Exelon Generation®

4300 Winfield Road
Warrenville, IL 60555
630 657 2000 Office

RS-21-042 10 CFR 50.55a

March 26, 2021

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

LaSalle County Station, Unit 2
Renewed Facility Operating License No. NPF-18
NRC Docket No. 50-374

Subject: Relief Request I4R-12 Relief from Code Examinations for 2B33-F060A and 2B33-F060B Repairs, Revision 2

References:

1. Letter from D. Murray (Exelon Generation Company, LLC) to U.S. NRC (Nuclear Regulatory Commission), "Relief Request I4R-12 Relief from Code Surface Examinations for 2B33-F060B Valve Repair," dated March 7, 2021 (ML21067A000).

2. Email from B. Vaidya (U.S NRC) to J. Taken (EGC), "LASALLE UNITS 1 AND 2 – REQUEST FOR ADDITIONAL INFORMATION (RAI) RE: Relief Request I4R-12 Relief from Code Surface Examinations for 2B33-F060B Valve Repair, (EPID-L-2021-LLR-0016)," dated March 9, 2021.

3. Letter from D. Murray (Exelon Generation Company, LLC) to U.S. NRC (Nuclear Regulatory Commission), "Relief Request I4R-12 Relief from Code Surface Examinations for 2B33-F060B Valve Repair," dated March 9, 2021 (ML21068A442).

4. Email from B. Vaidya (U.S. NRC) to J.Taken (EGC), "LaSalle Unit 2 - Verbal Authorization of LaSalle Unit 2 Relief Request I4R-12, Revision 1 re: Valve Repairs on Valves 2B33-F060A and 2B33-F060B," dated March 15, 2021.

In Reference 1, Exelon Generation Company, LLC (EGC) requested NRC approval of a relief request associated with the fourth Inservice Inspection (ISI) interval for LaSalle County Station (LSCS), Unit 2 in accordance with 10 CFR 50.55a, "Codes and standards," paragraph (z)(2). Specifically, the referenced letter requested authorization of alternative examination requirements for the repair of Unit 2 Reactor Recirculation flow control valve 2B33-F060B, currently in progress, in accordance with American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section XI, paragraph IWA-4000.

The fourth interval of the LSCS Unit 2 ISI Program is based on the ASME Code, Section XI, 2007 Edition through 2008 Addenda. The fourth ISI interval at LSCS began on October 1, 2017 and is currently scheduled to end September 30, 2027.

In Reference 2, the NRC requested additional information needed to complete its review of Reference 1. A clarification call was held between NRC and EGC on March 9, 2021 to ensure a common understanding of the questions.

In Reference 3, EGC responded to the request for additional information and supplemented the information in Reference 1.

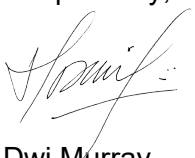
Reference 4 documents the verbal authorization of relief request I4R-12, Revision 1, which took place via teleconference on March 11, 2021.

EGC has determined that, due to delays encountered during current repairs of 2B33-F060A and 2B33-F060B valves, an alternate design approach will be pursued. This alternate design approach changes some of the information provided to the NRC in Reference 3, and therefore, EGC is submitting this supplemental information for relief request I4R-12 in Attachments 1 and 2 of this letter. Changes to Revision 1 of relief request I4R-12 are noted by revision bars on Attachment 1.

EGC requests authorization of the proposed relief request for both 2B33-F060A and 2B33-F060B by March 29, 2021.

There are no regulatory commitments contained within this letter. Should you have any questions concerning this letter, please contact Mr. Jason Taken at (630) 657-3660.

Respectfully,



Dwi Murray
Sr. Manager – Licensing
Exelon Generation Company, LLC

Attachments:
1. Relief Request I4R-12 Associated with Alternative Examination Requirements for Repairs of Reactor Recirculation Flow Control Valves, Revision 2
2. Associated Figures

cc: NRC Regional Administrator, Region III
NRC Senior Resident Inspector – LaSalle County Station
NRC Project Manager, NRR – LaSalle County Station
Illinois Emergency Management Agency – Division of Nuclear Safety

ATTACHMENT 1

Relief Request I4R-12 Associated with Alternative Examination Requirements for Repair of Reactor Recirculation Flow Control Valves 2B33-F060A and 2B33-F060B, Revision 2

ATTACHMENT 1

10 CFR 50.55a Relief Request I4R-12, Revision 2
Alternative Examination Requirements for Repair of Reactor Recirculation Flow Control Valves in Accordance with 10 CFR 50.55a(z)(2)
--Hardship or Unusual Difficulty Without Compensating Increase in Level of Quality or Safety--

1. ASME Code Component(s) Affected

LaSalle County Station (LSCS), Unit 2 valve 2B33-F060A ("A" Reactor Recirculation System Flow Control Valve).

LaSalle County Station (LSCS), Unit 2 valve 2B33-F060B ("B" Reactor Recirculation System Flow Control Valve).

2B33-F060A and 2B33-F060B valves are ASME Section XI, Class 1 (Section III 1971 Edition, Summer 1972 Addenda) components, and the valve bodies are ASME SA-351 Grade CF8M material.

The design temperature of the valves is 575°F and the design pressure of the valves is 1675 psig. The design pressure of the attached system is 1650 psig. The maximum valve operating temperature is 550°F with a maximum operating pressure of 1260 psig.

2. Applicable Code Edition and Addenda

The Code of Construction is ASME Section III 1971 Edition, Summer 1972 Addenda.

For LaSalle County Station Unit 2, the Inservice Inspection Code of Record and Interval Dates are:

Interval	Section XI Edition/Addenda	Interval Start Date	Interval End Date
Fourth	2007 Edition, through 2008 Addenda	October 1, 2017	September 30, 2027

3. Applicable Code Requirement

ASME Section XI IWA-4411, "Welding, Brazing, Fabrication, and Installation," states in part:

> Welding brazing, fabrication, and installation shall be performed in accordance with the Owner's Requirements…and in accordance with the Construction Code of the item.

ASME Section III NB-2570, "Examination and Repair of Statically and Centrifugally Cast Products," contains NB-2571, "Required Examinations," which states in part:

> Cast pressure-retaining materials shall be examined by radiographic methods, except cast ferritic steels shall be examined by either radiographic or ultrasonic methods or a combination of both methods…In addition, all cast products shall be examined on all external surfaces and all accessible internal surfaces by either magnetic particle or liquid penetrant methods. Machined surfaces, except threaded surfaces, of a cast

> product shall be examined by either liquid penetrant of magnetic particle methods after machining.

ASME Section III NB-2573, "Radiographic Examination," contains NB-2573.1, "Extent, Methods, and Acceptance Standards," which provides the requirements and associated references for conducting radiographic examination.

ASME Section III NB-2578, "Elimination of Defects," states:

> Elimination of defects shall be in accordance with NB-2538.

ASME Section III NB-2579, "Repair by Welding," states in part:

> Repair by welding shall be in accordance with NB-2539.

ASME Section III NB-2538, "Elimination of Surface Defects," subparagraph (a)(3) states in part:

> After defect elimination, the area is reexamined by…the liquid penetrant method in accordance with NB-2546 to assure that the defect has been removed or the indication reduced to an acceptable size.

ASME Section III NB-2539, "Repair by Welding," contains NB-2539.4, "Examination of Repair Welds," which states in part:

> Each repair weld shall be examined by…the liquid penetrant method in accordance with the requirements of NB-2546. In addition, repair cavities, the depth of which exceeds the lesser of 3/8 in. or 10 percent of the section thickness, shall be radiographed after repair in accordance with NB-5110 and to the acceptance standards of NB-5320.

ASME Section III NB-2546, "Liquid Penetrant Examination," provides the requirements for conducting liquid penetrant examinations along with the Acceptance Standards.

ASME Section III NB-5110, "Procedures, Qualifications and Evaluation," and ASME Section III NB-5320, "Radiographic Acceptance Standards," provide the general requirements and associated acceptance standards for radiographic examination, respectively.

ASME Section III NB-5300, "Acceptance Standards," contains NB-5310, “General Requirements” which states in part:

> Unacceptable weld defects shall be removed or reduced to an acceptable limit and when required the weld shall be repaired and re-examined, in accordance with NB-4400.

ASME Section III NB-4440, "Examination of Welds," which states in part:

All welds shall be examined in accordance with the requirements of NB-5000.

ASME Section III NB-4450, "Repair of Weld Metal Defects," provides the requirements for addressing weld metal defects.

ASME Section III NB-4452, "Elimination of Surface Defects," which states in part:

> The area is examined after blending by … meeting the requirements of … IX-3600 (Mandatory Appendix IX-3600: Liquid Penetrant Examination) … to ensure that the defect has been removed or the indication reduced to an acceptable limit.

ASME Section III NB-4453, "Requirements for Making Repairs of Welds," provides the requirements for making repairs of welds.

ASME Section III NB-4453.1, "Defect Removal," which states in part:

> Unacceptable defects detected visually by the examination or test required by NB-5100 … shall be removed by mechanical means … . The area prepared for repair shall be examined and comply with the requirements of … NB-5350.

ASME Section III NB-4453.4, "Examination of Repair Welds," which states in part:

> The examination of weld repairs shall be repeated as required for the original weld except that repair of defects originally detected by…liquid penetrant method, when the repair cavities do not exceed the lesser of 3/8 in. or 10% of the thickness, need only to be re-examined by…liquid penetrant method.

ASME Section III NB-5245, "Partial-Penetration Welds," states in part:

> Partial-penetration welds…shall be examined progressively at the lesser of one-half the thickness of the weld joint or each ½ inch of thickness by the…liquid penetrant method.

ASME Section III NB-5300, "Acceptance Standards," contains NB-5310, "General Requirements," which states in part:

> Unacceptable weld defects shall be removed or reduced to an acceptable limit and when required the weld shall be repaired and re-examined, in accordance with NB-4400.

ASME Section III NB-5250, "Fillet and Socket Welds" states in part:

> Fillet and socket welds shall be examined … by liquid penetrant method.

ASME Section III NB-5260, "Structural Attachments," states in part:

> Structural attachment welds made to pressure-retaining materials shall be examined by … liquid penetrant method.

ASME Section III NB-5350, "Liquid Penetrant Acceptance Standards," provides the requirements for conducting liquid penetrant examinations along with the Acceptance Standards.

ASME Section III NB-5352, "Acceptance Standards," provides the liquid penetrant acceptance criteria for NB-5245, NB-5250, and NB-5260 and states:

> Unless otherwise specified in this Section of the Code, the following relevant indications are unacceptable:
> a) Any cracks or linear indications;
> b) Rounded indications with dimensions greater than 3/16 inch;
> c) Four or more rounded indications in a line separated by 1/16 inch or less edge to edge;
> d) Ten or more rounded indications in any 6 square inches of surface with the major dimensions of this area not to exceed 6 inches with the area taken in the most unfavorable location relative to the indications being evaluated.

4. Reason for Request

In accordance with 10 CFR 50.55a(z)(2), relief is requested on the basis that compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Background

In an effort to identify the source of the debris found in LSCS Unit 2 Reactor Pressure Vessel Jet Pumps during the previous refueling outage (L2R17) in February 2019, detailed inspections of the Reactor Recirculation (RR) system flow control valves were scheduled and performed during the current refueling outage (L2R18) in February 2021. Upon disassembly of the 2B33-F060A and 2B33-F060B valves, damage to each valve's internals and lower body was discovered. In order to restore the valves to an acceptable condition to allow the valve internals to fit into the valve body, activities in accordance with ASME Section III and ASME Section XI requirements will be employed.

Valve Details

The original drawings of the 2B33-F060A and 2B33-F060B valves are provided in Attachment 2. Figures I4R-12-1 and I4R-12-3 are the drawings of the entire valve assembly, including the actuator for 2B33-F060B and 2B33-F060A, respectively. Figure I4R-12-2 is a close-up drawing of the area of the 2B33-F060B valve body in question. Figure I4R-12-2 is highlighted in orange for the lower plug guide, blue for the plug guide

anti-rotation segment, and yellow as the estimated area of wear in the valve body where material is missing due to the lower plug guide impact on the valve body. Figure I4R-12-4 is a close-up drawing of the area of the 2B33-F060A valve body in question. Figure I4R-12-4 is highlighted in yellow as the estimated area of wear in the valve body where material is missing due to the lower plug guide impact on the valve body.

The drawings of the valves do not provide thickness dimensions of the valve bodies. At this point in the refueling outage, LSCS has been unsuccessful in obtaining direct thickness measurements of the valve body for 2B33-F060A and 2B33-F060B in their current conditions. Valve body thickness measurements were taken and documented in a 1976 report by the valve manufacturer after the valves were cast. Ultrasonic (UT) measurements were taken in several locations in the pocket area at the bottom of the valve close to where the work is being performed. The average of the thickness readings from this report for 2B33-F060A is 3.45 inches and for 2B33-F060B is 3.7 inches. This value is taken as the nominal sectional thickness of the valve body in this area. This same report documents the valve specified minimum sectional thickness for both valves as 2.418 inches.

LSCS has been unable to explicitly quantify or measure the material lost in 2B33-F060A and 2B33-F060B. This is due to the limited space of a person getting into the valve body and the radiological dose exposure internal to the valve body. Measurements have been obtained for the 2B33-F060B through contour gauge readings. This was done by taking a reading in an area where there was limited material loss and comparing it to another reading in a corresponding area where there was wall loss. Comparison of those readings shows the point where the most wall loss occurred for 2B33-F060B measures approximately 0.75 inches of material. These readings are compared to the nominal wall thickness to assess if the wall thickness had decreased below the minimum required wall thickness, and therefore into the required pressure boundary design area. The material loss on 2B33-F060A was visually determined to be less than the material loss on 2B33-F060B. Based on this approach, LSCS determined that the operational wear on the valve body did not result in wall thickness decreasing below the minimum wall thickness value.

However, during the maintenance activities to restore the valves to an acceptable condition, measurements determined that the maintenance performed on the valve body for surface conditioning encroached into minimum wall thickness of the valve. For 2B33-F060A, LSCS determined the surface conditioning extended approximately 0.135 inches below minimum wall thickness. For 2B33-F060B, LSCS determined that the surface conditioning extended approximately 0.095 inches below minimum wall thickness. These values below minimum wall thickness are not representative of the general condition throughout the valve body but are localized in one area of the lower valve body. As a result, these are defects that must be removed in accordance with NB-2538. In addition, weld repairs following defects removal must be radiographed in accordance with NB-2539.

NB-2538 requires a liquid penetrant (PT) examination to be performed following removal of the defect. NB-2539 requires that repair cavities the depth of which exceeds the lesser of 3/8 in. or 10 percent of the section thickness, shall be radiographed. After removal of the

defect, weld buildup using the machine Gas Tungsten Arc Welding, Gas Metal Arc Welding, or Shielded Metal Arc Welding will be performed to restore the minimum wall thickness. All welding methods will be qualified and performed in accordance with ASME code requirements. Following weld build up and in accordance with NB-2538 and NB-2539, a PT examination must be performed of the weld surface and a radiographic examination must be performed of the weld repairs, respectively.

As part of the restoration of the valves, LSCS has elected to perform a design change to the valve internals and install an oversized lower plug guide in both valves. These modified, new lower plug guides perform the same function, in the same manner as the original lower plug guide, and valve control and operation will be unaffected from its original design. The modified lower plug guides effectively reduce the amount of weld restoration required for installation to achieve the same fit to the adjacent valve components. Exelon Industrial Services (EIS) will manufacture the modified plug guides. The modified lower plug guides will be made of a 316 grade stainless steel and will feature a Stellite overlay on the top face and internal bore.

As part of the installation of the oversized lower plug guide, some areas of the lower valve body will not be restored to the original manufactured wall thickness. Welding and machining will be done to achieve sufficient wall thickness above minimum wall thickness to support restoration of valve functionality across entire valve body. Following completion of valve body welding and machining, the area of the valve body that would not be restored to its nominal wall thickness would be less than 3% of the entire valve body surface area that maintains pressure boundary.

The modified lower plug guide design includes an anti-rotation segment similar to the original design. Exelon Industrial Services (EIS) will manufacture the anti-rotation segment. The anti-rotation segment will be either fillet welded or partial penetration welded along its entire outer curved edge on the top face with an appropriately qualified and suitable material for the design of the weld joint. ASME Section III paragraphs NB-5245, NB-5250, and NB-5260 require a PT examination to be performed following completion of a partial penetration welds, fillet welds, and structural attachment welds made to pressure retaining materials, respectively. An EVT-1 examination of this weld will be performed in lieu of any required PT examination.

The modified lower plug guide design incorporates several features to reduce internal wear on the valve body that may result in reduction of wall thickness. The anti-rotation device is welded in place to restrict undesirable movement between the modified lower plug guide and the valve body. This weld design is superior to the original configuration. Additionally, the modified design incorporates tight fit-up tolerances which limit relative motion between valve internals. Finally, the modified lower plug guide material and valve body are both made of stainless steel which results in less adverse impact and potential wear on the valve body.

The proposed alternative of enhanced VT-1 visual examination (EVT-1) will be performed as part of the repair activities in lieu of PT examination. Following machining activities, and prior to welding, an EVT-1 will be performed to ensure surface quality. Welding activities will then be performed to restore the valves to above minimum wall thickness, followed by an EVT-1. The maintenance activity will continue with additional welding and machining to establish the modified configuration of the valve wall to support valve internals and restoration of 2B33-F060A and 2B33-F060B functionality. The final EVT-1 will be performed following establishment of modified valve configuration prior to valve reassembly.

Radiological Hardship

During the L2R18 refueling outage, significant radiological dose rates are being experienced both internally to the valves and in the external area surrounding the valves. Therefore, LSCS is employing several approaches to limit the personnel exposure during the valve repair activities (e.g., automatic welding is being used).

The internal dose rate at the bottom of valve 2B33-F060A is 8 R/hour, and the internal dose rate at the bottom of valve 2B33-F060B is 10 R/hour. The total combined exposure impact for performing surface examinations (PT) associated with both valve repairs is estimated at 11.6 person-Rem. The total combined exposure for performing a radiographic examination associated with both valve repairs is estimated at 11.8 person-Rem. This is based on stay time estimates for examiners to perform PT and radiographic examinations under the conditions described below. As a result of the significant dose rates, LSCS has evaluated alternatives to the required nondestructive examinations (NDE).

By comparison, performing the PT examination scope using the proposed alternative of EVT-1 approach discussed in Section 5, "Proposed Alternative and Basis of Use," would result in an estimated EVT-1 examination dose of 1.3 person-Rem, which represents an approximate radiological dose savings of 10.3 person-Rem. This substantial radiological dose reduction is due to the EVT-1 examination not requiring the NDE technicians to be inside the valve bodies when compared to the PT examinations. Additionally, not performing the radiographic examination provides an additional radiological dose savings of approximately 11.8 person-Rem. Therefore, the total radiological dose savings associated with this relief request is approximately 22.1 person-Rem.

Physical Limitations Hardship

The area of repair inside valves 2B33-F060A and 2B33-F060B is at the bottom of each valve which is approximately 42 inches from the main flange on the top of the valve body. Additionally, the valve throat opening is 18 inches in diameter. To perform PT examinations, NDE technicians have limited remote options available to support performing the PT surface examinations. Technicians must clean the examination surface prior to applying the dye penetrant. Although penetrant dye may be applied using a brush with an attachment piece to limit entering the valve body, the technician

must enter the valve body to adequately remove excessive dye penetrant and to apply and remove developer.

To perform radiographic examinations, NDE technicians are challenged due to valve access restrictions to position the film inside the valve. With the current dose rates inside the valve between 8 to 10 R/hour, the ability to produce a quality radiographic examination film required by the ASME Code will be impacted due to exposure of the same type of gamma radiation. Placing the source for radiography from inside of the valve body and the film on the outside of the valve, presents an issue of being able to properly distance the radiography source to satisfy the ASME Code required geometric calculation. Lastly, the size and weight of the container for the Cobalt-60 source is 2'x3'x3' and nearly 800 pounds, which represents a physical challenge.

The significant radiological dose and physical limitations associated with the PT and radiographic examinations of 2B33-F060A and 2B33-F060B in accordance with the ASME Code would be contrary to the as low as reasonably achievable (ALARA) radiological controls program.

5. Proposed Alternative and Basis for Use

In lieu of the surface examination requirements of ASME Section III 1971 Edition, Summer 1972 Addenda and/or ASME Section XI 2007 Edition with 2008 Addenda associated with repair activities on valves 2B33-F060A and 2B33-F060B, EGC proposes to substitute the PT examinations with EVT-1.

The enhanced visual examination of the applicable machined and welded surfaces will be performed using methods and personnel qualified to the standards of ASME Section XI VT-1 visual examination requirements. The EVT-1 will be conducted using remote visual equipment such as a video probe or camera equipment. The acceptance criteria for the EVT-1 examinations will be consistent with NB-2546.3, for the valve body restoration and NB-5352 for the valve body to anti-rotation segment weld, from ASME Section III 1971 Edition, Summer 1972 Addenda.

EGC has performed a resolution demonstration, which is the process of demonstrating the ability of the remote visual examination equipment, equipment setup, inspection area environment, and inspection technique to resolve the appropriate 0.044-inch characters.

EGC has evaluated the resolution and examination capabilities of the EVT-1 and PT examination methods. A comparison between the two techniques demonstrates that the EVT-1 will provide the ability to detect a post-machining or post-welding flaw as the PT method with no loss of examination capability. Specifically:

- Liquid Penetrant (and Magnetic Particle) acceptance criteria is required to identify an indication with dimensions greater than 1/16 inch (0.0625 inches).

- Visual Examination, EVT-1 examination capabilities are demonstrated before and after the examination to dimensions down to 0.044-inch characters.

EVT-1 is a proven and accepted visual examination method and technique as described in Electric Power Research Institute (EPRI) Technical Report (TR) 3002007793, "Remote Visual Testing Round-Robin Study," published December 2, 2016 and NRC NUREG/CR 7246, PNNL-27003, "Reliability Assessment of Remote Visual Examination," published August 2018.

EPRI TR 3002007793 documented an approach that has been used throughout the nuclear industry for remote visual examination of various types of flaws, simulated cracks, electrical discharge machining (EDM) notches and actual cracks for its demonstration. In addition, EVT-1 examinations are routinely used for In Vessel Inspections (IVVI) under the boiling water reactors (BWR) Vessel and Internals Project (VIP) at BWR.

The NRC has approved EVT-1 as an acceptable alternative to PT examination previously as described in Section 7 below.

6. Duration of Proposed Alternative

Use of this proposed alternative is applicable only to L2R18 repair activities associated with 2B33-F060A and 2B33-F060B valves.

7. Precedents

Braidwood Station, Units 1 and 2 – Relief from the Requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (EPID L-2018-LLR-0033), dated January 17, 2019 (ADAMS Accession No. ML18347B419).

ATTACHMENT 2

Associated Figures

Figure I4R-12-1

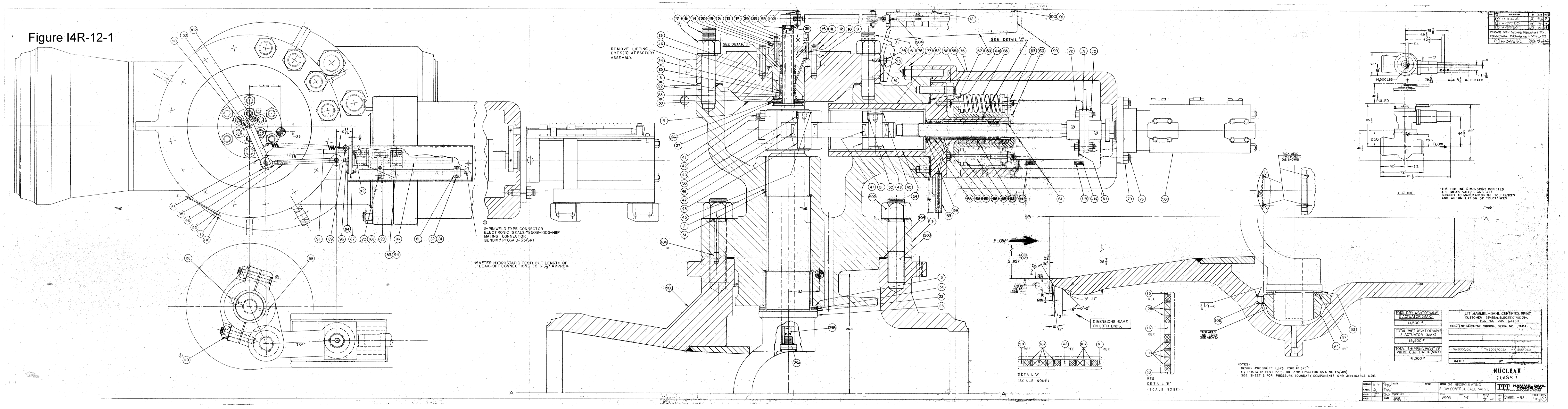


Figure I4R-12-2

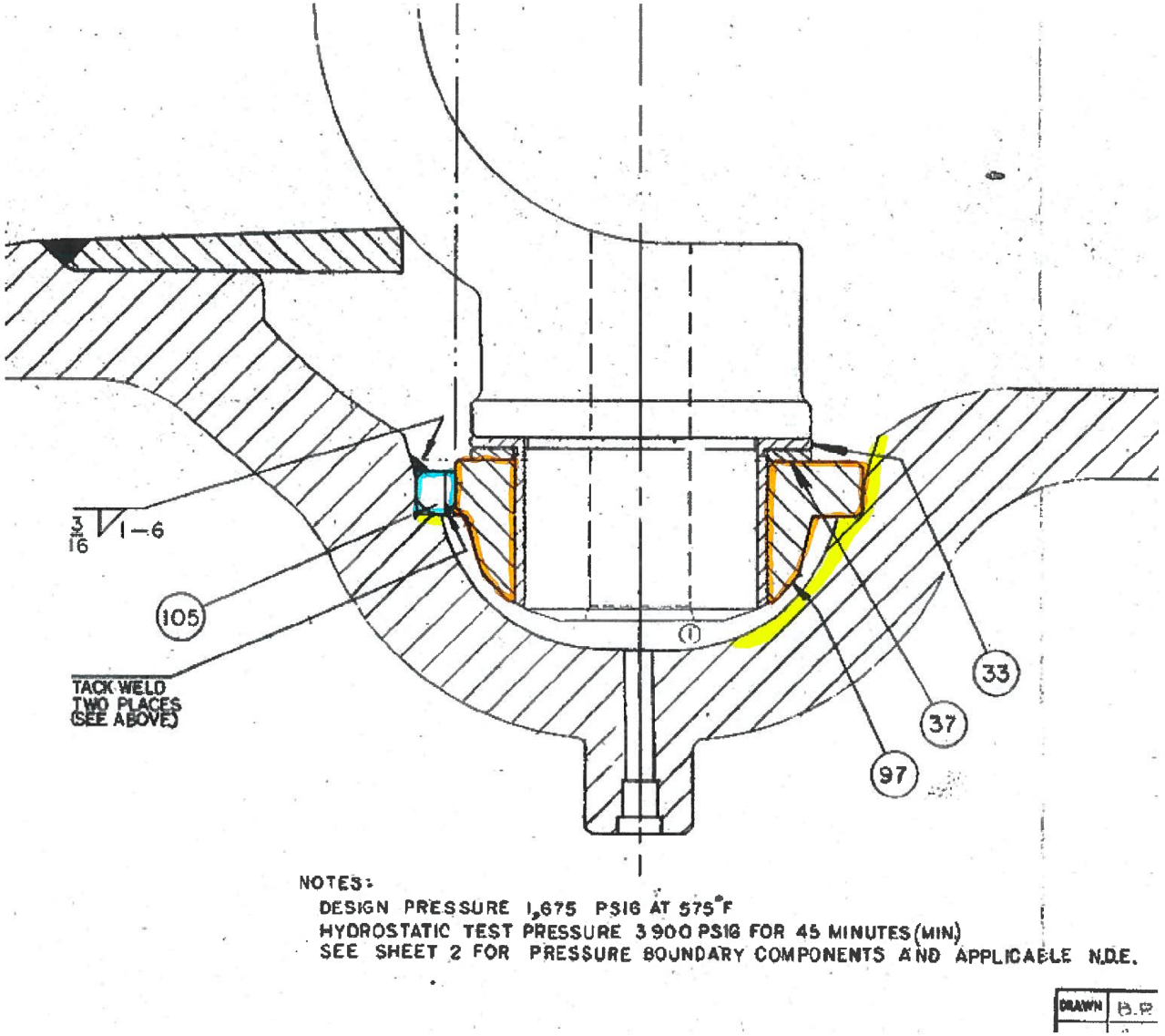


Figure I4R-12-2

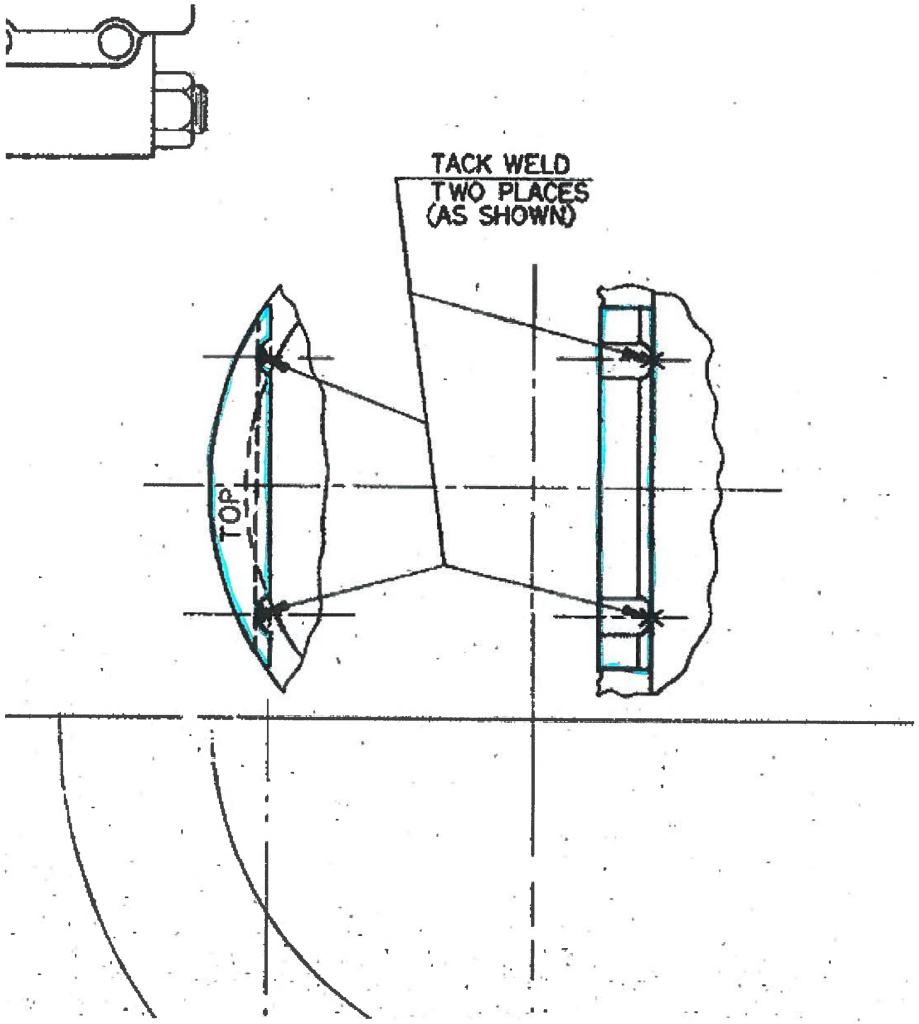


Figure I4R-12-3 - 2B33-F060A

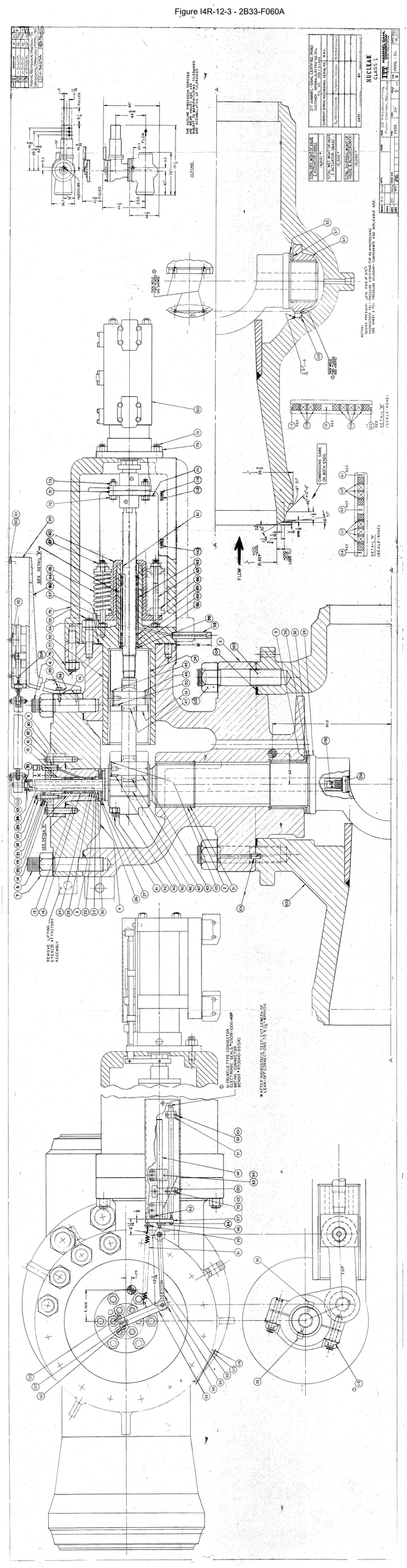


Figure I4R-12-4, Closeup 2B33-F060A