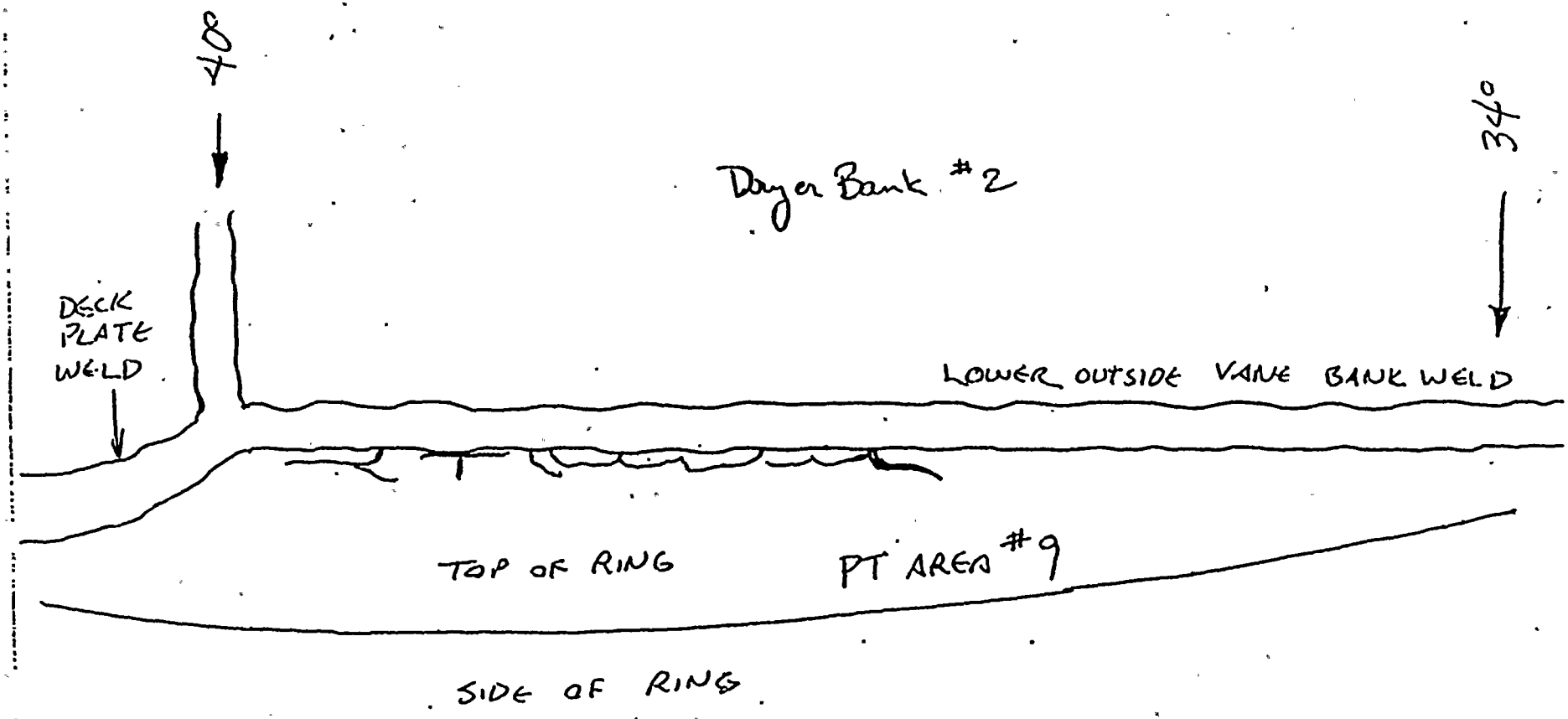
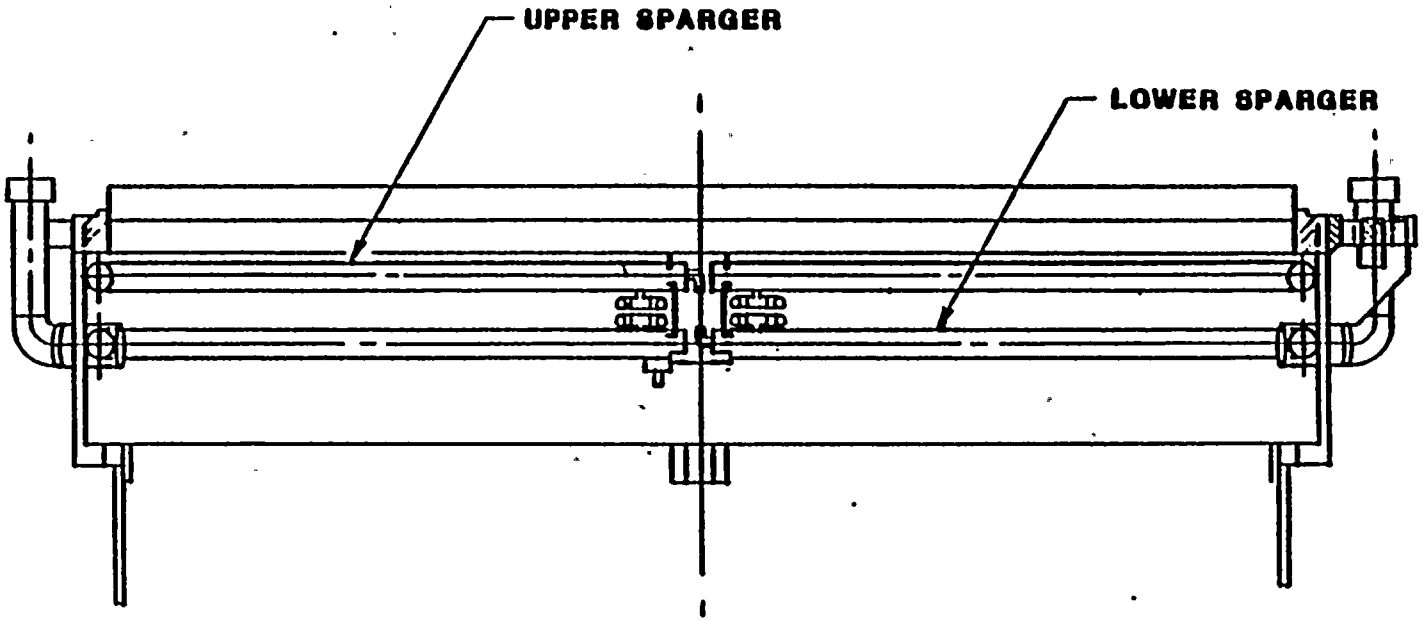


FIGURE 3. B-2 Sheet 3



CORE SPRAY SPARGER
(ELEVATION)

FIGURE 3 C-1

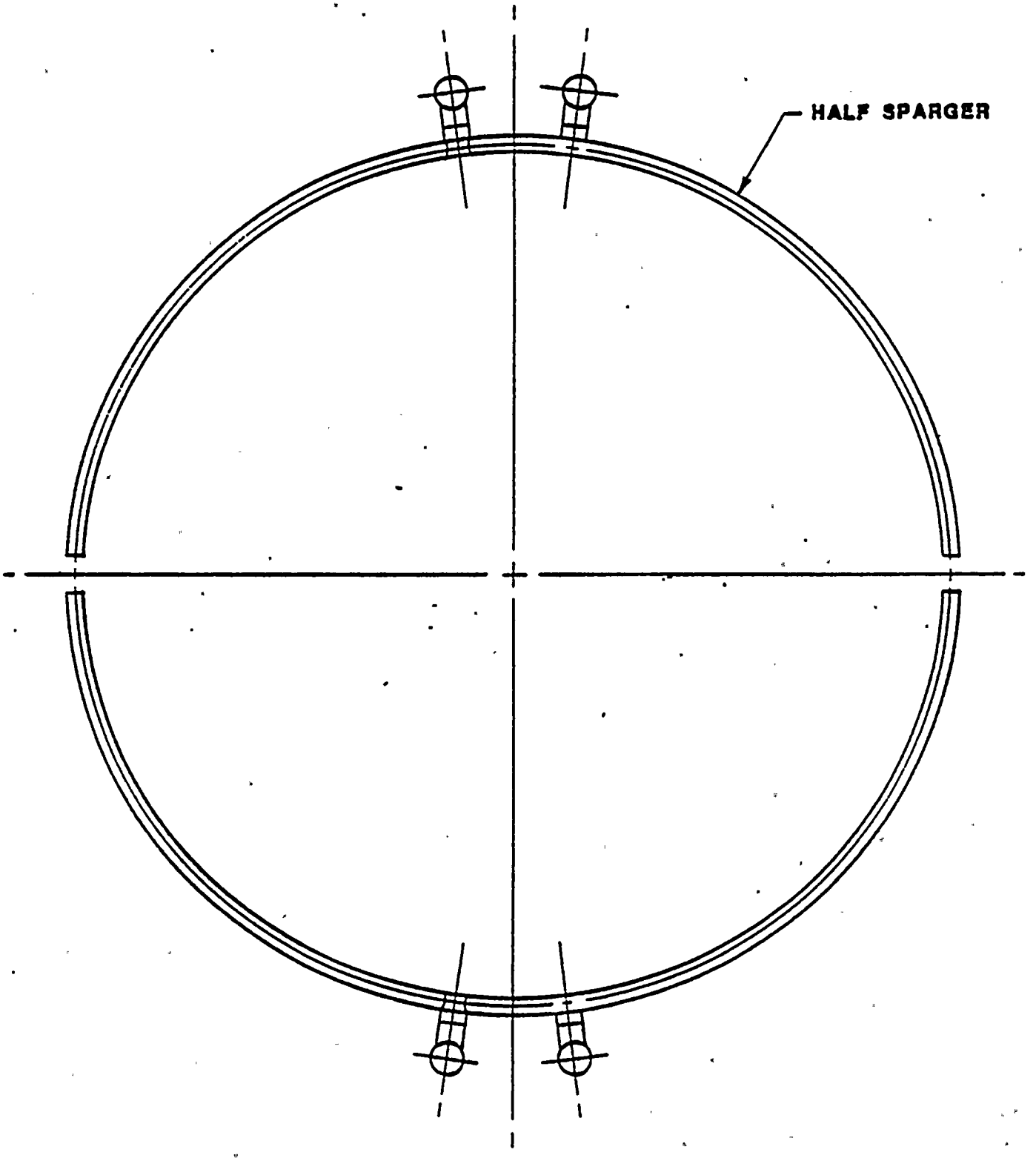


FIGURE 3 C-2

CORE SPRAY SPARGER

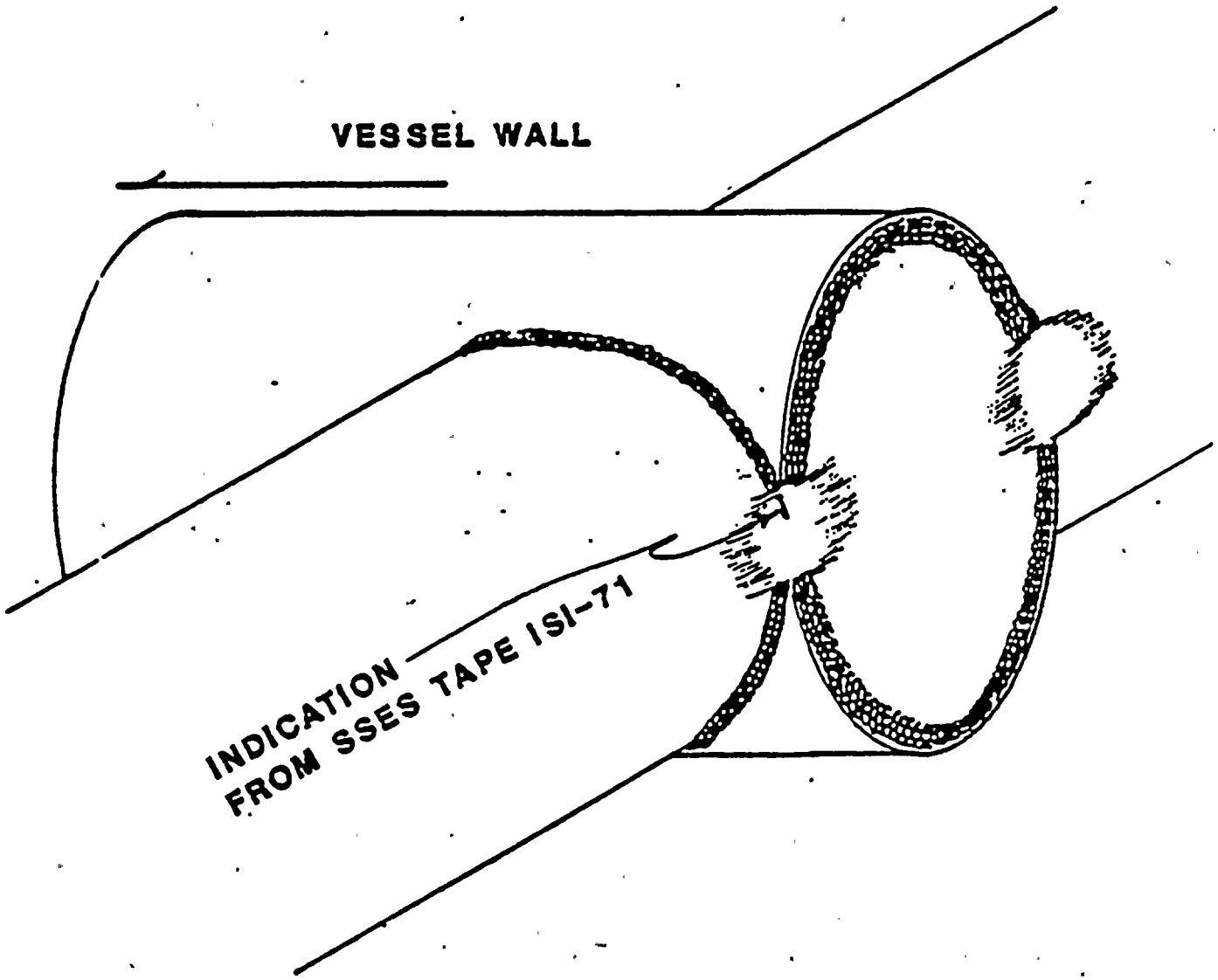


FIGURE 3 C-3
C SPARGER INDICATION

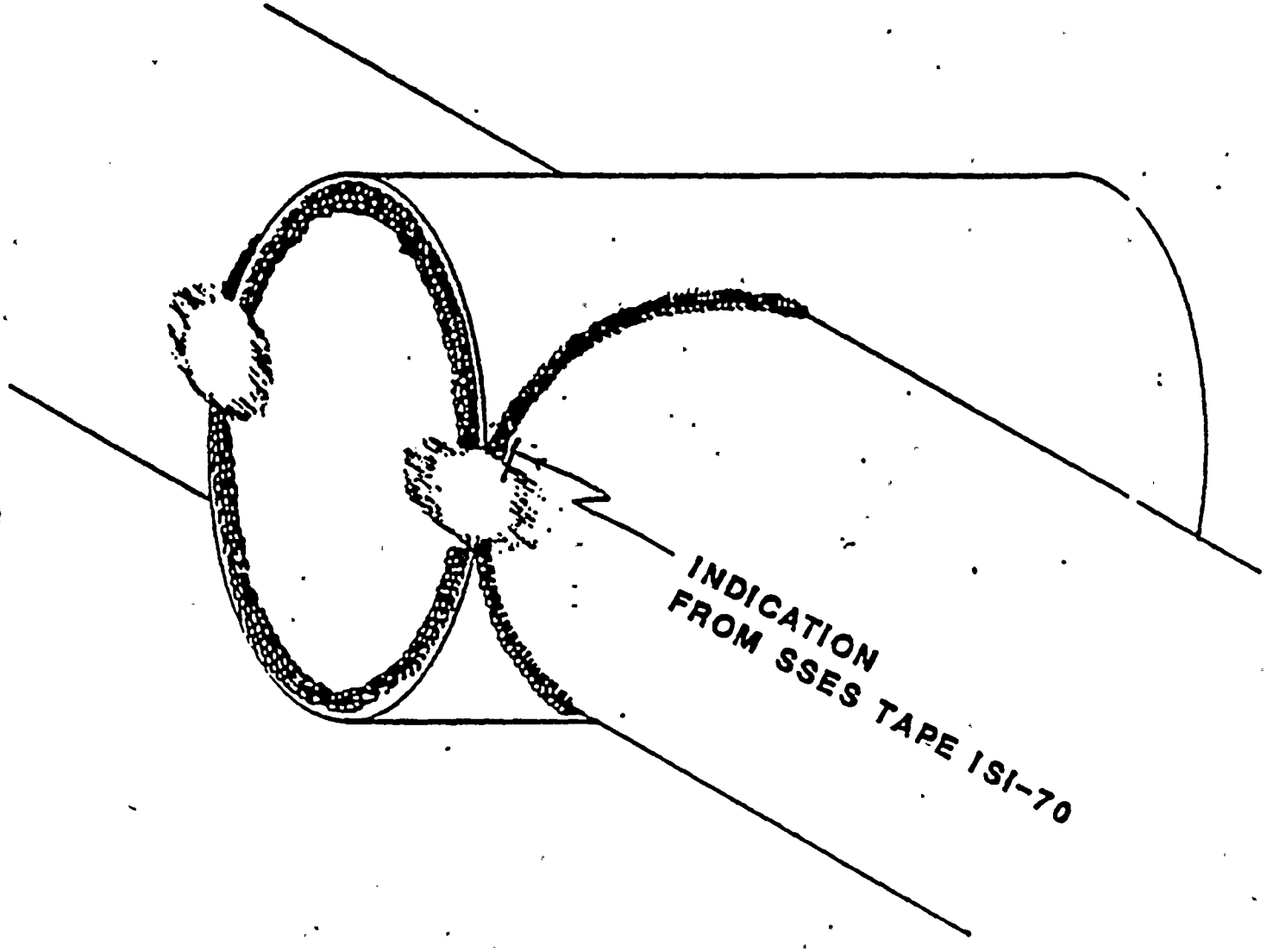


FIGURE 3 C-4
D SPARGER INDICATION

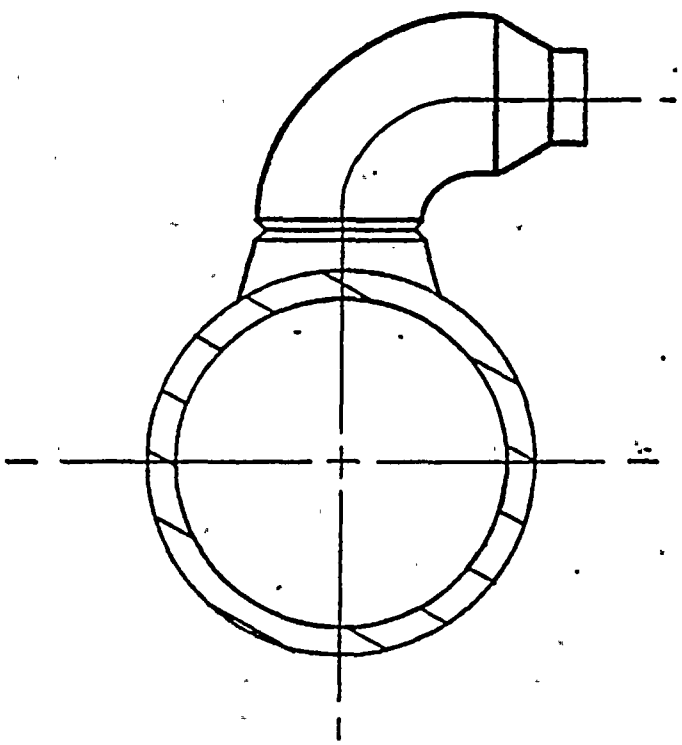


FIGURE 3 D-1

FEEDWATER SPARGER FLOW NOZZLE

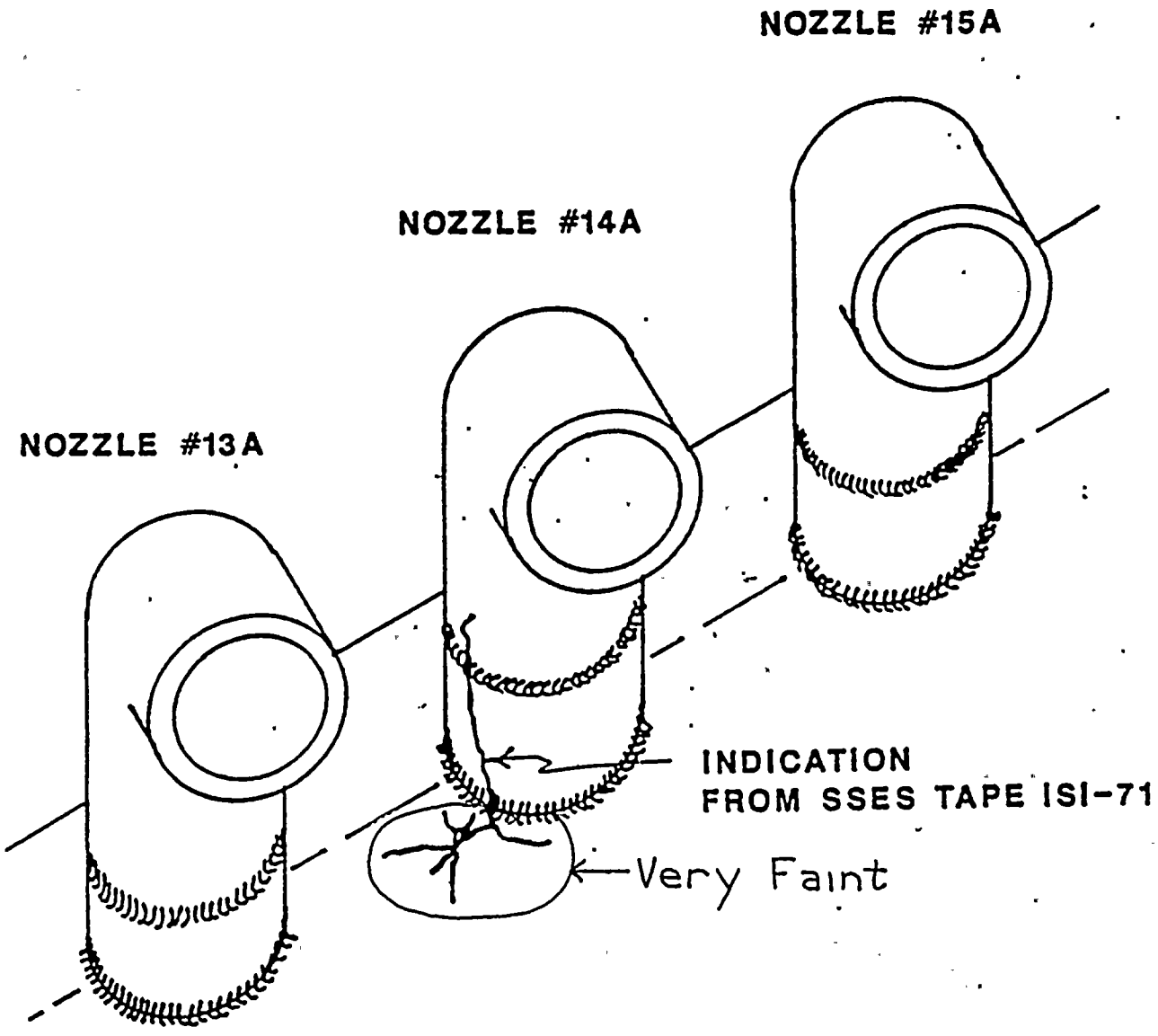


FIGURE 3 D-2

FLOW NOZZLE INDICATION

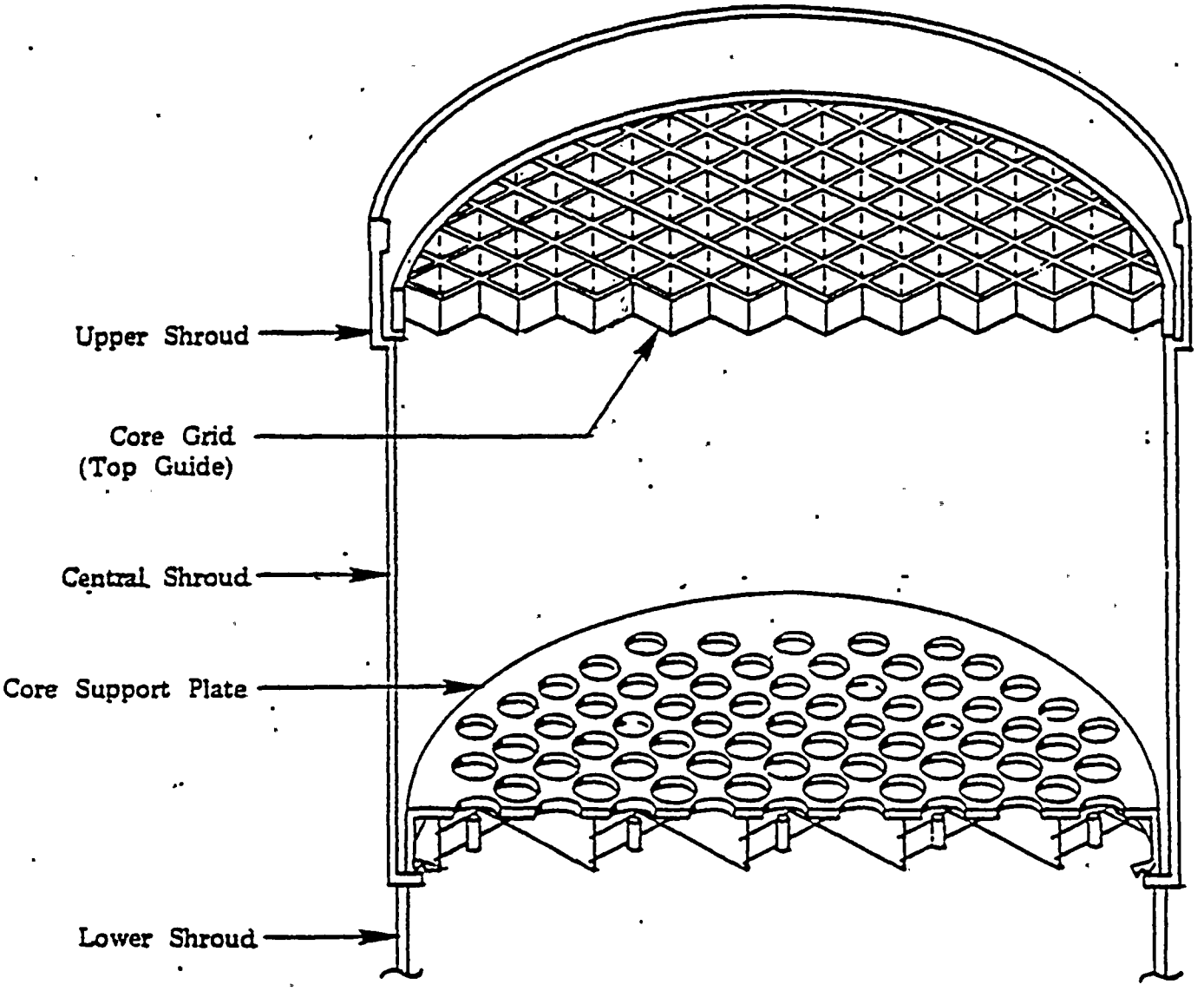

Upper Shroud
Core Grid
(Top Guide)
Central Shroud
Core Support Plate
Lower Shroud

FIGURE 3 E

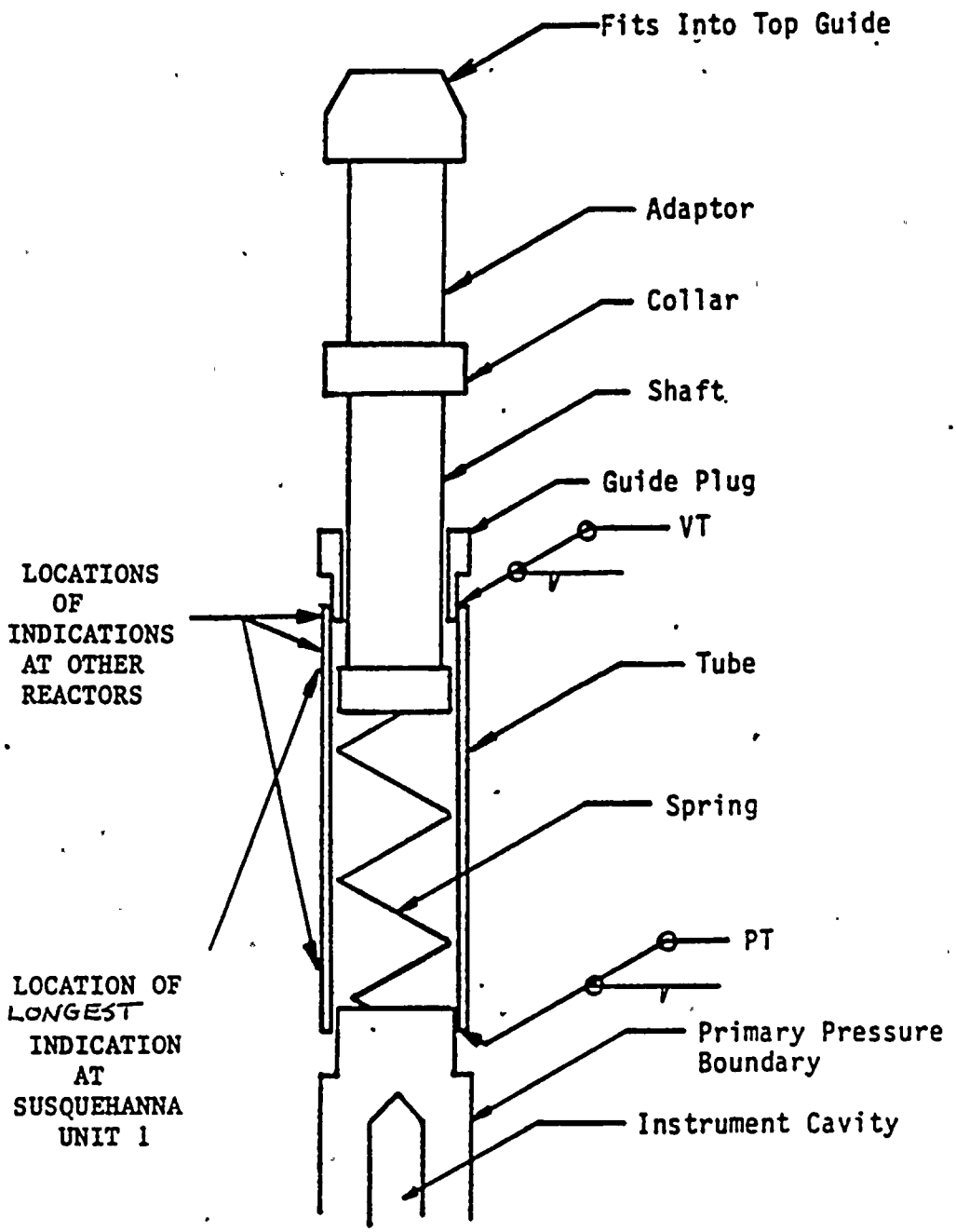


FIGURE 3 F-1

SCHEMATIC OF TOP PORTION OF DRY TUBE

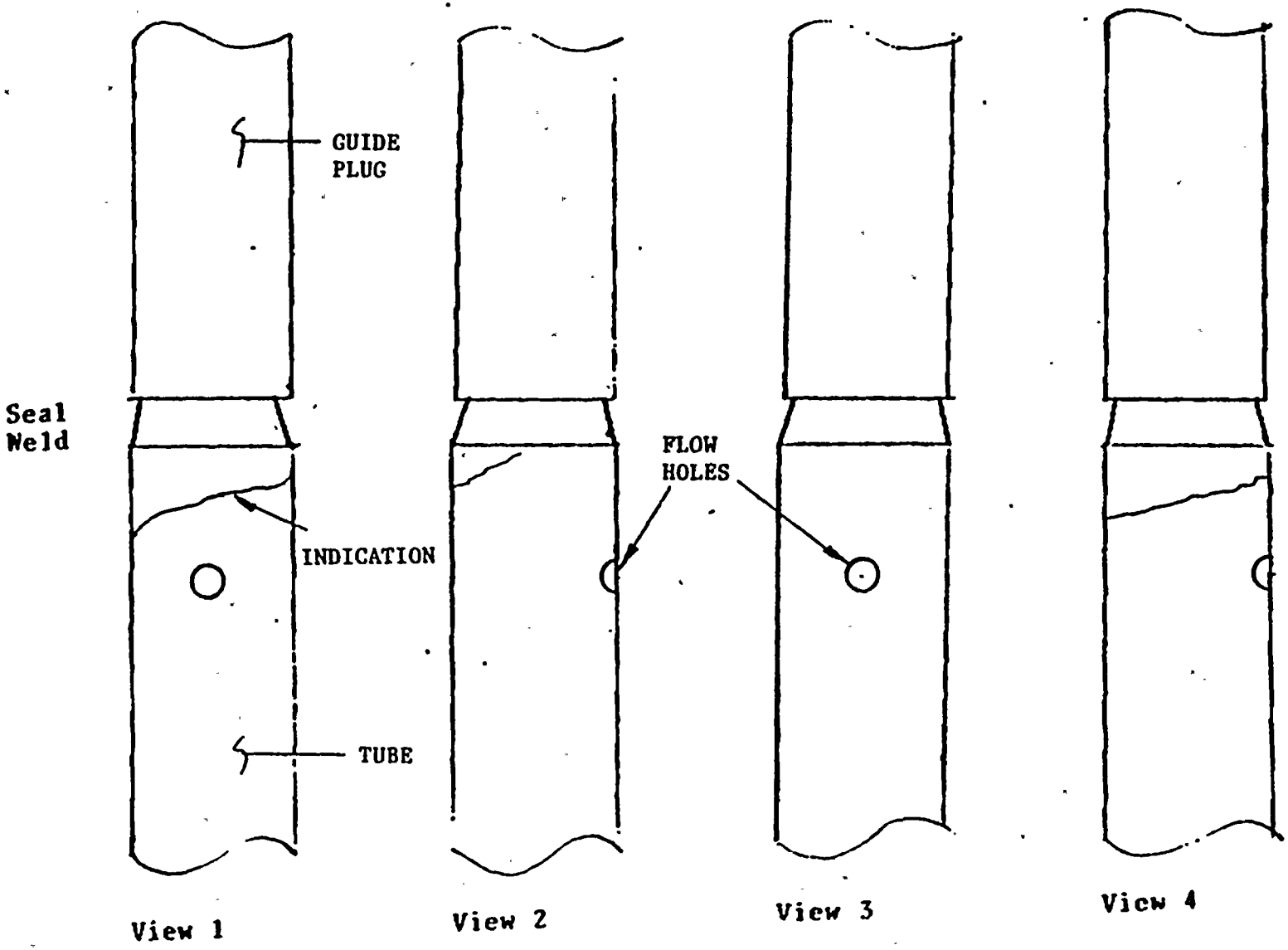


FIGURE 3 F-2

NOT TO SCALE

DRY TUBE LOCATION 16-13

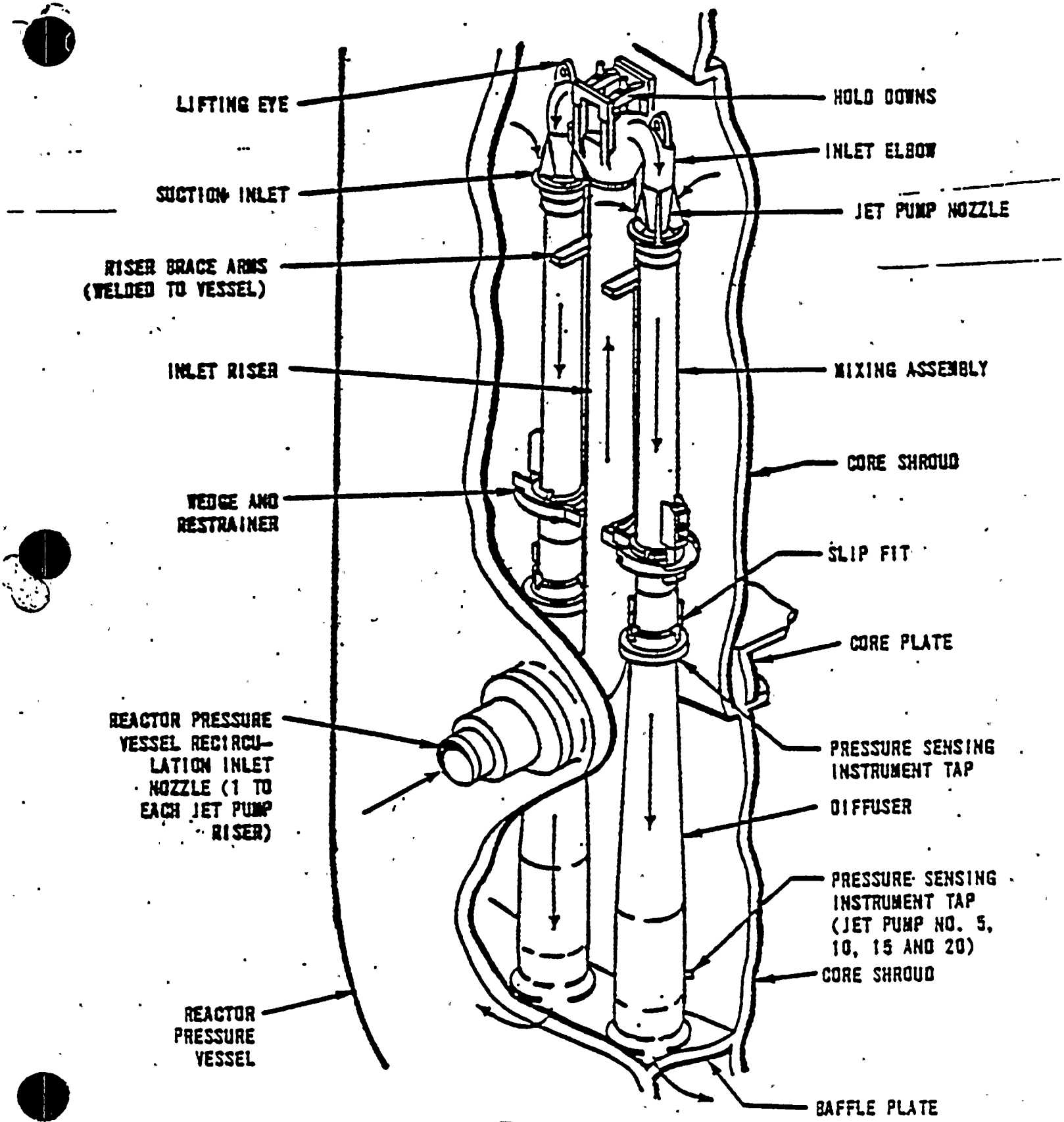


FIGURE 3 G

JET PUMP ASSEMBLY (TYPICAL OF 10)

APPENDIX A

APPENDIX A
SUSQUEHANNA I WATER CHEMISTRY DATA

Susquehanna I water chemistry records were reviewed by GE for the period from first criticality on September 10, 1982 to January 1, 1985. An overall summary is that Susquehanna I had better than average reactor water conditions, as compared with most BWRs during the startup testing period and the remainder of the first fuel cycle.

From these data there appears to be no connection indicated between chemical impurity levels and the cracking of in-vessel components.

The daily plant data are well summarized by data submitted, as a partial fulfillment of fuel warranty requirements. These data are shown in attached plots.

Figure 1 shows the average weekly reactor conductivity on a time base. The weekly average value is derived as an arithmetic mean of 5 to 7 daily values in a one week period. Only two of the values are at or above 1 uS/cm. This same data is plotted on a log normal probability grid in Figure 2. A characteristic of this type plot is that the 50% probability point represents the geometric mean of the data set. Thus, for the startup period and the first fuel cycle to mid-1984, Unit 1 had a mean reactor water conductivity of 0.32 uS/cm. From experience, this is a better than average value for a BWR in early life operation, and better than about 1/3 of the BWR fleet, each of which has a more mature data base.

The maximum weekly reactor water conductivity is plotted on a time base in Figure 3. These data are a sub-set of the weekly average data in that only the single maximum value for a one week period is plotted. Only two points are shown above 1 uS/cm. It should be noted that the values in all of the figures do not consider reactor power level and, therefore, several of the less severe spikes are, in fact, associated with reactor shutdown conditions.

Average chloride concentrations in the reactor coolant are shown in Figure 4 with weekly maximum values in Figure 5. None of the values approach the specified maximum operating value of 200 ppb and both plots are dominated by values at the lower limit of detectability (20 ppb).

Overall, Susquehanna 1 reactor water conditions have been comparatively better than other early life BWRs, and there is no indicated causitive relationship between reactor water chemistry and reactor internals cracking.

sjd/e109i:mg

GENERAL ELECTRIC COMPANY

PROPRIETARY INFORMATION

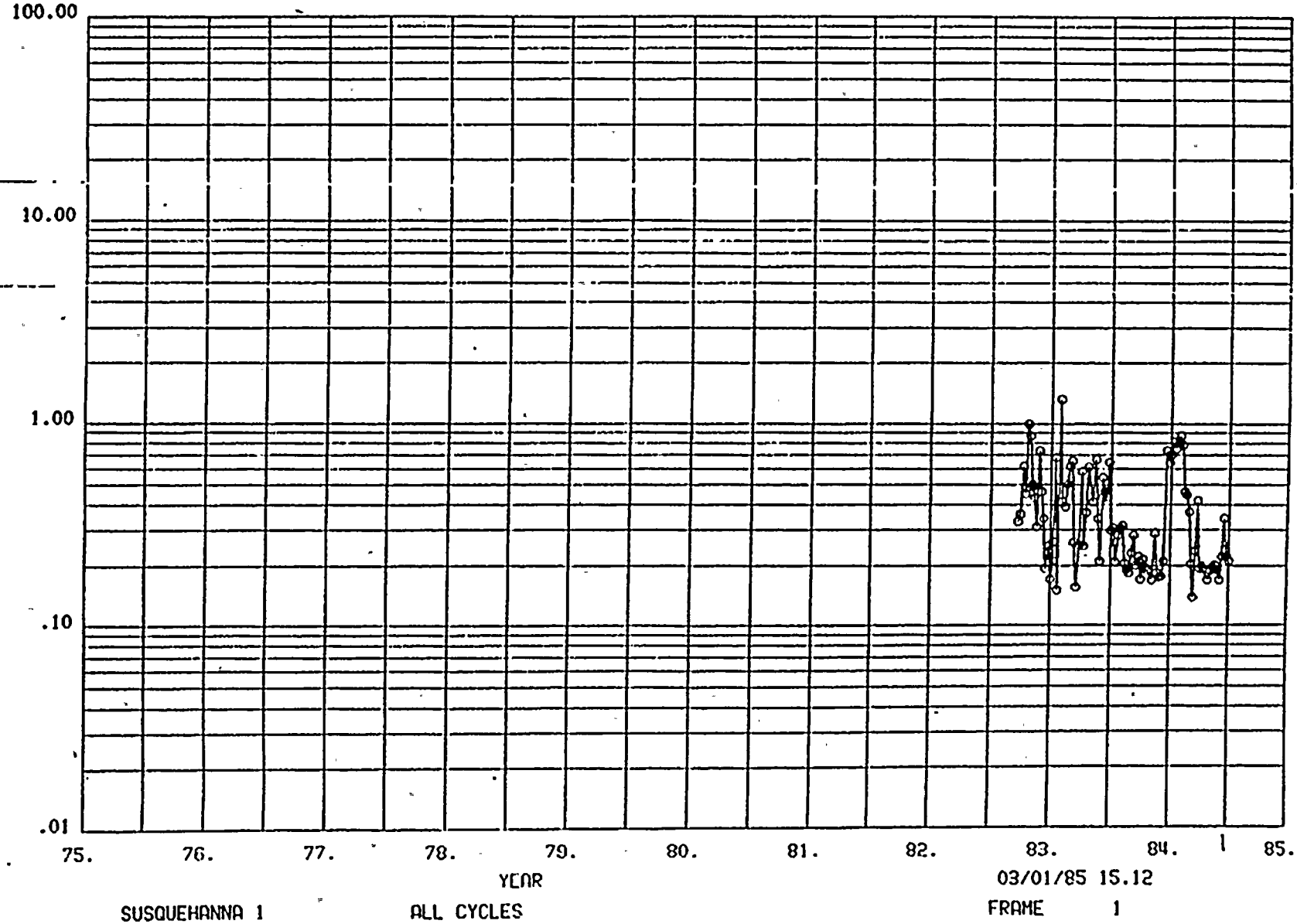


FIGURE 1

'85.05.08 06:57

FROM 1687

GENERAL ELECTRIC COMPANY

PROPRIETARY INFORMATION

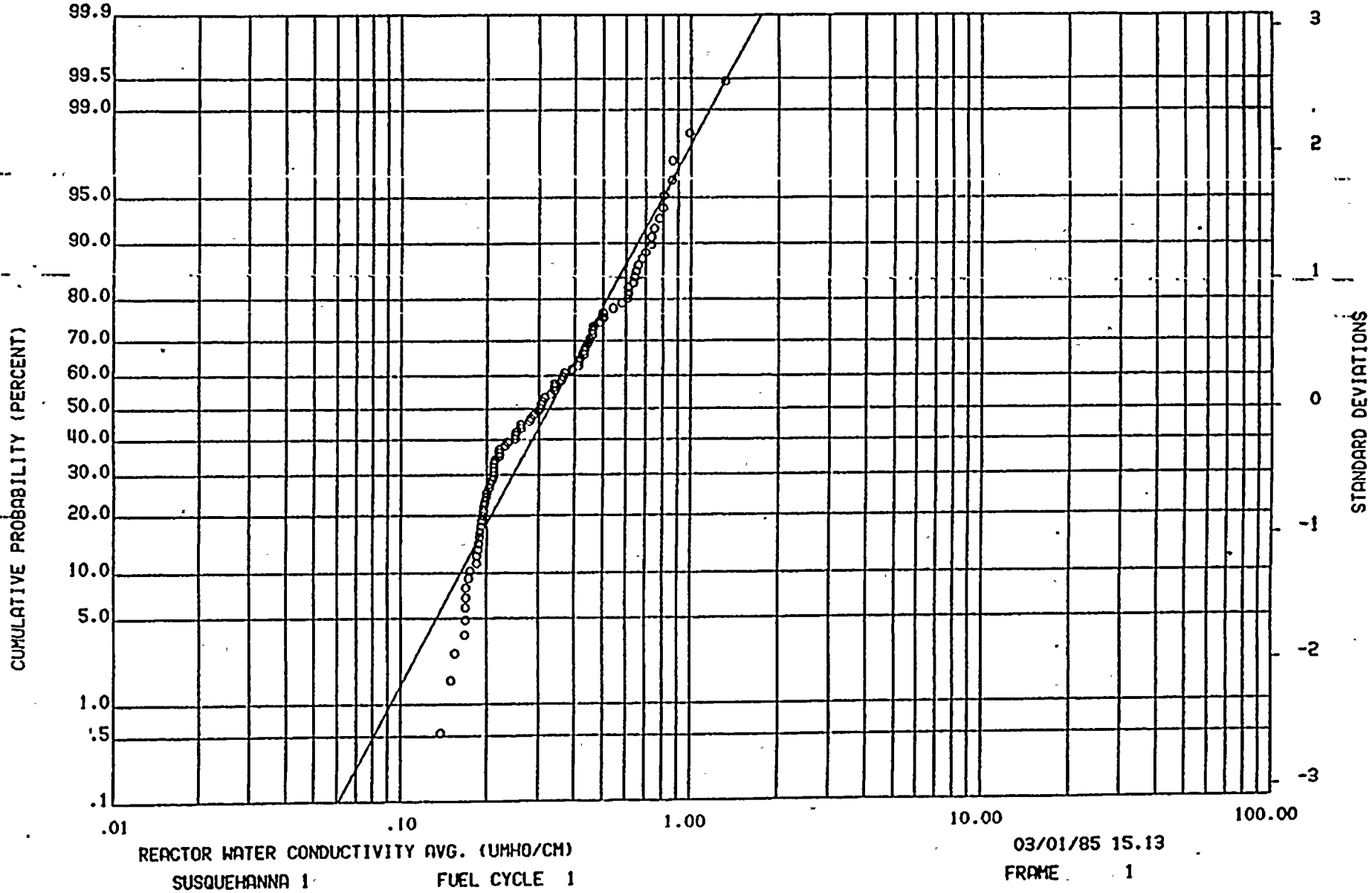


FIGURE 2

GENERAL ELEC[illegible]C COMPANY

PROPRIETARY INFORMATION

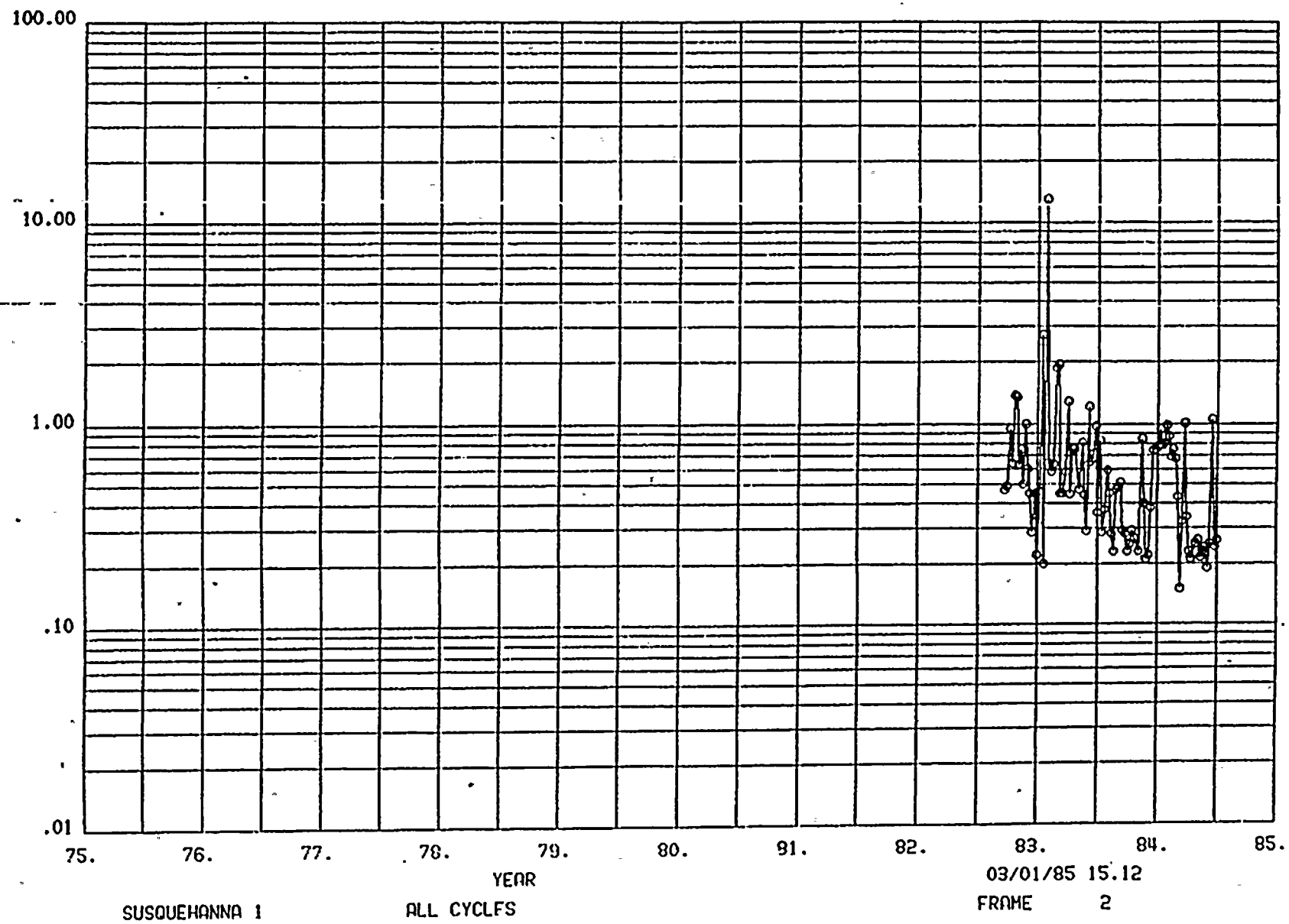


FIGURE 3

'85.05.08 07:02

FROM 1687

GENERAL ELECTRIC COMPANY

PROPRIETARY INFORMATION

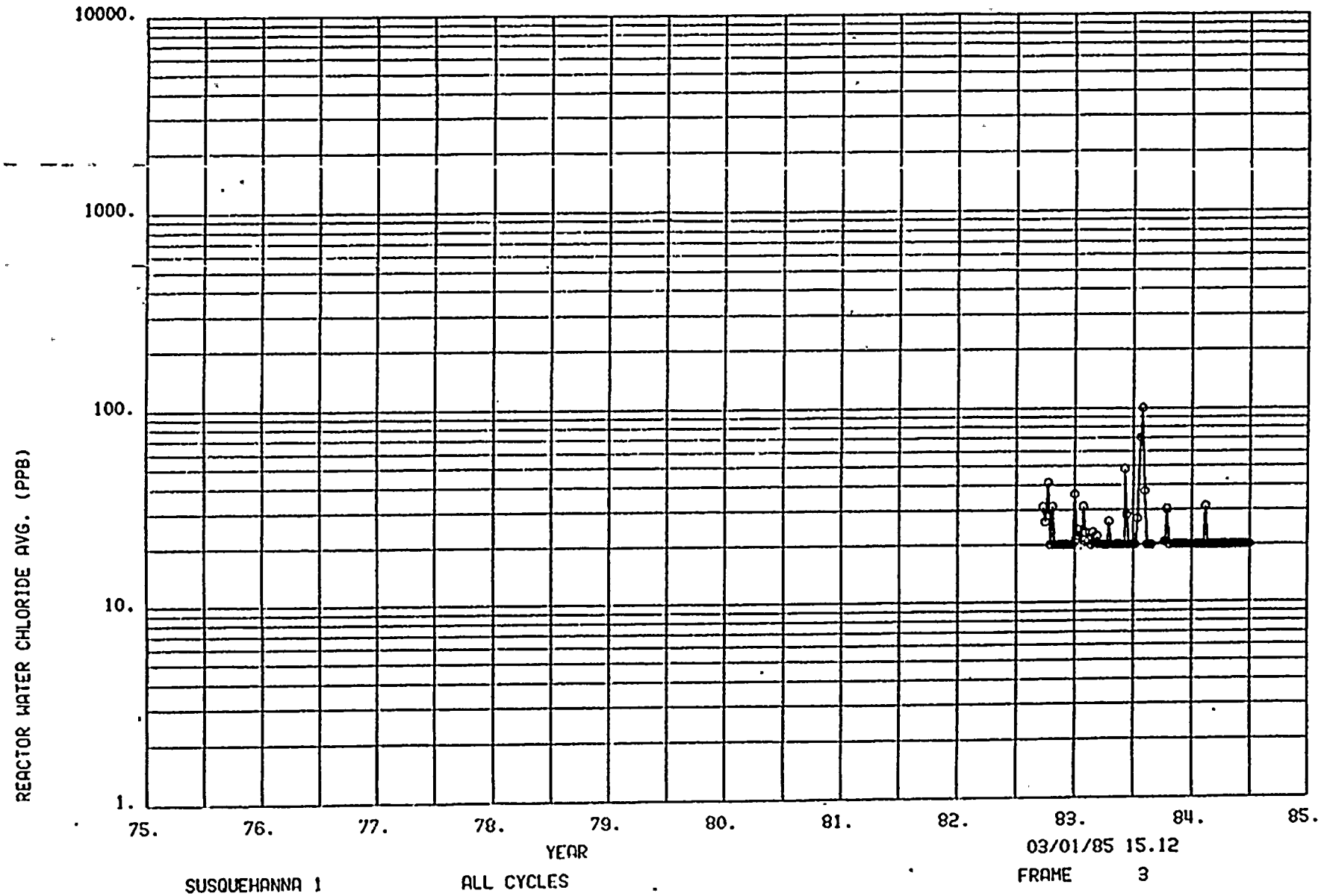


FIGURE 4

GENERAL ELECTRIC COMPANY

PROPRIETARY INFORMATION

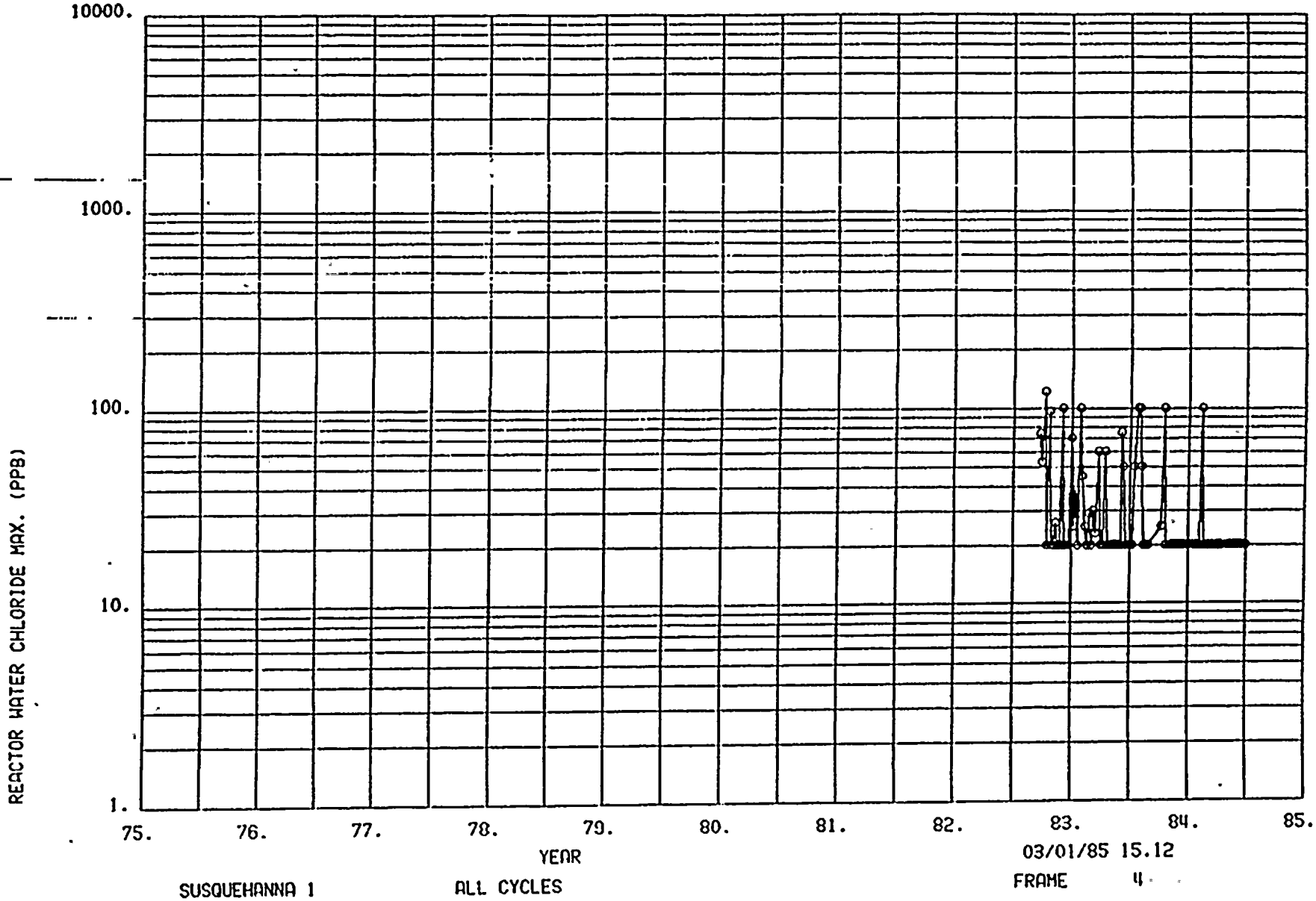


FIGURE 5

1. Complete CB&I welding history of welding and PWHT of -

   a. shell course weld (SA533)

   b. inconel weld pad

   c. bracket attachment weld

   (See Attachment 1)

2. Detailed water chemistry history summary including highlights of unusual events. (See Attachment 2)

3. Tubing materials for -

   a. condenser and FWH's: 304 Stainless

   b. Moisture Separators: Carbon Steel Baffles (Chevrons)

4. Known occurrences of unusual air leakage and source of problem (See RPV Internals/Steam Dryer Report)

5. Preliminary and final failure analyses reports based on fracture study (See RPV Internals/Steam Dryer Report for Preliminary Failure Analysis)

6. Description of steam dryer instrumentation to be installed (See Attachment 6)

7. Chemistry data on sulphurous species in feedwater: Data not available. Collection began in March, 1985.

8. Steam dryer skirt fabrication information: There were no indications on dryer skirt, therefore no information is supplied.

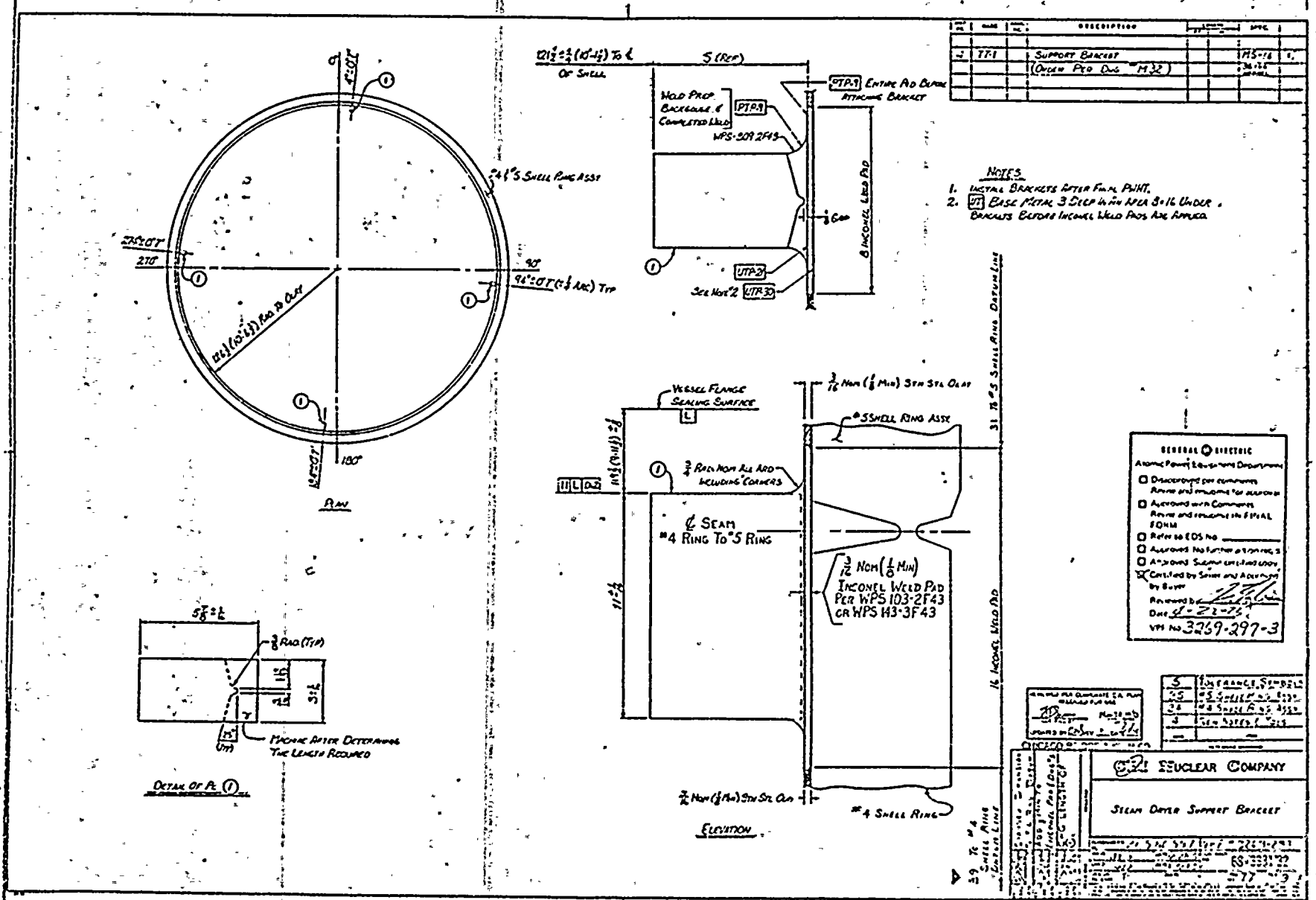
9. Restricted Access Welder Qualification (See Attachment 9)

10. Bracket and seismic block loading patterns (See Attachment 10)

11. Results of NDE (VT) on seismic blocks (See Attachment 11)

12. Results of NDE (PT) on 94° & 274° support brackets (See Attachment 12)

ATTACHMENT #1



Anamet Laboratories, Inc.

EMERYVILLE, CALIFORNIA 94608

October 25, 1972

LABORATORY NUMBER: 1072.235 P/O 66012/66013 T

TITLE: One (1) Tensile Specimen

MARK: 204
Customer: Chicago Bridge & Iron
Material: Inco 600
Heat No: NX 2461

DATE SUBMITTED: October 24, 1972

REPORT TO: Coulter Steel & Forge Company
1494 - 67th Street
Emeryville, California

TENSILE TEST

		Requirements SB 166 & MS 16 Rev
Diameter of Specimen:	0.506 Inches	
Area:	0.201 Square Inches	
Tensile Strength:	100000 Psi	80000 Psi
Yield Strength @ 0.2% Offset:	48800 Psi	35000 Psi
Elongation in 2" Gage:	37-1/2%	30%
Reduction of Area:	56.5%	Inf.

Respectfully submitted,

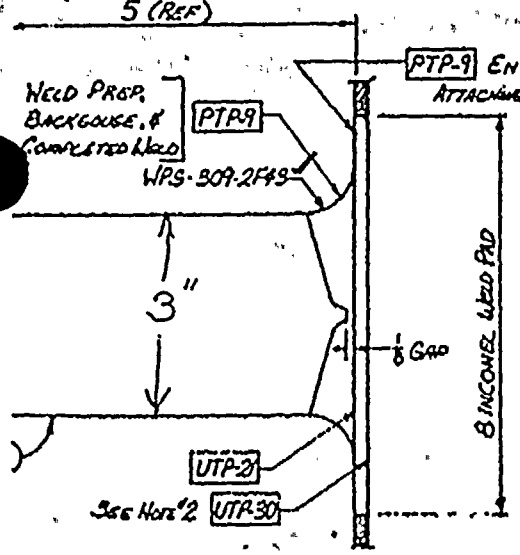
ANAMET LABORATORIES, INC.

By C. A. Tatman

CM 273.

MKD PC.	MARK	ASSM. PC.	DESCRIPTION	LENGTH FT.	LENGTH IN.	SPEC.	
4	TT-1		SUPPORT BRACKET — (ORDER PER DWG M32)			M3-16 SEE NOTE 1	

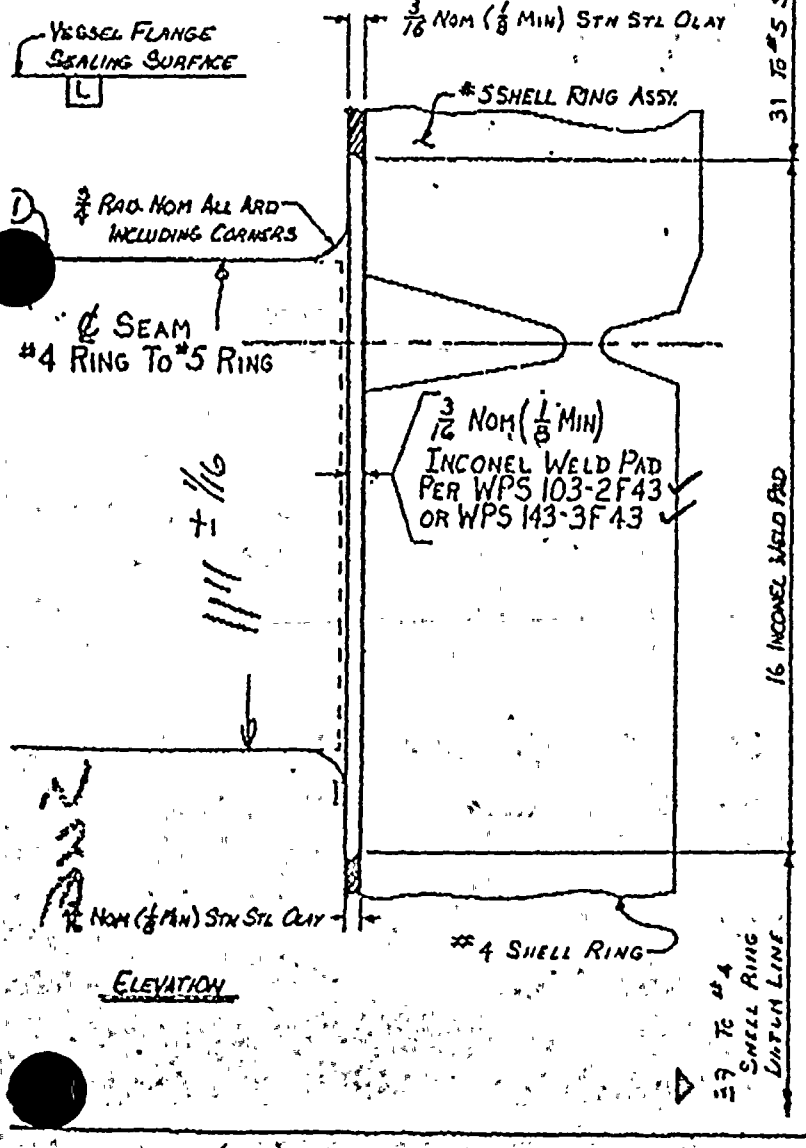
(2)



NOTES

1. INSTALL BRACKETS AFTER FINAL PWHT.
2. UT BASE METAL 3 DEEP IN AN AREA 8 x 16 UNDER BRACKETS BEFORE INCONEL WELD PADS ARE APPLIED.

what weld material & process for pad ad bracket weld, both Inconel 182 Stick pad & bracket



ELEVATION

GENERAL ELECTRIC
Atomic Power Equipment Department

- ☐ Disapproved per comments. Revise and resubmit for approval.
- ☐ Approved with Comments. Revise and resubmit in FINAL FORM.
- ☐ Refer to EDS No. _____
- ☐ Approved. No further action req'd.
- ☐ Approved. Submit certified copy
- ☒ Certified by Seller and Approved by Buyer.

Reviewed by: _____
Date 2-22-75
VPF No. 3269-297-3

5	TOLERANCE SYMBOLS
25	#5 SHELL RING ASSY.
24	#4 SHELL RING ASSY
4	GEN. NOTES & TOLS.

REVISED PER CORPORATE Q.A. PLAN RELEASED FOR USE
11-28-1973
UPDATED BY CHRNEV. 3 DATE 2/6

CHICAGO BRIDGE & IRON CO

CBI NUCLEAR COMPANY

STEAM DRYER SUPPORT BRACKET

PC-5 110 951 | VPF # 3269-297
68-3331732
77 | REV 3

CHANGED DIMENSION C.L. TO C.L. DATUM ADD 3 MIN TO INCONEL PAD & DWG'S CHG. LENGTH OF

Chicago Bridge & Iron Company

(CBI)

Date: February 14, 1977

Reference: Boiling Water Nuclear Reactor Vessel
21.0833' I.D. x 72.5417' Ins. Hds.
Manufacturer's Serial No. B5023
Pennsylvania Power & Light Company
Susquehanna I
Berwick, Pennsylvania
G.E. P.O. 205-H0957
CBI Contract 66-3331U

Subject: Weld Rod, Wire and Flux Certification

TO WHOM IT MAY CONCERN:

This is to certify that all weld rod, wire and flux used by Chicago Bridge and Iron Company in the fabrication of this vessel was within the acceptable limits of the ASME Code Section III, 1968 Edition with addenda through Summer 1970 and GE Specs. 21A9340AD and 21A9340, paragraph 4.3.2.16 together with approved Chicago Bridge and Iron Company procedures which are included in the Susquehanna Contract QA Handbook.

The types of weld rod, wire and flux used on this contract were as follows:

E-308L-15
E-308L-16
E-309-15
E-309L-16
ER-308L
Oxweld 65-GTA Wire with Argon
ER-308L and Arcos 642CDA Flux
ER-309L Special
ER309L Wire and Arcos 642CDA flux
E7018
E8018G (8018NM)
Inconel 82
Inconel 182
INMN Wire and Linde 124 flux
INMN - Adcom
Chromenar 382 (Inconel 82) and
Inco Flux #4

CHICAGO BRIDGE AND IRON COMPANY

W. R. Ashbaker
Chief Quality Assurance Coordinator

mlo

J. J. Mellotta
Assistant Superintendent QA

[illegible]
Shop Welding and QA Manager

C032

DIVISION

CERTIFICATE OF TESTS

MATERIAL AS SHIPPED FROM HUNTINGTON PLANT FREE FROM CONTAMINATION BY HG, PB, AND ALPHA SOURCE.

Carl Hale

DATE: 06-16-72

MARK ORDER NO.

DOC JUN 7 1984

PREPARED PRIOR TO [X] AFTER [ ] SHIPMENT

CERTIFICATE OF: [ ] CHEMICAL ANALYSIS [ ] COMPLIANCE [ ] CERTIFIED DUPL. [X] TEST

QUALITY CONTROL DEPARTMENT

STATE OF WEST VIRGINIA COUNTY OF CABELL. SUBSCRIBED AND SWORN TO BEFORE ME THIS 15TH DAY OF JUNE 1972. MY COMMISSION EXPIRES APRIL 14, 1973. NOTARY PUBLIC

DESCRIPTION OF MATERIAL SHIPPED

HEAT	C	MN	FE	S	SI	CU	NI	CR	AL	TI		CO					P	B
[illegible]	0.07	00.27	07.60	007	00.22	00.20	75.76	15.89	0.15	0.32		00.01					P 00.003	B 0.003

* INCLUDED IN THE NICKEL PERCENT REPORTED.

LOT	QUANTITY		HEAT NO.	PIECE NUMBERS										
[illegible]			[illegible]		LOT NO. T0707									

ULTRASONIC TESTING

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VISUAL AND DIMENSIONAL [illegible]INATION-O[illegible]

COULTER STEEL & FORGE COMPANY

METALLURGICAL REPORT

(15)

Soled

Gilbert Bridge & Iron Company
P. O. Box 277
Birmingham, Alabama 35238

P.O. 3351 - Contract 60-3931 — Date 6/22/72

Ship To:
Same
1500 North 30th Street
Birmingham, Alabama

Item No.	Quantity Ord.	Quantity Shp.	Description	Weight
			Spec Material 600 except Carbon .10% Max. Annealed Proc. CSF 6-103 NS (9-8-72) in accordance with SB 166 MS 16 Rev. 8 (4-30- Do. Mech. 125 BHN UT & Penet. Inspected in accordance with CSF 251 NS Rev. 9 (9-8-72) & LPI 41001 Rev. 1 (3-26-71) & Do. Boiler Add 1 (9-21-72) SA 388, Para 6.2.2.1 Paras N322.1 & N322.2 ASME Boiler & Pressure Vessel Code Sec. IX & XIX (1968) to July 1969 Addenda through Summer 1970	
1	A		Steam Dryer Support Bracket per Dwg. H51 Rev.0	
			Heat 77-2	
			(2) @ 5-1/8" R. 11"	

Subcontract P/O No. Fr. Lot: 2 Pc
No. Req. CF Costal, Dem,
Incl polyethylene

Item No.	Heat No.	C	Mn	P	S	Si	Ni	Cr	Mo	Cb	Ta	Co
	M12461	.07	17	.006	.007	.22	15.09	75.7				
	Included in Nickel reported				.003	B	Fe 7.60	Cu .20	Al .15	Ti .31	Cb .04	
				G/S	3	14						

Item No.	Kind(s) of Material Supplied	Tensile	Yield—0.2% Offset	El.	R.A.	Cond.	Size of Bars Stock	Melt
		100,000	48,800	37-1/2	56.5	187	10"Di	Inco
		Rb Hardness 85						

Item No.	Standard Jominy Hardenability Test Results—Sixteenths												
	1	2	3	4	5	6	8	10	12	16	20	24	28

HT: Anneal 1700° 1 hour A.C.
Heat Treat Charts on file at C.S.F.

We certify that all requirements of ASME Spec and C.B.A.I Sp. MS-16 Rev. 8 have been met.

We certify that the material described herein has been inspected and/or tested for conformance to the applicable specifications. Our warranty of quality provides for replacement only of any part of this material which subsequent inspection, test or use shows non-conformance with the specification. Inspection records, certifications, chemical and/or physical test reports are on file for your examination at EMERYVILLE, CALIFORNIA.

COULTER STEEL & FORGE COMPANY

By F. Hanna
METALLURGIST
Title

272

CONTAMINATION INC.

A SUBSIDIARY OF

AUTOMATION INDUSTRIES, INC.

[illegible] SOUTH 31ST AVENUE • RICHMOND, CALIFORNIA 94804 • TELEPHONE (415) [illegible]

[illegible] DATE: [illegible]

[illegible] CUSTOMER P.O. [illegible]

[illegible] CONTRACTOR P.O. [illegible]

☒ ULTRASONIC ☐ MAGNETIC PARTICLE

☐ PENETRANT ☐ EDDY CURRENT

[illegible] NDW Code No. 8 0 [illegible] (DCC) [illegible]

[illegible] 1070-Rev-U1A1M1-Rev-1 [illegible]

[illegible] 6 Addendum 1 dated 6-28-77. [illegible]

[illegible] EXAMINATION DATA

[illegible] CALIBRATION

O DEPTH [illegible] D/N MARK [illegible] MAKE [illegible]

[illegible] CORRECTIVE READ OUT [illegible] MODEL [illegible]

[illegible] LATERAL INDEX [illegible] D/N [illegible]

[illegible] PAD [illegible] FREQUENCY [illegible] TEST FREQUENCY [illegible]

MATERIAL [illegible]

BEST COPY AVAILABLE

DCC JUN 7 1984

INVOICE/REPORT NUMBER	JOB NUMBER	J. W. [illegible]
[illegible]	[illegible]	

[illegible]	0		Pipe, 3" x Sch 40 x 18"		0
			Mat'l CS Carbon .20% max.		
			Nuclear Power Support Bracket		
			Dwg. M31 Rev. 0 Work 77-1		
			Heat No. M32401		
			Ferrous-Rock Penetrant Type P103		
			Batch # C40		
			Sulfur Content: .008% Halogen Content: .03%		
			Remover Water		
			Aerosol Lot No. 27218-1		
			Sulfur Content .0003% Halogen Content: 0.0%		

BEST COPY AVAILABLE

DCC JUN 7 1984

CAUSE FOR REJECTION OR REMARKS

No reportable indications found.

0 274

INSPECTED BY JM

CERTIFIED BY [signature]

[illegible] ALL ITEMS LISTED HAVE BEEN TESTED IN CONFORMANCE WITH THE SPECIFICATIONS AND/OR [illegible] EXCEPT AS NOTED. AUTOMATION INDUSTRIES, INC. SHALL NOT BE LIABLE FOR ANY [illegible]

GE & APED

Page 01
No. 43 Rev. 1

NPV QC "A" CHECK LIST

Project: [illegible]	Subject: Inconel Weld Pad, Steam Dryer Support Bracket Field Fabrication	H 5.4
Dwg: No. 77	Rev. 3	

Seq. Number:	Pad 1								
Date:	6/12/75								

Initials		Procedure Specification	Rev	R	Record Reference	R	Insp. Code
	Process SMA	WPS 103-2F43	1	✓			
	Proc. Qual. Test				Tests 635/958/1136	✓	A
	Perf. Qual. Test				Field Files	✓	A
	Weld Metal Qual.				Field Files	✓	
	Base Metal Weld Qual.	UTP-30	3	✓	Card 549 Seq 16A ① Card 568A Seq 18B	✓	—
	Fit-up						N/A
6/12/75	Preheat & Interpass						W
6/12/75	In-Process Audit						A
	HT/PT - Back Gouge	N/A	N/A		N/A	—	N/A
6/12/75	PWHT + Furn. Charts	HTP-12A	1	✓	Card 14D Seq 18 ②	✓	W
6/12/75	Visual Weld Exam.						OK
	Ferrite Control	N/R	N/R		N/R	—	N/R
	HT	N/R	N/R		N/R	—	N/R
6/12/75	PT	PTP-9	2	✓	Card 14D Seq 29	✓	W
6/12/75	UT	UTP-21	7	✓	Card 14D Seq 20I	✓	W
	RT	N/R	N/R		N/R	—	N/R
☆	Major Repairs	None					
	Subject:						
☆	Deviations	None					
	Subject:						

REMARKS: ① Base metal UT done at Birmingham Shop.
② Final PWHT, documented as Chart #9

M. LeVasseur 6/12/75

Reviewed By: Date
M. LeVasseur, Quality Control Representative
General Electric Co. • BWR Projects Dept.

261

Dwg. No. 99 Rev. 8

[illegible] CHECK LIST

[illegible]	Subject: Weld Stem Ryan Square Ended O Ring							U
Job: Navy	D	Final Assembly						S-Fab
Serial Number:	Final							
Date:	7-8-74							

Weld Data		Procedure Specification	Rev	R	Record Reference	R	Insp. Code
	Process GMA	WPS 309-2F09	2	✓			
	Proc. Qual. Test				Tests 1018-1024	✓	A
	Perf. Qual. Test				Field Files	✓	A
	Weld Metal Qual.				Field Files	✓	
[illegible]	MT/PT - Weld Edges	PTP(68-339)(2)9	1	✓	Card 16B Seq 3D	✓	W
[illegible]	Fit-up Seq 4E						W
	Preheat & Interpass						N/R
[illegible]	In-Process Audit						A
[illegible]	MT/PT - Back Gouge	PTP(68-339)(2)9	1	✓	Card 16B Seq 4H	✓	W
	PWHT & Furn. Charts	N/A	N/A		N/A	—	N/A
[illegible]	Visual Weld Exam.						OK
	Ferrite Control	N/R	N/R		N/R	—	N/R
	HT	N/A	N/A		N/A	—	N/A
[illegible]	PT	PTP(68-339)(2)9	1	✓	Card 16B Seq 4K	✓	W
	UT	N/R	N/R		N/R	—	N/R
	RT	N/A	N/A		N/A	—	N/A
	Major Repairs	None					
	Subject:						
	Deviations	None					
	Subject:						

Remarks:

[illegible]

262

CE 4-4-3 (Rev. 1) Supersedes NAVSHIPS 2804/49 Rev. 1

MATERIAL CHECK LIST

Customer: Burgermeister	Subject: Steam Dryer Support Bracket								
P.O.: 77	3								
Seq. No.:	1	2							
Date:	7/27/77	Final							

Material		Procedure Specification	Rev.	R	Record Reference	R	Insp. Code
	Vendor Material Identification	Piece marks 77-1-1 thru 4			Heat # NX2461	✓	
	Specification	MS 16 Rev. SAM			Traveler Card 736		
	Forming	N/A					
	Forming Qualif.	N/A					
	Shop H.T. & Furn. Charts	—					
	Mech. Testing "As Fabricated"						
	Ultrasonic Test	CSE NU	9				
	UT - Special	N/A	"		"		
	Magn. Particle	N/A					
	Liquid Penetrant	LPI 41001	1		↓		
	Major Repairs	N/A	—		N/A	—	—
	Subject:						
	Deviations	N/A	—	—	N/A	—	—
	Subject:						

REMARKS: Details obtained from CE&I Houston per telecon.

[signature] 7/27/77
Authorized C.E. Rep. Date
C. H. Cahill, Quality Control Engineer
General Electric Co. - CE&I Houston Corp.

2

CONAM INSPECTION INC.

A SUBSIDIARY OF

AUTOMATION INDUSTRIES, INC.

[illegible] DIGHT DRIVE [illegible] 0 RICHMOND, CALIFORNIA 94804 0 [illegible]

[illegible] Mfg. Co. DATE 11-2-71

[illegible] CUSTOMER [illegible]

[illegible] CONTRACT P.O. [illegible]

B

☐ ULTRASONIC
☐ RADIANT

☐ MAGNETIC PARTICLE
☐ EDDY CURRENT

[illegible] Rev. H & [illegible]
6 [illegible] 1970, [illegible]
[illegible] Rev. 0 [illegible] 5-8-71

D

C

[illegible]	N MARK 2COL	MAKE [illegible]	
[illegible]	EFFECTIVE MAT'L DIA .775	MODEL 711	
[illegible]	LATERAL INDEX .60	O/H 10-7	
[illegible]	FREQUENCY 2.25 MHz	TEST FREQUENCY 2.25 MHz	
	MATERIAL [illegible]		

[illegible]

INVOICE/REPORT NUMBER	JOB NUMBER	INSPECTED
[illegible]	31080	[illegible]

ALLOY	DESCRIPTION		
8a	1	R/M Dwg. 3" x 6-7/8" x 92-3/4"	1 0
		90 Deg: 4 Req. 11° Lg. - P.O. COUNT 4 Req. 11° Lg. - P.O. COUNT	BEST COPY AVAILABLE DCC JUN. 7 1974
		Insp. 2000 Centers .10" max.	
		Shown Dwg. Support Drawing Dwg. M 32 Rev. 0 Mark 77-1 Heat No. H 22461	
		BEST COPY AVAILABLE DCC JUN. 7 1974	

*CAUSE FOR REJECTION OR REMARKS

[illegible] Indications found.

275

INSPECTED BY

CERTIFIED BY
[illegible] Nicacio

POST WELD HEAT TREATMENT (PWHT)

CBI PROCEDURE HTP-12A CALL FOR PWHT FOR ALL WELDS ON THE REACTOR VESSEL. THE PWHT INCLUDES BUT IS NOT LIMITED TO A FINAL PWHT. AN INTERMEDIATE PWHT CAN BE PERFORMED IF IT IS NECESSARY TO RADIOGRAPH THE WELD BEFORE FINAL PWHT.

THE PROCEDURE IDENTIFIES TWO INTERMEDIATE PWHTS:

1) FOR THE SHELL COURSE WELDS THE WELD IS MAINTAINED AT PREHEAT TEMPERATURE OF 300 - 400°F. IF AN INTERMEDIATE WELD IS DESIRED A TEMPERATURE OF 1150°F $^{+25\,°F}_{-50\,°F}$ IS MAINTAINED FOR 15 MINUTES/INCH THICKNESS, AND NOT TO EXCEED ONE HOUR. THE WELD CAN THEN BE TAKEN TO AMBIENT TEMPERATURE UNTIL FINAL PWHT

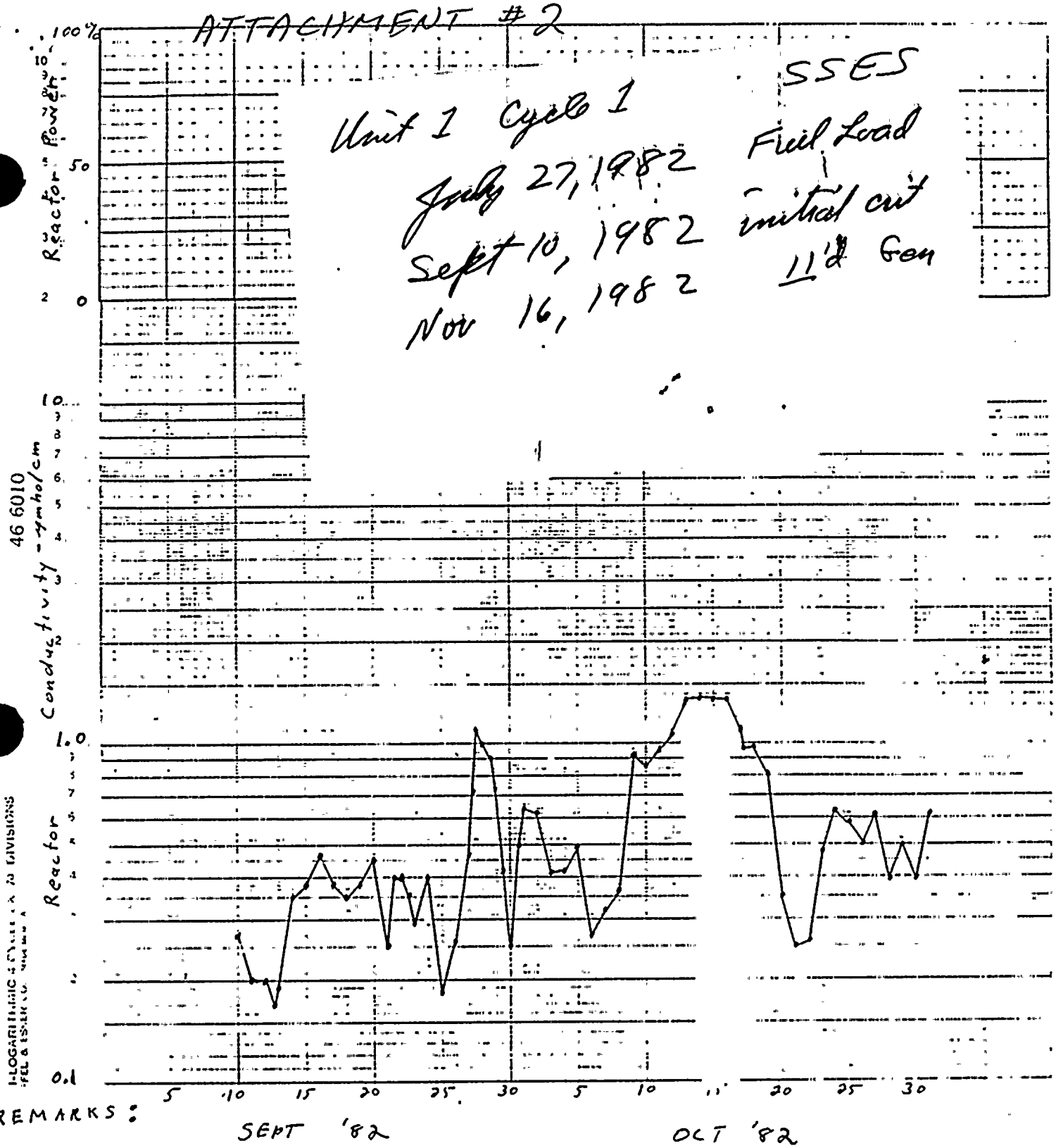
2) FOR AN INCONEL OVERLAY THE WELD IS MAINTAINED AT THE SAME TEMP. AS NO 1. THE INTERMEDIATE WELD IS TO THE SAME DESIRED TEMPERATURE, SAME TIME FOR THICKNESS. THE WELD CAN THEN BE TAKEN TO AMBIENT TEMPERATURE UNTIL FINAL PWHT

THE FINAL PWHT IS PERFORMED AS STATED BELOW:

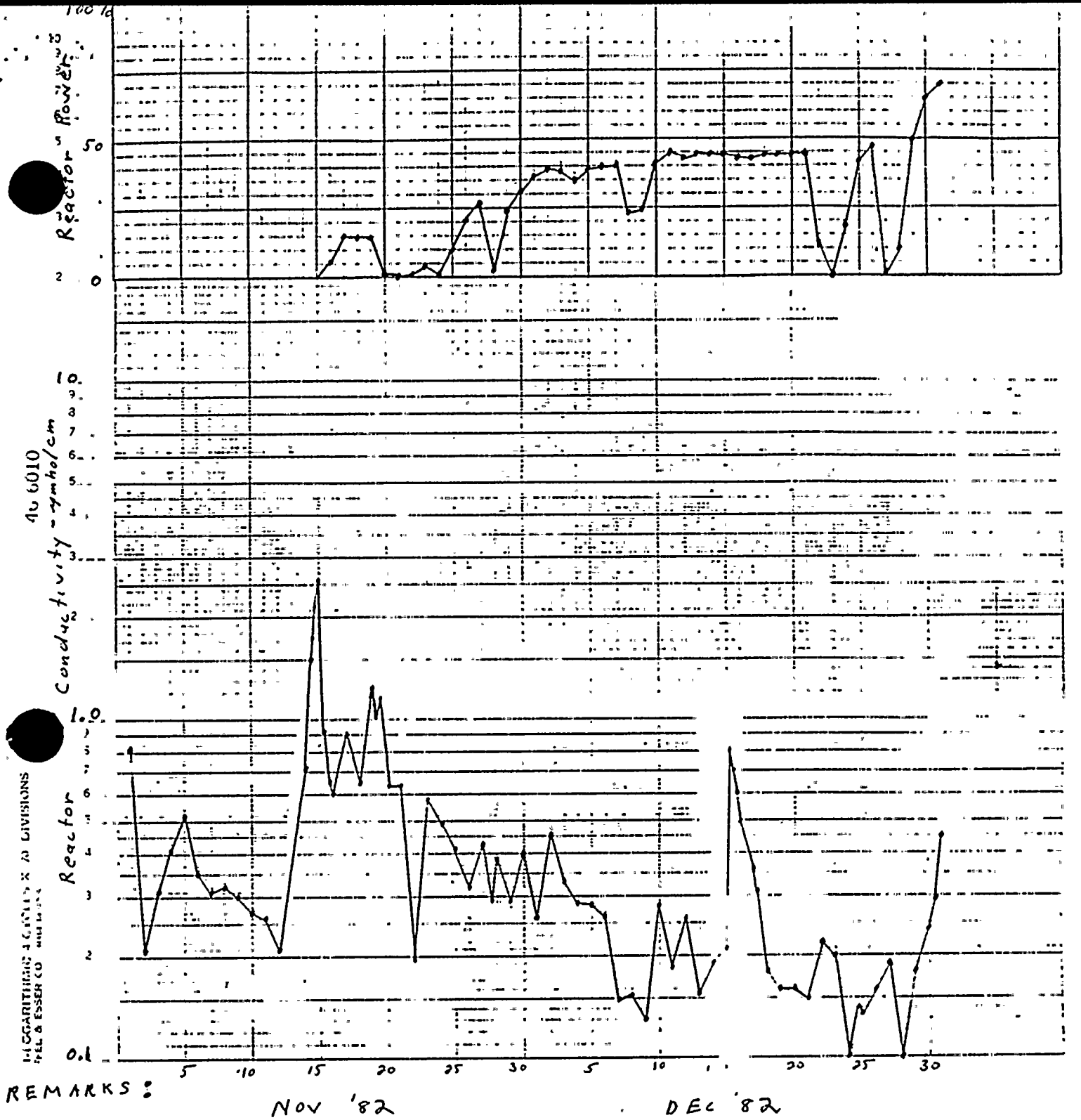
THE WELD IS MAINTAINED AT 300 - 400 °F OR AMBIENT, (DEPENDING ON INTERMEDIATE PWHT) THE FINAL PWHT IS TO THE TEMPERATURE OF 1150 $^{+25}_{-50}$ °F AND IS MAINTAINED AT THAT TEMPERATURE FOR 1 HOUR / INCH FOR 1ST 5 INCHES AND AN ADDITION 15 MINUTES FOR EACH SUBSEQUENT INCH.

SINCE THE INCONEL PAD WAS OVER THE SHELL COURSE WELD THE PAD WILL HAVE A FINAL PWHT OF 5 1/4 HOURS.

ATTACHMENT #2

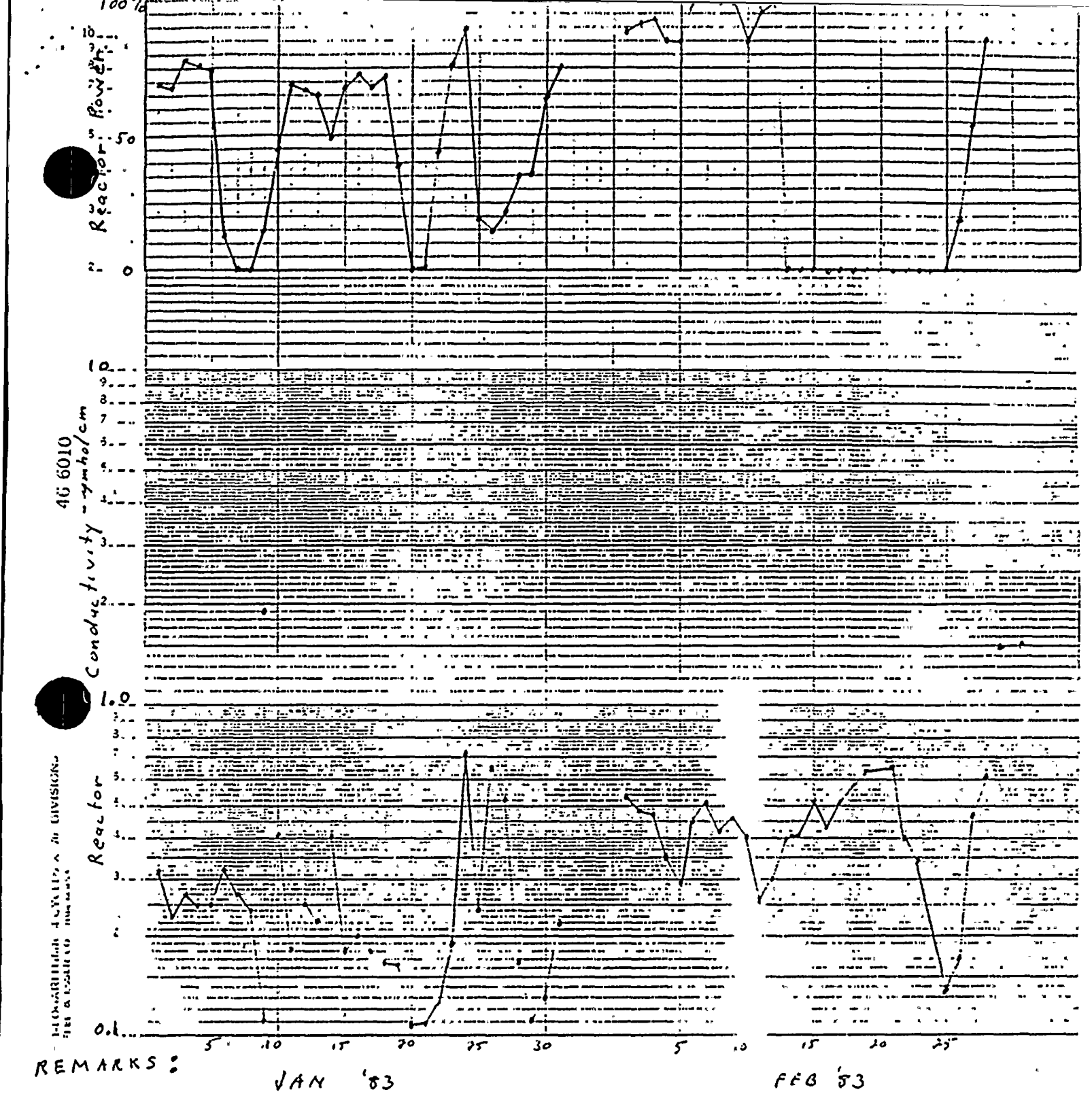


REMARKS:



REMARKS:

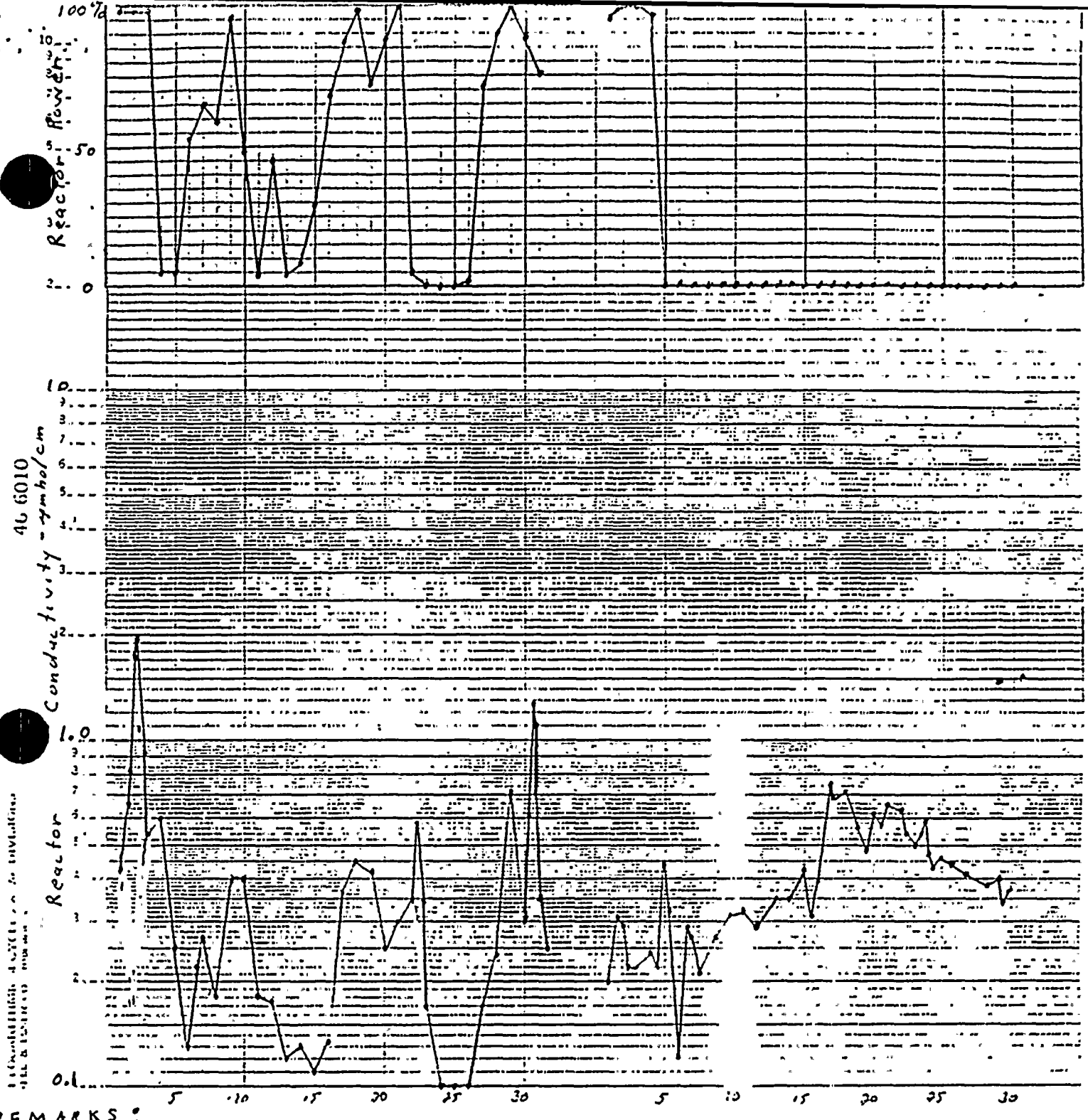
NOV '82 DEC '82



REMARKS:

JAN '83

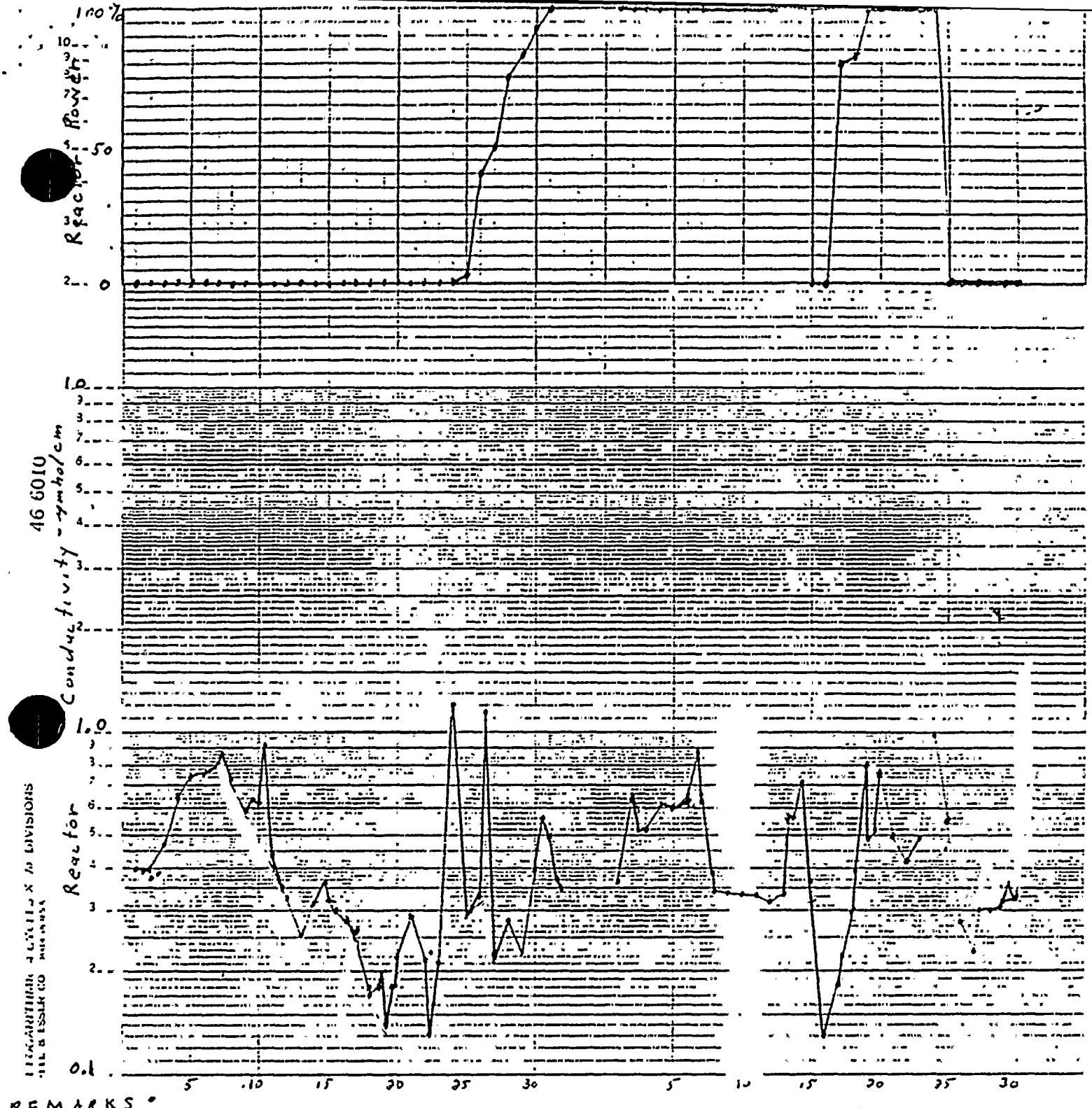
FEB '83



REMARKS :

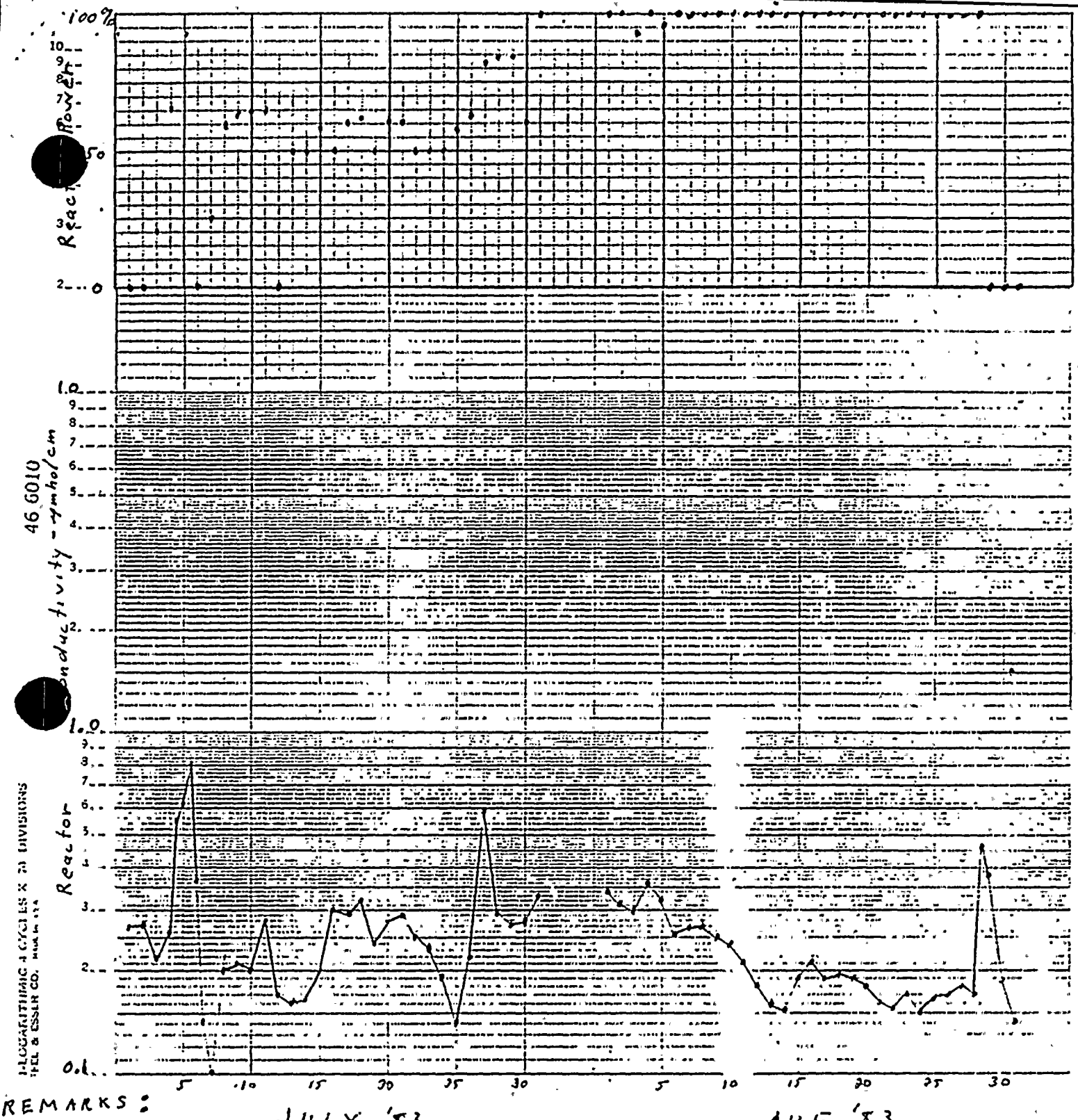
MAR '83

APR '83

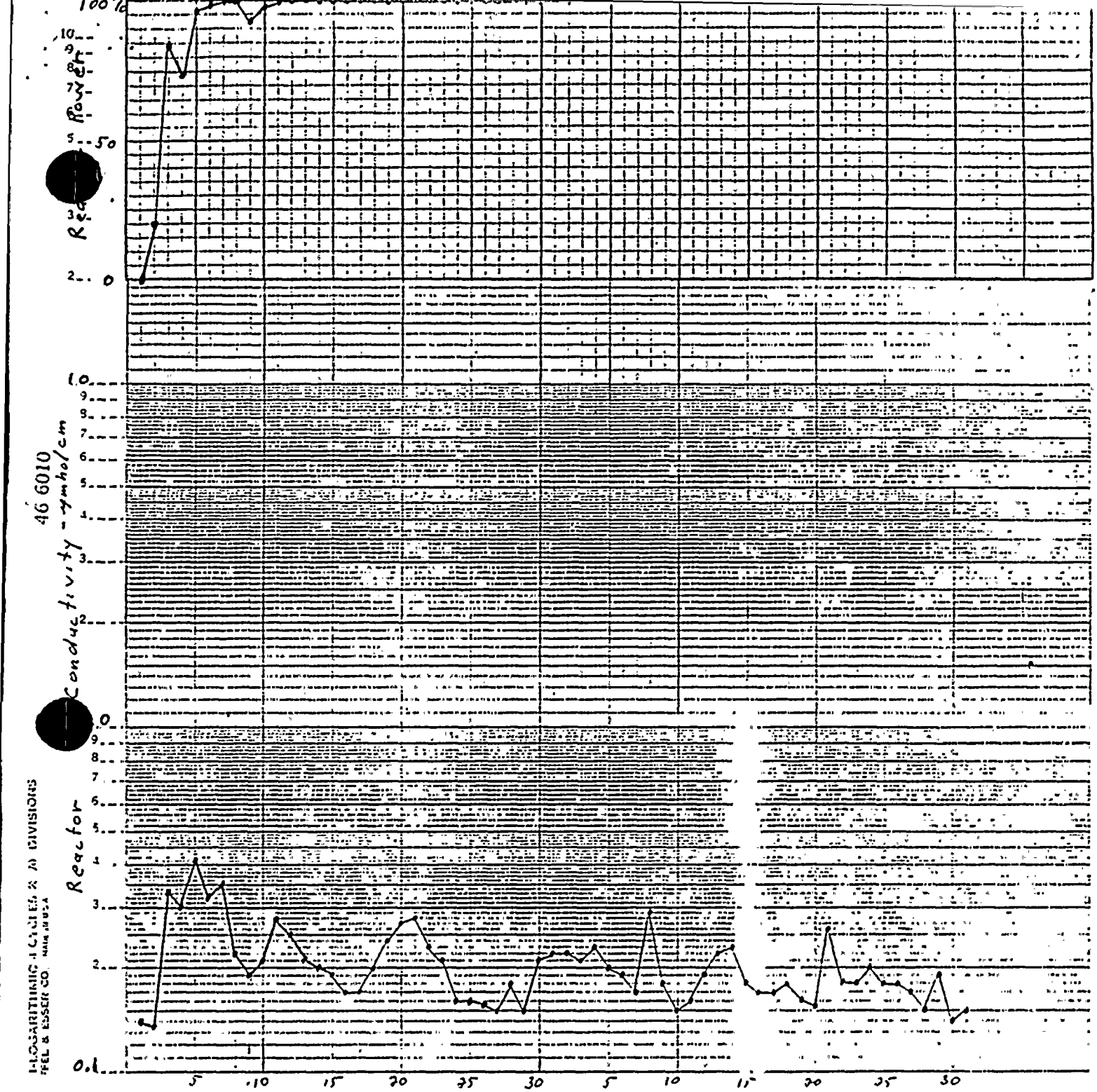


REMARKS:

reactor water sampled daily for chlorides - < 20 ppb.


100%
Reactor Power
Conductivity - μmho/cm
46 6010
Reactor
5
10
15
20
25
30
JULY '83
AUG '83

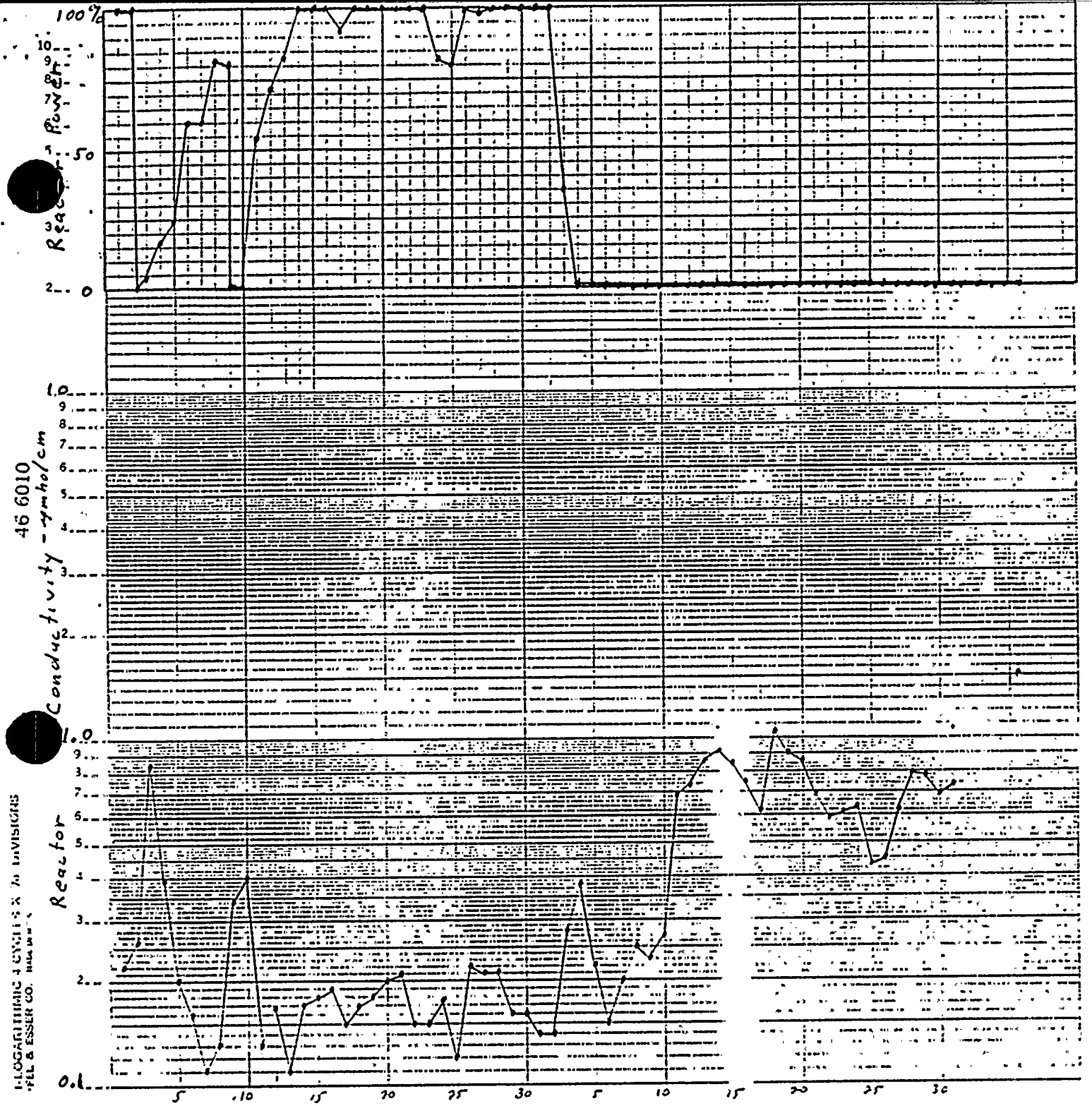
REMARKS:



REMARKS:

Sept '83 Oct '83

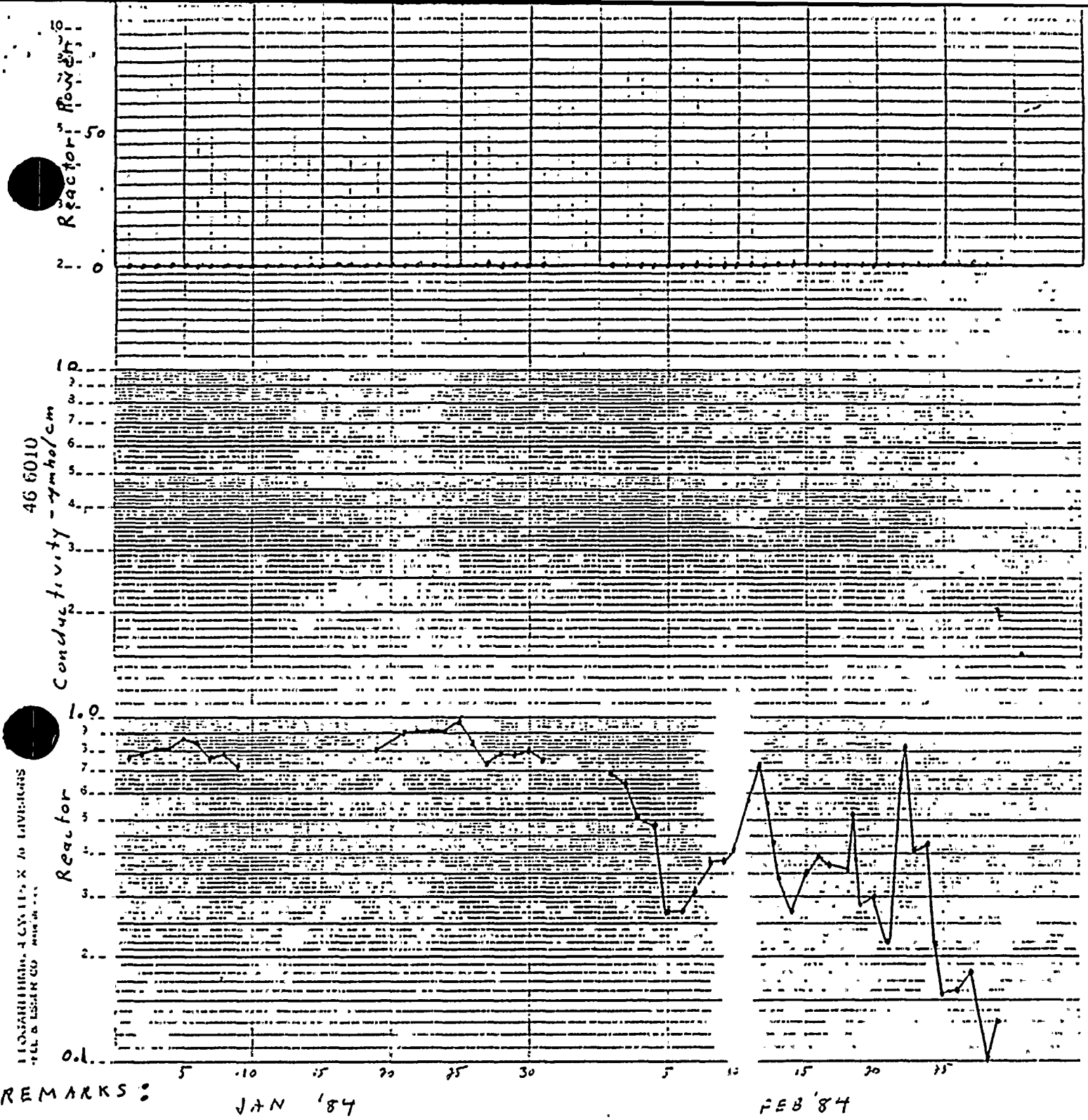
chlorides - Sampled daily - < 20 ppb



REMARKS:

NOV '83

DEC '83

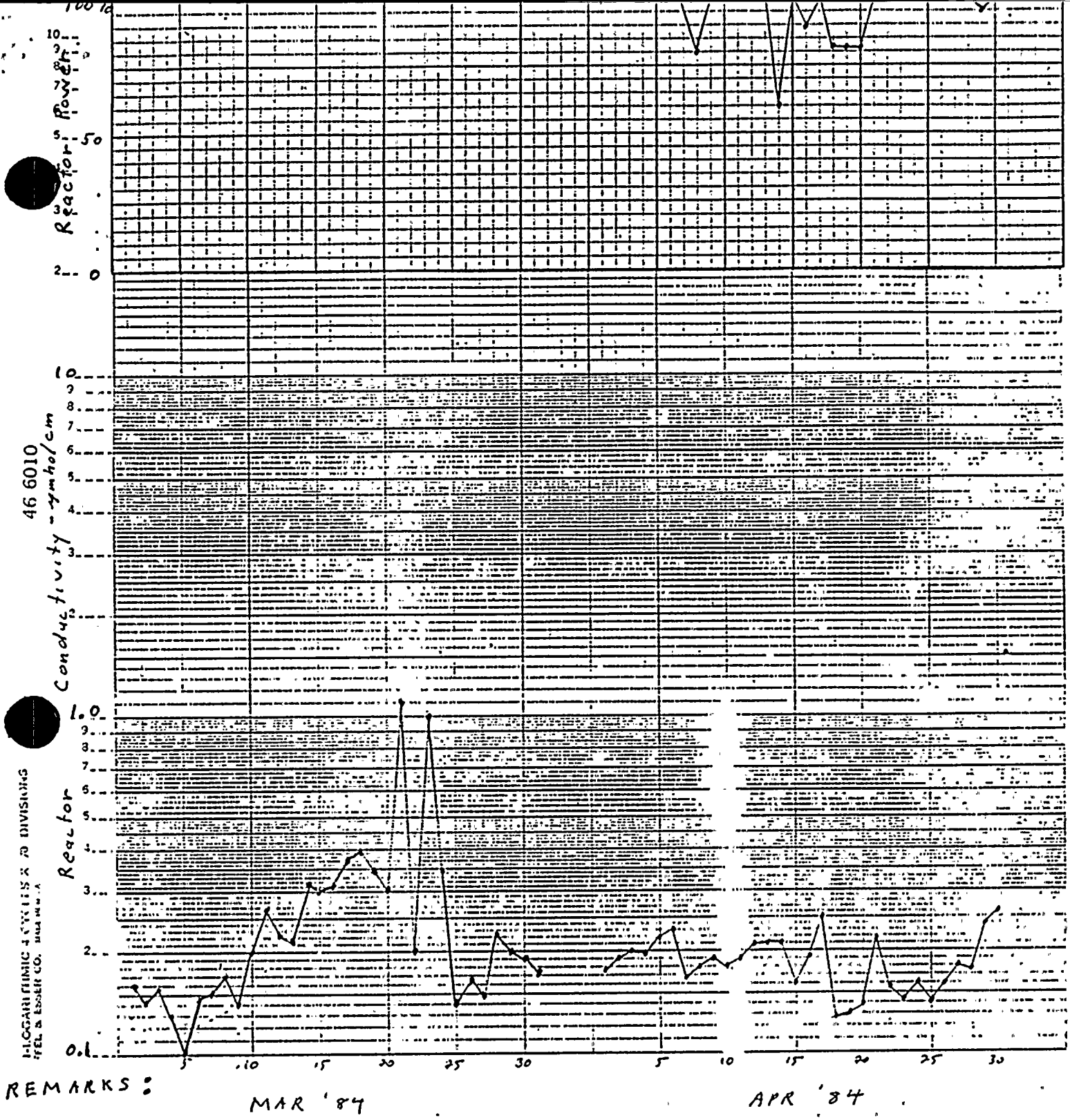


46 6010

REMARKS:

JAN '84

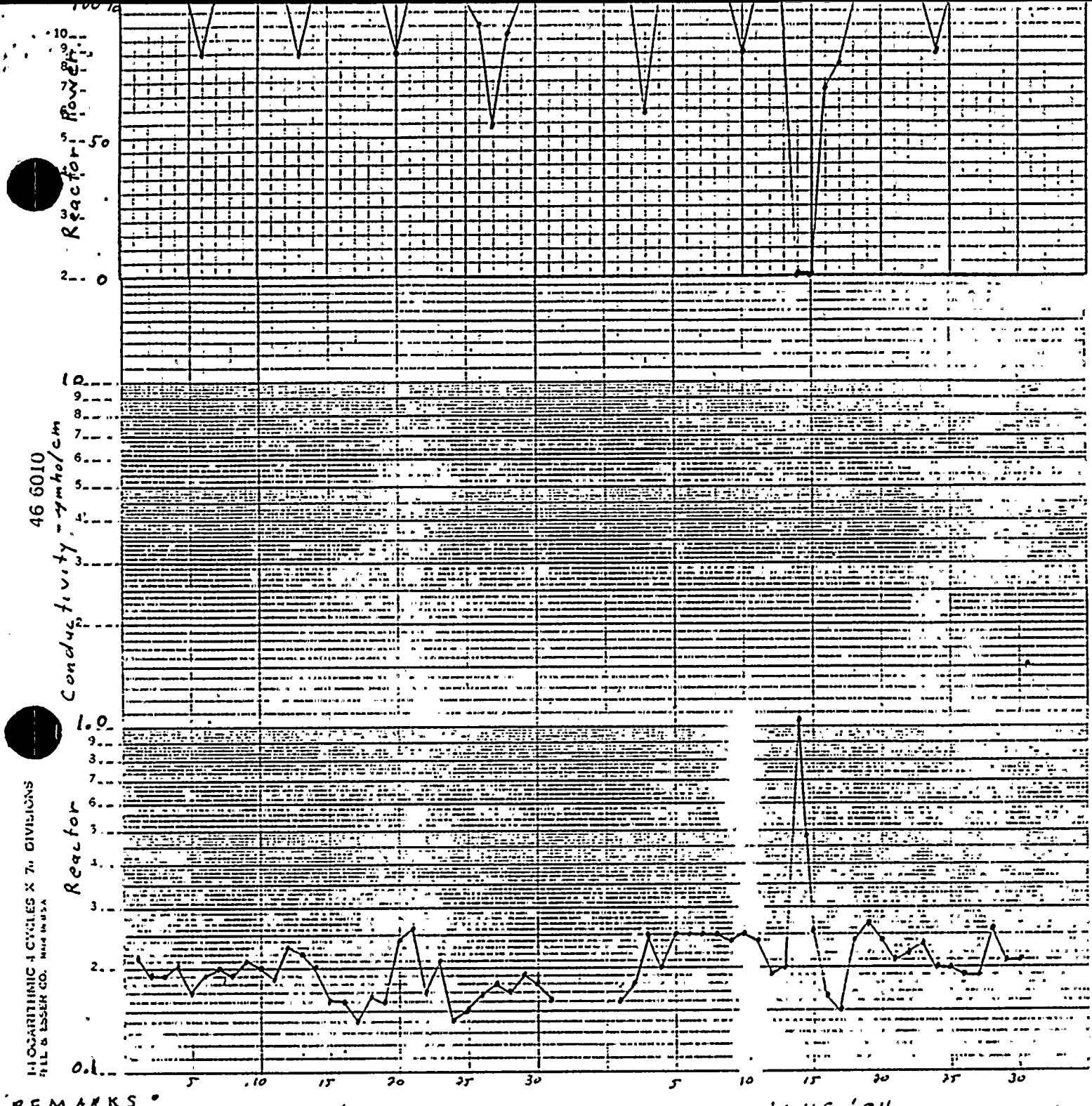
FEB '84



46 6010

KEUFFEL & ESSER CO.

REMARKS:



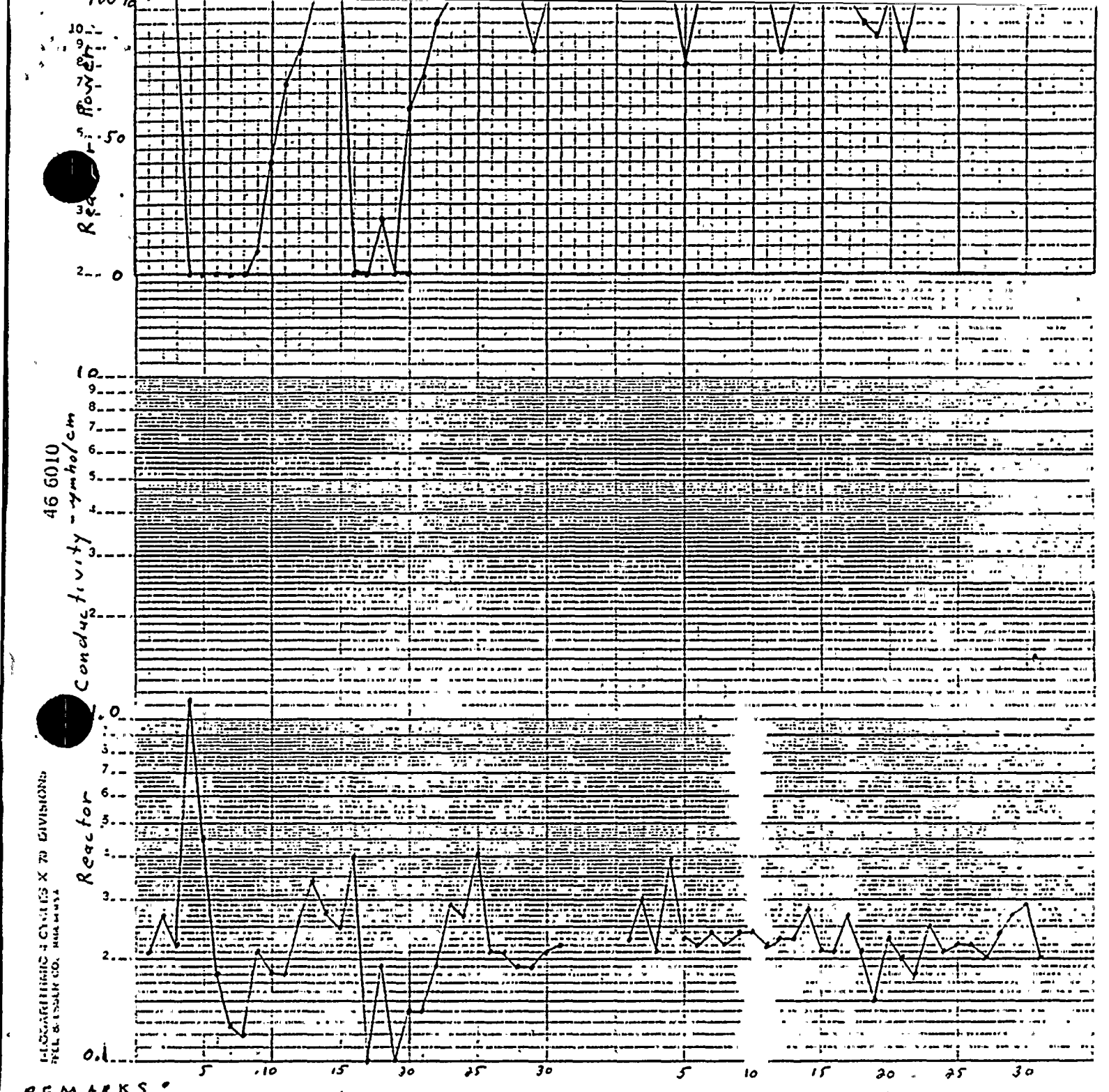
46 6010

LOGARITHMIC 4 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

REMARKS:

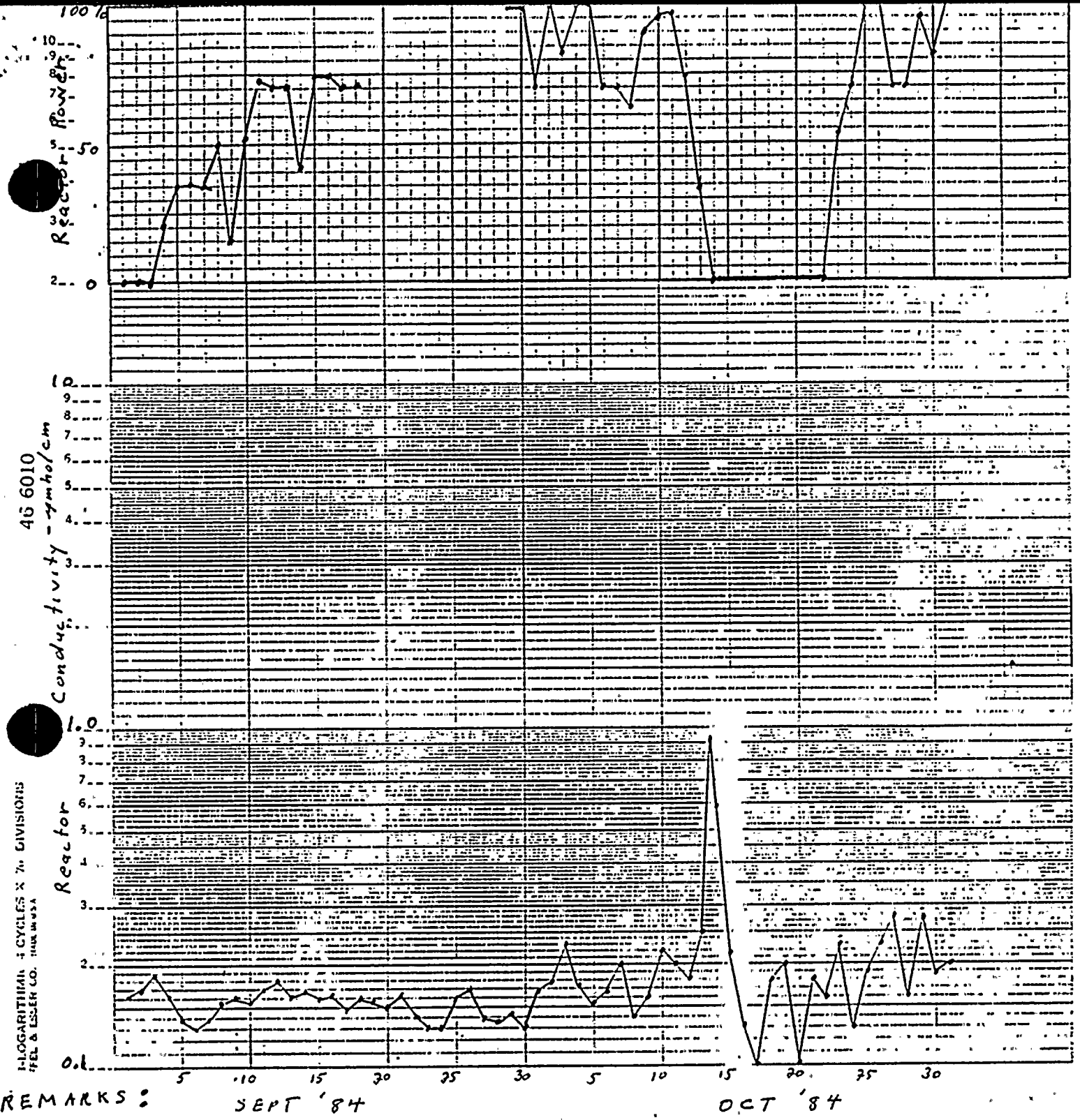
MAY '84

JUNE '84



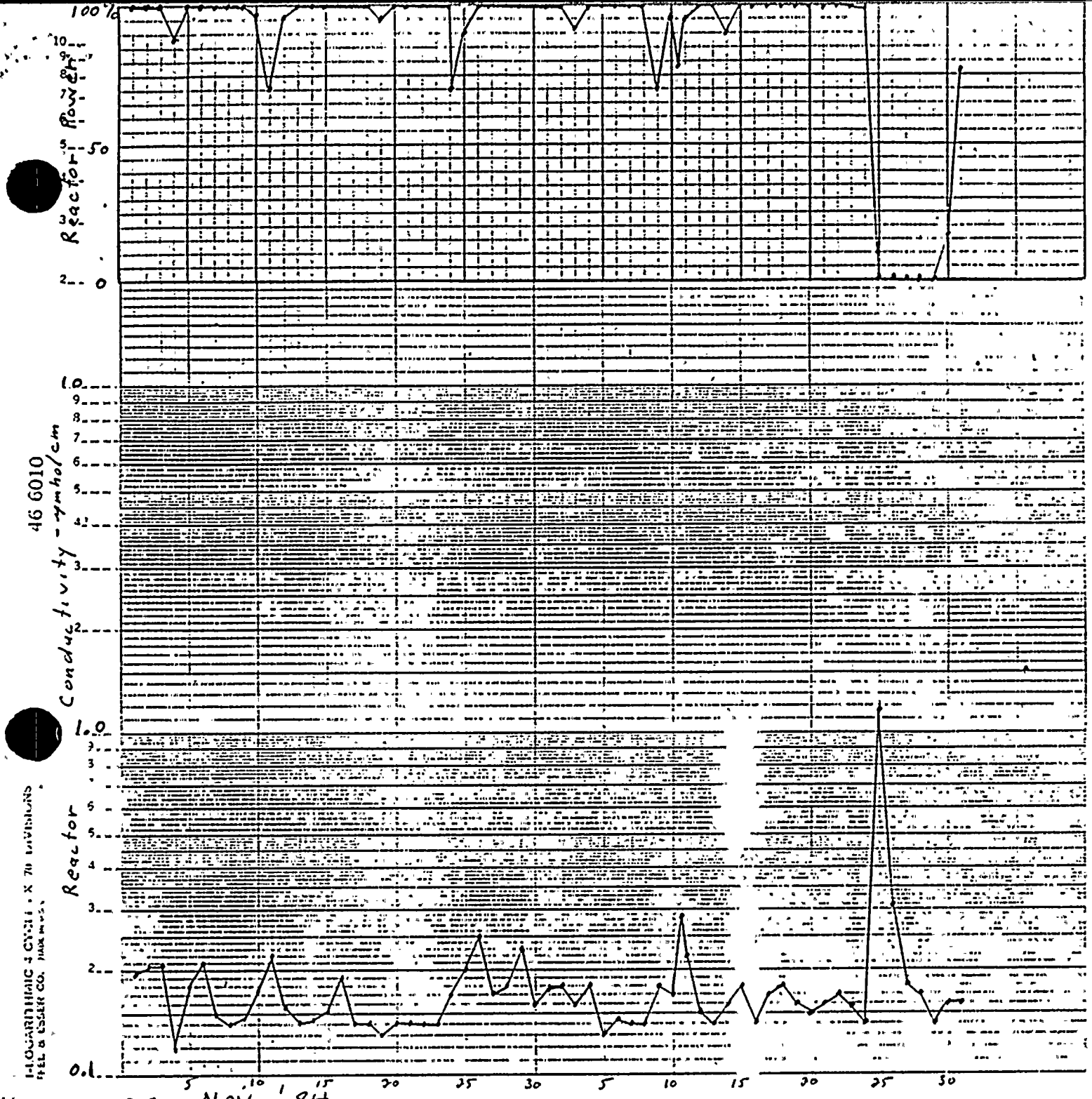
REMARKS:

Reactor water was sampled and analyzed daily for chlorides. Each analysis indicated < 20 ppb.



REMARKS:

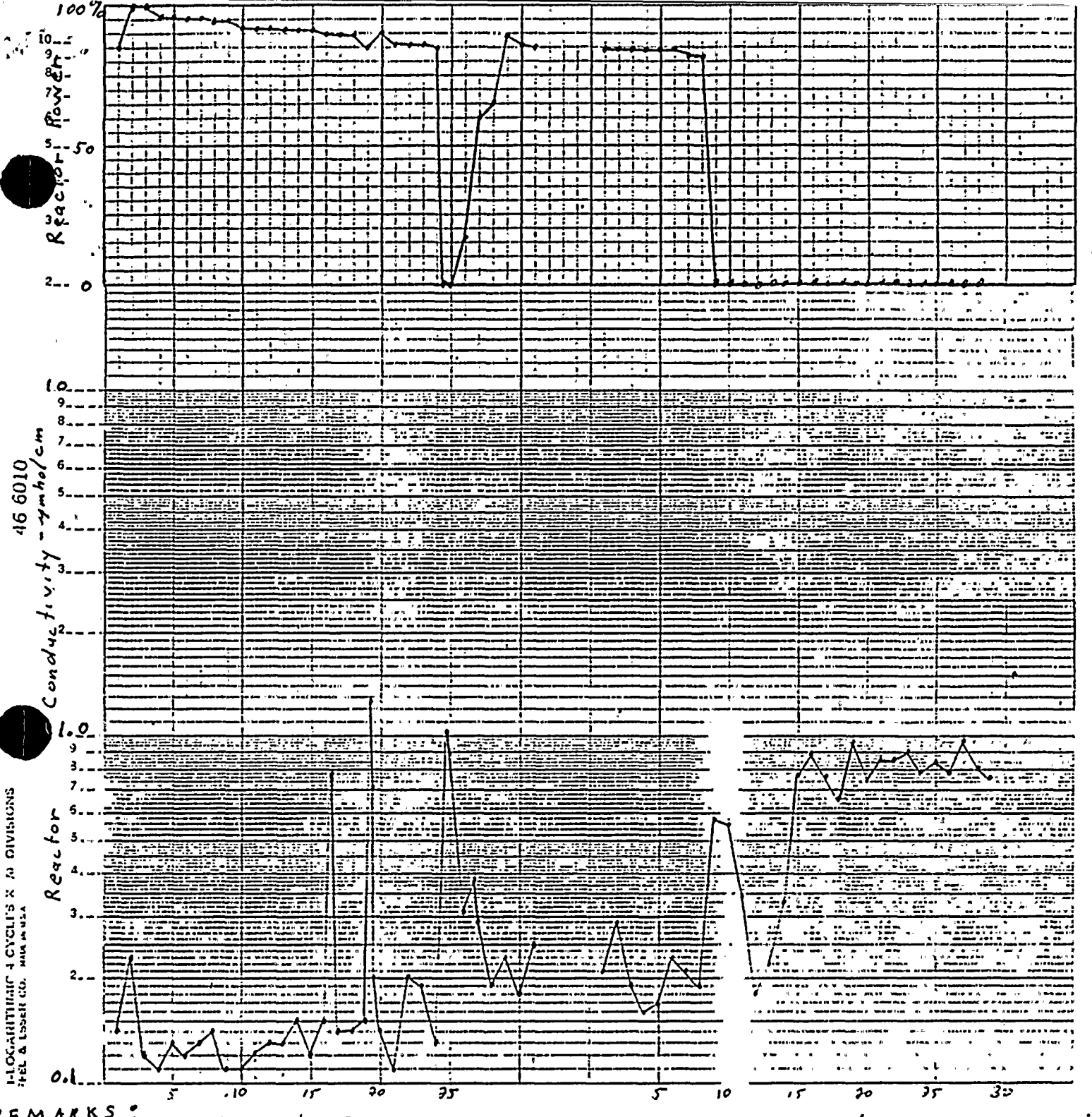
Sampled daily for chlorides; each sample was analyzed at ≤ 20 ppb



REMARKS:

chlorides - daily grab - < 20 ppb

chlorides - daily grab - < 20 ppb



REMARKS:

JAN '85

FEB '85

Attachment 6

Steam Dryer Instrumentation

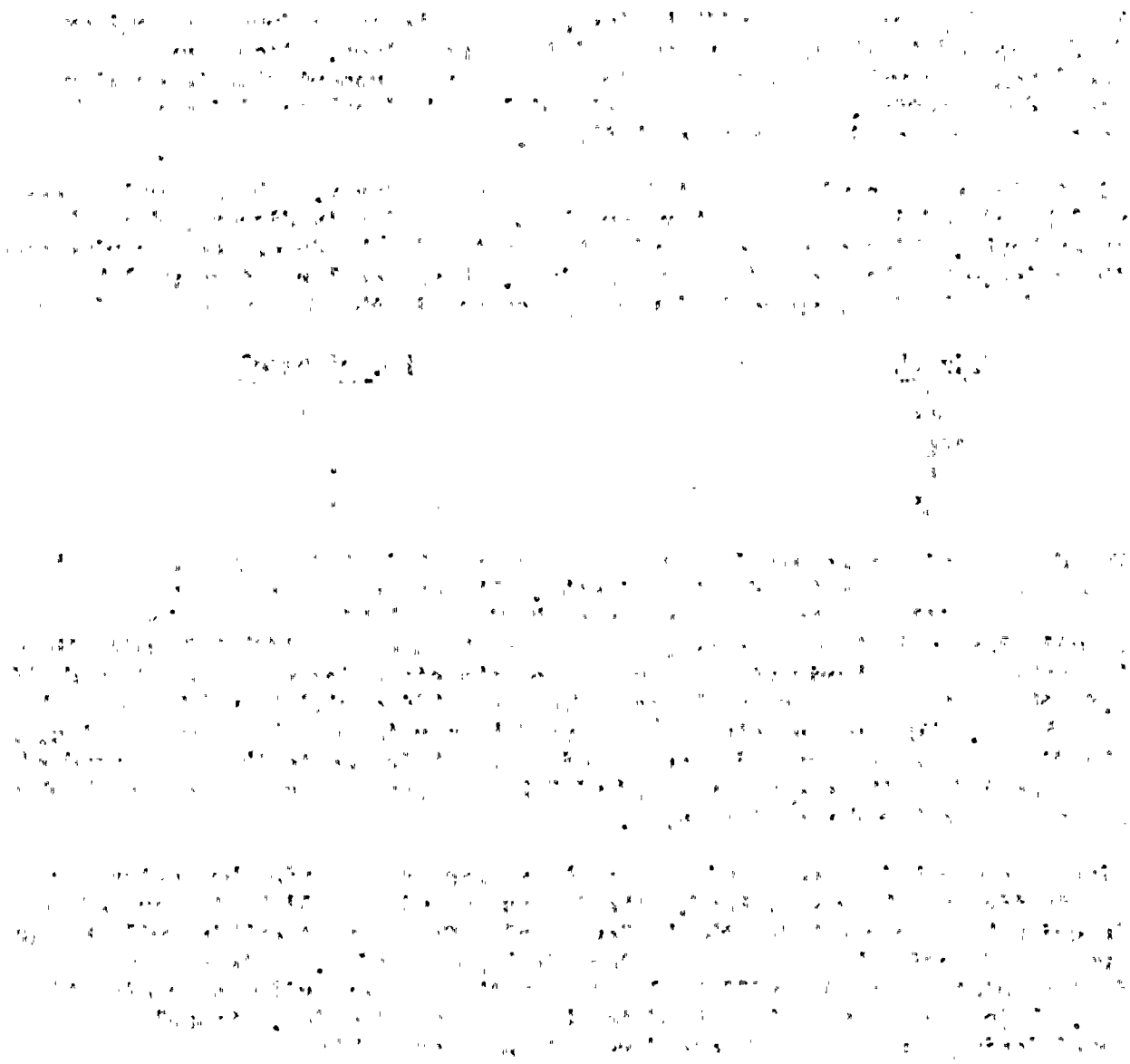
Temporary instrumentation will be installed on the steam dryer to monitor loads applied to the steam dryer and it's support lugs. Also four accelerometers will be mounted to the steam dryer support ring to monitor steam dryer motion. These instruments will feed signal conditioners and recorders located in the reactor building.

Eight strain gages will be installed on the steam dryer. Three strain gages will be placed in two areas where cracks were previously discovered on the dryer banks. Five strain gages will be located in the dryer support ring and the seismic blocks lcoated at 94° and 184°. Four accelerometers will be located on the dryer support ring at approximately the following locations:

Azimuth	No. of Accel
90°	1
140°	1
185°	1
230°	1

Two differential pressure instruments will be fabricated on the edge of the steam dryer at the 90° and 270° azimuths. The differential pressure instrument will be fabricated out of a 8" dia. x 4" high 304 SS pipe. A 60 mil plate will be welded over one end of the pipe. A 1/2" hole will then be drilled in the horizontal end plates of the steam dryer at the 90° and 270° azimuths. The open ends of the pipe drum assemblies will be welded over the 1/2" holes. Two or four strain gages will be mounted on the 60 mil plates. The differential pressure instrument will be fabricated to the same standards that applied to the steam dryer and will be of equal or greater strength when compared to other dryer structures.

Wires from each instrument will exit the reactor vessel via the instrument penetration in the vessel head. The instrument wires will be terminated to a junction box located below the bellows seal. Containment cabling will be run from the junction box to a spare electrical penetration. A temporary instrumentation station will be located in the reactor building on elevation 749. This station will be cabled to the spare penetration. Signal conditioning equipment and recorders will be provided by GE.



ATTACHMENT #9

GENERAL ELECTRIC

ORIGINAL COPY WHEN THIS IMPRINT IN RED

Specification No. GPS 43.2

Revision No. 1

Date 3-26-85

Page 1 of 1

RECORD OF WELDER PERFORMANCE TEST

Welding Process	Manual / Machine	Material Specification					
GTAW/SMAW	Manual ☒ Machine ☐	SA 106 GR B	to	SA 106 GR B	of P No. 1	to P No. 1	

Thickness (if pipe, diameter and wall thickness) Welded	Thickness Range Qualified	Diameter Range Qualified
1" THICK PLATE	GTAW - UP TO 1½" (2T) SMAW - MAX TO BE WELDED	24" AND OVER

Describe Filler Metal	Filler Metal Group No. F.	Weld Metal Analysis No. A.
ENiCrFe-3, BARE ELECTRODE, SFA 5.14 & ENiCrFe-3 COVERED ELECTRODE, SFA 5.11	43	NONE

WELDING PROCEDURE

Single Pass / Multiple Pass	Single Arc / Multiple Arc	Position of Groove	If 3G, 5G, 6G Upward / Downward
Single Pass ☐ Multiple Pass ☒	Single Arc ☒ Multiple Arc ☐	1G ☐ 2G ☐ 3G ☐ 4G ☒ 5G ☐ 6G ☐	N/A Upward ☐ Downward ☐

Preheat Temperature	Interpass Temperature	Postweld Heat Treatment Temp.	Postweld Heat Treatment Time
50°F MIN	350°F MAX	NONE	NONE

ATMOSPHERE

Shielding Gas Composition	Trade Name	Torch Gas Flow Rate
ARGON WELDING GRADE	N/A	10-25 CFH

FOR INFORMATION ONLY

Filler Wire-Diameter	Trade Name	Type of Backing	Joint Dimensions per
1/16" 3/32" 1/8" 5/32"	N/A	BACKING STRIP	SINGLE "V" GROOVE

Welding Characteristics	Current/Polarity	Amps	Volts	Inches per Minute	
	GTAW - DCSP SMAW - DCRP	50-170 60-185	9-16 21-30	N/A	Forehand ☒ Backhand ☐

TEST RESULTS

REDUCED SECTION TENSILE TEST

Specimen No.	Dimensions		Area	Ultimate Total Load (lbs.)	Ultimate Unit Stress (PSI)	Character of Failure and Location
	Width	Thickness				
N/A						
N/A						

GUIDED BEND TESTS

Type and Figure No.	Result	Type and Figure No.	Result
N/A			
N/A			

Test Conducted By N/A Laboratory-Test No. N/A

RADIOGRAPHY TEST

Radiographic Results: Accept

Test Conducted By Lehigh Testing Lab. Laboratory-Test No.

per Robert Ahrmann GE Level III 3-26-85

Welder's Name N. Robert Fuhrmann Stamp No. F-0822

Film F-8022

Who by virtue of these tests meets welder performance requirements.

We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

By J. Fuhrmann

4-1-85

ORIGINAL COPY WHEN THIS IMPRINT IN RED

GENERAL ELECTRIC

ORIGINAL COPY WHEN THIS IMPRINT IN RED

Specification No. TPS 45.45.5
Revision No. 1
Date 3-23-85
Page 1 of 1

RECORD OF WELDER PERFORMANCE TEST

Welding Process: GTAW/SMAW	Manual ☒ Machine ☐	Material Specification: SA 106 GR B to SA 106 GR B	of P No. 1	to P No. 1
Thickness (if pipe, diameter and wall thickness) Welded: 1" THICK PLATE	Thickness Range Qualified: GTAW - UP TO 1½" (GT) SMAW - MAX TO BE WELDED		Diameter Range Qualified: 24" AND OVER	
Describe Filler Metal: ERNiCr-3, BARE ELECTRODE, SFA 5.14 & ENiCrFe-3 COATED ELECTRODE, SFA 5.11		Filler Metal Group No. F: 43	Weld Metal Analysis No. A: NONE	

WELDING PROCEDURE

Single Pass ☐ Multiple Pass ☒	Single Arc ☒ Multiple Arc ☐	Position of Groove: 1G ☐ 2G ☐ 3G ☒ 4G ☐ 5G ☐ 6G ☐	If 3G, 5G, 6G Upward ☒ Downward ☐	
Preheat Temperature: 50°F MIN	Interpass Temperature: 350°F MAX	Postweld Heat Treatment Temp.: NONE	Postweld Heat Treatment Time: NONE	

ATMOSPHERE

Shielding Gas Composition: ARGON, WELDING GRADE	Trade Name: N/A	Torch Gas Flow Rate: 10-25 CFH

FOR INFORMATION ONLY

Filler Wire-Diameter: 1/16" 3/32" 1/8" 5/32"	Trade Name: N/A	Type of Backing: BACKING STRIP	Joint Dimensions per: SINGLE "V" GROOVE

Welding Characteristics: Current/Polarity: GTAW-DCSP / SMAW-DCRP; Amps: 50-170 / 60-185; Volts: 9-16 / 21-30; Inches per Minute: N/A; Forehand ☒ Backhand ☐

TEST RESULTS

REDUCED SECTION TENSILE TEST

Specimen No.	Dimensions: Width	Dimensions: Thickness	Area	Ultimate Total Load (lbs.)	Ultimate Unit Stress (PSI)	Character of Failure and Location
N/A						
N/A						

GUIDED BEND TESTS

Type and Figure No.	Result	Type and Figure No.	Result
N/A			
N/A			

Test Conducted By: N/A Laboratory-Test No.: N/A

RADIOGRAPHY TEST

Radiographic Results: Accept

Test Conducted By: Lehigh Testing Lab Laboratory-Test No.:

per: RT Camera GE LTH 3-23-85

Welder's Name: N.R. FUHRMANN Stamp No.: F-0822

Who by virtue of these tests meets welder performance requirements.

We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

By: [signature] 4/7/1

ORIGINAL COPY WHEN THIS IMPRINT IS RED

GENERAL ELECTRIC
ORIGINAL COPY WHEN
THIS IMPRINT IN RED
SPECIAL PROCESS CONTROL SHEET

FILE NO. 5.7.89

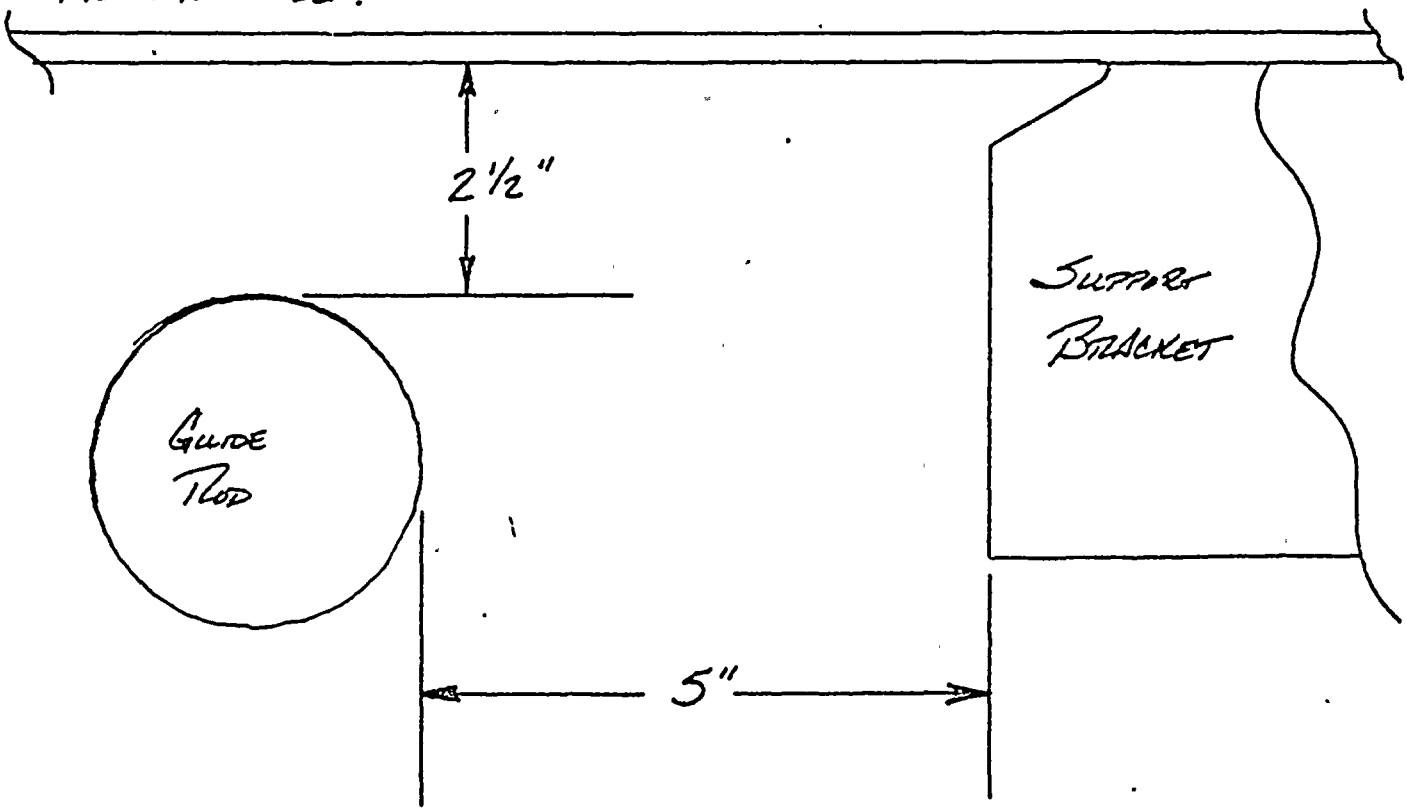
Project SUSQUEHANNA SPCS NO. SDSB-1 Rev. 0

Project No. _____ Page 1 of 1

Description: MOCK-UP, SUSQUEHANNA STEAM DRYER SUPPORT BRACKET

References: FDDR KR1-7000

AS DEPICTED BELOW, A MOCK-UP OF ACTUAL CONDITIONS WAS CONSTRUCTED AT THE G.E. TECHNICAL CENTER. ALL WELDERS THAT PASSED THE REQUIRED ASME SECTION IX TESTS, WERE REQUIRED TO WELD ON THE MOCK-UP.



WELDER'S NAME & ID # R. FUHRMANN F-0822

ORIGINAL COPY WHEN
THIS IMPRINT IN RED

FILE NO. 5.7.89

SPECIAL PROCESS CONTROL SHEET

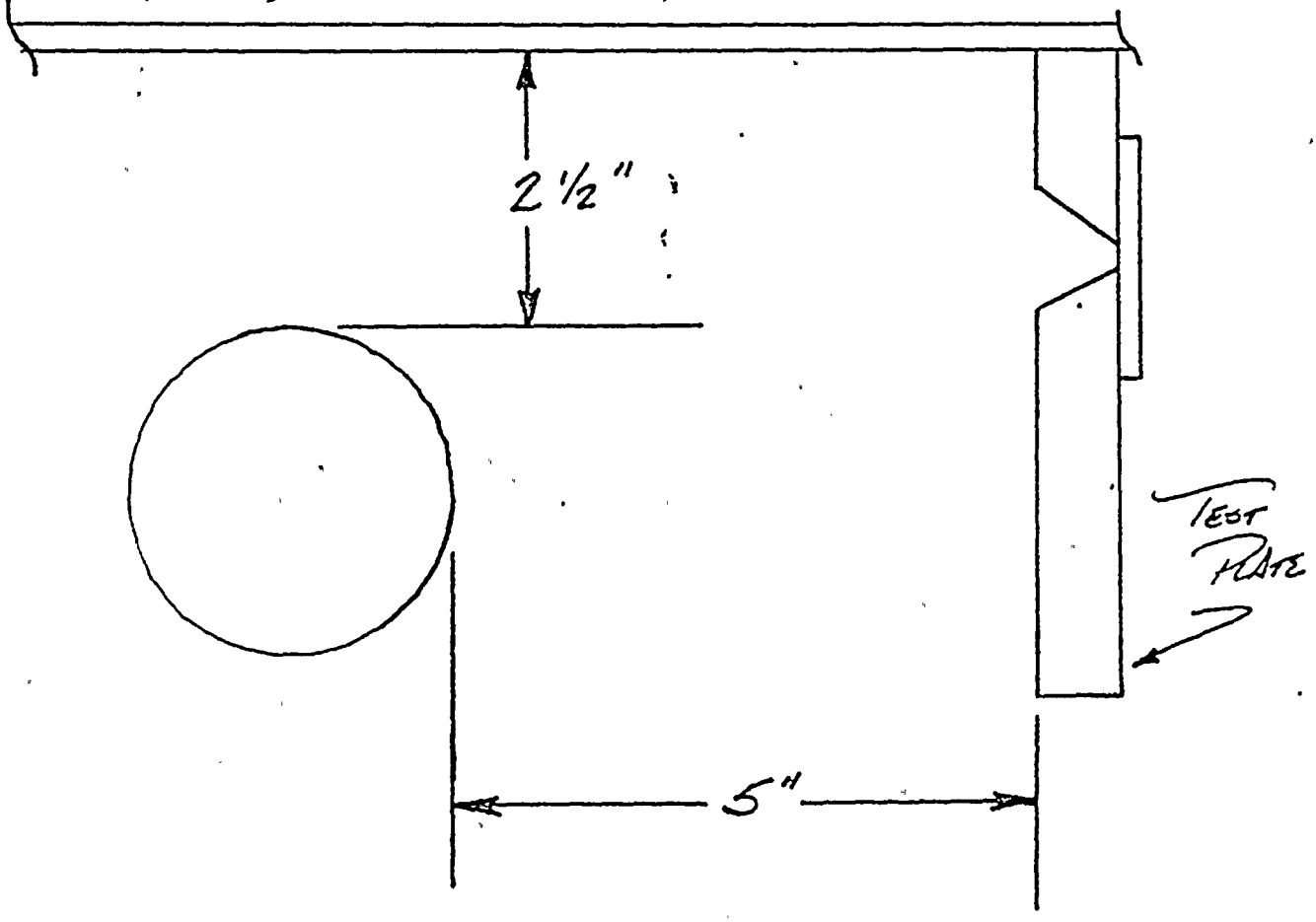
Project SUSQUEHANNA SPCS NO: SDSB-2 Rev. 0

Project No. Page 1 of 1

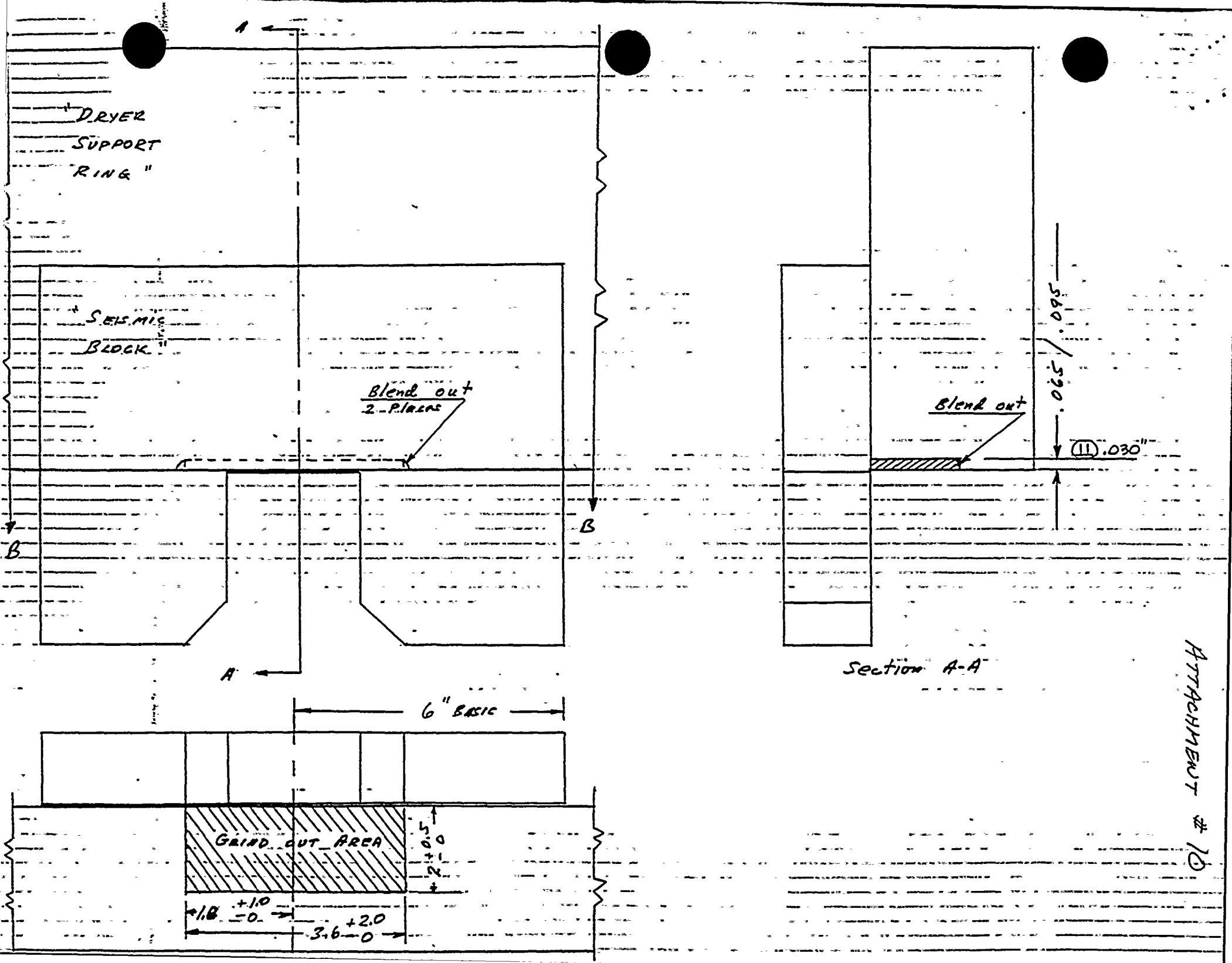
Description: "RESTRICTED ACCESS" WELDER QUALIFICATION - 3G POSITION

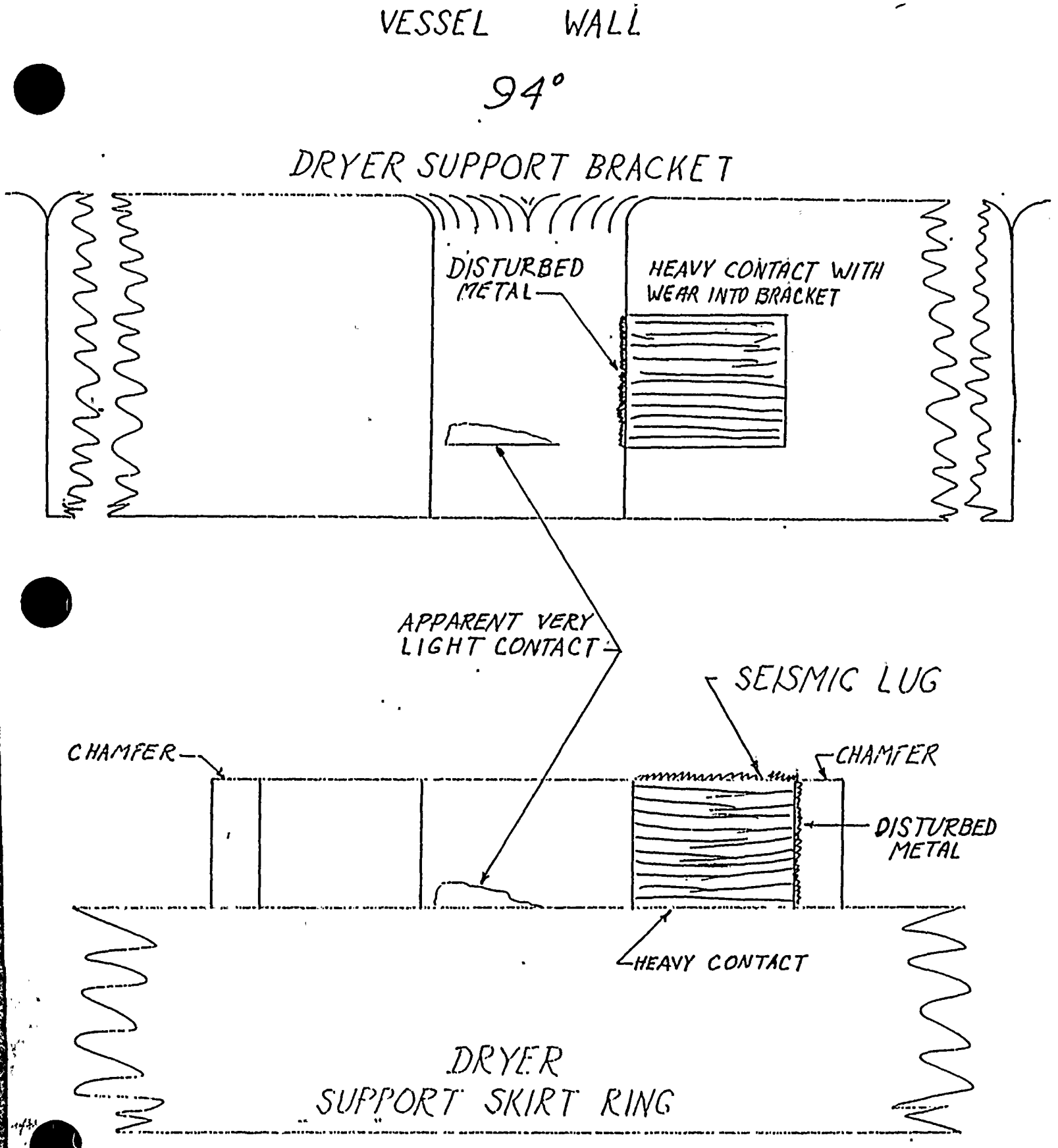
References: (FDDR KRI-7000

AS DEPICTED BELOW, ALL WELDERS WERE REQUIRED TO WELD-UP THEIR 3G TEST PLATE WITH "RESTRICTED ACCESS". WPS 43.43.3 (GTAW/SMAW) WAS UTILIZED.



WELDER NAME & ID# R. FUHRMANN F-0822


1
DRYER SUPPORT "RING"
SEISMIC BLOCK
Blend out 2 Places
B
B
A
A
Blend out
.590"
.590"
(11) .030"
Section A-A
6" BASIC
GRIND OUT AREA
.5 +0 -1
2 +1 -0
+1.0 -0
1.8
+2.0 -0
3.6
ATTACHMENT # 10

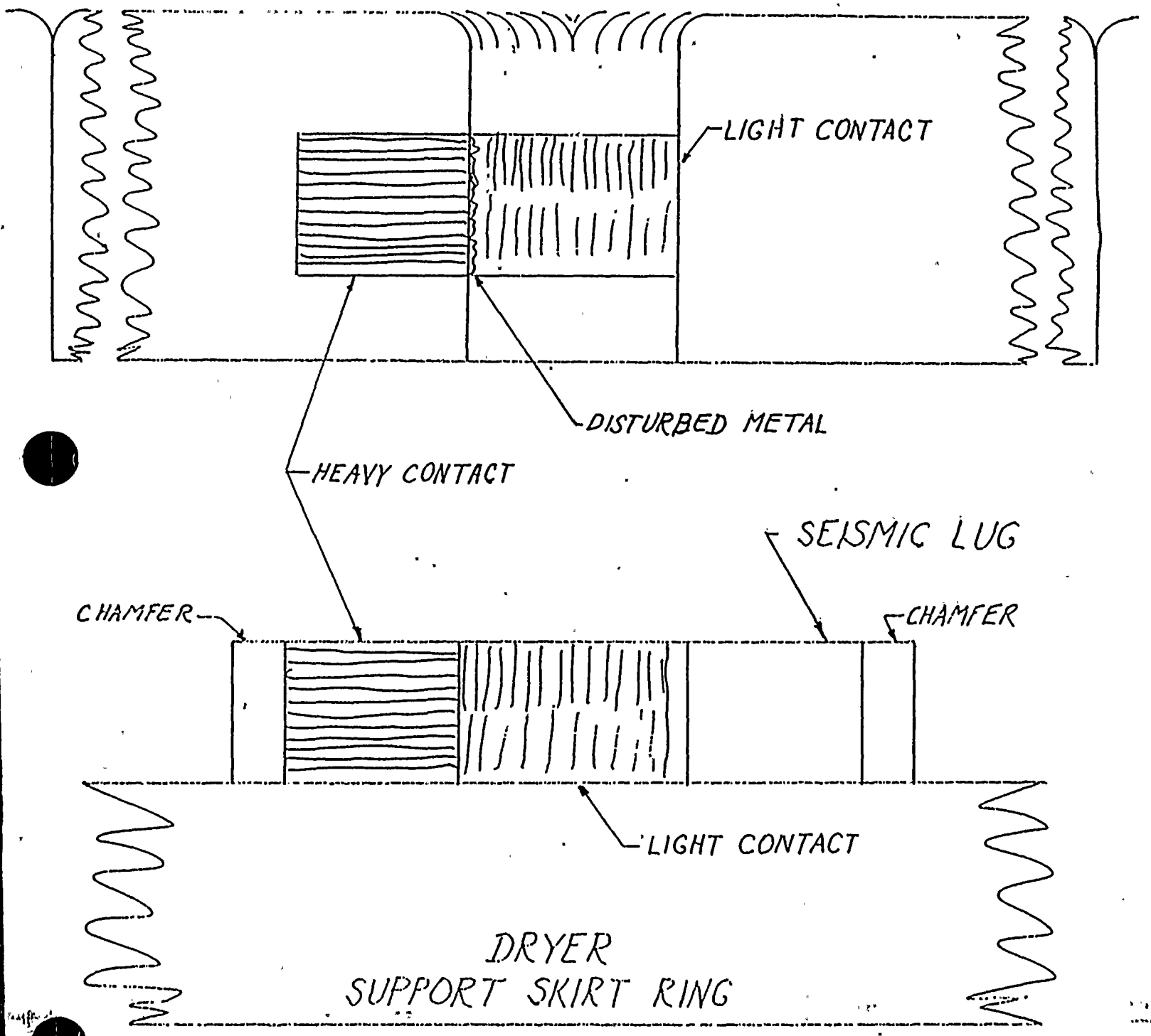


R. P. SHIMKUS 3/20/85

VESSEL WALL

274°

DRYER SUPPORT BRACKET

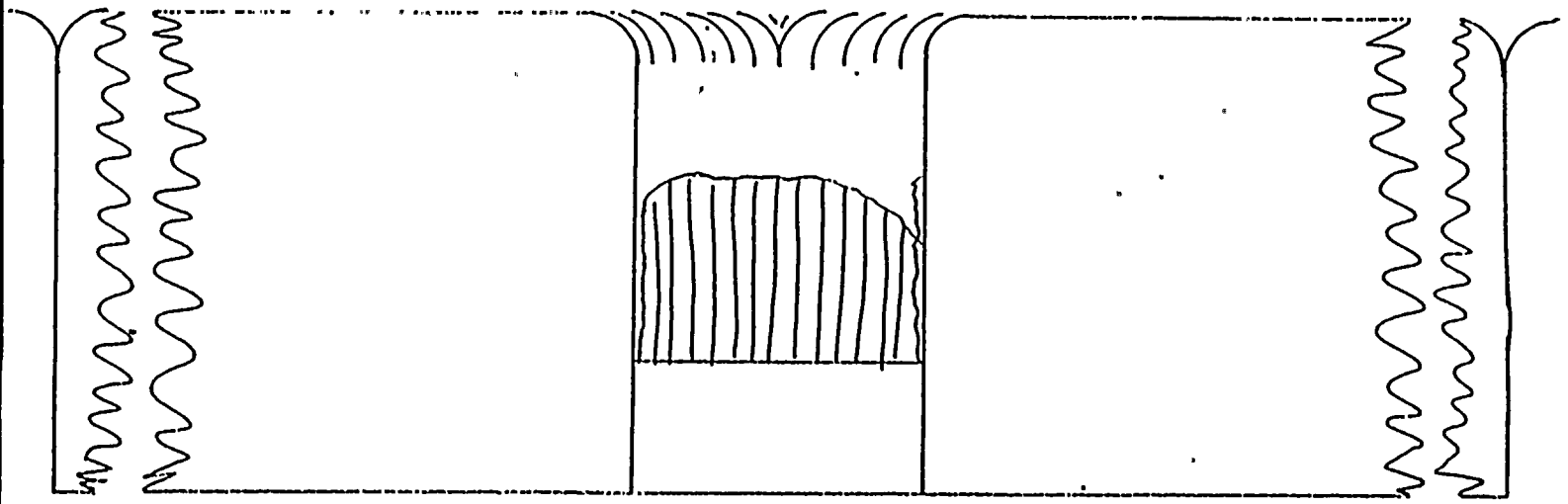


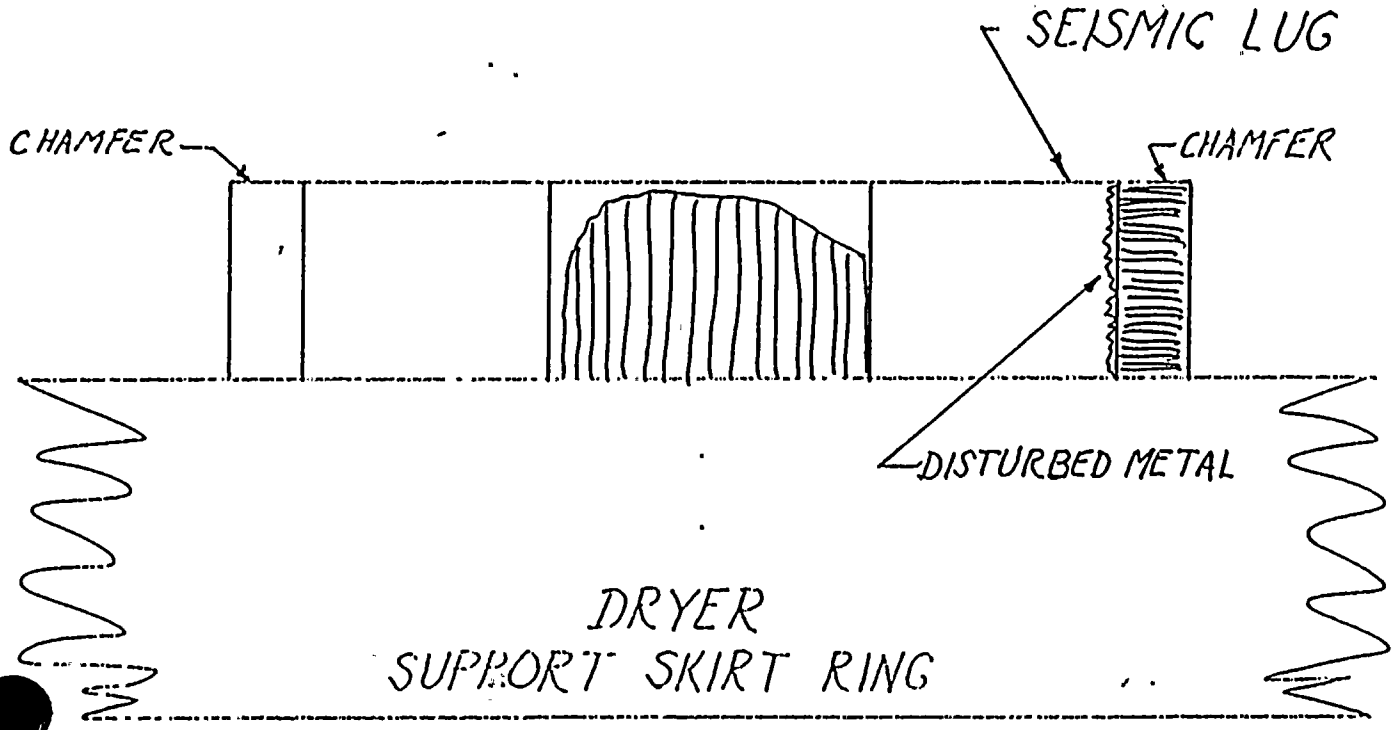
R.F. SHIMKUS 3/20/85

VESSEL WALL

4°

DRYER SUPPORT BRACKET





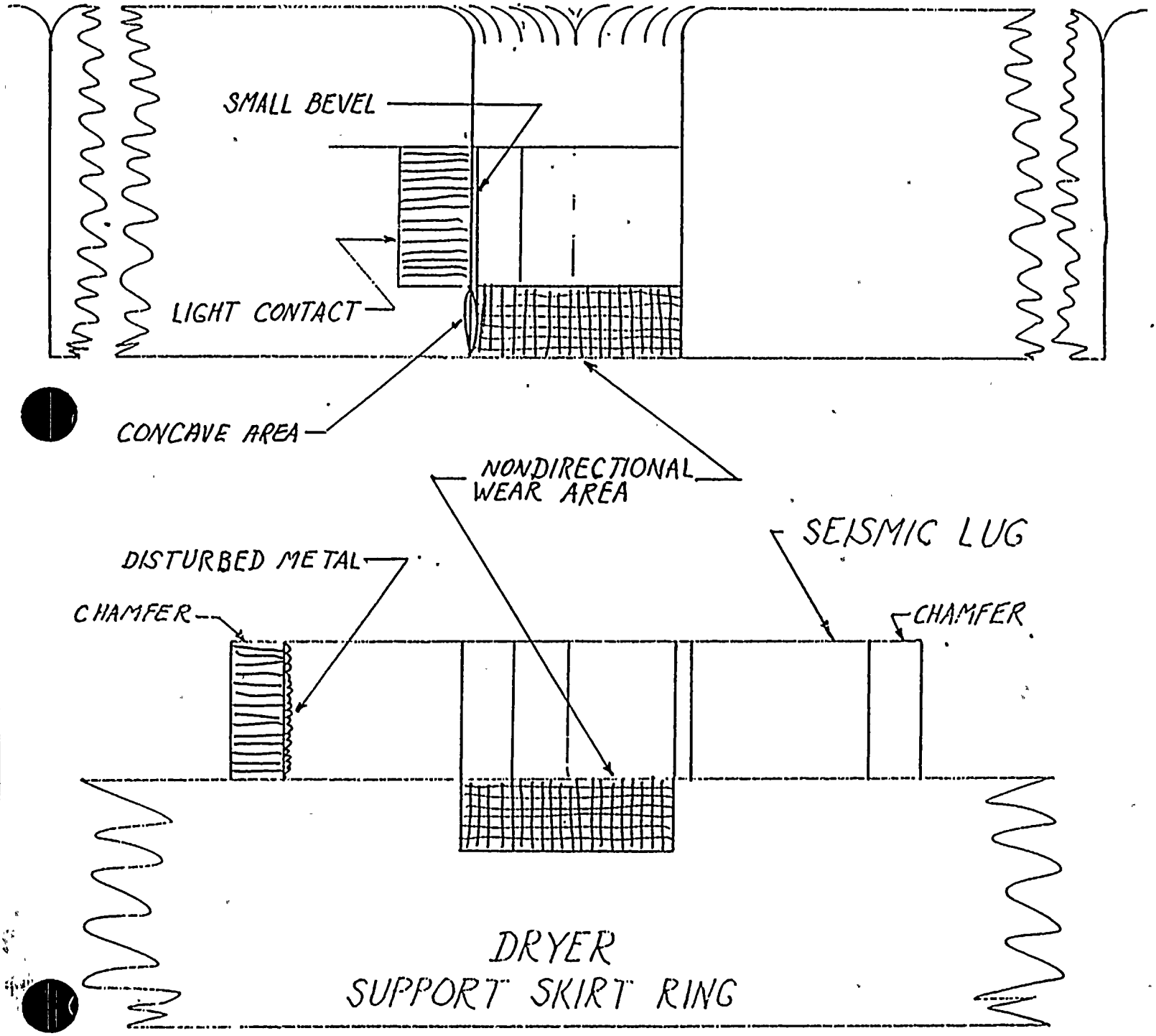
DRYER
SUPPORT SKIRT RING

R.P. SHIMKUS 3/20/85

VESSEL WALL

184°

DRYER SUPPORT BRACKET



R. P. SHIMKUS 3/20/85

VISUAL EXAMINATION OF REACTOR COMPONENTS

FINAL REPORT

ATTACHMENT 11
(SEE PAGE 6 OF 6)

Unit No. 1, Winter, 1985 Outage

Procedure No. NVTE-R Rev. 0

Component Inspected/Location: Steam Dryer, VT-1

Visual Aids: Westinghouse ETV-1250 Underwater TV camera.

DEFICIENCIES				
TYPE	YES	NO	N/A*	REMARKS
WELD FAILURES		X		
WELD CRACKS	X			SEE PG 3 & 1 OF ATTACHMENT
BROKEN PARTS		X		
LOOSE PARTS		X		
MISSING PARTS		X		
WORN PARTS		X		
SIGNS ON MOVEMENT		X		
SURFACE CRACKS	X			SEE ATTACHMENT
SURFACE PITTING	X			MINOR - ASSOCIATED WITH NORMALLY OBSERVED CONDITIONS

*Not Applicable.

VIDEO FILM CAT. NO.: ISI-02 THRU 33, 35 THRU 38, 40, 44, 45, 46, 49, 51, 52, 53

DEFICIENCY DETAILS OR COMMENTS:

NONE

SEE PARTIAL DATA REPORTS DATED 2/26/85, 3/7/85 & 3/8/85

Attachments ☒ Yes ☐ No

13 PAGES

Examiners/Level:

/ Date

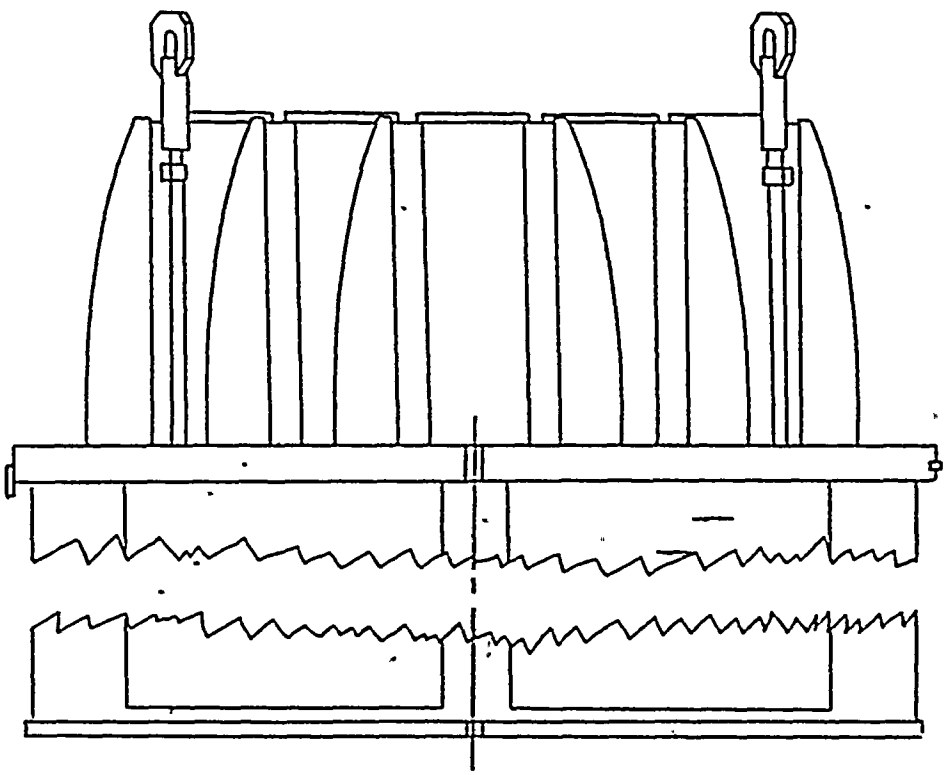
A.R. Shimpkins Level III 3/26/85 Date

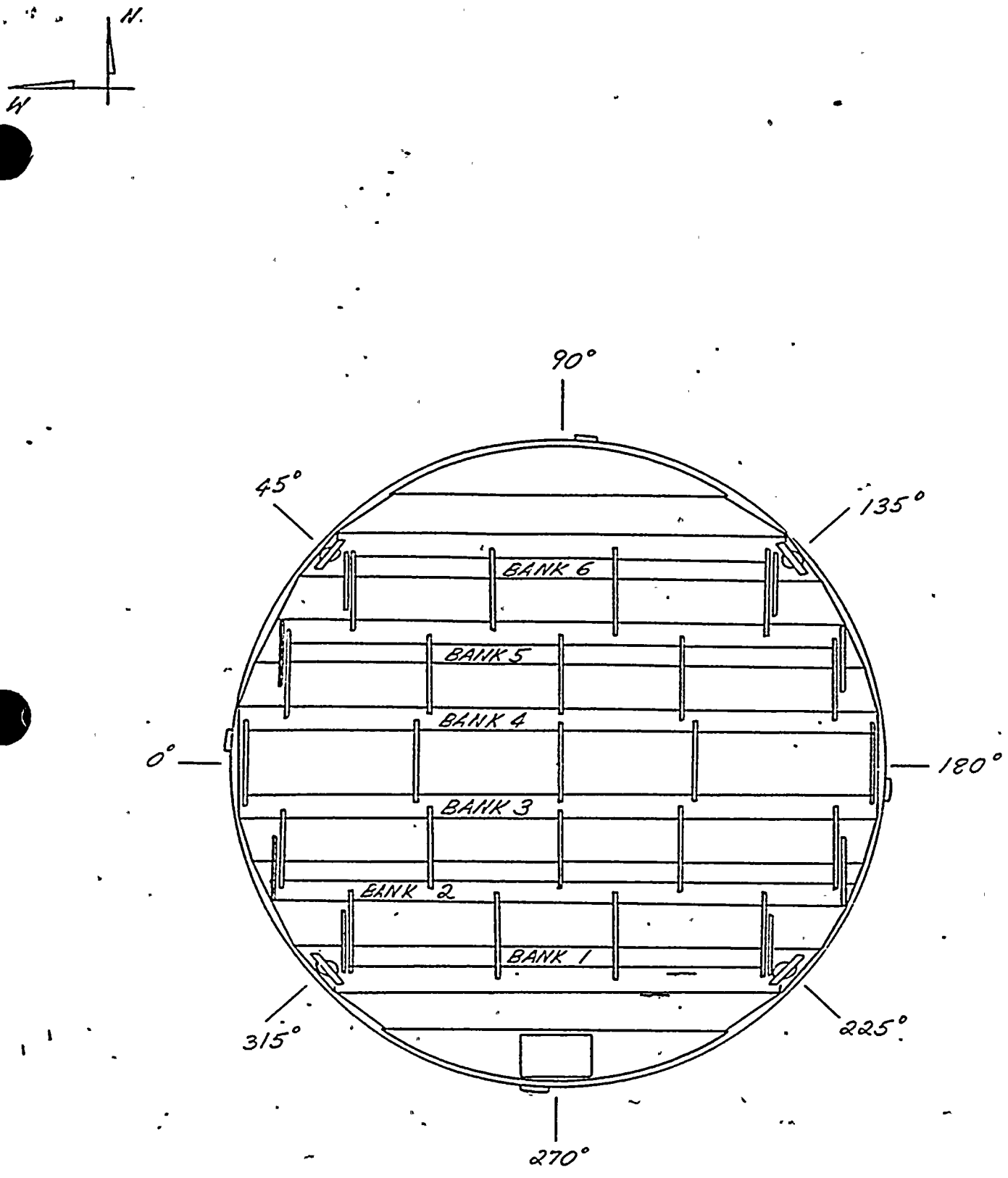
Review & Accepted by: / Date

Verified by: / Date
ASME ANII

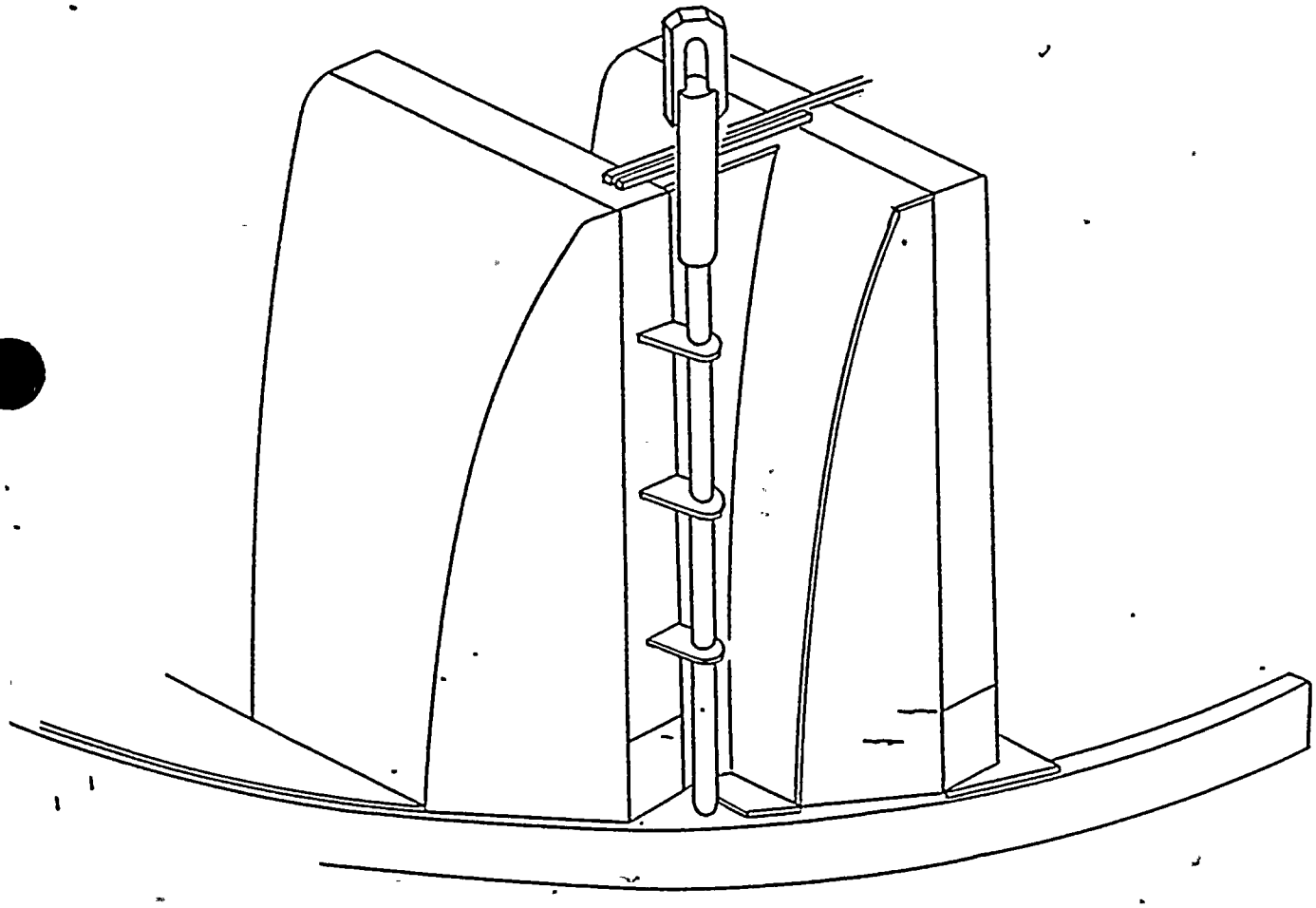
Form No.-NVIE-R-3

SUSQUEHANNA UNIT NO. 1
STEAM DRYER





SUSQUEHANNA UNIT NO. 1
STEAM DRYER



STEAM DRYER
SUSQUEHANNA UNIT NO. 1
225°

SUSQUEHANNA
UNIT NO. 1
STEAM DRYER

REACTOR COMPONENTS

INSERVICE INSPECTION

WINTER, 1985 OUTAGE
VIDEO FILM CAT. NO.: _____

REACTOR COMPONENT	RECORDABLES YES	RECORDABLES NO	COMMENTS
Inspect the Steam Dyer, VT-1, 100%.	X		SEE ATTACHMENT
Note that there are previously dis-			PAGES RF 1 THRU 13
covered indication and that repairs			
have been made. Refer to SES Work			
Authorization Package No. T33085.			
20 Jan 84.			
PREVIOUS INDICATIONS			
ON WA-T33085			
Location #13 - 225° lifting lug. All		X	
4 stabilizing straps removed. View			
removal areas.			
Location #7 - Vertical weld.		X	
Unresolved indications in center area.			
Location #5 - Vertical weld.		X	
Linear indication on 1/4" plate			
1/2" up from horizontal weld.			
Location #8 - Vertical weld.	—	X	
Linear indication above the hori-			
zontal weld 1/8" plate 1" over from			
the vertical weld.			

Form No.-NVIE-R-1

REACTOR COMPONENTS

INSERVICE INSPECTION

REACTOR COMPONENT	RECORDABLES YES	RECORDABLES NO	COMMENTS
Location #1 - Vertical weld	X		45°
Linear indication 60" in. length.			REPAIR WELD ON
Welding repairs were performed. 45°			VANE BANK SIDE.
			SEE ATTACHMENT
NORMAL INSPECTION			PAGES 1 THRU 13
Lifting lug assembly, including			
attachment welds and surfaces			
45° lifting lug - welds and surfaces		X	
135° lifting lug - welds and surfaces		X	
225° lifting lug - welds and surfaces		X	
315° lifting lug - welds and surfaces		X	
270° Manway		X	
Vane Bank #1 - Welds and surfaces		X	
Vane Bank #2 - Welds and surfaces		X	
Vane Bank #3 - Welds and surfaces	X		SEE PAGE 8 OF ATTACH. IND. (10)
Vane Bank #4 - Welds and surfaces	X		SEE PAGE 8 OF ATTACH. IND (14)
Vane Bank #5 - Welds and surfaces		X	
Vane Bank #6 - Welds and surfaces	X		SEE PAGE 1 OF ATTACH. IND (8) & (9)

Form No.-NVIE-R-1

REACTOR COMPONENTS INSERVICE INSPECTION

REACTOR COMPONENT	RECORDABLES YES	RECORDABLES NO	COMMENTS SEE LIST OF INDICATIONS
Upper support ring - Note that there	X		PAGES 1 THRU 13
may be 3 linear indications at 320°.			OF ATTACHMENT.
Dryer Skirt - welds and surfaces		X	
Lower Support Ring		X	
Upper Tie Bars - Attachment welds.		X	
4° Support Lug		X	
94° Support Lug		X	
184° Support Lug		X	
274° Support Lug		X	
Comments Below			
INDICATIONS LISTED ON PAGES 1 THRU 13 OF ATTACHMENT			
HAVE BEEN RESOLVED AS CRACKS.			
		—	

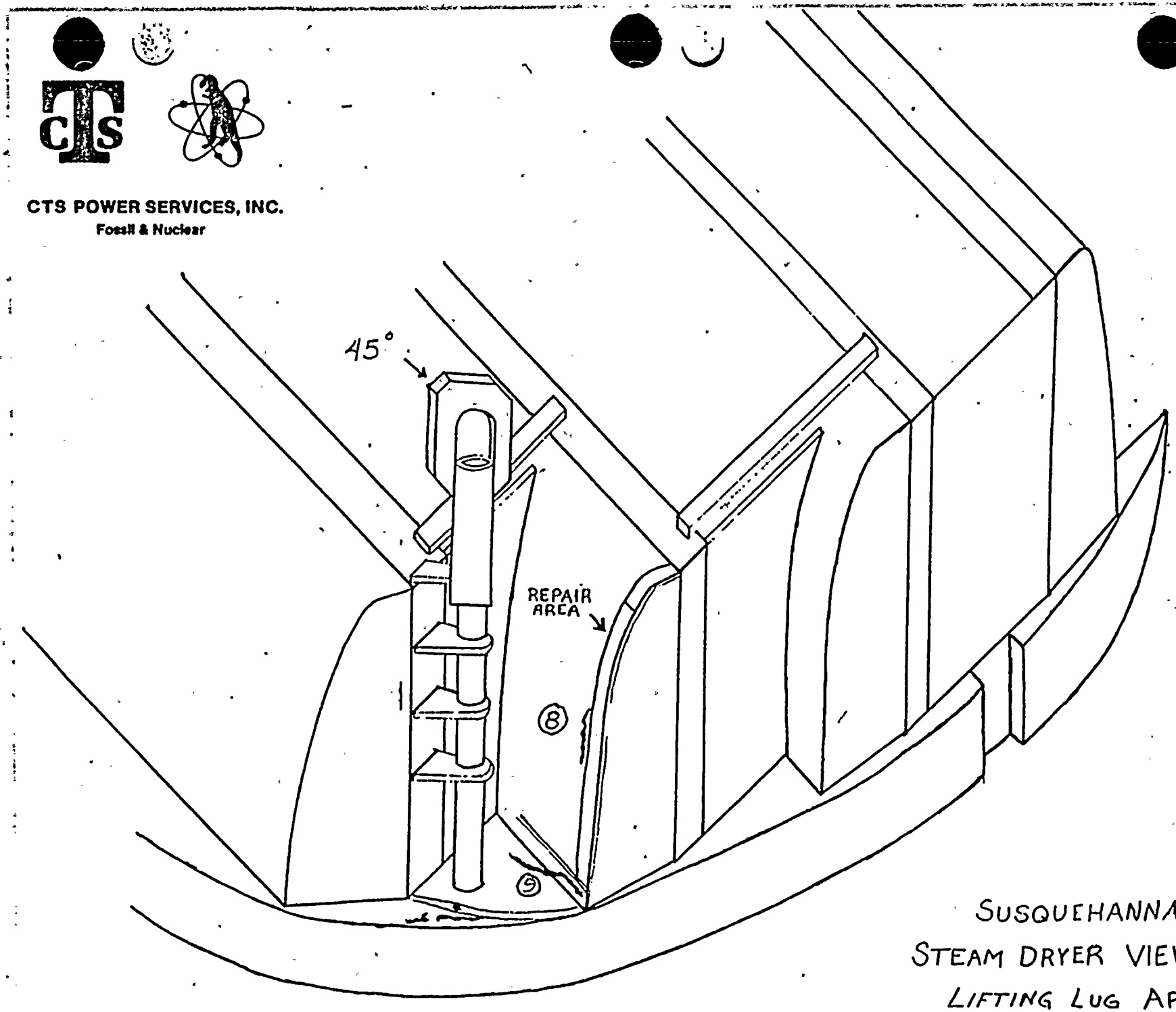
Examiners/Level: R P Shimkus Level III Date: 3/26/85

Reviewed & Accepted by: _____ / Date

Verified by: _____ / Date
ASME ANII

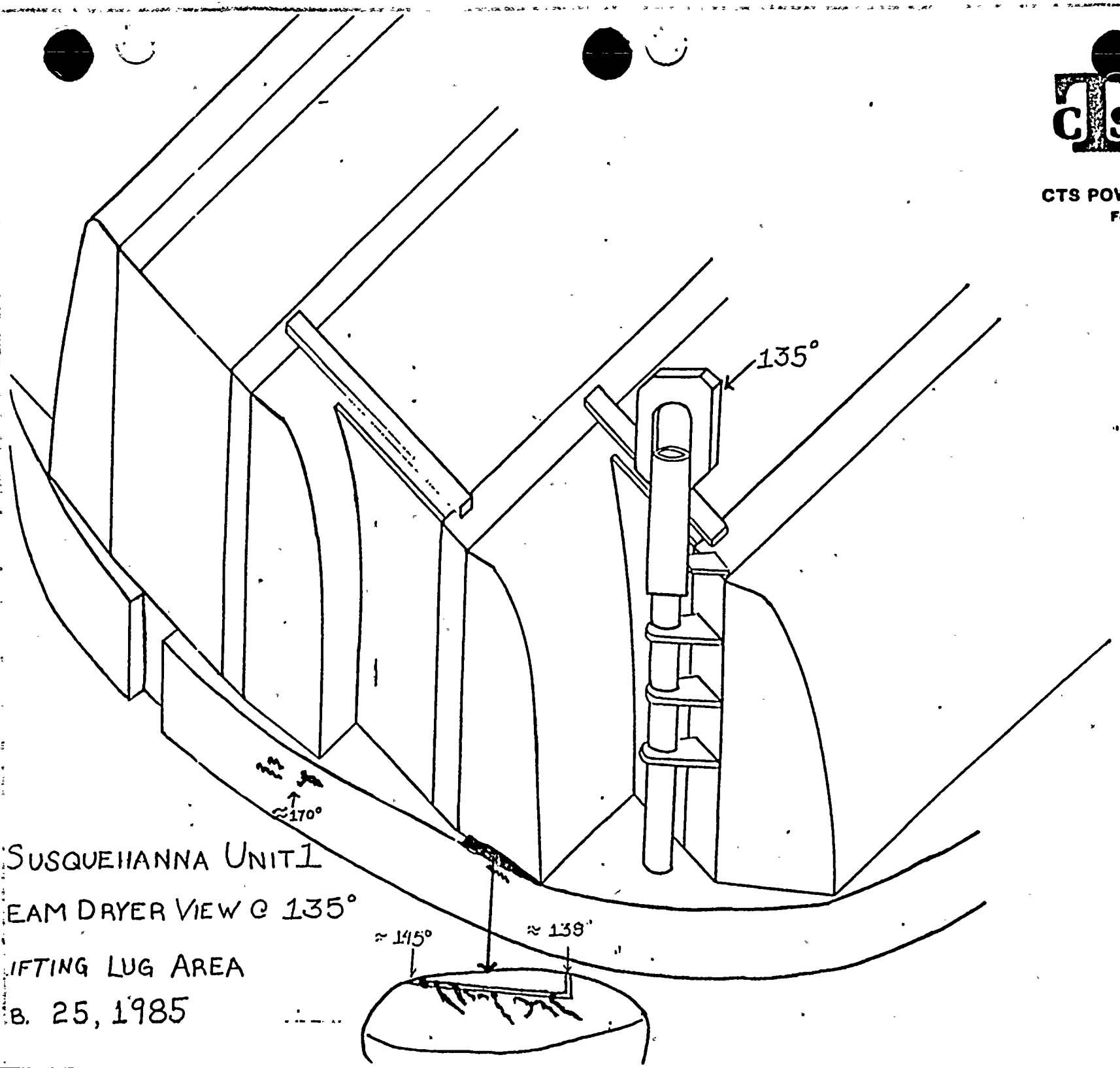
Form No.-NVIE-R-2

CTS POWER SERVICES, INC.
Fossil & Nuclear



SUSQUEHANNA UNIT 1
STEAM DRYER VIEW @ 45°
LIFTING LUG AREA
FEB. 25, 1985

CTS POWER SERVICES, INC
Fossil & Nuclear

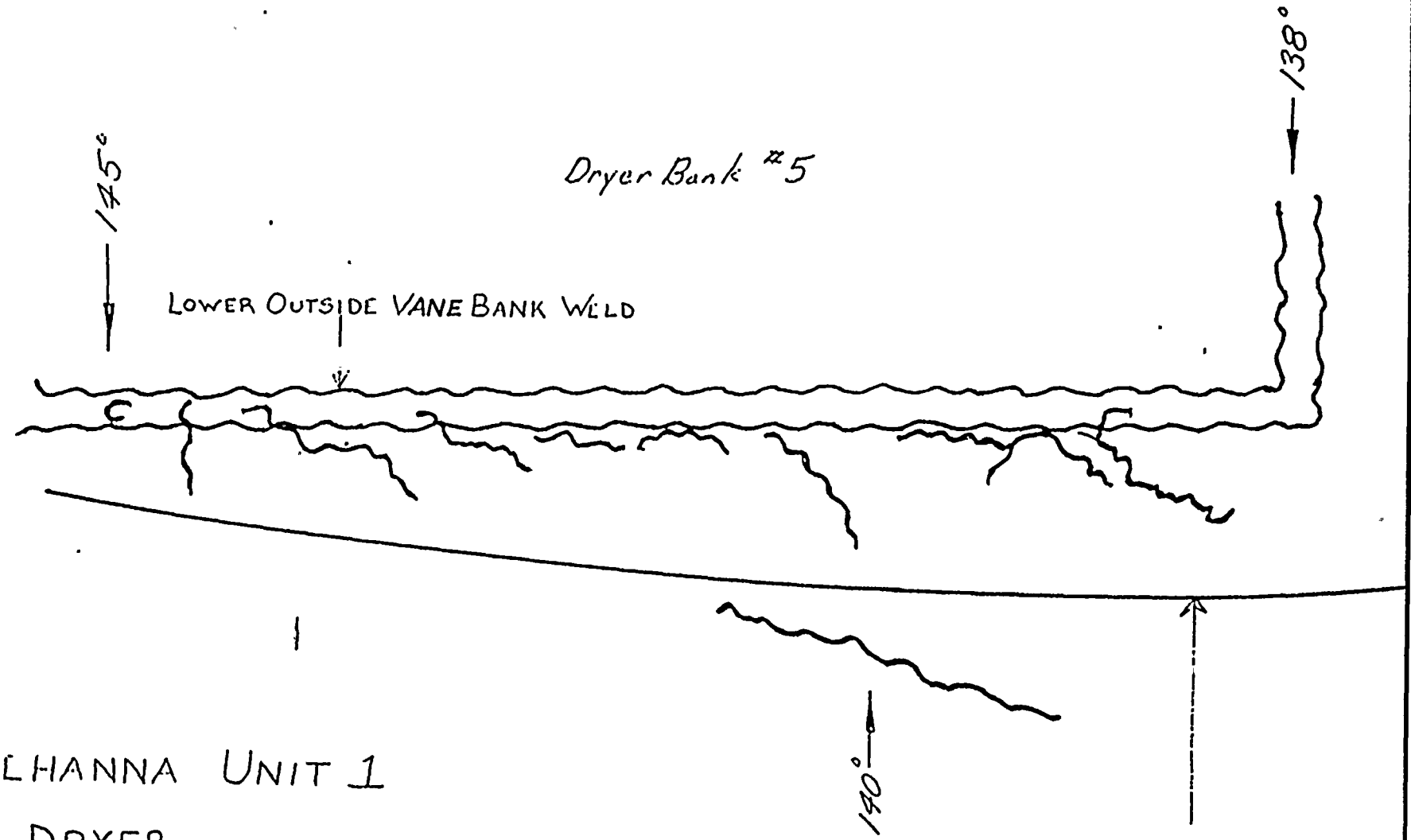


SUSQUEHANNA UNIT 1

EAM DRYER VIEW @ 135°

IFTING LUG AREA

B. 25, 1985

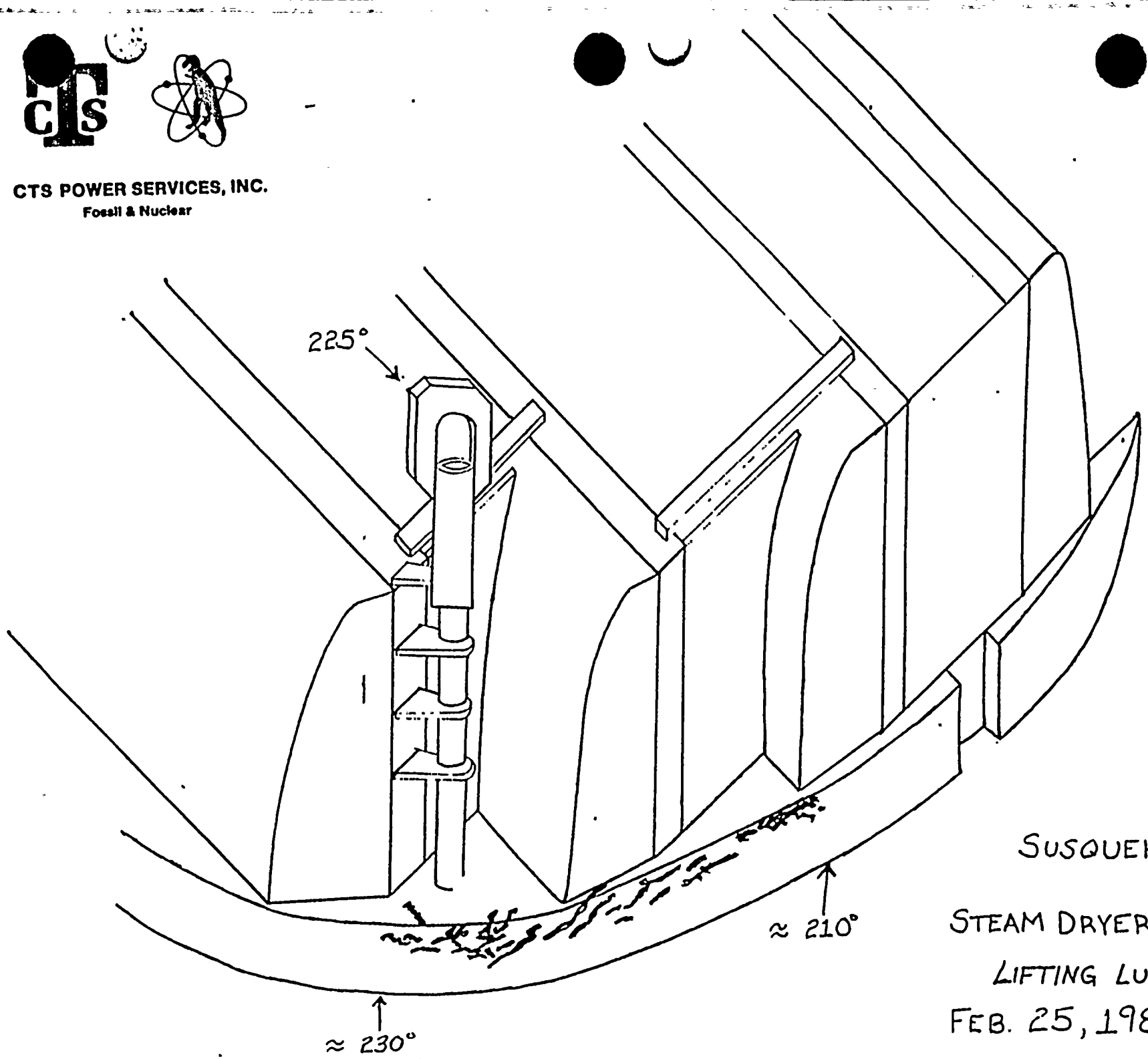


SUSQUEHANNA UNIT 1

STEAM DRYER

FEB. 25, 1985

CTS POWER SERVICES, INC.
Fossil & Nuclear



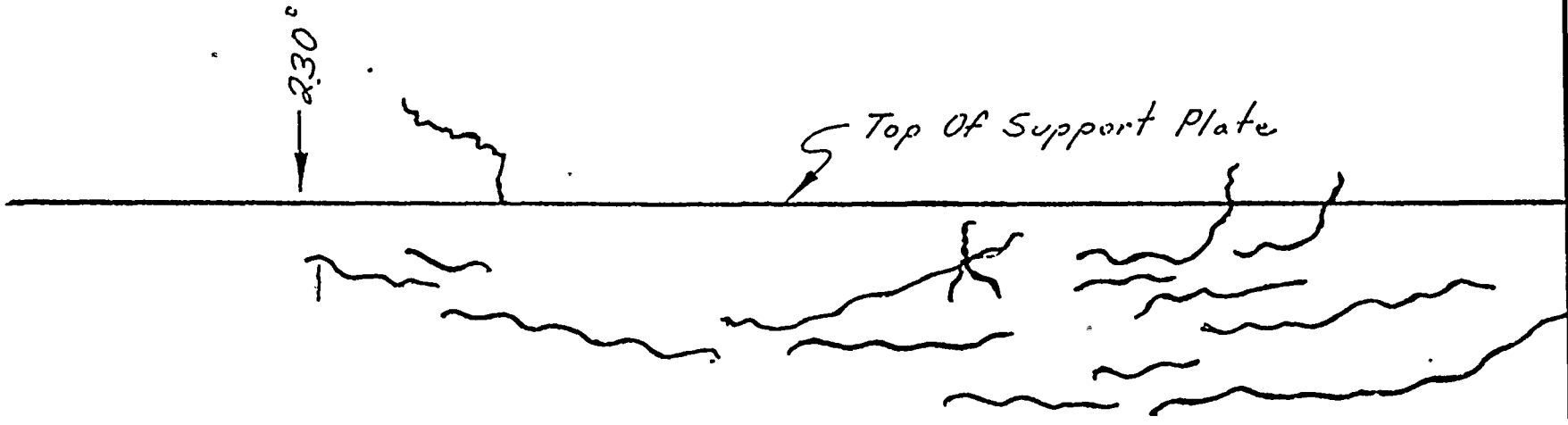
SUSQUEHANNA UNI

STEAM DRYER VIEW@2

LIFTING LUG AREA

FEB. 25, 1985

A



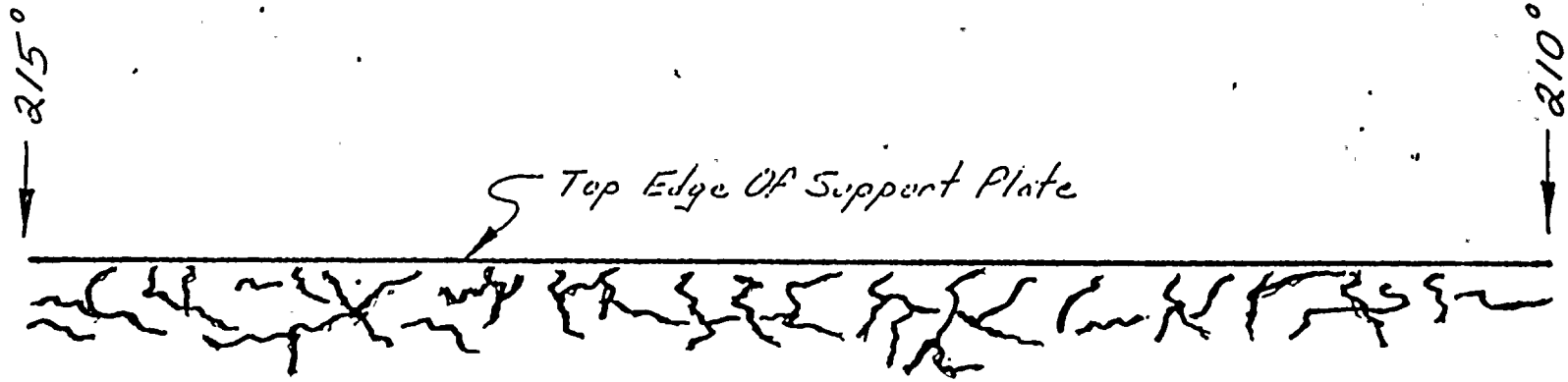
SUSQUEHANNA UNIT 1

STEAM DRYER

FEB. 25, 1985

B


A
217°
Side Of Support Plate
B



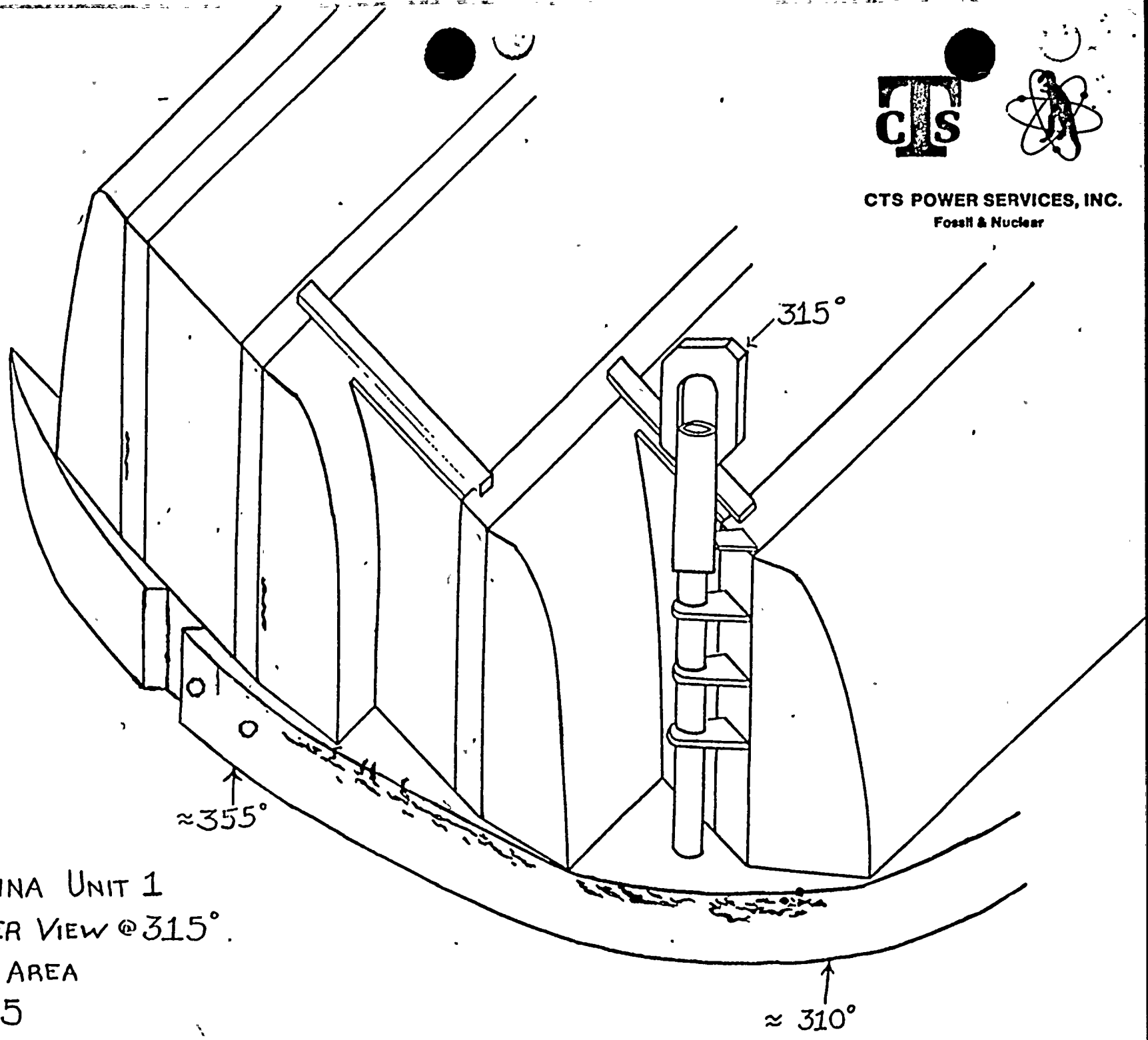
Side Of Support Plate

SUSQUEHANNA UNIT 1

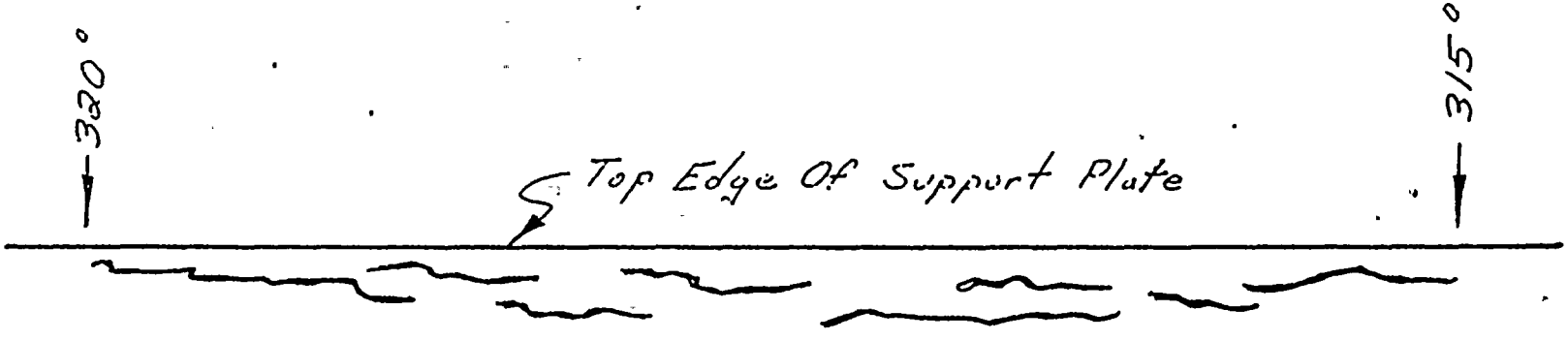
STEAM DRYER

FEB. 25, 1985

CTS POWER SERVICES, INC.
Fossil & Nuclear



USQUEHANNA UNIT 1
TEAM DRYER VIEW @315°.
IFTING LUG AREA
:B. 25, 1985

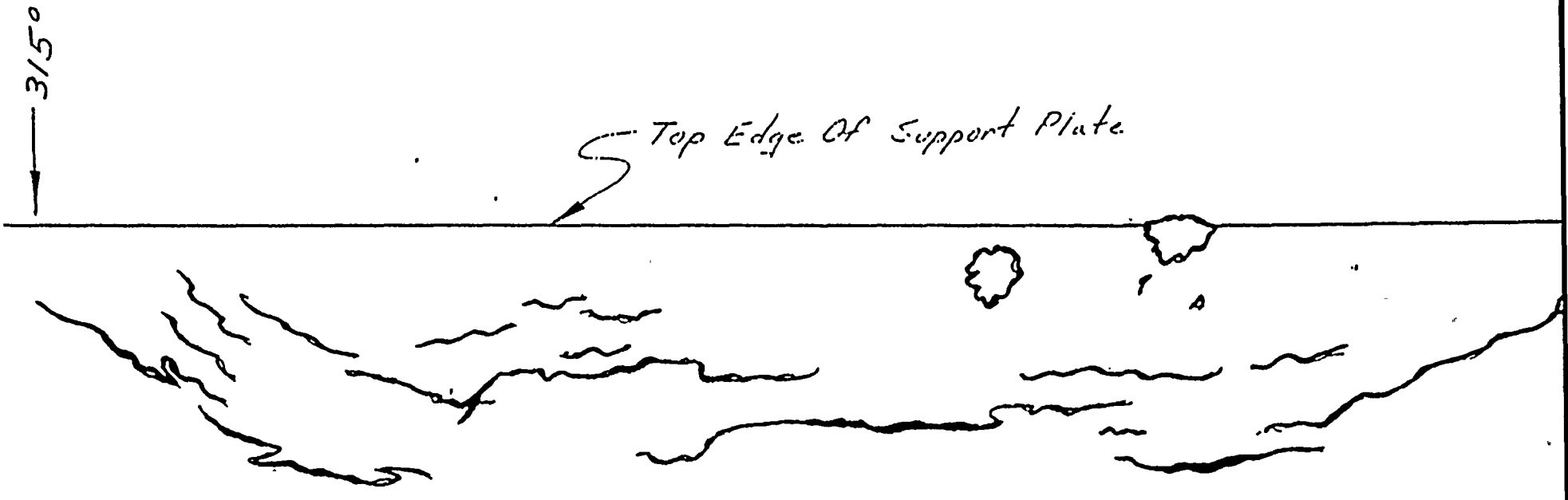


Side Of Support Plate

SUSQUEHANNA . UNIT 1

STEAM DRYER

FEB. 25, 1985

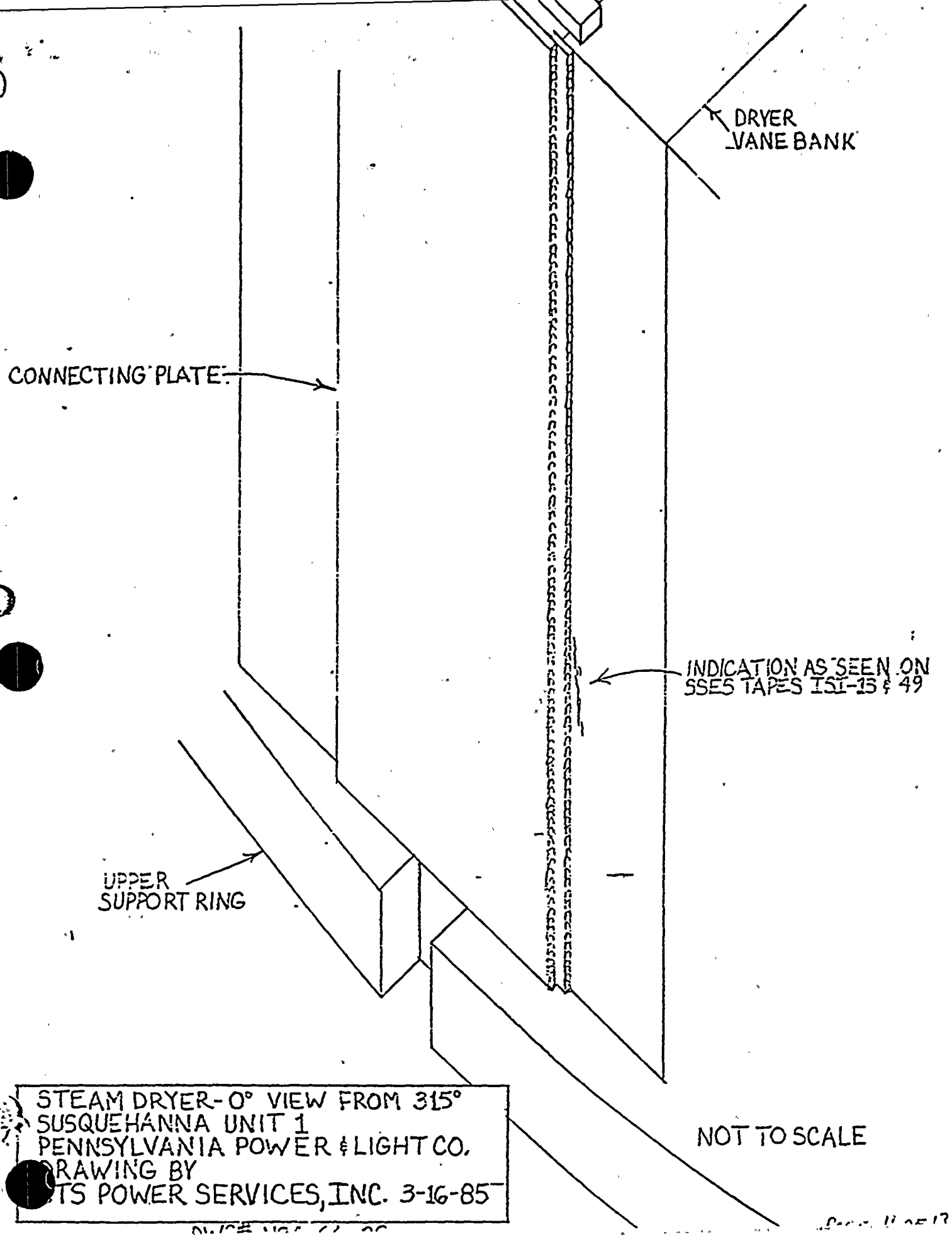


No. INDICATIONS ON TOP SURFACE

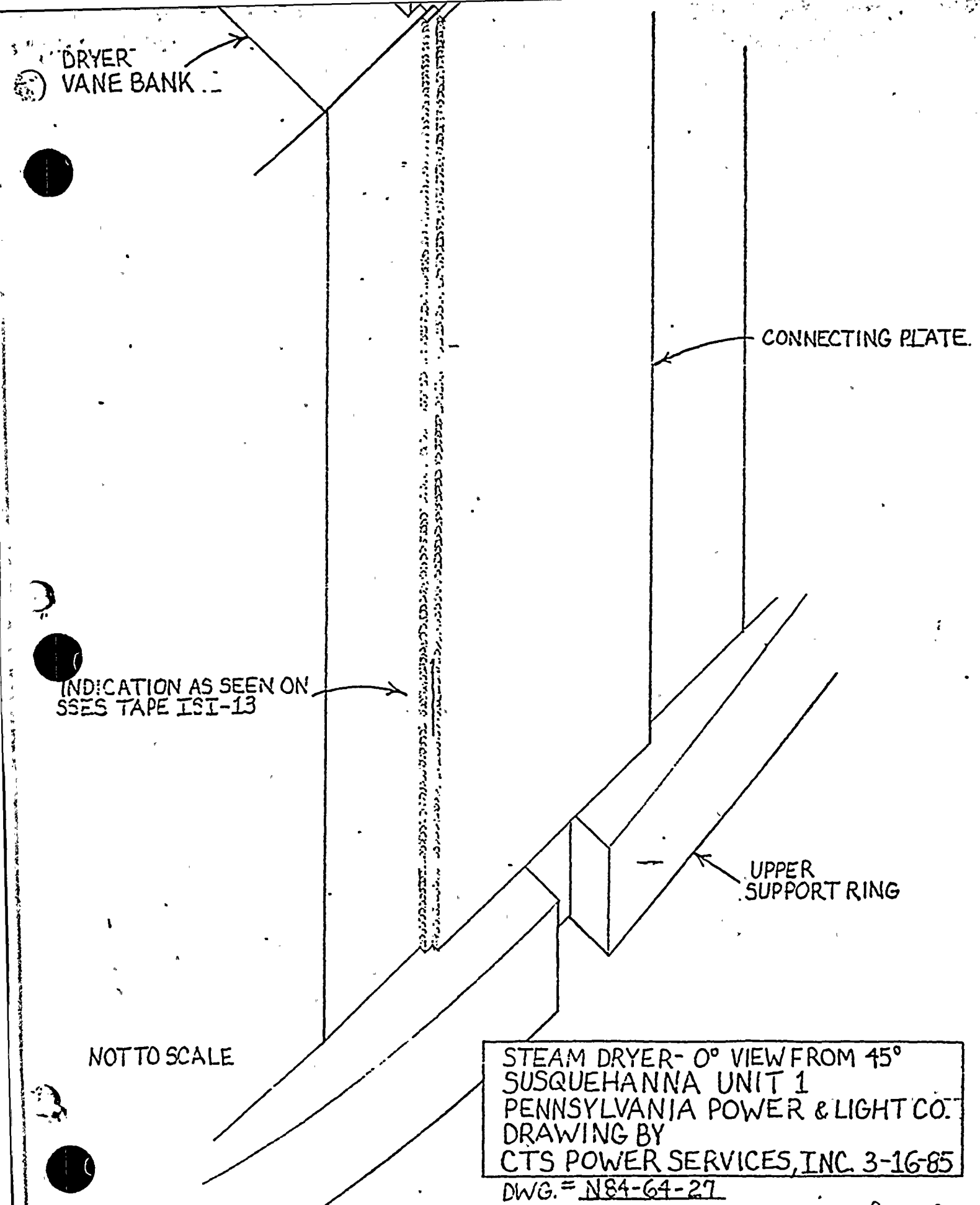
SUSQUEHANNA UNIT 1

STEAM DRYER

FEB. 25, 1985



STEAM DRYER-0° VIEW FROM 315°
SUSQUEHANNA UNIT 1
PENNSYLVANIA POWER & LIGHT CO.
DRAWING BY
NTS POWER SERVICES, INC. 3-16-85



STEAM DRYER- 0° VIEW FROM 45°
SUSQUEHANNA UNIT 1
PENNSYLVANIA POWER & LIGHT CO.
DRAWING BY
CTS POWER SERVICES, INC. 3-16-85
DWG. = N84-64-27

LIST OF INDICATIONS

(1) 310° To 315° Side Of Support Ring Plate (Multiple)

(2) 210° To 215° Side Of Support Ring Plate (Multiple)

(3) 315° To 320° Side Of Support Ring Plate (Multiple)

(4) 217° To 230° Side Of Support Ring Plate (Multiple)

(5) 140° Side Of Support Ring Plate (Singular)

(6) 217° To 230° Upper Surface Of Support Ring Plate (Multiple)

(7) 145° To 138° Upper Surface Of Support Ring Plate (Multiple)

(8) 45° Repair Patch Plate. Center Of Weld. Left Side Of Patch. Half Way Up The Vertical Weld. (Singular)

(9) 45° Repair Patch Plate. Bottom Of Patch. Heat Affected Zone. (Singular) 3" ≈

(10) 358° Vertical Weld On Bank #2. (Singular 12" ≈)

(11) 170° Side Of Support Ring Plate (Multiple)

(12) 330°-355° Side & Top Surface Of The Support Ring (Multiple)

(13) INDICATIONS ON 6 TIE ROD WASHERS

(14) 5° VERTICAL WELD ON BANK #4 (SINGULAR)

ATTACHMENT 12

LIQUID PENETRANT EXAMINATION REPORT
(Color Contrast - Solvent Removable)

INFORMATION ONLY

Report # T4-PTX07 Rev 0 4-19-85

Date: 4-19-85

Project: RPV Component Repair Project # 8864

Procedure # SES-18.0 REV. 0

Description of Item: STEAM DRYER SUPPORT BRACKETS AT 94° AND 274°

Examination Results:

Item Identification (e.g. weld identification, component, base material, part #)	Accept	Reject	Remarks
DRYER SUPPORT BRACKET	X		NO RECORDABLE
94° AND 274°			INDICATIONS

Sketch Attached: yes (no)

Component Temperature (yes) no between 60° - 125°F

Examiner: David J. Smith, Reza Dinae, Michael Bordley Level: II Date: 4-19-85

Reveiwed by: J. E. Xtelp 4/19/85 Level: N/A Accept ✓ Reject ____

GENERAL ELECTRIC