M-347

VERMONT YANKEE NUCLEAR POWER STATION

PROGRAM PROCEDURE

PP 7028

ORIGINAL

PIPING FLOW ACCELERATED CORROSION INSPECTION PROGRAM

USE CLASSIFICATION: **INFORMATION**

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Implementation Statement: This procedure supercedes VY Procedure DP 4023 and use of the Vermont Yankee Piping Flow Accelerated Corrosion Program Manual, Revision 2a, prepared for Vermont Yankee by Yankee Atomic – Nuclear Services Division.

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U.S. NUCLEAR REGULATORY COMMISSION
In the Matter of Entergy Nuclear Vermont Yankee LLC
Docket No. 50-271 Official Exhibit No. E4-34-VY
OFFERED by (Applicant/Licensee) Intervenor ____
NRC Staff Other ____
IDENTIFIED on 7/23/08 Witness/Panel NEC 4
Action Taken: (ADMITTED) REJECTED WITHDRAWN
Reporter/Clerk MAC

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TABLE OF CONTENTS

1.0 PURPOSE, SCOPE, AND DISCUSSION 3

2.0 DEFINITIONS 5

3.0 PRIMARY RESPONSIBILITIES 5

4.0 PROCEDURE 9

4.1. Program Maintenance 9

4.2. Initial Screening and Identification of FAC Susceptible Piping 9

4.3. CHECWORKS Modeling 9

4.4. Outage to Outage Activities 10

5.0 REFERENCES AND COMMITMENTS 12

6.0 FINAL CONDITIONS 14

7.0 ATTACHMENTS 15

1.0 PURPOSE, SCOPE, AND DISCUSSION

1.1. Purpose

The purpose of the Vermont Yankee Piping Flow Accelerated Corrosion (FAC) Inspection Program is to provide a systematic approach to ensure that FAC does not lead to degradation of plant piping systems and feedwater heaters. This Program Procedure controls the engineering and inspection activities performed to predict, detect, monitor, and evaluate wall thinning due to FAC at the Vermont Yankee Nuclear Power Station.

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1.2. Scope

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The scope of this program is limited to evaluation and inspection of plant piping systems and feedwater heater shells that could be susceptible to FAC.

FAC is known to occur in piping systems constructed of carbon or low-alloy steels, which carry water or wet steam. All plant piping systems have been screened for susceptibility to damage from FAC. A separate document titled "FAC Susceptible Piping Identification" has been developed to identify, on a line by line basis, the piping which is susceptible to damage from FAC. This document is maintained by the Piping FAC Inspection Program coordinator and is updated as required to reflect changes in plant operation and configuration.

There is no finite scope of piping components to be scheduled for inspection on a periodic basis. Each refueling outage inspection efforts will be optimized to focus on piping components which have been identified as wearing, or potentially wearing due to FAC. The components selected for inspection each refueling outage are identified using:

- Results of ultrasonic thickness (UT) inspections from previous refueling outages.
- Results of the CHECWORKS predictive software, which incorporates actual inspection data.
- Operating conditions at VY, which may indicate FAC damage is occurring.
- Operating experience and events from other plants.

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Carbon steel feedwater heater shells have experienced thinning and through wall leaks due to FAC. Vermont Yankee has replaced all low pressure feedwater heaters with new heaters constructed of materials resistant to FAC. The four remaining high pressure feedwater heater shells are carbon steel. Long term monitoring of shell thickness for plant feedwater heaters is included in the scope of this program.

1.3. Discussion

Following the December 1986 Surry pipe rupture the industry has worked steadily to develop and implement monitoring programs to prevent the rupture of high energy piping due to single phase erosion-corrosion (FAC). In March 1987 INPO issued Significant Operating Experience Report (SOER) 87-3 which recommended that a continuing program be established at all U.S. nuclear power plants including analyses to predict wear rates and to plan and schedule periodic inspections. USNRC Generic Letter GL 89-08, requires all holders of operating licenses to provide assurances that a systematic program has been implemented to ensure that Flow Accelerated Corrosion does not lead to degradation of plant piping systems.

This Program Procedure (PP) controls engineering and inspection activities performed to assess the susceptible plant piping. This procedure defines the methods and criteria used in the evaluation and inspection of plant piping components which are susceptible to wall thinning due to FAC. The program is based on current industry practice and the latest EPRI recommendations (REF 5.4.8.).

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Long term monitoring of plant feedwater heater shell thickness is included in the scope of this program. Previous heater inspection efforts were performed by Project Engineering and Design Engineering in conjunction with feedwater heater repair and replacement efforts. All six of the low pressure feedwater heaters have been replaced with new heaters constructed of materials resistant to FAC. The four remaining high pressure feedwater heater shells are carbon steel. Design criteria used in the feedwater heater repair and replacement activities are included in the documentation for the corresponding design change or work order which implemented the repair or replacement.

Overall health of the feedwater heaters is not only determined by the condition of the shell and nozzles, but is also dependent on the condition of the heater internals: tubes, tube support plates, impingement plates, tie rods, drain cooler end plates, etc. Evaluation of the overall component health is the responsibility of the Maintenance Department. Shell and nozzle inspections of feedwater heaters will be coordinated through the responsible System Engineer and the Maintenance Support Department. UT inspections of the heater shells will be performed in conjunction with internal visual inspections and eddy current testing of the heater tubes under Preventive Maintenance (PM) work orders.

Elements of the program controlled by this procedure are:

- Criteria for selection of piping systems and components susceptible to FAC and for maintenance of a "FAC Susceptible Piping Identification", which identifies all plant piping susceptible to FAC.
- Criteria for ongoing program maintenance including; benchmarking with current industry practice, evaluation of industry events, and participation in industry working groups.
- Criteria for use and control of the CHECWORKS predictive software used to evaluate piping, plan inspections, track inspection results, wear rates, piping component data, and repair and/or replacement history.
- Criteria for selection and scheduling of components to be inspected during refueling outages including initial inspections, follow-on inspections, and scope expansion / reduction.
- Criteria and procedures for evaluation of thinned piping components and, if required, for repair and replacements.
- Documentation requirements and criteria for maintenance and storage of inspection data.

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NOTE

The program only addresses wall thinning due to FAC in pressure boundary piping components and feedwater heater shells. Wear in other pressure vessels, pumps, valves, and in-line items is not included. However, detected wear in the attached piping may indicate wear in the component and should be pursued.

The primary purpose of performing UT inspections each outage is to locate piping components degraded by FAC prior to the time that an immediate repair or replacement is required. This allows sufficient lead time for a planned replacement which will have a minimum impact on plant operation.

Given the costs of inspection and replacement of piping components, a long term approach for mitigating the effects of FAC taken under this program will be towards reducing component wear rates. To accomplish this, components found with significant wall loss due to FAC under this program, will be preferably replaced with materials which are more resistant to FAC damage.

2.0 DEFINITIONS

2.1. Flow Accelerated Corrosion (FAC): A corrosion process that causes thinning of steel piping exposed to flowing water or wet steam. The rate of loss is dependent on several parameters, which include flow regime, service life, water chemistry, piping material, piping geometry, and hydrodynamics.

2.2. Program: A set of activities that benefit from the existence of a formal, high level "Program Document." Such documents are meant to provide for a common understanding of program depth, breath and technical bases as well as the responsibilities of the program owner and those helping to implement the program. "Program Documents" are typically created to ensure regulatory requirements are satisfied. They can also be used to lay out the technical bases and personnel responsibilities related to complex, multi-departmental processes.

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2.3. Program Owner: The individual responsible for maintaining the program, program documents, and assuring proper execution of the program requirements. Each program shall have an individual assigned as the program owner. The appropriate job title is determined by the responsible Department Manager. A summary of expectations for the program owner are contained in Appendix A of AP 0098 and shall be referenced in all Program Procedures.

2.4. Single-Phase Flow: The flow in the piping system remains in the liquid phase at all design and operating pressures and temperatures.

2.5. Two-Phase Flow: The flow in the piping system may vary from liquid to wet steam. This depends on the operating pressures and temperatures and varies with the specific location in the piping system.

3.0 PRIMARY RESPONSIBILITIES

Implementation of the tasks performed under this program involve several plant departments. The organization for personnel performing tasks under this program is shown in Figure 1.

3.1. The VY Design Engineering Mechanical / Structural (DE M/S) Department is responsible for the Piping FAC Inspection Program. The DE M/S Lead Design Engineer (LDE) has responsibility for the overall program management and administration and, for structural evaluation of thinned piping components.

3.1.1. Establishment and maintenance of criteria and procedures for evaluation of thinned wall piping components.

3.1.2. Performing structural evaluations of thinned wall piping components.

3.2. The Vermont Yankee Piping FAC Inspection Program Coordinator (FACPC) works within the Mechanical Structural (DE M/S) Department under the direction of the DE M/S LDE. The responsibilities of the FAC Program Coordinator are:

3.2.1. Maintenance of the Vermont Yankee Piping FAC Inspection Program Procedure and supporting documents to ensure that program meets commitments to GL 89-08 and the "Expectations of Program Owners" as defined in Appendix A of AP 0098.

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3.2.2. Continual assessment of FAC inspection program to insure program effectiveness.

3.2.3. Participation in relevant industry working groups, benchmarking with current industry practice, evaluation of industry events; and implementation of revisions, changes, and process improvements which result from the participation.

3.2.4. Establishment and maintenance of criteria for selection of piping systems and components susceptible to FAC and for maintenance of the "FAC Susceptible Piping Identification" document which screens all current plant piping systems and identifies piping susceptible to FAC.

3.2.5. Establishment and maintenance of criteria for selection and scheduling of components to be inspected during refueling outages including: initial inspections, follow-on inspections, and scope expansion and/or reduction.

3.2.6. Establishment and maintenance of criteria for use and control of the CHECWORKS predictive software used to evaluate piping, plan inspections, track inspection results, wear rates, piping component data, and repair and/or replacement history.

3.2.7. Review of design change and maintenance documents as necessary to assess the impact of the proposed tasks on the inspection program, and recommend action when appropriate.

3.2.8. Ensure that all physical and operational changes or additions to plant piping systems are incorporated into the program.

3.2.9. Analytical evaluation of plant piping systems for FAC using the EPRI CHECWORKS codes as appropriate.

3.2.10. Pre-outage activities including:

- Development of inspection scope for each refueling outage.
- Perform/update analytical evaluations (CHECWORKS models) as required.
- Provide pre-inspection implementation support.

3.2.11. Outage activities including:

- Providing engineering support for inspection implementation.
- Evaluation and disposition of all inspection results.
- Recommend changes to the planned inspection scope upon discovery of unacceptable conditions.
- Providing assistance as required in the development of repair/replacement options.
- Providing written summary of inspection results to ISIPC prior to plant startup.
- Ensure that cognizant departments and the Control Room are informed of unacceptable conditions discovered during evaluation of inspection results and facilitate completion of appropriate paperwork (ER's, WOR, IDR, etc.).

3.2.12. Post-outage activities including:

- Development of outage inspection report including trending analyses and long term recommendations.
- Update/maintain the plant CHECWORKS models and maintain a history of all piping inspections.
- Update/maintain "FAC Susceptible Piping Identification" document to reflect plant changes as required.

3.2.13. Keep DE M/S LDE informed on the progress of FAC related tasks.

3.3. The Vermont Yankee In-Service Inspection Program Coordinator (ISIPC): works within the System Engineering Department under the direction of the Superintendent of System Engineering. The responsibilities of the ISIPC include:

3.3.1. Provide for overall coordination with the Vermont Yankee In-Service Inspection Program if inspection results on safety class piping indicate violations of the piping design code.

3.3.2. Coordination of pre-outage activities including:

- Input to the development of outage schedules and budgets relative to FAC activities.
- Providing oversight of work order planning and coordination with ISI Program resources.
- Arrange on-site services as required.

3.3.3. Coordination of outage activities including:

- Ensure components scheduled for inspection are properly prepared and accessible.
- Performance of inspections.
- Post inspection restoration of components.
- Repair/replacement effort of unacceptable components.

3.3.4. Interface with the cognizant departments, as needed to insure all safety related repair/replacement ISI examination requirements are satisfied.

3.3.5. Ensure that required piping repairs and/or replacements are performed according to plant procedures and repairs to safety class piping and components are performed in accordance with ASME Section XI requirements.

3.3.6. Ensure that cognizant departments and the Control Room are informed of unacceptable conditions discovered during evaluation of inspection results and facilitate completion of appropriate paperwork (ER's, WOR, IDR, etc.).

3.3.7. Ensure that inspection records are temporarily stored per AP 6807 and permanently stored per AP 6809 and available for the plant lifetime.

3.3.8. Keep the Superintendent of System Engineering informed on the progress of FAC related tasks.

3.3.9. Provide technical advice on implementation and inspection aspects of the FAC program.

3.3.10. NDE procedure development and maintenance.

3.4. Level III / ISI Supervisor is a certified Level III UT examiner and works under the direction of the ISIPC. The responsibilities of the Level III /ISI Supervisor include:

3.4.1. Review of applicable NDE procedures used in pipe UT wall thickness measurements.

3.4.2. Ensuring that UT inspectors are properly qualified and trained to the applicable inspection procedures.

3.4.3. Review of inspection results for compliance to the applicable procedures.

3.4.4. Resolution of anomalies found in inspection data.

3.4.5. Recommendations for augmented or special NDE procedures or techniques as required.

3.4.6. Direct supervision of inspection personnel to ensure that the inspection personnel accurately and efficiently execute the inspection plan, complete inspections, and appropriately document inspection results.

3.4.7. Control of all inspection data during the refueling outage.

3.4.8. At the completion of inspections forwarding all inspection records to the ISIPC for permanent storage per the requirements of Section 6.2

3.5. Non Destructive Examination (NDE) Personnel

3.5.1. Meet Applicable qualification Standards. Personnel performing ultrasonic inspections shall be qualified to the requirements of NE 8043.

3.5.2. Perform assigned setup, calibrations, and examinations.

3.5.3. Documentation of results in accordance with approved procedures.

3.6. Plant Support Services

The Project Engineering Department is responsible for providing staging, lighting, insulation removal, surface preparation of piping components, and for component restoration after inspections are performed. Activities are controlled through the VY Work Order process in accordance with plant procedures.

4.0 PROCEDURE

4.1. Program Maintenance

The FACPC shall maintain the Yankee Piping FAC Inspection Program Procedure, PP 7028 and supporting documents to ensure that program meets commitments to GL 89-08 by:

4.1.1. Continual reassessment of the piping FAC inspection program to insure program effectiveness. A FAC Program Self Assessment shall be performed at least once per operating cycle.

4.1.2. Participation in relevant industry working groups, benchmarking with current industry practice, evaluation of industry events; and implementation of revisions, changes, and process improvements which result from the participation.

4.1.3. Adaptation of current or developing industry practices: for selection and scheduling of components to be inspected, follow-on inspections, scope expansion and/or reductions, and criteria and procedures for evaluation of thinned wall piping components.

4.1.4. Review design change and maintenance documents as necessary to assess the impact of the proposed tasks on the inspection program, and recommend action when appropriate.

4.1.5. Incorporate all physical and operational changes or additions to plant piping systems into the program as applicable.

4.2. Initial Screening and Identification of FAC Susceptible Piping

4.2.1. A screening and evaluation of all plant piping systems for susceptibility to FAC shall be performed. The screening shall use the EPRI Guidelines from reference 5.4.8., industry experience, and previous Vermont Yankee inspection results. The evaluation shall be performed and reviewed by engineers with FAC experience and familiar with plant systems. The resulting document shall be controlled by the FACPC.

4.2.2. The FACPC shall revise the "FAC Susceptible Piping Identification" document as required to reflect changes in plant operation, piping configuration, and/or materials.

4.3. CHECWORKS Modeling

4.3.1. Evaluate the susceptible plant piping systems for FAC using the EPRI CHECWORKS code. The evaluations shall be performed, reviewed, and documented per the requirements of Appendix D.

4.4. Outage to Outage Activities

Inspection and evaluation efforts performed under the program follow a cyclic pattern. Once inspection data from a given outage is obtained, it is incorporated into the appropriate predictive model and the results are then used in conjunction with other FAC related information to establish the inspection scope for the next refueling outage.

NOTE

Each large bore piping component within the scope of this program has been given a unique identification number as described in Appendix A. The location (building and elevation) of each large bore component is obtained from the Component Location Sketches in Appendix A. Small bore piping inspection locations included in the program are identified in Appendix B.

The tasks performed each refueling outage to implement the piping inspections under the FAC inspection program are detailed below. These are also broken out chronologically in a flow chart included here as Figure 2.

4.4.1. The outage inspection scope is determined by the FACPC using previous inspection data, the results of the CHECWORKS models, industry experience , and the guidelines contained in Appendix E.

4.4.2. The outage inspection scope is reviewed by the ISIPC for impact on and conflicts with the overall outage plan. The ISIPC will plan and organize the on-site resources required to implement the piping inspections.

4.4.3. A work package is assembled for each piping component or group of components. This package includes component location sketches, support requirements such as scaffolding, lighting, etc., surface preparation and gridding requirements, and any special inspection requirements as determined by the FACPC.

4.4.4. Prepare piping components for inspection.

4.4.4.1. As directed by the ISIPC, scaffolding, lighting, insulation removal, and surface preparation of each piping component to be inspected are performed by on-site services in accordance with the applicable plant procedures.

4.4.4.2. Surface preparation and gridding of piping components for inspection shall conform to the guidelines in NSAC 202L (reference 5.4.8.). Specific instructions for surface preparation are given in NE 8044. Specific instructions for gridding of piping components are given in Attachment A of NE 8053, or as further directed by the FACPC.

4.4.5. Perform UT inspections.

4.4.5.1. Piping wall thickness shall be determined using ultrasonic testing (UT). Personnel performing ultrasonic or other inspections shall be qualified to the requirements of NE 8043. Wall thickness measurements made by UT shall be performed in accordance with NE 8053.

4.4.5.2. Inspection will be performed by using a 100% scan of the area between the grids lines. The lowest measurement in each area will be recorded as the measured thickness.

4.4.5.3. An inspection results package shall be assembled for each large bore component and for each group of small bore components inspected. The form and content of the inspection results package shall be per NE 8053.

4.4.6. The Level III / ISI Supervisor shall review all UT inspection data for procedure compliance, anomalies, and completeness.

4.4.6.1. Ensure discrepancies are resolved, and any missing data are supplied.

4.4.6.2. The completed examination report shall be forwarded to the FACPC for evaluation.

4.4.7. The inspection data for each piping component shall be evaluated for structural integrity by qualified Mechanical/Structural Design Engineering personnel in accordance with DP 0072.

4.4.7.1. Per DP 0072 all components inspected will be classified as either "acceptable as is", "acceptable for continued operation" (with future inspections required), or "repair or replacement is required".

4.4.7.2. If significant wear is found in a component, additions to the planned inspection scope may be required. The FACPC shall use the criteria for sample expansion in Appendix E for selection of additional components.

4.4.7.3. Deletions in the planned inspection scope may be warranted based on the inspection results of similar piping components. The FACPC shall provide written justification to the ISIPC and the DE M/S LDE for all scope reductions.

4.4.8. Piping components determined to be "accept as is" by DE M/S can be restored (replace insulation, etc.) for operation.

4.4.8.1. If future inspections on a component are required or anticipated, then consideration should be given to installing removable insulation blankets.

4.4.9. For piping components determined to need repair or replacement, the FACPC will notify the ISIPC, the DE M/S LDE, the cognizant departments and/or the Control Room of unacceptable conditions discovered during evaluation of inspection results by completion of appropriate paperwork (ER's, WOR, IDR, etc.).

4.4.10. Piping repairs and/or replacements shall be performed in accordance with the applicable design codes and plant procedures.

4.4.10.1. Safety class piping and components under ASME Section XI requirements shall be dispositioned in accordance with DP 4027.

4.4.10.2. Repair of safety related components shall be performed per AP 0070.

4.4.10.3. Baseline Inspections (wall thickness measurements) shall be performed for all new piping components installed to replace worn piping. Measurements shall be made using approved procedures. The baseline inspection measurements and the replacement material data shall be forwarded to the FACPC.

4.4.11. Prior to plant startup the FACPC shall:

4.4.11.1. Ensure all inspection results are assessed for piping code compliance, impact on plant operability, and personnel safety.

4.4.11.2. Provide the ISIPC and the DE M/S LDE with a written summary of inspection results. The summary will identify all thinned components found, and any required repairs and/or replacements performed during the outage.

4.4.12. Within 90 days of plant startup the FACPC shall prepare an outage inspection report. The contents of the outage inspection report shall be per Section 6.3.

4.4.13. The FACPC will, as applicable, incorporate the inspection results into the CHECWORKS models for use in planning the scope of the next refueling outage.

5.0 REFERENCES AND COMMITMENTS

5.1. Technical Specifications and Site Documents

5.1.1. VOQAM – Appendix D

5.2. Codes, Standards, and Regulations

5.2.1. USAS B31.1.0 - 1967, Power Piping Code
5.2.2. ANSI B31.1 - 1977, Power Piping Code
5.2.3. ASME Code Case N-597, Requirements for Analytical Evaluation of Pipe Wall Thinning, Section XI, Division 1

5.3. Commitments

5.3.1. USNRC Generic Letter 89-08, Erosion/Corrosion-Induced Pipe Wall Thinning, dated May 2, 1989
5.3.2. Vermont Yankee letter to the USNRC, Vermont Yankee Response to NRC Generic Letter 89-08: "Erosion/Corrosion-Induced Pipe Wall Thinning, dated July 14, 1989
5.3.3. USNRC Bulletin No. 87-01, Thinning of Pipe Walls in Nuclear Power Plants, dated July 9, 1987
5.3.4. Vermont Yankee letter to the USNRC, Vermont Yankee Response to NRC Bulletin No. 87-01: Thinning of Pipe Walls in Nuclear Power Plants, dated September 11, 1987
5.3.5. Vermont Yankee letter to the USNRC, Supplement to Vermont Yankee Response to NRC Bulletin No. 87-01: Thinning of Pipe Walls in Nuclear Power Plants, dated December 24, 1987
5.3.6. USNRC Generic Letter 90-05, Guidance for Performing Temporary Non-Code Repair of ASME Code Class 1, 2, and 3 Piping, dated June 15,1990
5.3.7. Vermont Yankee Letter to the USNRC, Request for Relief from the ASME Code to Use Code Case N-597, dated March 19, 2001, BVY 01-12
LPC 1
5.3.8. USNRC Letter to Vermont Yankee, Vermont Yankee Nuclear Power Station - Relief Request for Use of ASME Code Case N-597 as an Alternative Analytical Evaluation of Wall Thinning (TAC No. MB1530), dated July 27, 2001, NVY 01-74
5.3.9. VY Memo: J.F. Calchera to OEC (R. McCullough), Subject: Response to Commitment Item: ER-990876_01, Reevaluate Feedwater (Heater) Inspection Program to Address Ownership, dated April 25, 2000

5.4. Supplemental References

5.4.1. Vermont Yankee FAC Susceptible Piping Identification, Rev. 0, Dated May 15, 2000
5.4.2. Vermont Yankee CHECWORKS MODELS, Rev.0, Dated June 30, 2000
5.4.3. VY Small Bore Piping Component Selection Review, Revision 1, dated December 6,1999
5.4.4. Institute of Nuclear Power Operations (INPO), Significant Operating Experience Report (SOER) No.87-3, Pipe Failures in High Energy Systems Due to Erosion/Corrosion, dated March 20, 1987
5.4.5. W.Stuart, et al, NUMARC Working Group on Erosion-Corrosion Summary Report, June 1987
5.4.6. Boiling Water Reactor Ebasco Specification for Piping, Piping Components, Hangers and Supports for Station Piping Systems, Specification No. BWR QC-10 9/15/68, by EBASCO Services Inc.
5.4.7. Acceptance Criteria for Structural Evaluation of Erosion-Corrosion Thinning in Carbon Steel Piping, EPRI NP-5911SP, Project 1757-61, Final Report, July 1988
5.4.8. Recommendations for an Effective Flow-Accelerated Corrosion Program, NSAC-202L-R2, Final Report, April 1999, Electric Power Research Institute
5.4.9. CHECWORKS - Computer Program User Guide, TR 103496, August 1994 by Altos Engineering Applications Inc. for EPRI.
5.4.10. CHECWORKS FAC Application Guidelines for Plant Modeling and Interpretation of Inspection Data, Draft Report, By Altos Engineering for EPRI, dated February 3,1997
5.4.11. AP 0009, Event Reports
5.4.12. AP 0017, Calculations and Analyses
5.4.13. AP 0070, ASME Section XI Repair and Replacement Procedure
5.4.14. DP 0072, Structural Evaluation of Thinned Wall Piping Components
5.4.15. DP 4027, Disposition of Inservice Inspection Findings
5.4.16. AP 6024, Plant Housekeeping and Foreign Material Exclusion/Cleanliness Control
5.4.17. AP 6045, Engineering Record Correspondence (ERC) and Technical Evaluations (TE)
5.4.18. AP 6807, Collection, Temporary Storage and Retrieval of QA Records
5.4.19. AP 6809, Plant QA Records Management System
5.4.20. NE 8043, Training, Qualification and Certification of NDE Personnel

5.4.21. NE 8044, Preparation of Examination Surfaces and Reference Marking of Welds for Nondestructive Examination

5.4.22. NE 8047, Visual Examination Procedure for VT-3 and General Visual

5.4.23. NE 8053, Ultrasonic Thickness Measurement

LPC 1 5.4.24. EPRI CHUG Position Paper No. 3, Recommendations for Inspecting Feedwater Heater Shells for Flow Accelerated Corrosion Damage, dated February 2000

6.0 FINAL CONDITIONS

The following requirements apply to all permanent documents for the Piping FAC Inspection Program.

Inspection records including personnel, equipment, and material certifications, calibration sheets, inspection data sheets, records of repairs, and other records required by the applicable piping codes are submitted to the ISIPC for filing in accordance with the applicable implementation procedures.

6.1. Systems Screening, Predictive Models, and Wall Thinning Evaluations

LPC 1 6.1.1. The "FAC Susceptible Piping Identification" shall be maintained by the FACPC. A copy shall be forwarded to Records & Information Management Services (RIMS) for permanent storage.

6.1.2. The CHECWORKS predictive models and FAC evaluations of plant piping systems shall be documented maintained by the FACPC. A copy shall be forwarded to DCC for permanent storage.

6.1.3. All evaluations of pipe wall thinning below code minimum wall thickness (Level 3) shall be performed and documented in a VY Calculation per the requirements of AP 0017 and DP 0072.

6.2. UT & VT Inspection Data

6.2.1. The official inspection record for each large bore component or group of small bore components is the UT Inspection Report developed per NE 8053.

6.2.2. For each component inspected, the complete record of instrument data and thickness measurements from the data loggers as applicable shall be stored on disk or for future retrieval.

6.2.3. During the refueling outage all inspection records are controlled by the ISI Supervisor and are stored per AP 6807.

6.2.4. At the completion of the inspections, all records and forms required by the applicable UT & VT, procedures used to perform the inspections shall be forwarded to the ISIPC for permanent storage per the requirements of AP 6809.

6.3. Refueling Outage Inspection Reports

An Inspection Report shall be generated after each refueling outage to summarize the inspection activities performed, and to provide a formal means for documentation of the inspection results. The Piping Inspection Report shall identify the following:

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- Total number of piping components inspected, including a summary of measured thickness data.
- Components which were repaired or replaced.
- Components designated as requiring future monitoring.
- Components or portions of piping systems which UT measurements indicate repair or replacement will be required.
- Components added or deleted from the planned Inspection Scope. Also provide the basis for adding or deleting each component.
- Unexpected measurement results/problems.
- Recommended changes/revisions to the Inspection Program to be implemented in future outages.
- Reference to applicable VY Calculations.

LPC 1 A copy shall be forwarded to RIMS for permanent storage.

6.4. Supplemental Program Data

The FACPC shall maintain files for any other FAC related correspondence and documents such as:

- QA audit reports and NRC Inspections
- Program Self Assessments
- Evaluation of FAC related Industry Events
- Documentation of additional activities to supplement the FAC Inspection Program

7.0 ATTACHMENTS

7.1.	Figure 1	Piping FAC Inspection Site Organization
7.2.	Figure 2	Piping FAC Inspection & Evaluation Process Flow Chart
7.3.	Appendix A	Large Bore Piping Component Location Sketches
7.4.	Appendix B	Small Bore Piping Inspection Location Database
7.5.	Appendix C	Identification of FAC Susceptible Systems and Piping Components
7.6.	Appendix D	Use and Control of CHECWORKS Models
7.7.	Appendix E	Criteria for Selection of Piping Components for Inspection and sample Expansion Guidelines

FIGURE 1

PIPING FAC INSPECTION SITE ORGANIZATION

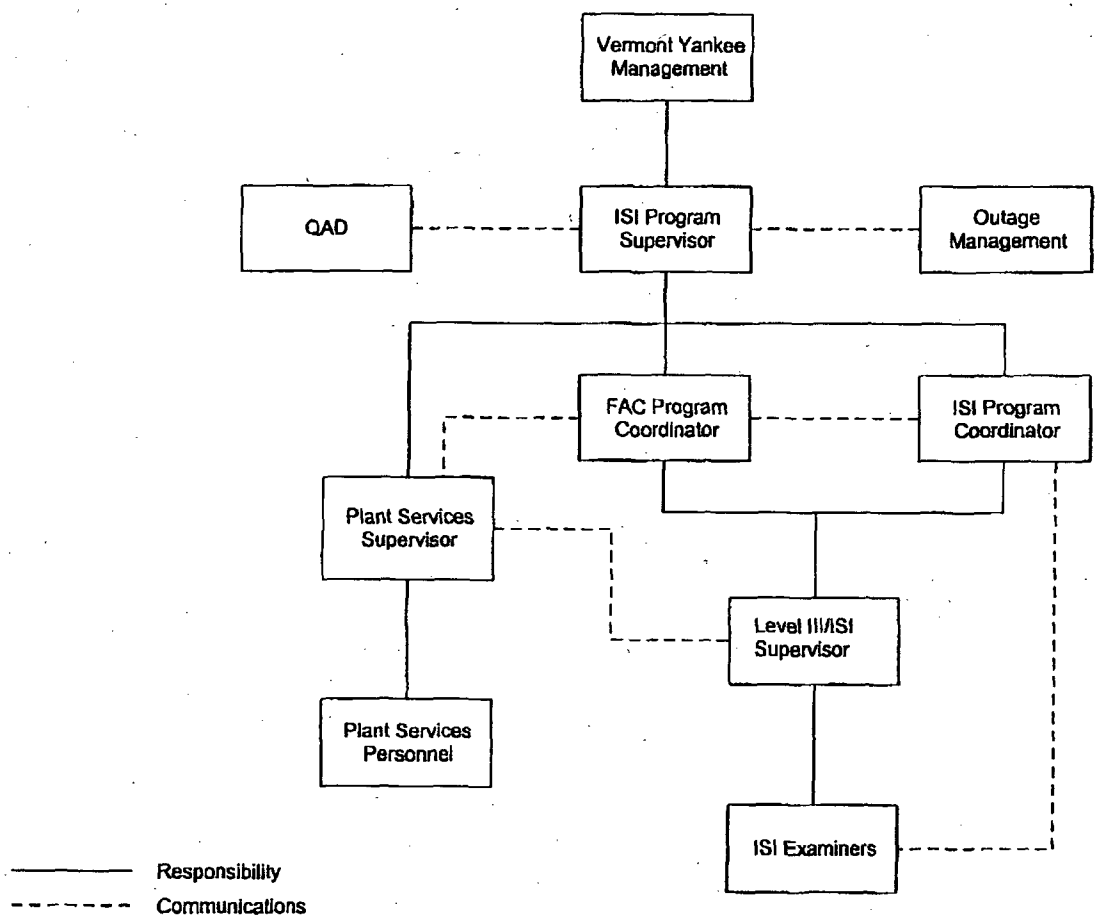
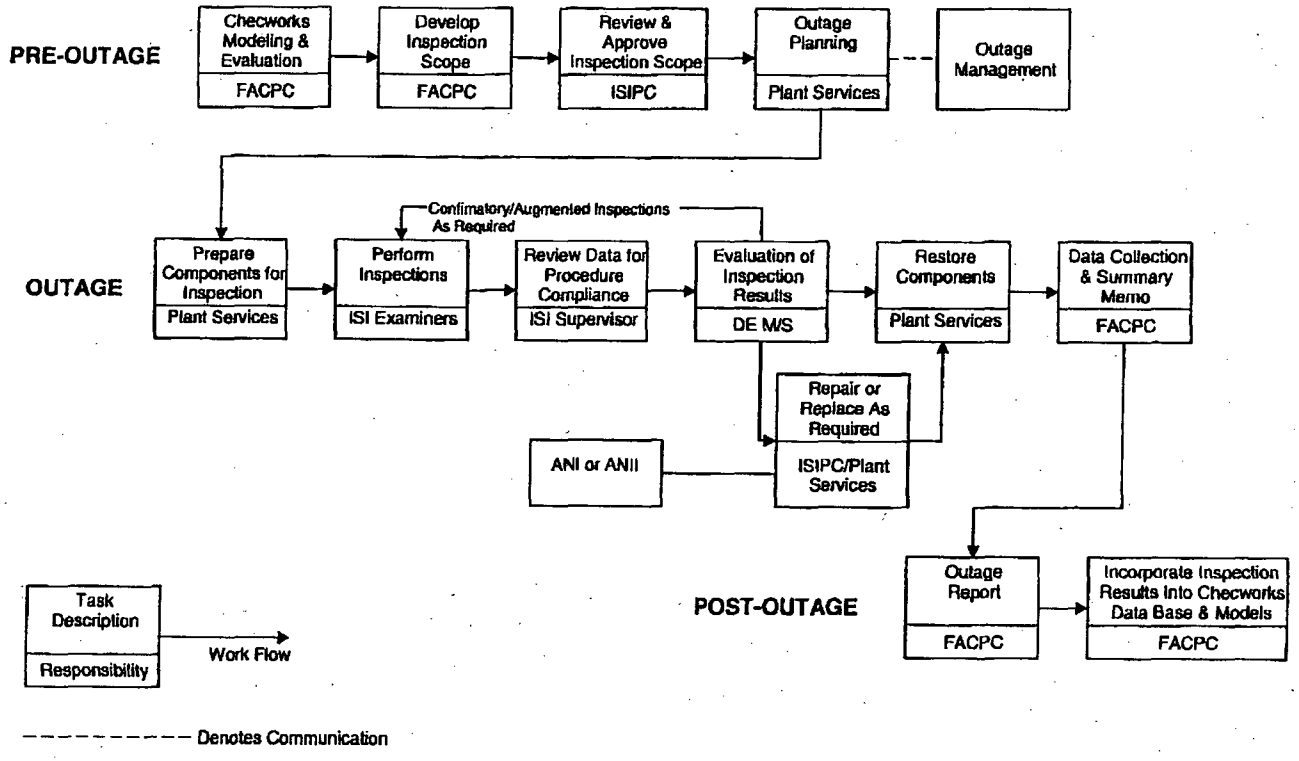


FIGURE 2

PIPING FAC INSPECTION & EVALUATION PROCESS FLOW CHART



APPENDIX A

LARGE BORE PIPING COMPONENT LOCATION SKETCHES

Notes For Component Locations Sketches

1. The Component Location Sketches contained in this Appendix are to be used only for identification and location of specific piping components which are modeled, inspected, and evaluated under this program.

2. The sketches are not to be used for design work. Refer to the Plant Drawings referenced on each Sketch.

3. The Component Location Sketches are in the form of partial piping isometric drawings. Lengths shown are approximate.

4. The piping component numbering scheme is shown on page 2 of this Appendix.

Piping Component Numbering Scheme

Each large bore piping component (elbow, valve, reducer, straight run, etc.) has been given an 8 or 10 character identification number based on the following convention:

Component I.D. Number : **F D 0 1 S P 0 1** (Sample)

System Identification

Line Number from Flow Diagrams (See Note 1)

Component Identification by type

Component number on this line by component type, generally in sequence, and in the direction of flow (Note 2)

System Identification:	FD	Feedwater
	CD	CONDENSATE
	MS	Main Steam
	HD	Heater Drains
	ES	Extraction Steam
	CU	Reactor Water Cleanup
	CAR	Turbine Cross-around Piping
	HV	Feedwater Heater Vent Piping
	MD(MSD)	Main Steam Drain Piping
	HH	House Heating Steam

Component Type:	SP	Straight Pipe
	EL	ELBOW
	VA	Valve
	TE	Tee
	RD	Reducer
	OR	Orifice
	FE	Flow Element
	BL	Bellows

Notes on Numbering Scheme:

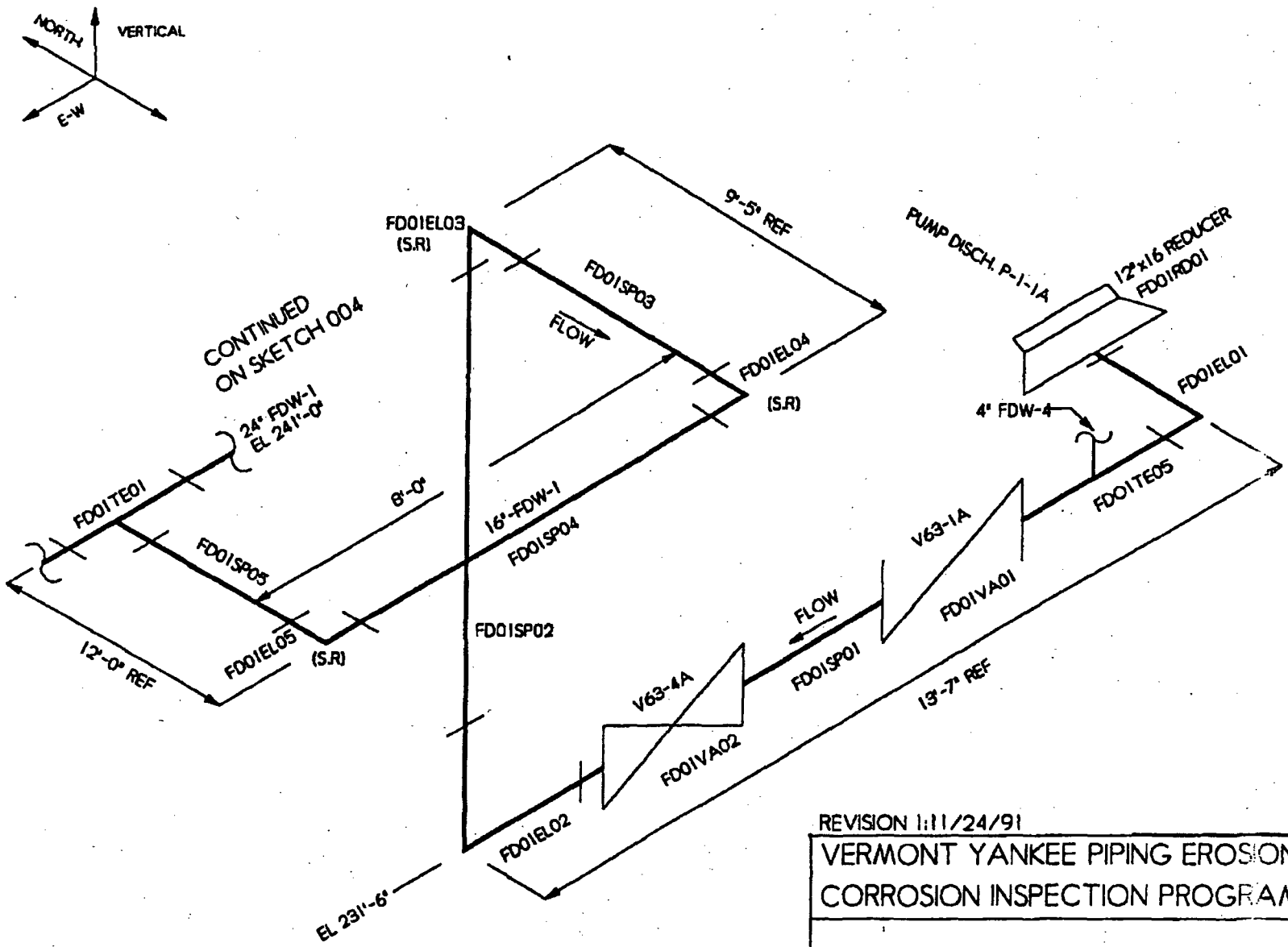
1. At the time this numbering system was developed, the original data logging equipment had an 8 character limitation. Piping systems with multiple trains are numbered 1A, 2A, 3A, etc. For multiple trains with line numbers 10 and above, (10A, 10B, 10C, etc.) components are generally identified in order by train (line 10A, 10B, 10C, etc.) in the direction of fluid flow.

2. Straight pipe segments longer than about 15 diameters in length have subsequently been modeled as two distinct piping locations. The same first 8 characters are used with the addition of "US" for the upstream end of the pipe run and "DS" for the down stream end of the pipe run. (Example: "FD01SP01US")

SKETCH No.	TITLE	REVISION
001	FEEDWATER LINE 16" FDW-1	1
002	FEEDWATER LINE 16" FDW-2	1
003	FEEDWATER LINE 16" FDW-3	1
004	FEEDWATER HEADER 24" FDW-1	1
005	FEEDWATER LINE 18" FDW-7	1
006	FEEDWATER LINE 18" FDW-7 (CONT)	2
007	FEEDWATER LINE 18" FDW-12	1
008	FEEDWATER LINE 16"-FDW-14	1
009	FEEDWATER LINES 16" FDW-14 & 16	1
010	FEEDWATER LINES 10"-FDW-19 & -21	1
011	FEEDWATER LINE 18"-FDW-8	1
012	FEEDWATER LINE 18" FDW-8 (CONT)	2
013	FEEDWATER LINE 18" FDW-13	2
014	FEEDWATER LINE 16"-FDW-15	1
015	FEEDWATER LINES 16" FDW-15 & 17	1
016	FEEDWATER LINES 10"-FDW-18 & 20	1
017	FEEDWATER LINE 4"-FDW-4	1
018	FEEDWATER LINE 4"-FDW-5	1
019	FEEDWATER LINE 4"-FDW-6	1
020	FEEDWATER LINES 6"-FDW-9 & 18" FDW-10	1
021	FEEDWATER LINES 18"-FDW-10 & 10" FDW-11	1
022	FEEDWATER LINES 8"-FDW-22A & 10" FDW-23A	2
023	FEEDWATER LINES 8"-FDW-22B & 10" FDW-23B	1
024	CONDENSATE LINES 20"-C1 & C2, 36"-C-3, 24"-C4, AND 24"-C5	0
025	CONDENSATE LINES 18"-C-6,7,8, 24"-C-8, 12"-C-9,10,11	0
026	CONDENSATE LINES 12"-C-13,14,15, 24"-C-15 AND 24"-C-16	0
027	CONDENSATE HEADER TO DEMINS.	0
028	CONDENSATE LINE 24"-CD-3 & 24"-C-18	0
029	CONDENSATE LINE 24"-C-18 & 20"-C-19	0
030	CONDENSATE LINE 20"-C-25	1
031	CONDENSATE LINE 20"-C-26	0
032	CONDENSATE LINE 20"-C-27	0
033	CONDENSATE LINE 20"-C-28	0
034	CONDENSATE LINE 20"-C-29	1
035	CONDENSATE LINE 20"-C-30	1
036	CONDENSATE LINE 24"-C-30	0
037	CONDENSATE LINE 20"-C-30 (CONTINUED)	0
038	CONDENSATE LINE 20"-C-31	0
039	CONDENSATE LINE 20"-C-32	0
040	CONDENSATE LINE 14"-C-21	1
041	CONDENSATE LINES 14"-C-21, 10"-C-21& 10"-C-22	0
042	CONDENSATE LINE 12"-C-23	0
043	HEATER DRAIN LINES 6"-HD-1A & 6"-HD-2A	1
044	HEATER DRAIN LINES 10"-HD-3A & 10"-HD-4A	2
045	HEATER DRAIN LINES 14"-HD-5A & 14"-HD-6A	1
046	HEATER DRAIN LINES 16"-HD-7A & 20"-HD-25A	1

SKETCH No.	TITLE	REVISION
047	HEATER DRAIN LINES 16"-HD-8A, 12"-HD-9A, & 18"-HD-21A	1
048	HEATER DRAIN LINES 12"-HD-9A & 4"-HD-10A	1
049	HEATER DRAIN LINES 20"-HD-14A, 16"-HD-14A, AND & 24"-HD-17A & C	0
050	HEATER DRAIN LINES 6"-HD-1B & 6"-HD-2B	1
051	HEATER DRAIN LINES 10"-HD-3B & 10"-HD-4B	2
052	HEATER DRAIN LINE 14"-HD-5B & 14"-HD-6B	1
053	HEATER DRAIN LINES 16"-HD-7B & 20"-HD-25B	2
054	HEATER DRAIN LINES 16"-HD-8B, 12"-HD-9B, & 18"-HD-21B	
055	HEATER DRAIN LINES 12"-HD-9B & 4"-HD-10B	1
056	HEATER DRAIN LINES 20"-HD-14B, 16"-HD-14B, AND 24"-HD-17B & D	0
057	HEATER DRAIN LINES 6"-HD-11A, 6"-HD-12A, 6", 6"-HD-13A, AND 6"-HD-16A	1
058	HEATER DRAIN LINES 6"-HD-11B, 6"-HD-12B, 6"-HD-13B AND 6"-HD-16B	1
059	HEATER DRAIN LINE 6"-HD-11C, 6"-HD-12C, 6"-HD-13C, 6"-HD-16C	2
060	HEATER DRAIN LINES 6"-HD-11D, 6"-HD-12D, 6"-HD-13D, 6"-HD-16D	1
061	HEATER DRAIN LINES 6"-HD-12A, 6"-HD-12B, AND 14"-HD-15B	2
062	HEATER DRAIN LINES 6"-HD-12C, 6"-HD-12D, AND 14"-HD-15A	1
063	EXTRACTION STEAM LINE 12"-ES-1A	1
064	EXTRACTION STEAM LINE 12"-ES-1B	1
065	EXTRACTION STEAM LINE 10"-ES-2A	1
066	EXTRACTION STEAM LINE 10"-ES-2B	1
067	EXTRACTION STEAM LINE 20"-ES-3A	2
068	EXTRACTION STEAM LINE 20"-ES-3B	2
069	EXTRACTION STEAM LINES 20"-ES-4A & 30"-ES-4A	1
070	EXTRACTION STEAM LINES 30"-ES-4B	0
071	EXTRACTION STEAM LINES 20" & 26"-ES-5A, 5B, 5C, 5D	1
072	EXTRACTION STEAM LINES 20" & 26"-ES-5E, 5F. 5G, 5H	1
073	EXTRACTION STEAM LINE 12"-ES-6	1
074	MAIN STEAM LINE 18"-MS-1A & 18"-MS-7A	0
075	MAIN STEAM LINE 18"-MS-1A (CONTINUED)	0
076	MAIN STEAM LINE 18"-MS-1B & 18"-MS-7B	0
077	MAIN STEAM LINE 18"-MS-1B (CONTINUED)	0
078	MAIN STEAM LINE 18"-MS-1C & 18"-MS-7C	0
079	MAIN STEAM LINE 18"-MS-1C (CONTINUED)	0
080	MAIN STEAM LINE 18"-MS-1D & 18"-MS-7D	0
081	MAIN STEAM LINE 18"-MS-1D (CONTINUED)	0
082	30" & 36" TURBINE CROSS AROUND PIPING, "A" LINE	0
083	30" & 36" TURBINE CROSS AROUND PIPING "B" LINE	0
084	30" & 36" TURBINE CROSS AROUND PIPING "C" LINE	0
085	30" & 36" TURBINE CROSS AROUND PIPING "D" LINE	0
086	REACTOR WATER CLEANUP 4" CUW-54 & 55	0
087	BPV 1 10"-MS-3A	0
088	BPV 2 10"-MS-3B	0

SKETCH No.	TITLE	REVISION
089	BPV 3 10"-MS-3C	0
090	BPV 4 10"-MS-3D	0
091	BPV 5 10"-MS-3E	0
092	BPV 6 10"-MS-3F	0
093	BPV 7 10"-MS-3G	0
094	BPV 8 10"-MS-3H	0
095	BPV 9 10"-MS-3I	0
096	BPV 10 10"-MS-3J	0
097	8"-MSD-9	0



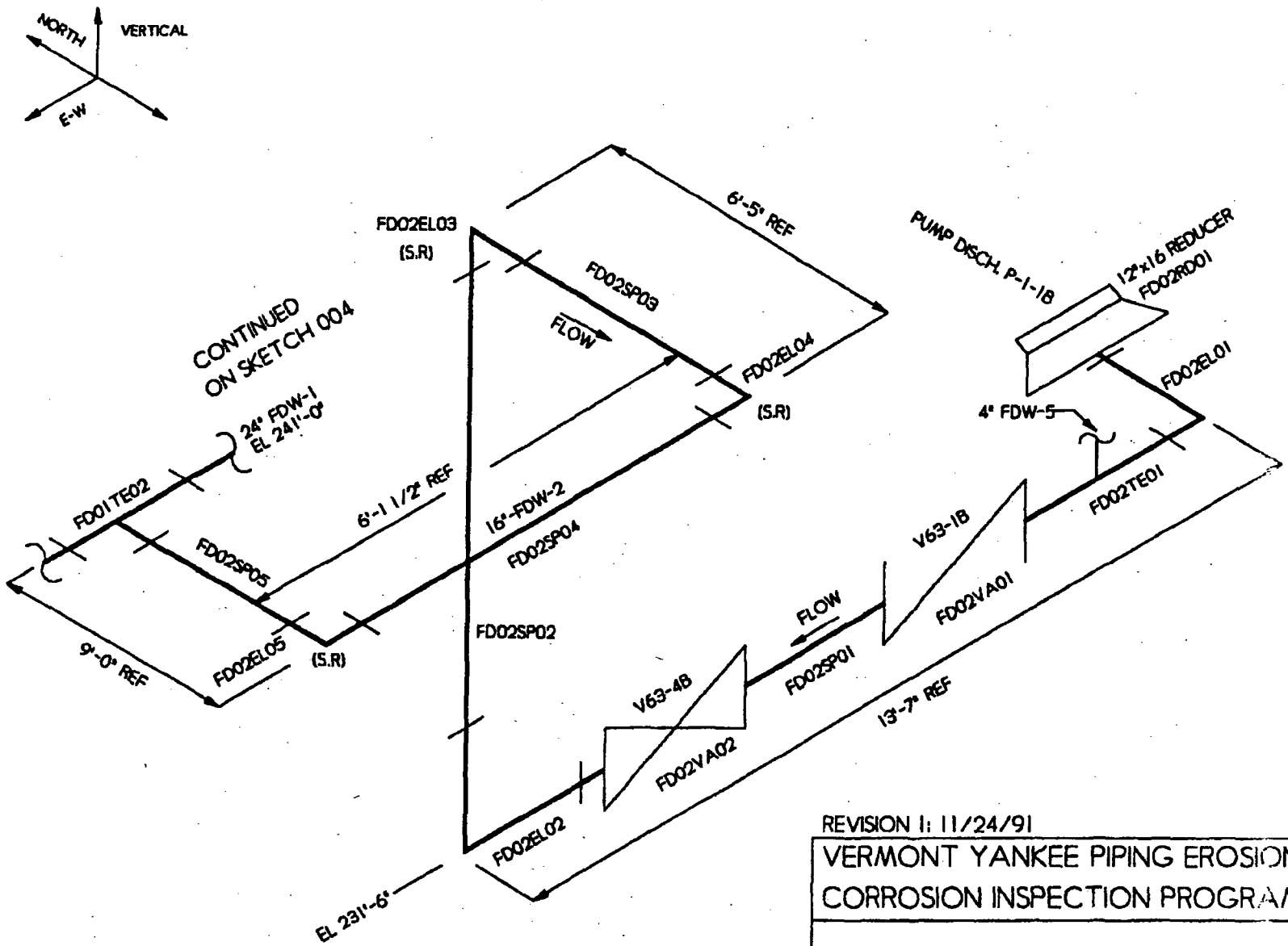
REVISION 1:11/24/91

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

FEEDWATER LINE 16" FDW-1

COMPONENT LOCATION SKETCH No.001

TURBINE BUILDING-FEEDWATER PUMP ROOM.
REFERENCES: G191157,G191182,G191183,5920-FS-124



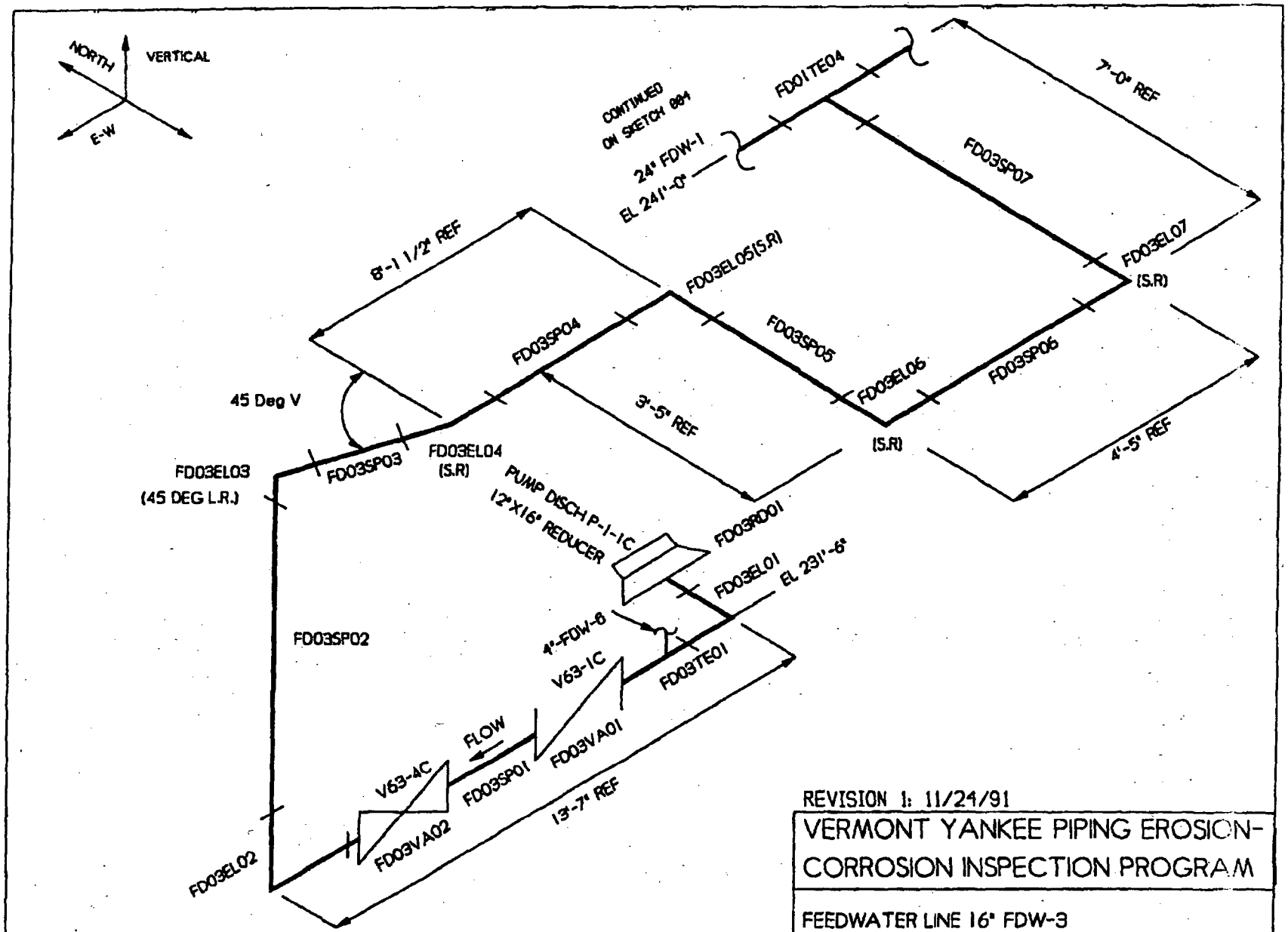
REVISION 1: 11/24/91

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

FEEDWATER LINE 16" FDW-2

COMPONENT LOCATION SKETCH No.002

TURBINE BUILDING-FEEDWATER PUMP ROOM.
REFERENCES: G191157,G191182,G191183,5920-FS-124



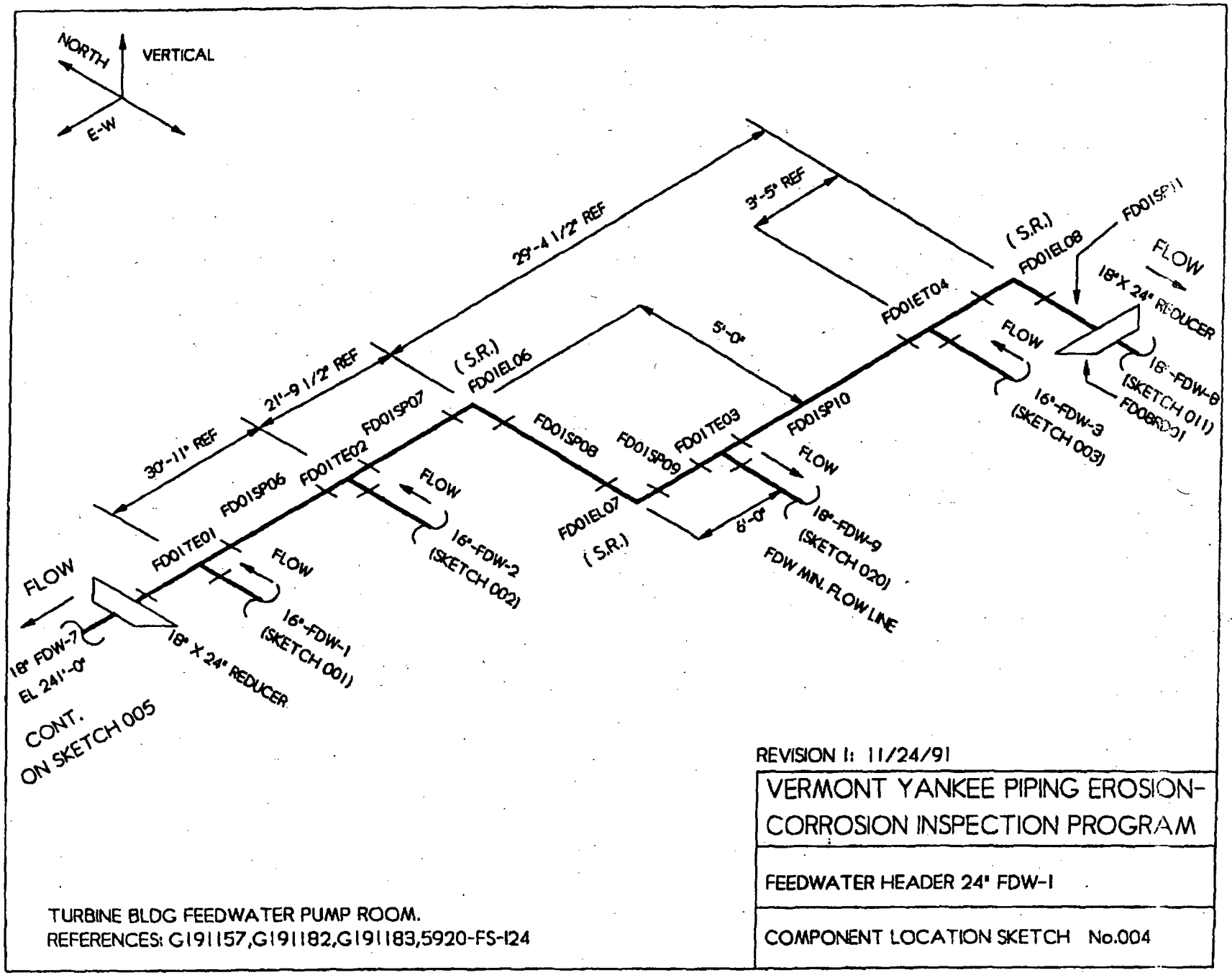
REVISION 1: 11/24/91

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

FEEDWATER LINE 16" FDW-3

COMPONENT LOCATION SKETCH No.003

TURBINE BUILDING-FEEDWATER PUMP ROOM
REFERENCES: G191157,G191182,G191183,5920-FS-124



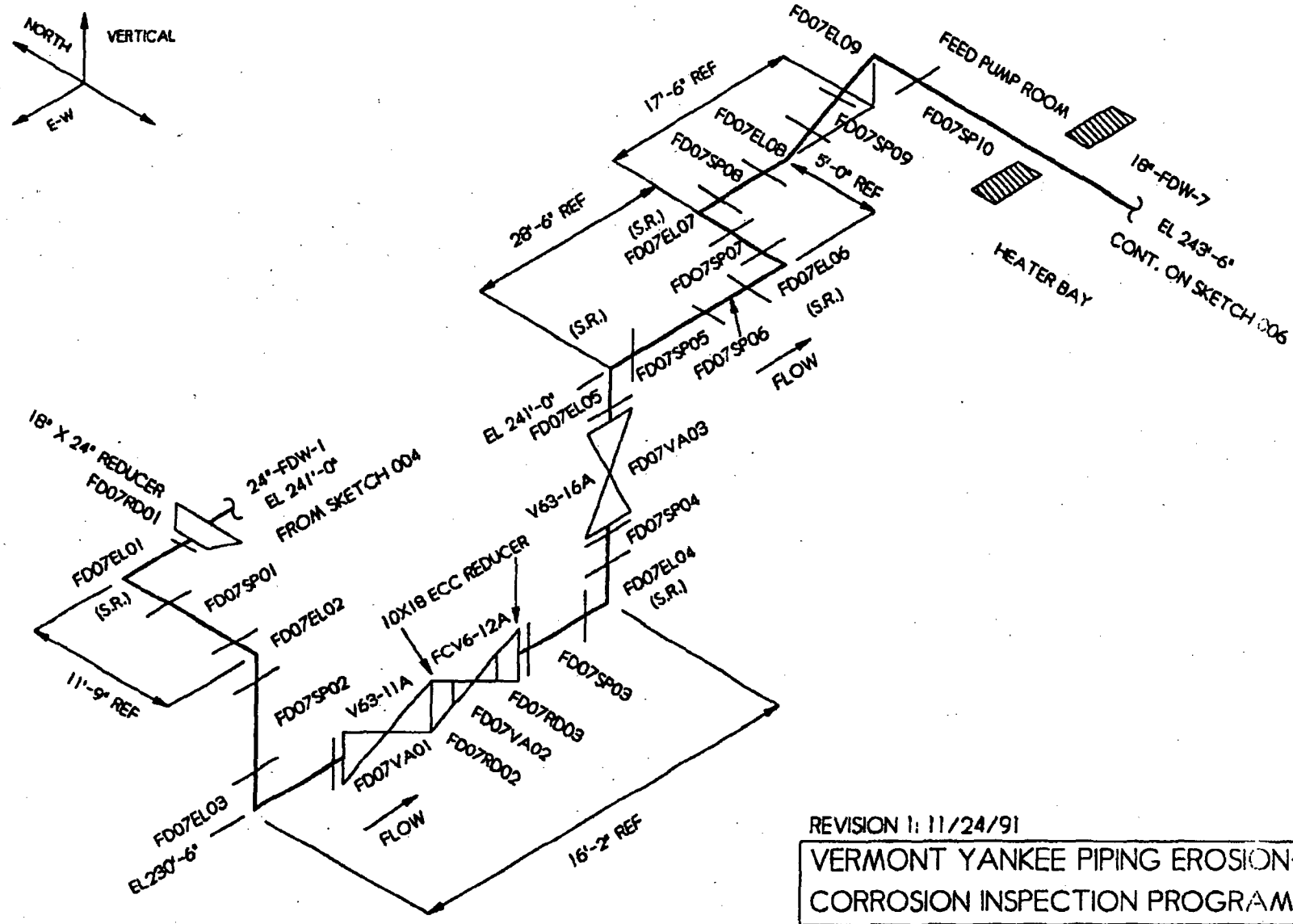
REVISION 1: 11/24/91

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

FEEDWATER HEADER 24" FDW-1

COMPONENT LOCATION SKETCH No.004

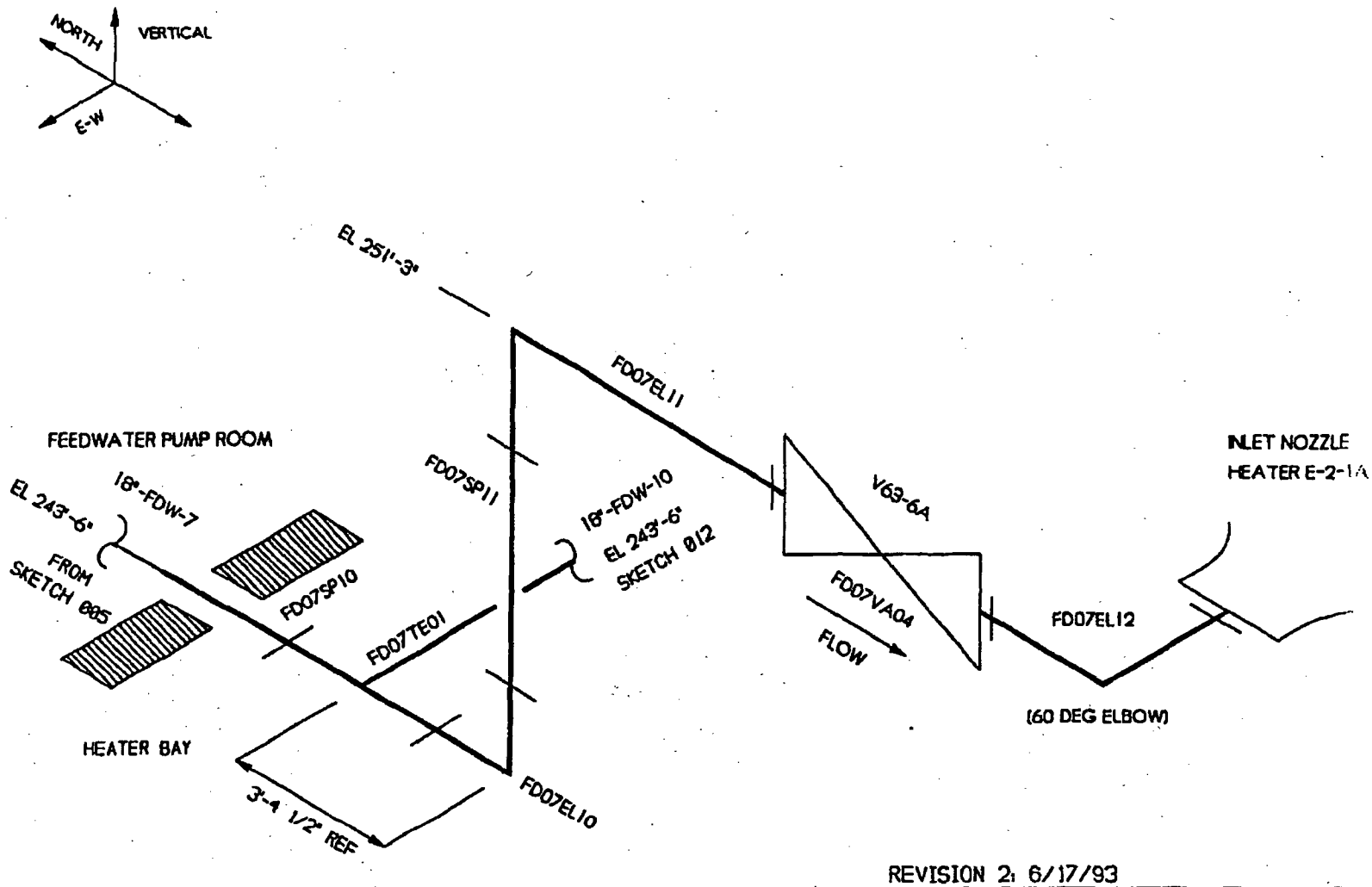
TURBINE BLDG FEEDWATER PUMP ROOM.
REFERENCES: G191157,G191182,G191183,5920-FS-124



REVISION 1: 11/24/91

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
FEEDWATER LINE 18" FDW-7
COMPONENT LOCATION SKETCH No.005

TURBINE BLDG FEED PUMP ROOM/HEATER BAY.
REFERENCES: G191157,G191182,191183,5920-FS-124



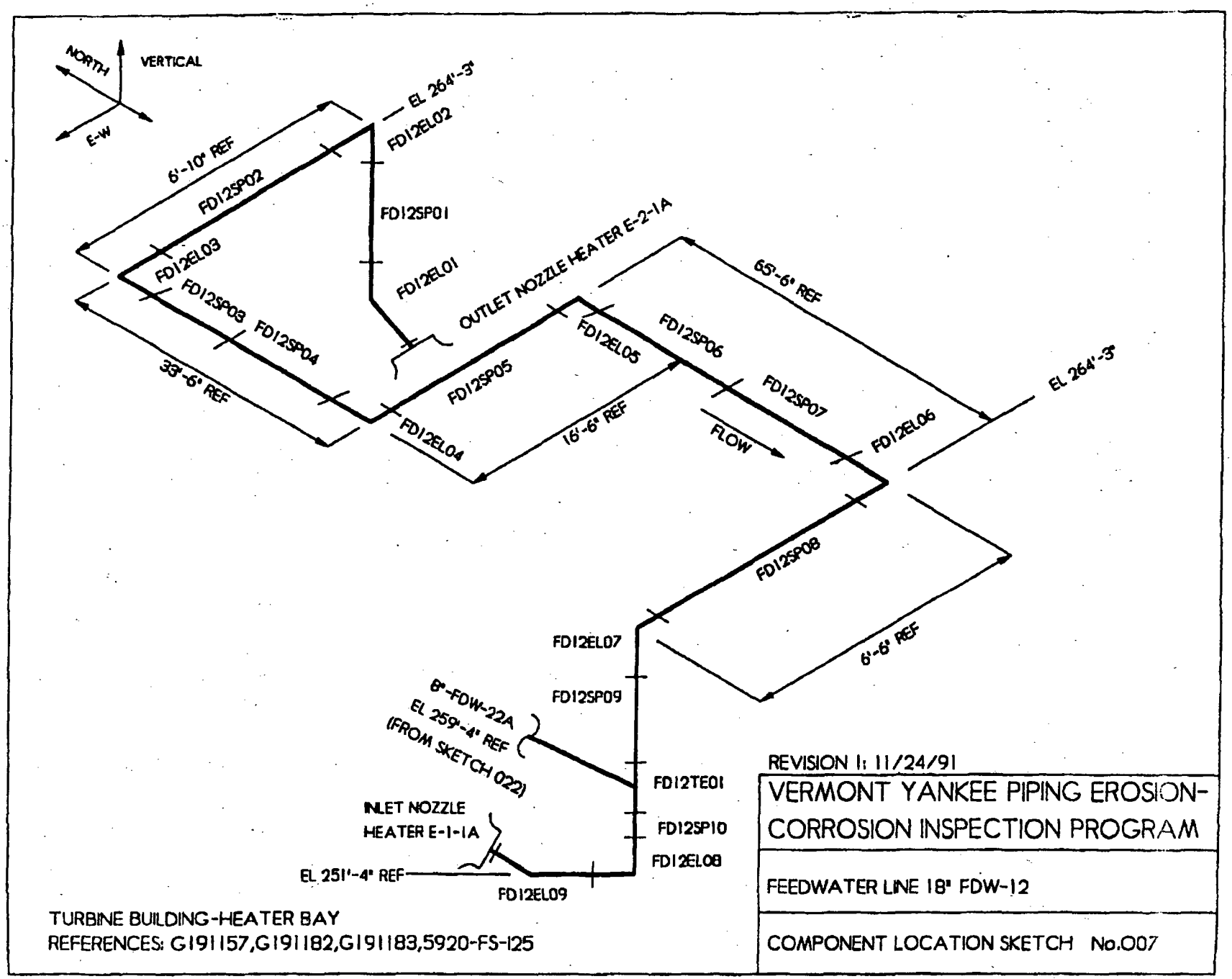
REVISION 2: 6/17/93

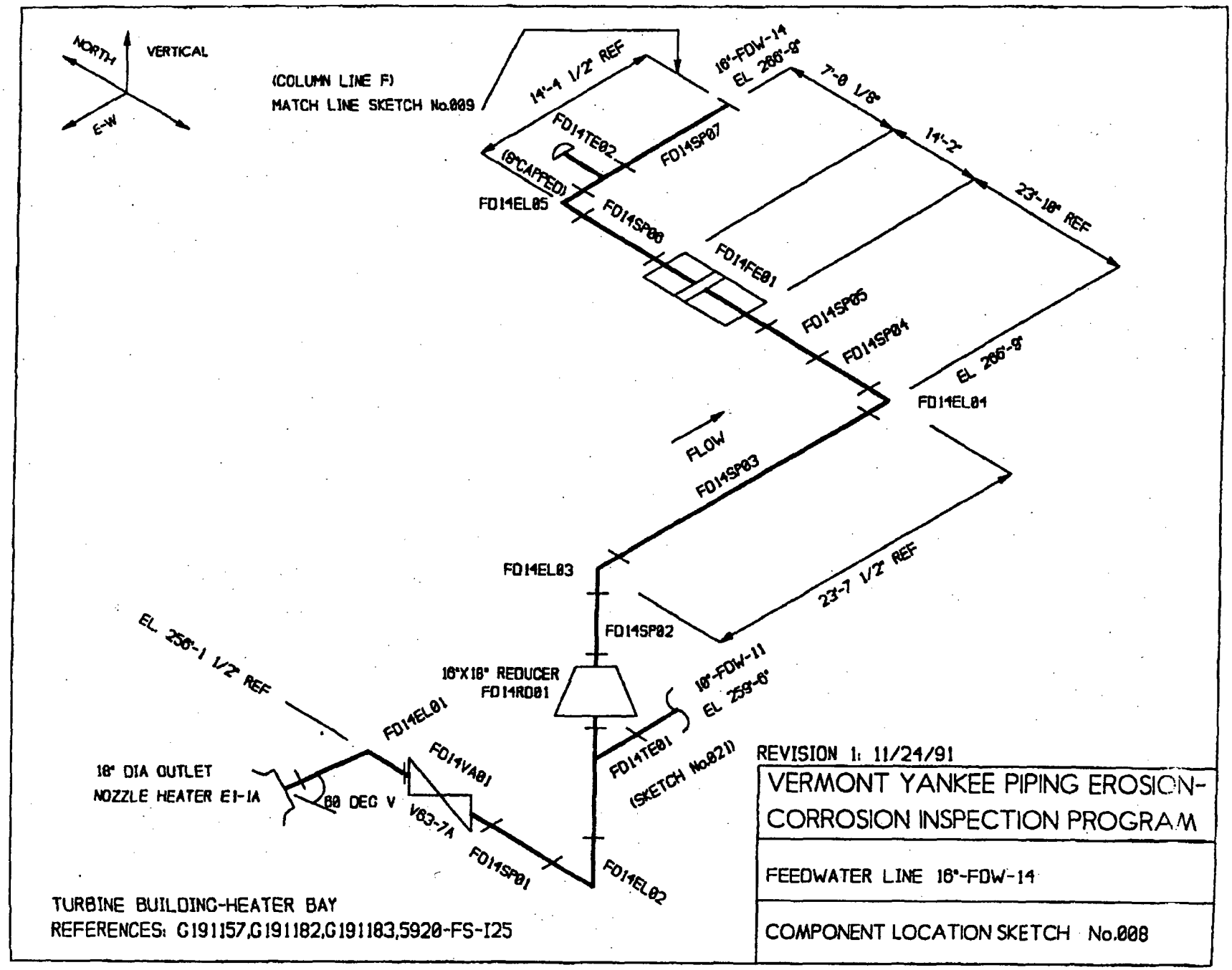
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

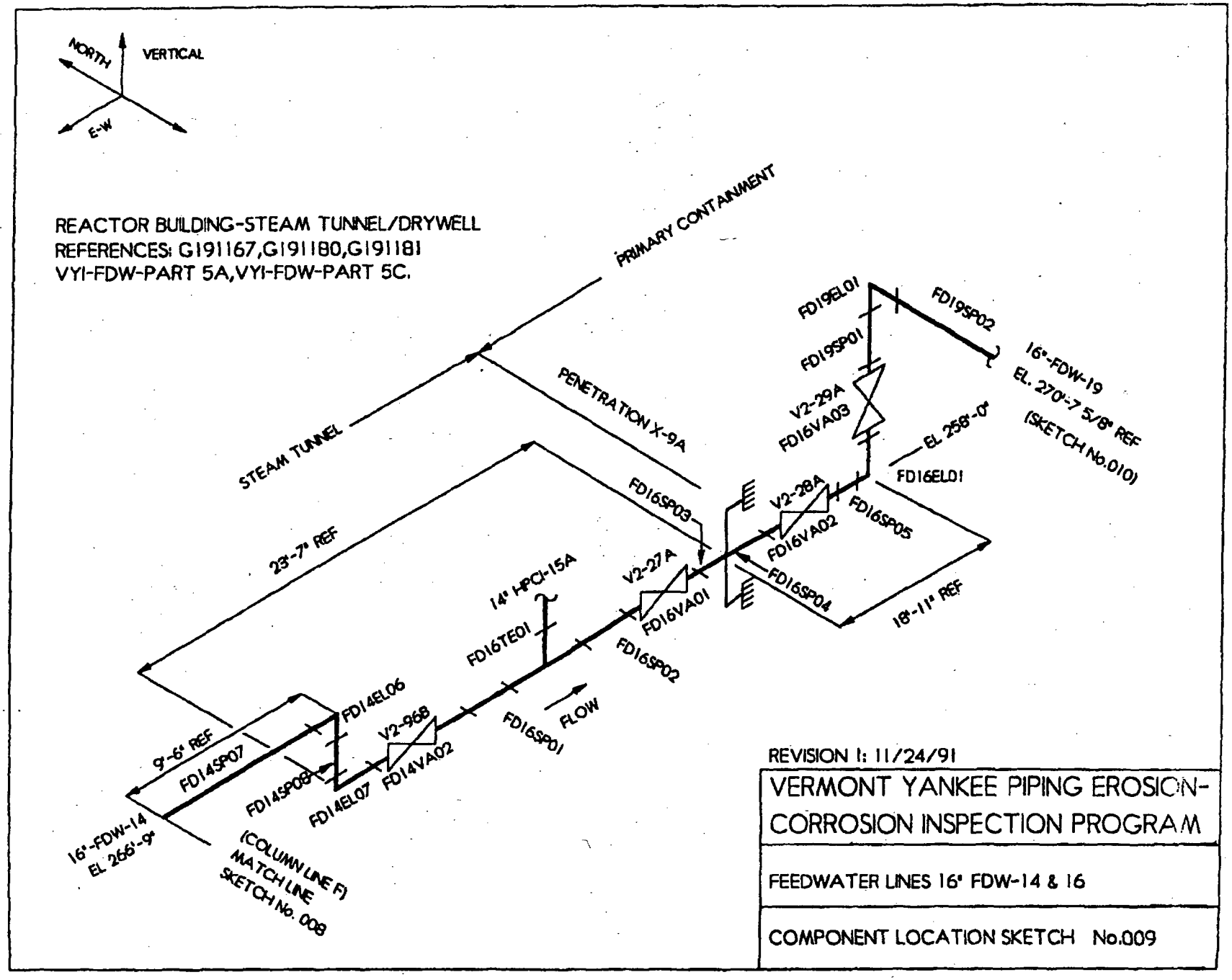
FEEDWATER LINE 18" FDW-7 (CONT)

COMPONENT LOCATION SKETCH No. 006

TURBINE BUILDING/HEATER BAY
REFERENCES: G191157,G191182,G191183,5920-FS-125


NORTH
VERTICAL
E-W
EL 264'-3"
FD12EL02
6'-10" REF
FD12SP02
FD12SP01
FD12EL03
FD12EL01
FD12SP03
FD12SP04
OUTLET NOZZLE HEATER E-2-1A
65'-6" REF
FD12EL05
FD12SP06
FD12SP05
FD12SP07
EL 264'-3"
33'-6" REF
FD12EL04
16'-6" REF
FLOW
FD12EL06
FD12SP08
FD12EL07
6'-6" REF
FD12SP09
8"-FDW-22A
EL 259'-4" REF
(FROM SKETCH 022)
FD12TE01
INLET NOZZLE
HEATER E-1-1A
FD12SP10
FD12EL08
EL 251'-4" REF
FD12EL09
TURBINE BUILDING-HEATER BAY
REFERENCES: G191157,G191182,G191183,5920-FS-125
REVISION 1: 11/24/91
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
FEEDWATER LINE 18" FDW-12
COMPONENT LOCATION SKETCH No.007


NORTH
VERTICAL
E-W
(COLUMN LINE F)
MATCH LINE SKETCH No.009
14'-4 1/2" REF
16"-FDW-14
EL 266'-9"
7'-0 1/8"
14'-2"
23'-10" REF
FD14TE02
FD14SP07
(8"CAPPED)
FD14EL05
FD14SP06
FD14FE01
FD14SP05
FD14SP04
EL 266'-9"
FD14EL04
FLOW
FD14SP03
FD14EL03
23'-7 1/2" REF
FD14SP02
EL 256'-1 1/2" REF
16"X18" REDUCER
FD14RD01
18"-FDW-11
EL 259'-6"
FD14EL01
FD14VA01
FD14TE01
(SKETCH No.021)
18" DIA OUTLET
NOZZLE HEATER E1-1A
60 DEG V
V63-7A
FD14SP01
FD14EL02
TURBINE BUILDING-HEATER BAY
REFERENCES: G191157,G191182,G191183,5920-FS-I25
REVISION 1: 11/24/91
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
FEEDWATER LINE 16"-FDW-14
COMPONENT LOCATION SKETCH No.008

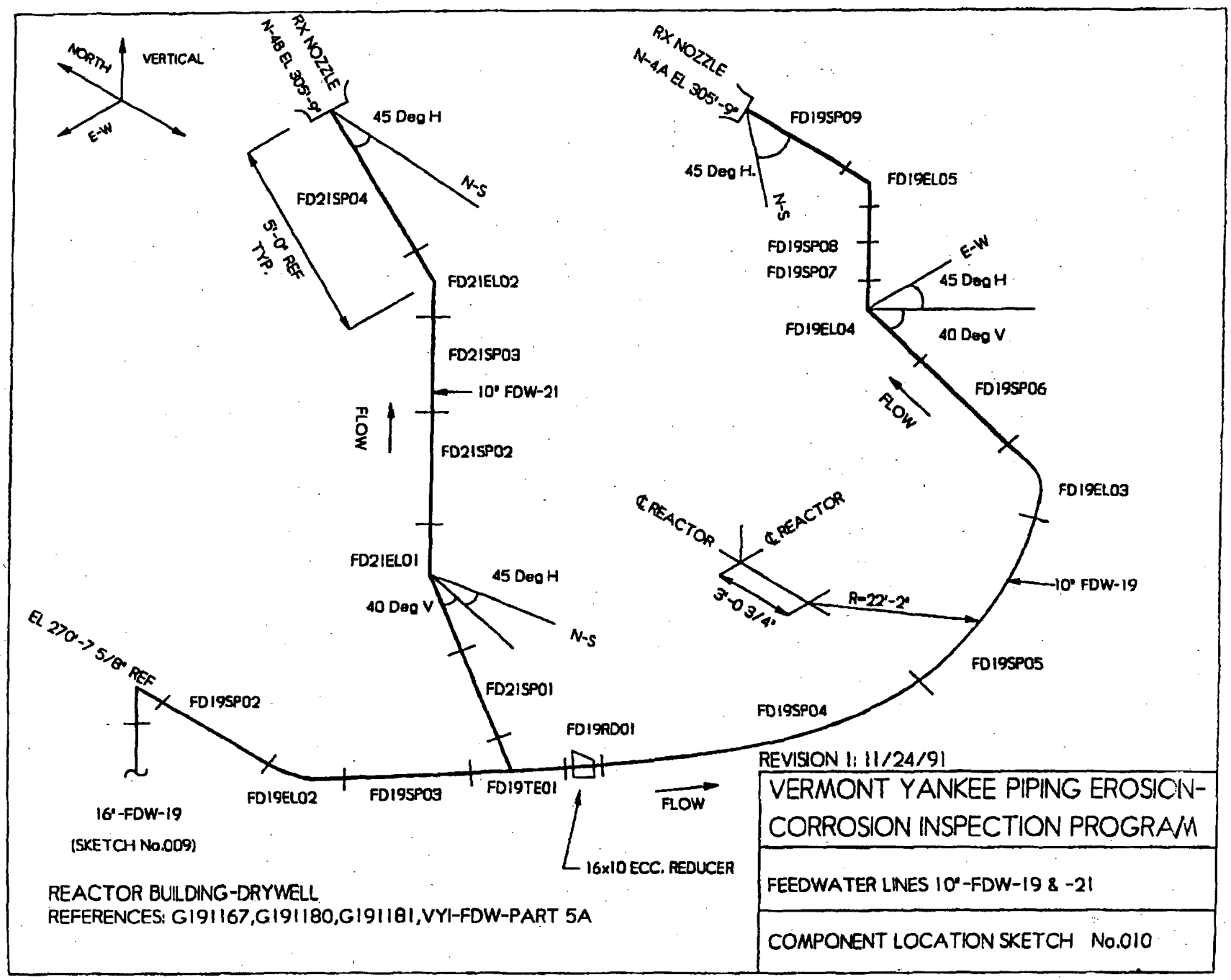


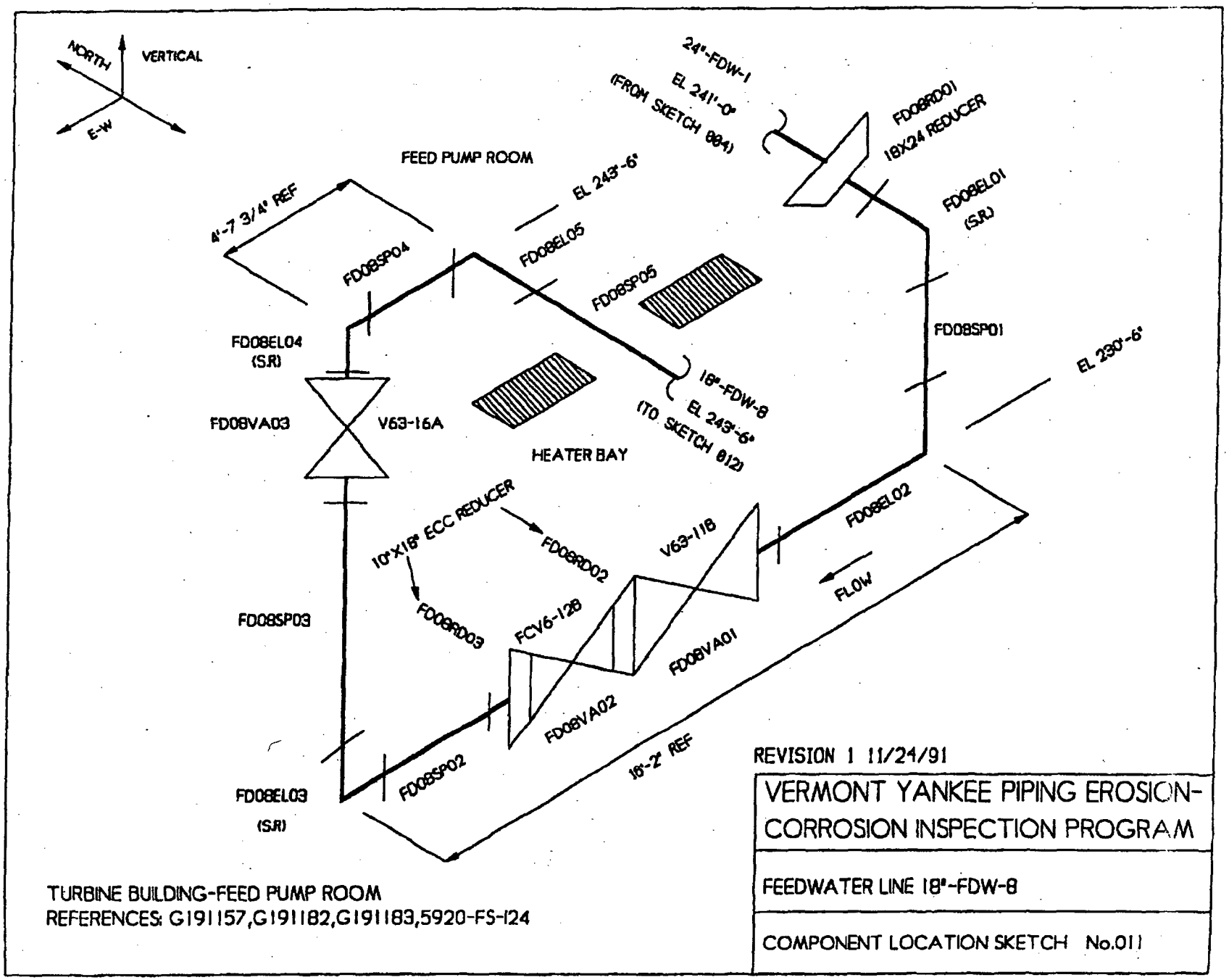
REVISION 1: 11/24/91

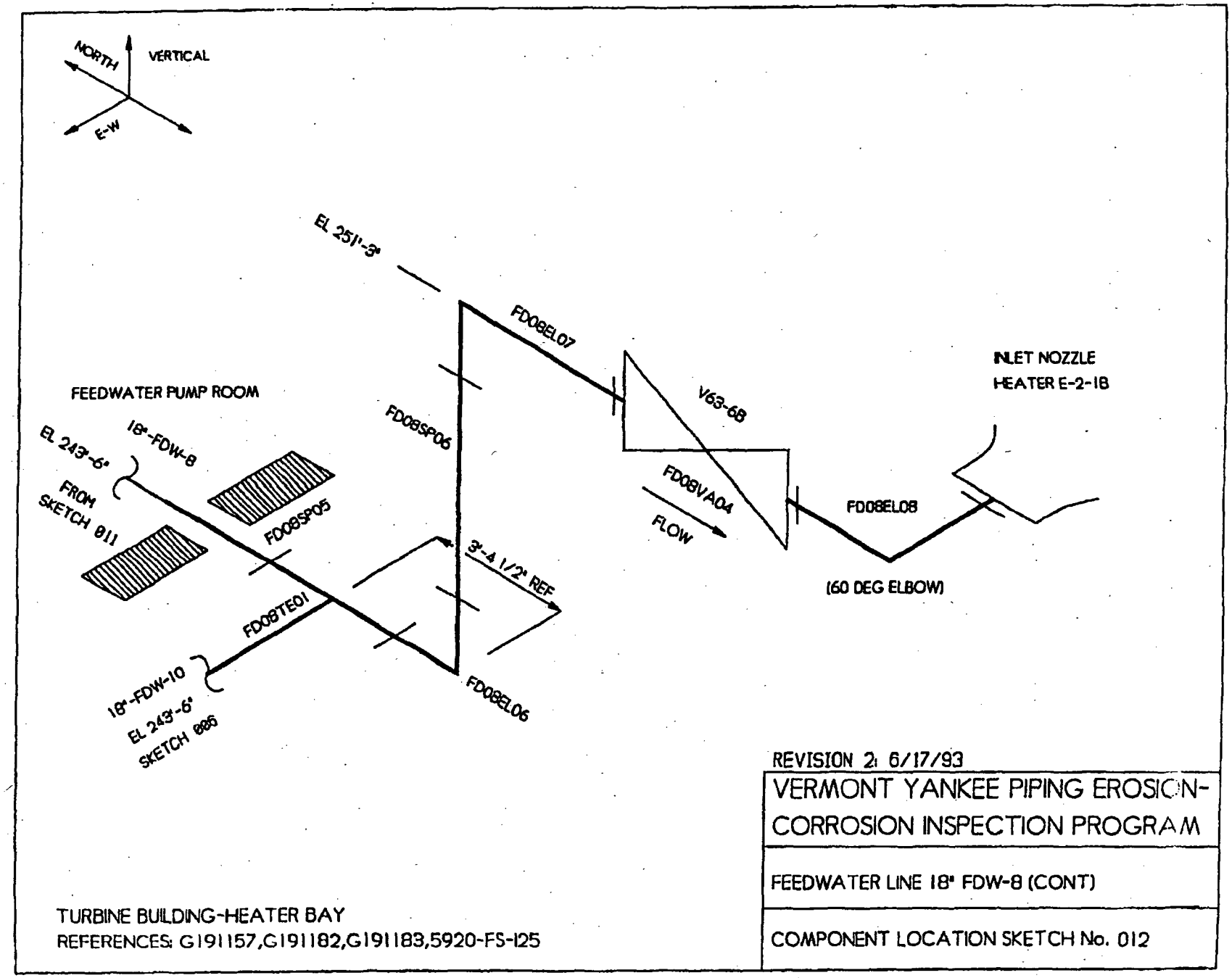
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

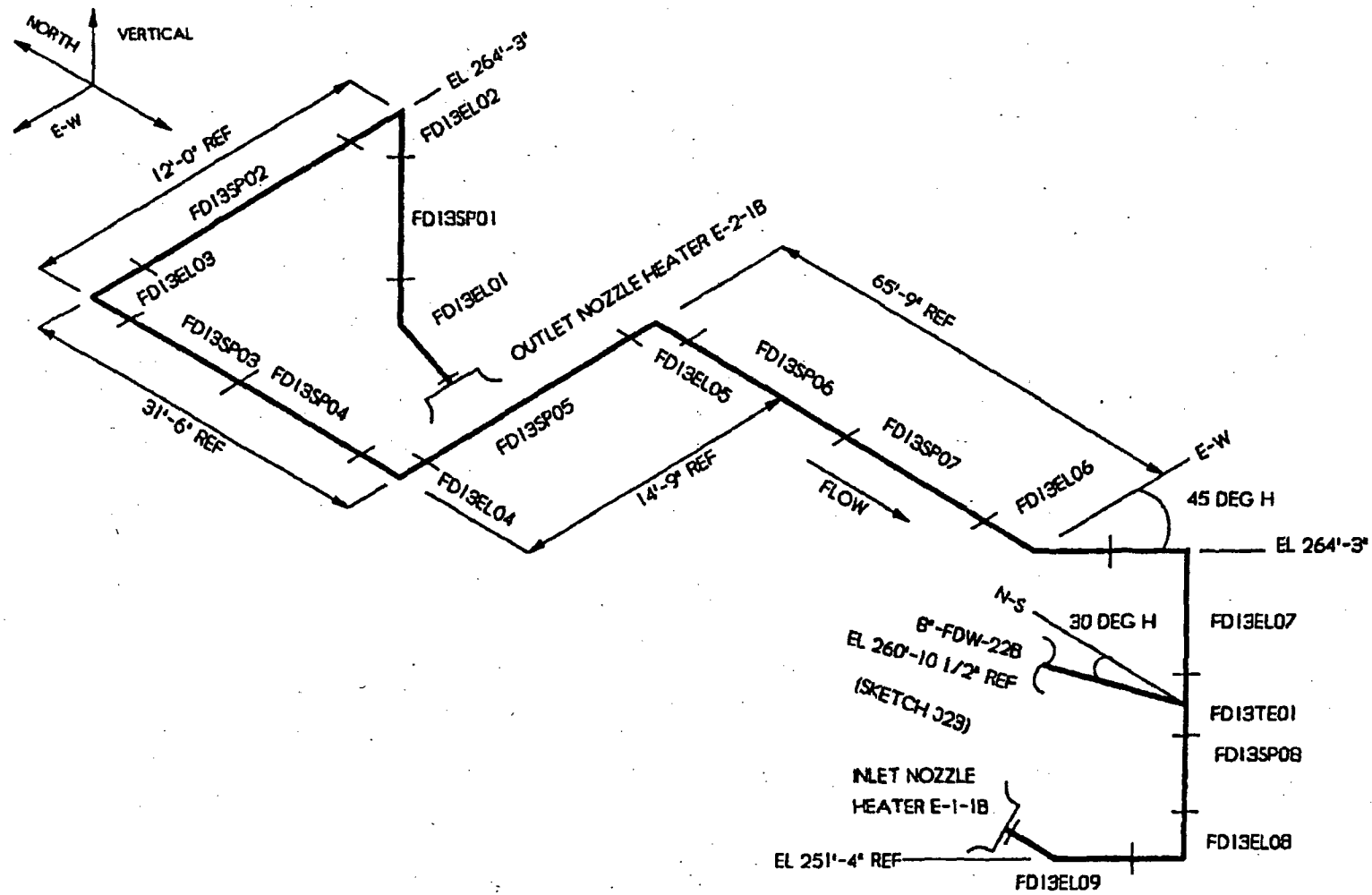
FEEDWATER LINES 16" FDW-14 & 16

COMPONENT LOCATION SKETCH No.009


NORTH
VERTICAL
E-W
RX NOZZLE
N-4B EL 305'-9"
45 Deg H
N-S
FD21SP04
5'-0" REF
TYP.
FD21EL02
FD21SP03
10" FDW-21
FLOW
FD21SP02
FD21EL01
45 Deg H
40 Deg V
N-S
FD21SP01
EL 270'-7 5/8" REF
FD19SP02
FD19EL02
FD19SP03
FD19TE01
FD19RD01
16"-FDW-19
(SKETCH No.009)
16x10 ECC. REDUCER
FLOW
RX NOZZLE
N-4A EL 305'-9"
FD19SP09
45 Deg H.
N-S
FD19EL05
FD19SP08
FD19SP07
E-W
45 Deg H
FD19EL04
40 Deg V
FD19SP06
FLOW
FD19EL03
℄ REACTOR
℄ REACTOR
3'-0 3/4"
R=22'-2"
10" FDW-19
FD19SP05
FD19SP04
REVISION 1: 11/24/91
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
FEEDWATER LINES 10"-FDW-19 & -21
COMPONENT LOCATION SKETCH No.010
REACTOR BUILDING-DRYWELL
REFERENCES: G191167,G191180,G191181,VYI-FDW-PART 5A


NORTH
VERTICAL
E-W
24"-FDW-1
EL 241'-0"
(FROM SKETCH 084)
FD08RD01
18X24 REDUCER
FEED PUMP ROOM
EL 243'-6"
4'-7 3/4" REF
FD08EL01
(S.R.)
FD08SP04
FD08EL05
FD08SP05
FD08SP01
FD08EL04
(S.R)
EL 230'-6"
18"-FDW-8
EL 243'-6"
(TO SKETCH 812)
FD08VA03
V63-16A
HEATER BAY
10"X18" ECC REDUCER
FD08RD02
V63-118
FD08EL02
FLOW
FD08SP03
FD08RD03
FCV6-128
FD08VA01
FD08VA02
16'-2" REF
FD08SP02
FD08EL03
(S.R)
REVISION 1 11/24/91
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
FEEDWATER LINE 18"-FDW-8
COMPONENT LOCATION SKETCH No.011
TURBINE BUILDING-FEED PUMP ROOM
REFERENCES: G191157,G191182,G191183,5920-FS-124

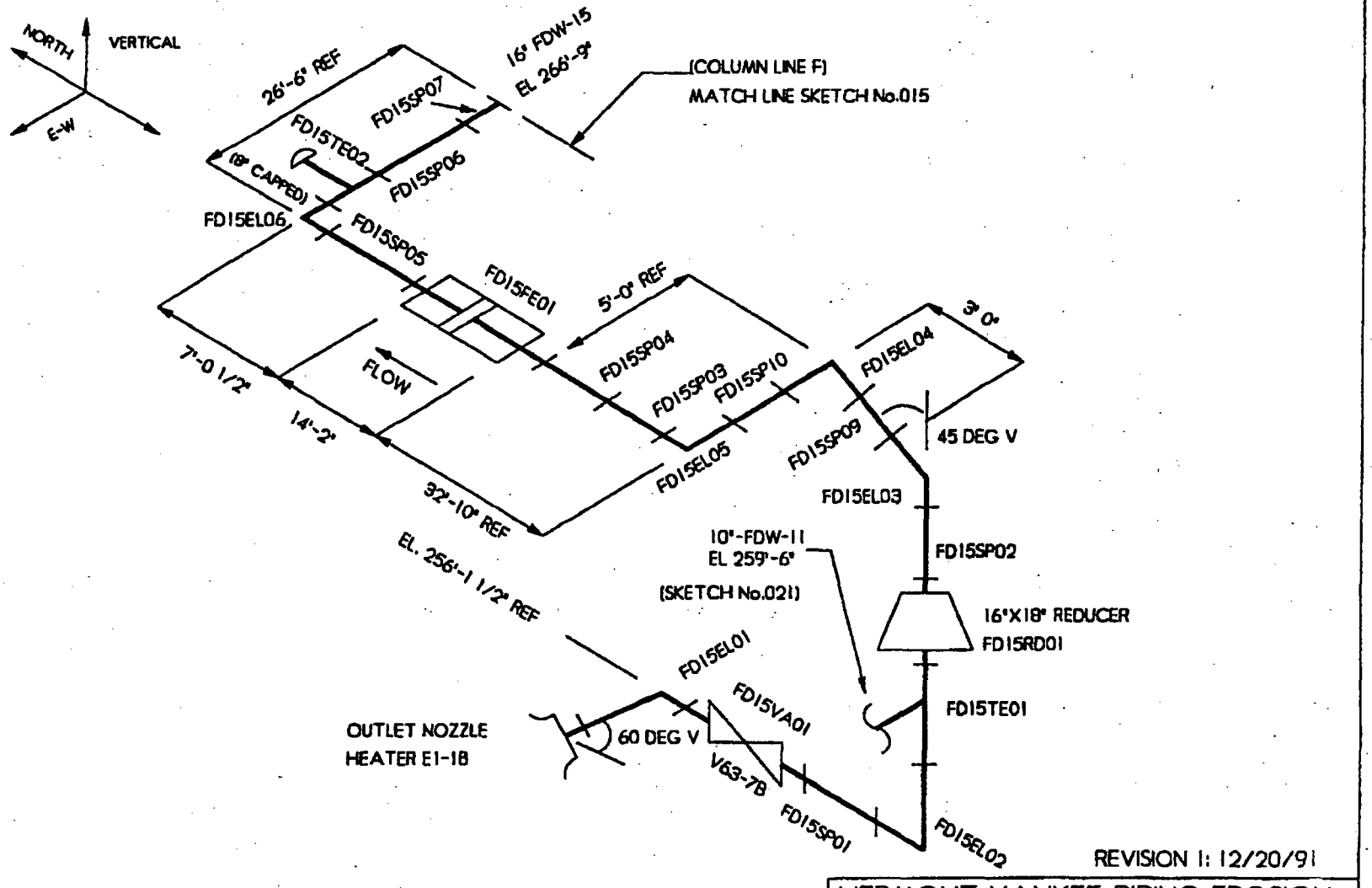

NORTH
VERTICAL
E-W
EL 251'-3"
FD08EL07
V63-68
INLET NOZZLE
HEATER E-2-1B
FEEDWATER PUMP ROOM
FD08SP06
18"-FDW-8
EL 243'-6"
FROM
SKETCH 011
FD08SP05
FD08VA04
FLOW
FD08EL08
3'-4 1/2" REF
(60 DEG ELBOW)
FD08TE01
18"-FDW-10
EL 243'-6"
SKETCH 006
FD08EL06
REVISION 2: 6/17/93
VERMONT YANKEE PIPING EROSION-
CORROSION INSPECTION PROGRAM
FEEDWATER LINE 18" FDW-8 (CONT)
COMPONENT LOCATION SKETCH No. 012
TURBINE BUILDING-HEATER BAY
REFERENCES: G191157,G191182,G191183,5920-FS-125

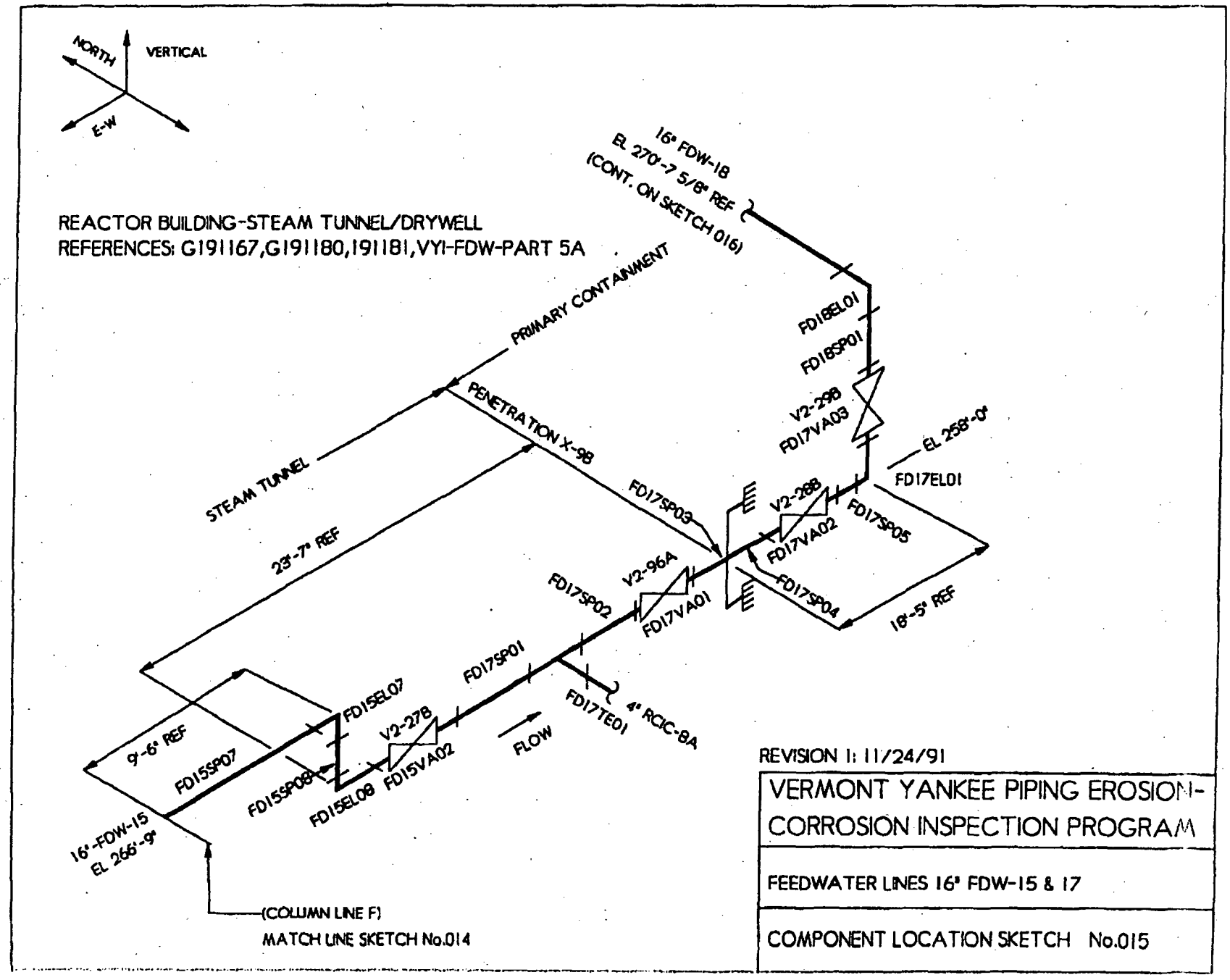


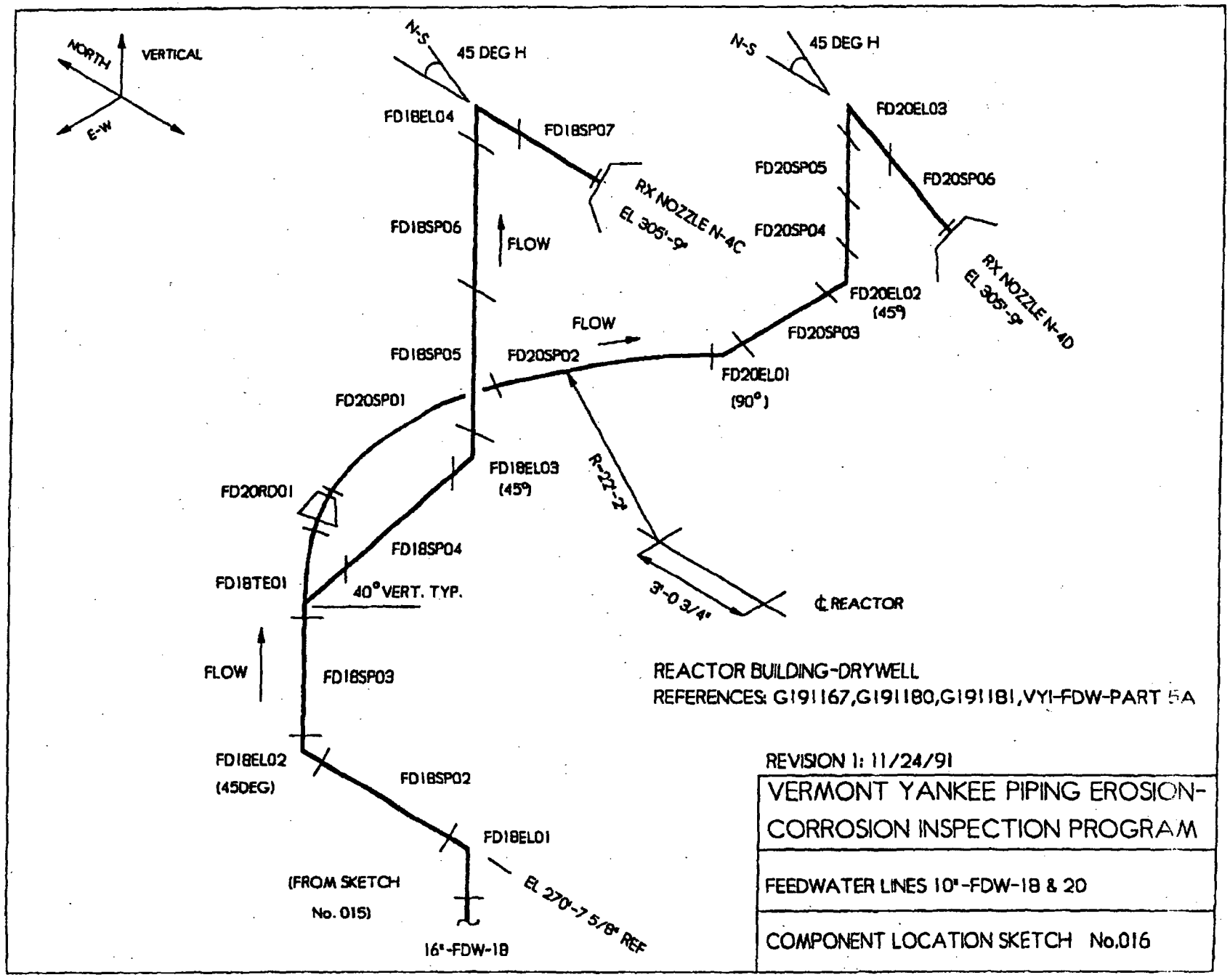
REVISION 2: 6/17/93

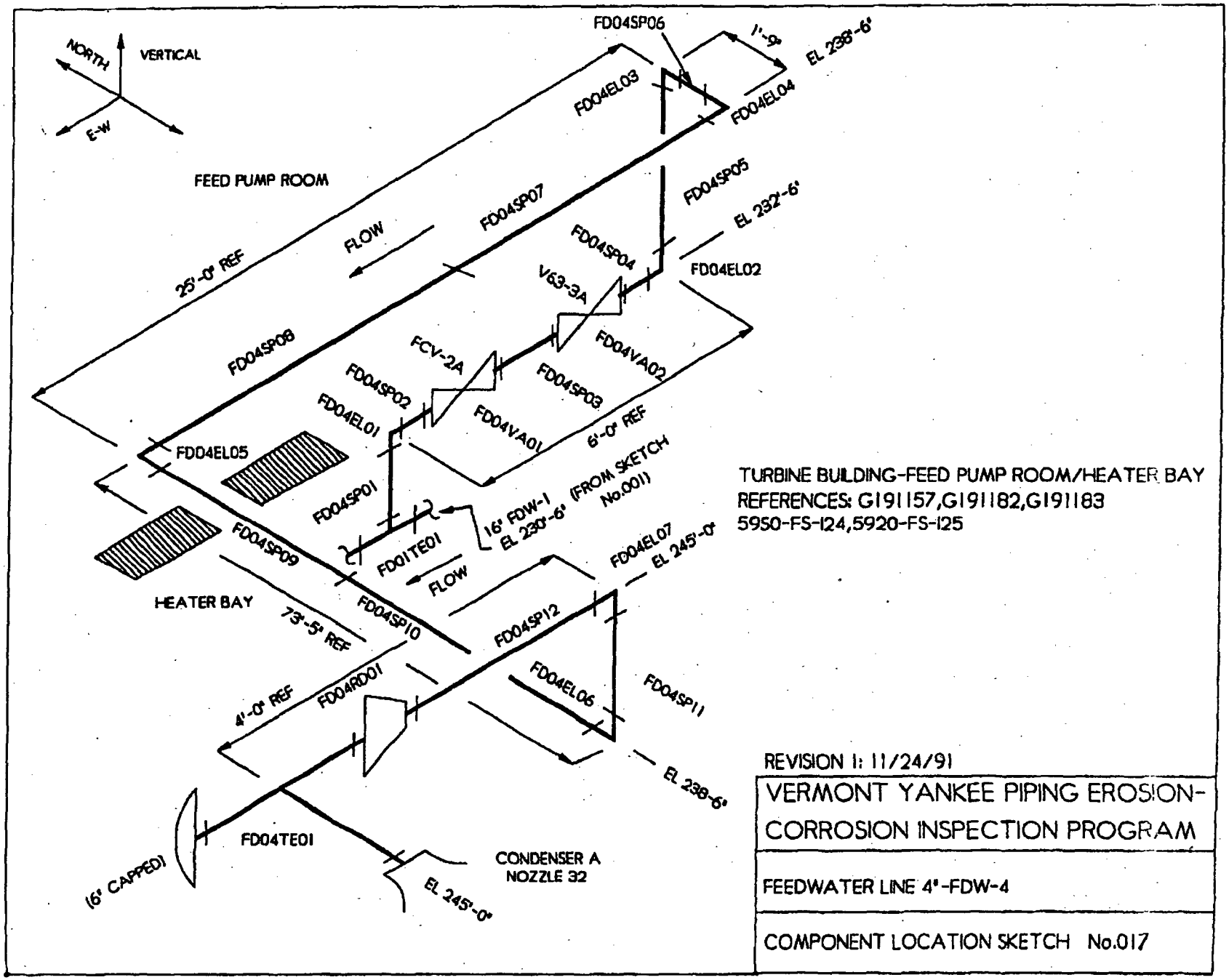
TURBINE BUILDING-HEATER BAY
REFERENCES: G191157,G191182,G191183,5920-FS-125

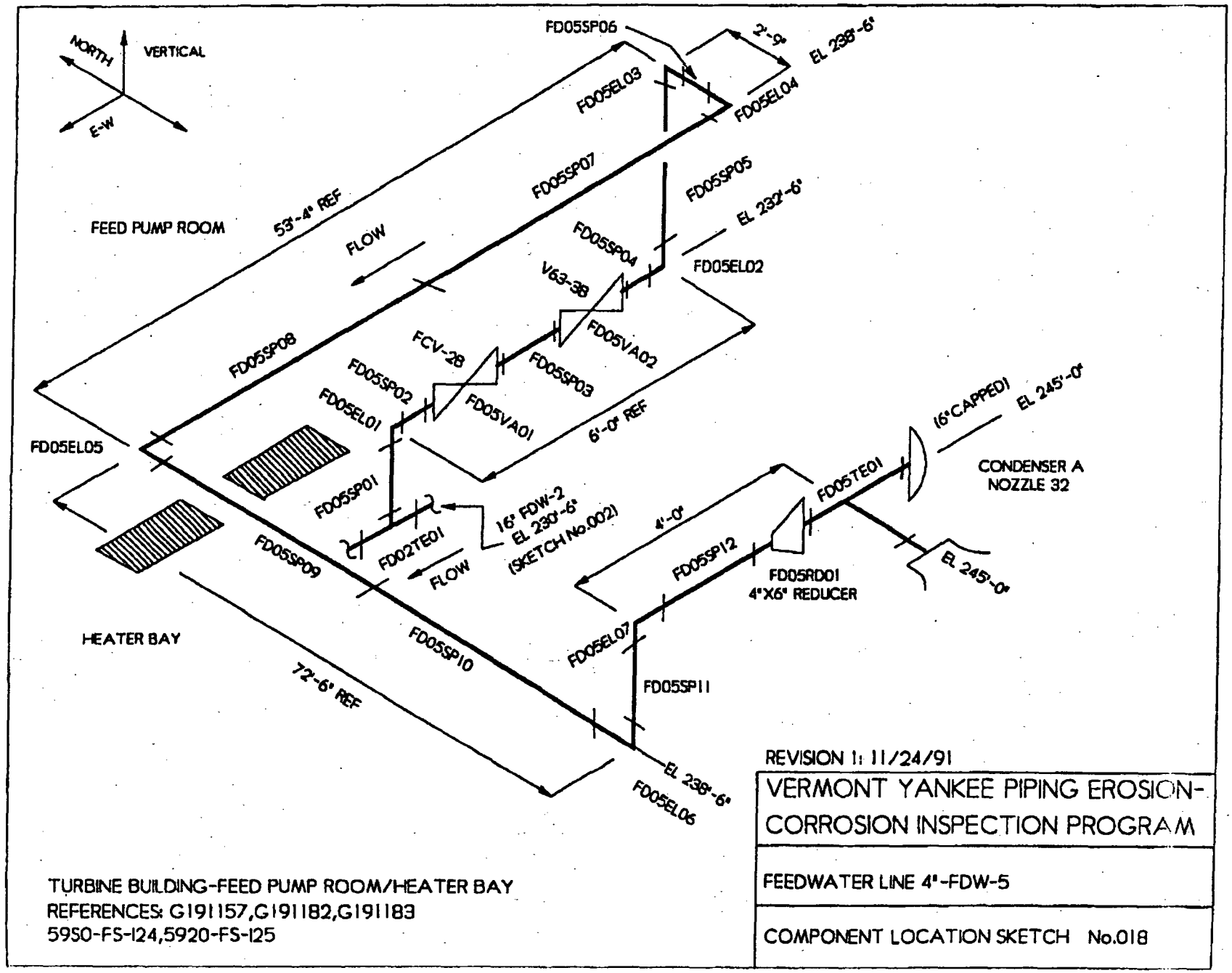
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
FEEDWATER LINE 18" FDW-13
COMPONENT LOCATION SKETCH No.013


NORTH
VERTICAL
E-W
26'-6" REF
16" FDW-15
EL 266'-9"
(COLUMN LINE F)
MATCH LINE SKETCH No.015
FD15SP07
FD15TE02
FD15SP06
(18" CAPPED)
FD15EL06
FD15SP05
FD15FE01
5'-0" REF
3'-0"
FD15EL04
7'-0 1/2"
FLOW
14'-2"
FD15SP04
FD15SP03
FD15SP10
FD15SP09
45 DEG V
FD15EL05
FD15EL03
32'-10" REF
10"-FDW-11
EL 259'-6"
(SKETCH No.021)
FD15SP02
EL. 256'-1 1/2" REF
16"X18" REDUCER
FD15RD01
FD15EL01
FD15VA01
FD15TE01
OUTLET NOZZLE
HEATER E1-18
60 DEG V
V63-7B
FD15SP01
FD15EL02
REVISION 1: 12/20/91
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
FEEDWATER LINE 16"-FDW-15
COMPONENT LOCATION SKETCH No.014
TURBINE BUILDING-HEATER BAY
REFERENCES: G191157,G191182,G191183,5920-FS-125


NORTH
VERTICAL
E-W
REACTOR BUILDING-STEAM TUNNEL/DRYWELL
REFERENCES: G191167,G191180,191181,VYI-FDW-PART 5A
16" FDW-18
EL 270'-7 5/8" REF
(CONT. ON SKETCH 016)
PRIMARY CONTAINMENT
PENETRATION X-98
STEAM TUNNEL
23'-7" REF
FD18EL01
FD18SP01
V2-298
FD17VA03
EL 258'-0"
FD17EL01
V2-288
FD17VA02
FD17SP05
FD17SP03
FD17SP04
18'-5" REF
V2-96A
FD17VA01
FD17SP02
FD17SP01
FD17TE01
4" RCIC-8A
FLOW
FD15EL07
V2-278
FD15VA02
FD15SP08
FD15EL08
FD15SP07
9'-6" REF
16"-FDW-15
EL 266'-9"
(COLUMN LINE F)
MATCH LINE SKETCH No.014
REVISION 1: 11/24/91
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
FEEDWATER LINES 16" FDW-15 & 17
COMPONENT LOCATION SKETCH No.015


NORTH
VERTICAL
E-W
N-S
45 DEG H
N-S
45 DEG H
FD18EL04
FD18SP07
FD20EL03
FD20SP05
FD20SP06
RX NOZZLE N-4C
EL 305'-9"
FD18SP06
FLOW
FD20SP04
RX NOZZLE N-4D
EL 305'-9"
FD20EL02
(45°)
FLOW
FD20SP03
FD18SP05
FD20SP02
FD20EL01
(90°)
FD20SP01
FD18EL03
(45°)
R-22'-2"
FD20RD01
FD18SP04
FD18TE01
40° VERT. TYP.
3'-0 3/4"
℄ REACTOR
FLOW
FD18SP03
REACTOR BUILDING-DRYWELL
REFERENCES: G191167,G191180,G191181,VYI-FDW-PART 5A
FD18EL02
(45DEG)
FD18SP02
REVISION 1: 11/24/91
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
FD18EL01
(FROM SKETCH
No. 015)
EL 270'-7 5/8" REF
FEEDWATER LINES 10"-FDW-18 & 20
16"-FDW-18
COMPONENT LOCATION SKETCH No.016


NORTH
VERTICAL
E-W
FEED PUMP ROOM
FD04SP06
1'-9"
EL 238'-6"
FD04EL03
FD04EL04
FD04SP05
EL 232'-6"
FD04SP07
FLOW
25'-0" REF
FD04SP04
V63-3A
FD04EL02
FD04SP08
FCV-2A
FD04VA02
FD04SP02
FD04SP03
FD04EL01
FD04VA01
6'-0" REF
FD04EL05
FD04SP01
16" FDW-1
EL 230'-6"
(FROM SKETCH No.001)
FD04SP09
FD01TE01
FLOW
FD04EL07
EL 245'-0"
HEATER BAY
73'-5" REF
FD04SP10
FD04SP12
FD04EL06
FD04SP11
4'-0" REF
FD04RD01
EL 238'-6"
FD04TE01
(6" CAPPED)
CONDENSER A
NOZZLE 32
EL 245'-0"
TURBINE BUILDING-FEED PUMP ROOM/HEATER BAY
REFERENCES: G191157,G191182,G191183
5950-FS-124,5920-FS-125
REVISION 1: 11/24/91
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
FEEDWATER LINE 4"-FDW-4
COMPONENT LOCATION SKETCH No.017



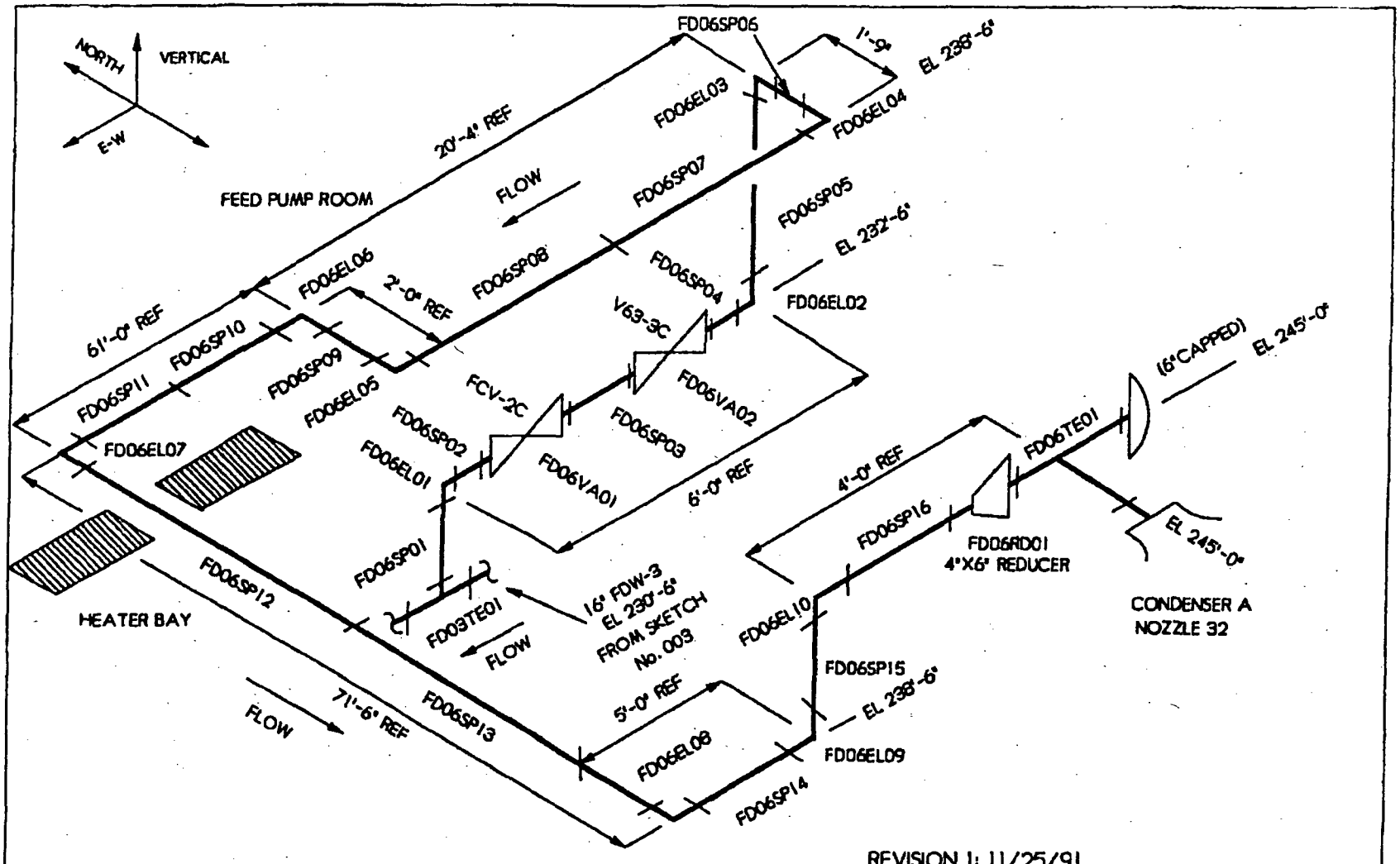
REVISION 1: 11/24/91

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

FEEDWATER LINE 4"-FDW-5

COMPONENT LOCATION SKETCH No.018

TURBINE BUILDING-FEED PUMP ROOM/HEATER BAY
REFERENCES: G191157,G191182,G191183
5950-FS-124,5920-FS-125



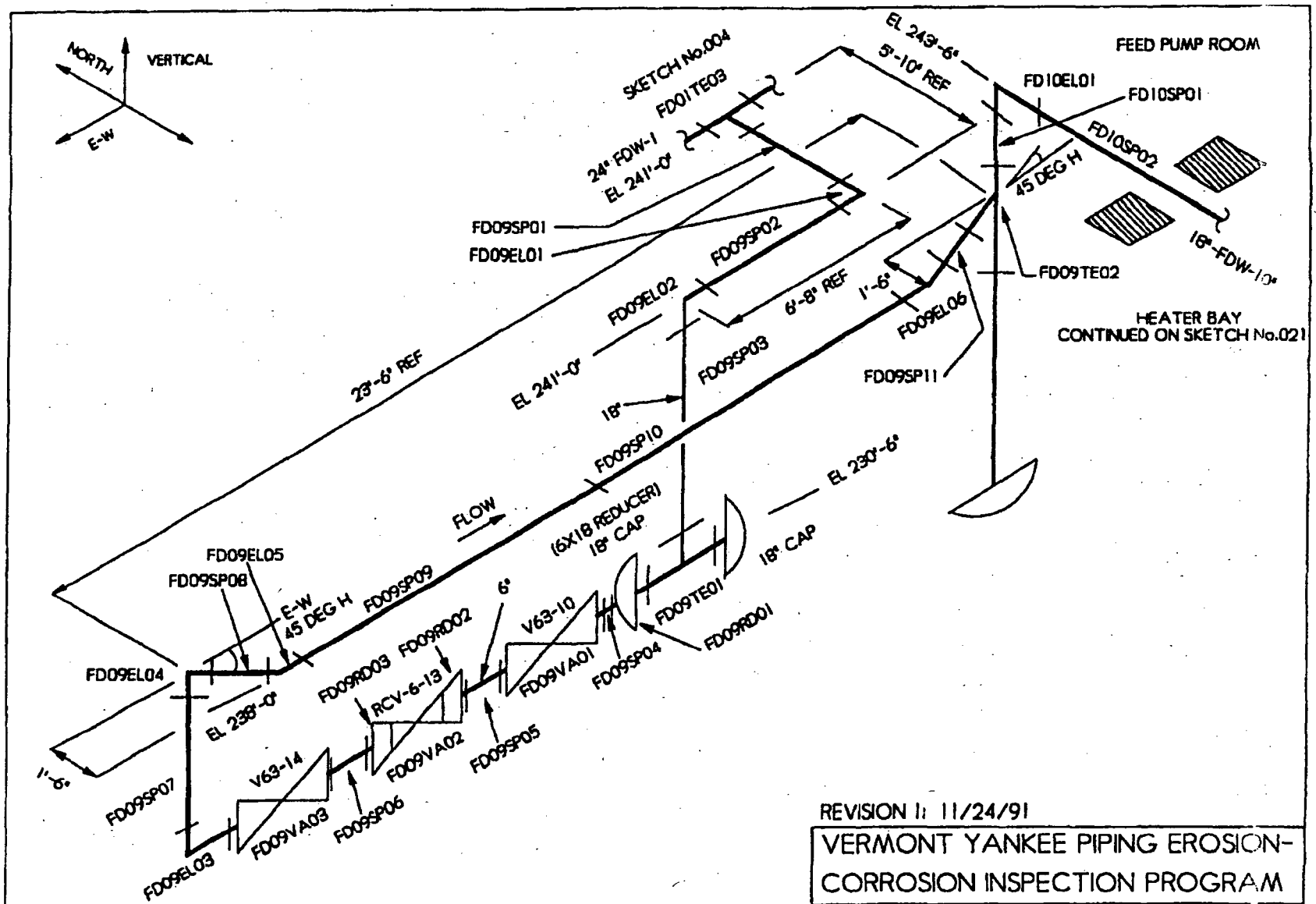
REVISION 1: 11/25/91

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

FEEDWATER LINE 4"-FDW-6

COMPONENT LOCATION SKETCH No.019

TURBINE BUILDING-FEED PUMP ROOM/HEATER BAY
REFERENCES: G191157,G191182,G191183
5950-FS-124,5920-FS-125



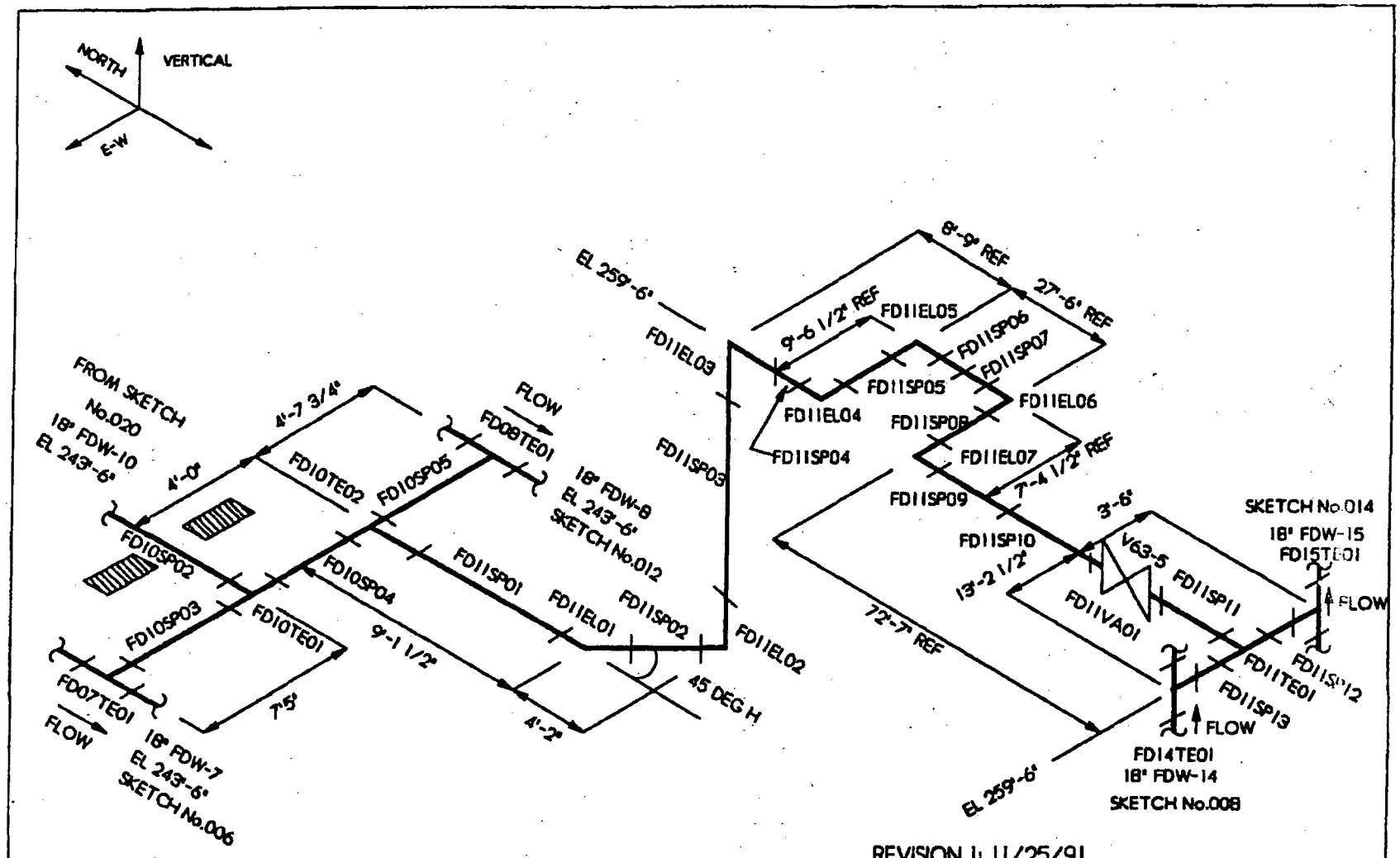
TURBINE BUILDING-FEED PUMP ROOM
REFERENCES: G191157,G191182,G191183
5920-FS-125

REVISION 1: 11/24/91

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

FEEDWATER LINES 6"-FDW-9 & 18" FDW-10

COMPONENT LOCATION SKETCH No.020



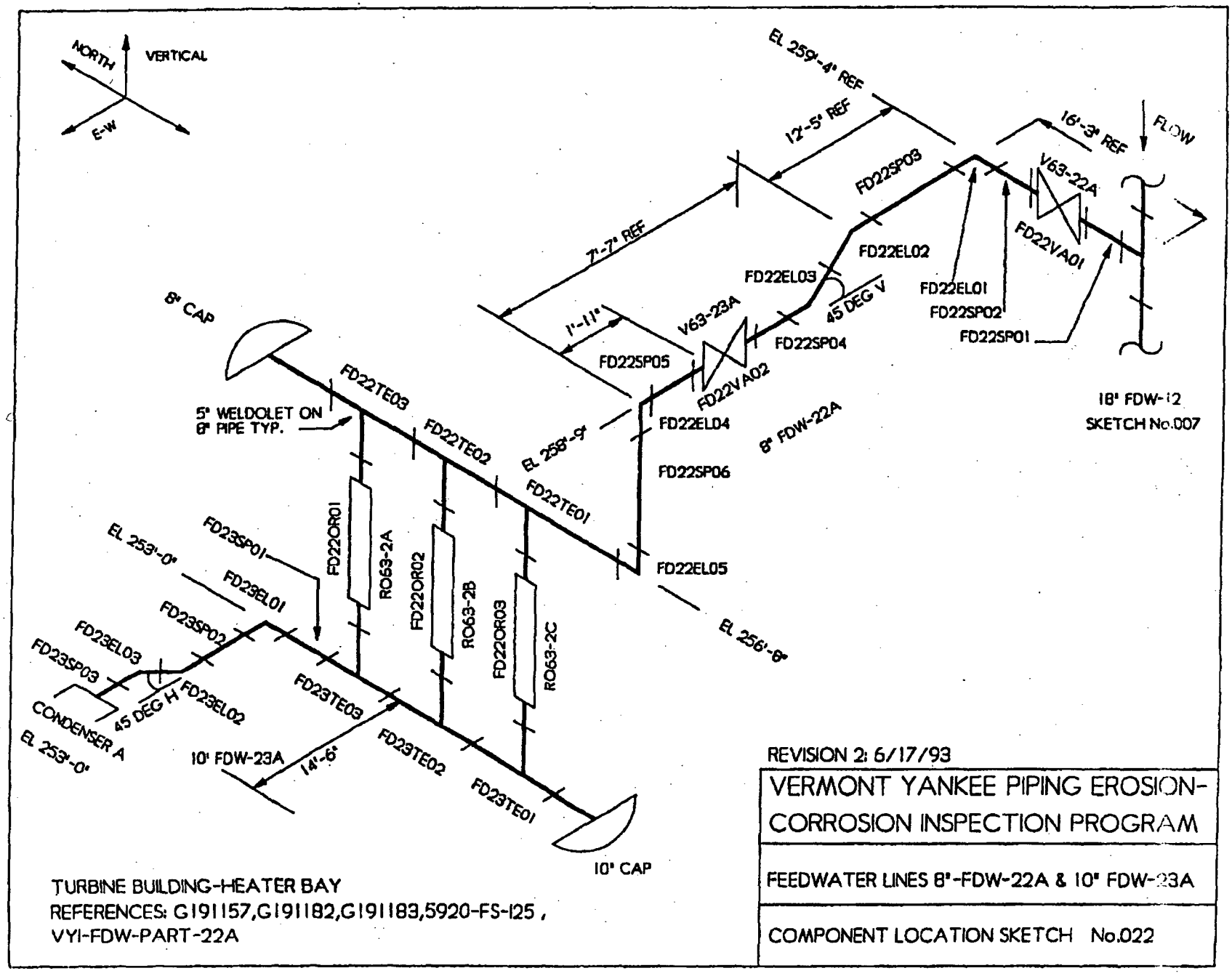
REVISION 1: 11/25/91

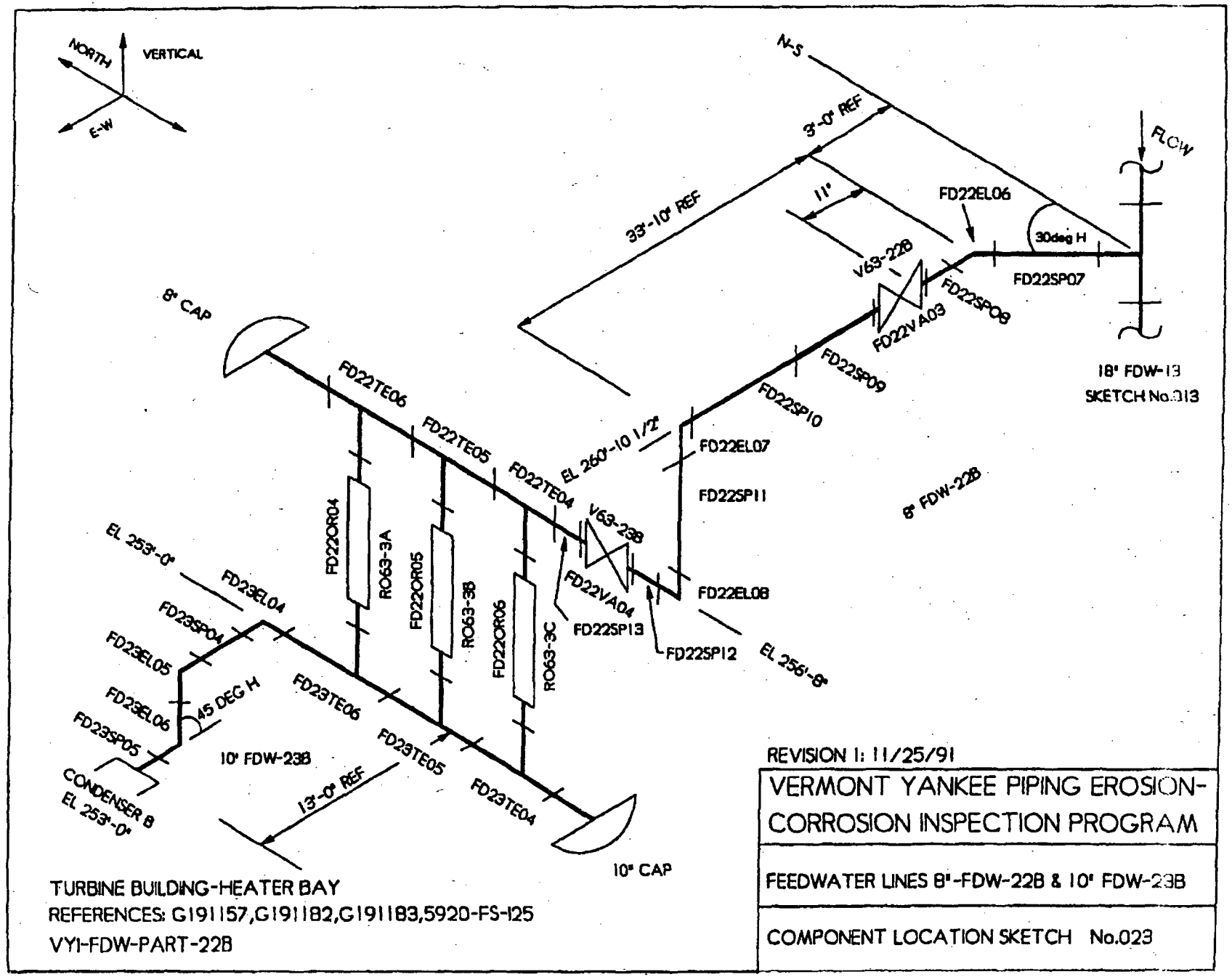
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

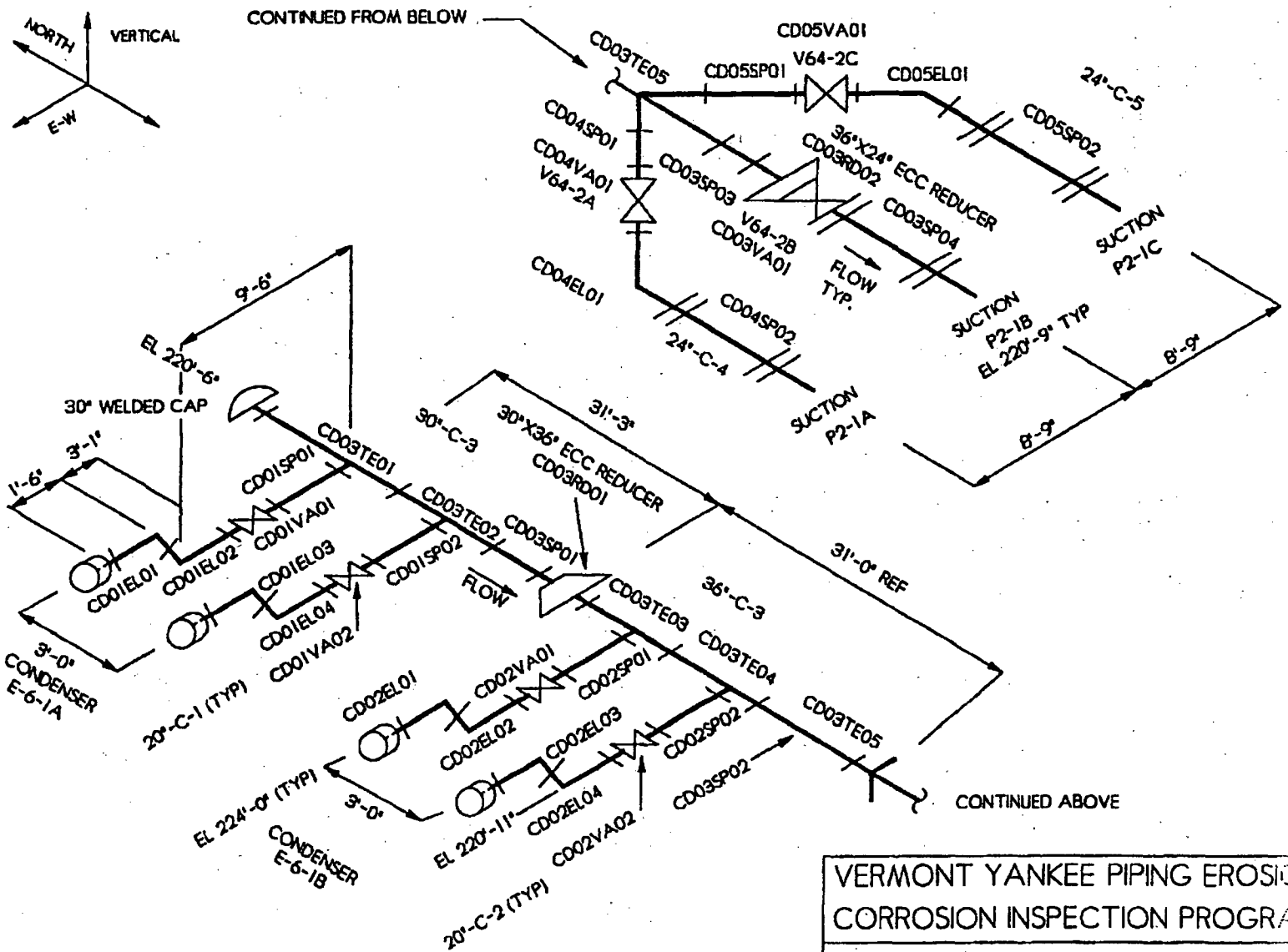
FEEDWATER LINES 18"-FDW-10 & 10" FDW-11

COMPONENT LOCATION SKETCH No.021

TURBINE BUILDING-HEATER BAY
REFERENCES: G191157,G191182,G191183,VYI-FDW-PART 5C(2/2)


NORTH
VERTICAL
E-W
EL 259'-4" REF
12'-5" REF
16'-3" REF
FLOW
FD22SP03
V63-22A
FD22VA01
7'-7" REF
FD22EL02
FD22EL03
45 DEG V
FD22EL01
FD22SP02
FD22SP01
8" CAP
1'-11"
V63-23A
FD22SP04
FD22SP05
FD22VA02
FD22TE03
5" WELDOLET ON
8" PIPE TYP.
FD22TE02
EL 258'-9"
FD22EL04
8" FDW-22A
18" FDW-12
SKETCH No.007
FD22SP06
FD22TE01
FD22OR01
RO63-2A
FD22OR02
RO63-2B
FD22OR03
RO63-2C
FD22EL05
EL 253'-0"
FD23SP01
FD23EL01
FD23SP02
FD23EL03
FD23SP03
45 DEG H
FD23EL02
CONDENSER A
EL 253'-0"
FD23TE03
10" FDW-23A
14'-6"
FD23TE02
FD23TE01
EL 256'-8"
10" CAP
TURBINE BUILDING-HEATER BAY
REFERENCES: G191157,G191182,G191183,5920-FS-125 ,
VYI-FDW-PART-22A
REVISION 2: 6/17/93
VERMONT YANKEE PIPING EROSION-
CORROSION INSPECTION PROGRAM
FEEDWATER LINES 8"-FDW-22A & 10" FDW-23A
COMPONENT LOCATION SKETCH No.022


NORTH
VERTICAL
E-W
N-S
3'-0" REF
33'-10" REF
11"
FLOW
FD22EL06
30deg H
V63-22B
FD22SP07
FD22SP08
FD22VA03
FD22SP09
FD22SP10
18" FDW-13
SKETCH No.013
8" CAP
FD22TE06
FD22TE05
FD22TE04
EL 260'-10 1/2"
FD22EL07
FD22SP11
8" FDW-22B
V63-23B
FD22VA04
FD22SP13
FD22EL08
FD22SP12
EL 256'-8"
FD22OR04
RO63-3A
FD22OR05
RO63-3B
FD22OR06
RO63-3C
EL 253'-0"
FD23EL04
FD23SP04
FD23EL05
FD23EL06
45 DEG H
FD23SP05
CONDENSER B
EL 253'-0"
10" FDW-23B
FD23TE06
FD23TE05
FD23TE04
13'-0" REF
10" CAP
TURBINE BUILDING-HEATER BAY
REFERENCES: G191157,G191182,G191183,5920-FS-125
VYI-FDW-PART-22B
REVISION 1: 11/25/91
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
FEEDWATER LINES 8"-FDW-22B & 10" FDW-23B
COMPONENT LOCATION SKETCH No.023

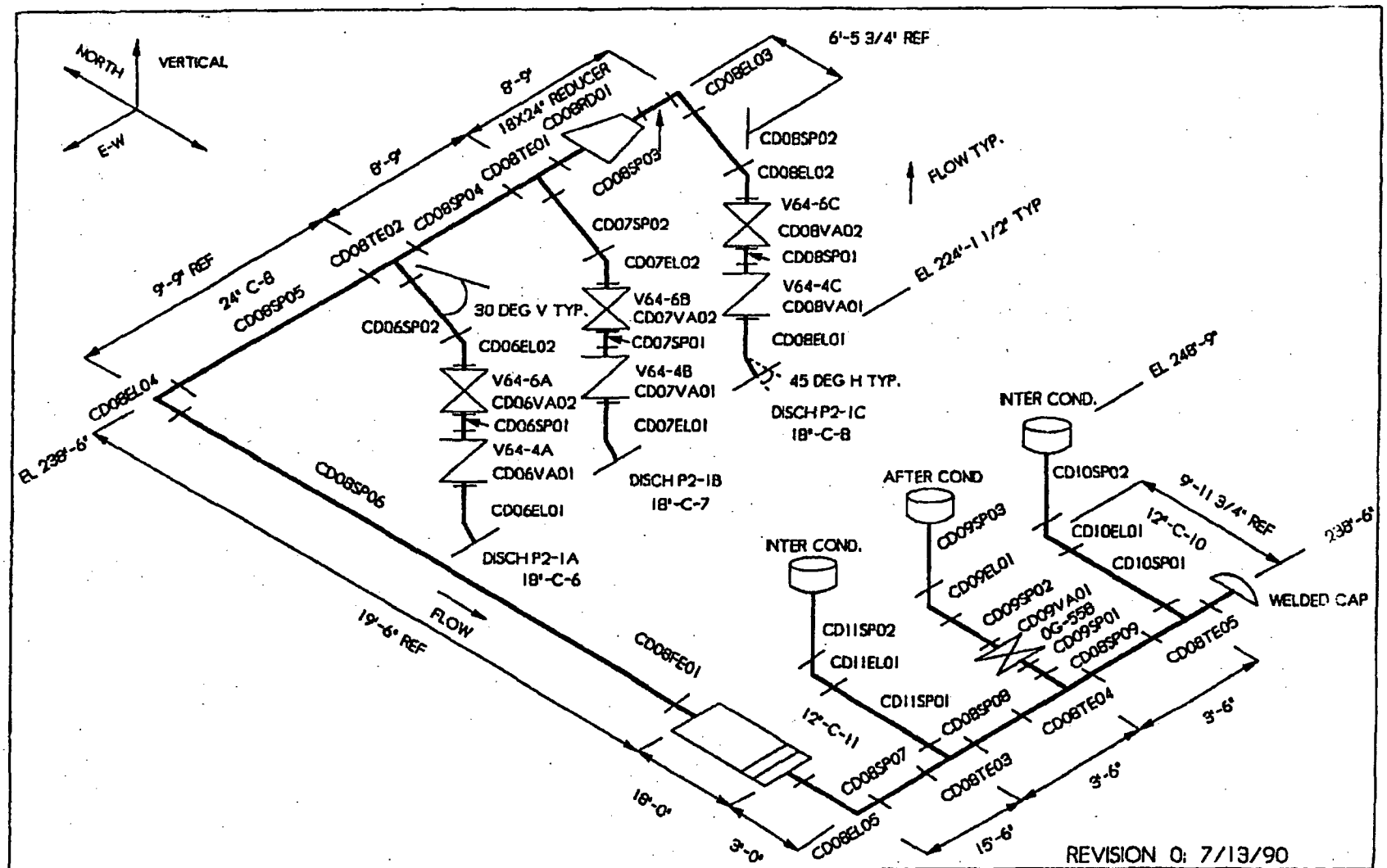


TURBINE BULDING-HEATER BAY (TRENCH) & CONDENSATE PUMP ROOM
REFERENCES: G191157,G191186,G191187,5920-FS-I16

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

CONDENSATE LINES 20"-C1 & C2, 36"-C-3
24"-C4, AND 24"-C5

COMPONENT LOCATION SKETCH No. 02



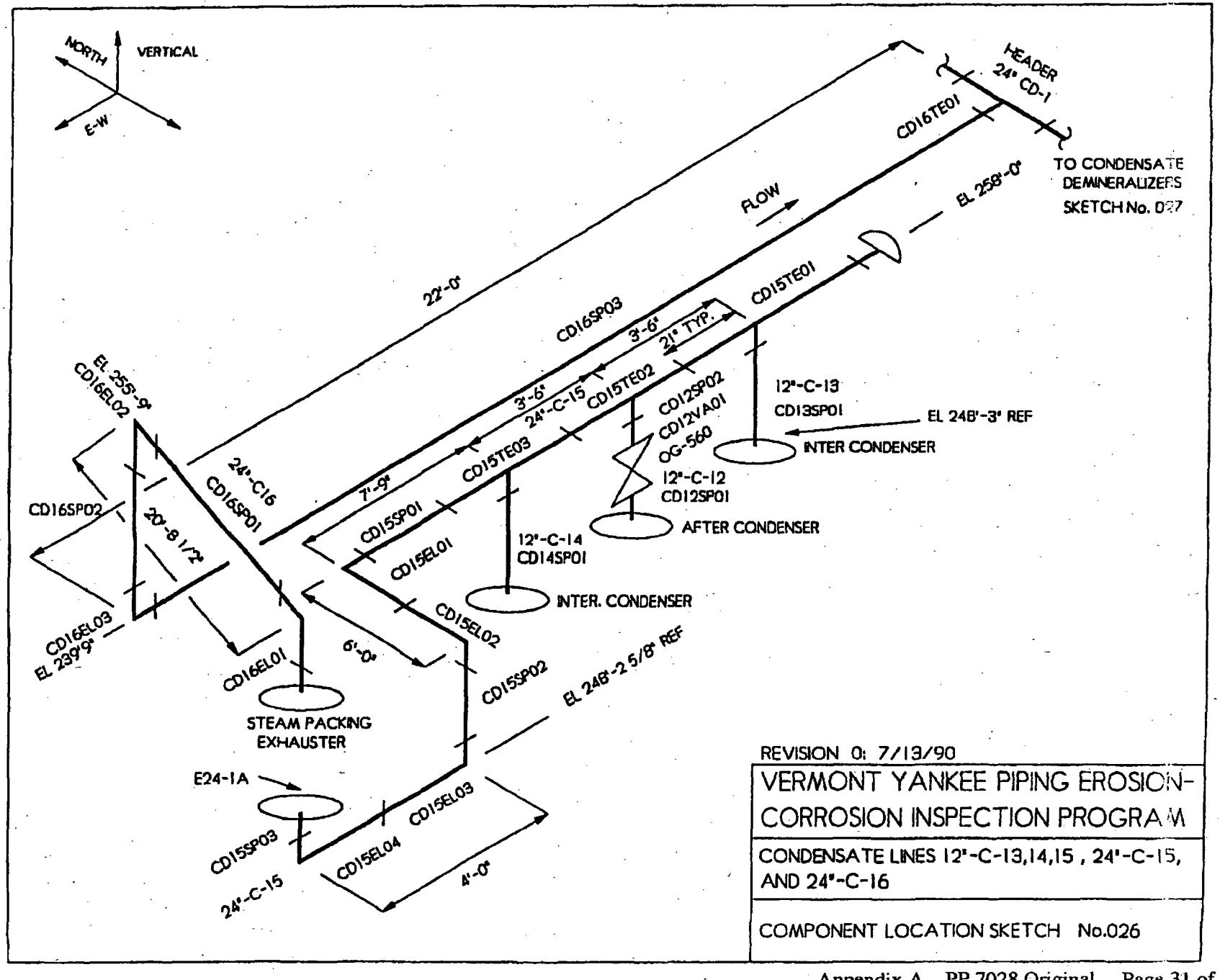
REVISION 0: 7/13/90

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

CONDENSATE LINES 18"-C-6,7,8, 24"-C-8, 12"-C-9,10,11

COMPONENT LOCATION SKETCH No.025

TURBINE BULDING-CONDENSATE PUMP ROOM
REFERENCES G191157,G191186,G191187,5920-FS-117

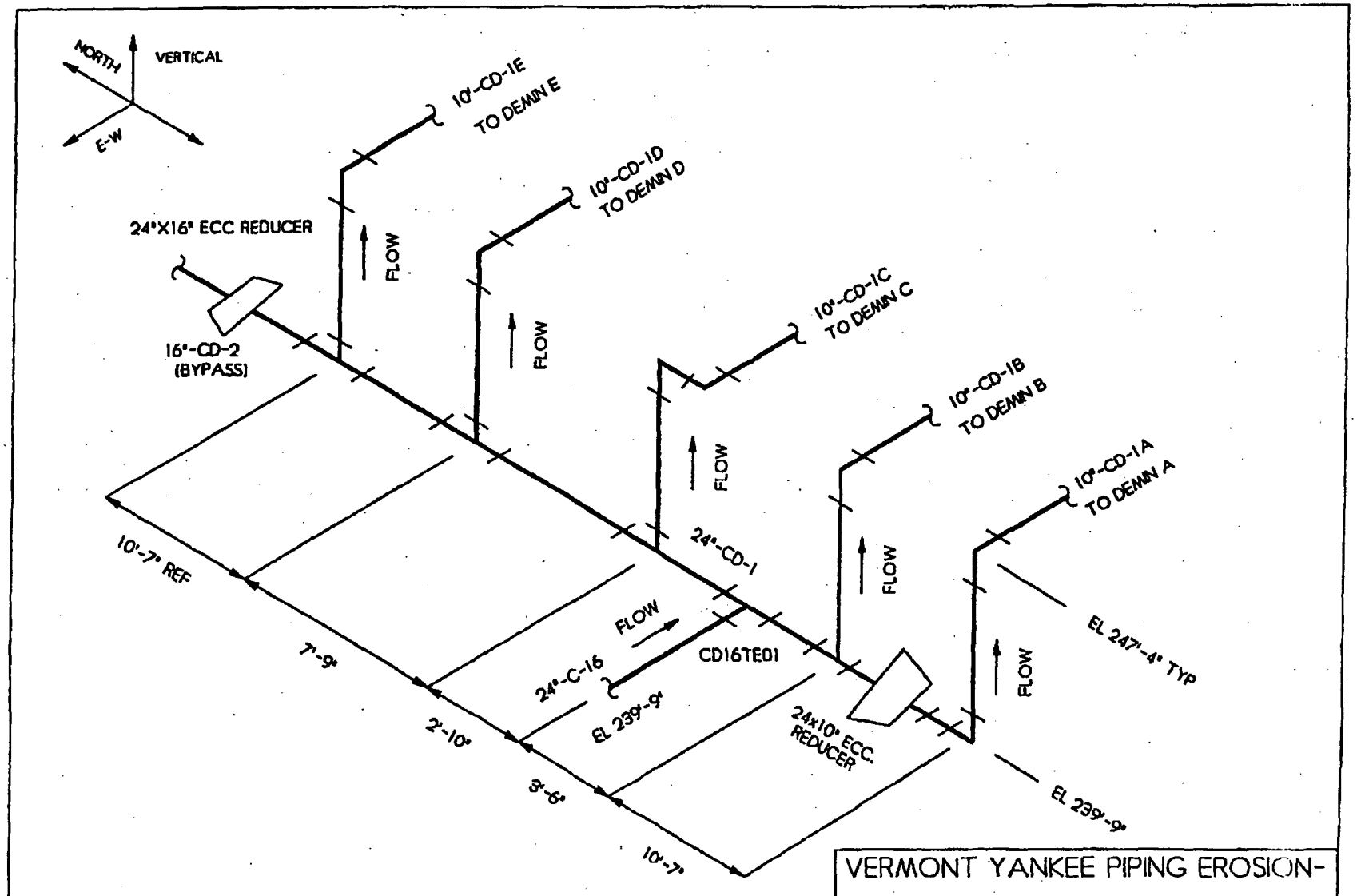


REVISION 0: 7/13/90

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

CONDENSATE LINES 12"-C-13,14,15 , 24"-C-15, AND 24"-C-16

COMPONENT LOCATION SKETCH No.026

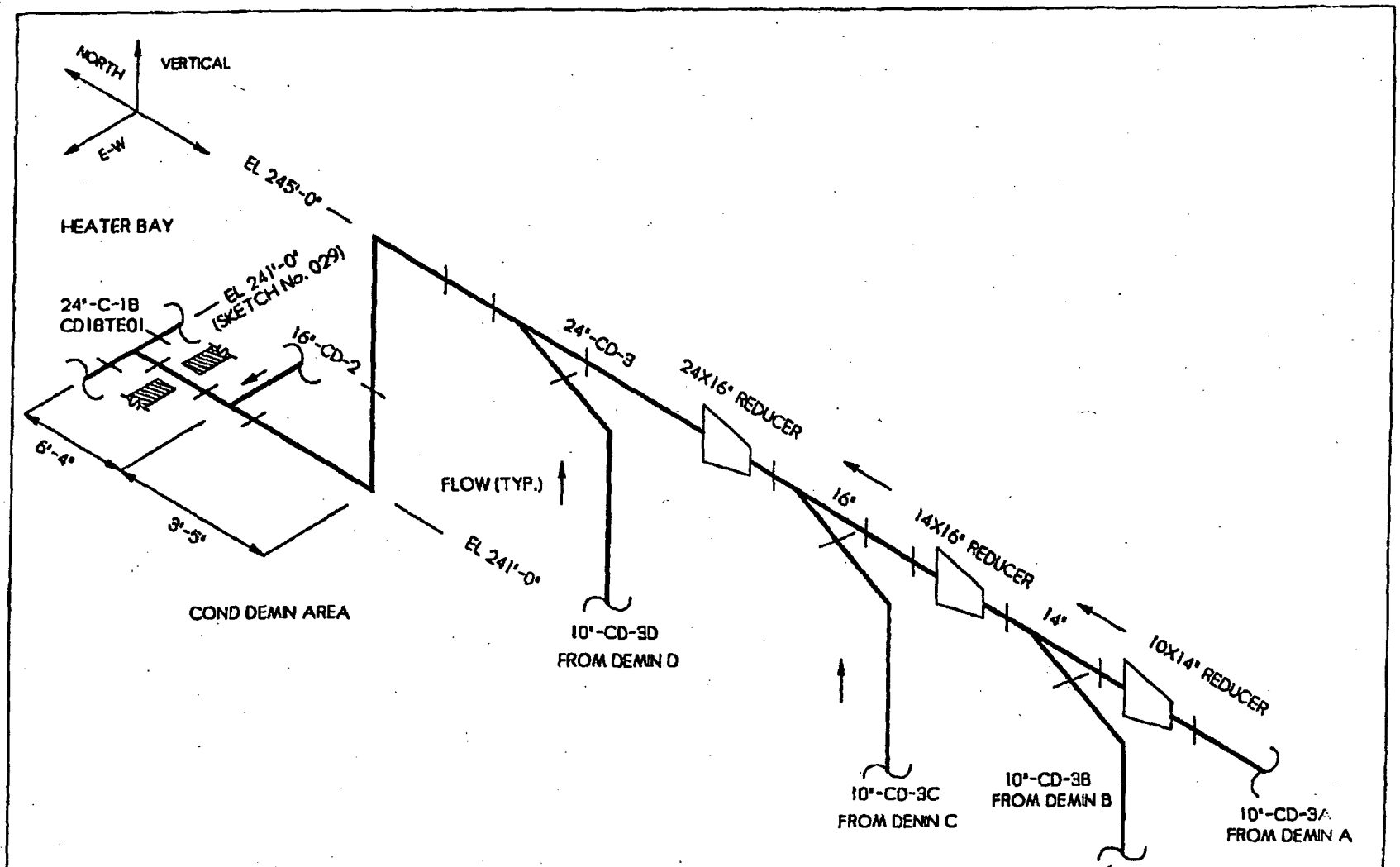


TURBINE BULDING-CONDENSATE DEMIN AREA
REFERENCES: G191157,G191186,G191275,5920-FS-178A

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

CONDENSATE HEADER TO DEMINS.

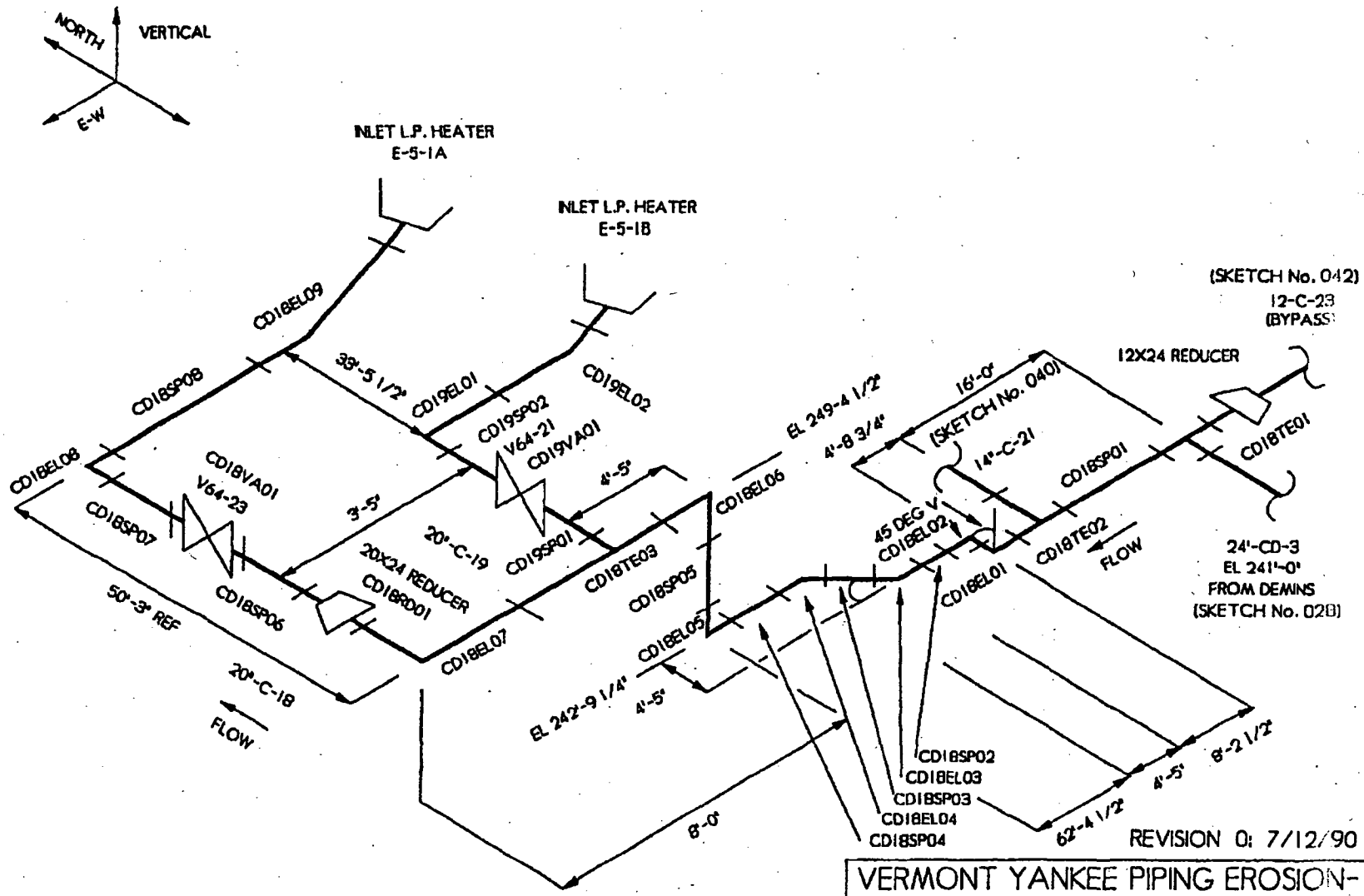
COMPONENT LOCATION SKETCH No.027



TURBINE BULDING-HEATER BAY/CONDENSATE DEMIN AREA
REFERENCES: C191157,C191275,5920-FS-179A,5920-FS-116

REVISION 0: 7/13/90

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
CONDENSATE LINE 24"-CD-3 & 24"-C-18
COMPONENT LOCATION SKETCH No.028

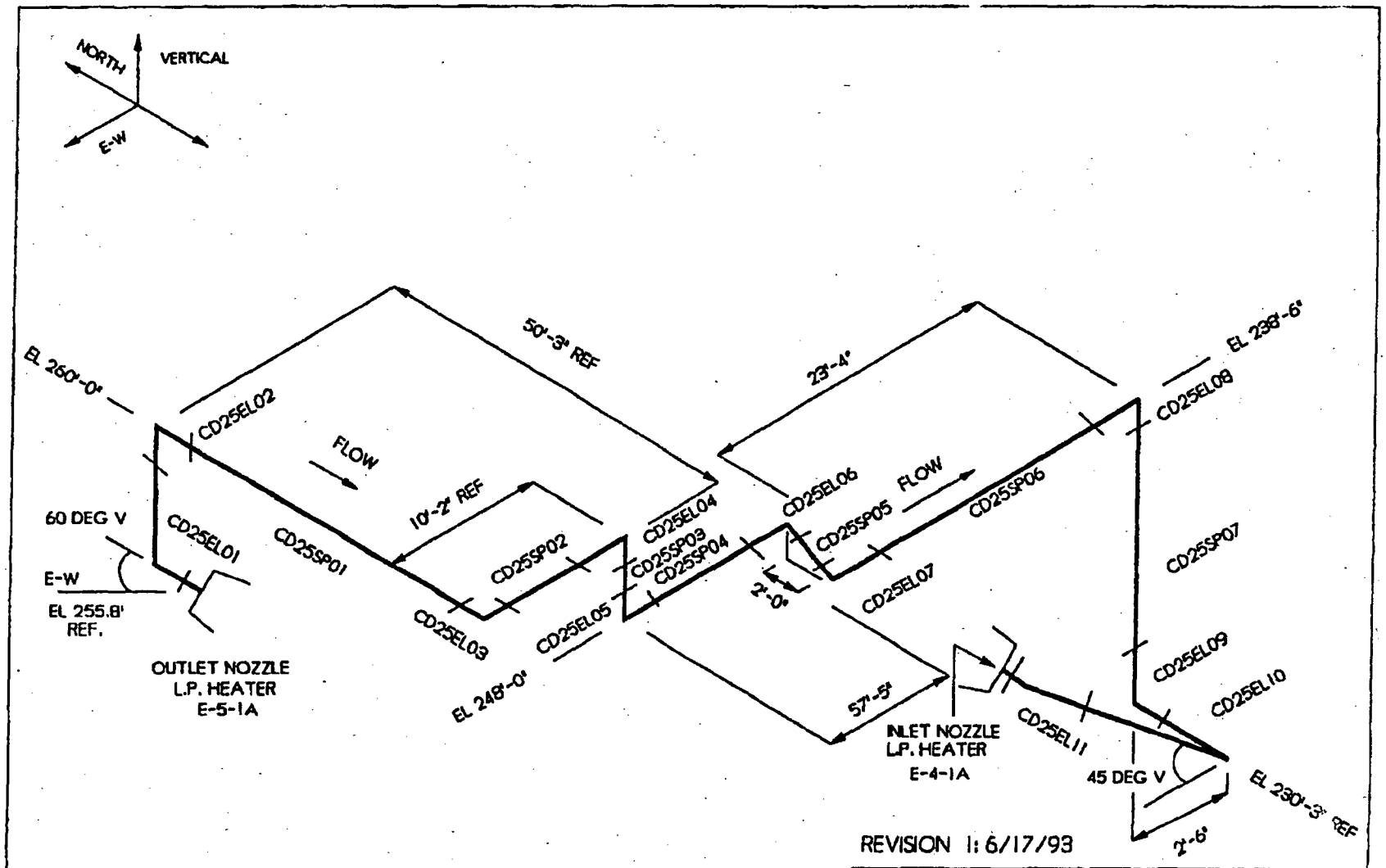


TURBINE BULDING-HEATER BAY
REFERENCES: G191157,G191186,G191187,5920-FS-I16,5920-FS-I17

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

CONDENSATE LINE 24"-C-18 & 20"-C-19

COMPONENT LOCATION SKETCH No. 029



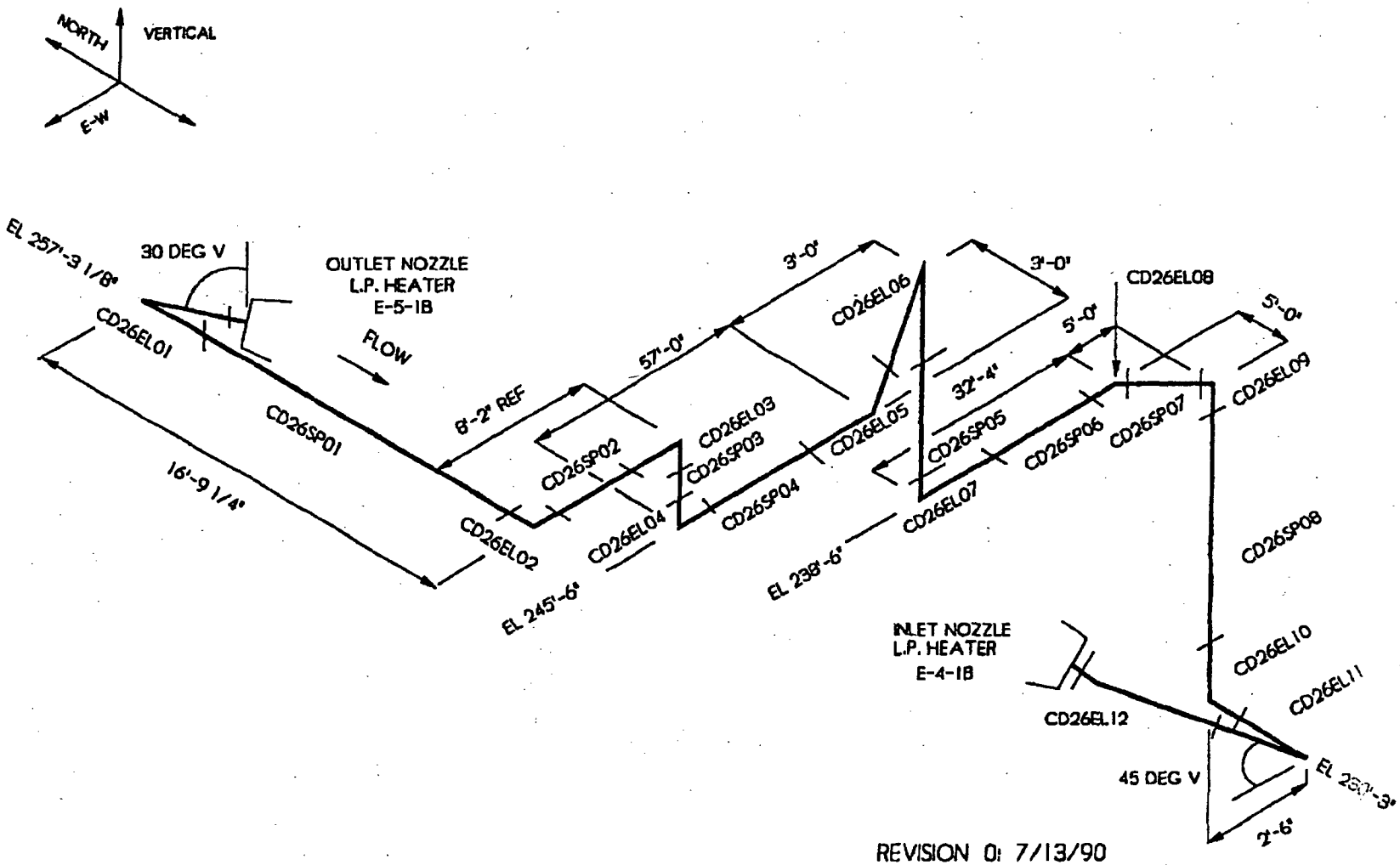
REVISION 1: 6/17/93

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

CONDENSATE LINE 20"-C-25

COMPONENT LOCATION SKETCH No.030

TURBINE BULDING-HEATER BAY
REFERENCES: G191157,G191186,G191187,5920-FS-116,5290-FS-117



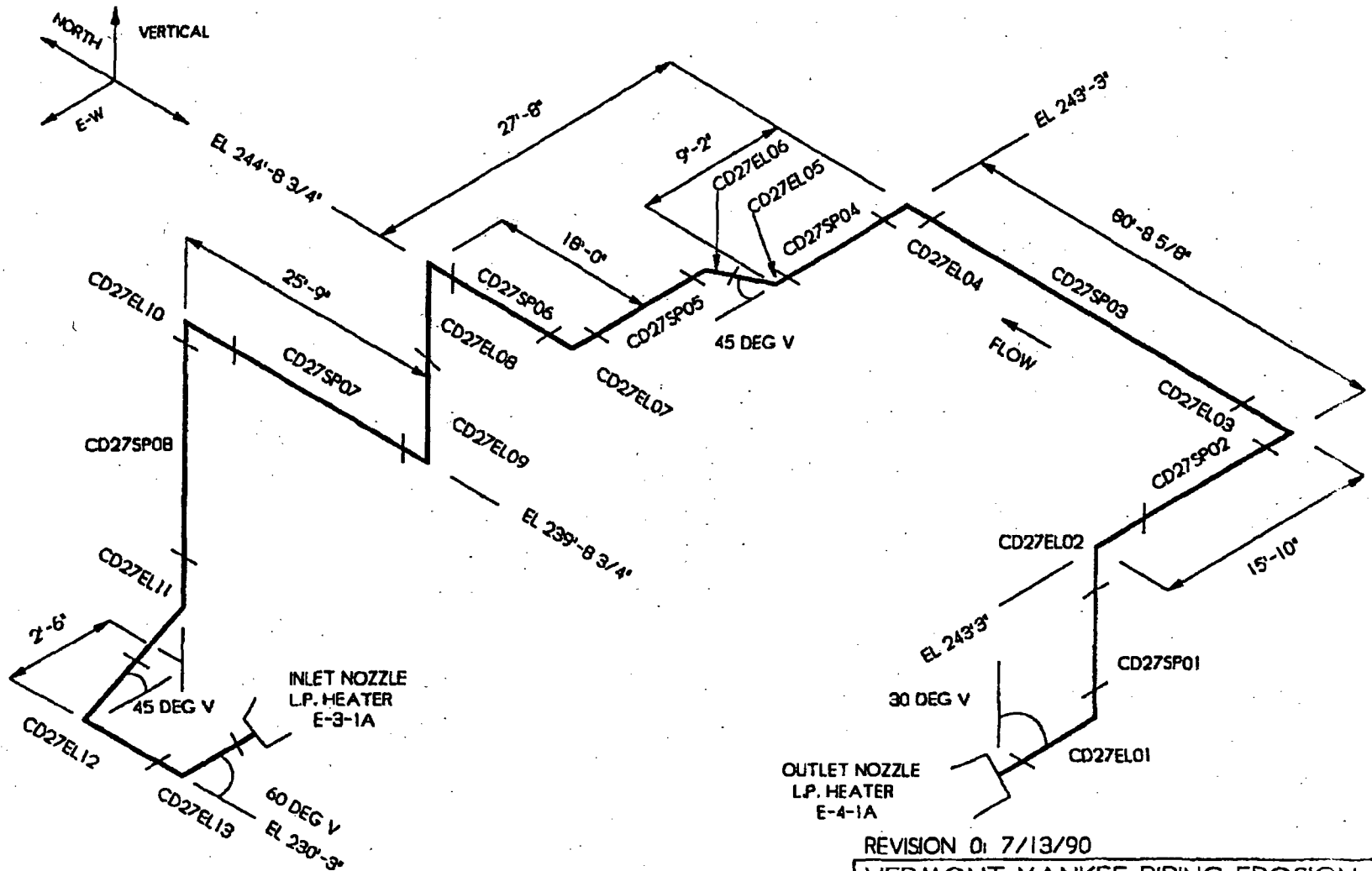
REVISION 0: 7/13/90

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

CONDENSATE LINE 20"-C-26

COMPONENT LOCATION SKETCH No.031

TURBINE BULDING-HEATER BAY
REFERENCES: G191157,G191186,G191187,5920-FS-116,5290-FS-117



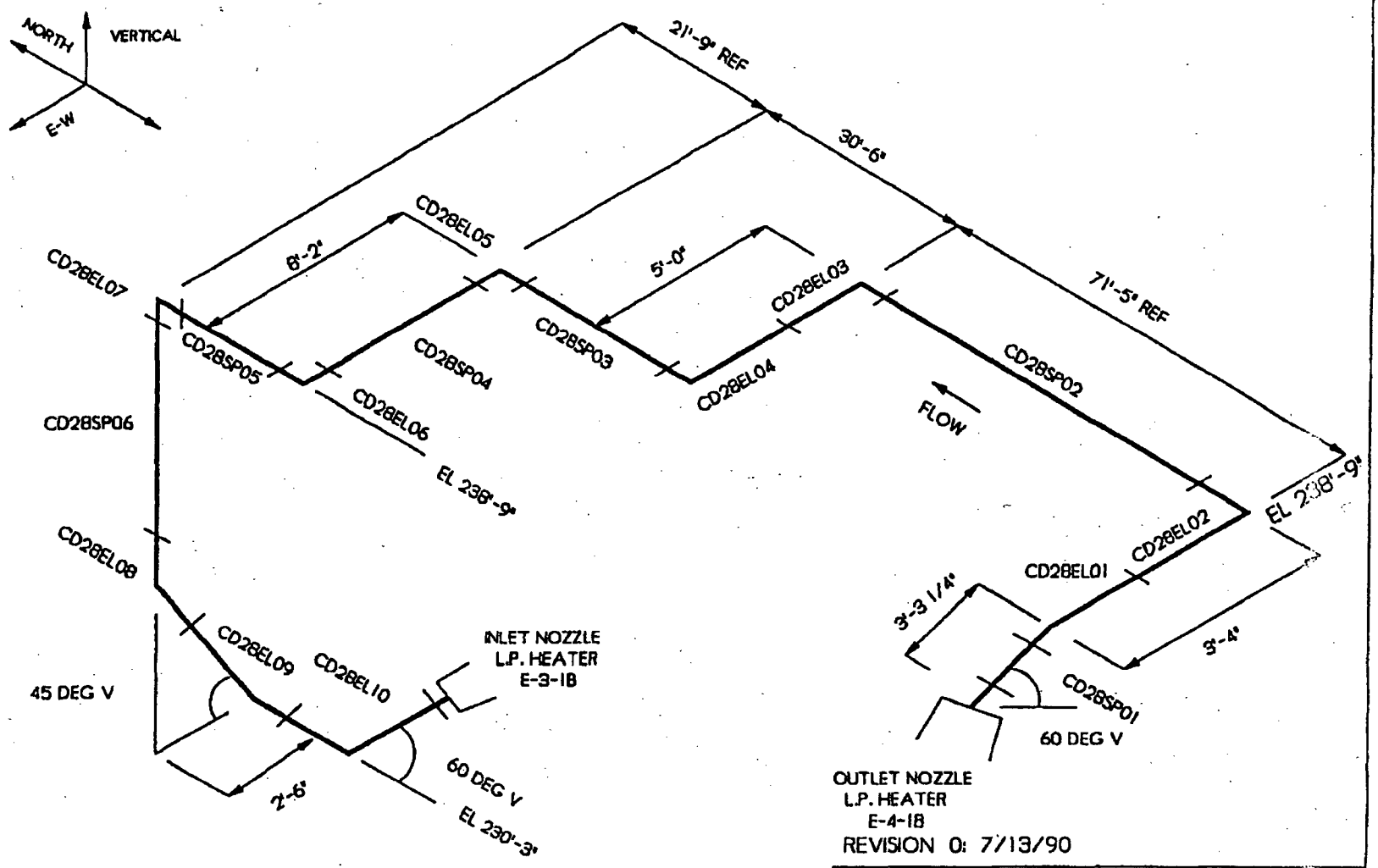
REVISION 0: 7/13/90

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

CONDENSATE LINE 20"-C-27

COMPONENT LOCATION SKETCH No.032

TURBINE BULDING-HEATER BAY
REFERENCES: G191157,G191186,G191187,5920-FS-I16,5920-FS-I17

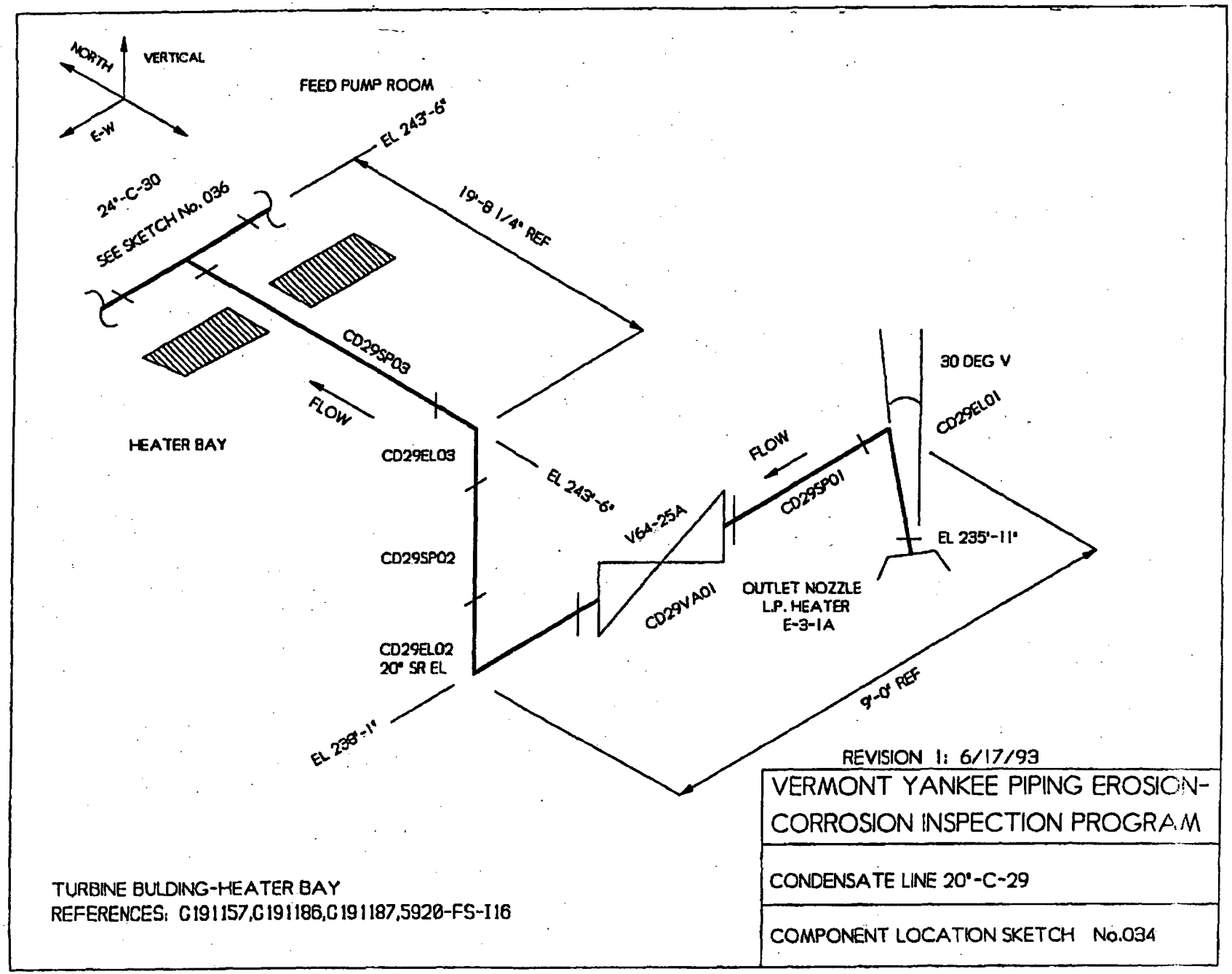


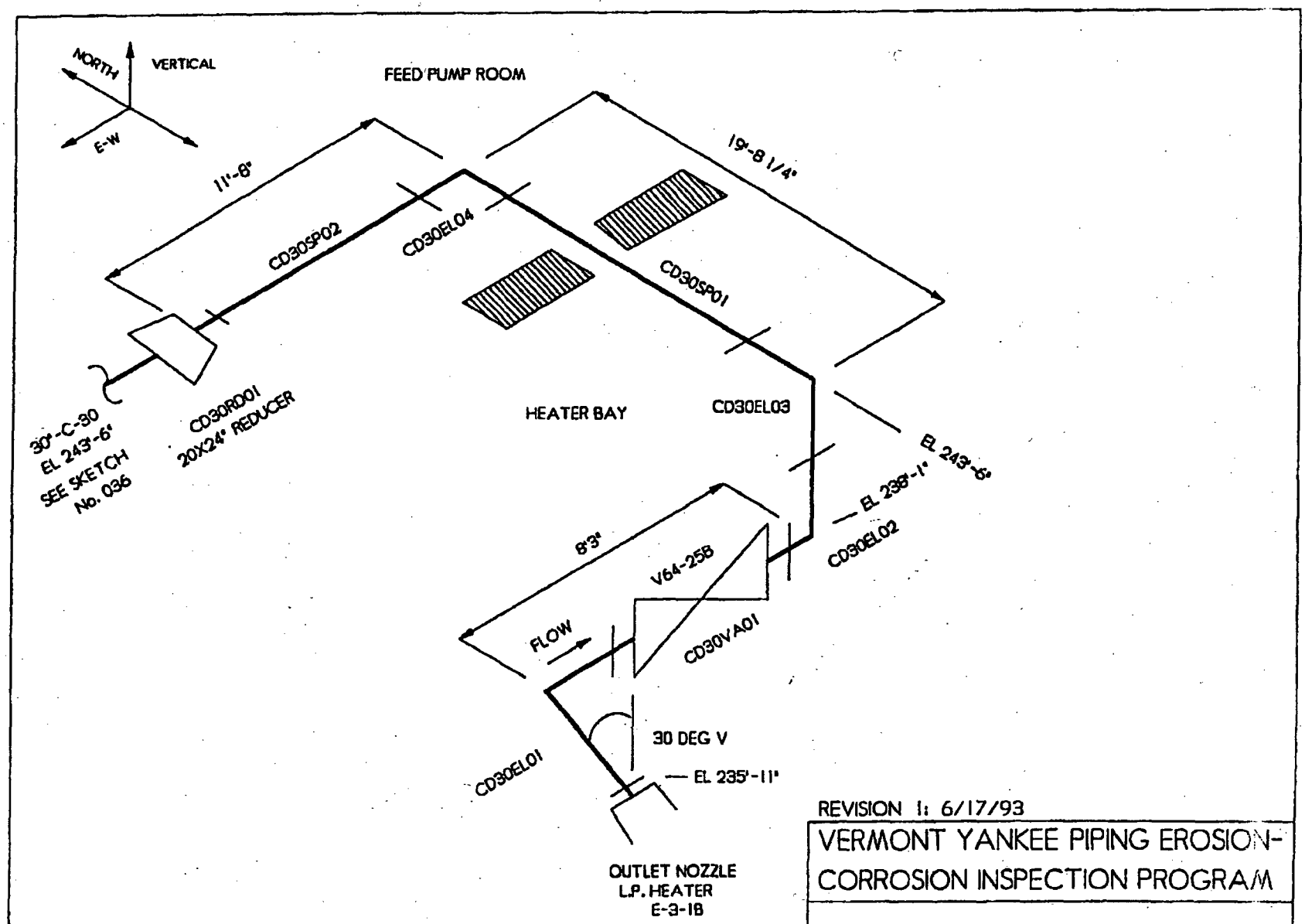
TURBINE BULDING-HEATER BAY
REFERENCES: G191157,G191186,G191187,5920-FS-116,5920-FS-117

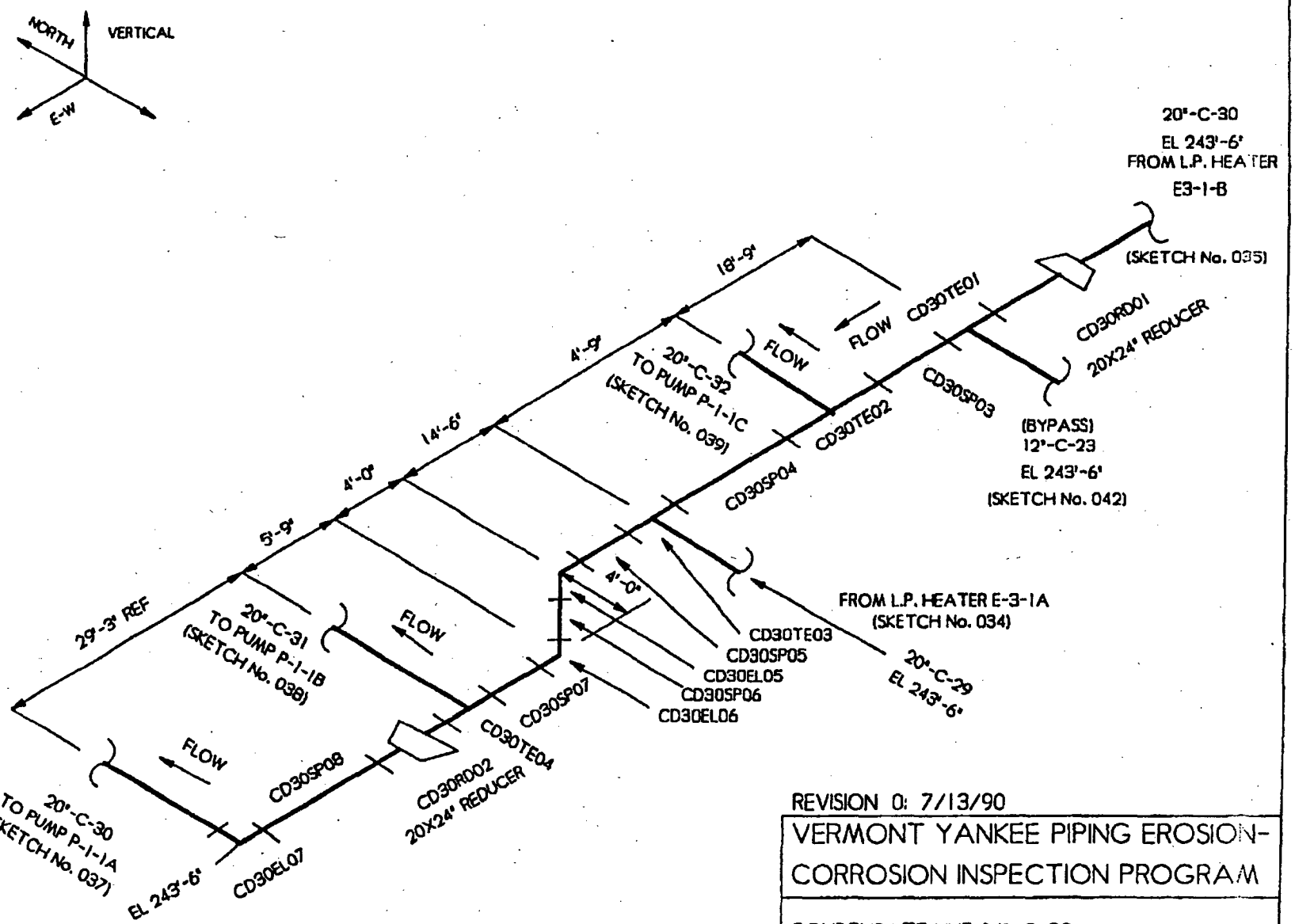
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

CONDENSATE LINE 20"-C-28

COMPONENT LOCATION SKETCH No.033


NORTH
VERTICAL
E-W
FEED PUMP ROOM
EL 243'-6"
24"-C-30
SEE SKETCH No. 036
19'-8 1/4" REF
CD29SP03
FLOW
HEATER BAY
CD29EL03
EL 243'-6"
30 DEG V
CD29EL01
FLOW
CD29SP01
V64-25A
EL 235'-11"
CD29SP02
CD29VA01
OUTLET NOZZLE
L.P. HEATER
E-3-1A
CD29EL02
20" SR EL
9'-0" REF
EL 236'-1"
REVISION 1: 6/17/93
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
CONDENSATE LINE 20"-C-29
COMPONENT LOCATION SKETCH No.034
TURBINE BULDING-HEATER BAY
REFERENCES: G191157,G191186,G191187,5920-FS-116


NORTH
VERTICAL
E-W
FEED PUMP ROOM
11'-8"
19'-8 1/4"
CD30SP02
CD30EL04
CD30SP01
30"-C-30
EL 243'-6"
SEE SKETCH
No. 036
CD30RD01
20X24" REDUCER
HEATER BAY
CD30EL03
EL 243'-6"
EL 238'-1"
CD30EL02
8'3"
V64-258
FLOW
CD30VA01
30 DEG V
CD30EL01
EL 235'-11"
OUTLET NOZZLE
L.P. HEATER
E-3-18
TURBINE BULDING-HEATER BAY
REFERENCES: G191157,G191186,G191187,5920-FS-116
REVISION 1: 6/17/93
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
CONDENSATE LINE 20"-C-30
COMPONENT LOCATION SKETCH No.035



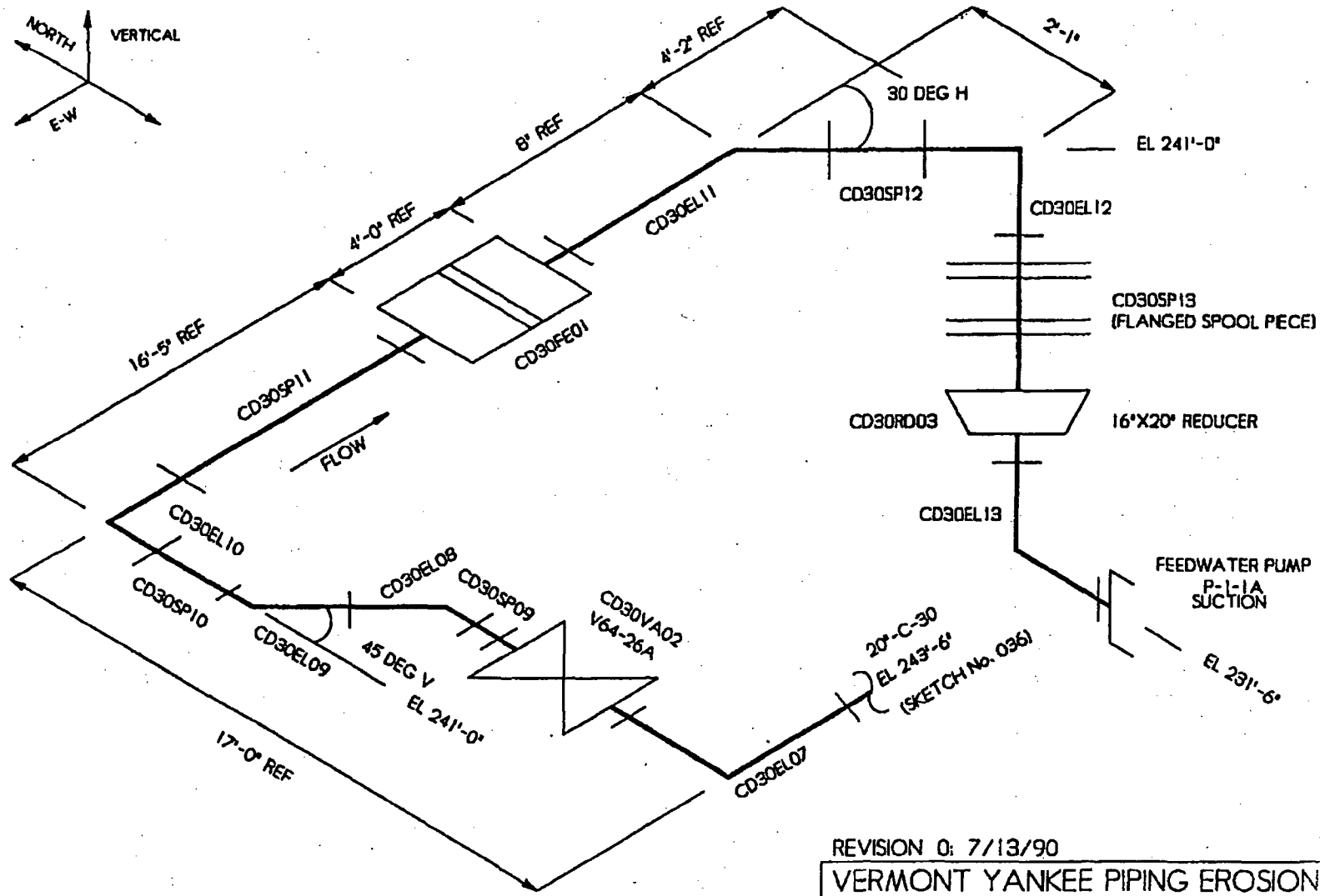
TURBINE BULDING-FEEDWATER PUMP ROOM
REFERENCES: G191157,G191186,G191187,5920-FS-116

REVISION 0: 7/13/90

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

CONDENSATE LINE 24"-C-30

COMPONENT LOCATION SKETCH No. 036



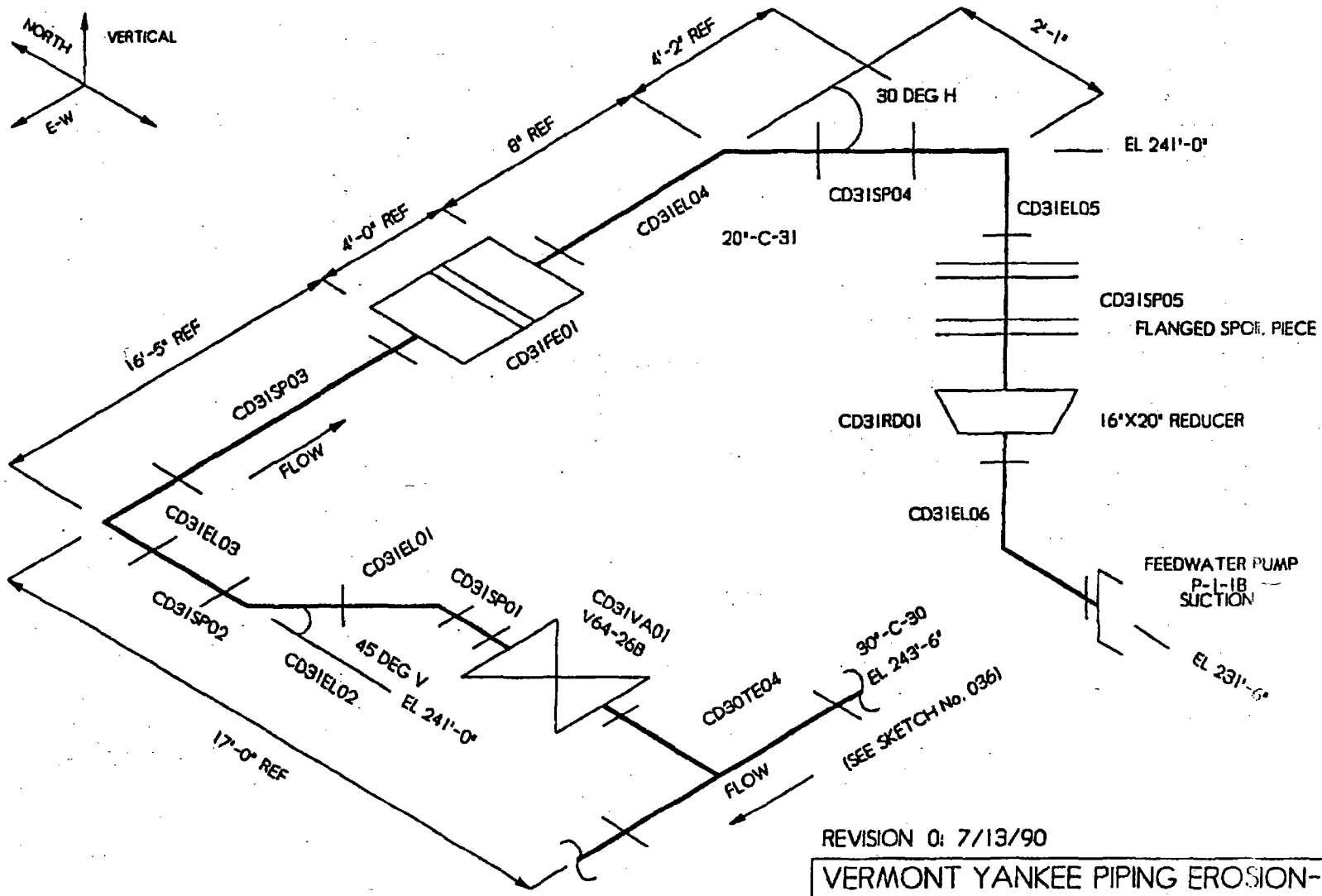
REVISION 0: 7/13/90

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

CONDENSATE LINE 20"-C-30 (CONTINUED)

COMPONENT LOCATION SKETCH No. 037

TURBINE BULDING-FEEDWATER PUMP ROOM
REFERENCES: G191157,G191186,G191187,5920-FS-116



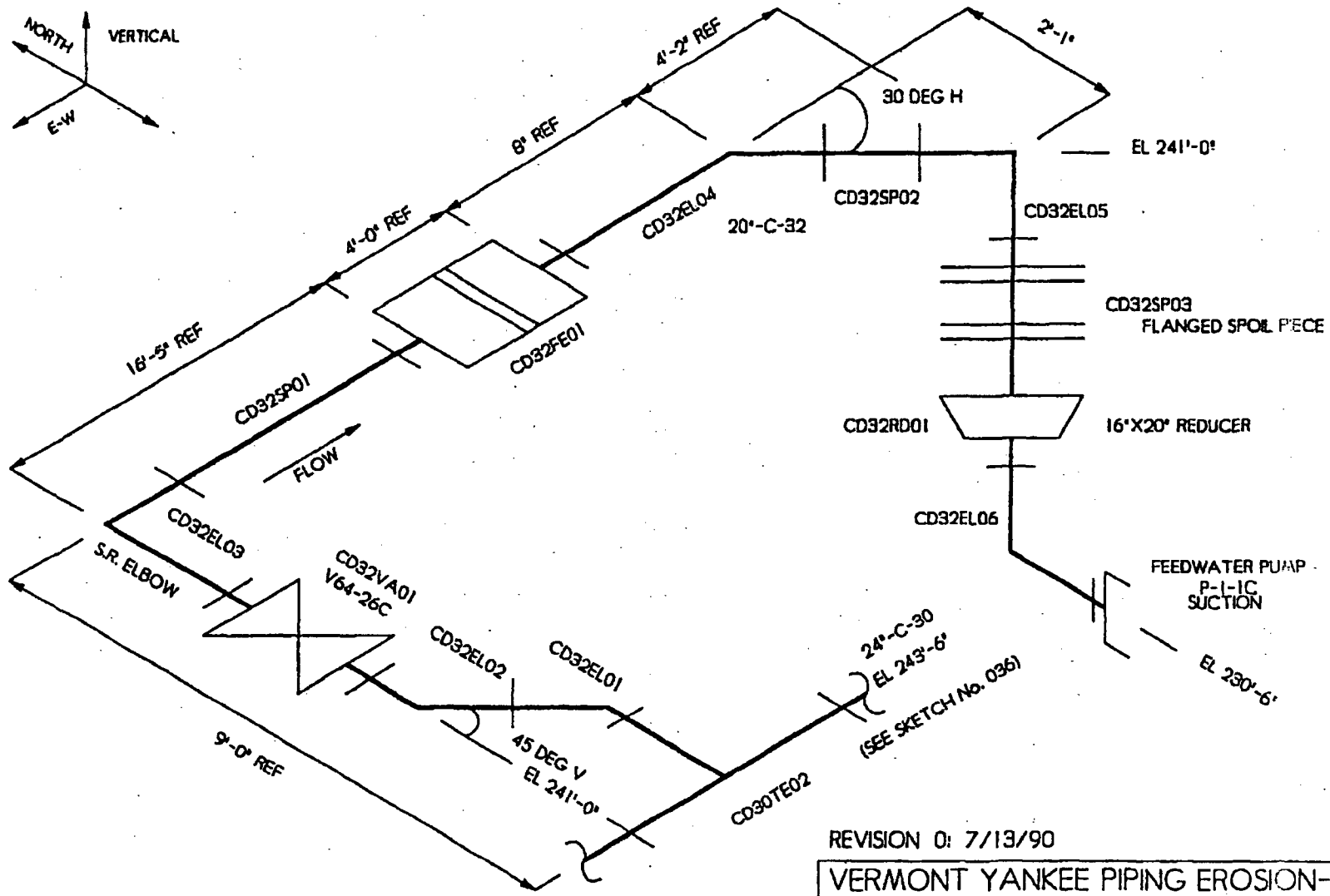
REVISION 0: 7/13/90

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

CONDENSATE LINE 20"-C-31

COMPONENT LOCATION SKETCH No. 038

TURBINE BULDING-FEEDWATER PUMP ROOM
REFERENCES: G191157,G191186,G191187,5920-FS-116



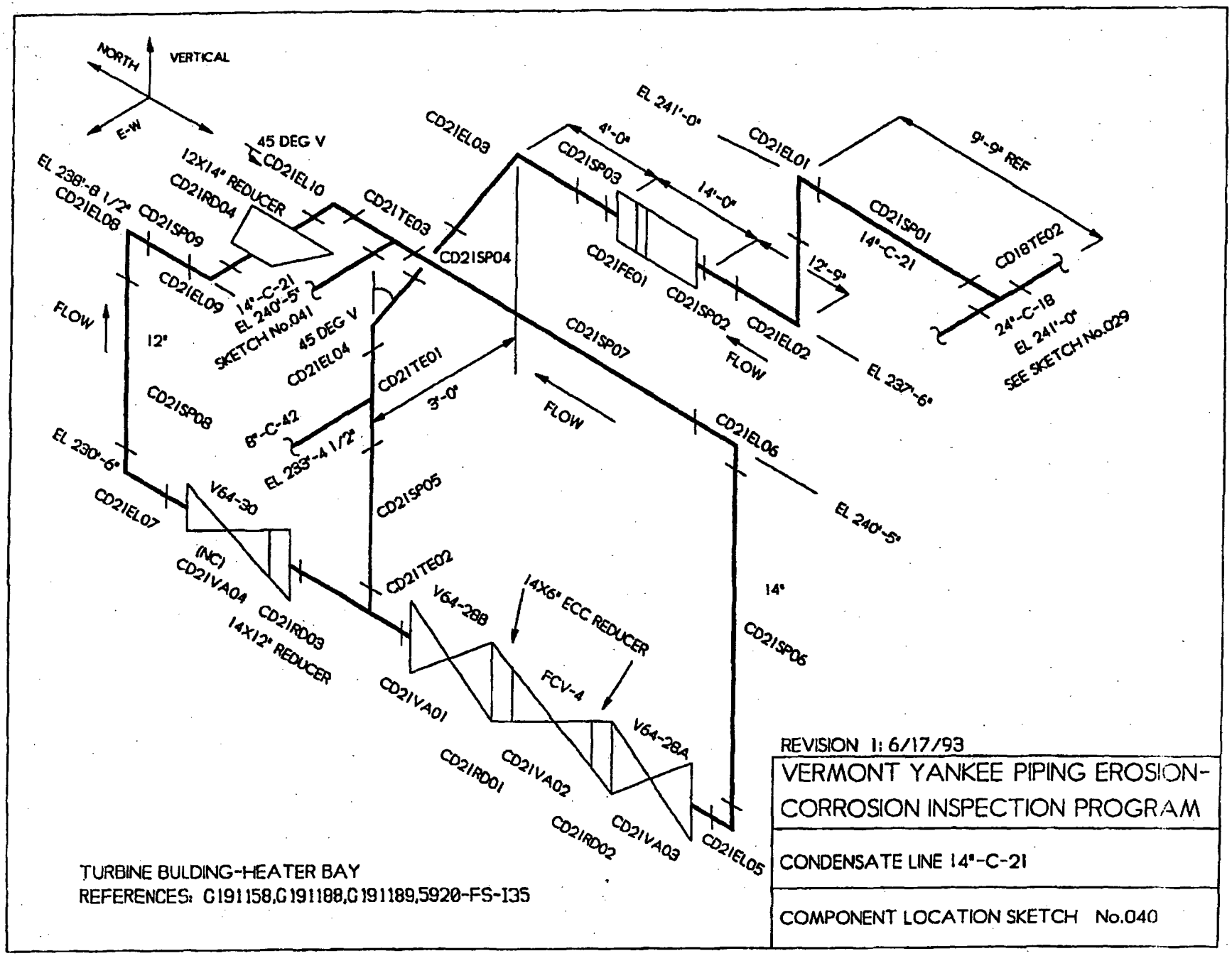
REVISION 0: 7/13/90

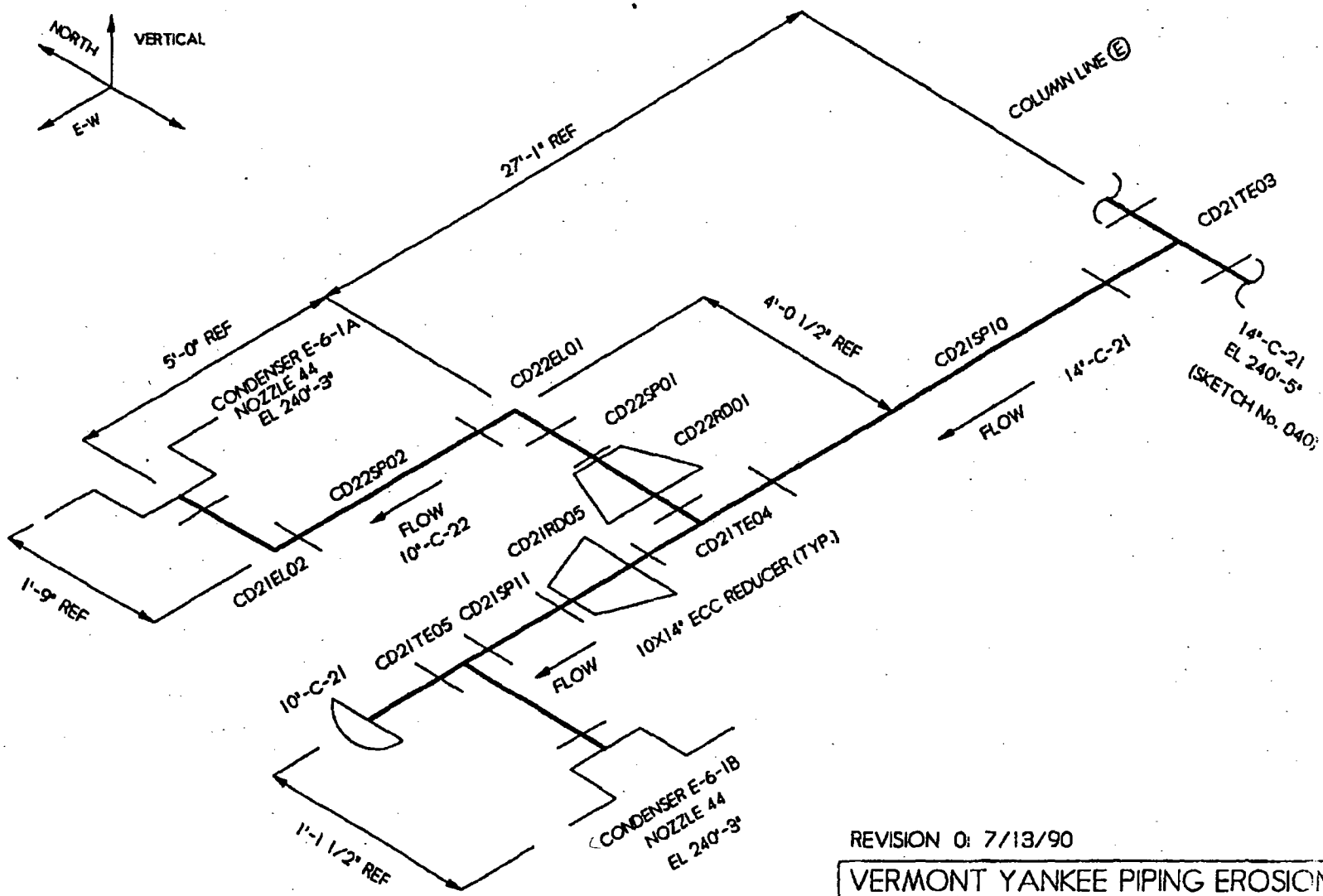
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

CONDENSATE LINE 20"-C-32

COMPONENT LOCATION SKETCH No. 039

TURBINE BULDING-FEEDWATER PUMP ROOM
REFERENCES: G191157,G191186,G191187,5920-FS-116


NORTH
VERTICAL
E-W
45 DEG V
CD21EL10
12X14" REDUCER
CD21RD04
EL 238'-8 1/2"
CD21EL08
CD21SP09
CD21EL09
14"-C-21
EL 240'-5"
SKETCH No.041
FLOW
12"
45 DEG V
CD21EL04
CD21SP08
6"-C-42
EL 233'-4 1/2"
EL 230'-6"
CD21EL07
V64-30
(NC)
CD21VA04
CD21RD03
14X12" REDUCER
CD21TE03
CD21EL03
CD21SP04
CD21TE01
3'-0"
CD21SP05
CD21TE02
V64-28B
CD21VA01
CD21RD01
CD21VA02
CD21RD02
CD21VA03
CD21EL05
14X6" ECC REDUCER
FCV-4
V64-28A
EL 241'-0"
4'-0"
CD21SP03
14'-0"
CD21FE01
CD21SP02
FLOW
CD21SP07
FLOW
CD21EL01
CD21EL02
12'-9"
EL 237'-6"
CD21EL06
EL 240'-5"
14"
CD21SP06
9'-9" REF
CD21SP01
14"-C-21
CD18TE02
24"-C-18
EL 241'-0"
SEE SKETCH No.029
REVISION 1: 6/17/93
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
CONDENSATE LINE 14"-C-21
COMPONENT LOCATION SKETCH No.040
TURBINE BULDING-HEATER BAY
REFERENCES: G191158,G191188,G191189,5920-FS-135



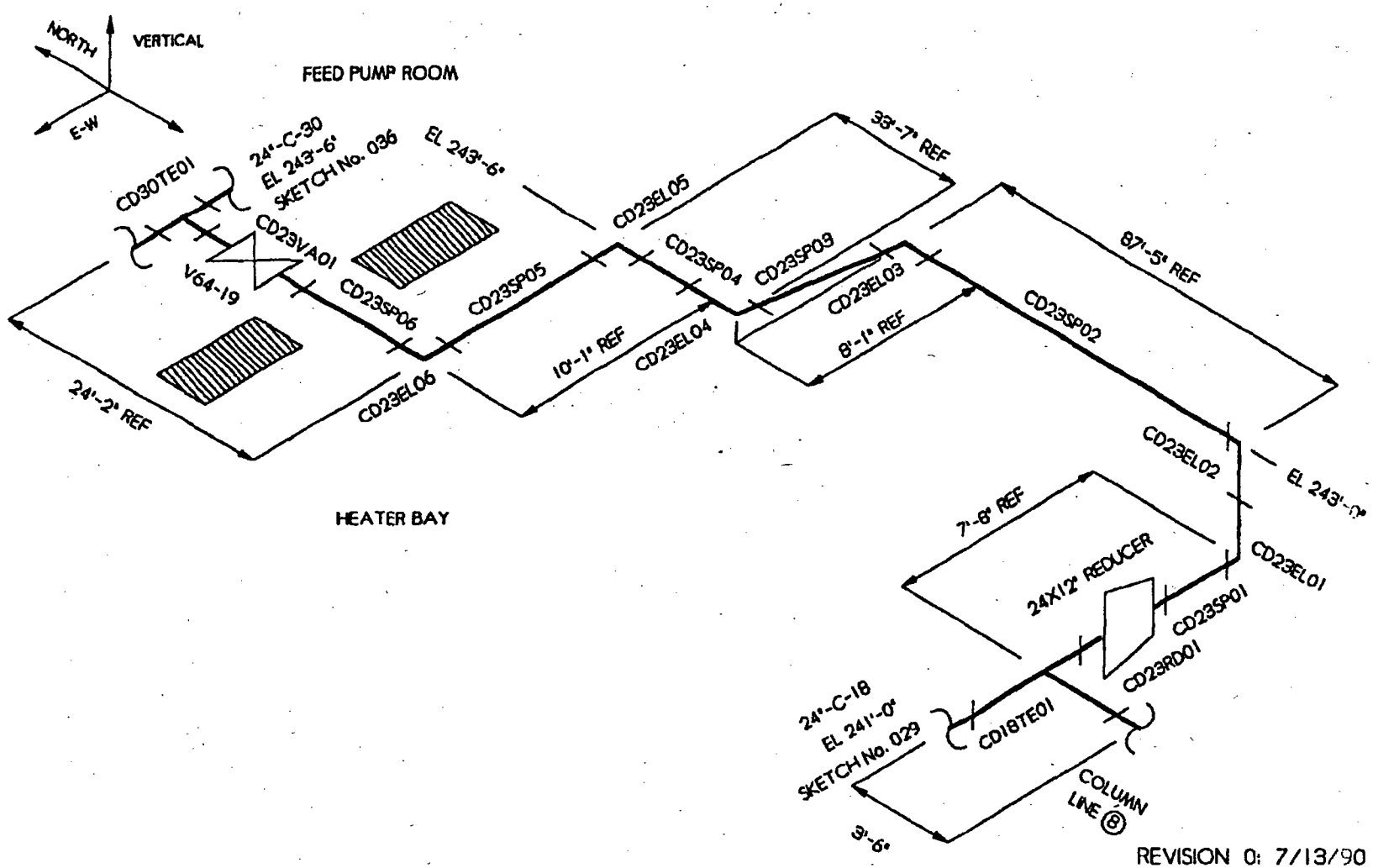
TURBINE BULDING-HEATER BAY
REFERENCES: G191158,G191188,G191189,5920-FS-135

REVISION 0: 7/13/90

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

CONDENSATE LINES 14"-C-21, 10"-C-21 AND 10"-C-22

COMPONENT LOCATION SKETCH No.041



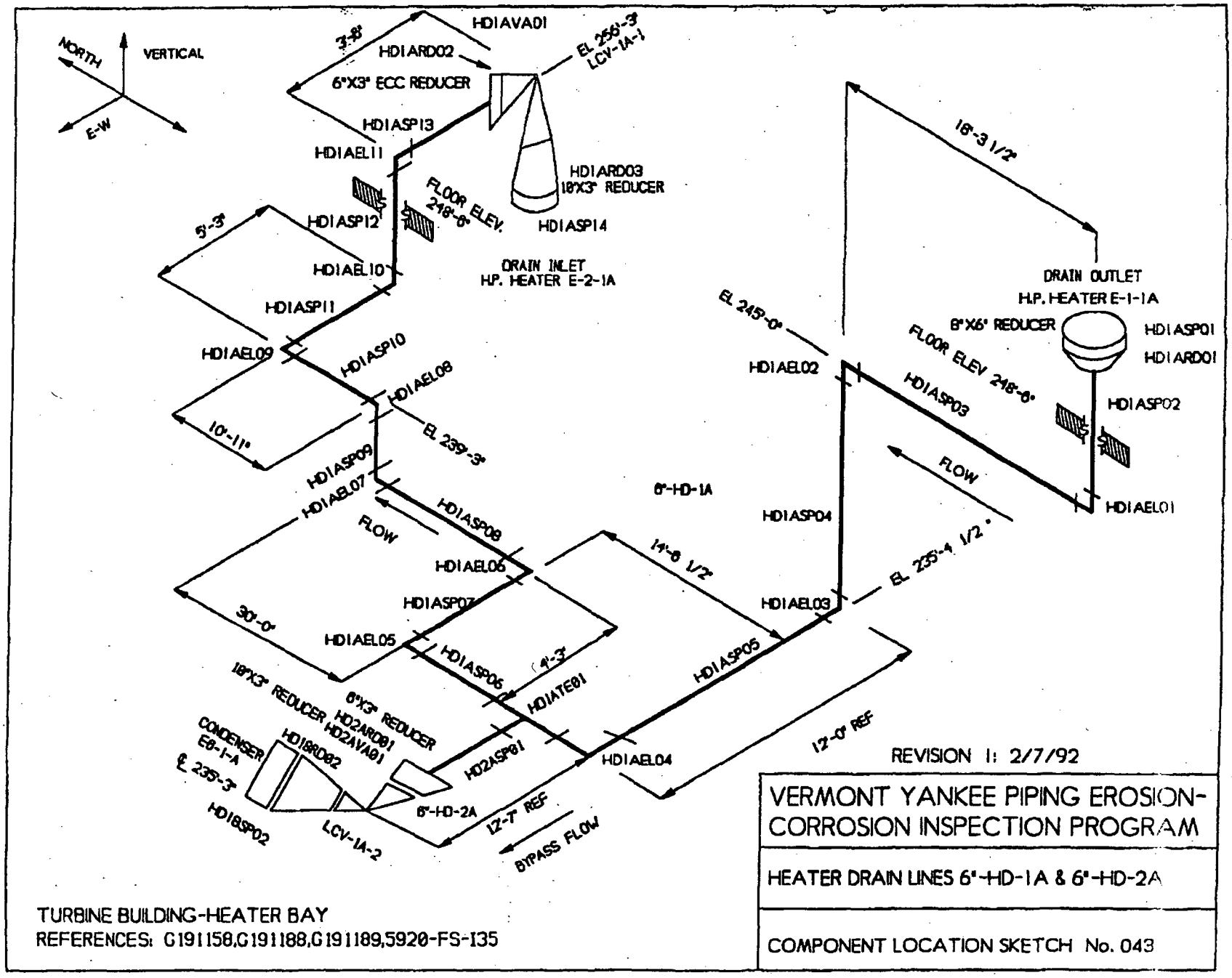
REVISION 0: 7/13/90

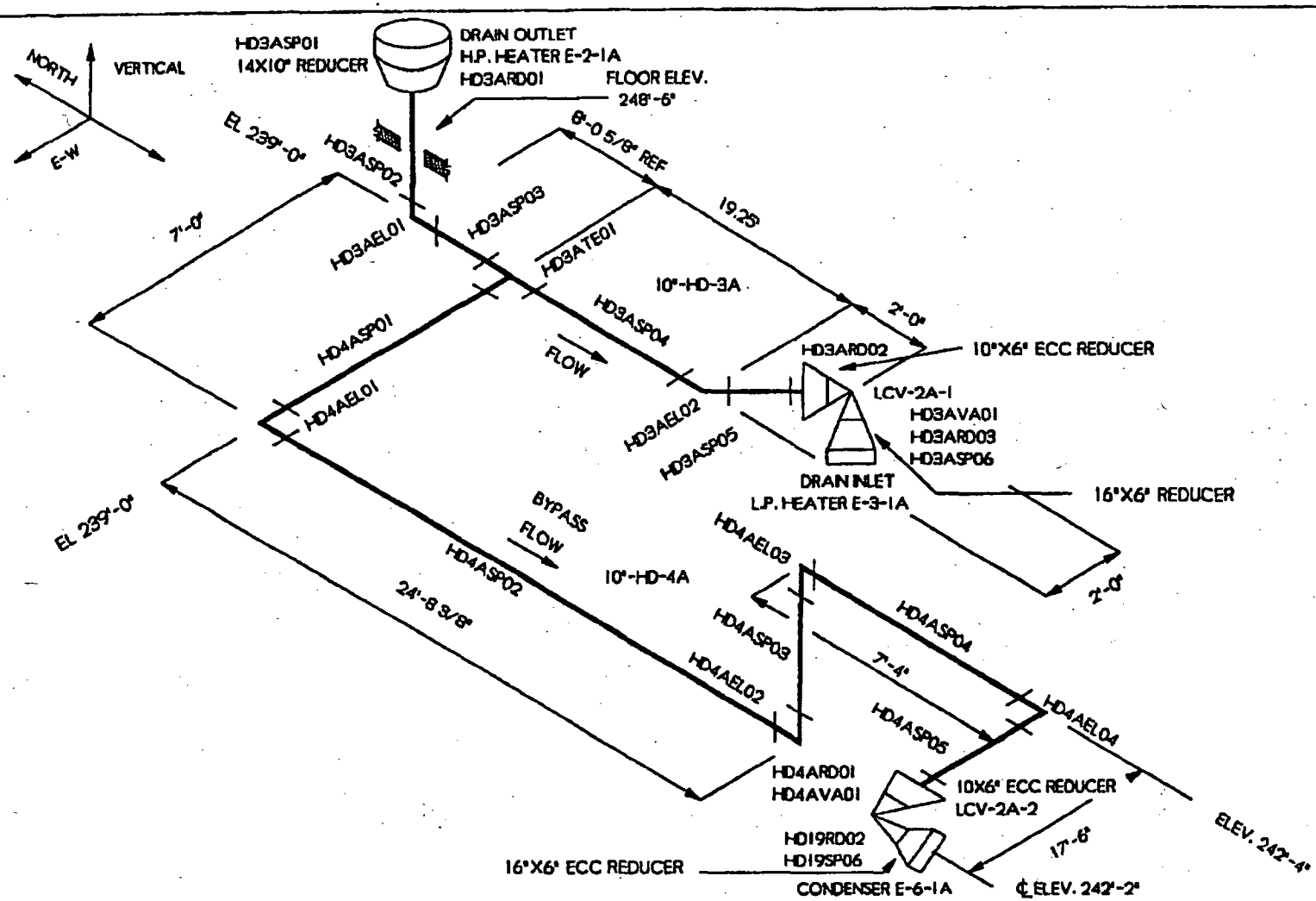
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

CONDENSATE LINE 12"-C-23

COMPONENT LOCATION SKETCH No.042

TURBINE BULDING-HEATER BAY
REFERENCES: G191158,G191188,G191189,5920-FS-I35


NORTH
VERTICAL
E-W
3'-8"
HD1AVA01
HD1ARD02
6"X3" ECC REDUCER
EL 256'-3"
LCV-1A-1
HD1ASP13
HD1AEL11
HD1ARD03
18"X3" REDUCER
FLOOR ELEV. 248'-6"
HD1ASP12
HD1ASP14
5'-3"
HD1AEL10
DRAIN INLET
H.P. HEATER E-2-1A
HD1ASP11
HD1AEL09
HD1ASP10
HD1AEL08
10'-11"
EL 239'-3"
HD1ASP09
HD1AEL07
FLOW
HD1ASP08
HD1AEL06
HD1ASP07
30'-0"
HD1AEL05
HD1ASP06
4'-3"
HD1ATE01
18"X3" REDUCER
6"X3" REDUCER
HD2ARD01
HD2AVA01
CONDENSER
E0-1-A
HD1BRD02
HD2ASP01
HD1AEL04
EL 235'-3"
HD1BSP02
LCV-1A-2
6"-HD-2A
12'-7" REF
BYPASS FLOW
12'-0" REF
HD1ASP05
14'-8 1/2"
HD1AEL03
EL 235'-4 1/2"
HD1ASP04
6"-HD-1A
EL 245'-0"
HD1AEL02
HD1ASP03
FLOOR ELEV 248'-6"
FLOW
18'-3 1/2"
DRAIN OUTLET
H.P. HEATER E-1-1A
8"X6" REDUCER
HD1ASP01
HD1ARD01
HD1ASP02
HD1AEL01
REVISION 1: 2/7/92
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
HEATER DRAIN LINES 6"-HD-1A & 6"-HD-2A
COMPONENT LOCATION SKETCH No. 043
TURBINE BUILDING-HEATER BAY
REFERENCES: G191158,G191188,G191189,5920-FS-135



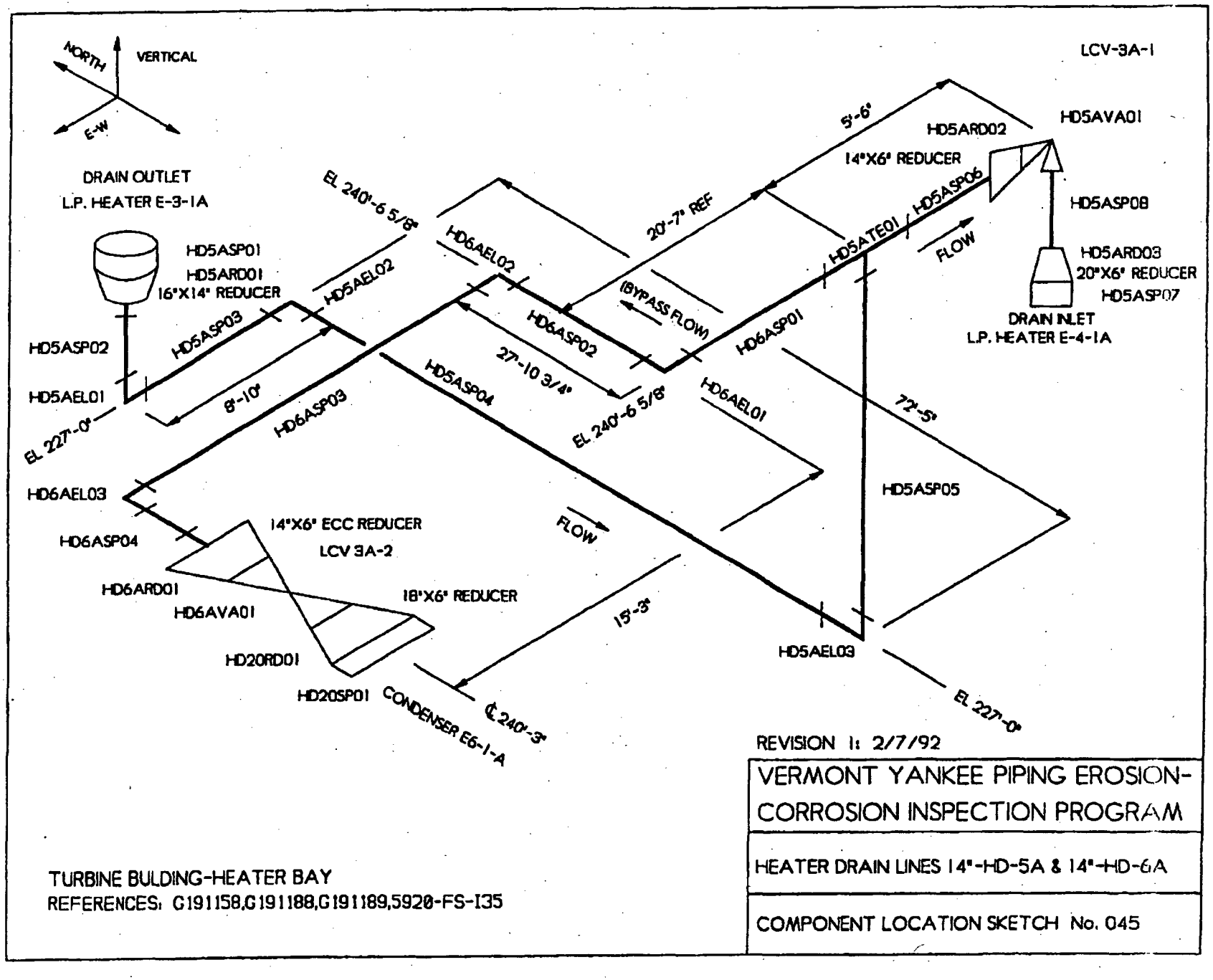
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

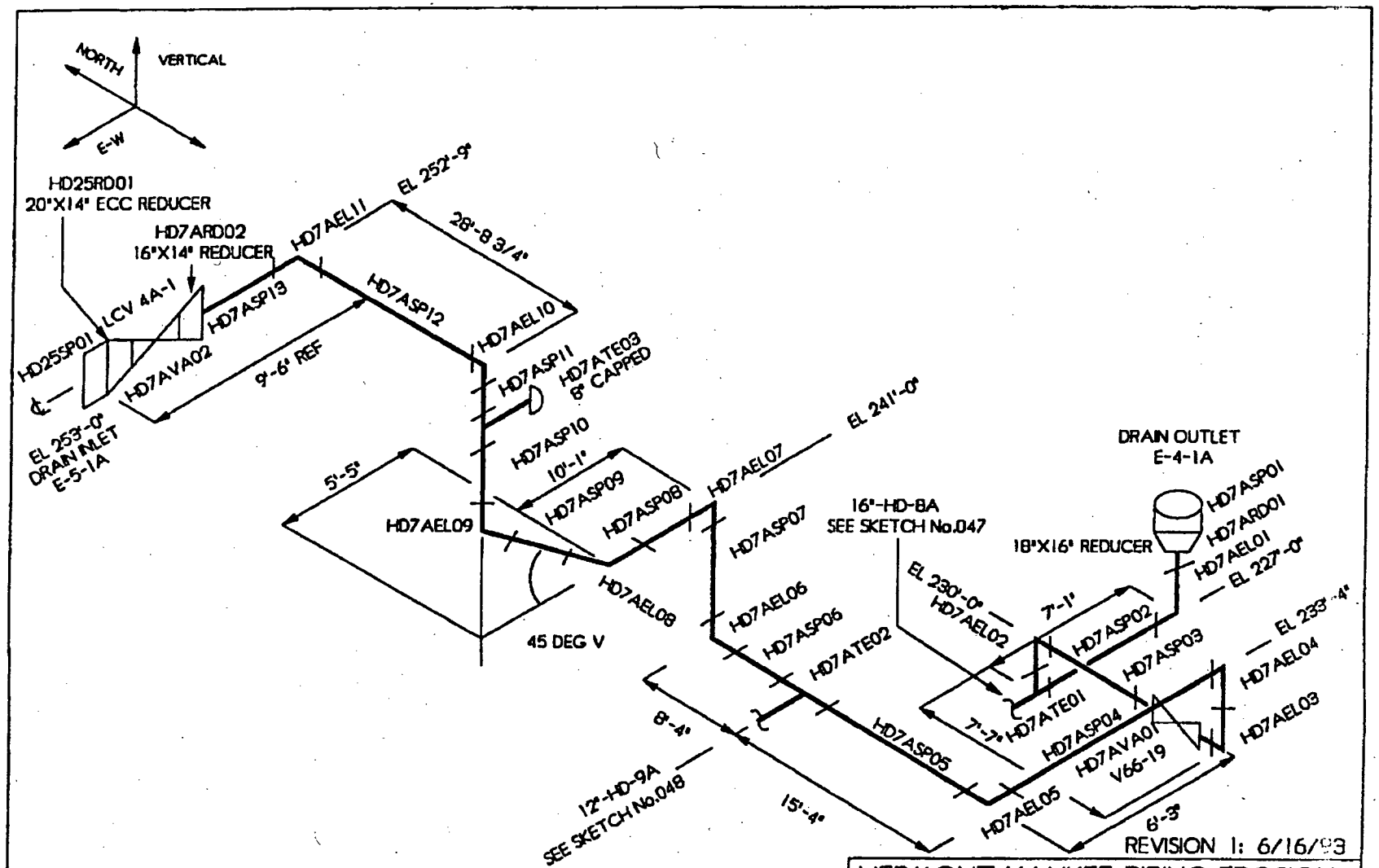
HEATER DRAIN LINES 10"-HD-3A & 10"-HD-4A

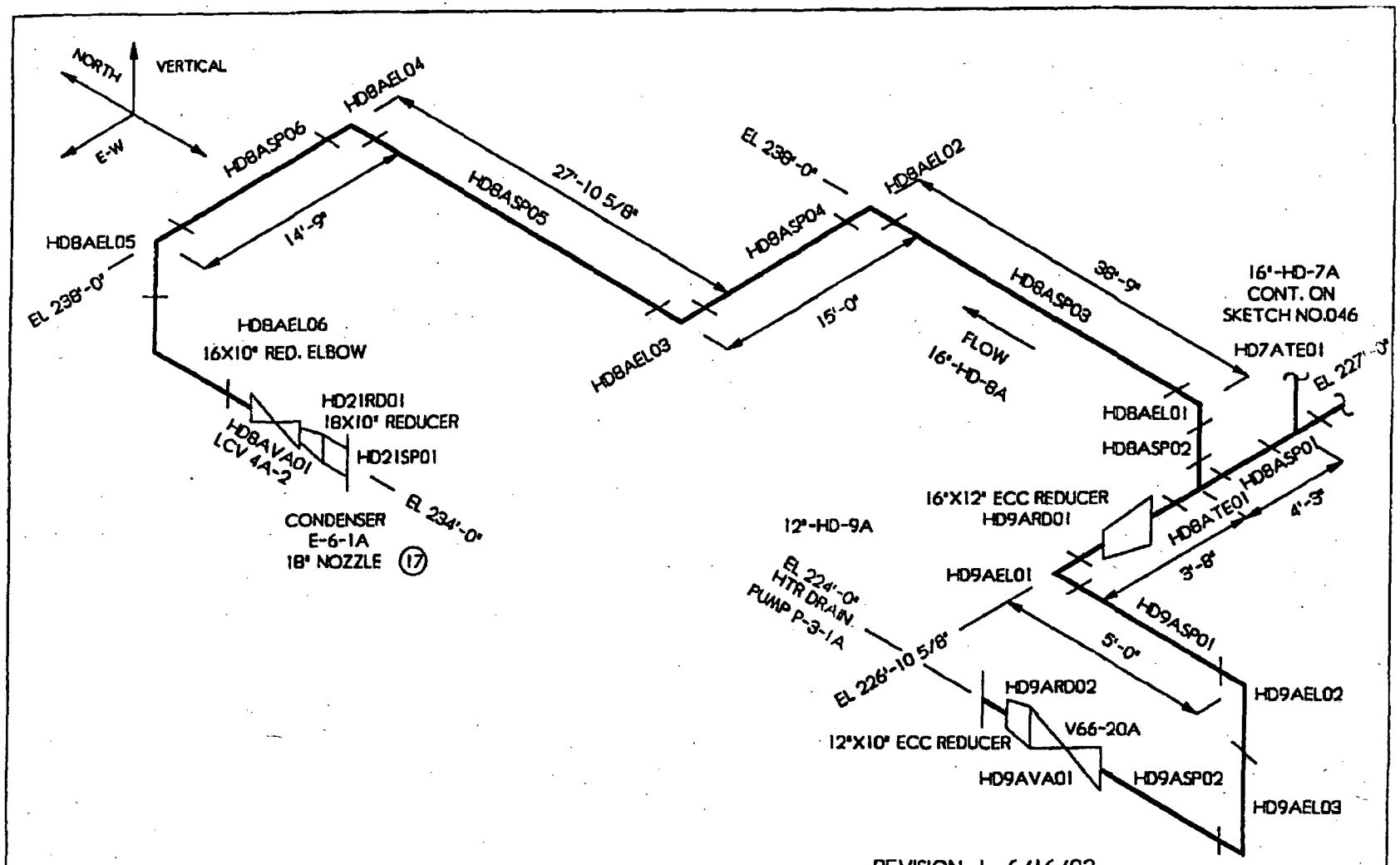
TURBINE BULDING-HEATER BAY
REFERENCES: G191158,G191188,G191189,5920-FS-15

REVISION 2: 6/17/93

COMPONENT LOCATION SKETCH No. 044


NORTH
VERTICAL
E-W
DRAIN OUTLET
L.P. HEATER E-3-1A
HD5ASP01
HD5ARD01
16"X14" REDUCER
HD5ASP02
HD5AEL01
EL 227'-0"
HD5ASP03
8'-10"
HD5AEL02
EL 240'-6 5/8"
HD6AEL02
HD6ASP03
HD6AEL03
HD6ASP04
14"X6" ECC REDUCER
LCV 3A-2
HD6ARD01
HD6AVA01
18"X6" REDUCER
HD20RD01
HD20SP01
CONDENSER E6-1-A
HD5ASP04
27'-10 3/4"
HD6ASP02
EL 240'-6 5/8"
(BYPASS FLOW)
20'-7" REF
5'-6"
HD5ARD02
14"X6" REDUCER
LCV-3A-1
HD5AVA01
HD5ASP06
HD5ATE01
FLOW
HD5ASP08
HD5ARD03
20"X6" REDUCER
HD5ASP07
DRAIN INLET
L.P. HEATER E-4-1A
HD6ASP01
HD6AEL01
72'-5"
HD5ASP05
FLOW
15'-3"
HD5AEL03
EL 227'-0"
℄ 240'-3"
REVISION 1: 2/7/92
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
HEATER DRAIN LINES 14"-HD-5A & 14"-HD-6A
COMPONENT LOCATION SKETCH No. 045
TURBINE BULDING-HEATER BAY
REFERENCES: G191158,G191188,G191189,5920-FS-I35


NORTH
VERTICAL
E-W
HD25RD01
20"X14" ECC REDUCER
HD7ARD02
16"X14" REDUCER
LCV 4A-1
HD25SP01
HD7AVA02
HD7ASP13
HD7AEL11
EL 252'-9"
28'-8 3/4"
HD7ASP12
HD7AEL10
9'-6" REF
HD7ASP11
HD7ATE03
6" CAPPED
EL 253'-0"
DRAIN INLET
E-5-1A
HD7ASP10
10'-1"
5'-5"
HD7AEL09
HD7ASP09
HD7ASP08
HD7AEL07
EL 241'-0"
HD7AEL08
45 DEG V
HD7ASP07
HD7AEL06
HD7ASP06
HD7ATE02
16"-HD-8A
SEE SKETCH No.047
EL 230'-0"
HD7AEL02
7'-1"
DRAIN OUTLET
E-4-1A
HD7ASP01
HD7ARD01
18"X16" REDUCER
HD7AEL01
EL 227'-0"
HD7ASP02
HD7ASP03
EL 233'-4"
HD7AEL04
HD7AEL03
7'-7"
HD7ATE01
HD7ASP04
HD7AVA01
V66-19
HD7ASP05
HD7AEL05
6'-3"
8'-4"
12"-HD-9A
SEE SKETCH No.048
15'-4"
REVISION 1: 6/16/93
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
HEATER DRAIN LINES 16"-HD-7A & 20"-HD-25A
COMPONENT LOCATION SKETCH No.046
TURBINE BUILDING-HEATER BAY
REFERENCES: G191158,G191188,G191189,5920-FS-I35



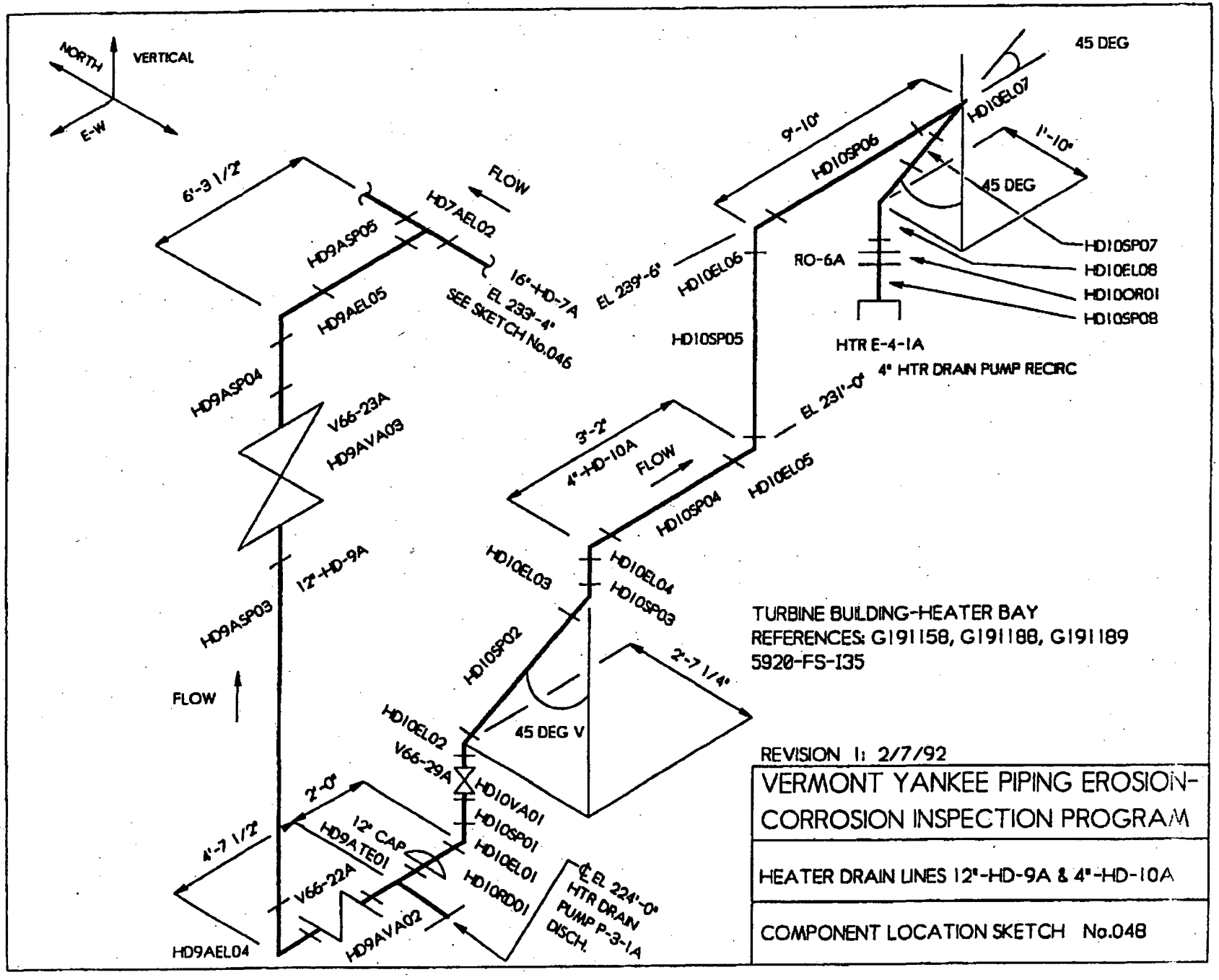
REVISION 1: 6/16/93

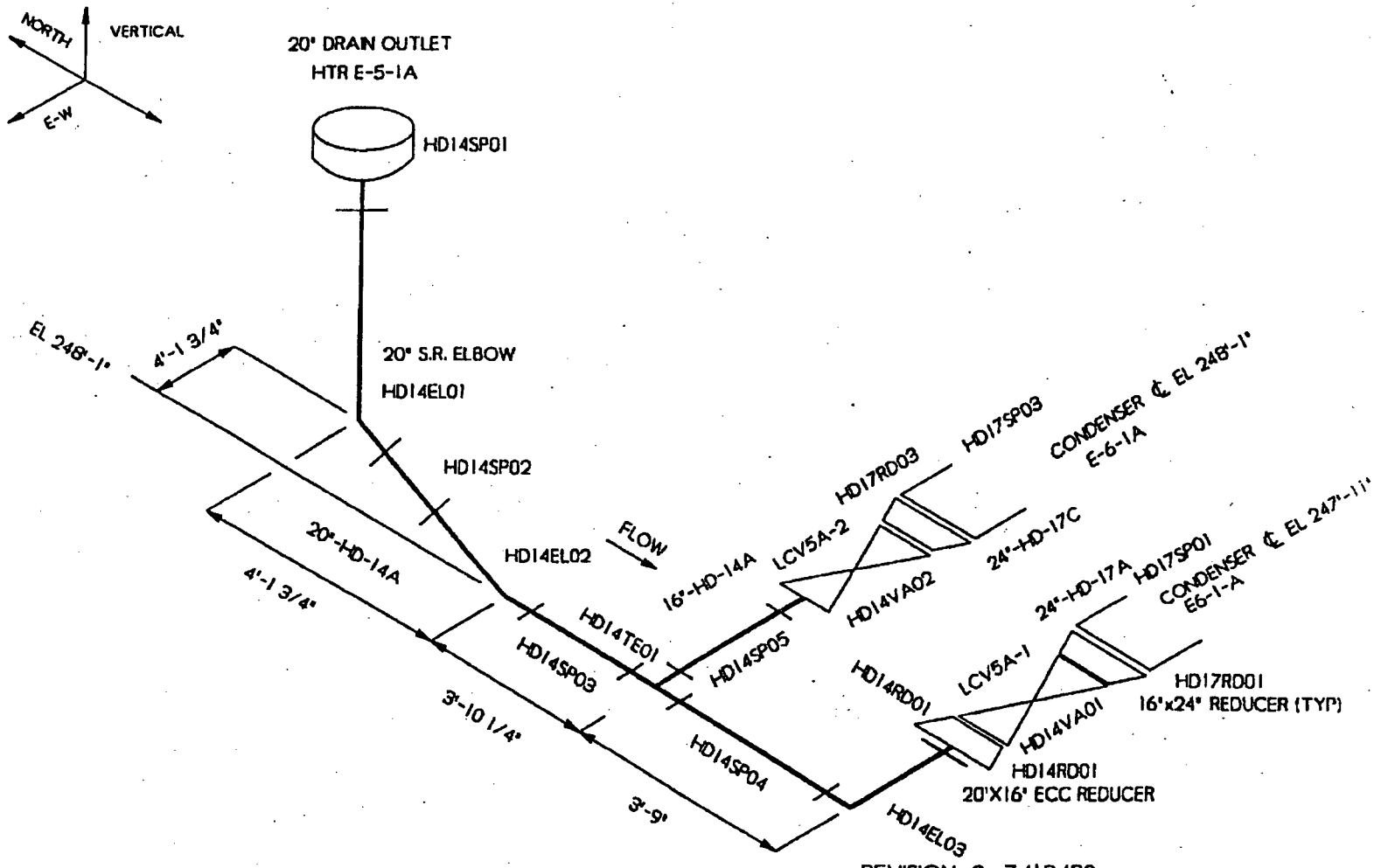
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

HEATER DRAIN LINES 16"-HD-8A, 12"-HD-9A 18"-HD-21A

COMPONENT LOCATION SKETCH No.047

TURBINE BUILDING-HEATER BAY
REFERENCES: G191158,G191188,G191189,5920-FS-I35


NORTH
VERTICAL
E-W
6'-3 1/2"
HD9ASP05
HD7AEL02
FLOW
16"-HD-7A
EL 233'-4"
SEE SKETCH No.046
HD9AEL05
HD9ASP04
V66-23A
HD9AVA03
12"-HD-9A
HD9ASP03
FLOW
4'-7 1/2"
HD9AEL04
2'-0"
12" CAP
HD9ATE01
V66-22A
HD9AVA02
HD10RD01
HD10EL01
HD10SP01
HD10VA01
V66-29A
HD10EL02
45 DEG V
HD10SP02
HD10EL03
HD10SP03
HD10EL04
HD10SP04
HD10EL05
4"-HD-10A
3'-2"
FLOW
EL 231'-0"
HD10SP05
HD10EL06
EL 239'-6"
HD10SP06
9'-10"
HD10EL07
45 DEG
1'-10"
45 DEG
RO-6A
HD10SP07
HD10EL08
HD10OR01
HD10SP08
HTR E-4-1A
4" HTR DRAIN PUMP RECIRC
2'-7 1/4"
℄ EL 224'-0"
HTR DRAIN
PUMP P-3-1A
DISCH.
TURBINE BUILDING-HEATER BAY
REFERENCES: G191158, G191188, G191189
5920-FS-135
REVISION 1: 2/7/92
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
HEATER DRAIN LINES 12"-HD-9A & 4"-HD-10A
COMPONENT LOCATION SKETCH No.048



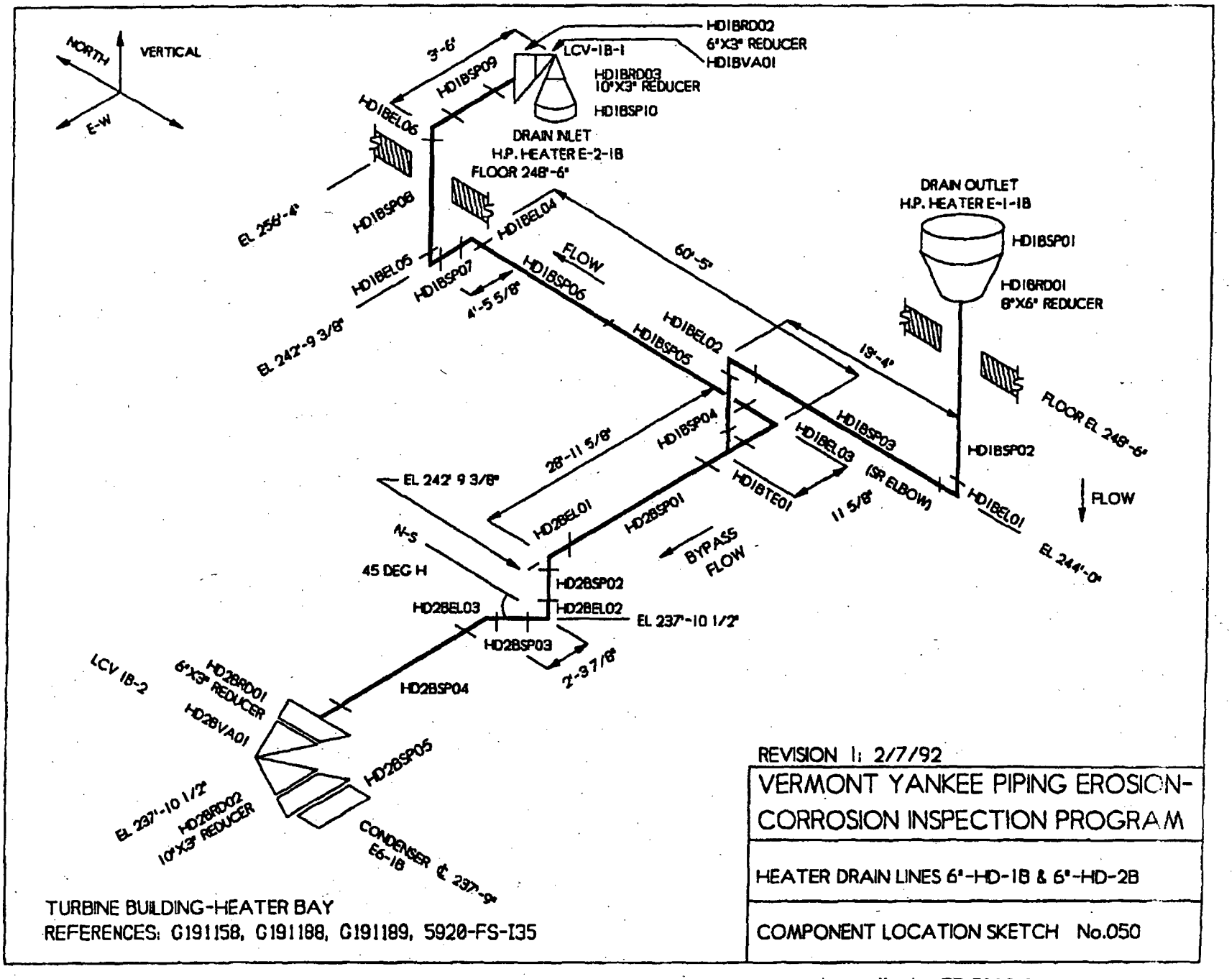
REVISION 0: 7/18/90

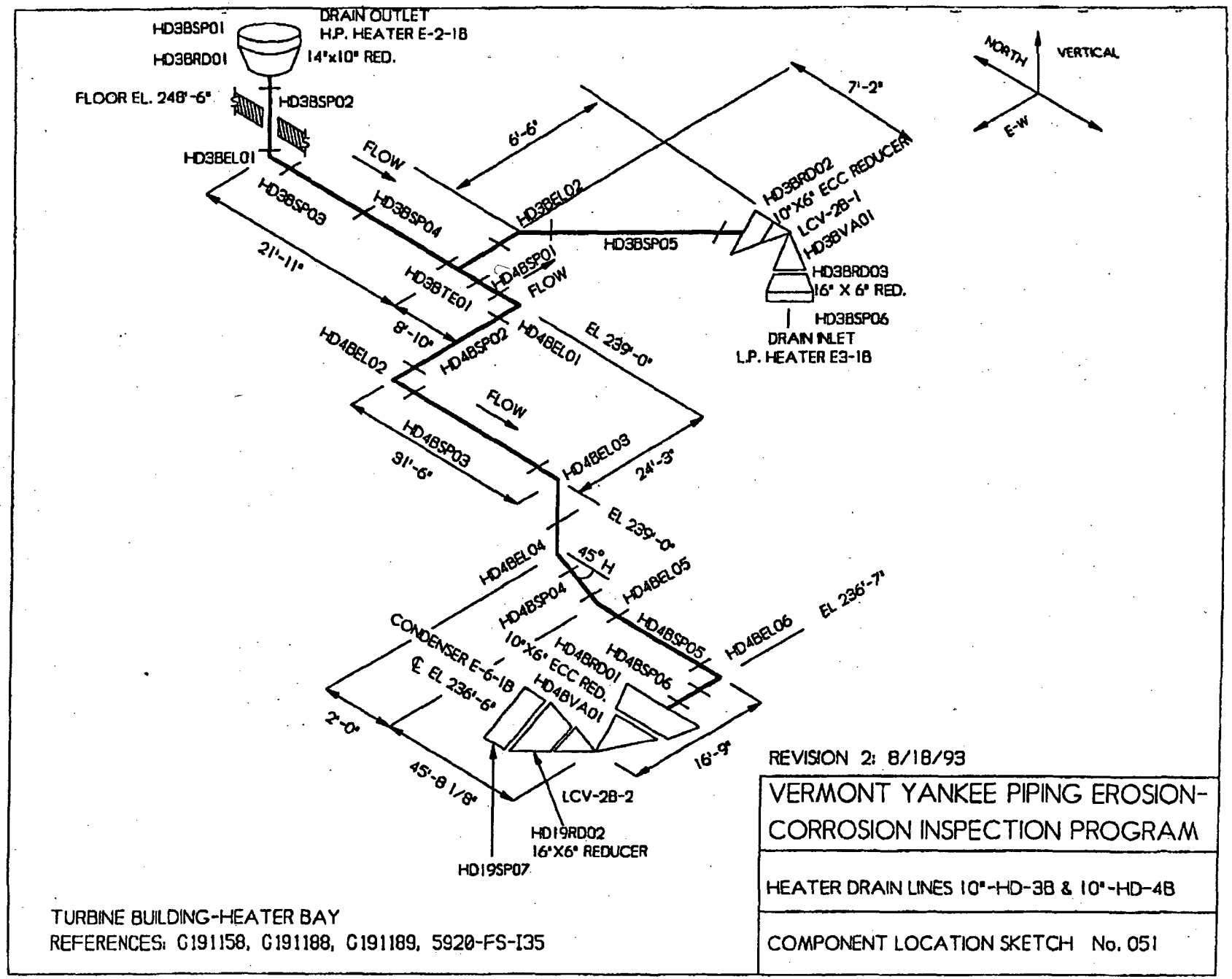
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

HEATER DRAIN LINES 20"-HD-14A, 16"-HD-14A AND 24"-HD-17A & C

REFERENCES: G191158,G191188,G191189,5920-FI-15

COMPONENT LOCATION SKETCH No.049


NORTH
VERTICAL
E-W
3'-6"
HD1BSP09
HD1BEL06
HD1BRD02
6"X3" REDUCER
HD1BVA01
LCV-1B-1
HD1BRD03
10"X3" REDUCER
HD1BSP10
DRAIN INLET
H.P. HEATER E-2-1B
FLOOR 248'-6"
EL 256'-4"
HD1BSP08
HD1BEL04
HD1BEL05
HD1BSP07
4'-5 5/8"
FLOW
HD1BSP06
60'-5"
EL 242'-9 3/8"
HD1BEL02
HD1BSP05
DRAIN OUTLET
H.P. HEATER E-1-1B
HD1BSP01
HD1BRD01
8"X6" REDUCER
13'-4"
FLOOR EL 248'-6"
HD1BSP03
HD1BSP02
HD1BEL03
(SR ELBOW)
HD1BTE01
11 5/8"
HD1BEL01
FLOW
EL 244'-0"
28'-11 5/8"
HD1BSP04
EL 242' 9 3/8"
HD2BEL01
HD2BSP01
BYPASS
FLOW
N-S
45 DEG H
HD2BSP02
HD2BEL03
HD2BEL02
EL 237'-10 1/2"
HD2BSP03
2'-9 7/8"
LCV 1B-2
HD2BRD01
6"X3" REDUCER
HD2BVA01
HD2BSP04
HD2BSP05
EL 237'-10 1/2"
HD2BRD02
10"X3" REDUCER
CONDENSER
E6-1B
℄ 237'-9"
TURBINE BUILDING-HEATER BAY
REFERENCES: G191158, G191188, G191189, 5920-FS-I35
REVISION 1: 2/7/92
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
HEATER DRAIN LINES 6"-HD-1B & 6"-HD-2B
COMPONENT LOCATION SKETCH No.050



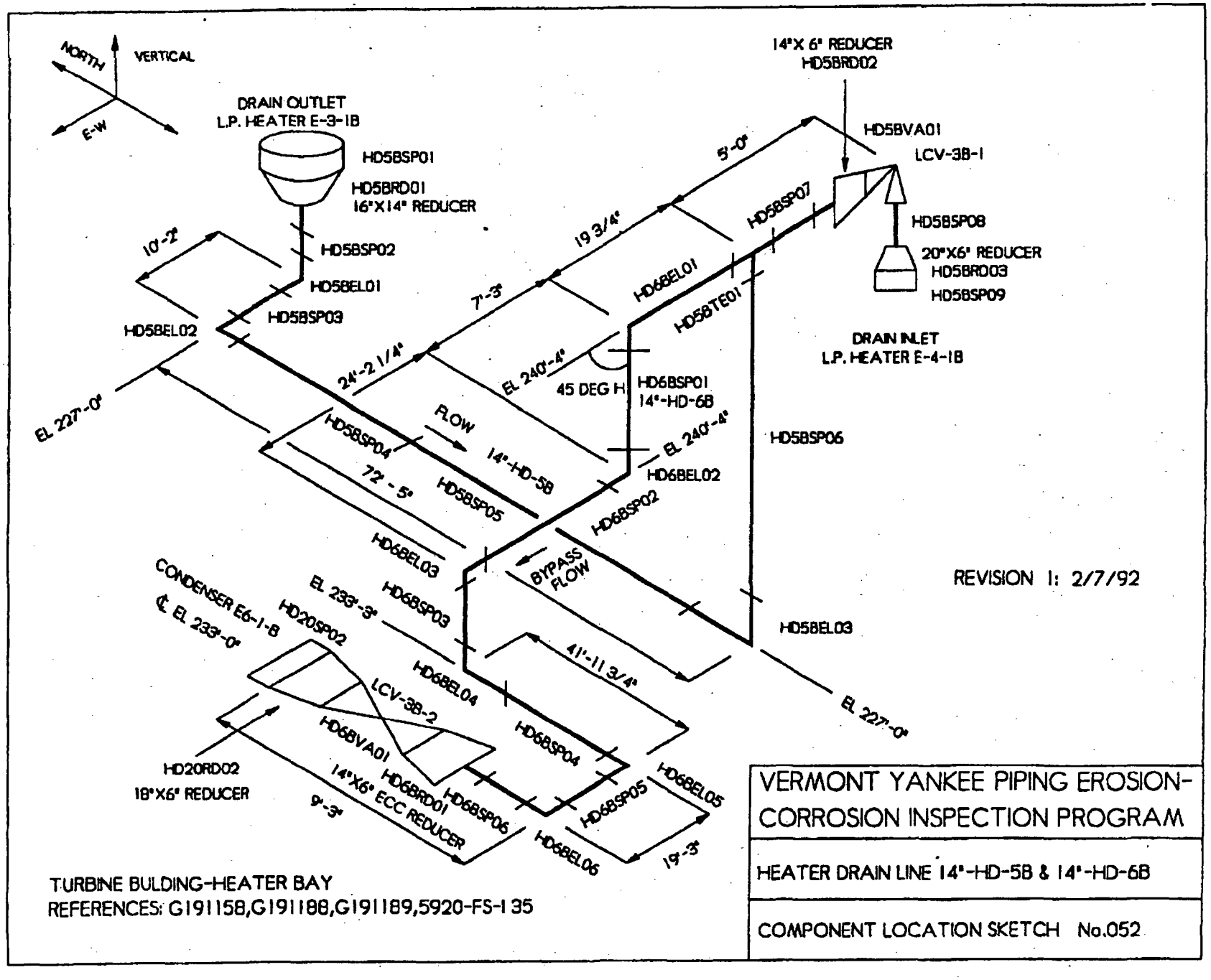
REVISION 2: 8/18/93

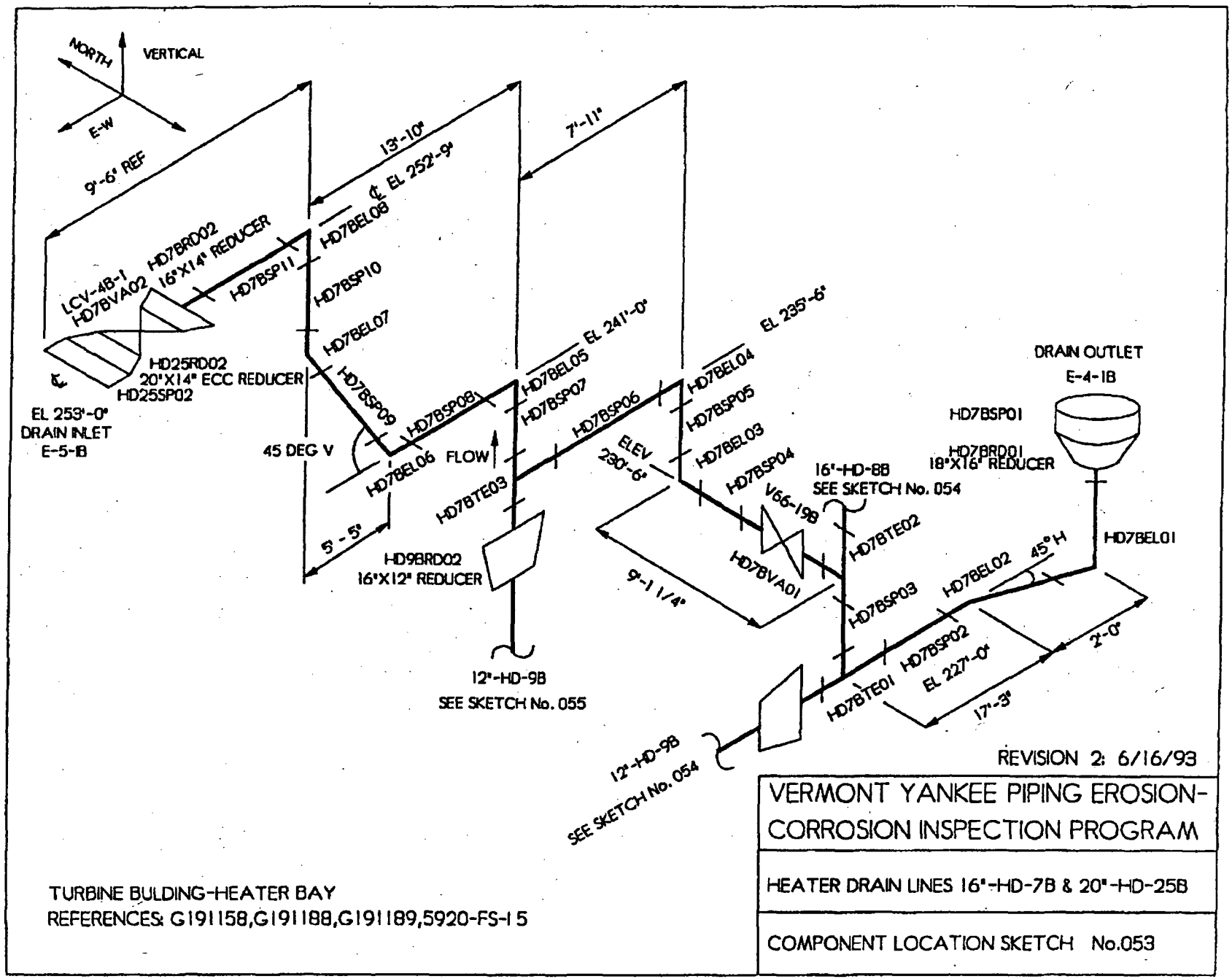
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

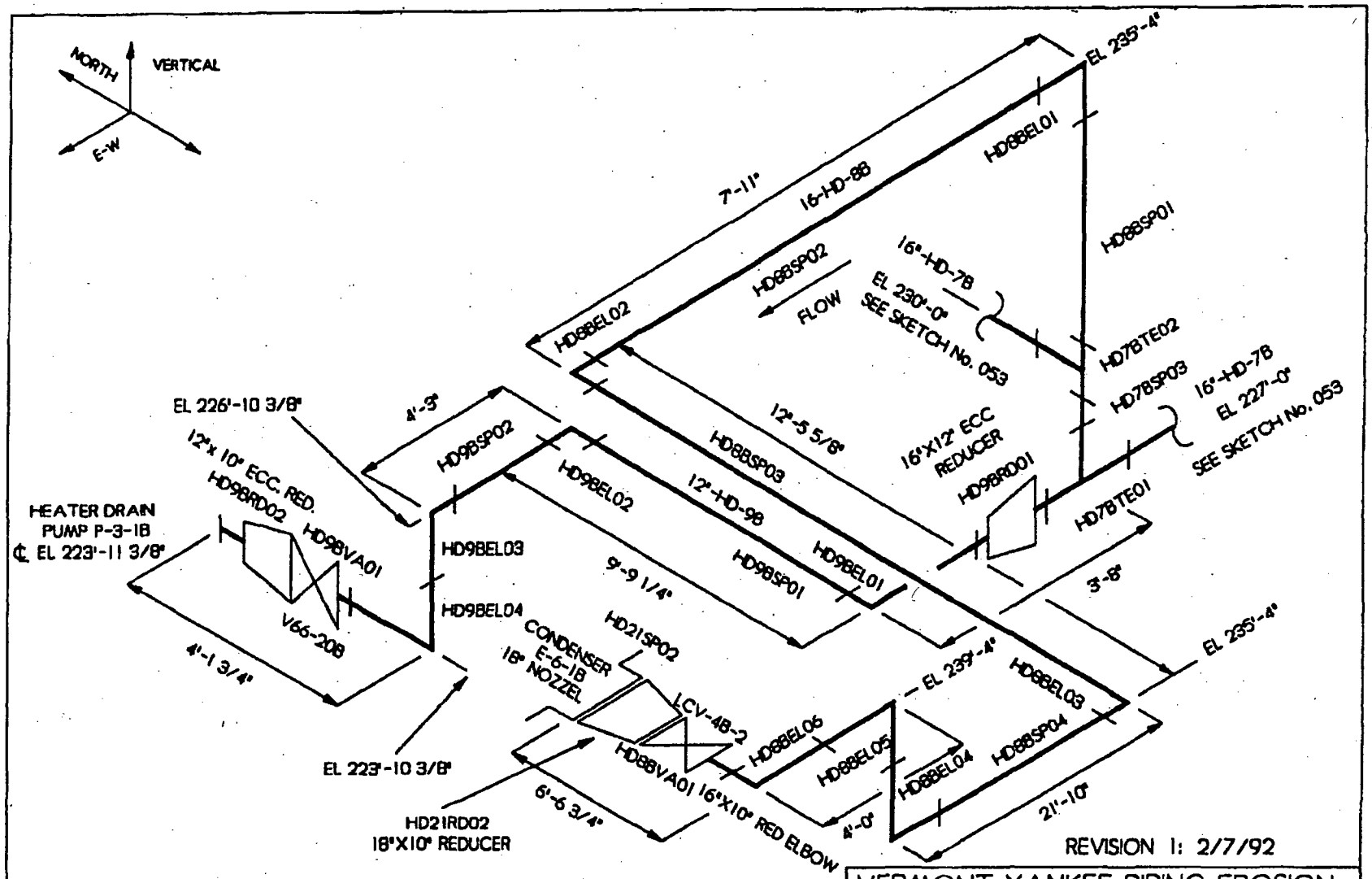
HEATER DRAIN LINES 10"-HD-3B & 10"-HD-4B

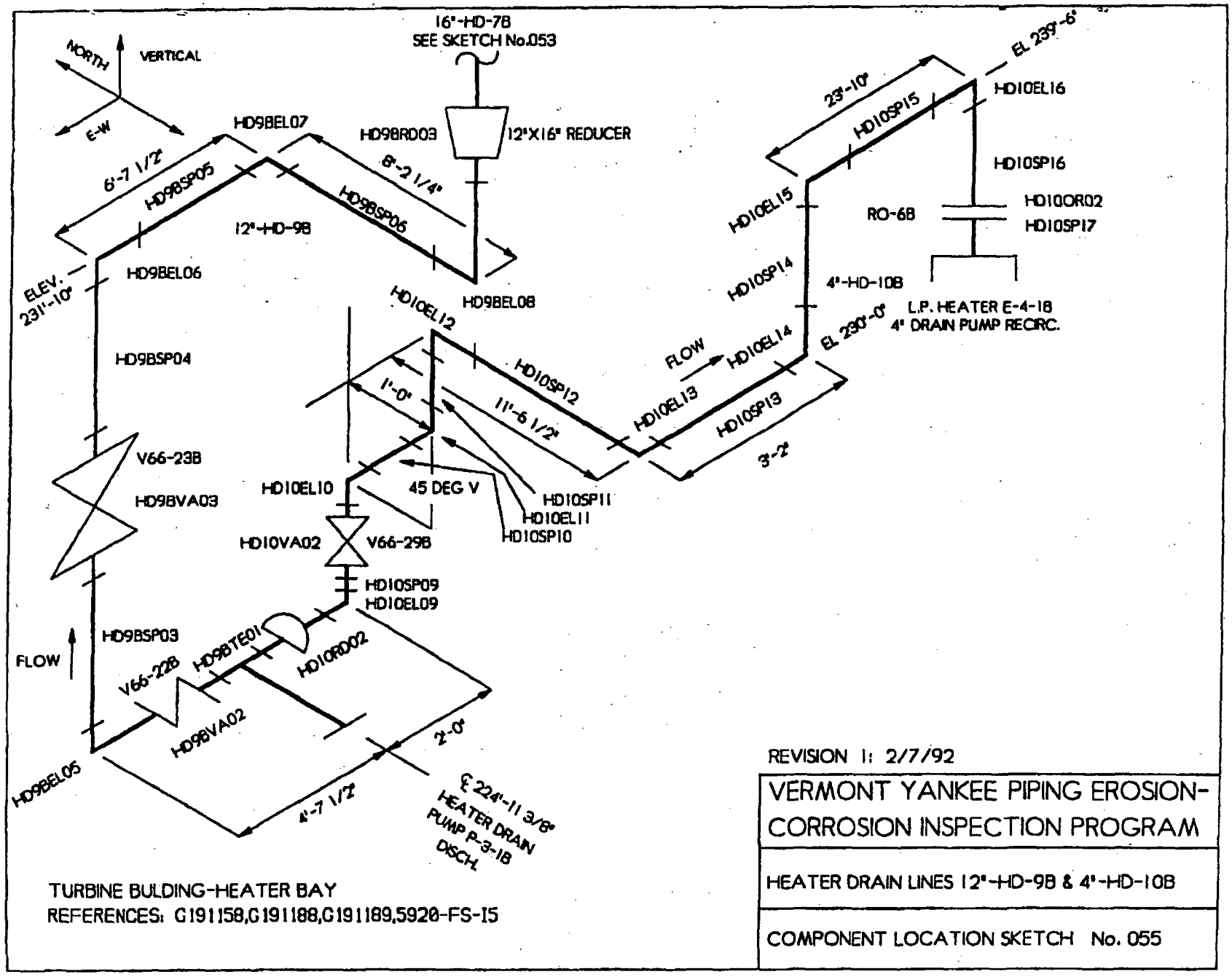
COMPONENT LOCATION SKETCH No. 051

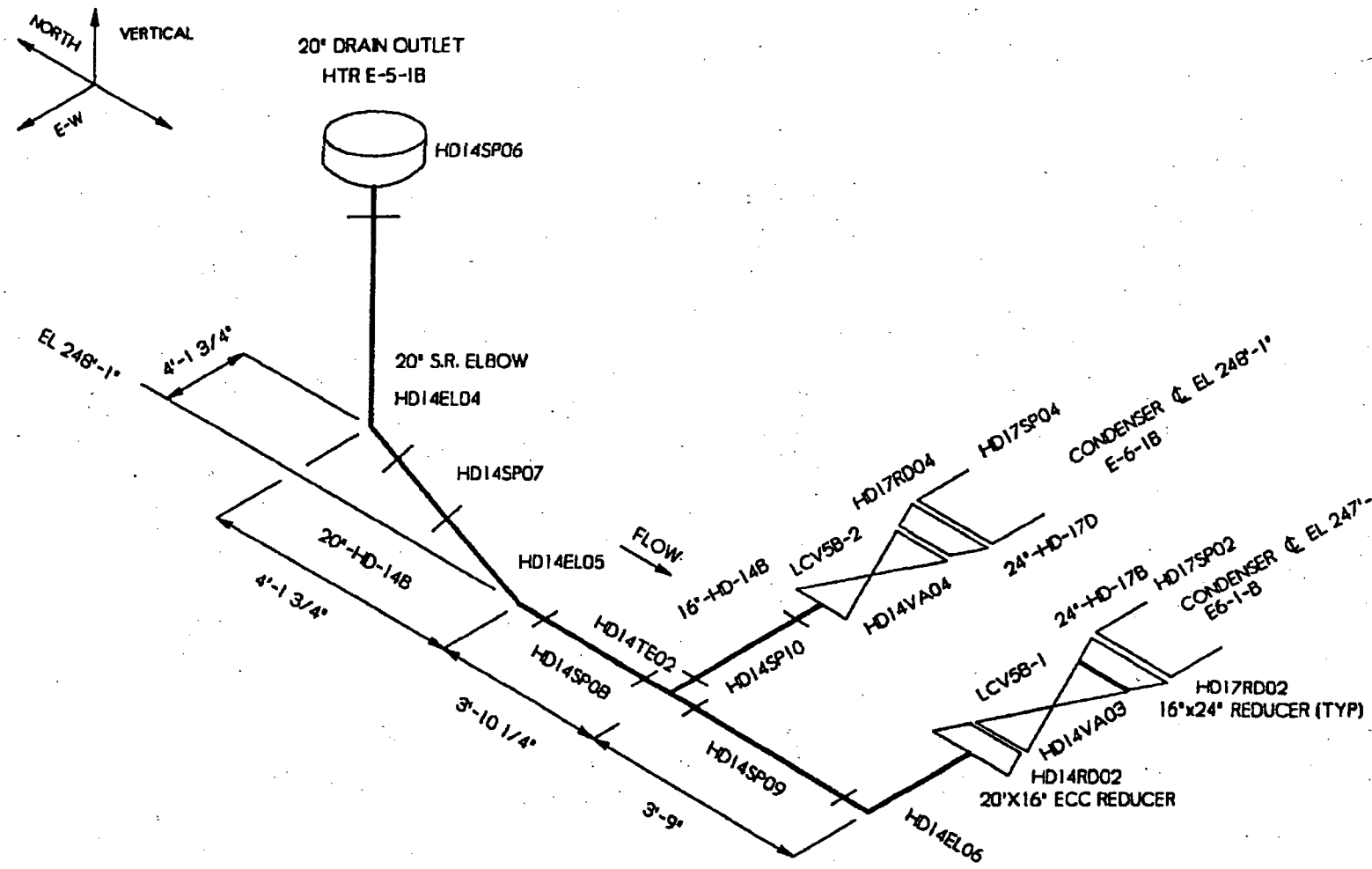
TURBINE BUILDING-HEATER BAY
REFERENCES: G191158, G191188, G191189, 5920-FS-I35


NORTH
VERTICAL
E-W
DRAIN OUTLET
L.P. HEATER E-3-1B
HD5BSP01
HD5BRD01
16"X14" REDUCER
HD5BSP02
HD5BEL01
HD5BSP03
HD5BEL02
10'-2"
EL 227'-0"
24'-2 1/4"
7'-3"
19 3/4"
5'-0"
14"X 6" REDUCER
HD5BRD02
HD5BVA01
LCV-3B-1
HD5BSP07
HD5BSP08
20"X6" REDUCER
HD5BRD03
HD5BSP09
HD6BEL01
HD5BTE01
DRAIN INLET
L.P. HEATER E-4-1B
EL 240'-4"
45 DEG H
HD6BSP01
14"-HD-6B
FLOW
14"-HD-5B
HD5BSP04
72'-5"
HD5BSP05
EL 240'-4"
HD6BEL02
HD5BSP06
HD6BSP02
HD6BEL03
BYPASS FLOW
CONDENSER E6-1-B
℄ EL 233'-0"
EL 233'-3"
HD20SP02
HD6BSP03
HD6BEL04
41'-11 3/4"
HD5BEL03
EL 227'-0"
LCV-3B-2
HD6BVA01
HD6BSP04
HD20RD02
18"X6" REDUCER
14"X6" ECC REDUCER
9'-3"
HD6BRD01
HD6BSP06
HD6BSP05
HD6BEL05
HD6BEL06
19'-3"
REVISION 1: 2/7/92
TURBINE BULDING-HEATER BAY
REFERENCES: G191158,G191188,G191189,5920-FS-135
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
HEATER DRAIN LINE 14"-HD-5B & 14"-HD-6B
COMPONENT LOCATION SKETCH No.052


NORTH
VERTICAL
E-W
9'-6" REF
13'-10"
7'-11"
℄ EL 252'-9"
HD7BRD02
16"X14" REDUCER
HD7BEL08
LCV-4B-1
HD7BVA02
HD7BSP11
HD7BSP10
HD7BEL07
HD25RD02
20"X14" ECC REDUCER
HD25SP02
EL 253'-0"
DRAIN INLET
E-5-1B
HD7BSP09
45 DEG V
HD7BSP08
HD7BEL05
EL 241'-0"
HD7BSP07
HD7BSP06
HD7BEL04
EL 235'-6"
HD7BSP05
HD7BEL03
HD7BSP04
HD7BEL06
FLOW
HD7BTE03
ELEV 230'-6"
V66-19B
16"-HD-8B
SEE SKETCH No. 054
HD7BTE02
HD7BVA01
HD7BSP03
5'-5"
HD9BRD02
16"X12" REDUCER
9'-1 1/4"
12"-HD-9B
SEE SKETCH No. 055
DRAIN OUTLET
E-4-1B
HD7BSP01
HD7BRD01
18"X16" REDUCER
HD7BEL01
45° H
HD7BEL02
HD7BSP02
EL 227'-0"
HD7BTE01
2'-0"
17'-3"
12"-HD-9B
SEE SKETCH No. 054
REVISION 2: 6/16/93
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
HEATER DRAIN LINES 16"-HD-7B & 20"-HD-25B
COMPONENT LOCATION SKETCH No.053
TURBINE BULDING-HEATER BAY
REFERENCES: G191158,G191188,G191189,5920-FS-15


NORTH
VERTICAL
E-W
EL 235'-4"
HD88EL01
7'-11"
16-HD-88
HD88SP01
16"-HD-78
HD88SP02
EL 230'-0"
SEE SKETCH No. 053
FLOW
HD88EL02
HD78TE02
HD78SP03
16"-HD-78
EL 227'-0"
SEE SKETCH No. 053
EL 226'-10 3/8"
4'-3"
12"x 10" ECC. RED.
HD98RD02
HD98SP02
12'-5 5/8"
16"X12" ECC
REDUCER
HD98RD01
HD88SP03
HD98EL02
12"-HD-98
HD78TE01
HEATER DRAIN
PUMP P-3-1B
℄ EL 223'-11 3/8"
HD98VA01
HD9BEL03
HD98EL01
HD98SP01
3'-6"
9'-9 1/4"
HD9BEL04
V66-208
CONDENSER
E-6-1B
18" NOZZEL
HD21SP02
EL 235'-4"
4'-1 3/4"
EL 239'-4"
HD88EL03
LCV-48-2
HD88EL06
HD88EL05
HD88SP04
EL 223'-10 3/8"
HD88VA01
HD88EL04
6'-6 3/4"
16"X10" RED ELBOW
4'-0"
21'-10"
HD21RD02
18"X10" REDUCER
REVISION 1: 2/7/92
TURBINE BULDING-HEATER BAY
REFERENCES: G191158,G191188,G191189,5920-FS-I35
VERMONT YANKEE PIPING EROSION-
CORROSION INSPECTION PROGRAM
HEATER DRAIN LINES 16"-HD-8B, 12"-HD-9B
AND 18"-HD-21B
COMPONENT LOCATION SKETCH No. 054


NORTH
VERTICAL
E-W
16"-HD-7B
SEE SKETCH No.053
HD9BEL07
HD9BRD03
12"X16" REDUCER
6'-7 1/2"
HD9BSP05
8'-2 1/4"
HD9BSP06
12"-HD-9B
ELEV. 231'-10"
HD9BEL06
HD9BEL08
HD10EL12
HD9BSP04
1'-0"
HD10SP12
11'-6 1/2"
V66-23B
HD9BVA03
HD10EL10
45 DEG V
HD10SP11
HD10EL11
HD10SP10
HD10VA02
V66-29B
HD10SP09
HD10EL09
FLOW
HD9BSP03
HD9BTE01
HD10RD02
V66-22B
HD9BVA02
HD9BEL05
4'-7 1/2"
2'-0"
℄ 224'-11 3/8"
HEATER DRAIN
PUMP P-3-1B
DISCH.
23'-10"
HD10SP15
EL 239'-6"
HD10EL16
HD10SP16
HD10EL15
RO-6B
HD10OR02
HD10SP17
HD10SP14
4"-HD-10B
L.P. HEATER E-4-1B
4" DRAIN PUMP RECIRC.
EL 230'-0"
FLOW
HD10EL14
HD10EL13
HD10SP13
3'-2"
TURBINE BULDING-HEATER BAY
REFERENCES: G191158,G191188,G191189,5920-FS-I5
REVISION 1: 2/7/92
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
HEATER DRAIN LINES 12"-HD-9B & 4"-HD-10B
COMPONENT LOCATION SKETCH No. 055



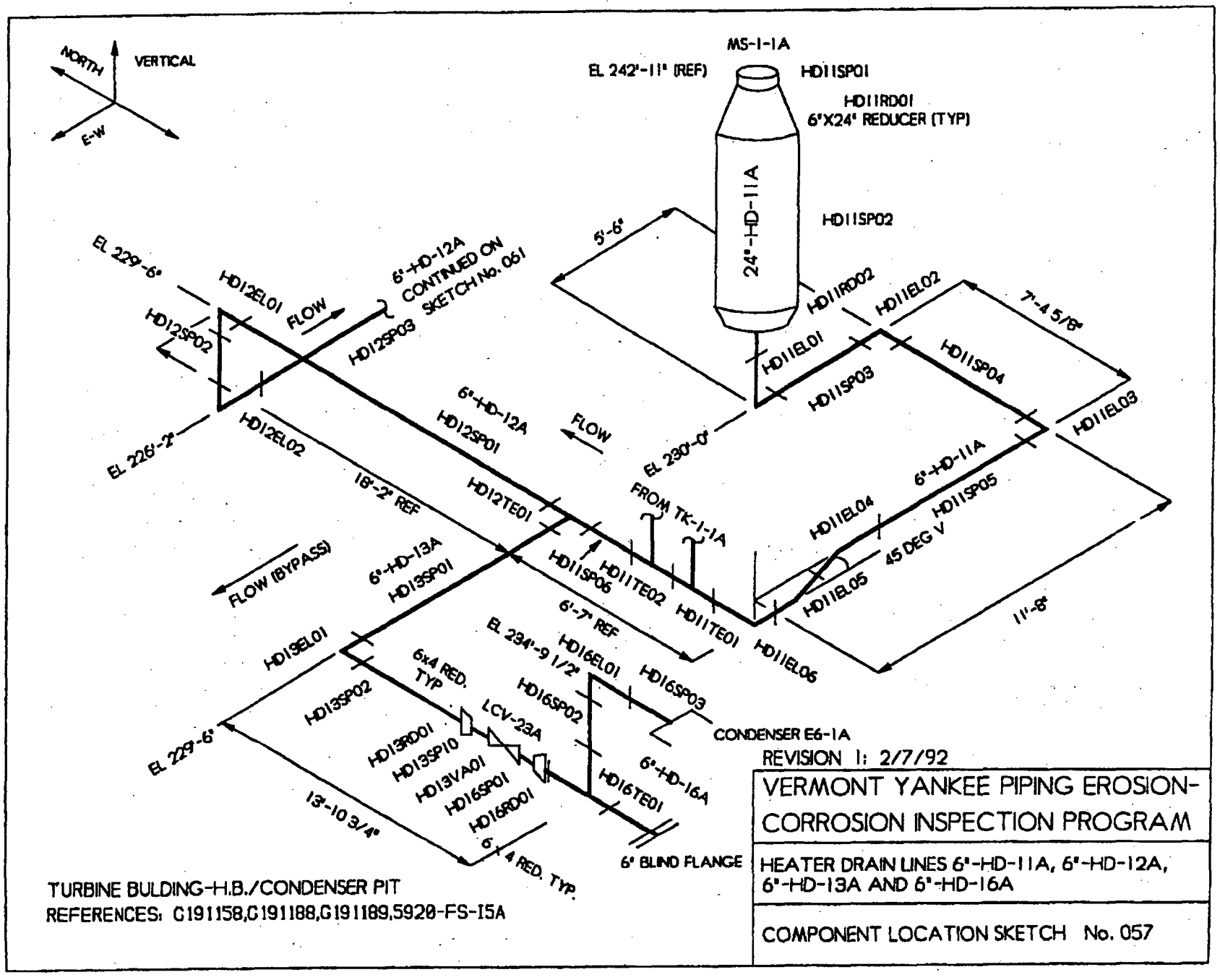
REVISION 0: 7/19/90

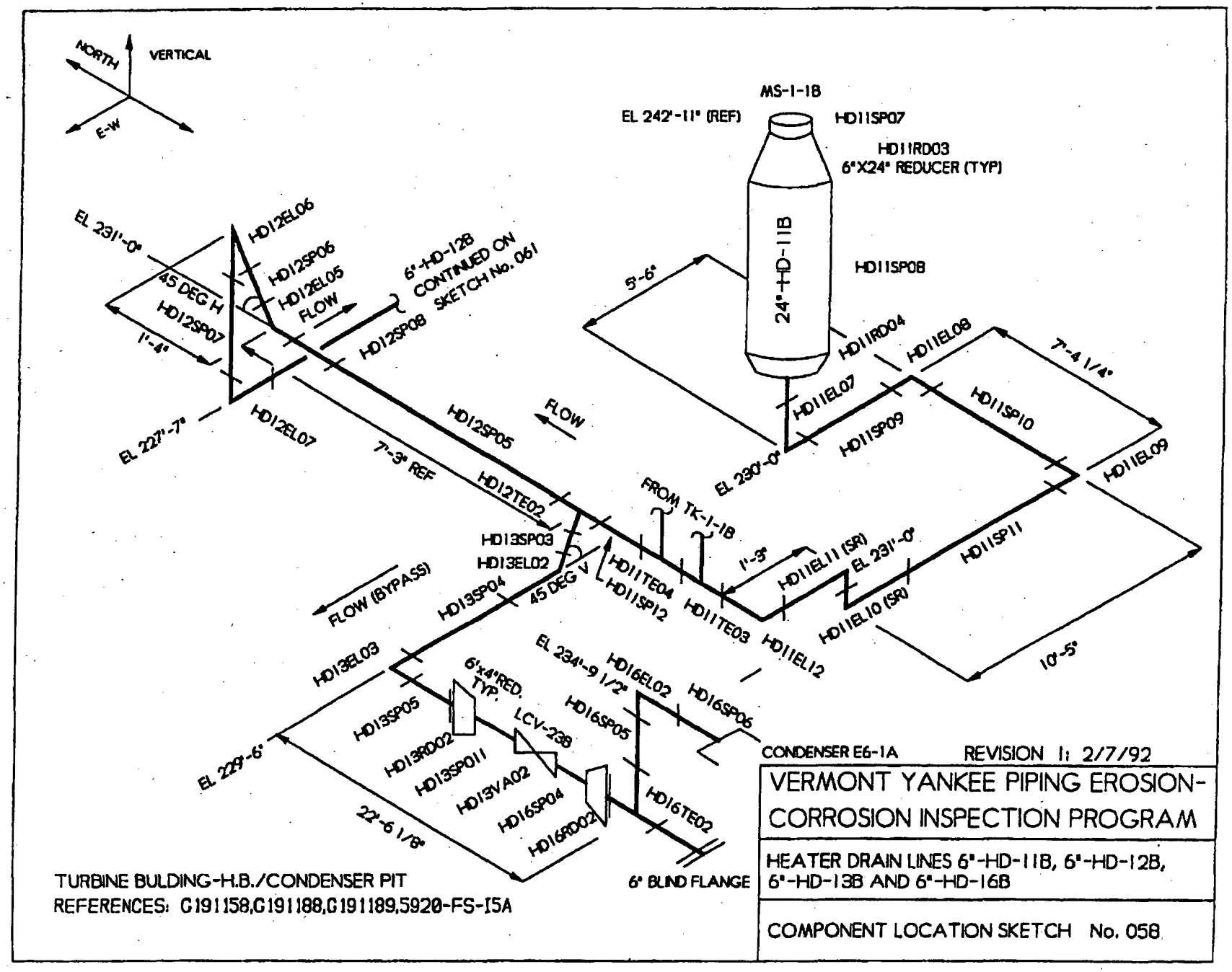
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

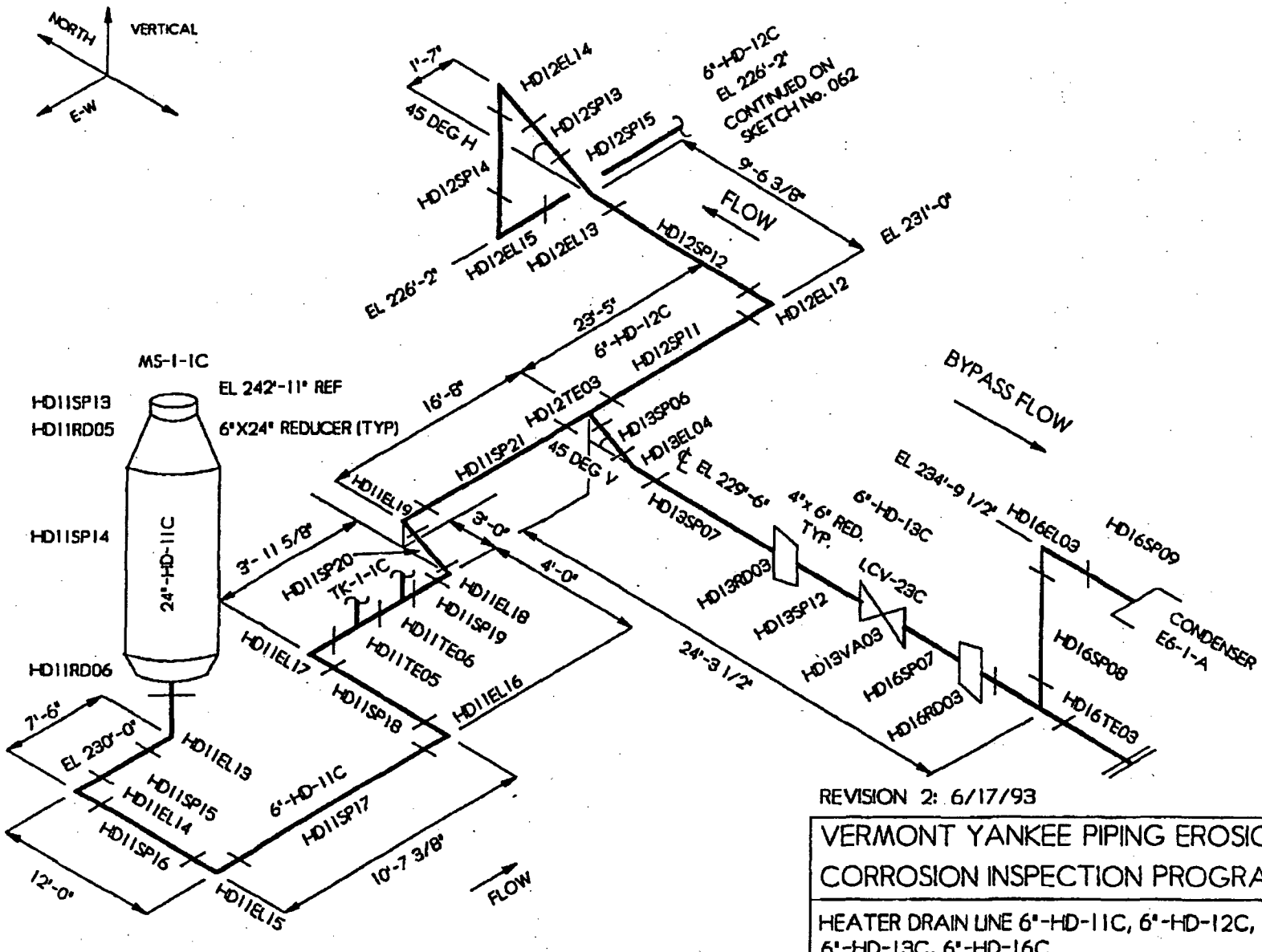
HEATER DRAIN LINES 20"-HD-14B, 16"-HD-14B AND 24"-HD-17B & D

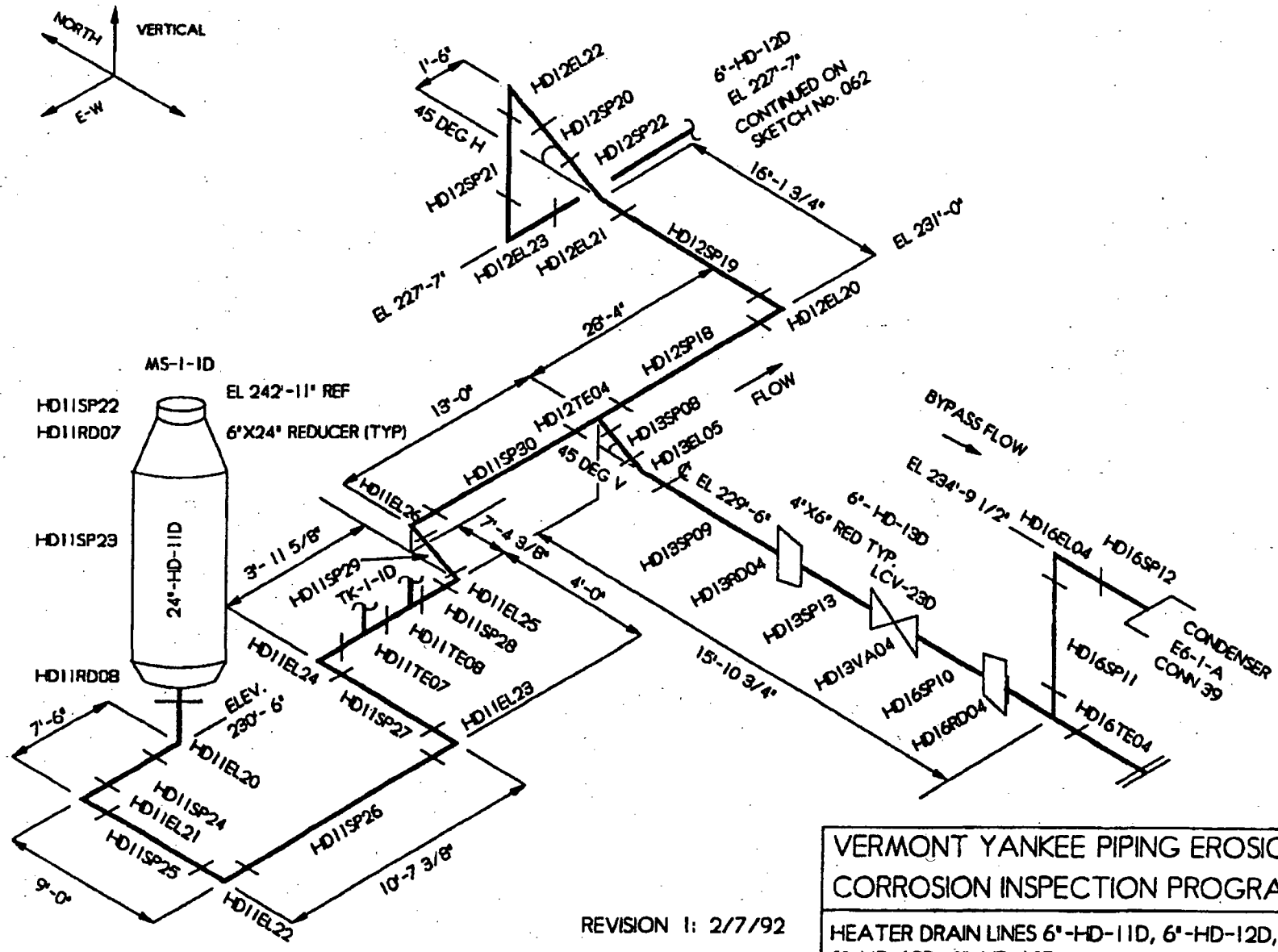
COMPONENT LOCATION SKETCH No. 056

REFERENCES: G191158,G191188,G191189,5920-FI-15


NORTH
VERTICAL
E-W
MS-1-1A
EL 242'-11" (REF)
HD11SP01
HD11RD01
6"X24" REDUCER (TYP)
24"-HD-11A
HD11SP02
5'-6"
EL 229'-6"
HD12EL01
FLOW
6"-HD-12A
CONTINUED ON
SKETCH No. 061
HD12SP02
HD12SP03
HD11RD02
HD11EL02
7'-4 5/8"
HD11EL01
HD11SP04
HD11SP03
HD11EL03
6"-HD-12A
HD12SP01
FLOW
EL 230'-0"
EL 226'-2"
HD12EL02
18'-2" REF
HD12TE01
FROM TK-1-1A
6"-HD-11A
HD11SP05
HD11EL04
45 DEG V
FLOW (BYPASS)
6"-HD-13A
HD13SP01
HD11SP06
HD11TE02
HD11TE01
HD11EL05
11'-8"
6'-7" REF
HD11EL06
HD13EL01
EL 234'-9 1/2"
HD16EL01
HD16SP03
6x4 RED.
TYP
HD13SP02
LCV-23A
HD16SP02
CONDENSER E6-1A
EL 229'-6"
HD13RD01
HD13SP10
HD13VA01
HD16SP01
HD16RD01
6"-HD-16A
HD16TE01
13'-10 3/4"
6x4 RED. TYP.
6" BLIND FLANGE
TURBINE BULDING-H.B./CONDENSER PIT
REFERENCES: G191158,G191188,G191189,5920-FS-I5A
REVISION 1: 2/7/92
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
HEATER DRAIN LINES 6"-HD-11A, 6"-HD-12A, 6"-HD-13A AND 6"-HD-16A
COMPONENT LOCATION SKETCH No. 057


NORTH
VERTICAL
E-W
MS-1-1B
EL 242'-11" (REF)
HD11SP07
HD11RD03
6"X24" REDUCER (TYP)
24"-HD-11B
HD11SP08
5'-6"
HD11RD04
HD11EL08
7'-4 1/4"
HD11EL07
HD11SP09
HD11SP10
HD11EL09
EL 230'-0"
HD11SP11
HD11EL11 (SR)
EL 231'-0"
HD11EL10 (SR)
10'-5"
HD11EL12
HD11TE03
HD11TE04
HD11SP12
1'-3"
FROM TK-1-1B
HD12EL06
EL 231'-0"
HD12SP06
HD12EL05
45 DEG H
HD12SP07
1'-4"
6"-HD-12B
CONTINUED ON
SKETCH No. 061
HD12SP08
FLOW
EL 227'-7"
HD12EL07
7'-3" REF
HD12SP05
FLOW
HD12TE02
HD13SP03
HD13EL02
45 DEG V
HD13SP04
FLOW (BYPASS)
HD13EL03
HD13SP05
6"x4"RED.
TYP.
HD13RD02
LCV-238
HD13SP011
HD13VA02
HD16SP04
HD16RD02
EL 229'-6"
22'-6 1/8"
EL 234'-9 1/2"
HD16EL02
HD16SP05
HD16SP06
HD16TE02
CONDENSER E6-1A
6" BLIND FLANGE
TURBINE BULDING-H.B./CONDENSER PIT
REFERENCES: G191158,G191188,G191189,5920-FS-I5A
REVISION 1: 2/7/92
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
HEATER DRAIN LINES 6"-HD-11B, 6"-HD-12B, 6"-HD-13B AND 6"-HD-16B
COMPONENT LOCATION SKETCH No. 058

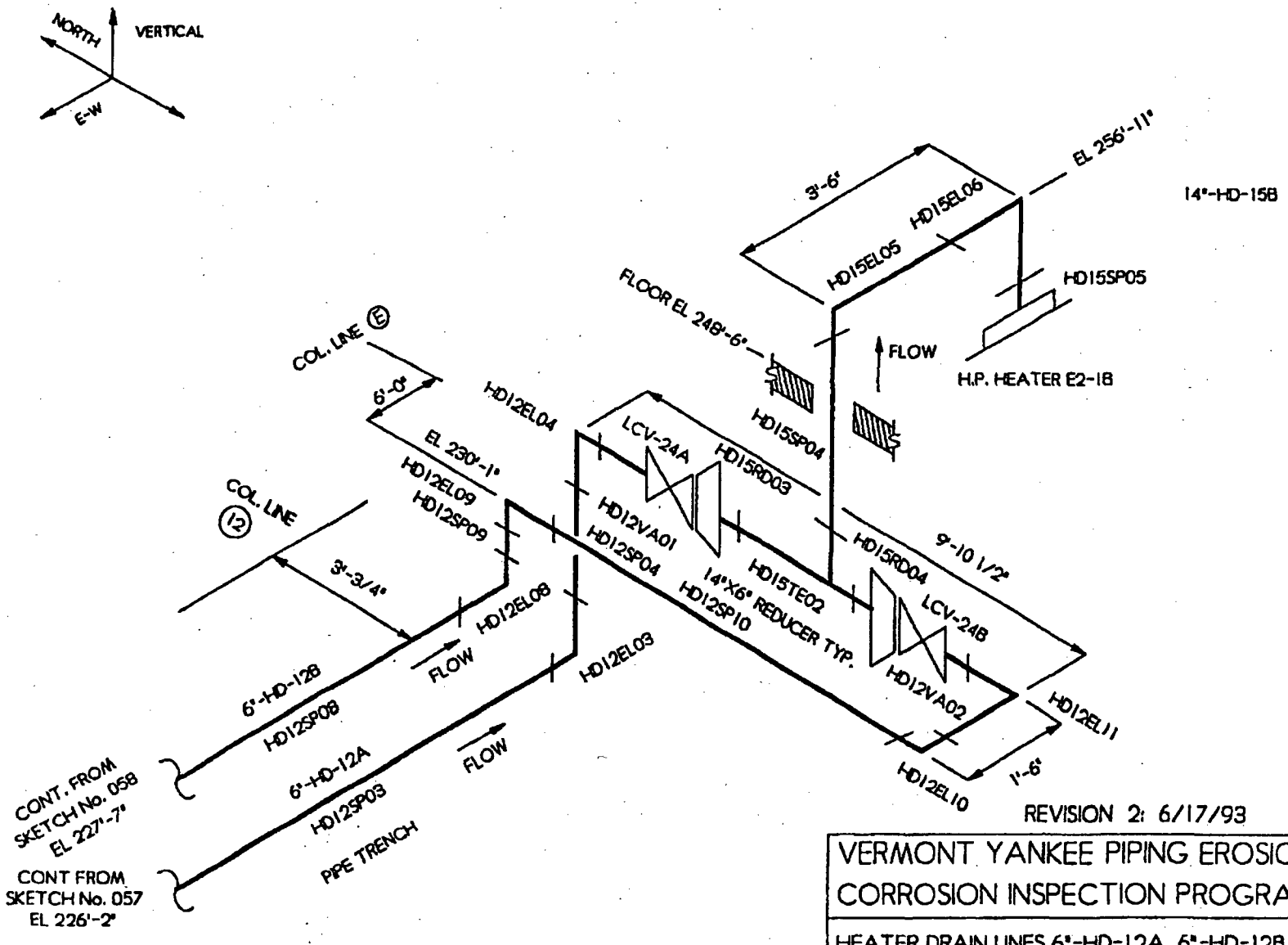

NORTH
VERTICAL
E-W
1'-7"
HD12EL14
45 DEG H
HD12SP13
HD12SP15
6"-HD-12C
EL 226'-2"
CONTINUED ON
SKETCH No. 062
HD12SP14
9'-6 3/8"
FLOW
EL 231'-0"
HD12EL15
HD12EL13
HD12SP12
EL 226'-2"
HD12EL12
23'-5"
6"-HD-12C
HD12SP11
MS-1-1C
EL 242'-11" REF
HD11SP13
HD11RD05
6"X24" REDUCER (TYP)
16'-8"
HD12TE03
HD13SP06
BYPASS FLOW
HD11SP21
45 DEG V
HD13EL04
EL 229'-6"
EL 234'-9 1/2"
HD11EL19
HD13SP07
4"x 6" RED.
TYP.
6"-HD-13C
HD16EL03
HD16SP09
HD11SP14
24"-HD-11C
3'-11 5/8"
3'-0"
4'-0"
HD11SP20
TK-1-1C
HD11EL18
HD13RD03
LCV-23C
HD13SP12
CONDENSER
E6-1-A
HD11SP19
HD11TE06
HD11EL17
HD11TE05
HD13VA03
HD16SP08
24'-3 1/2"
HD16SP07
HD11RD06
HD11SP18
HD11EL16
HD16RD03
HD16TE03
7'-6"
EL 230'-0"
HD11EL13
HD11SP15
6"-HD-11C
HD11EL14
HD11SP17
HD11SP16
10'-7 3/8"
12'-0"
HD11EL15
FLOW
REVISION 2: 6/17/93
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
HEATER DRAIN LINE 6"-HD-11C, 6"-HD-12C, 6"-HD-13C, 6"-HD-16C
COMPONENT LOCATION SKETCH No. 059
TURBINE BULDING-CONDENSER PIT
REFERENCES: G191158,G191188,G191189,5920-FS-15A

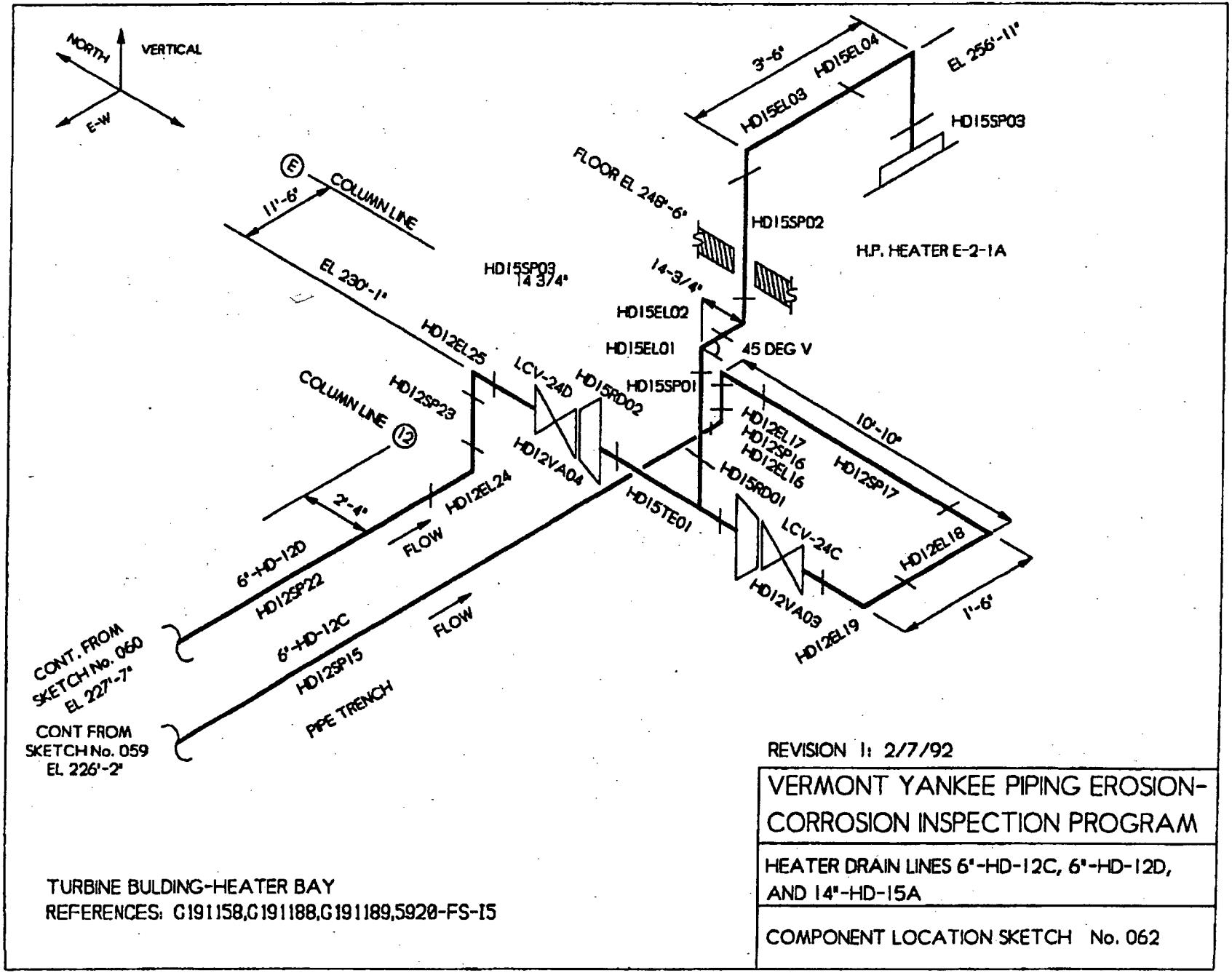


REVISION 1: 2/7/92

TURBINE BULDING-CONDENSER PIT
REFERENCES: G191158,G191188,G191189,5920-FS-I5A

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
HEATER DRAIN LINES 6"-HD-11D, 6"-HD-12D, 6"-HD-13D, 6"-HD-16D
COMPONENT LOCATION SKETCH No. 060


NORTH
VERTICAL
E-W
3'-6"
EL 256'-11"
14"-HD-15B
HD15EL06
HD15EL05
HD15SP05
FLOOR EL 248'-6"
FLOW
H.P. HEATER E2-1B
COL. LINE (E)
6'-0"
HD12EL04
HD15SP04
LCV-24A
HD15RD03
EL 230'-1"
HD12EL09
HD12SP09
COL. LINE (12)
HD12VA01
HD12SP04
HD15TE02
14"X6" REDUCER TYP.
HD12SP10
HD15RD04
9'-10 1/2"
LCV-24B
3'-3/4"
HD12EL08
HD12EL03
6"-HD-12B
HD12SP08
FLOW
HD12VA02
HD12EL11
6"-HD-12A
HD12SP03
FLOW
HD12EL10
1'-6"
CONT. FROM SKETCH No. 058 EL 227'-7"
CONT FROM SKETCH No. 057 EL 226'-2"
PIPE TRENCH
TURBINE BULDING-HEATER BAY
REFERENCES: G191158,G191188,G191189,5920-FS-15
REVISION 2: 6/17/93
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
HEATER DRAIN LINES 6"-HD-12A, 6"-HD-12B, AND 14"-HD-15B
COMPONENT LOCATION SKETCH No. 061



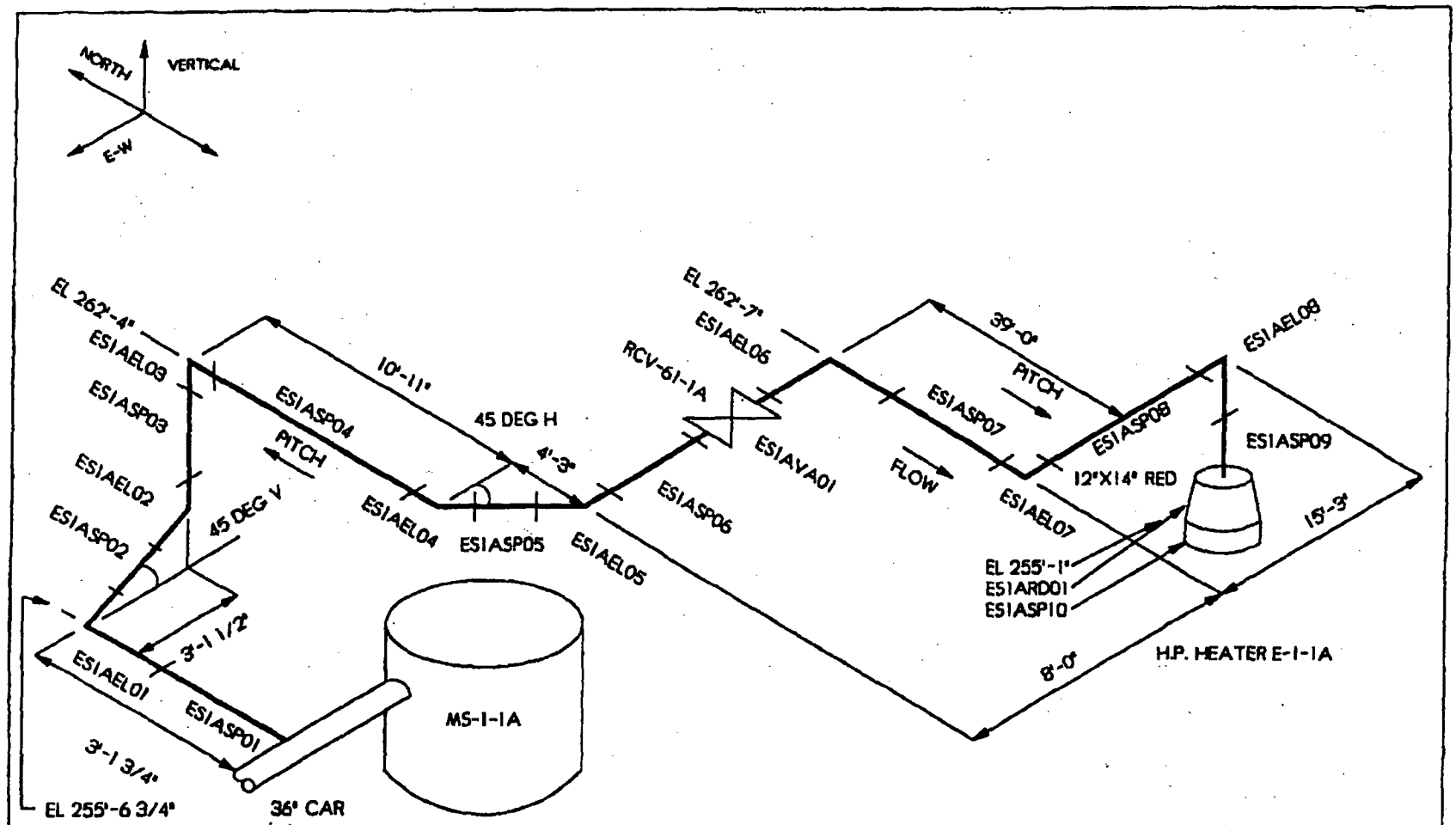
TURBINE BULDING-HEATER BAY
REFERENCES: G191158,G191188,G191189,5920-FS-15

REVISION 1: 2/7/92

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

HEATER DRAIN LINES 6"-HD-12C, 6"-HD-12D, AND 14"-HD-15A

COMPONENT LOCATION SKETCH No. 062



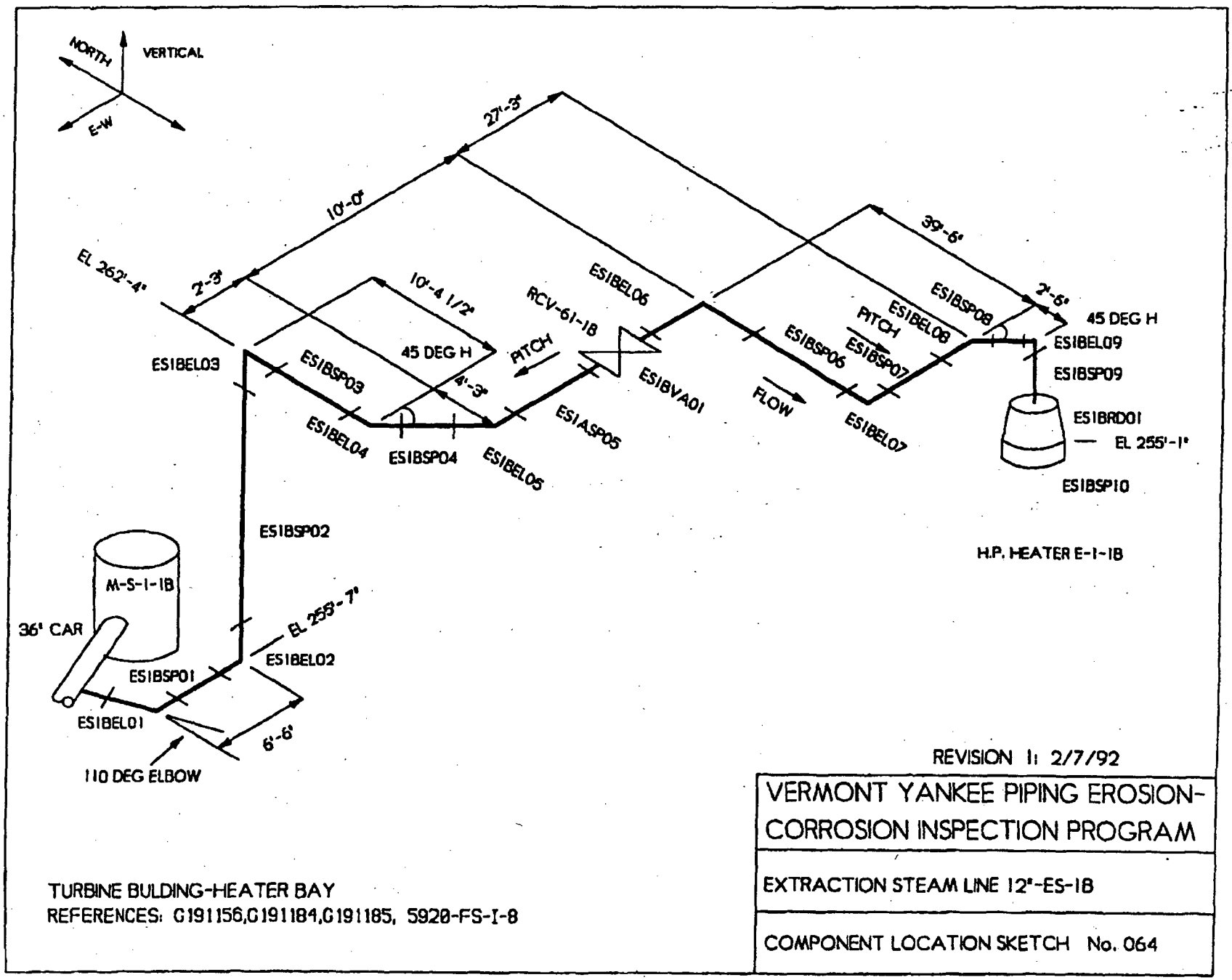
REVISION 1: 2/7/92

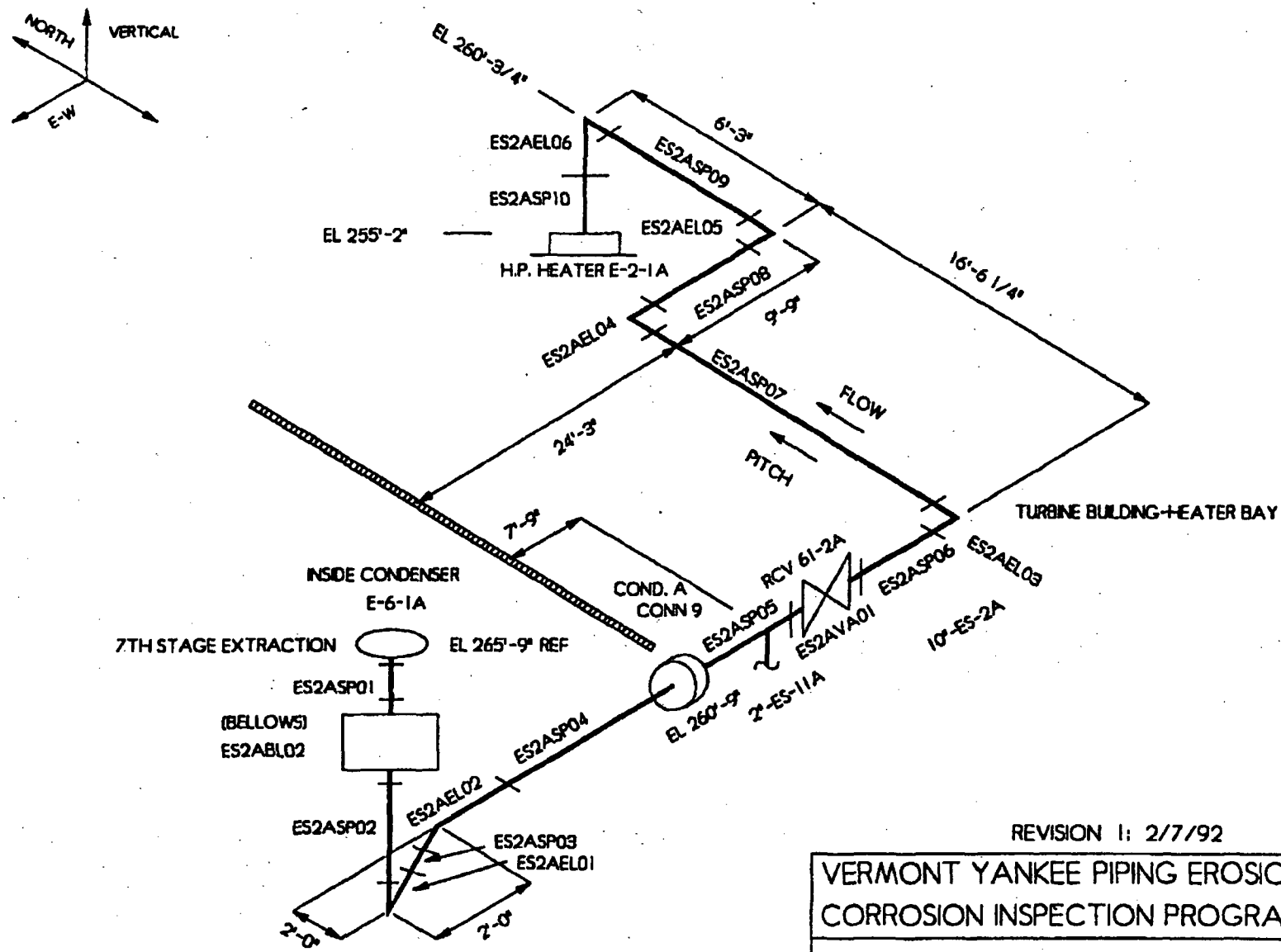
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

EXTRACTION STEAM LINE 12"-ES-1A

COMPONENT LOCATION SKETCH No. 063

TURBINE BULDING-HEATER BAY
REFERENCES: G191156,G191184,G191185,5920-FS-I-8

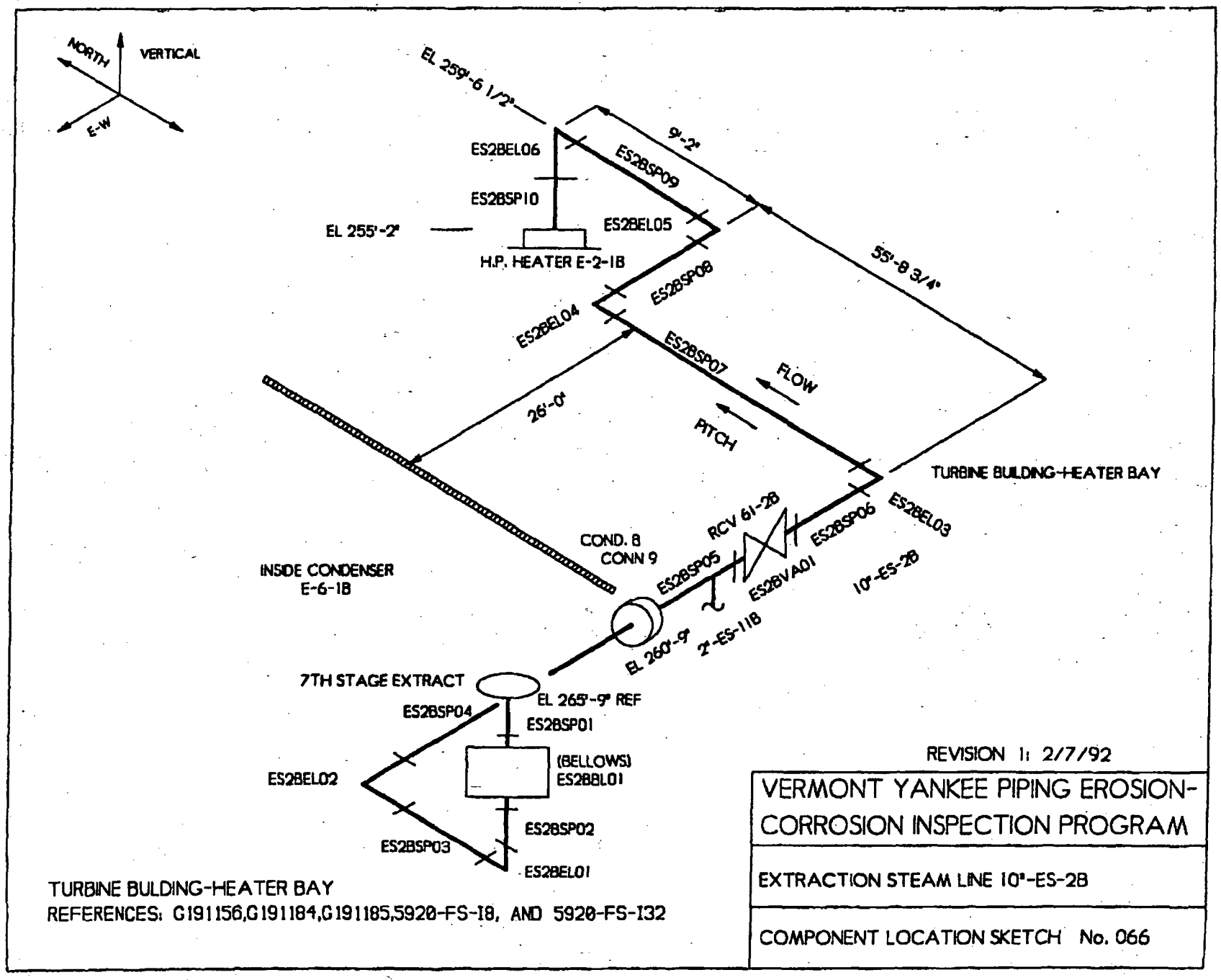

NORTH
VERTICAL
E-W
27'-3"
10'-0"
39'-6"
EL 262'-4"
2'-3"
10'-4 1/2"
RCV-61-1B
ES1BEL06
ES1BSP08
2'-6"
45 DEG H
ES1BEL09
ES1BSP09
ES1BEL08
PITCH
ES1BSP07
ES1BSP06
ES1BEL03
ES1BSP03
45 DEG H
PITCH
4'-3"
ES1BVA01
FLOW
ES1BEL07
ES1BEL04
ES1BSP04
ES1BEL05
ES1ASP05
ES1BRD01
EL 255'-1"
ES1BSP10
ES1BSP02
H.P. HEATER E-1-1B
M-S-1-1B
36" CAR
EL 253'-7"
ES1BEL02
ES1BSP01
ES1BEL01
6'-6"
110 DEG ELBOW
REVISION 1: 2/7/92
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
EXTRACTION STEAM LINE 12"-ES-1B
COMPONENT LOCATION SKETCH No. 064
TURBINE BULDING-HEATER BAY
REFERENCES: G191156,G191184,G191185, 5920-FS-I-8

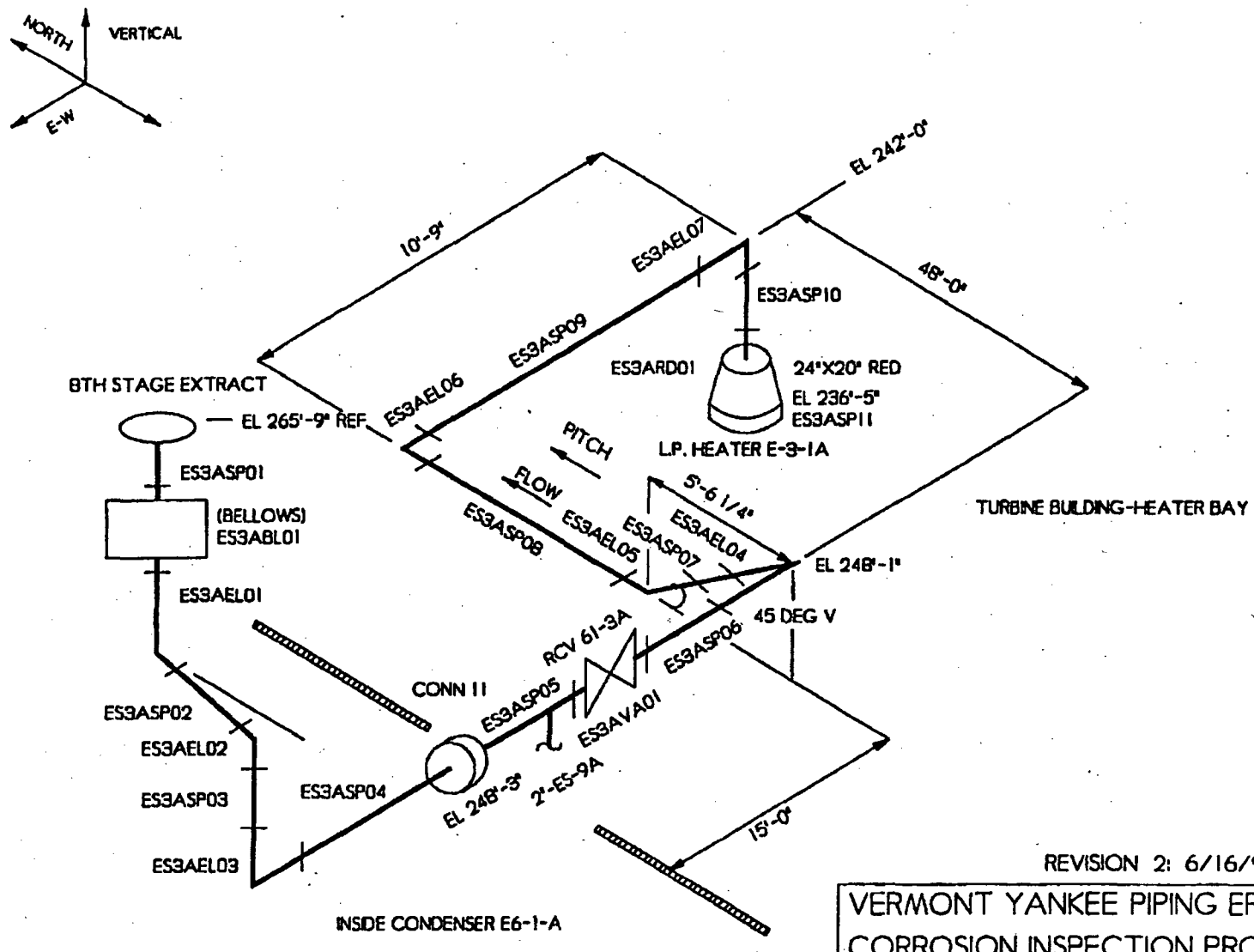


TURBINE BULDING-HEATER BAY
REFERENCES: G191156,G191184,G191185,5920-FS-I8, AND 5920-FS-I32

REVISION 1: 2/7/92

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
EXTRACTION STEAM LINE 10"-ES-2A
COMPONENT LOCATION SKETCH No. 065


NORTH
VERTICAL
E-W
EL 259'-6 1/2"
ES2BEL06
ES2BSP10
EL 255'-2"
H.P. HEATER E-2-1B
ES2BEL05
9'-2"
ES2BSP09
ES2BSP08
55'-8 3/4"
ES2BEL04
ES2BSP07
FLOW
PITCH
26'-0"
TURBINE BULDING-HEATER BAY
RCV 61-2B
ES2BSP06
ES2BEL03
COND. B
CONN 9
INSIDE CONDENSER
E-6-1B
ES2BSP05
ES2BVA01
10"-ES-2B
EL 260'-9"
2"-ES-11B
7TH STAGE EXTRACT
EL 265'-9" REF
ES2BSP04
ES2BSP01
(BELLOWS)
ES2BBL01
ES2BEL02
ES2BSP02
ES2BSP03
ES2BEL01
TURBINE BULDING-HEATER BAY
REFERENCES: G191156,G191184,G191185,5920-FS-18, AND 5920-FS-132
REVISION 1: 2/7/92
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
EXTRACTION STEAM LINE 10"-ES-2B
COMPONENT LOCATION SKETCH No. 066



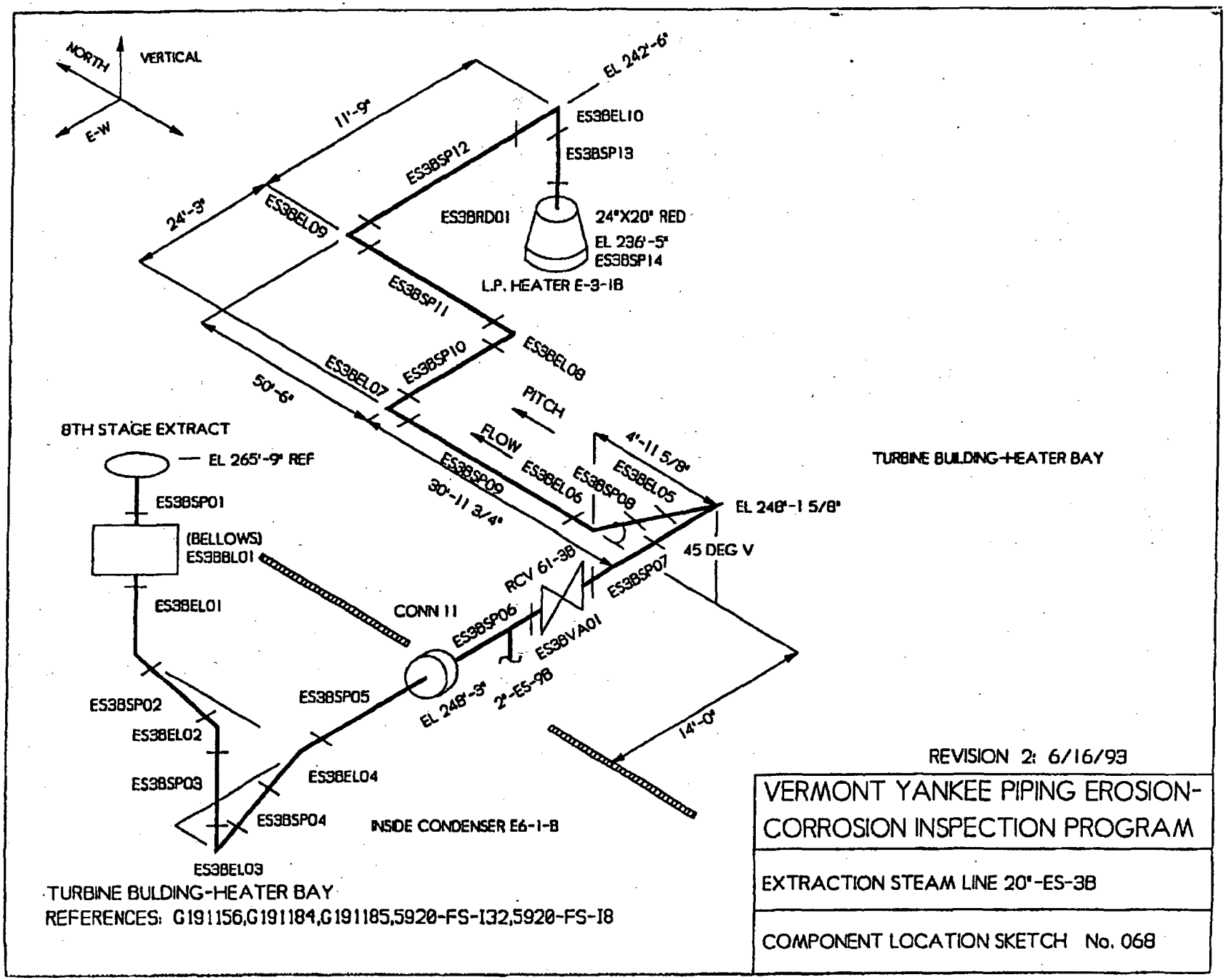
REVISION 2: 6/16/93

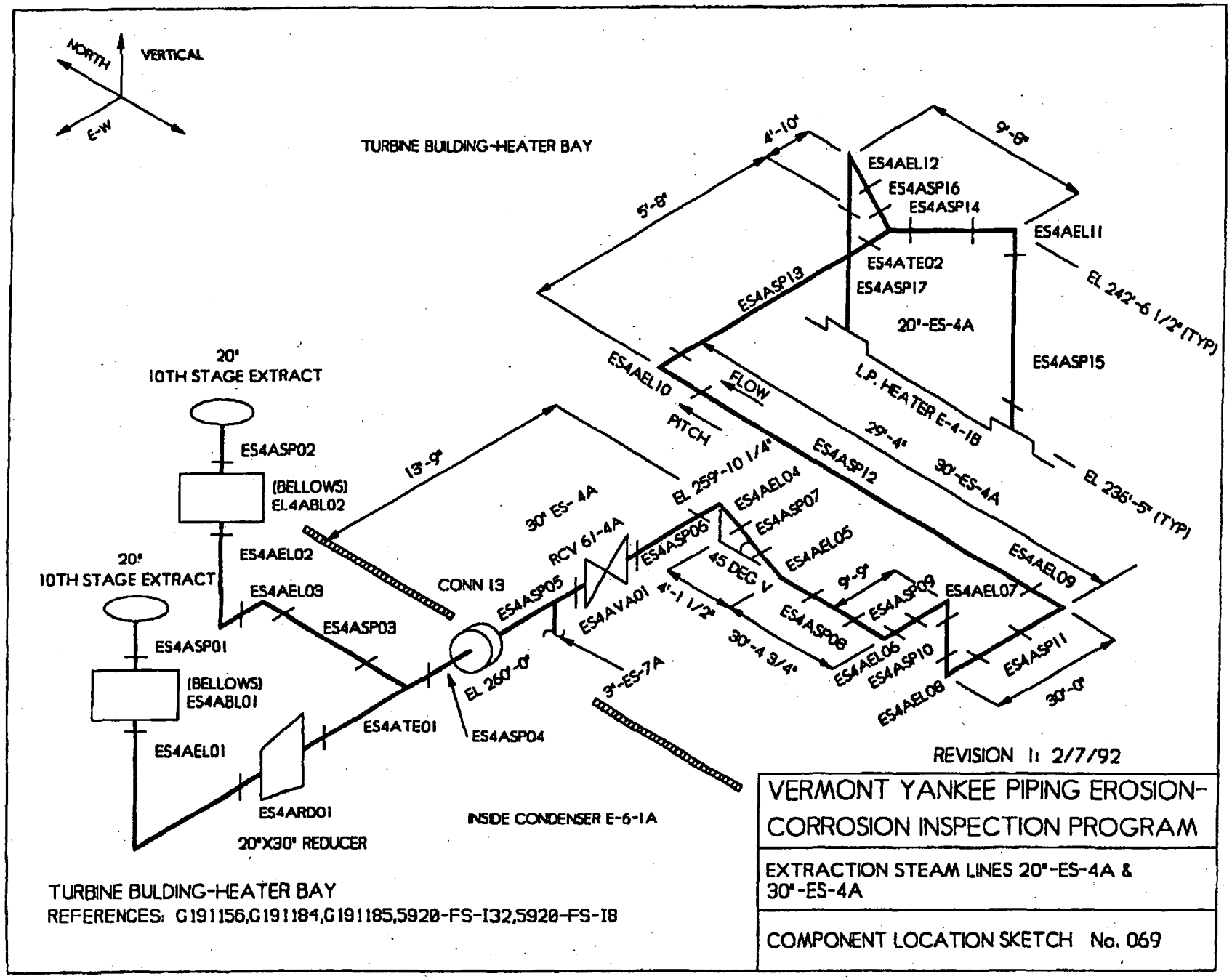
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

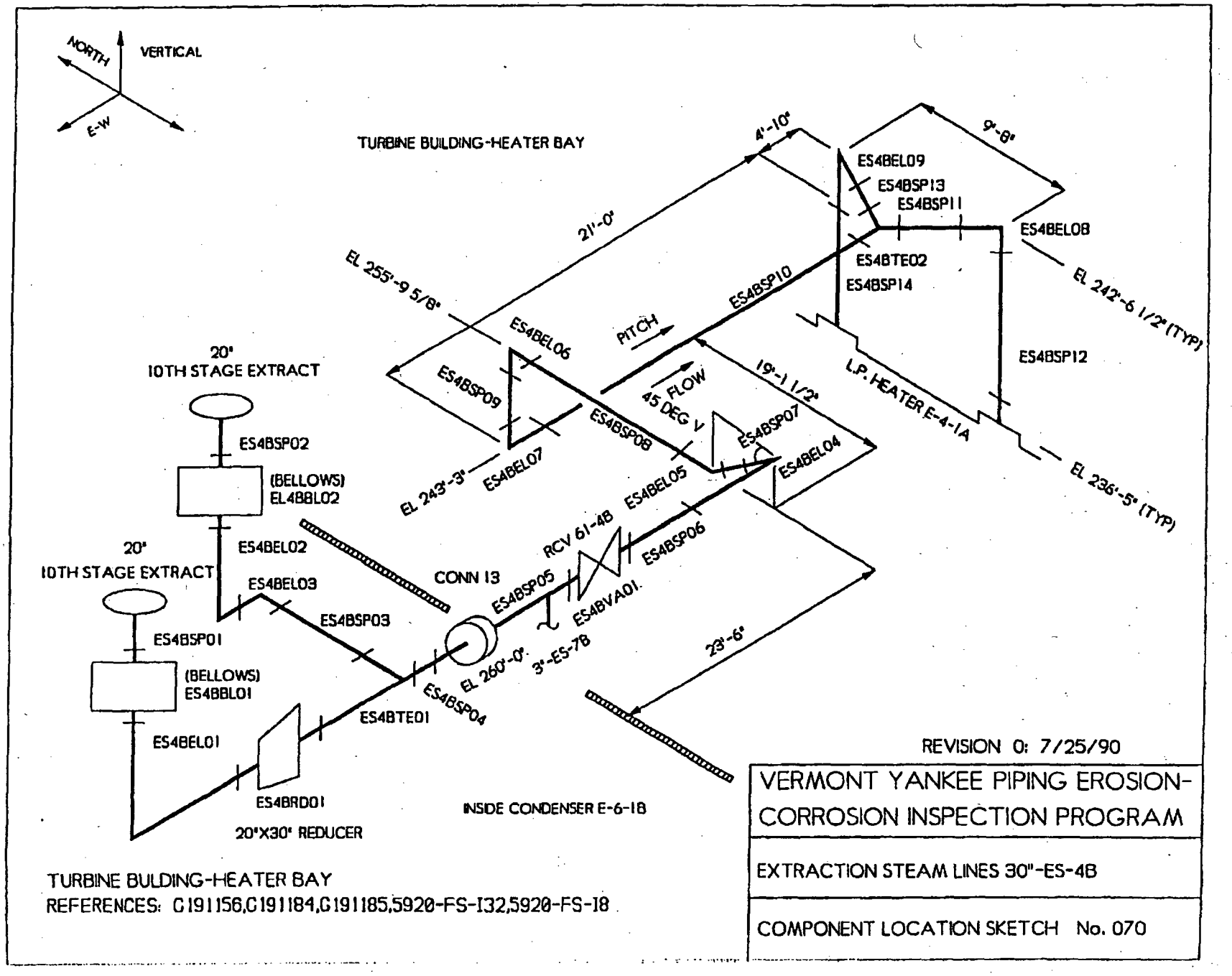
EXTRACTION STEAM LINE 20"-ES-3A

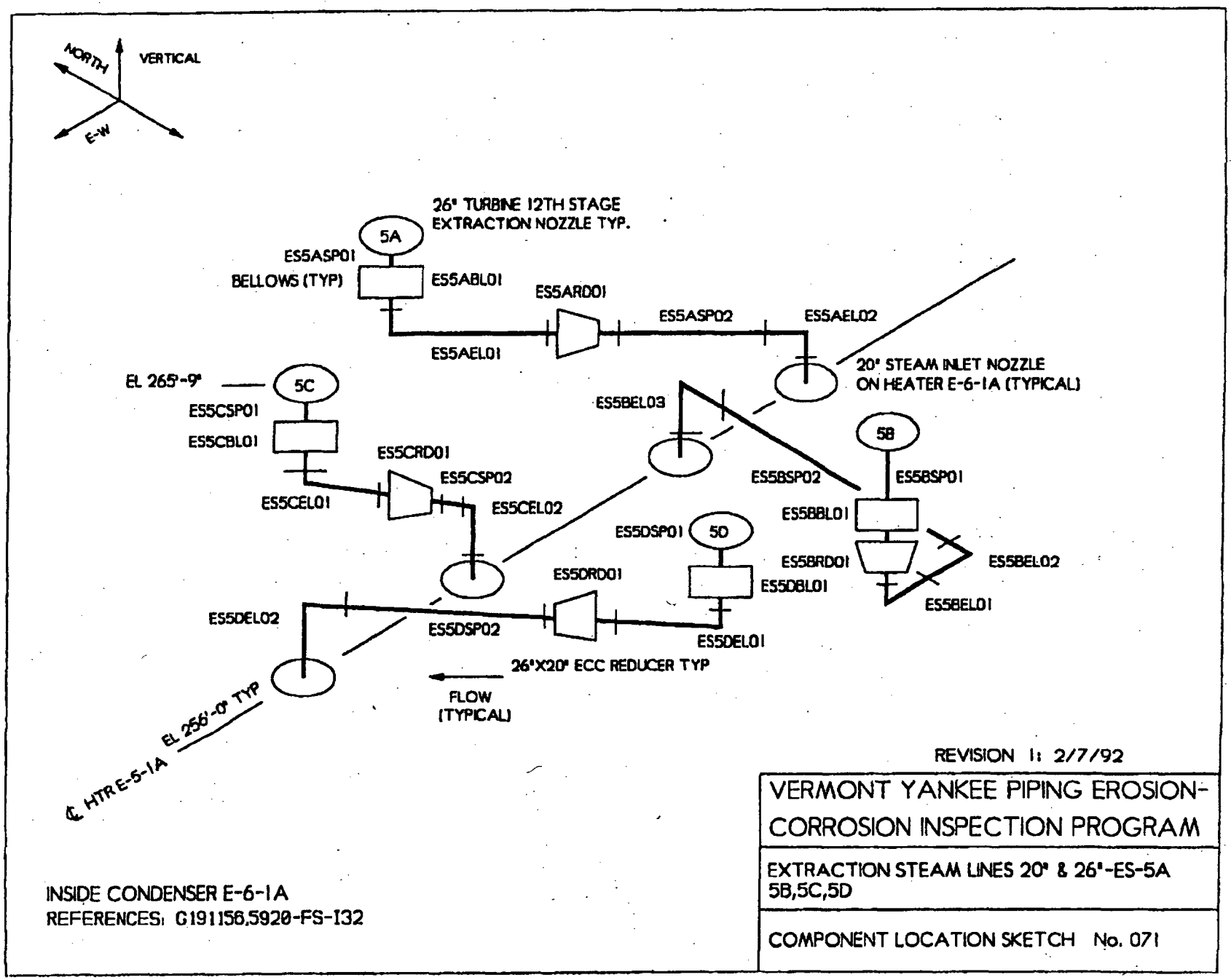
COMPONENT LOCATION SKETCH No. 067

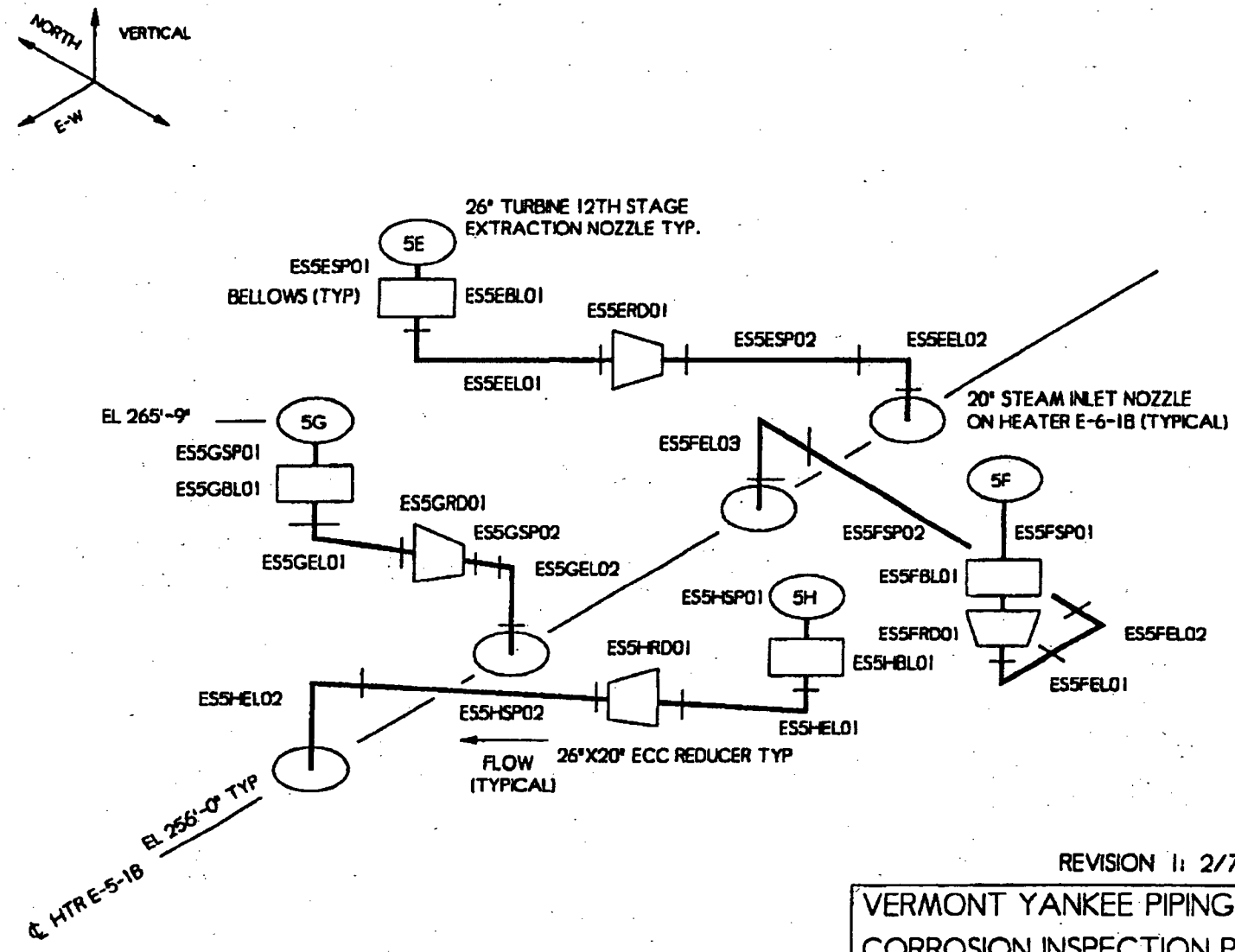
TURBINE BULDING-HEATER BAY
REFERENCES: G191156,G191184,G191185,5920-FS-132


NORTH
VERTICAL
E-W
EL 242'-6"
11'-9"
ES3BEL10
ES3BSP13
ES3BSP12
24'-3"
ES3BEL09
ES3BRD01
24"X20" RED
EL 236'-5"
ES3BSP14
L.P. HEATER E-3-1B
ES3BSP11
ES3BEL08
ES3BSP10
ES3BEL07
50'-6"
PITCH
FLOW
4'-11 5/8"
8TH STAGE EXTRACT
EL 265'-9" REF
ES3BSP09
ES3BEL06
ES3BSP08
ES3BEL05
TURBINE BUILDING-HEATER BAY
ES3BSP01
30'-11 3/4"
EL 248'-1 5/8"
(BELLOWS)
ES3BBL01
45 DEG V
RCV 61-3B
ES3BSP07
ES3BEL01
CONN 11
ES3BSP06
ES3BVA01
ES3BSP05
EL 248'-3"
2"-ES-9B
ES3BSP02
14'-0"
ES3BEL02
ES3BEL04
ES3BSP03
ES3BSP04
INSIDE CONDENSER E6-1-B
ES3BEL03
TURBINE BULDING-HEATER BAY
REFERENCES: G191156,G191184,G191185,5920-FS-I32,5920-FS-I8
REVISION 2: 6/16/93
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
EXTRACTION STEAM LINE 20"-ES-3B
COMPONENT LOCATION SKETCH No. 068


NORTH
VERTICAL
E-W
TURBINE BUILDING-HEATER BAY
4'-10"
9'-8"
5'-8"
ES4AEL12
ES4ASP16
ES4ASP14
ES4AEL11
ES4ATE02
ES4ASP17
ES4ASP13
EL 242'-6 1/2" (TYP)
20"-ES-4A
ES4ASP15
ES4AEL10
FLOW
PITCH
L.P. HEATER E-4-1B
29'-4"
30"-ES-4A
EL 236'-5" (TYP)
20"
10TH STAGE EXTRACT
ES4ASP02
(BELLOWS)
EL4ABL02
13'-9"
EL 259'-10 1/4"
ES4AEL04
ES4ASP07
30" ES- 4A
RCV 61-4A
ES4ASP06
ES4AEL05
45 DEG V
ES4AEL09
ES4AEL02
20"
10TH STAGE EXTRACT
ES4AEL03
CONN 13
ES4ASP05
ES4AVA01
4'-1 1/2"
9'-9"
ES4ASP09
ES4AEL07
ES4ASP03
ES4ASP01
30'-4 3/4"
ES4ASP08
ES4AEL06
ES4ASP10
ES4ASP11
(BELLOWS)
ES4ABL01
EL 260'-0"
3"-ES-7A
ES4AEL08
30'-0"
ES4ATE01
ES4ASP04
ES4AEL01
ES4ARD01
INSIDE CONDENSER E-6-1A
20"X30" REDUCER
REVISION 1: 2/7/92
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
EXTRACTION STEAM LINES 20"-ES-4A & 30"-ES-4A
COMPONENT LOCATION SKETCH No. 069
TURBINE BULDING-HEATER BAY
REFERENCES: G191156,G191184,G191185,5920-FS-I32,5920-FS-I8


NORTH
VERTICAL
E-W
TURBINE BUILDING-HEATER BAY
4'-10"
9'-8"
21'-0"
ES4BEL09
ES4BSP13
ES4BSP11
ES4BEL08
ES4BTE02
ES4BSP14
EL 242'-6 1/2" (TYP)
EL 255'-9 5/8"
ES4BSP10
PITCH
ES4BEL06
ES4BSP12
20"
10TH STAGE EXTRACT
ES4BSP09
45 DEG
FLOW
19'-1 1/2"
L.P. HEATER E-4-1A
ES4BSP07
ES4BSP08
ES4BSP02
ES4BEL04
(BELLOWS)
EL4BBL02
EL 243'-3"
ES4BEL07
ES4BEL05
EL 236'-5" (TYP)
RCV 61-4B
ES4BSP06
20"
10TH STAGE EXTRACT
ES4BEL02
CONN 13
ES4BSP05
ES4BEL03
ES4BVA01
ES4BSP03
ES4BSP01
23'-6"
EL 260'-0"
3"-ES-7B
(BELLOWS)
ES4BBL01
ES4BSP04
ES4BTE01
ES4BEL01
ES4BRD01
INSIDE CONDENSER E-6-1B
20"X30" REDUCER
TURBINE BULDING-HEATER BAY
REFERENCES: C191156,C191184,C191185,5920-FS-132,5920-FS-18
REVISION 0: 7/25/90
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
EXTRACTION STEAM LINES 30"-ES-4B
COMPONENT LOCATION SKETCH No. 070


NORTH
VERTICAL
E-W
26" TURBINE 12TH STAGE
EXTRACTION NOZZLE TYP.
5A
ES5ASP01
BELLOWS (TYP)
ES5ABL01
ES5ARD01
ES5ASP02
ES5AEL02
ES5AEL01
20" STEAM INLET NOZZLE
ON HEATER E-6-1A (TYPICAL)
EL 265'-9"
5C
ES5CSP01
ES5CBL01
ES5BEL03
5B
ES5CRD01
ES5CSP02
ES5BSP02
ES5BSP01
ES5CEL01
ES5CEL02
ES5BBL01
ES5DSP01
5D
ES5BRD01
ES5BEL02
ES5DRD01
ES5DBL01
ES5BEL01
ES5DEL02
ES5DSP02
ES5DEL01
26"X20" ECC REDUCER TYP
FLOW
(TYPICAL)
EL 256'-0" TYP
℄ HTR E-5-1A
REVISION 1: 2/7/92
VERMONT YANKEE PIPING EROSION-
CORROSION INSPECTION PROGRAM
EXTRACTION STEAM LINES 20" & 26"-ES-5A
5B,5C,5D
COMPONENT LOCATION SKETCH No. 071
INSIDE CONDENSER E-6-1A
REFERENCES: G191156,5920-FS-132



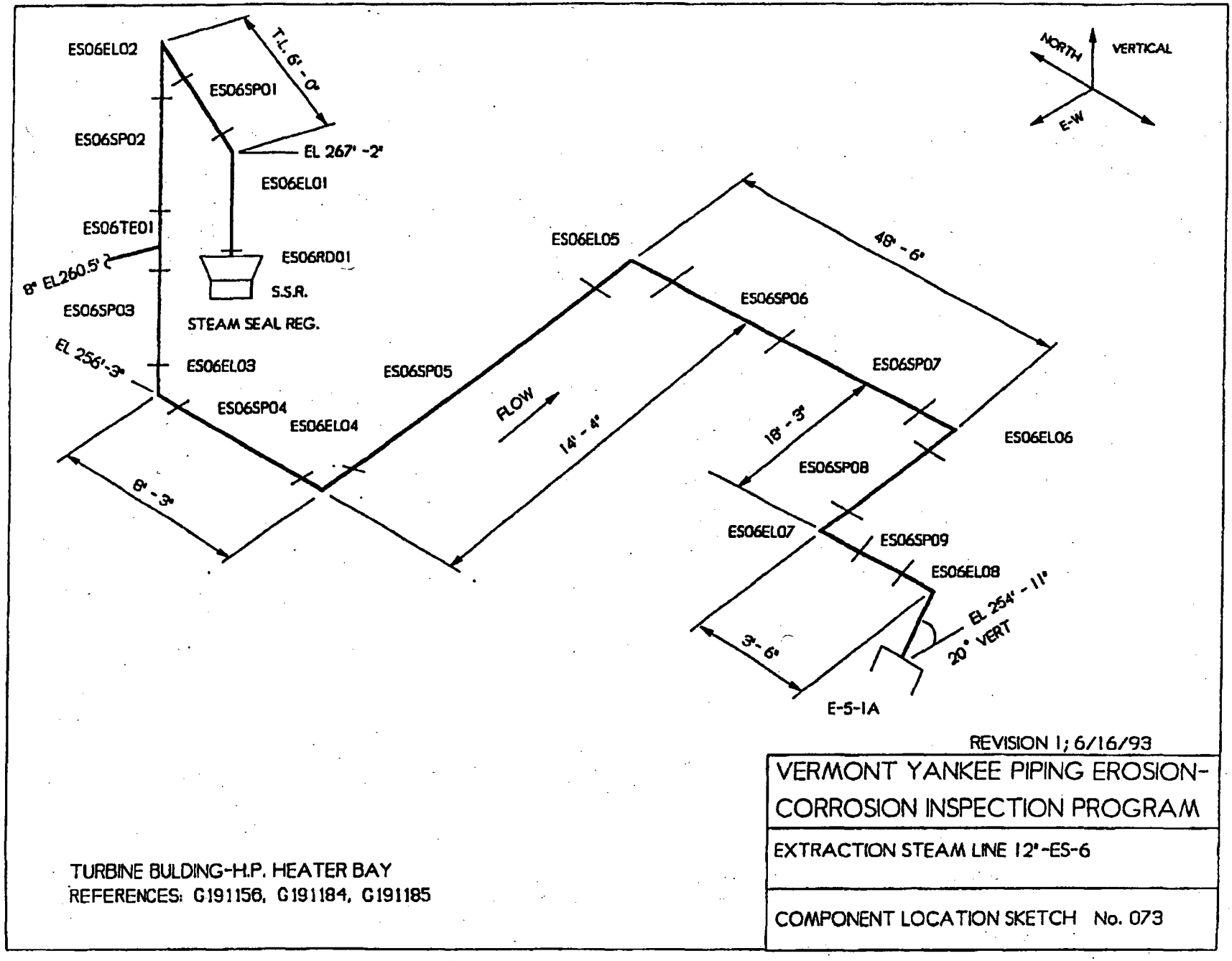
REVISION 1: 2/7/92

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

EXTRACTION STEAM LINES 20" & 26"-ES-5E 5F,5G,5H

COMPONENT LOCATION SKETCH No. 072

INSIDE CONDENSER E-6-1B
REFERENCES: G191156,5920-FS-132



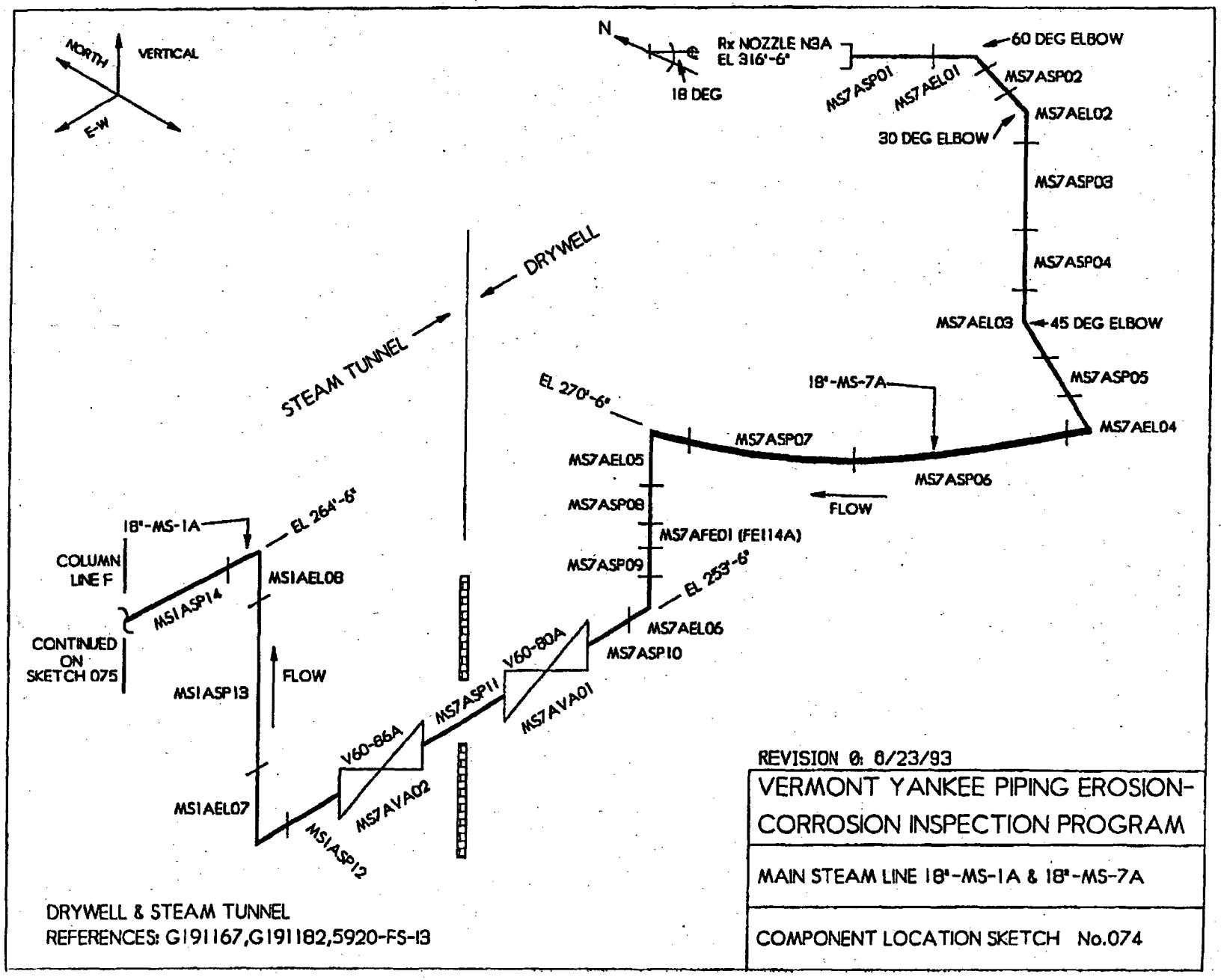
TURBINE BULDING-H.P. HEATER BAY
REFERENCES: G191156, G191184, G191185

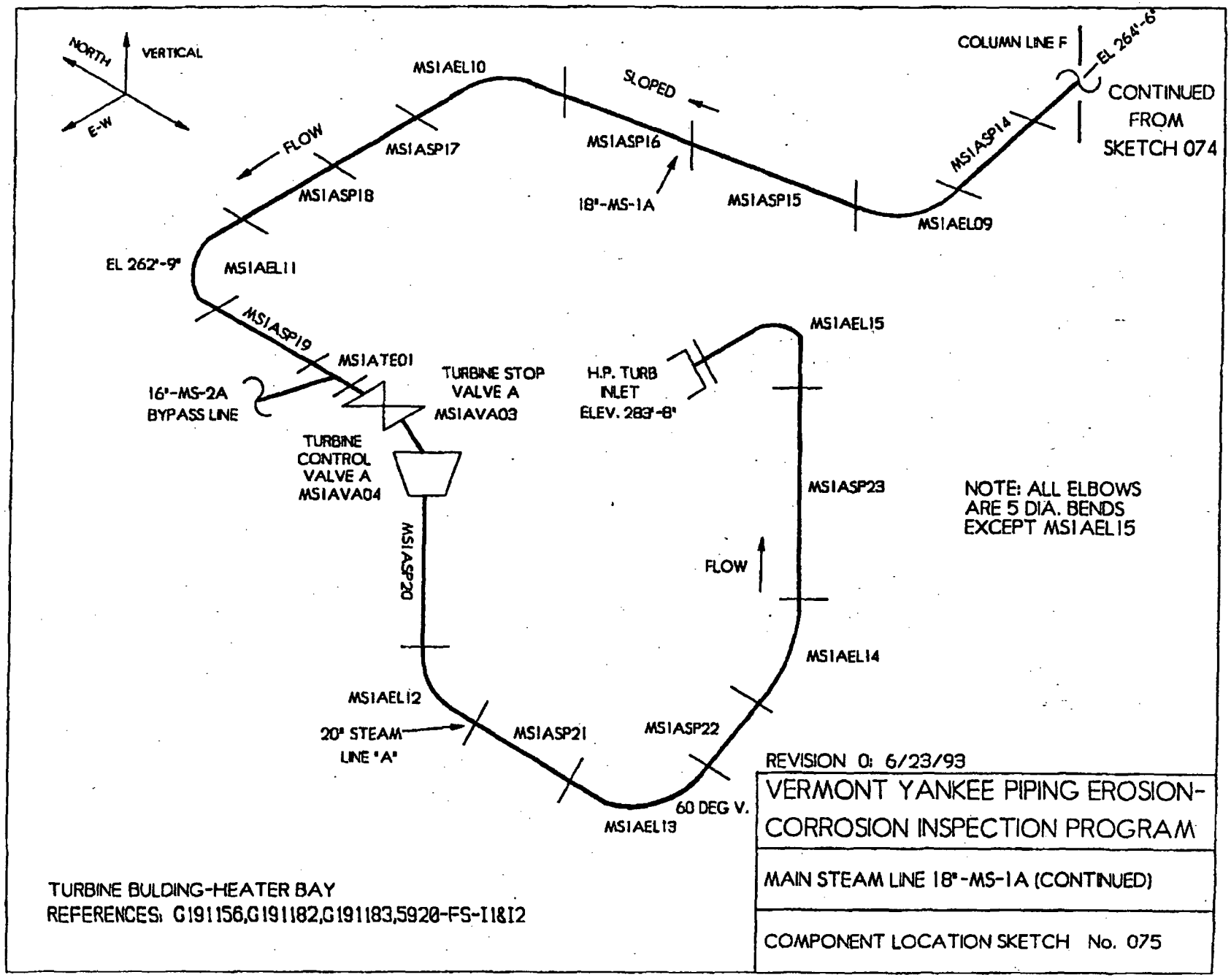
REVISION 1; 6/16/93

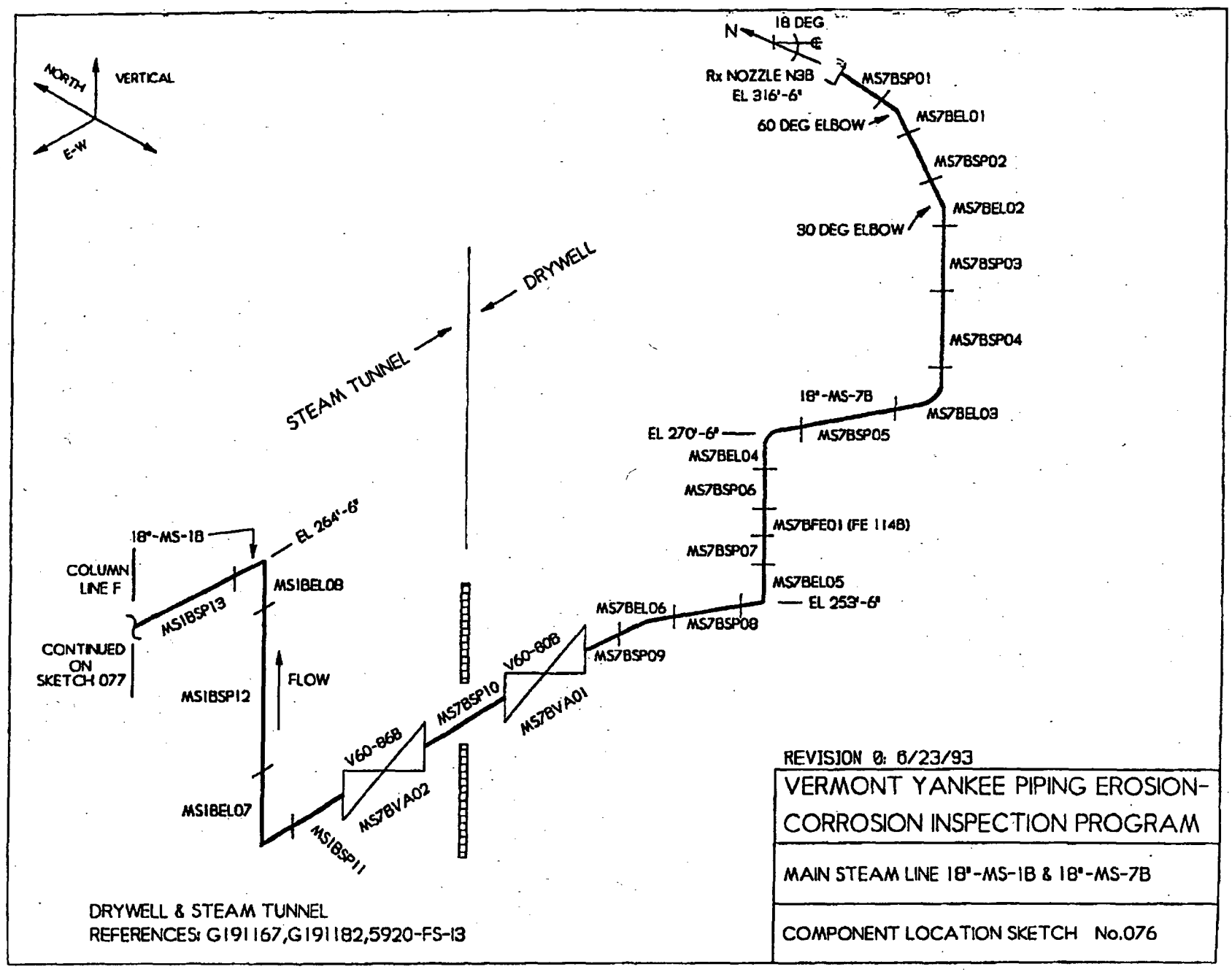
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

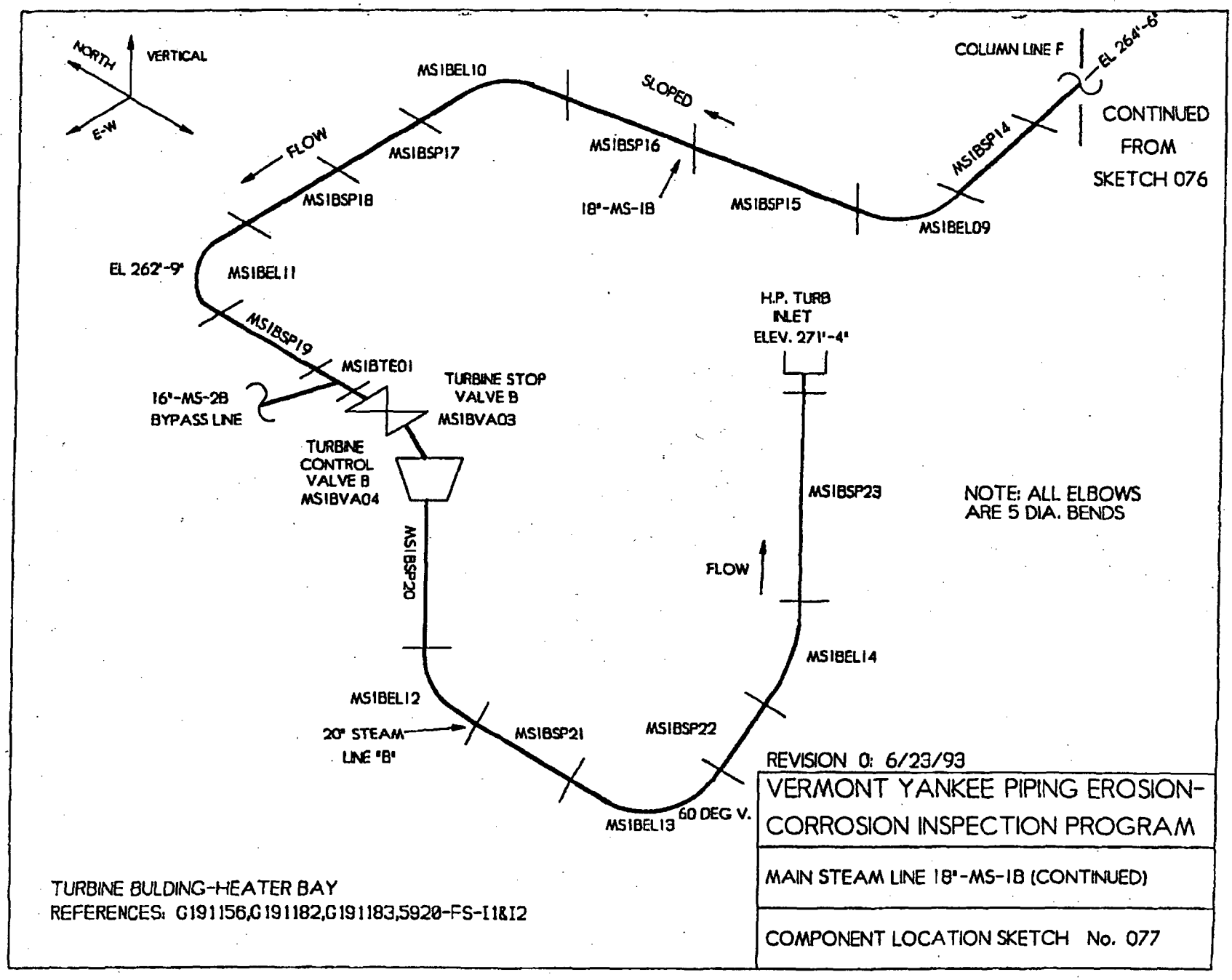
EXTRACTION STEAM LINE 12"-ES-6

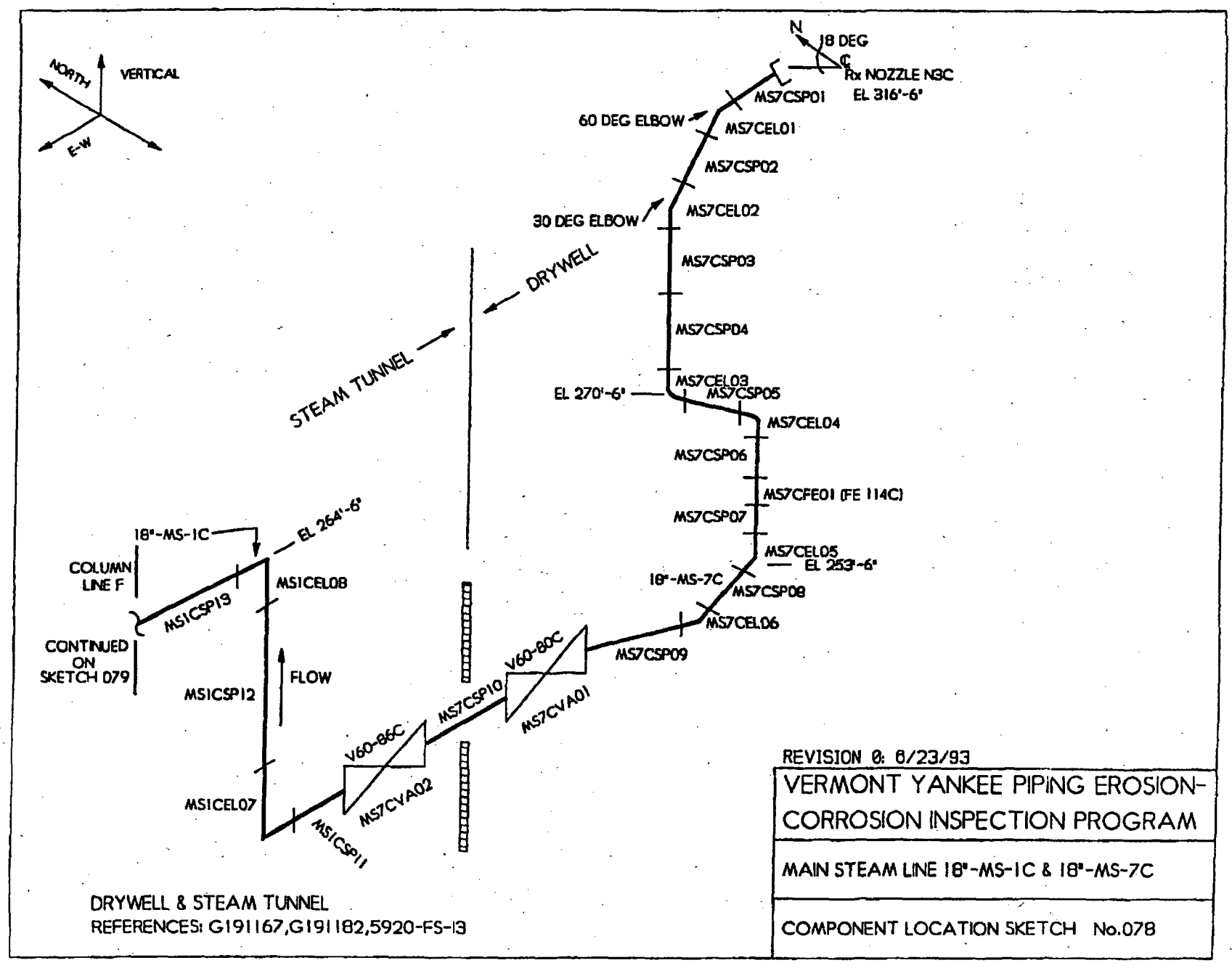
COMPONENT LOCATION SKETCH No. 073

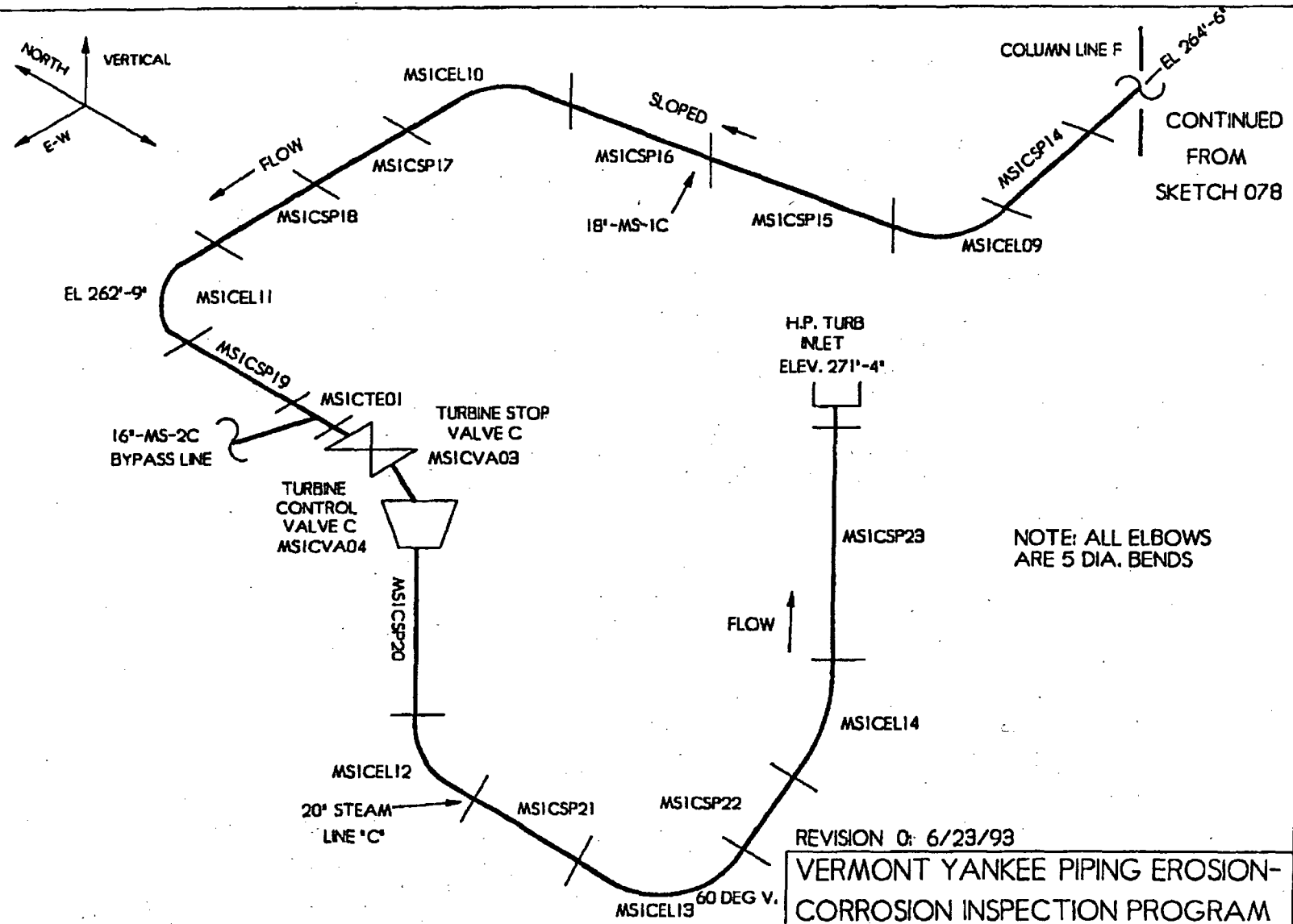

NORTH
VERTICAL
E-W
N
18 DEG
Rx NOZZLE N3A
EL 316'-6"
60 DEG ELBOW
MS7ASP01
MS7AEL01
MS7ASP02
MS7AEL02
30 DEG ELBOW
MS7ASP03
MS7ASP04
MS7AEL03
45 DEG ELBOW
MS7ASP05
MS7AEL04
DRYWELL
STEAM TUNNEL
EL 270'-6"
18"-MS-7A
MS7ASP07
MS7AEL05
MS7ASP06
FLOW
MS7ASP08
MS7AFE01 (FE114A)
MS7ASP09
EL 253'-6"
MS7AEL06
MS7ASP10
V60-80A
MS7AVA01
MS7ASP11
V60-86A
MS7AVA02
MS1ASP12
MS1AEL07
MS1ASP13
FLOW
MS1AEL08
EL 264'-6"
18"-MS-1A
COLUMN LINE F
MS1ASP14
CONTINUED ON SKETCH 075
DRYWELL & STEAM TUNNEL
REFERENCES: G191167,G191182,5920-FS-13
REVISION 0: 6/23/93
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
MAIN STEAM LINE 18"-MS-1A & 18"-MS-7A
COMPONENT LOCATION SKETCH No.074

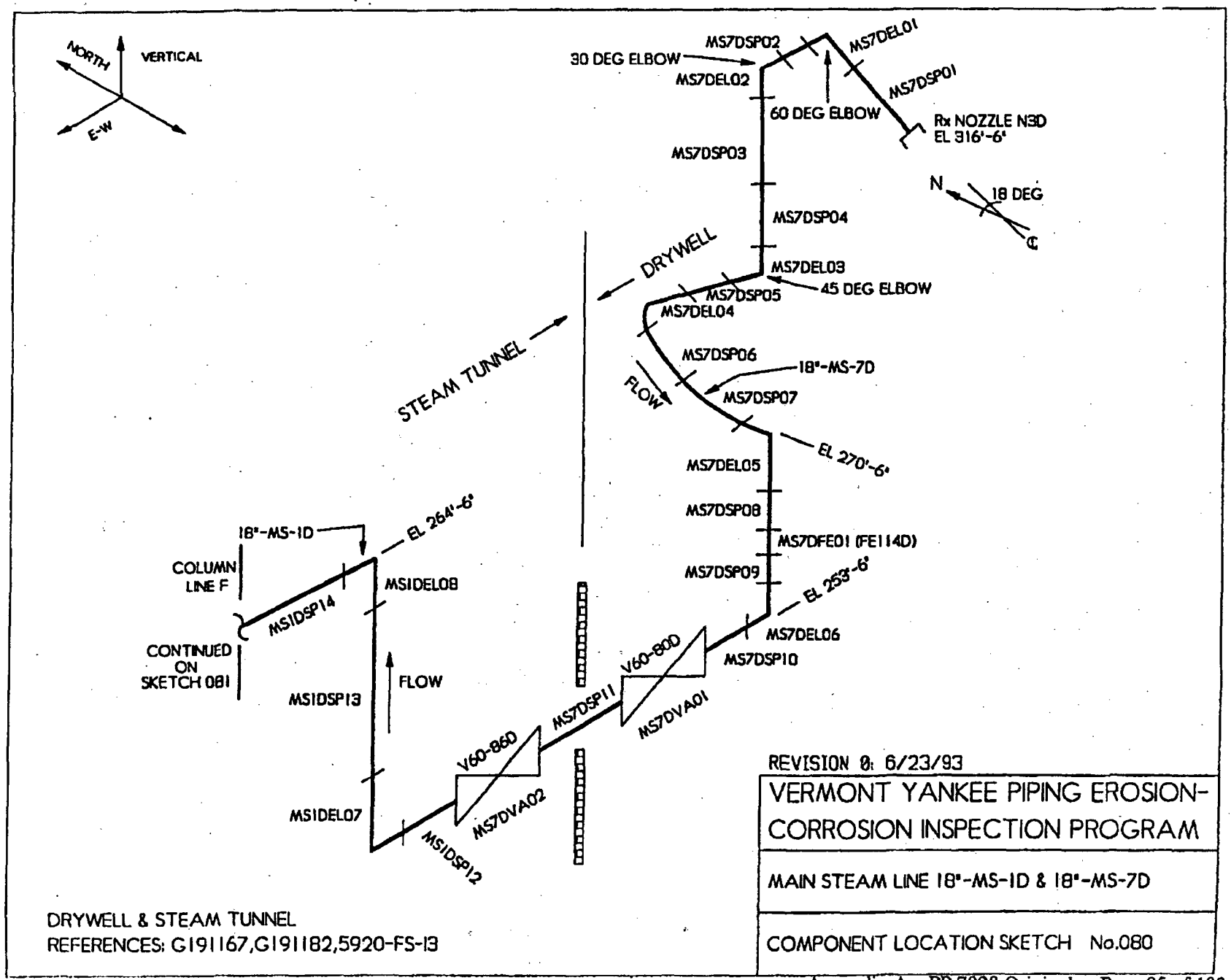

NORTH
VERTICAL
E-W
FLOW
MS1AEL10
MS1ASP17
MS1ASP18
SLOPED
MS1ASP16
18"-MS-1A
MS1ASP15
MS1AEL09
MS1ASP14
COLUMN LINE F
EL 264'-6"
CONTINUED FROM SKETCH 074
EL 262'-9"
MS1AEL11
MS1ASP19
MS1ATE01
16"-MS-2A BYPASS LINE
TURBINE STOP VALVE A MS1AVA03
TURBINE CONTROL VALVE A MS1AVA04
H.P. TURB INLET ELEV. 283'-8"
MS1AEL15
MS1ASP23
NOTE: ALL ELBOWS ARE 5 DIA. BENDS EXCEPT MS1AEL15
MS1ASP20
FLOW
MS1AEL14
MS1AEL12
20" STEAM LINE "A"
MS1ASP21
MS1ASP22
60 DEG V.
MS1AEL13
TURBINE BULDING-HEATER BAY
REFERENCES: G191156,G191182,G191183,5920-FS-I1&I2
REVISION 0: 6/23/93
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
MAIN STEAM LINE 18"-MS-1A (CONTINUED)
COMPONENT LOCATION SKETCH No. 075

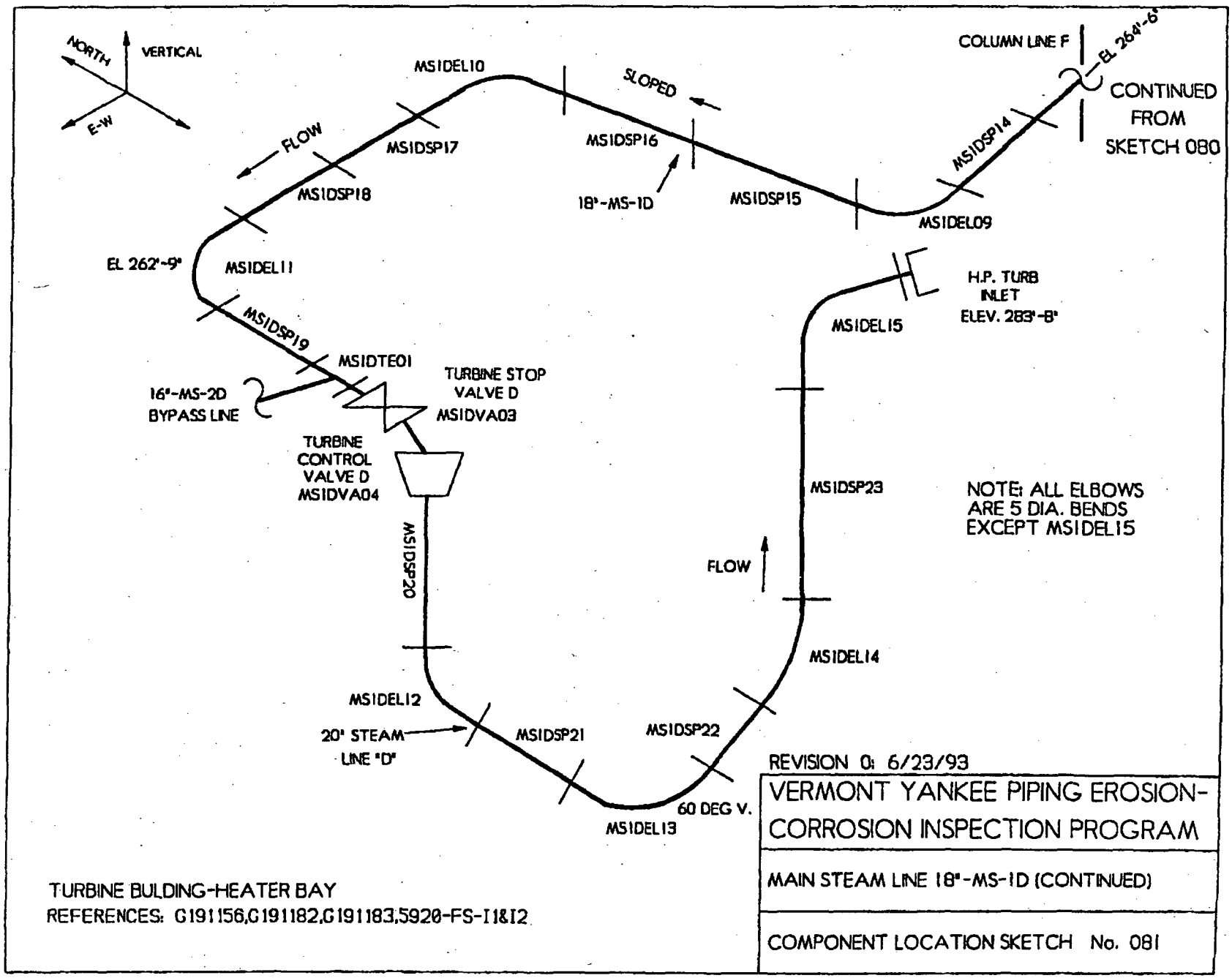

NORTH
VERTICAL
E-W
N
18 DEG
Rx NOZZLE N3B
EL 316'-6"
MS7BSP01
60 DEG ELBOW
MS7BEL01
MS7BSP02
MS7BEL02
90 DEG ELBOW
MS7BSP03
MS7BSP04
DRYWELL
STEAM TUNNEL
18"-MS-7B
MS7BEL03
EL 270'-6"
MS7BSP05
MS7BEL04
MS7BSP06
MS7BFE01 (FE 114B)
MS7BSP07
MS7BEL05
EL 253'-6"
MS7BEL06
MS7BSP08
MS7BSP09
V60-808
MS7BVA01
MS7BSP10
V60-868
MS7BVA02
MS1BSP11
MS1BEL07
MS1BSP12
FLOW
CONTINUED ON SKETCH 077
MS1BSP13
COLUMN LINE F
MS1BEL08
EL 264'-6"
18"-MS-1B
DRYWELL & STEAM TUNNEL
REFERENCES: G191167,G191182,5920-FS-13
REVISION 0: 6/23/93
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
MAIN STEAM LINE 18"-MS-1B & 18"-MS-7B
COMPONENT LOCATION SKETCH No.076

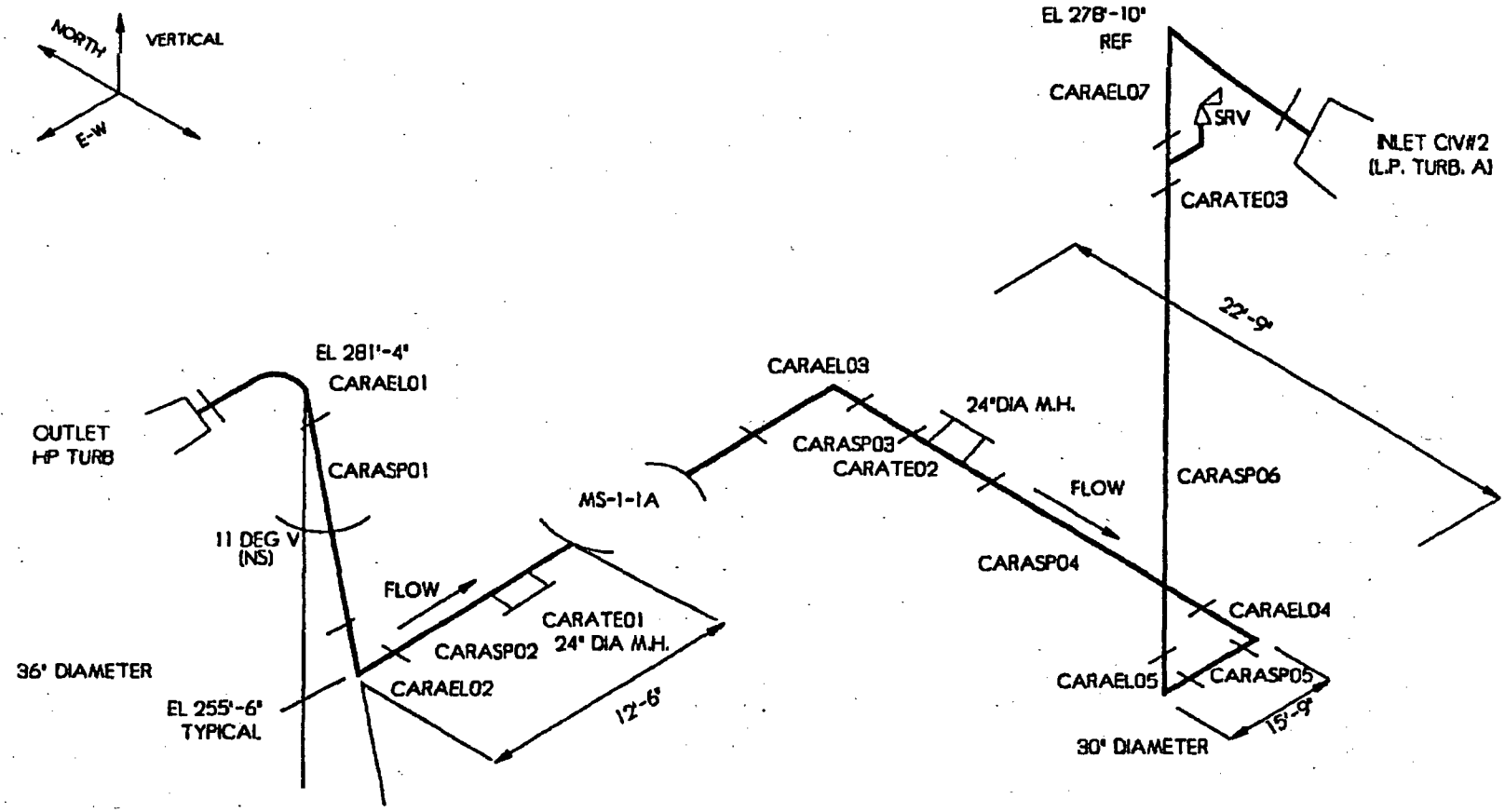

NORTH
VERTICAL
E-W
MS1BEL10
SLOPED
COLUMN LINE F
EL 264'-6"
CONTINUED
FROM
SKETCH 076
FLOW
MS1BSP17
MS1BSP16
MS1BSP14
MS1BSP18
18"-MS-1B
MS1BSP15
MS1BEL09
EL 262'-9"
MS1BEL11
H.P. TURB
INLET
ELEV. 271'-4"
MS1BSP19
MS1BTE01
TURBINE STOP
VALVE B
MS1BVA03
16"-MS-2B
BYPASS LINE
TURBINE
CONTROL
VALVE B
MS1BVA04
MS1BSP23
NOTE: ALL ELBOWS
ARE 5 DIA. BENDS
MS1BSP20
FLOW
MS1BEL14
MS1BEL12
20" STEAM
LINE "B"
MS1BSP21
MS1BSP22
MS1BEL13
60 DEG V.
REVISION 0: 6/23/93
VERMONT YANKEE PIPING EROSION-
CORROSION INSPECTION PROGRAM
MAIN STEAM LINE 18"-MS-1B (CONTINUED)
COMPONENT LOCATION SKETCH No. 077
TURBINE BULDING-HEATER BAY
REFERENCES: G191156,G191182,G191183,5920-FS-I1&I2


NORTH
VERTICAL
E-W
N
18 DEG
℄
Rx NOZZLE N3C
EL 316'-6"
MS7CSP01
60 DEG ELBOW
MS7CEL01
MS7CSP02
30 DEG ELBOW
MS7CEL02
MS7CSP03
DRYWELL
MS7CSP04
STEAM TUNNEL
MS7CEL03
EL 270'-6"
MS7CSP05
MS7CEL04
MS7CSP06
MS7CFE01 (FE 114C)
MS7CSP07
MS7CEL05
EL 253'-6"
18"-MS-7C
MS7CSP08
MS7CEL06
MS7CSP09
V60-80C
MS7CVA01
MS7CSP10
V60-86C
MS7CVA02
MS1CSP11
MS1CEL07
MS1CSP12
FLOW
MS1CEL08
EL 264'-6"
18"-MS-1C
COLUMN LINE F
MS1CSP13
CONTINUED ON SKETCH 079
DRYWELL & STEAM TUNNEL
REFERENCES: G191167,G191182,5920-FS-13
REVISION 0: 6/23/93
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
MAIN STEAM LINE 18"-MS-1C & 18"-MS-7C
COMPONENT LOCATION SKETCH No.078


NORTH
VERTICAL
E-W
FLOW
MSICEL10
MSICSP17
MSICSP18
EL 262'-9"
MSICEL11
MSICSP19
MSICTE01
16"-MS-2C
BYPASS LINE
TURBINE STOP
VALVE C
MSICVA03
TURBINE
CONTROL
VALVE C
MSICVA04
MSICSP20
MSICEL12
20" STEAM
LINE "C"
MSICSP21
MSICEL13
60 DEG V.
MSICSP22
MSICEL14
FLOW
MSICSP23
H.P. TURB
INLET
ELEV. 271'-4"
SLOPED
MSICSP16
18"-MS-1C
MSICSP15
MSICEL09
MSICSP14
COLUMN LINE F
EL 264'-6"
CONTINUED
FROM
SKETCH 078
NOTE: ALL ELBOWS
ARE 5 DIA. BENDS
TURBINE BULDING-HEATER BAY
REFERENCES: G191156,G191182,G191183,5920-FS-I1&I2
REVISION 0: 6/23/93
VERMONT YANKEE PIPING EROSION-
CORROSION INSPECTION PROGRAM
MAIN STEAM LINE 18"-MS-1C (CONTINUED)
COMPONENT LOCATION SKETCH No. 079


NORTH
VERTICAL
E-W
30 DEG ELBOW
MS7DSP02
MS7DEL01
MS7DEL02
MS7DSP01
60 DEG ELBOW
Rx NOZZLE N3D
EL 316'-6"
MS7DSP03
N
18 DEG
MS7DSP04
DRYWELL
MS7DEL03
45 DEG ELBOW
MS7DSP05
MS7DEL04
STEAM TUNNEL
MS7DSP06
18"-MS-7D
FLOW
MS7DSP07
EL 270'-6"
MS7DEL05
MS7DSP08
MS7DFE01 (FE114D)
MS7DSP09
EL 253'-6"
MS7DEL06
MS7DSP10
V60-800
MS7DVA01
MS7DSP11
V60-860
MS7DVA02
MSIDSP12
MSIDEL07
MSIDSP13
FLOW
CONTINUED ON SKETCH 081
MSIDSP14
COLUMN LINE F
MSIDEL08
18"-MS-1D
EL 264'-6"
DRYWELL & STEAM TUNNEL
REFERENCES: G191167,G191182,5920-FS-13
REVISION 0: 6/23/93
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
MAIN STEAM LINE 18"-MS-1D & 18"-MS-7D
COMPONENT LOCATION SKETCH No.080


NORTH
VERTICAL
E-W
FLOW
MSIDEL10
MSIDSP17
MSIDSP18
SLOPED
MSIDSP16
18"-MS-1D
MSIDSP15
MSIDEL09
MSIDSP14
COLUMN LINE F
EL 264'-6"
CONTINUED FROM SKETCH 080
EL 262'-9"
MSIDEL11
MSIDSP19
MSIDTE01
16"-MS-2D BYPASS LINE
TURBINE STOP VALVE D MSIDVA03
TURBINE CONTROL VALVE D MSIDVA04
MSIDSP20
MSIDEL12
20" STEAM LINE "D"
MSIDSP21
MSIDSP22
60 DEG V.
MSIDEL13
MSIDEL14
FLOW
MSIDSP23
MSIDEL15
H.P. TURB INLET ELEV. 283'-8"
NOTE: ALL ELBOWS ARE 5 DIA. BENDS EXCEPT MSIDEL15
TURBINE BULDING-HEATER BAY
REFERENCES: G191156,G191182,G191183,5920-FS-I1&I2
REVISION 0: 6/23/93
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM
MAIN STEAM LINE 18"-MS-1D (CONTINUED)
COMPONENT LOCATION SKETCH No. 081



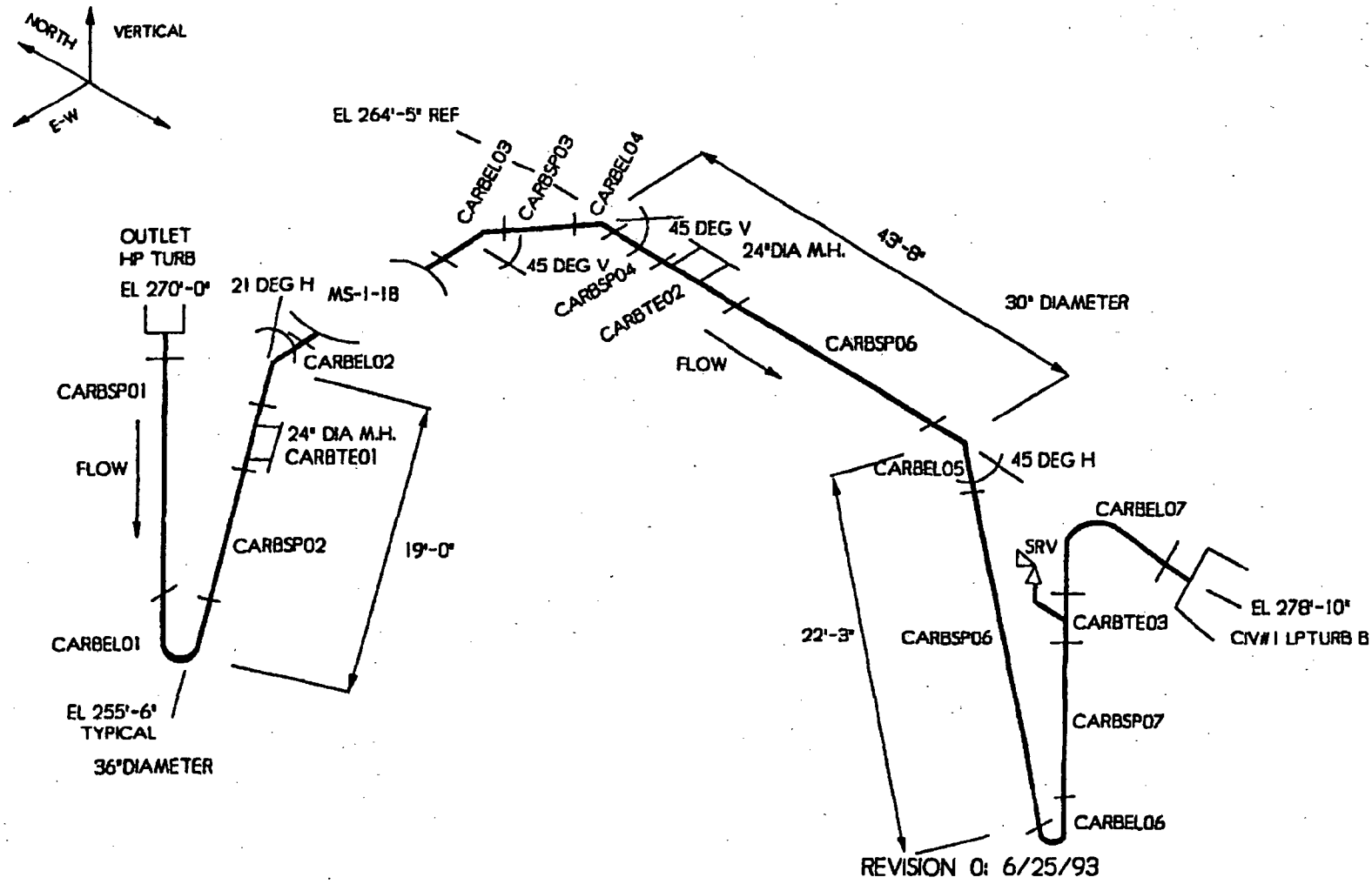
REVISION 0: 6/25/93

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

30" & 36" TURBINE CROSS AROUND PIPING - "A" LINE

TURBINE BULDING-HEATER BAY
REFERENCES: G191156,5920-6841,5920-6846,5920-FS-I2

COMPONENT LOCATION SKETCH No.082



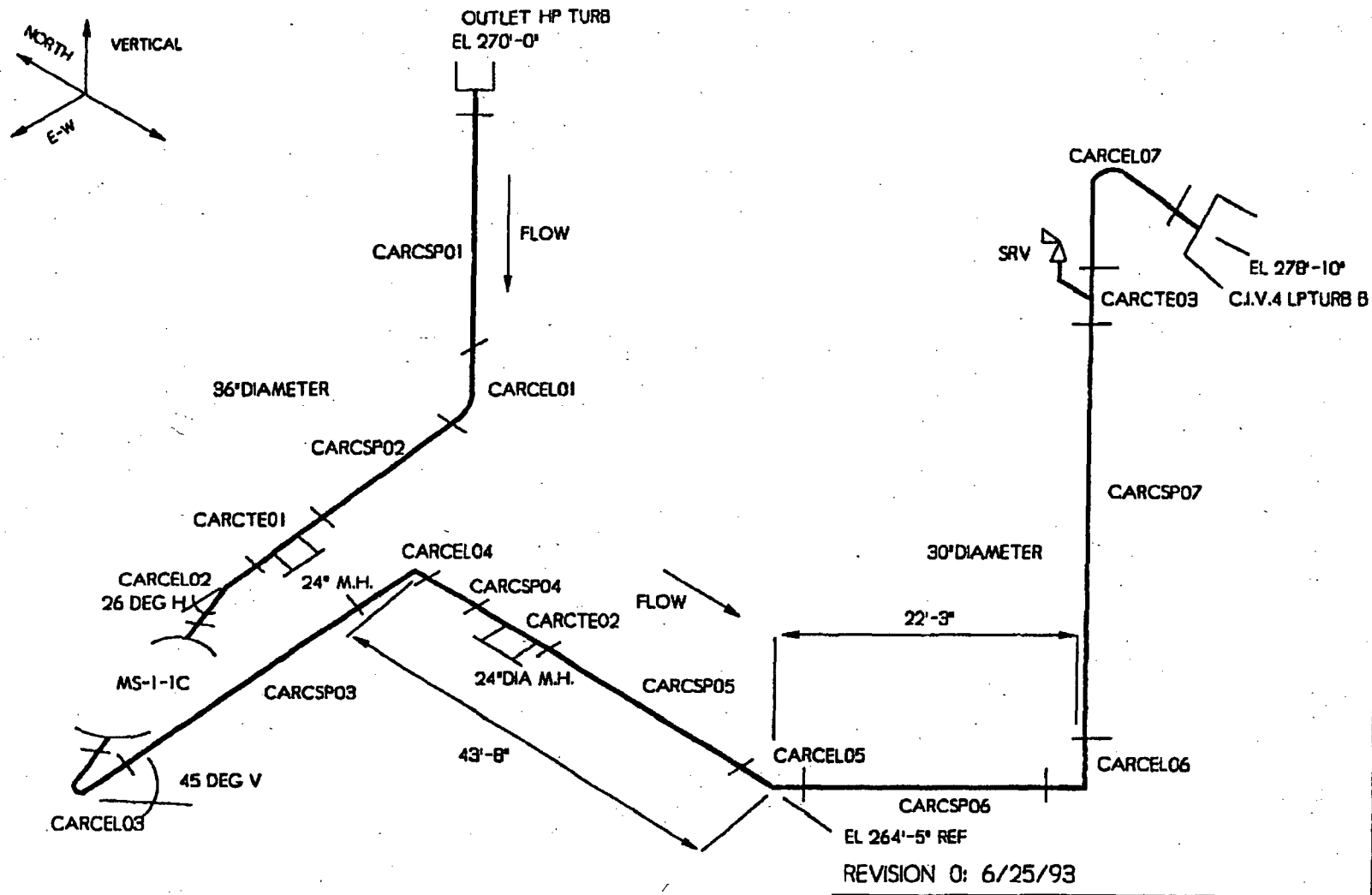
REVISION 0: 6/25/93

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

30" & 36" TURBINE CROSS AROUND PIPING - "B" LINE

COMPONENT LOCATION SKETCH No.083

TURBINE BULDING-HEATER BAY
REFERENCES: G191156,5920-6841,5920-6846,5920-FS-I2



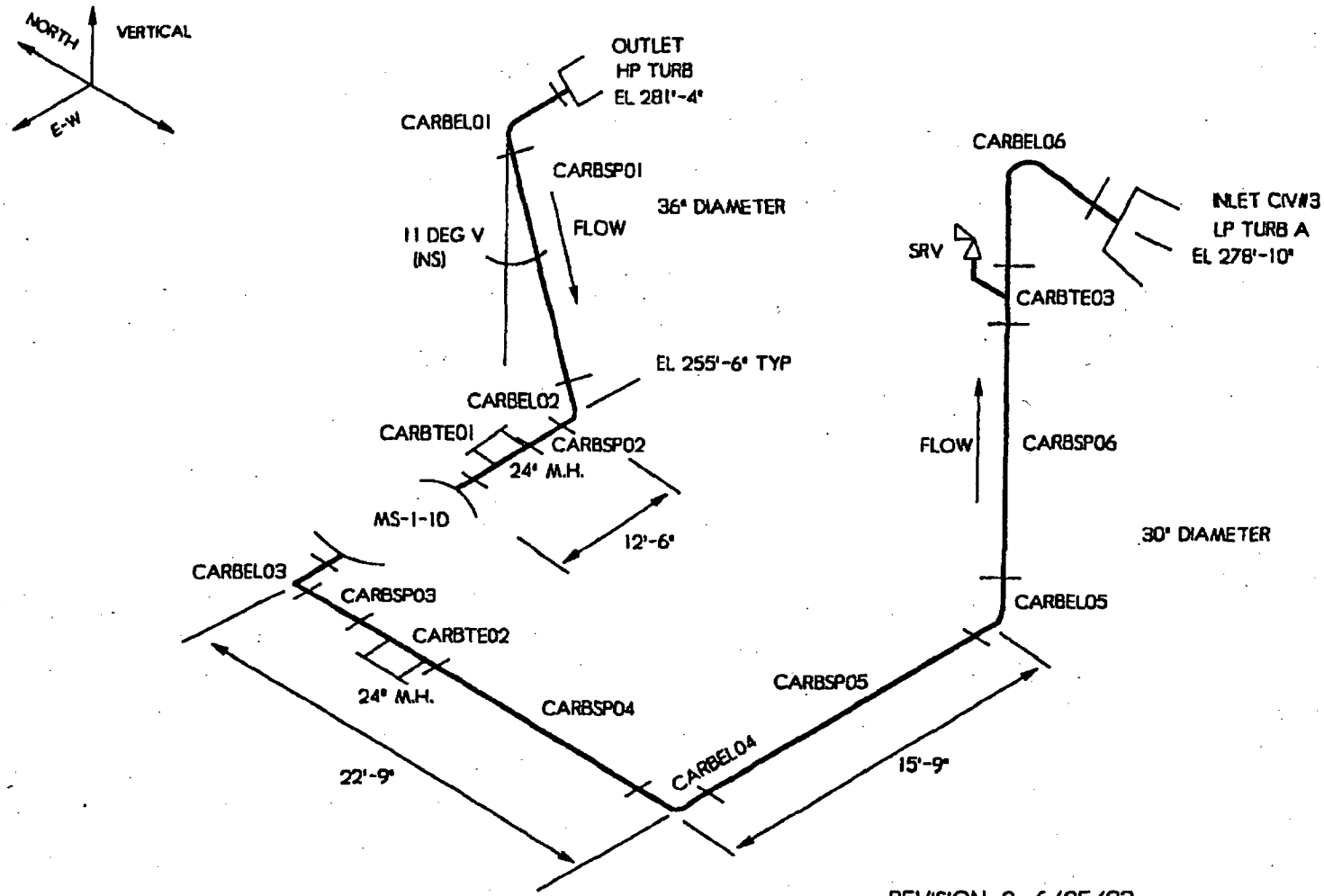
REVISION 0: 6/25/93

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

30" & 36" TURBINE CROSS AROUND PIPING - "C" LINE

COMPONENT LOCATION SKETCH No.084

TURBINE BULDING-HEATER BAY
REFERENCES: G191156,5920-6841,5920-6846,5920-FS-12



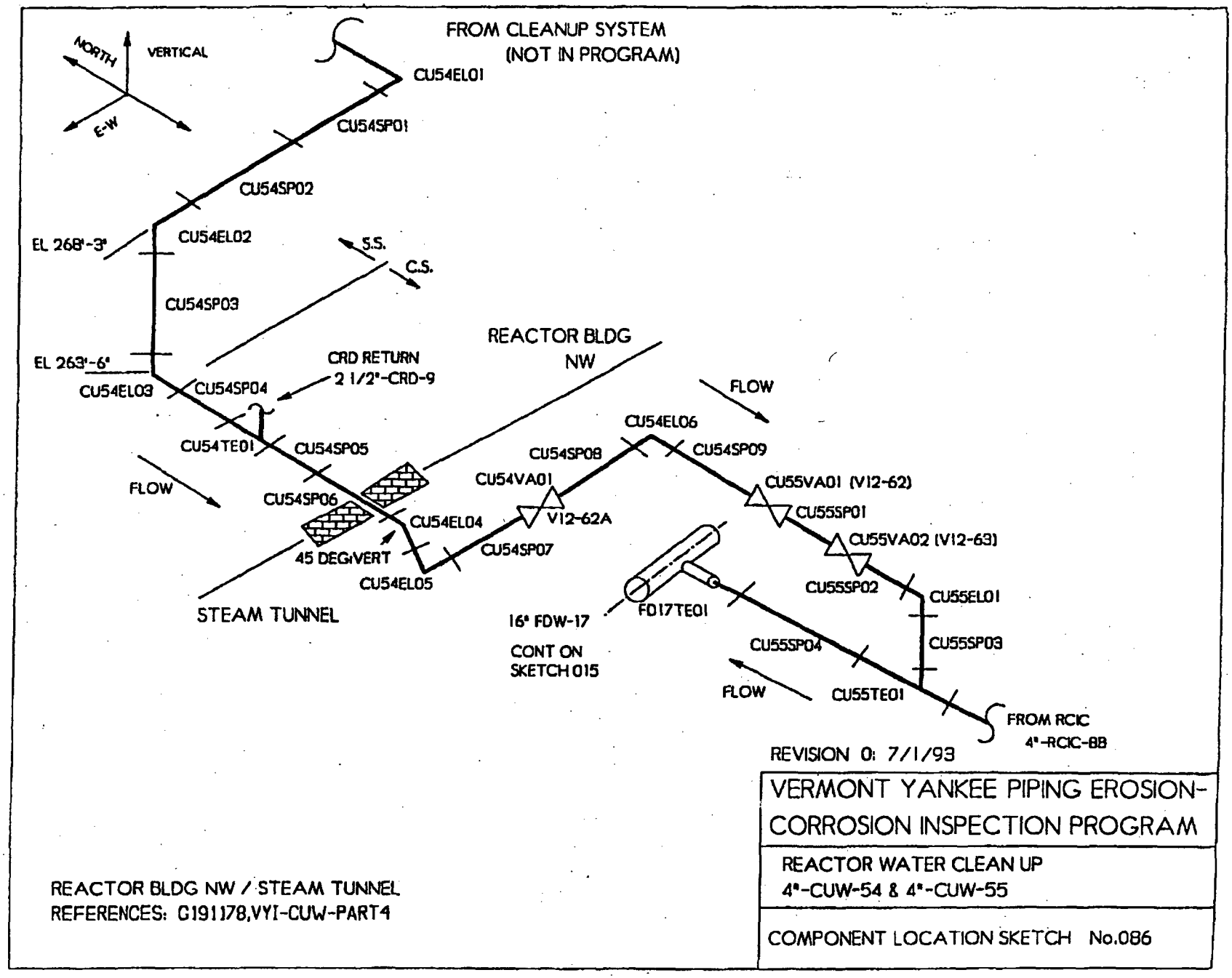
REVISION 0: 6/25/93

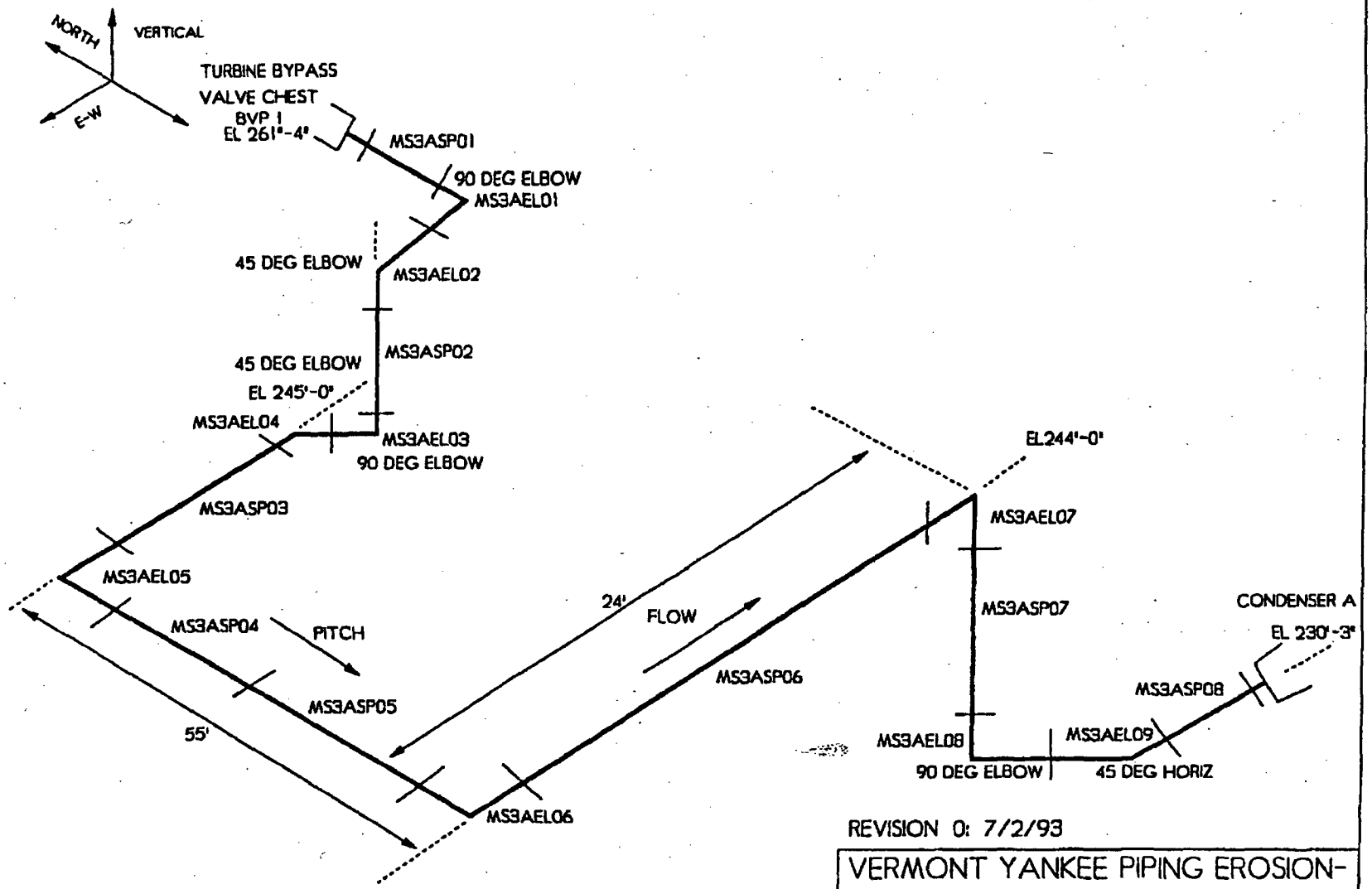
VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

30" & 36" TURBINE CROSS AROUND PIPING - "D" LINE

COMPONENT LOCATION SKETCH No.085

TURBINE BULDING-HEATER BAY
REFERENCES: G191156,5920-6841,5920-6846,5920-FS-12


NORTH
VERTICAL
E-W
FROM CLEANUP SYSTEM
(NOT IN PROGRAM)
CU54EL01
CU54SP01
CU54SP02
EL 268'-3"
CU54EL02
S.S.
C.S.
CU54SP03
EL 263'-6"
CU54EL03
CU54SP04
CRD RETURN
2 1/2"-CRD-9
REACTOR BLDG
NW
FLOW
CU54TE01
CU54SP05
CU54EL06
CU54SP08
CU54SP09
CU54VA01
CU55VA01 (V12-62)
FLOW
CU54SP06
CU54EL04
V12-62A
CU55SP01
CU55VA02 (V12-63)
45 DEG VERT
CU54SP07
CU54EL05
CU55SP02
CU55EL01
STEAM TUNNEL
16" FDW-17
FD17TE01
CONT ON
SKETCH 015
CU55SP04
CU55SP03
FLOW
CU55TE01
FROM RCIC
4"-RCIC-88
REVISION 0: 7/1/93
VERMONT YANKEE PIPING EROSION-
CORROSION INSPECTION PROGRAM
REACTOR WATER CLEAN UP
4"-CUW-54 & 4"-CUW-55
COMPONENT LOCATION SKETCH No.086
REACTOR BLDG NW / STEAM TUNNEL
REFERENCES: G191178,VYI-CUW-PART4



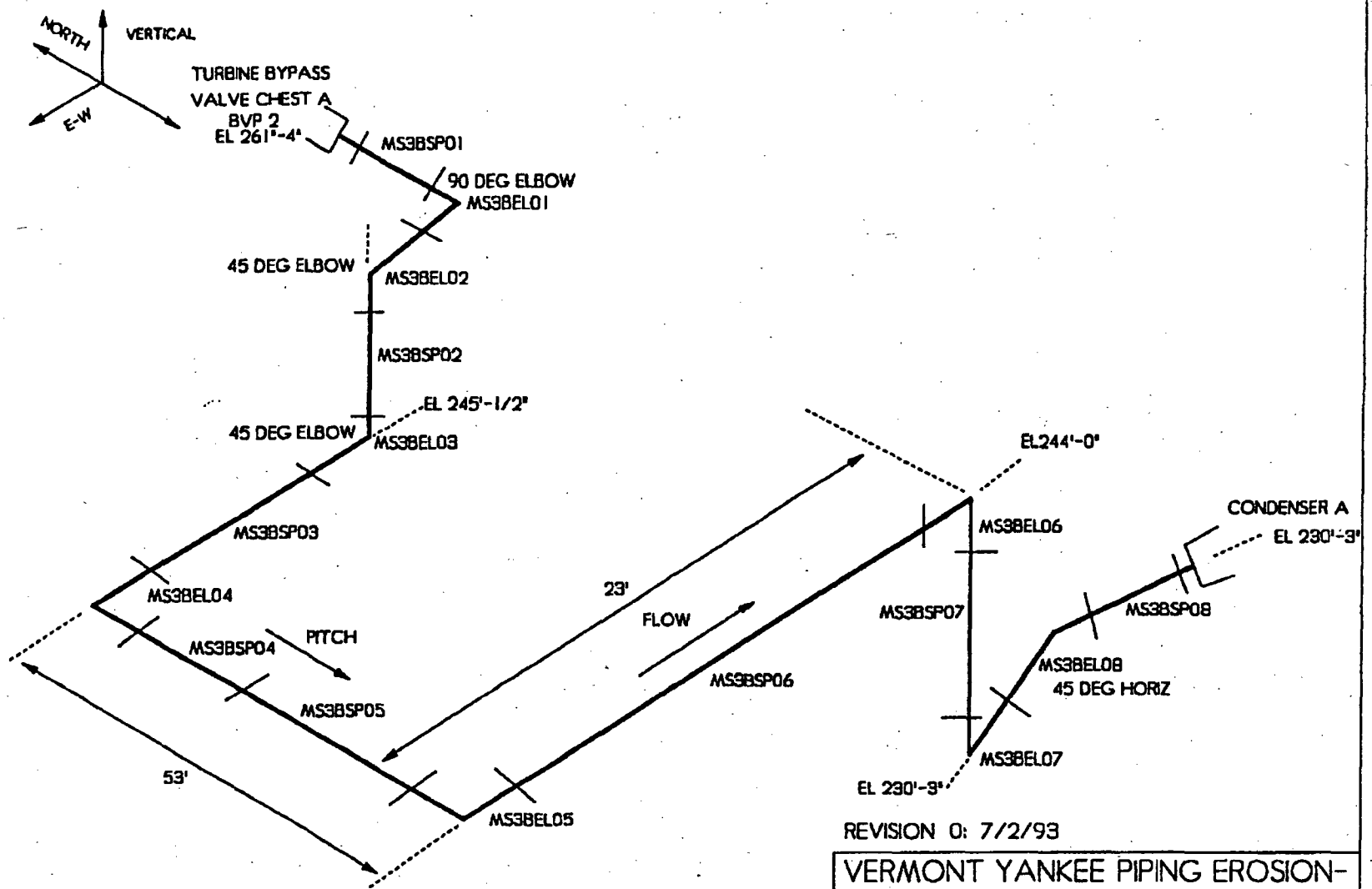
TURBINE BULDING-HEATER BAY
REFERENCES: G191156,G191182,G191183,5920-FS-I2

REVISION 0: 7/2/93

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

10"-MS-3A

COMPONENT LOCATION SKETCH No.087



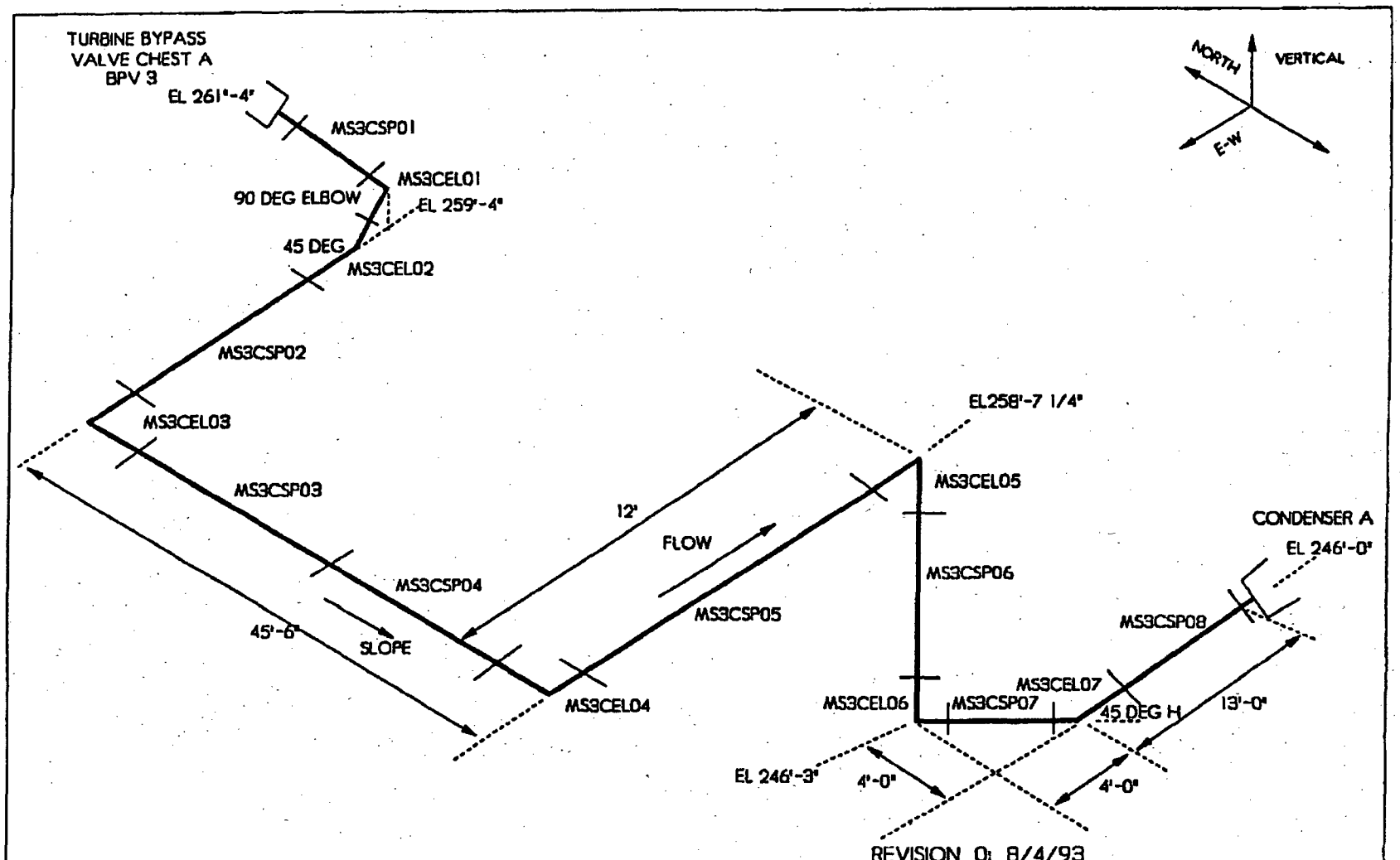
REVISION 0: 7/2/93

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

10"-MS-3B

TURBINE BULDING-HEATER BAY
REFERENCES: G191156,G191182,G191183,5920-FS-I2

COMPONENT LOCATION SKETCH No.088



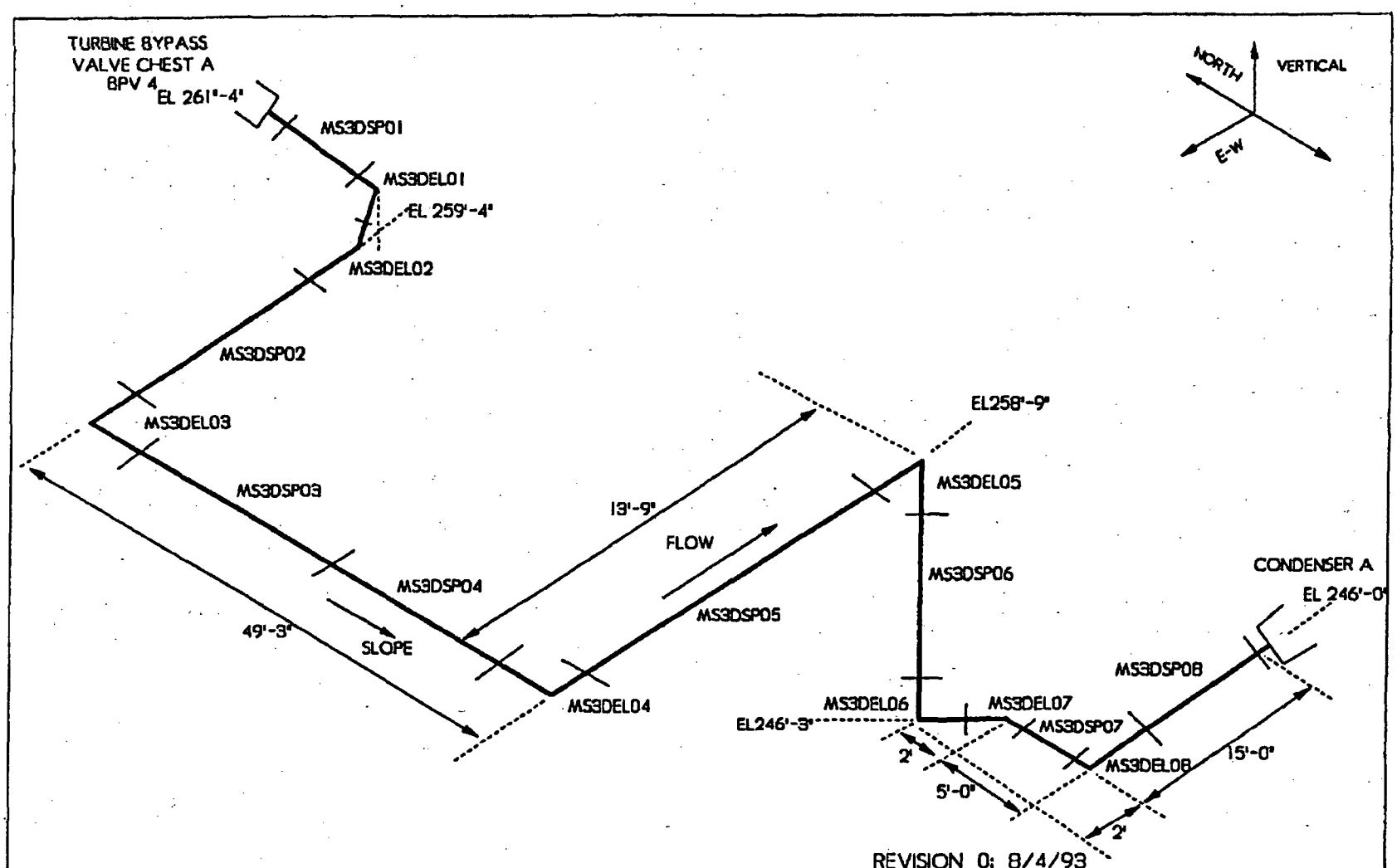
REVISION 0: 8/4/93

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

10"-MS-3C

TURBINE BULDING-HEATER BAY
REFERENCES: G191156,G191182,G191183,5920-FS-I2

COMPONENT LOCATION SKETCH No.089



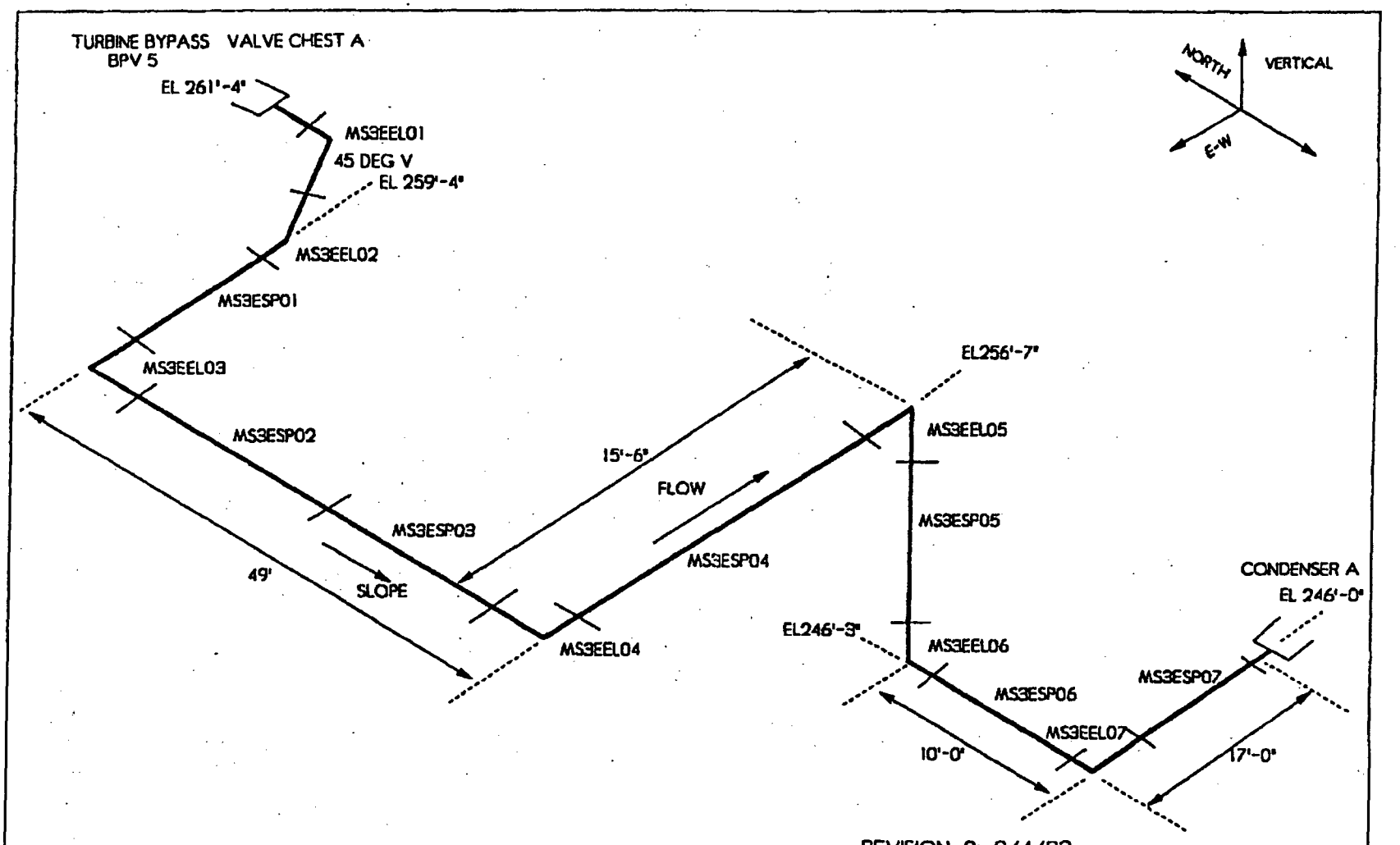
REVISION 0: 8/4/93

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

10"-MS-3D

TURBINE BULDING-HEATER BAY
REFERENCES: G191156,G191182,G191183,5920-FS-I2

COMPONENT LOCATION SKETCH No.090



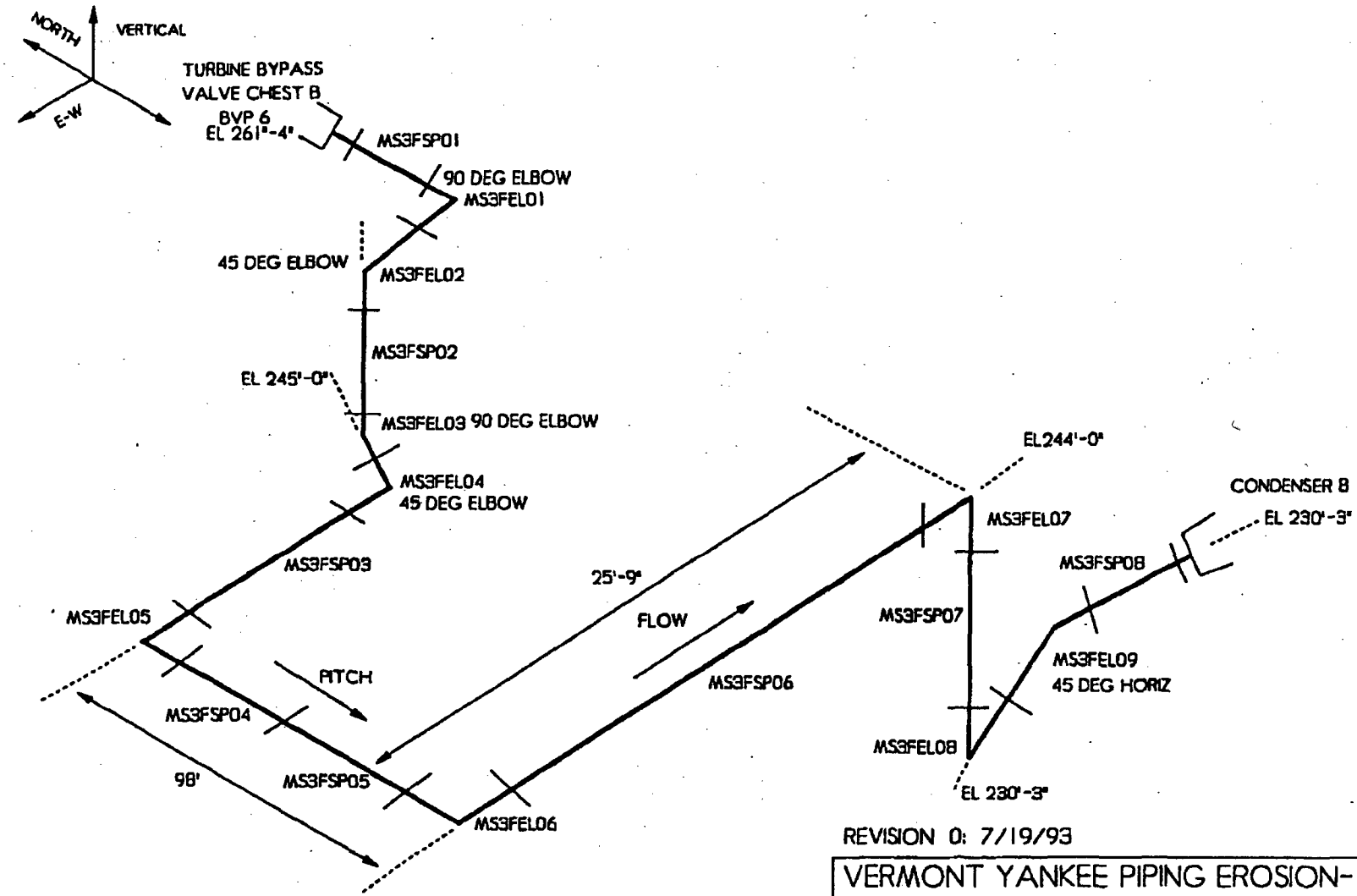
REVISION 0: 8/4/93

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

10"-MS-3E

COMPONENT LOCATION SKETCH No.091

TURBINE BULDING-HEATER BAY
REFERENCES: G191156,G191182,G191183,5920-FS-I2



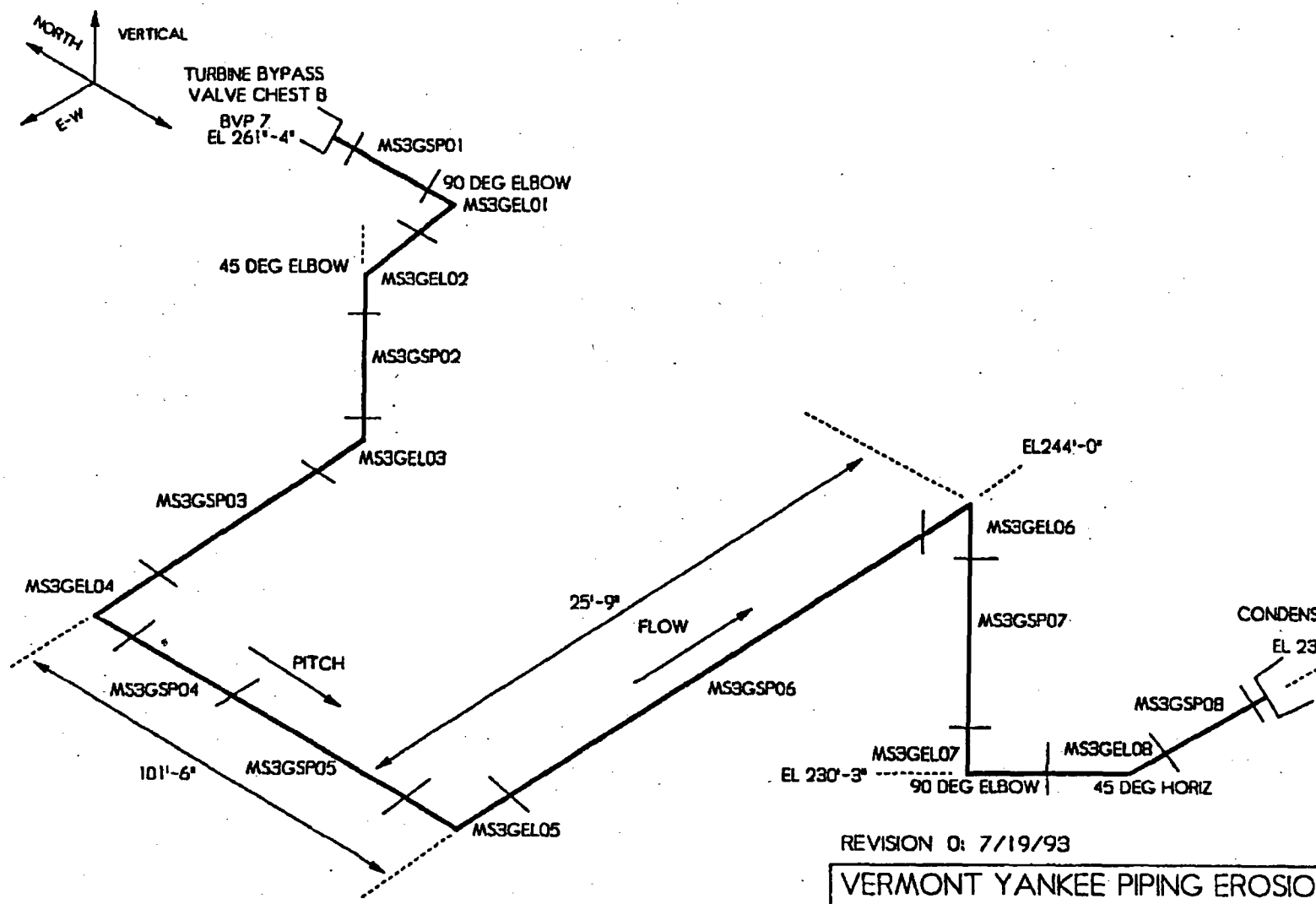
REVISION 0: 7/19/93

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

10"-MS-3F

COMPONENT LOCATION SKETCH No.092

TURBINE BULDING-HEATER BAY
REFERENCES: G191156,G191182,G191183,5920-FS-I2



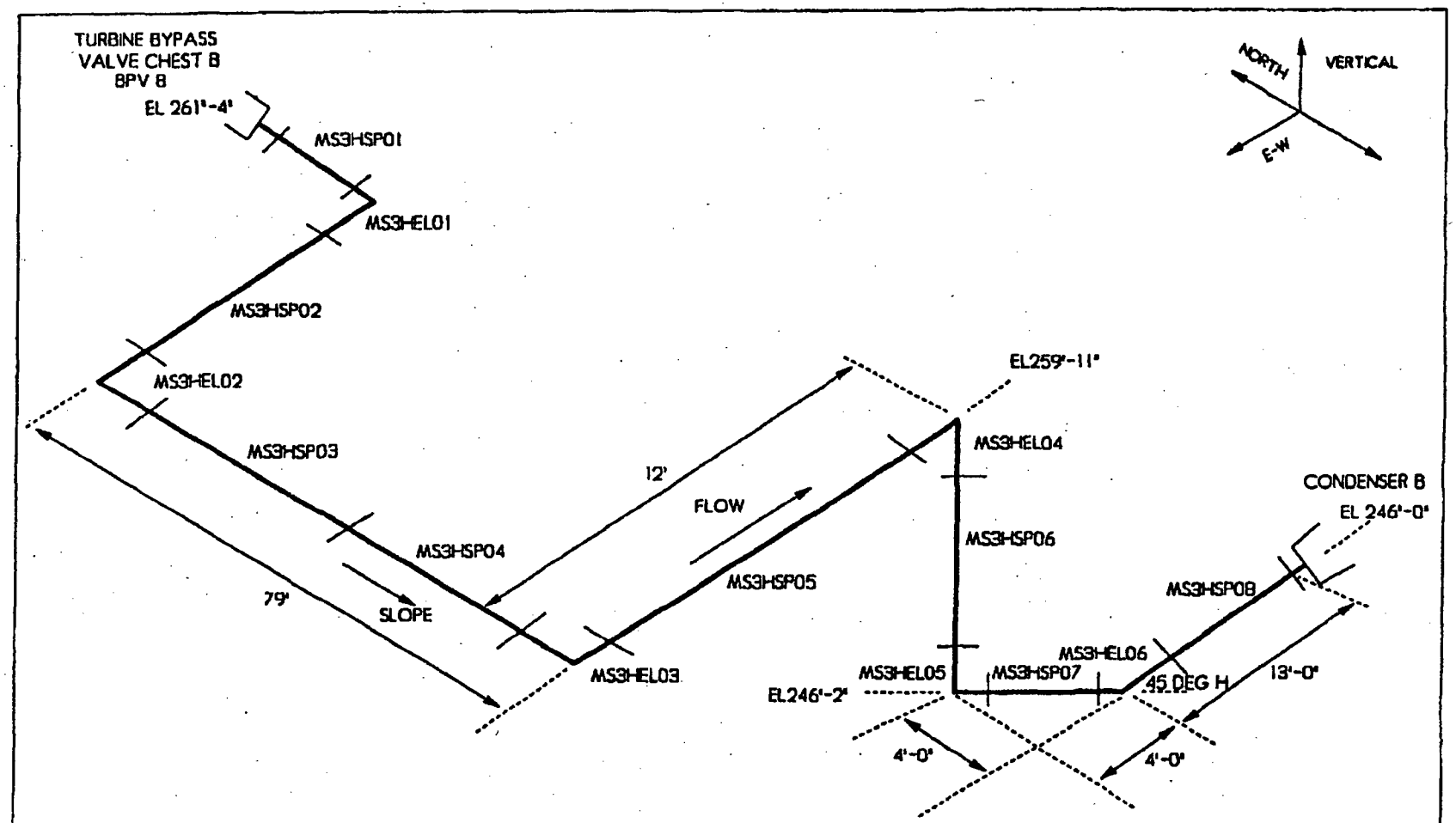
REVISION 0: 7/19/93

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

10"-MS-3G

TURBINE BULDING-HEATER BAY
REFERENCES: G191156,G191182,G191183,5920-FS-I2

COMPONENT LOCATION SKETCH No.093



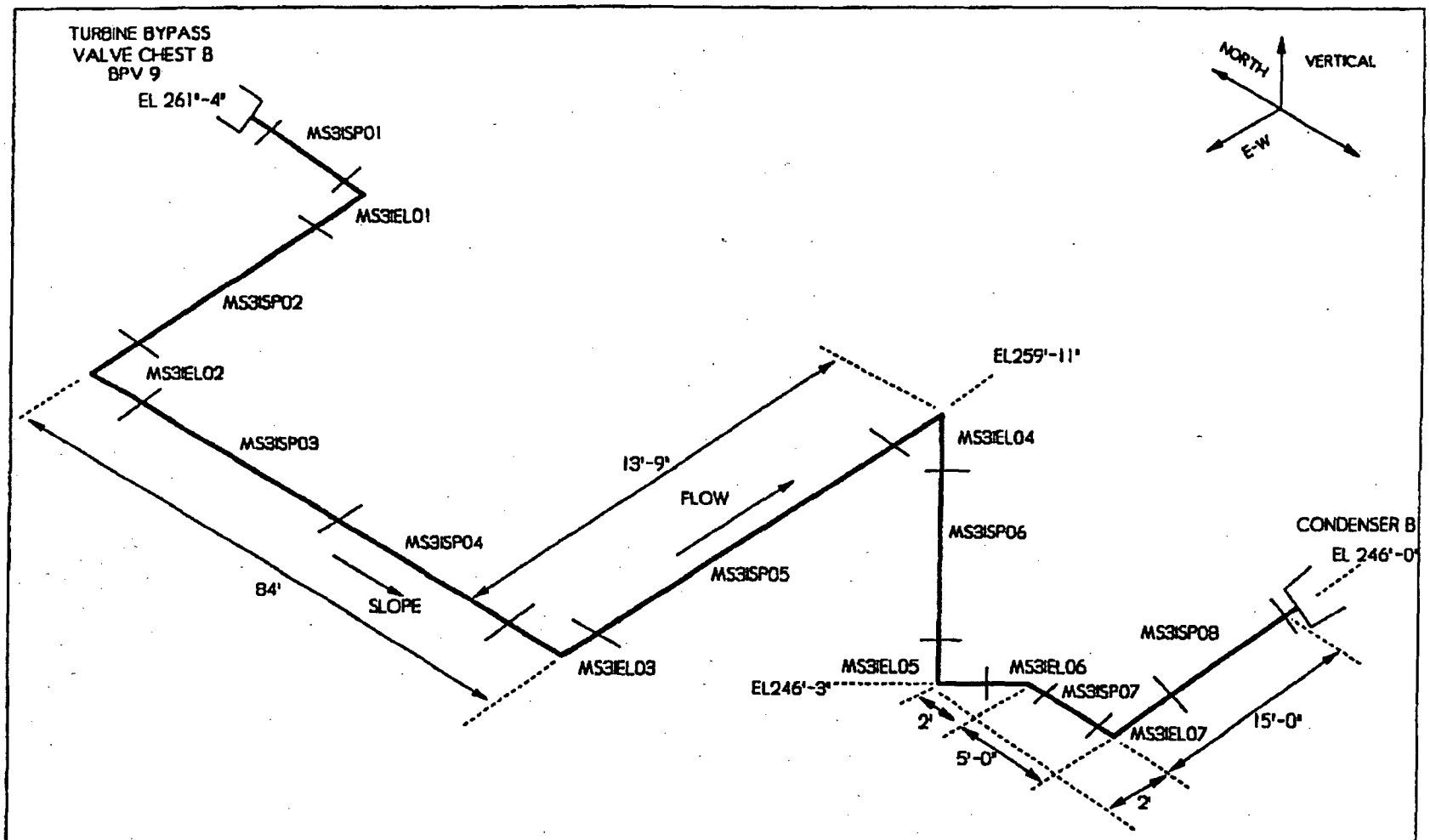
REVISION 0: 8/2/93

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

10"-MS-3H

TURBINE BULDING-HEATER BAY
REFERENCES: G191156,G191182,G191183,5920-FS-I2

COMPONENT LOCATION SKETCH No.094



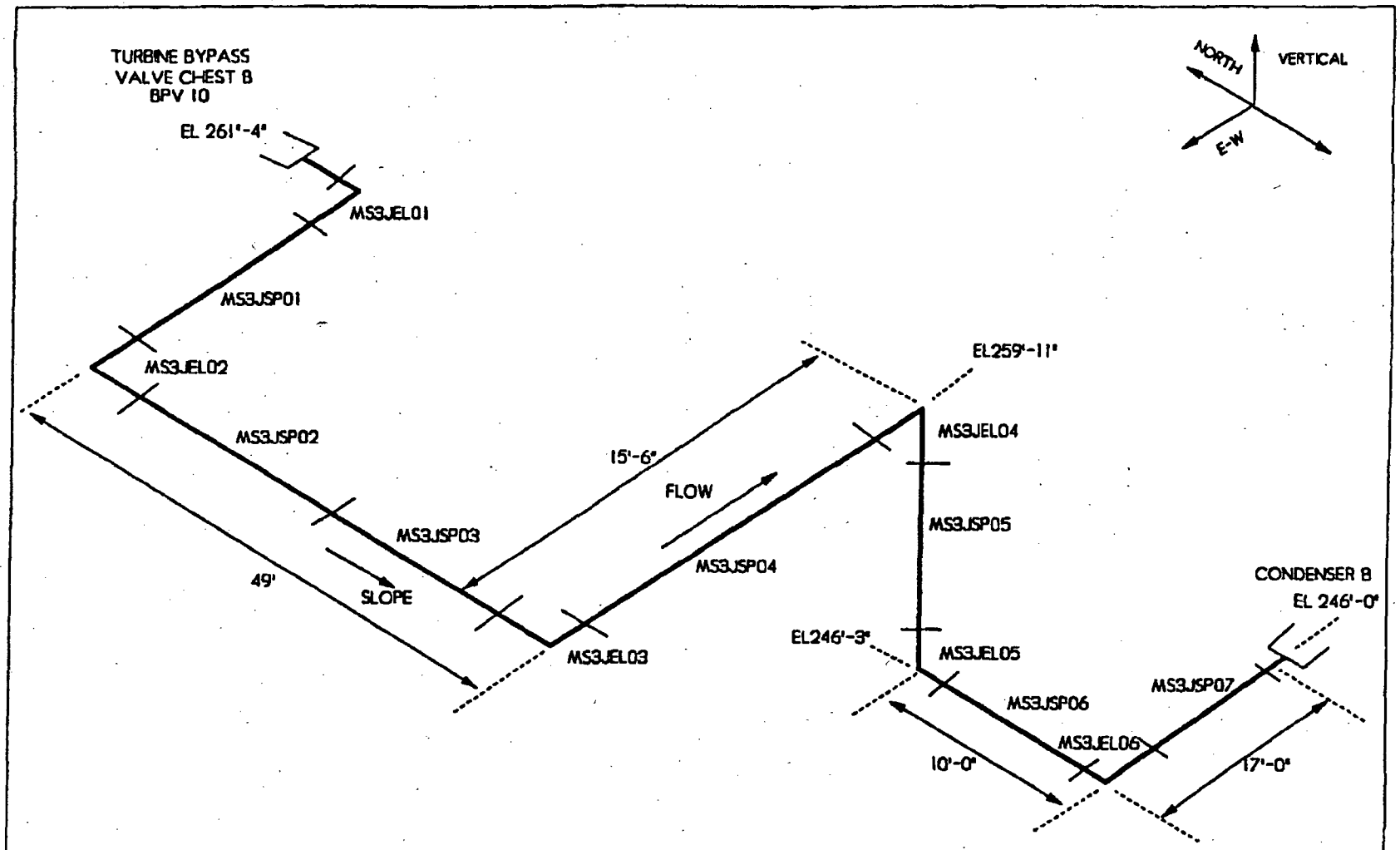
REVISION 0: 8/3/93

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

10"-MS-31

TURBINE BULDING-HEATER BAY
REFERENCES: G191156,G191182,G191183,5920-FS-I2

COMPONENT LOCATION SKETCH No.095



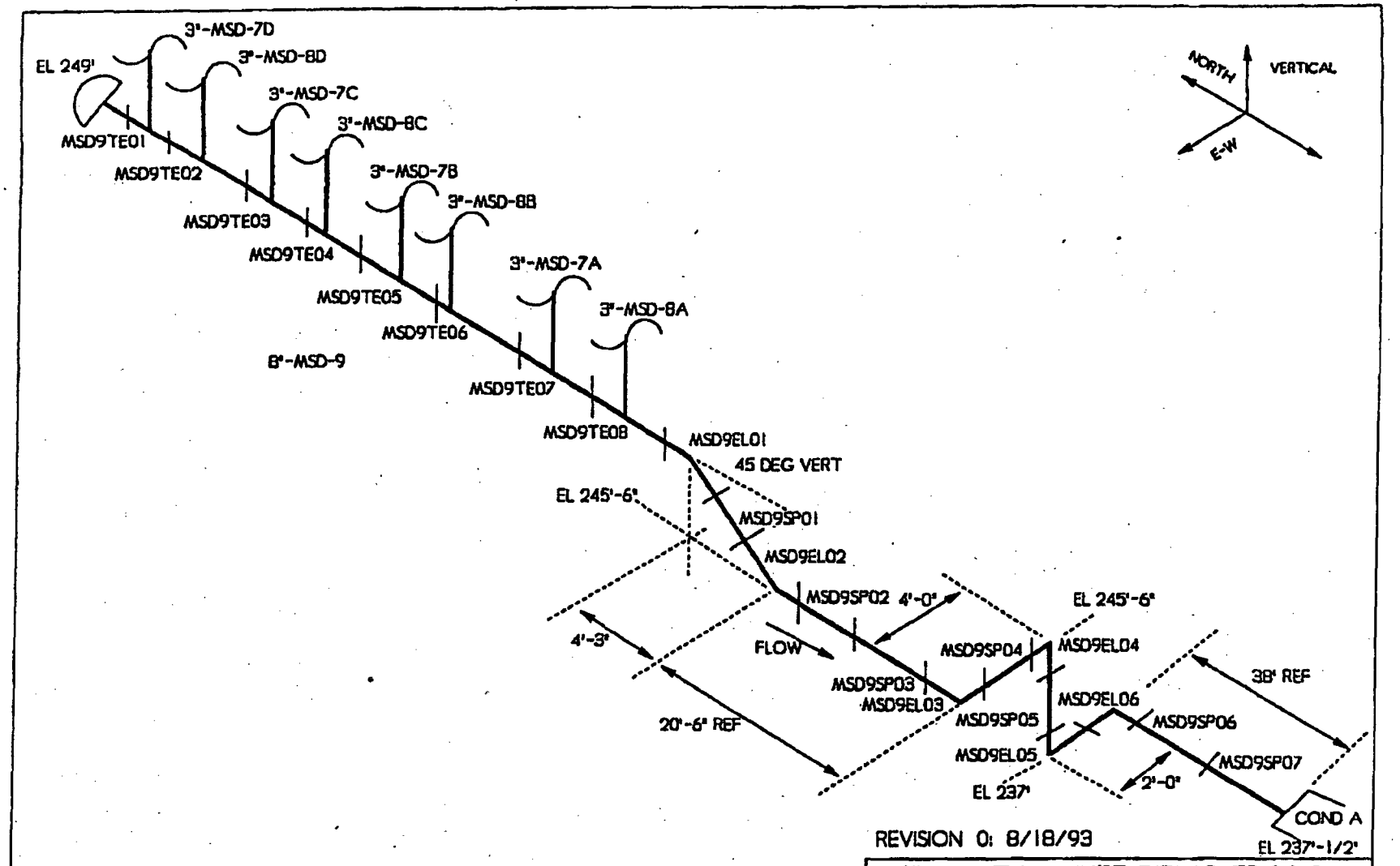
REVISION 0: 8/4/93

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

10"-MS-3J

TURBINE BULDING-HEATER BAY
REFERENCES: G191156,G191182,G191183,5920-FS-I2

COMPONENT LOCATION SKETCH No.096



REVISION 0: 8/18/93

VERMONT YANKEE PIPING EROSION-CORROSION INSPECTION PROGRAM

8"-MSD-9

TURBINE BULDING-HEATER BAY
REFERENCES: G191156,G191182,G191183,5920-FS-I-1B

COMPONENT LOCATION SKETCH No.097

APPENDIX B

SMALL BORE PIPING INSPECTION LOCATION DATABASE

Identification of Small bore components

Only specific small bore locations consisting of piping components (valves, steam traps, orifices, etc.) and the adjacent piping will be inspected under this program. These locations were selected and identified in reference 5.4.3., and are compiled in the Small Bore Inspection Database.

Each location has been given a unique point number in the Small Bore Component Database. Additional components will be included into the database as warranted. Since the majority of the small bore components will be inspected only once, the previous system for identification of inspection results was retained.

Each inspection performed is identified as follows:

"YR-SBxx"

where: **YR** - is the year the location is inspected.

SB - denotes small bore piping (less than 2-1/2" diameter).

xx - a number assigned to the location by the FACPC for that specific refueling outage.

Example: **93-SB04**

The Data base identifies all small bore points inspected up to and including the 1999 RFO.

SMALL BORE PIPING INSPECTION LOCATION DATABASE										
PT.	PREV. INSPECT. No.	SYSTEM	DESCRIPTION	LOCATION	DRAWINGS	COMMENTS	SIZE	SCH.	Tnom inch	T min inch
1	93-SB01	MSD	1" Pipe & Fittings D.S. of valve M-33	Rx. Bldg. Torus Area	G191167	MS-33(N.C.)labeled as orificed valve.	1"	160	.250	.053
2	93-SB02 95-SB01	MSD	1" Pipe & Fittings D.S. of steam trap ST60-3.	Rx. Bldg. Torus Area	G191167	Normal flow to condenser is thru ST60-3. (dp=965psi)	1"	160	.250	.053
3	93-SB03	MSD	1" piping D.S. of LCV-2-143	Rx. Bldg. Torus Area	G191167	Mn Steam strainer ST60-3 blow down . (dp=965psi)	1"	160	.250	.053
4	93-SB04	MSD	3" & 2½" MSD D. S. of valve MS-79 (3"-MSD-4)	Rx. Bldg. Torus Area	G191167	N.C. valve (dp=965psi)	3" 2½"	160 160	.438 .375	0.141 0.116
5	93-SB05	MSD	3" MSD-4 U.S. of Condenser A. Nozzle 67	T. B. - Heater Bay	G191156	IE	3"	160 STD	.438 .216	0.141 0.141
6	93-SB06	MSD	1" & 2½" MSD-7A D.S. of steam trap, ST-60-2A	T. B. - Heater Bay	G191156	IE	1" 2-1/2"	160 160	.250 .375	.053 .116
7	93-SB07	MSD	1" & 2½" MSD-8A @ LCV-38A.	T. B. - Heater Bay	G191156	IE	1" 2½"	160 160	.250 .375	.053 .116
8	95-SB03	MSD	1" & 2½" MSD-7B D.S. of steam trap, ST-60-2B.	T. B. - Heater Bay	G191156	IE	1" 2-1/2"	160 160	.250 .375	.053 .116
9	95-SB04	MSD	1" & 2½". MSD-8B @ LCV-38B.	T. B. - Heater Bay	G191156	IE	1" 2½"	160 160	.250 .375	.053 .116
10	93-SB09	MSD	1"&2½" MSD-7C D.S. of steam trap ST60-2C.	T. B. - Heater Bay	G191156	IE	1" 2-1/2"	160 160	.250 .375	.053 .116
11	93-SB10 95-SB02	MSD	1" & 2½" MSD-8C @ LCV-38C.	T. B. - Heater Bay	G191156	IE	1" 2½"	160 160	.250 .375	.053 .116
12	95-SB05	MSD	1" & 2½" MSD-7D D.S. of steam trap, ST-60-2D.	T. B. - Heater Bay	G191156	IE	1" 2-1/2"	160 160	.250 .375	.053 .116
13	95-SB-06	MSD	1" & 2½" MSD-8D @ LCV-38D.	T. B. - Heater Bay	G191156	IE	1" 2½"	160 160	.250 .375	.053 .116
	93-SB08	MSD	8" MSD-9 Hdr. @ 2½" conn. (See L.B. Sketch 097)	T. B. - Heater Bay	G191156	(IE) Portions of LB component inspected with SB pipe.	8"	80	.500	.347

SMALL BORE PIPING INSPECTION LOCATION DATABASE										
PT.	PREV. INSPECT. No.	SYSTEM	DESCRIPTION	LOCATION	DRAWINGS	COMMENTS	SIZE	SCH.	Tnom inch	T min inch
14	93-SB12	MSD	1"&2½" Piping @ valve MS-2A.	T. B. - Heater Bay	G191156	IE	1"	160	.250	.053
15	95-SB-07	MSD	1"&2½" Piping @ valve MS-2B.	T. B. - Heater Bay	G191156	IE	1"	160	.250	.053
16	93-SB13	MSD	1"&2½" Piping @ valve MS-2C.	T. B. - Heater Bay	G191156	IE	1" 2½"	160 160	.250 .375	.053 .116
17	95-SB08	MSD	1"&2½" Piping @ valve MS-2D.	T. B. - Heater Bay	G191156	IE	1" 2½"	160 160	.250 .375	.053 .116
18	93-SB14	MSD	D.S. of valve MS-4 on 2½" MSD-6.	T. B. - Heater Bay	G191156	IE	2½"	160	.375	.116
19	93-SB15	MSD	2½" MSD-6 @ Fittings U. S. of Condenser A.	T. B. - Heater Bay	G191156	IE	2½"	160	.375	.116
20	95-SB09 96-SB01	MSD	2½" MSD-6. (2 ft. length at Connect. to Conden. A -Noz.33	T. B. - Heater Bay	G191156	IE	2½"	160	.375	.116
21	93-SB16	MSD	1" MSD U.S. & D.S. of valve MS-5A. ,	T. B. - Heater Bay	G191156	IE	1"	160	.250	.053
22	93-SB55	MSD	1" MSD U.S. & D.S. of valve MS-5B.	T. B. - Heater Bay	G191156	IE	1"	160	.250	.053
23	93-SB17	MSD	1" MSD U.S. & D.S. of valve MS-5C.	T. B. - Heater Bay	G191156	IE	1"	160	.250	.053
24	93-SB56	MSD	1" MSD U.S. & D.S. of valve MS-5D.	T. B. - Heater Bay	G191156	IE	1"	160	.250	.053
25	93-SB18	MSD	2" MSD hdr. Under 5A & 5C valves.	T. B. - Heater Bay	G191156	IE	2"	160	.344	.096
26	93-SB19	MSD	2" pipe & fittings D.S. of valves MS-5A to 5D..	T. B. - Heater Bay	G191156	IE	2"	160	.344	.096
27	95-SB10	MSD	2" pipe & fittings D.S. of valves MS-5A to 5D. at Connect to Condenser. A Noz.34	T. B. - Heater Bay	G191156	IE	2"	160	.344	.096
28	92-SB10 92-SB11 95-SB38	MSD	2" pipe & fittings D.S. of valve MS-12 up to tee conn.	T. B. - Heater Bay	G191156	Leak @ MS-12 valve in 1992 Replaced in 1992	2"	80	.218	.096
29	92-SB13 to 92-SB15 95-SB11	MSD	1" pipe & fittings U.S. & D.S. of R.O. 60-1 up to tee conn.	T. B. - Heater Bay	G191156	Replaced in 1992.	1"	80	.179	.053

SMALL BORE PIPING INSPECTION LOCATION DATABASE										
PT.	PREV. INSPECT. No.	SYSTEM	DESCRIPTION	LOCATION	DRAWINGS	COMMENTS	SIZE	SCH.	Tnom inch	T min inch
30A	92-SB12 95-SB12	MSD	2" piping D.S. of tee conn. D.S. of R.O.60-1.	T. B. - Heater Bay	G191156	Leak @MS-12 valve in 1992 Replaced in 96 W/ A335 P11	2"	80	.218	.096
30B	95-SB12	MSD	2" piping D.S. of tee conn. D.S. of R.O. 60-1. at condenser	T. B. - Heater Bay	G191156	Replaced in 96 W/ A335 P11				
31	96-SB03	MSD (HPCI)	1" pipe & fittings D.S. of valve HPCI FCV - 43	RX. - HPCI Room.	G191169 VYI-HPCI/RCIC-DRAIN	Replaced in 1990, w/ A335-P11	1"	80	.179	.053
32	96-SB04	MSD (RCIC)	1" pipe & fittings D.S. of valve RCIC FCV-35	RX. - RCIC Room	G191174 VYI-HPCI/RCIC-DRAIN	Replaced in 1990, w/ A335-P11	2"	80	.218	.096
33		MSD (HPCI/ RCIC)	2" pipe & fittings U.S. of connect. to Condenser B.	T.B. - Heater Bay	G191156 VYI-HPCI/RCIC-DRAIN	Replaced in 1990, w/ A335-P11	2"	80	.218	.096
34	93-SB20	HV	1"-HV-1A, pipe & fittings U.S. of connect. to Cond. B.	T. B. - Heater Bay	G191158	Industry Experience Point	1"	80	.179	.011
35	93-SB21	HV	1"HV -1A, pipe & fittings D.S. of R.O.-1A	T. B. - Heater Bay	G191158	Industry Experience Point	1"	80	.179	.011
36	93-SB22	HV	1"HV-1A, pipe & fittings @ valve HV-1A	T. B. - Heater Bay	G191158	Industry Experience Point	1"	80	.179	.011
37	95-SB17	HV	1"-HV-1B. pipe & fittings U.S. of connect. to Cond. B	T. B. - Heater Bay	G191158	Industry Experience Point	1"	80	.179	.011
38	95-SB16	HV	1"- HV-1B, pipe & fittings D.S. of R.O.-1B	T. B. - Heater Bay	G191158	Industry Experience Point	1"	80	.179	.011
39	95-SB18	HV	1"-HV-1B, pipe & fittings @ valve HV-1B	T. B. - Heater Bay	G191158	Industry Experience Point	1"	80	.179	.011
40	95-SB19 98-SB01	HV	1"-HV-2A, pipe & fittings @ valve HV-4A	T. B. - Heater Bay	G191158	Industry Experience Point	1"	80	.179	.007
41	95-SB20 98-SB02	HV	1"-HV-2A, pipe & fittings @ R.O.-2A.	T. B. - Heater Bay	G191158	Industry Experience Point	1"	80	.179	.007

SMALL BORE PIPING INSPECTION LOCATION DATABASE										
PT.	PREV. INSPECT. No.	SYSTEM	DESCRIPTION	LOCATION	DRAWINGS	COMMENTS	SIZE	SCH.	Tnom inch	T min inch
42	95-SB21 98-SB03	HV	1"-HV-2A, pipe & fittings @ Condenser A.	T. B. - Heater Bay	G191158	Industry Experience Point	1"	80	.179	.007
43	93-SB23	HV	1"-HV-2B, pipe & fittings @ valve HV-4B	T. B. - Heater Bay	G191158	Industry Experience Point	1"	80	.179	.007
44	93-SB24	HV	1"-HV-2B, pipe & fittings @ R.O.-2B.	T. B. - Heater Bay	G191158	Industry Experience Point	1"	80	.179	.007
45	93-SB25	HV	1"-HV-2B, pipe & fittings @ condenser A	T. B. - Heater Bay	G191158	Industry Experience Point	1"	80	.179	.007
46		HV	1½"-HV-3A, pipe & fittings @ valve HV-7A	T. B. - Heater Bay	G191158	Industry Experience Point	1½"	80	.200	.007
47	95-SB22	HV	1½"-HV-3A, pipe & fittings @ Condenser A. Nozzle 23	T. B. - Heater Bay	G191158	Industry Experience Point	1½"	80	.200	.007
48		HV	2"-HV-9A, pipe & fittings @ R.O.-3A.	T. B. - Heater Bay	G191158	Industry Experience Point	2"	80	.218	.008
49		HV	2"-HV-9A, pipe & fittings D.S. of valve HV- 15A	T. B. - Heater Bay	G191158	IE	2"	80	.218	.008
50		HV	2"-HV-9A, pipe & fittings @ Condenser A.	T. B. - Heater Bay	G191158	IE	2"	80	.218	.008
51		HV	1½"-HV-3B, pipe & fittings @ valve HV-7B	T. B. - Heater Bay	G191158	IE	1½"	80	.200	.007
52	95-SB23	HV	1½"-HV-3B, pipe & fittings @ Condenser A.	T. B. - Heater Bay	G191158	IE	1½"	80	.200	.007
53		HV	2"-HV-9B, pipe & fittings @ R.O.-3B.	T. B. - Heater Bay	G191158	IE	2"	80	.218	.008
54		HV	2"-HV-9B, pipe & fittings D.S. of valve HV- 15B	T. B. - Heater Bay	G191158	IE	2"	80	.218	.008
55		HV	2"-HV-9B, pipe & fittings @ Condenser A.	T. B. - Heater Bay	G191158	IE	2"	80	.218	.008

SMALL BORE PIPING INSPECTION LOCATION DATABASE										
PT.	PREV. INSPECT. No.	SYSTEM	DESCRIPTION	LOCATION	DRAWINGS	COMMENTS	SIZE	SCH.	Tnom inch	T min inch
56		HV	2½"-HV-4A, pipe & fittings U.S. of connect. to Cond. B.	T. B. - Heater Bay	G191158	Industry Experience Point	1"	80	.179	.011
57		HV	2½"-HV -4A, pipe & fittings D.S. of R.O.-4A	T. B. - Heater Bay	G191158	Industry Experience Point	1"	80	.179	.011
58		HV	2½"-HV-4A, pipe & fittings @ valve HV-9A	T. B. - Heater Bay	G191158	Industry Experience Point	1"	80	.179	.011
59		HV	2½"-HV-4B. pipe & fittings U.S. of connect. to Cond. B	T. B. - Heater Bay	G191158	Industry Experience Point	1"	80	.179	.011
60		HV	2½"- HV-4B, pipe & fittings D.S. of R.O.-4B	T. B. - Heater Bay	G191158	Industry Experience Point	1"	80	.179	.011
61		HV	2½"-HV-4B, pipe & fittings @ valve HV-9B	T. B. - Heater Bay	G191158	Industry Experience Point	1"	80	.179	.011
62	95-SB24 98-SB08	ES	2"-ES-12A piping US & DS of LCV-2A near Condenser A	T. B. - Heater Bay	G191156	Industry Experience Point	2"	80	.218	.012
63	95-SB25	ES	2"-ES-10A piping US & DS of LCV-3A near Condenser A	T. B. - Heater Bay	G191156	Industry Experience Point	2"	80	.218	.012
64	93-SB26	ES	2"-ES-12B piping US & DS of LCV-2B near Condenser B.	T. B. - Heater Bay	G191156	Industry Experience Point	2"	80	.218	.012
65	93-SB27 98-SB09	ES	2"-ES-10B piping US &DS of LCV-3B near Condenser B	T. B. - Heater Bay	G191156	Industry Experience Point	2"	80	.218	.012
66	93-SB28	AS	1" piping US &DS of valve LCV-101-39	T.B. - SJAE Room.	G191156	Industry Experience Point	1"	160	.250	.053
67	93-SB29 98-SB04	AS	1" & 2" piping US &DS of steam trap ST 62-1.	T.B. - SJAE Room.	G191156	Industry Experience Point	1" 2"	160 160	.250 .344	.053 .096
68	93-SB30 98-SB03	AS	2"-MSD-465 pipe & fittings @ connect. to Condenser B Nozzle 68	T.B. - Heater Bay	G191156	Industry Experience Point	2"	160	.344	.096

SMALL BORE PIPING INSPECTION LOCATION DATABASE										
PT.	PREV. INSPECT. No.	SYSTEM	DESCRIPTION	LOCATION	DRAWINGS	COMMENTS	SIZE	SCH.	Tnom inch	T min inch
69	95-SB26	AS	2"-MSD-465 pipe & fittings DS of valve V-62-2	T.B. - SJAE Room.	G191156	Industry Experience Point	1"	160	.250	.053
70	95-SB27	AS	1" piping US &DS of valve LCV-101-40	T.B. - SJAE Room.	G191156	Industry Experience Point	1"	160	.250	.053
71	95-SB28 98-SB06	AS	1" & 1½" piping US &DS of steam trap ST 62-2.	T.B. - SJAE Room.	G191156	Industry Experience Point	1" 2"	160 160	.250 .344	.053 .096
72	95-SB29 98-SB07	AS	1½" -MSD-464 pipe & fittings @ connect. to Condenser B Nozzle 69	T.B. - Heater Bay	G191156	Industry Experience Point	2"	160	.344	.096
73	95-SB30	AS(AOG)	2" piping of DS of valve OG PRV -834A	T.B. - Heater Bay El.248.	33600-A217	Industry Experience Point	1"	160	.250	.053
74	95-SB31	AS(AOG)	3/4" piping US &DS of steam trap MS-113-1A.	T.B. - Heater Bay El.248.	33600-A217	Industry Experience Point	1" 2"	160 160	.250 .344	.053 .096
75	95-SB32	AS(AOG)	3/4" piping US &DS of steam trap MS115-1A	T.B. - Heater Bay El.248.	33600-A217	Industry Experience Point	2"	160	.344	.096
76	95-SB33	AS(AOG)	3/4"MS-189-D3 AS drain from OG @ conn. to 3"-MSD-4.	T.B. - Heater Bay El 233'-4".	33600-A217	Industry Experience Point	2"	160	.344	.096
77	95-SB34	AS(AOG)	3/4"HCN-188-H1 AS drain from OG @ conn. to 3"-MSD-4.	T.B. - Heater Bay El 233'-4"	33600-A217	I. E. Point, Replaced prior to 1990	2"	160	.344	.096
78	93-SB31	SSL	1½" & 3" Header for 1SLMSV off Turbine Stop Valves	T.B. - Heater Bay.	5920-224	Industry Experience Point	1½" 3"	80 40	.200 .216	.077 .141
79	93-SB32	SSL	1½"-1SLMSV - Stop Valve A	T.B. - Heater Bay	5920-224	Industry Experience Point	1½"	80	.200	.077
80	93-SB33	SSL	1½"-1SLMSV - Stop Valve B	T.B. - Heater Bay	5920-224	Industry Experience Point	1½"	80	.200	.077
81	93-SB34	SSL	1½"-1SLMSV - Stop Valve C	T.B. - Heater Bay	5920-224	Industry Experience Point	1½"	80	.200	.077
82	93-SB35	SSL	1½"-1SLMSV - Stop Valve D	T.B. - Heater Bay	5920-224	Industry Experience Point	1½"	80	.200	.077

SMALL BORE PIPING INSPECTION LOCATION DATABASE										
PT.	PREV. INSPECT. No.	SYSTEM	DESCRIPTION	LOCATION	DRAWINGS	COMMENTS	SIZE	SCH.	Tnom inch	T min inch
83	93-SB36	SSL	1½" Header for 1SCVL off Turbine Control Valves	T.B. - Heater Bay	5920-224		1½"	80	.200	.067
84	93-SB38	SSL	½"-1SCVL - Control Valve A.	T.B. - Heater Bay	5920-224		½"	80	.147	.033
85	93-SB39/40	SSL	½"-1SCVL - Control Valve B.	T.B. - Heater Bay	5920-224		½"	80	.147	.033
86	93-SB41/42	SSL	½"-1SCVL - Control Valve C.	T.B. - Heater Bay	5920-224		½"	80	.147	.033
87	93-SB37	SSL	½"-1SCVL - Control Valve D.	T.B. - Heater Bay	5920-224		½"	80	.147	.033
88	93-SB43	SSL	1" & 3" Header for 2SLMSV off Turbine Stop Valves A & B	T.B. - Heater Bay	5920-224		2-1/2" 1"	40 80	.203 .179	.116 .053
89	93-SB44	SSL	1" & 3" Header for 2SLMSV off Turbine Stop Valve C	T.B. - Heater Bay	5920-224		3" 1"	40 80	.216 .179	.141 .053
90	93-SB45	SSL	1" - 2SLMSV off Turbine Stop Valve D	T.B. - Heater Bay	5920-224		3" 1"	40 80	.216 .179	.141 .053
91	93-SB58	SSL	2½" - Header for 2SCVL off Turbine Control Valves	T.B. - Heater Bay	5920-224		1"	80	.179	.053
92	93-SB61	SSL	1" - 2SCVL off Control Valve A	T.B. - Heater Bay	5920-224		2½"	40	.203	.116
93	93-SB60	SSL	1" - 2SCVL off Control Valve B	T.B. - Heater Bay	5920-224		1"	80	.179	.053
94	93-SB59	SSL	1" - 2SCVL off Control Valve C	T.B. - Heater Bay	5920-224		1"	80	.179	.053
95	93-SB57	SSL	1" - 2SCVL off Control Valve D	T.B. - Heater Bay	5920-224		1"	80	.179	.053
96	92-(SB-info only)	SSL	Turbine Bypass Valve Chest 1st Seal Leakoff 1/2"-1SLBPV	T.B. - Heater Bay	5920-224		1/2"	80	.147	.034
97	92-SB01	SSL	TBV Chest 1st Seal Leakoff 2"-1SLBPV	T.B. - Heater Bay	5920-224		2"	80	.218	.099
98	92-SB02	SSL	TBV Chest 1st Seal Leakoff 2"-1SLBPV	T.B. - Heater Bay	5920-224		2"	80	.218	.099
99	92-SB03	SSL	TBV Chest 1st Seal Leakoff 2"-1SLBPV	T.B. - Heater Bay	5920-224		2"	80	.218	.099

SMALL BORE PIPING INSPECTION LOCATION DATABASE										
PT.	PREV. INSPECT. No.	SYSTEM	DESCRIPTION	LOCATION	DRAWINGS	COMMENTS	SIZE	SCH.	Tnom inch	T min inch
100	92-SB04	SSL	TBV Chest 1st Seal Leakoff 2"-1SLBPV	T.B. - Heater Bay	5920-224		2"	80	.218	.099
101	92-SB05	SSL	TBV Chest 1st Seal Leakoff 2"-1SLBPV	T.B. - Heater Bay	5920-224		2"	80	.218	.099
102		SSL	TBV Chest 1st Seal Leakoff 2"-1SLBPV	T.B. - Heater Bay	5920-224	Not Inspected in 1992	2"	80	.218	.099
103	92-SB07	SSL	TBV Chest 1st Seal Leakoff 2"-1SLBPV	T.B. - Heater Bay	5920-224		2"	80	.218	.099
104	92-SB08	SSL	TBV Chest 1st Seal Leakoff 2"-1SLBPV	T.B. - Heater Bay	5920-224		2"	80	.218	.099
105	92-SB09	SSL	TBV Chest 1st Seal Leakoff 2"-1SLBPV	T.B. - Heater Bay	5920-224	Vertical section replaced in 1992.	2"	80	.218	.099
106	92-SB10	SSL	TBV Chest 1st Seal Leakoff 2"-1SLBPV	T.B. - Heater Bay	5920-224	Loc, of 1992 leak, replaced in 1992.	2"	80	.218	.099
107	93-SB46	SSL	TBV Chest 2nd Seal Leakoff 2½" - 2SLBPV	T.B. - Heater Bay	5920-224	Continuation of 1992 inspections	2½"	40	.203	.116
108	93-SB47 95-SB35	SSL	TBV Chest 2nd Seal Leakoff 2½" – 2SLBPV	T.B. - Heater Bay	5920-224	" "	2½"	40	.203	.116
109	93-SB48A 93-SB48B 95-SB36A 95-SB36B	SSL	TBV Chest 2nd Seal Leakoff 2½" – 2SLBPV	T.B. - Heater Bay	5920-224	" "	2½"	40	.203	.116
110	93-SB49	SSL	2½" - 1SPL2 H.P. Turbine Pocket Drain	T.B. - Heater Bay	5920-224	Significant Wear @ Duane Arnold	2½"	40	.203	.023
111	93-SB50	SSL	2½" - 1SPL2 H.P. Turbine Pocket Drain	T.B. - Heater Bay	5920-224	" "	2½"	40	.203	.023
112	93-SB51	SSL	2½" - 1SPL2 H.P Turbine Pocket Drain	T.B. - Heater Bay	5920-224	" "	2½"	40	.203	.023
113	93-SB52	SSL	2½" - 1SPL2 H.P. Turbine Pocket Drain	T.B. - Heater Bay	5920-224	" "	2½"	40	.203	.023
114	93-SB53	SSL	2½" - 1SPL2 H.P. Turbine Pocket 90 deg elbow	T.B. - Heater Bay	5920-224	" "	2½"	40	.203	.023
115	93-SB54	SSL	1SPL2 2½" x 2" reducer at 36" CAR pipe.	T.B. - Heater Bay	5920-224	" "	2½" 2"	40 40	.203 .154	.023 .019

SMALL BORE PIPING INSPECTION LOCATION DATABASE										
PT.	PREV. INSPECT. No.	SYSTEM	DESCRIPTION	LOCATION	DRAWINGS	COMMENTS	SIZE	SCH.	Tnom inch	T min inch
116	95-SB37	C	1½" & 2½" piping US & DS of LCV 1A-3	T.B. - Heater Bay	G191157 Sht.1	IE	1½" 2½"	80 80	.200 .276	.038 .057
117		MSD	Steam Seal Regulator to Steam Seal Piping low point drain		G191156 5920-224	IE	1"			
118		HV	4"-HV-8A @ Condenser A No.4 continuous vent.	T.B. - Heater Bay	G191158	IE				
119		C	1" Piping D.S. of R.O. 64-2	T.B. - Heater Bay	G191157 Sht.1	IE				
120		ES	3"-ES-8A D.S. of LCV-4A	T.B. - Heater Bay	G191156	IE				
121		ES	3"-ES-8B D.S. of LCV-4B	T.B. - Heater Bay	G191156	IE				
122	99-SB01	MSD	1" piping US & DS valve HPCI-LCV-53	Rx. Bldg. HPCI Rm.	G191169 Sht.1 VYI-HPCI-Pt.3A St.2/2	(I.E.) Dresden 3 LER 3/96	1"	160	.250	.053
123	99-SB02	MSD	1" piping US & DS of Steam Trap ST-3	Rx. Bldg. HPCI Rm.	G191169 Sht.1 VYI-HPCI-Pt.3A St.2/2	(I.E.) Dresden 3 LER 3/96	1"	160	.250	.053
124	99-SB03	MSD	1" piping US & DS valve HPCI-FCV-42	Rx. Bldg. HPCI Rm.	G191169 Sht.1 VYI-HPCI-Pt.3A St.2/2	(I.E.) Dresden 3 LER 3/96	1"	160	.250	.053
125	99-SB04	MSD	1" piping US & DS valve RCIC LCV-32	Rx. Bldg. RCIC Rm.	G191174 Sht.1 VYI-RCIC-Pt.3A Shts.1/2 & 2/2	(I.E.) Dresden 3 LER 3/96	1"	160	.250	.053
126	99-SB05	MSD	1" piping US & DS of Steam Trap ST-6	Rx. Bldg. RCIC Rm.	G191174 Sht.1 VYI-RCIC-Pt.3A Shts.1/2 & 2/2	(I.E.) Dresden 3 LER 3/96	1"	160	.250	.053
127	99-SB06	MSD	1" piping US & DS valve RCIC FCV-34	Rx. Bldg. RCIC Rm.	G191174 Sht.1 VYI-RCIC-Pt.3A Shts.1/2 & 2/2	(I.E.) Dresden 3 LER 3/96	1"	160	.250	.053

APPENDIX C

IDENTIFICATION OF FAC SUSCEPTIBLE SYSTEMS & COMPONENTS

C.1 FAC PHENOMENON

Flow-accelerated corrosion is a process that leads to wall thinning (metal loss) in carbon or low alloy steel piping exposed to flowing water or wet steam. The rate of metal loss depends on a complex interplay of several parameters. These include but are not limited to:

- water chemistry; pH, oxygen content, and temperature.
- piping material composition; chromium, copper, and molybdenum content.
- hydrodynamics; fluid flow velocity, piping geometry, and steam quality.

This phenomenon normally occurs in flowing deoxygenated water with a pH between 7.0 and 9.5. It is not a classical erosion process in that the metal loss is not caused by a mechanical process. A large body of experimental work has identified several key variables that influence the rate of attack. These are listed below with an indication of how they impact the material loss behavior.

Variable:	FAC increases if variable is:
Fluid Velocity	Higher
Fluid pH level	Lower
Fluid oxygen content	Lower
Fluid temperature	250-400 F.
Steam Quality	0.1 - 0.9
Component Geometry	Such as to create more turbulence
Component chromium content	Lower
Component copper content	Lower
Component molybdenum content	Lower

Single phase FAC is most likely to occur in main feedwater, condensate, and heater drain piping. Areas demonstrated to be especially susceptible include bypass lines for recirculation flow around pumps and control valves. It is also likely to occur downstream of control valves (angle valves in particular), restriction orifices, and in elbows in close proximity to other fittings.

Two-phase FAC often occurs in piping for main steam, extraction steam, moisture separator drains, blowdown piping, feedwater heater drains, and downstream of leaking valves.

C.2 SYSTEM SELECTION CRITERIA

All Plant piping systems are subject to review for potential inclusion into the Piping FAC Inspection Program . A piping system is defined here as a section of piping within a plant system which has a unique history of operating conditions (temperature, flow, water chemistry). Generally piping systems extend between two major components such as pumps, heaters, and vessels.

There are thousands of piping components in service at VY, most of which do not operate under conditions where FAC is a concern. FAC occurs in single phase water and two-phase water/steam piping under certain thermodynamic and chemistry conditions. In order to focus attention and resources effectively, those components where FAC is not a concern shall be eliminated from the scope of the inspection program. To accomplish this the exclusion criteria developed by EPRI contained in Section 4.2.2 of NSAC 202L (Ref. 5.4.8.) will be used.

NOTE

Portions of piping systems which meet certain exclusion criteria, may or may not be excluded from the program scope. The systems excluded by the criteria below could be susceptible to damage from other corrosion or degradation mechanisms. These include cavitation erosion, liquid impingement erosion, intergranular stress corrosion cracking (IGSCC) , microbiologically influenced corrosion (MIC), and solid particle erosion.

All plant systems are considered as in the scope of the VY Piping FAC Inspection Program unless excluded by one of the criteria listed in Appendix C.3

C.3 SYSTEM EXCLUSION CRITERIA

C.3.1 Stainless Steel or Low Alloy Steel Piping

Systems of stainless steel piping or low alloy steel piping with a nominal chromium content equal to or greater than 1-1/4%. This exclusion pertains only to complete piping systems constructed of FAC resistant alloys. If some components in a high alloy line are carbon steel (valves) then the line shall not be excluded. In lines with specific components or sections of piping replaced with FAC resistant materials, the entire line shall be identified as susceptible. Note that high chromium materials do not necessarily protect against other damage mechanisms, especially cavitation and liquid impingement erosion. If the damage mechanism which prompted previous material replacement has not been identified, then the system should not automatically be excluded from the program scope.

C.3.2 Superheated Steam Systems

Superheated steam systems with no moisture content regardless of temperature or pressure levels. However drains, traps, and other potentially high-moisture content lines from super-heated steam systems should not be excluded automatically.

C.3.3 High Dissolved Oxygen or Raw Water Systems

Systems with high levels of dissolved oxygen (oxygen > 1000. ppb), such as service water, circulating water, and fire protection.

C.3.4 Single Phase Systems with Temperature Below 175F.

EPRI recommends exclusion of single phase systems with temperature below 200F (low temperature). A temperature of 175F will be used for conservatism. If measurable wear is found in nearby piping operating slightly above 200F, EPRI recommends that the systems exclusion be reconsidered.

C.3.5 Systems With No Flow, or Which is in Use Less Than 2% of Pant Operating Time

Systems with no flow, or those that operate less than 2% of plant operating time or single phase systems that operate with temperature > 200F less than 2% of plant operating time. If the actual operating conditions of the system can not be confirmed (potentially leaking valves, etc.) or if the service is severe (flashing flow), the system should not be excluded based on operation time alone.

This includes normally closed small bore equipment vents, drains, and level control instrument lines.

C.3.6 Piping Which Carries Fluids Other Than water or Wet Steam

The VY Piping FAC Inspection Program applies only to piping carrying water or wet steam. Therefore non-water systems such as Instrument Air or Turbine Lube Oil Systems are excluded.

A formal evaluation to identify FAC of susceptible piping ("susceptibility analysis") has been performed and is documented in reference 5.4.1.. The susceptibility analysis will be revised as required to reflect changes in plant operation and configuration.

C.4 COMPONENT SELECTION CRITERIA

All components on large bore lines not excluded by the criteria in Appendix C.3 above are included in the scope of the program. Each component is given a unique identification (Component ID). Each large bore line will be modeled using CHECWORKS as appropriate. When large bore piping is inspected, the results included into the CHECWORKS model and long term wear is trended.

All small bore lines 2-1/2 inch nominal diameter and smaller not excluded by the criteria in Appendix C.3 are included in the scope of the program. However, not all components on these lines are given a unique component identification. Only selected locations on these lines are inspected to determine if significant wear is occurring.

Long term tracking of wear in small bore piping will not generally be performed. Components and attached piping which exhibit FAC damage will preferably be replaced with FAC resistant materials.

C.5 ADDITIONS TO THE PROGRAM SCOPE

Additional piping systems and components may be added to the inspection program at any time in the future based on: new industry experience, discovered wear during plant maintenance, installation of new piping, and planned or discovered changes in the operation of an existing system.

APPENDIX D

USE AND CONTROL OF CHECWORKS MODELS

D.1 EPRI CHECWORKS

The EPRI developed CHECWORKS code, (REF. 5.4.9.), is a Windows based personal computer code. It is an integrated software platform for evaluating power plant piping systems for the most common types of corrosion that degrade piping and equipment.

Version 1.0 of CHECWORKS contains a FAC module which incorporates the capabilities of the previously used CHECMATE family of codes, CHECMATE, CHEC-NDE, and CHEC-T as parts of the same program. It also contains extensive data base capabilities for: organizing plant design information for input to FAC evaluations, storage of piping inspection data, tracking component wear, and planning and scheduling piping component inspections.

D.2 TRAINING

As a minimum, the engineers modeling plant piping systems with CHECWORKS shall have received the EPRI/CHUG Introductory FAC and CHECWORKS training.

D.3 MODELING OF PLANT PIPING SYSTEMS USING CHECWORKS

Evaluation of the susceptible plant piping systems for FAC performed using the EPRI CHECWORKS code shall use references 5.4.9. and 5.4.10. for input conventions and modeling guidance.

D.4 DOCUMENTATION

CHECWORKS is used as a tool to plan inspections, track inspection results, wear rates, piping component data, and repair and/or replacement history. Results from the code are not used for design or to demonstrate conformance to design bases. The CHECWORKS evaluations are not considered as design basis input. Therefore, the evaluations will not be documented as a formal "VYC" calculation.

The CHECWORKS model inputs, assumptions, and results shall be documented in a manner consistent with the technical content requirements of AP 0017 or AP 6045 Technical Evaluations. The modeling and documentation shall be independently reviewed using Appendix B of AP 0017 as guidance. The models and supporting documentation will be controlled and maintained by the FACPC.

D.5 REVISIONS & UPDATES

Revisions to the plant CHECWORKS models shall be performed to reflect current plant operation and configuration. The Design changes and plant upgrades will be reviewed by the FACPC for effects on the current plant models.

The CHECWORKS models shall be updated after each refueling outage to incorporate inspection data taken during the outage for use in planning inspections for the following outage.

APPENDIX E

CRITERIA FOR SELECTION OF PIPING COMPONENTS FOR INSPECTION AND SAMPLE EXPANSION GUIDELINES

E.1 Inspection Planning

E.1.1 GENERAL

The outage inspection scope is determined by the FACPC using: pipe wall thickness measurements from past outages, predictive evaluations performed using the CHECWORKS computer code, industry events related to FAC, results from other plant inspection programs, and engineering judgment.

The FACPC prepares an inspection plan and identifies the inspection scope (specific components) prior to each refueling outage in accordance with outage planning milestones. This scope is used by the ISIPC for resource planning and for input to the outage schedule.

Repeat inspections are performed on piping components which have evidenced FAC damage in the past. Industry events such as a pipe rupture or discovery of eroded components may dictate a change or addition to the inspection scope. Components are added to the inspection scope based on experience or events at other operating plants as information is received. The planned inspection scope for each refueling outage may be increased or decreased during the outage based upon the quantitative inspection results of selected components.

When significant component wear is found, inspections of additional components (sample expansion) shall be performed. Sample expansion is based on the guidelines presented in Appendix E.3 below.

E.1.2 Long Term Planning

The scope of future piping inspections is dependent on the inspection results from previous outage inspections. For this reason all components to be inspected in the future cannot be scheduled several outages in advance.

With time, previous inspection results and the predictive models correlated with the inspection results will be the driving force behind inspection point selection. By then enough inspection data will have been obtained to predict, with a high degree of confidence, the locations at Vermont Yankee experiencing significant FAC damage.

Other factors to consider in planning future inspections include:

- The consequences of failure of a particular component with respect to personnel safety and plant availability.
- The margin of nominal wall thickness to code minimum wall thickness. It is a function of the original piping design and varies from system to system, and from line to line on the same system.
- Replacement of susceptible components with different piping materials. If wear rates are primarily due to piping material, replacement materials should reduce wear rates. If wear is due primarily to geometry, a partial or full redesign of the system will significantly reduce susceptibility to FAC.

E.1.3 Initial Inspections

Components selected for initial inspection shall be representative of the most susceptible systems and the component ranking within those systems. An effort to select a variety of component types should be made.

The corresponding components on parallel trains or on similar piping systems can be grouped. Each group can contain one or several piping components. At least one component from each group should be inspected.

Parallel trains of the same system should have essentially the same geometry and flow conditions. If not, the trains should be considered a separate group. Piping components downstream of each flow control valve should be considered as a separate group.

E.2 Selection Methods and/or Basis for Component Inspections

The basis for selection of specific components for examination during a refueling outage is by one or more of the following:

E.2.1. CHECWORKS Predictive Models

Components are ranked for susceptibility to FAC by the CHECWORKS computer code based on a number of factors including; component geometry, piping material, fluid environment (single-phase or two-phase flow), water chemistry, and temperature. Once actual inspection data is included the CHECWORKS model, the predicted wear rates and thickness values are statistically factored to reflect the actual wear from the inspection data.

a) For piping modeled using the EPRI CHECWORKS code without previous inspection data, select the most susceptible components on a line or section of piping for inspection.

b) For piping modeled using the EPRI CHECWORKS code with previous inspection data, select the components with the highest calculated wear rate and lowest time to minimum code wall thickness. In general, components should be scheduled for inspection by projecting the calculated wear such that it will be inspected prior to reaching 0.875 times the nominal wall thickness.

c) Components can be included in the inspection scope to help calibrate the CHECWORKS models. Generally include components from lines which have no (or a limited amount of) previous inspections data.

E.2.2 Components Identified During Previous Inspections

The Outage Inspection Reports identify components which have experienced wear and specific components to be included in future inspections. Components shall be scheduled for re-inspection for the following reasons:

- Monitoring of identified piping component wear on a component from a previous outage.
- Suspect or questionable inspection results which require confirmation.

E.2.3 Industry Experience Components

Industry experience components from other plant inspection programs or from other plant piping failures are typically identified via INPO industry operating experience (OE) or through the EPRI CHUG. Industry Experience Components include, but are not limited to locations listed below.

Large Bore Piping:

- Downstream of flow control valves.
- Downstream of orifices and /or flow meters.
- Downstream of exit nozzles.
- Downstream of feed pumps.

Small Bore Piping:

- Downstream of flow control valves.
- Downstream of orifices and /or flow meters.
- Upstream and downstream of steam traps.
- Drain and vent connections to large bore piping or components with two-phase flow.
- Last two changes in direction prior to entering the condenser.(i.e. 90 & 45 degree elbows, reducers, orifices, or globe valves).

E.2.4 Systems Not Modeled Using CHECWORKS (Susceptible–Non Modeled, SNM)

Susceptible Piping which has not been modeled using CHECWORKS (SNM) includes systems that contain lines which have unknown or widely varying operating conditions which preclude the development of accurate analytical models. These include vent and drain piping with multi-phase flow and lines subject to off normal flow conditions.

Inspection locations are selected based a combination of industry experience, plant experience, and engineering judgement. Locations should be selected for initial inspection with the objective of identifying a sufficient number and the appropriate locations to confirm system susceptibility.

Locations to inspect include:

a) Isolated lines to the condenser in which leakage is indicated from the turbine performance monitoring system. Data is normally obtained from the Systems Engineering Group, (Thermal Performance Monitoring)

b) Components in susceptible piping which has not been modeled using CHECWORKS and have not received an initial inspection. Specifically:

- Downstream of orifices
- Downstream of flow control valves and level control valves.
- Nozzles
- Tees and laterals, particularly field fabricated tees and laterals
- Complex geometric locations such as components located within two diameters of each other
- Components with backing rings and counterbores.
- Components downstream of replaced components (upstream, if expander).
- Components which have been replaced in the past and not upgraded to a FAC resistant material.

E.2.5 Parametric Studies and Engineering Judgment

In general, piping systems will be modeled using CHECWORKS. However, certain piping systems or portions of lines have usage and flow rates which cannot be accurately quantified due to operating conditions which vary greatly or are controlled by remote level, pressure or temperature signals. An example is the emergency bypass lines to the condenser on the heater drain system.

Alternate methods for selection of components for inspection include parametric studies and the use of seasoned engineering judgment. Comparative studies using the CHECWORKS code or other fluid dynamics analysis tools to model a piping segment while varying parameters such as temperature, flow rate, valve position, etc. can be used to rank the effects of each parameter on susceptibility to FAC. These rankings are then used as a guide in selecting components for inspection.

Certain piping configurations and flow conditions are known to have a high susceptibility to FAC. Lines containing control valves or pressure reducing orifices which flow to a lower pressure sink such as the condenser are important to consider because of possible flashing and high velocities downstream of these components. Other conditions are not as evident, such as leakage by normally closed valves on lines considered to have no flow during normal operation.

E.3 Sample Expansion Guidelines

Expansion of the scope is required when significant wall thinning is discovered in a particular piping component. When this occurs, identical or similar piping components in parallel and/or alternate piping components shall be inspected. The EPRI sample expansion guidelines (Reference 5.4.8.) shall be used to select additional components.

"Significant wall thinning" in a piping component is determined by the evaluation of inspection data performed by Design Engineering Mechanical/Structural Dept. using DP 0072.

(1) When sample expansion is required per DP 0072, the selection of additional components to be inspected shall be as follows:

(a) Any component within two diameters downstream of the component displaying significant wear, and within two diameters upstream if that component is an expander or expanding elbow.

(b) A minimum of the next two most susceptible components from the CHECWORKS relative wear ranking in the same train as the piping component displaying significant wear.

(c) Corresponding components in each other train of a multi-train line with a configuration similar to that of the piping component displaying significant wear

(2) When inspections of the expanded sample (1) above detect additional components with significant FAC wear the sample should be further expanded to include:

(a) Any component within two diameters downstream of the component displaying significant wear, and within two diameters upstream if that component is an expander or expanding elbow.

(b) A minimum of the next two most susceptible components from the relative wear ranking in the same train as the piping component displaying significant wear.

(3) When inspections of the expanded sample of (2) above detect additional components with significant FAC wear, the sample expansion of (2) above should be repeated until no additional components with significant wear are detected.