TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401

400 Chestnut Street Tower II

August 15, 1985

Director of Nuclear Reactor Regulation
Attention: Ms. E. Adensam, Chief
Licensing Branch No. 4
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Ms. Adensam:

In the Matter of the Application of Tennessee Valley Authority	))	Docket Nos. 50-390 50-391

In your letter to H. G. Parris dated July 9, 1985 you requested additional information and documentation to be available for NRC Staff review in Knoxville. Following the Staff review of these responses and documents, the NRC licensing project manager requested TVA to formally submit the responses and to provide additional documentation. He also indicated that the documents previously requested in the July 9, 1985 letter did not need to be formally submitted. Therefore, enclosed are responses to the requests for additional information contained in the July 9, 1985 letter and the additional documentation for Category 35 as requested in the July 18, 1985 exit meeting.

If there are any questions, please get in touch with D. L. Terrill at FTS 858-7840.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

J. A. Domer

J. A. Domer, Chief
Nuclear Licensing Branch

Sworn to and subscribed before me
this 15th day of Aug. 1985

Paulette D. White

Notary Public
My Commission Expires 8-24-88

Enclosure

cc: See page 2

Accurate Card Print

B001
1/1

Drawings
To: Tom Kenyon
LB#4

Director of Nuclear Reactor Regulation August 15, 1985

cc: U.S. Nuclear Regulatory Commission (Enclosure)
Region II
Attention: Dr. J. Nelson Grace, Regional Administrator
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

ENCLOSURE

RESPONSES TO REQUESTS FOR ADDITIONAL INFORMATION
IN E. G. ADENSAM'S LETTER TO H. G. PARRIS
DATED JULY 9, 1985
REGARDING TVA'S
UTILIZATION OF THE BLACK AND VEATCH (B&V)
INDEPENDENT DESIGN VERIFICATION PROGRAM (IDVP)
AT WATTS BAR

Category 3

Questions:

3.1 With respect to field change request (FCR) E-3508 previously provided, were the drawing changes corrected on this FCR associated with incorrectly wired electrical terminations?

3.2 If the wiring was incorrect, how was it discovered?

3.3 If only the drawings were incorrect, how were those errors discovered?

Responses:

3.1 No.

3.2 Not applicable.

3.3 The errors found on drawings listed on FCR E-3508 were discovered in the construction process. The TVA method of depicting wires on the wiring diagram is to show point-to-point terminations of each wire. The drawings listed in four cases show the wires on one end only and therefore could not have been installed per the drawings using the point-to-point method. On the four drawings, a wire was shown out of the terminal strip to the wire bundle and was not shown connected on the other end and was therefore deleted by the FCR.

Since the second end of the wire was not shown, the wire could not be installed and also was not required.

In five other drawings, one wire number was shown connecting to two places. The FCR added a jumper to comply with the point-to-point methods previously described.

The B&V findings F802 and F804 discovered errors on two drawings that were also found by construction test after the wires were incorrectly installed on drawings 45B1767-2B and 45B1769-2A. The drawings were also corrected on FCR E-3508.

Documents Required:

J. C. Standifer's memorandum to H. L. Jones dated September 29, 1983 (WBP 830929 024). A copy of this document was provided to NRC in Knoxville.

Category 4

Questions:

4.1 Has the FSAR review required by OE Special Engineering Procedure (SEP) 83-05 been completed?

4.2 If yes, have all FSAR changes been docketed in an amendment?

4.3 If not, what is TVA's schedule for completion of the review and docketing of changes?

4.4 What W-2 switches on the unit control board have P-auto contacts that are not monitored by the indicating light circuit modification described in IE Bulletin 80-20?

4.5 Provide switch identification information with respect to equipment controlled, function, and system.

4.6 Show that these switches are not used to control equipment necessary for safe shutdown of the reactor or to mitigate an accident condition.

Responses:

4.1 Yes, the FSAR review required by SEP 83-05 has been completed.

4.2 Yes, the amendments in which updated information resulting from the SEP 83-05 review was included are amendments 50, 51, 52, and 53, submitted to NRC from May 1, 1984, to June 16, 1984. These amendments include all changes resulting from the SEP 83-05 review.

4.3 Not applicable.

4.4 through 4.6

Attachment 1 is a listing of all W-2 switches on the unit 1 main control boards which have not been modified in accordance with IE Bulletin 80-20. This list was developed by first identifying all W-2 switches needed for unit 1 operaton. All switches on the unit control boards were then identified. All nontrained switches were then eliminated as non-safety-related. All switches which had previously received the IE Bulletin 80-20 modification were also eliminated. The remaining switches, the electrical drawings on which each switch is located, the equipment controlled by each switch, and the basic reason for not modifying the switch are listed.

Documents Required:

OE calculation, B&V Task Force Category 4 (NEB 840319 219). This calculation was provided to NRC in Knoxville.

Category 5

The Task Force evaluation for generic examples required a review of all safety-related valves procured by EEB.

The Task Force evaluation for cause lists "misuse of the S1 ECN . . ." Corrective action for future work state that Engineering Procedure (EP) 4.02 has been revised; a memorandum has been issued by management controlling the use of the S1 Engineering Change Noticed (ECN); and EP 5.06 has been issued (May 27, 1980) to control preparation and issue of specifications.

Questions:

5.1 Were all of the valves involved in the B&V review procured by EEB?

5.2 If so, what specification was used?

5.3 If not, who procured the valves and why were they not included in the generic review?

5.4 What is the S1 ECN that was apparently misused?

5.5 Are EP 4.02, S1 ECN, and EP 5.06 applicable to other than EEB?

Responses:

5.1 No.

5.2 See Attachment 2 for EEB-procured valves.

5.3 Other valves that were included in the B&V review were procured by the Mechanical Engineering Branch. Based on the results of the B&V review, the task force determined that it is not necessary to include them in the generic review.

5.4 Refer to section 3.1.6 of EP 4.02 (copy provided to NRC in Knoxville) for a complete description of the S1 ECN.

5.5 Yes, EP 4.02 and S1 ECN applies to all design branches. It has been superseded by OEP-11.

EP 5.06 applied to: Electrical Engineering Branch (EEB), Electrical Engineering and Design Branch, Thermal Power Engineering Design Projects, and Quality Engineering Branch. It has now been superseded (July 23, 1984) by Electrical Design Standard DS-E18.3.5.

Documents Required:

1. Design standards used for procurement of the check valves and isolaton valve identified in B&V findings F300 and F314.

Note: F300 should [redacted] F308. These valves were bough[redacted]n TVA contract 74C38-83015. They were bought to ASME Section III, Class 2 requirements for 1971 ASME Code requirements. The valves are Walworth figure No. 5353, 900 lb WOG valves.

For finding F314, these are carbon steel valves built to ANSI B16.5 edition in effect at contract award date which states that a 900 lb, B16.5-rated valve is good for 2150 lb/in^{2}g at 120°F and good for 1660 lb/in^{2}g at 600°F. Therefore, these valves were adequate for either of the design pressures and temperatures specified on the subject bill of material.

2. Any and all procedures used in conjunction with "the S1 ECN."

   See EP 4.02, section 3.1.7, and documents supplied under 5 below.

3. EP 4.02--All issues from original issue through current issue.

   This was provided to NRC in Knoxville.

4. EP 5.06--All issues from original issue through current issue.

   This was provided to NRC in Knoxville--superseded July 23, 1985, by DS-E18.3.5, also provided.

5. Copy of the memorandum issued by management controlling the use of the S1 ECN.

   No single memorandum, but rather a series of memorandums and training sessions. See memorandum package provided to NRC in Knoxville.

Category 6

Questions:

6.1 Provide the documentation to show that the licensing basis has been satisfied relative to findings F310, F751, and F868.

6.2 It is not clear from the TVA program that the revised version of the ANCHOR program was validated against benchmark problems for all situations (e.g., rigorous analysis on one side and alternate analysis on the other side).

6.3 Verify that in Watts Bar (WBN) unit 1 the 32 problems which were found to be affected by the ANCHOR program (12 of which were reanalyzed) represents the total number of the affected problems for this unit.

6.4 The scope of the evaluation for generic examples included a review of all rigorous analyzed lap zones and anchors (affected by the ANCHOR program) in WBN unit 1. Were anchors with rigorous analysis on one side and alternate analysis on the other side and anchors which did not have calculations to support the anchor load tables included in this evaluation?

Responses:

6.1 For finding F310: the analysis and the isometric and support design drawing agreed with each other and were correct. The support load table had an error and has since been corrected.

For finding F751: on drawing 03B-1AFW-R116 903, a weld was shown as needed all the way around between items 2 and 3 which was not welded. This lack of weld is acceptable as shown on BP drawing 6000-1. However, it was later revised because of the finding to show a weld on three sides.

For finding F868: hanger 1-038-1, sheets 1 and 2, R901, is not installed. The resolution of the finding refers to the response in finding F866. Missing supports would have been caught before we loaded fuel on unit 1 because we walkdown the piping during our IE Bulletin 79-14 inspection. SEP 82-13 (provided in Knoxville) describes design's role. Note that isometric 47W427-218 is included in the scope of work (attachment 11, page 2). WBN quality control procedure (QCP) 4.56 controlled construction work. Section 6.3.4 on page 4 requires missing supports to be identified.

6.2 The ANCHOR program is computer software which combines loads from both sides of the anchor if they are input, and provides output loads to give to the anchor designer. The rigorous piping analyst uses this computer program. He does not tabulate loads from the alternately analyzed piping. However, he puts a note on the anchor load table stating that the load from the alternately analyzed piping must be included in the design of the anchor. If loads are input from both sides of the anchor, the program has been verified to handle this situation correctly. An example was provided to NRC in Knoxville.

6.3 The lapping problem was identified and scoped for units 1 and 2. ECNs 3013 and 3608 were initiated to accommodate the necessary effort required to correct the deficiency.

The 32 problems affected as stated in Category 6, item 8B, of the B&V finding task force response were validated by ECN 3608 data sheets (provided to NRC in Knoxville). Note: It was indicated to NRC in Knoxville that in the timeframe available for preparing this documentation, we were not able to tell if only 12 were reanalyzed. However, since that time, investigations into the 32 problems indicate that as many as 19 may have required reanalysis.

No other problems have been identified regarding this issue since the B&V review.

6.4 Yes, it was all done on ECNs 3511 and 3882 as stated on nonconformance report (NCR) WBN CEB 8233R1.

Category 7

NCR WBN SWP 8307, which was the topic of a 10 CFR 50.55(e) report to NRC, states that corrective action to prevent recurrence would be:

"The Hanger Engineering and Quality Control units will receive additional training, emphasizing for explicit implementation of drawing requirements including notes specified on the drawings."

Question:

7.1 Was any training or retraining given to any of the craft (workers or supervisors) involved with hanger work?

Response:

7.1 There was no training given to the craft (workers or supervisors) as a result of this NCR. Craft training was not deemed necessary and not specified in the corrective action for this item. Training, however, was given and is documented for both Hanger Engineering and Quality Control units.

The corrective action for closure of this item was reviewed and approved by NRC and the item was closed by two resident NRC inspectors on August 25, 1983.

Category 9

Surveillance report dated November 16, 1984, lists a problem with implementation and effectiveness of corrective action. States that deviation was documented on NCR WBN QMS 8401.

WBN CEB 8203 was superceded by WBN CEB 8203 R1 which was not included.

Engineering Procedure (EP) 4.03, revision 9, issued March 2, 1984, which changed (relaxed) requirements for processing of field change requests (FCRs) on multiple attachments to embedded plates.

Questions:

9.1 What is the status of NCR WBN QMS 8401?

9.2 How were the 69 sample embedded plates selected to close out NCR WBN CEB 8203 R1?

9.3 What is the total population of embedded plates supporting safety-related loads?

9.4 How many FCRs were processed under revision 8 of EP 4.03 (original issue of Supplement 4)?

9.5 What was the average time to process FCRs under Supplement 4 of revision 8?

9.6 Revision 9 references DOC 840221 003 as a basis for part of the changes. What is this reference?

Responses:

9.1 NCR WBN QMS 8401 is still open. However, as documented in J. C. Standifer's memorandum to Those listed dated June 21, 1985 (B26 850624 003), E. G. Beasley's memorandums to J. C. Standifer dated October 29, 1984, and May 14, 1985 (QMS 841029 203 and B05 850514 007, respectively), (provided to NRC in Knoxville), resolution of the NCR is underway.

9.2 The sample of embedded plates for NCR WBN CEB 8203 was intended to be a random sample of embedded plates which had significant loads from multiple attachments. A random sample of <u>all</u> embedded plates was not taken because many plates do not have any significantly loaded attachments and many do not have any attachments. The intended bias in the direction of more heavily loaded plates does not make the sample nonrandom. The sample was taken using a prearranged plan for surveying specific areas of the Auxiliary and Reactor Buildings and the Intake Pumping Station.

The areas of the buildings which were to be surveyed were selected using drawings which detailed the location of embedded strip plates. About 60 areas were selected. Design engineers then performed a visual survey in each of these areas for embedded plates with significantly loaded multiple attachments. In some areas, several plates were

included in the sample, while in other areas, no significantly loaded plates were identified. A total of 69 plates were included in the sample.

9.3 The total number of embedded plates in WBN safety-related structures is approximately 12,500 ± 250, with approximately half of this total in each unit.

9.4 The jurisdiction of revision 8 effectively ended November 16,1983, in accordance with FCR H-10917, which authorized the revision of Construction Specification N3C-928 to permit the visual inspection approval option.

FCR H-10917 and then the subsequent issued revision of N3C-928 were used as the authorization for visual inspections until the issued revision 9 of EP 4.03 on March 2, 1984. Note: The only substantial difference between revision 8 and revision 9 of EP 4.03, Supplement 4, is the allowance by revision 9 of the visual inspection option. Thus, the number of FCRs on embeded plates processed under the jurisdiction of revision 8 of EP 4.03 (i.e., no allowance for visual inspection approval) must effectively be considered only through November 16, 1983. The number of FCRs on embedded plates processed is 323.

9.5 The average process time for such an FCR (i.e., without visual inspection) was approximately 30 to 34 man-hours. Note: Revision 9, superseding revision 8, of EP 4.03, only permits the visual inspection option. Thus, the process time for FCRs after revision 8, is still the above-quoted figure for those FCRs not visually approved.

9.6 This is a memorandum from TVA Construction to Engineering Design indicating that Construction has reviewed the proposed revision 9 to EP 4.03 and has recorded their comments in WBN 840215 011. (This document was provided in Knoxville.)

G. Wadewitz's memorandum to D. W. Mack dated February 15, 1984 (WBN 840215 011), requests what are essentially text changes to the (then) proposed revision 9. Thus, the reference in the EP 4.03 revision description log to C. Bonine's memorandum to R. W. Cantrell dated February 21, 1984 (DOC 840221 003), is the reason for these text changes.

Documents Required:

1. NCR WBN QMS 8402

2. Field change requests processed under revision 8 of EP 4.03.

3. Field change requests processed under revision 9 of EP 4.03.

4. C. Bonine's memorandum to R. W. Cantrell dated February 21, 1984 (DOC 840221 003).

5. Any other documentation used to justify relaxations of requirements under revision 9 of EP 4.03.

6. NCR WBN CEB 8203 R1.

Documents Provided:

Items 1, 4, and 6 were provided to NRC in Knoxville. Concerning items 2 and 3, the following discussion applies to documents provided in Knoxville.

Because of the vast number of FCRs on embedded plates (EPs) written, a sampling was provided of those written under revision 8 (i.e., no visual inspection approval option available) and revision 9 (visual inspection option available).

A sample of 10--FCR EPs were provided for revision 8 type. The numbers are: EP-3777, -3856, -3967, -4005, -4023, -4143, -4181, -4252, -5334, and -5501. Also provided in Knoxville were the office calculations done for their approval.

A sample of 20--FCR EPs which were visually approved were provided. FCRs EP-1593, -1825, -5445, -5566, -6071, -6372, -5600, -4681, -6490, and -5642 were visually approved between the dates November 16, 1983, and March 2, 1984, which was the date of issuance of revision 9 of EP 4.03. FCRs EP-6615, -4840, -4960, -8030R1, -5191, -9167, -3892, -4712, -2357, and -8131 were visually approved from March 2, 1984, onward. A nonvisually approved sample of an FCR EP under revision 9 would be the same as one under revision 8.

Other documents provided in Knoxville as pertinent to items 2 and 3:

- EP 4.03, Appendix No. 4, revision 8

- EP 4.03, Appendix No. 4, revision 9

- EP 4.03, Appendix No. 4, revision 11 (current, effective November 21, 1984)

- G. Wadewitz's memorandum to J. C. Standifer dated October 19, 1983 (WBN 831019 009)

- Attachment A, Informal transmittal of statistics on FCR EPs to TVA's Nuclear Safety Review Staff (NSRS)

- J. C. Standifer's memorandum to G. Wadewitz dated January 14, 1983 (SWP 830114 020)

- J. C. Standifer's memorandum to G. Wadewitz dated November 10, 1982 (CEB 821110 017)

- John A. Raulston's memorandum to L. M. Mills' dated December 7, 1982 (NEB 821207 259)

Note that the documents required for items 2 and 3, effectvely constitute questions on the same order as that of listed question 9.4. Thus, the documents required for item 3 was addressed as follows: As described previously, using November 16, 1983, as the effective end date of revision 8 of EP 4.03, the total number of FCR EPs processed in accordance with the visual inspection option (or revision 9 of EP 4.03) through July 1, 1985, is 4698. Of this total number, approximately 70 to 75 percent have been visually approved while the remaining 25 to 30 percent have been evaluated by calculations.

The following documents for item 5 were provided to NRC in Knoxville:

- G. Wadewitz's memorandum to J. C. Standifer dated October 19, 1983 (WBN 831019 009), requesting relief from the strict application of specification N3C-928 and detailing their reasons for this request. The OE response to this request was to revise N3C-928 to permit the visual inspection approval option for embedded plates with multiple attachments.

- Attachment A, a copy of statistics on the numbers of FCR EPs written, approved (either visually or by calculations), and rejected through June 12, 1985. This item was presented to NSRS personnel in a meeting on June 14, 1985. The gist of these numbers, compiled approximately 1-1/2-years after those cited in G. Wadewitz's memorandum to J. C. Standifer dated October 19, 1983 (WBN 831019 009), tends to confirm the conclusions drawn by that memorandum.

Category 11

SEP 82-15--Sampling program for review of operational modes data used in rigorously analyzed piping.

CEB was required to prepare and issue a final report documenting the results of all work done under SEP 82-15.

Questions:

11.1 Has the CEB report been issued?

11.2 What is the justification for limiting the review to rigorously analyzed piping?

Responses:

11.1 Yes, the number is CEB 84-02.

11.2 CEB was responsible for rigorous piping analysis. TVA's Watts Bar Engineering Project (WBEP) (then WBP) was responsible for the alternately analyzed piping. This alternate analysis qualification was done in the mechanical sections, where the operational modes data was developed.

Documents Required:

1. SE 82-15--All editions from original issue through current issue.

2. Any reports issued by CEB concerning work done under SEP 82-15.

These documents were provided to NRC in Knoxville.

Category 12

Failure by OE and OC to properly implement and document the alternate analysis criteria for seismically support piping: F347.

The corrective action for NCR WBN SWP 8252 (and other associated NCRs) and 4164R is a 100-percent verification per SEP 82-18 of all piping alternately analyzed by WBP and all pipe supports located by OC on piping that should have been supported in accordance with 47A053 drawing series prior to August 27, 1983.

The majority of the WBP corrective action was carried out by a personal services contractor. However, some was performed by WBP personnel.

Questions:

12.1 Explain how it was ensured that the personal services contractor adequately provided the analysis methods, procedures, and training to its staff which performed the corrective action.

12.2 Did CEB and WBP review the calculations performed by the personal services contractor? If so, to what extent?

12.3 In the identification and evaluation of ongoing corrective action for future work it is not clear who has the primary responsibility. If it's SWP to what extent does it review to confirm proper implementation?

12.4 To what extent will alternate analysis and/or rigorous analysis be used in either reanalysis or verification at WBN unit 1? If rigorous analysis is to be used to reanalyze alternate analysis problems, as stated in NCR WBN SWP 8252 R2, then where are the alternate analysis requirements being implemented?

Responses:

Note: Reorganizations have resulted in the WBN portion of SWP being renamed WBP which is now called WBEP.

12.1 A personal services contractor (United Engineer and Constructors (UE&C)) with extensive experience in piping analysis and support design on nuclear plants was selected. Individuals provided were approved after reviewing their resumes by TVA. TVA conducted an initial training class for the contractor at their headquarters in Philadelphia on the analysis methods and procedures to use for the verification. UE&C also proposed some additional methods that were provided, approved by TVA, and incorporated in revisions to SEP 82-18. Ongoing training was conducted for both TVA and contractor personnel as revisions to the procedures were approved. All contract personnel worked in TVA's office with technical assistance provided by TVA from both CEB and WBEP.

12.2 All analysis packages performed by the contractor were reviewed by TVA for the major discrepancies identified in the subject NCRs and any deficiencies were corrected before the package was accepted by TVA.

12.3 The TVA organization responsible for WBN alternate analysis is WBEP.

All work covered under the subject NCRs for WBN unit 1 has been reworked under the 100-percent verification program. Any new alternate analysis will be performed using our upgraded procedures. Specifically, all piping identified for alternate analysis on WBN unit 2 will be qualified using simplified analysis techniques that use the same computer program for analysis (TPIPE) as our rigorous analysis.

12.4 Any reanalysis required on unit 1 will be qualified using simplified analysis techniques. This approach uses the same computer program (TPIPE) for analysis as our rigorous analysis methods, but the documentation is according to our alternate analysis requirements. Minor documentation changes or verifications that do not require reanalysis will be evaluated based on the analysis techniques used previously. Also, as stated in response 12.3 above, we are fully implementing the simplified analysis techniques on WBN unit 2.

Additional Documentation Provided in Knoxville

1. Findings of the alternate analysis review team for WBN, attachment 4 to the report entitled, "Evaluation of WBN Piping Analysis Review Team Report by Independent Review Team," (QAS 820723 014).

2. OE-SEP 82-18, revision 2, pages 1-9.

3. SWP-EP 43.21, revision 0, page 1.

4. CEB 76-5, revision 3, pages 1-5.

5. NCR 4164.

Category 13

Questions:

13.1 In E. G. Beasley's memorandum to J. C. Standifer dated May 14, 1985 (B05 850514 007), the second sentence in paragraph 1 of the list of conclusions is not clear. Clarify this sentence and explain the intent.

13.2 Have the conditions of NCRs WBN QMS 8401 and 5889 R0 (WBN 841218 100) been fully corrected, including actions to prevent recurrence?

13.3 If yes, provide documentation of TVA line closeout and any Quality Assurance Staff review and closeout.

13.4 If not, what is TVA's completion schedule?

13.5 What actions has TVA taken or planned to resolve the cable tagging/identification deficiencies for medium-voltage cables identified in J. W. von Weisenstein's memorandum to Quality Management Staff Files dated December 10, 1984 (QMS 841210 203)? Provide pertinent documentation.

Responses:

13.1 Section III of the WBN Construction Requirements Manual (N3G-101) is titled "Acceptance Criteria Source Documents Listing." This section lists types of OE-approved documents that establish OE requirements for inspection. This listing contains construction specifications. A construction specification is an OE-developed document that provides construction, erection, and installation instructions to field forces. Construction specifications are considered supplemental to the drawings. There are two types of construction specifications in TVA. They are:

a. General Construction Specification - A construction specification which applies to all TVA projects or to a set of projects, such as "all thermal plants."

b. Project Construction Specification - A construction specification which applies to one project only. It may supplement or modify information contained in a general construction specifications or cover a subject unique to one project which is not addressed in a general construction specification.

Section III of the Consruction Requirements Manual (CRM) then lists the project construction specifications and general construction specifications that apply to WBN.

Some general construction specifications are considered to be self-invoking because of scope statements such as in G-2, "Plain and Reinforced Concrete," below:

1.1 Scope

1.1.1 This general construction specification prescribes acceptable materials for concrete, methods of production and placing of plain and reinforced concrete for TVA dams and hydro and thermal power plants designed by the Division of Engineering Design (EN DES) and constructed by the Division of Construction (CONST), and controls under which the work shall be done.

1.1.2 Concrete at other TVA construction, designed by EN DES or other TVA organizations or by contract and constructed by CONST or other TVA organizations or by contract, may be required to conform to all or part of this specification.

Intent

Although all drawings do not reference the construction specifications which supplement them, we believe the construction organization has been adequately informed of their applicability because:

1. The construction requirements manual provides a listing of the specifications which are applicable, and

2. Some are inherently known to apply because of their scopes, and

3. They were all reviewed by the construction organization, signed at "Approved By" by the manager of the construction organization, and issued to the construction organizations concerned with the subject.

Therefore, corrective action for prior work is not necessary. However, corrective action to prevent future recurrence is being implemented.

13.2 WBN QMS 8401--No, this NCR is currently being evaluated by OE for determination of corrective action and action to prevent recurrence. See 13.4 below.

5889R0--Yes.

13.3 Closed out NCR 5889R0 was provided to NRC in Knoxville. Block 7 indicates TVA line close out. No additional Quality Assurance Staff review and closeout was required.

13.4 As discussed with Steve Weise (NRC) on July 17, 1985, corrective action on NCR WBN QMS 8401 was to completely defined by July 26, 1985. This corrective action is for WBEP to issue a general drawing which lists the general and project construction specifications applicable to WBN. This drawing will be issued by August 26, 1985.

13.5 The following references show actions to correct the subject deficiencies.

a. Shield of me[redacted]um-voltage cables are not shown [redacted]n connection drawings. This was addressed by NCR WBN QMS 8401. The note on standard drawing SD-E-12.5.4, R2, was revised July 25, 1985, to require grounding of shield unless indicated otherwise on the detailed electrical drawings.

b. Missing documentation for cable 1-5PP-62-562-B. See NCR 5889 R0.

c. Termination records for cable 2-5PP-3-662-B indicated incorrect cable/phase connections. See NCR 5889 R0. Note corrective action specified by OE in J. C. Standifer's memorandum transmitting NCR 5889 to G. Wadewitz dated February 20, 1985 (WBP 850220 064). Also, see revised construction procedures provided to NRC in Knoxville.

Documents Required:

1. Response to potential generic condition evaluation for NCR WBN QMS 8401 (WBP 841115 007).

2. NCR WBN QMS 8401 including closeout documentation.

3. Wadewitz memorandum documenting review of 51 AFW termination records as discussed in paragraph 3.B of Category 13 evaluation sheet.

4. J. W. von Weisenstein's memorandum to the Quality Management Staff Files dated December 10, 1984 (QMS 841210 203), identified that the shields of medium-voltage cables are not shown on connection drawings. Provide documentation showing what TVA has done to correct this problem and showing any Quality Assurance Staff re-review and closeout.

The following documents were provided to NRC in Knoxville as requested to answer the above items.

1. The potential generic evaluation is documented in E. G. Beasley's memorandum to Those listed dated October 29, 1984 (QMS 841029 204). The memorandum is designed so that a response may be made on the bottom of the memorandum. This was done and noted in J. C. Standifer's memorandum to E. G. Beasley dated November 14, 1984 (WBP 841115 007).

   It was provided to NRC in Knoxville along with responses back to the engineering project manager containing the results of the reviews made by the various disciplines.

2. WBN QMS 8401 was provided to NRC in Knoxville but, since it is not closed, no closeout documentation is available.

3. Paragraph 3.B of Category 13 is a part of the G. Wadewitz memorandum to J. C. Standifer dated March 29, 1983 (WBN 830329 006) requested. The memorandum was provided in Knoxville.

4. TVA initiated NCR WBN QMS 8401 as a result of the findings listed in J. W. von Weisenstein's memorandum to the Quality Management Staff Files dated December 10, 1984 (QMS 841210 203).

Category 14

Various supports on the AFW system have been modified, redesigned, or initially designed per revised analysis ECN 2576.

Questions:

14.1 The Black and Veatch (B&V) review indicates 24 findings which were affected by ECN 2576. The TVA Task Force in their review lists only 22 findings. Clarify this discrepancy and provide details of resolution of the two B&V findings.

14.2 Provide the detailed requirements of the revised analysis required under ECNs 2576 and 3184.

14.3 Approximately 5000 rigorously analyzed support designs were reviewed against the current analysis under ECN 2576. Identify and provide the details of the support which required construction rework or documentation changes.

14.4 It appears that the effects of the revised loads (under ECNs 3184 and 2576) on the piping system were made in a qualitative way to determine whether or not the piping would fail. Explain how the TVA Task Force was able to conclude that the licensing basis has been satisfied on the basis of these qualitative assessments and without a quantitative determination of the revised piping stresses to ensure that they satisfy the ASME Code requirements under all service levels.

Responses:

14.1 The B&V Task Force include the following specific findings in Category 14: F369, F371, F756, F767, F783, F784, F788, F794, F821, F845, F853, F855, F899, F911, F949, F950, F951, F955, F958, F963, F964, and F965. The B&V report dated April 12, 1983, stated that 24 findings are traceable to a breakdown in the handling of a single ECN. Specific findings identified by B&V were F367, F369, F371, F756, F767, F783, F784, F788, F794, F845, F853, F855, F899, F911, F949, F950, F951, F955, F958, F963, F964, F965, F975, and F986. Comparison of the lists reveals that findings F367, F975, and F986 were designated by B&V but not included in the Task Force Category 14. The Task Force resolution of these findings was as follows:

F367- The Task Force review concluded that the finding was not tied to ECN 2576. The review did conclude that the finding should be placed in Category 7—nonconforming conditions in construction of previously inspected and accepted pipe supports. An NCR was written to document the condition (NCR WBN SWP 8307).

F975 - The Task Force review revealed that at the time of the B&V review, redesign of this hanger was in process. The Task Force placed this finding in Category 1(2)—work was incomplete. This determination is consistent with the information provided by form 1 for finding F975 in the B&V report dated April 12, 1983.

F986 - Refer to the discussion for F975. F986 was placed in Category 34--out of function, wherein a feature of a drawing was not in agreement with the latest design drawing showing the detailed design of the "out of function" feature.

Note: Finding F821 was included in the Task Force Category 14 but not noted by B&V as being related to ECN 2576. The Task Force review determined that the finding was created by the handling of ECN 2576.

14.2 ECN 3184 did not require any revised piping analysis. The problem dealt with support design errors.

ECN 2576 dealt with our 81-30 program (see CEB Report 81-30, provided in Knoxville). This program originated due to nonconformances dealing with the misapplication of piping and support design installation tolerances. The installed piping and supports were walked down at the construction site. Dimension changes, which were different from the design documents and outside of G-43 Construction Specification, were evaluated by OE. Differences which were evaluated as acceptable were documented. Differences that required reanalysis were reanalyzed and documented.

14.3 A ready summary as requested is not available. All of the approximately 5000 supports were reviewed and documented in pipe analysis review calculations as listed in attachment 2 of R. L. Ilich's memorandum to WBP Files dated December 14, 1983 (WBP 831214 001). These calculations were reviewed with NRC in Knoxville. A detailed review of three supports (1-70-186, 70-1CC-R060, and 47A406-8-19) was performed with NRC in Knoxville and full calculations and drawing details were provided.

14.4 The work performed on ECNs 3184 and 2576 was to meet the licensing basis. If differences in the original design were evaluated to be insignificant, the differences were accepted and documented. Significant changes were qualified by hand or computer calculations and also documented. Hardware was revised accordingly.

Additional discussion not provided in Knoxville:

This level of review was considered acceptable to the task force and as explained in 14.2 above, ECN 3184 did not require revised piping analysis and all significant concerns under ECN 2576 were reanalyzed.

Category 18

a. The Task Force report states that "EN DES has issued a construction specification that provides requirements for locating attachments on any embedded plate. This specification (N3C-928) will require a detailed review of connections of this nature."

Questions:

18.1 Does specification N3C-928 require detailed review of connections to embedment plates used in lieu of anchor bolts?

18.2 If so, what is the nature of this review? How is it documented?

Responses:

18.1 Yes. The criterion for the application of N3C-928 is strictly that should an attachment be made to an embedded plate, it shall be reviewed in accordance with N3C-928. No distinction is made as to size, type, or original design intent of the attachment to the plate.

18.2 The nature of this review, as explained in the response to question 18.1, is the same as that specified by N3C-928 for an attachment originally designed to be welded to an embedded plate.

b. The TVA Task Force, according to item 4B of the evaluation sheet, is continuing its evaluation to determine if there are other supports (with another type of bolts with sizes larger than 7/8-inch diameter) that are a potential candidate for the note No. 3. It, therefore, appears that a potential exists that there may be unidentified bolts of other types, not covered by the 10 systems investigated by OE, for which note No. 3 would be valid.

Questions:

18.3 Has this issue been resolved?

18.4 If so, provide the documentation verifying that all bolts for which note No. 3 is valid have been identified and corrective action identified and/or implemented?

18.5 Of the 22 supports identified to OC, the substitution of welds for anchor bolts was made on 5 supports. Provide the supporting calculations to show that these supports are adequate.

Responses:

18.3 Yes. All piping systems were reviewed to identify pipe supports with anchor bolts larger than 7/8-inch diameter. Ten systems were found with larger anchor bolts and those pipe supports were reviewed in detail. There is no significant potential for unidentified bolts on other systems.

18.4 The complete review is documented in calculation package WBP 830914 230, which was provided to NRC in Knoxville.

18.5 The supporting calculations are included on pages 15 through 17 of the calculation package provided in 18.4.

Documents Required:

1. Provide the documentation to indicate that note No. 3, referred to above, was issued with the intention that its application is good for selfdrilling anchors only (the maximum diameter is 7/8 inch).

Please refer to page 19 of the calculation package WBP 830914 230 for a copy of the revised note No. 3.

Other documents provided to NRC in Knoxville were:

N3C-928, revisions 0, 1, and 2
WBN FCR H-9521 (WBN 830314 323)
WBN FCR H-10917 (WBN 831109 353)
Civil Design Standard DS-C1.7.1, "General Anchorages to Concrete"

Category 20

Questions:

20.1 What is the basis for the statement in 8.B of the Category 20 evaluation sheet that all time delay settings determined by preoperational test prior to issuance of the interim memorandum were adequately documented?

20.2 For those time delay relay settings that are specified only by change, what is TVA's justification for accepting the preoperational test value versus a value predetermined by OE?

20.3 If any value within a range is acceptable, what is the significance of recording the preop test value on the drawing?

20.4 SEP 83-11 was issued October 14, 1983, to review and determine the set points of variable time delay relays for, in part, Watts Bar. J. C. Standifer's memorandum to F. W. Chandler dated April 27, 1983 (WBP 830427 022), seems to indicate this was already done. Explain this apparent discrepancy.

Responses:

20.1 A review of all TVA schematics was made to compile a list of all time delay relays used. A search was made of preop test instructions for those time delay relays which were listed as having a "range," rather than a fixed value. For all cases, preop test instructions required or were revised to require documentation of actual delay times. At the time the search was made, the preop tests had not been performed; therefore, no drawing changes had been made.

20.2 We assume "change" was meant to be "range." Based on this assumption, our answer is as follows:

Time delays are placed in control systems to account for process and process hardware response times. Exact values are not known during the design phase, even though the relative timing sequence is. For this reason, time delay determination is left to the preop test engineer to be based on actual conditions.

20.3 The need to record time delay settings determined during preop test is to preclude having to retest following control circuit maintenance work or time delay relay replacement.

20.4 J. C. Standifer's memorandum to F. W. Chandler dated April 27, 1983 (WBP 830427 022), served to document a specific WBN review in response to the B&V finding, Cateogry 20, and addresses only a one-time effort to document finished work. SEP 83-11, on the other hand, serves to provide direction for future time delay setting documentation efforts as well and covers Browns Ferry, Sequoyah, and Watts Bar Nuclear Plants.

Documents Required:

1. F. W. Chandler's memorandum to H. L. Jones dated November 25, 1983 (EEB 831125 436).

2. Attachment to J. C. Standifer's memorandum to F. W. Chandler dated April 27, 1983 (WBP 830427 022).

Item 1 was provided to NRC in Knoxville and the 200+ page attachment requested in item 2 was made available to Steve Weise via microfiche viewer in Knoxville from which he was able to obtain hard copies of any desired documentation.

Category 30

Questions:

30.1 Provide documentation that verifies generic review of status monitoring for all operating equipment which supports the operability of safety-related equipment.

30.2 Provide information regarding the implementation, completion and/or current status of the commitment to conduct the generic review of status monitoring as referenced in J. A. Coffey's memorandum to R. W. Cantrell dated February 28, 1984 (DES 840229 021).

Responses:

30.1 & 30.2 A copy of a memorandum from W. T. Cottle to D. B. Bowen dated July 10, 1985 (T15 850710 857), was provided to NRC in Knoxville to answer these questions. This memorandum says in part:

> NUC PR committed to initiate a program to evaluate changes to plant procedures and design change requests for impact on the Bypassed and Inoperable Status Indication (BISI) System. This impact evaluation was to be based on the three criteria contained in Regulatory Guide 1.47.
>
> The BISI System will not be operable until restart after the first refueling outage. OE is developing the lists of equipment and valves to be monitored. These system lists will be reviewed by NUC PR based on the plant configuration at that time. Once this baseline list of monitored equipment is established, all future changes to plant configuration or in test and maintenance procedures must be reviewed for impact on the BISI System.
>
> Under the current TVA organization, OE is responsible for the review of changes in plant configuration and should evaluate the impact of these changes on BISI. Changes to plant procedures that occur after implementation of BISI will be evaluated through the normal review process (reference WBN AI 3.1).

Documents Required:

1. C. C. Fisher's memorandum to WBP Files dated June 10, 1983 (WBP 830610 032).

2. DCR-P524 (DES 840312 008) including closeout documents.

3. J. A. Coffey's memorandum to R. W. Cantrell dated February 28, 1984 (DES 840229 021). Include status of this generic review to date.

Documents 1, 2, and 3 were provided to NRC in Knoxville. The status of the generic review is discussed in the responses to questions 30.1 and 30.2 above.

Category 35

Questions:

35.1 Provide information/justification for not including breakers with time delay/instantaneous trips for generic evaluation.

35.2 Provide information/justification for not including breakers with instantaneous only (and breakers with time delay/instantaneous) in other low-voltage load centers and/or switchboards.

35.3 How has the licensee assured that the instantaneous settings are not too high on circuit breakers in these load centers?

Responses:

35.1 Time delay/instantaneous trip breakers (thermal magnetic) are used in circuits other than motors. Since the 1300-percent limitation is based on the capability of the motor thermal overload, the thermal-magnetic breakers were not a concern.

35.2 The instantaneous settings for the non-IE motor control centers were not reviewed because they were not a safety concern.

35.3 The settings were selected according to the vendor-recommended set points. All Class IE low-voltage motor control centers were reviewed for instantaneous trip settings and corrected on ECN 4251.

Additional Documentation Requested in Knoxville by NRC:

Attachment 3 includes 10 pages requested by NRC including:

a. Table 3--480V reactor MOV board 1A1-A
b. Three time-current characteristic curves for cable analysis
c. Two charts of molded-case circuit breaker data
d. Four pages of discussion entitled: Limitorque Motors, Gate and Globe Valve Requirements, and Selecting Overload Protection
e. Copies (half-size) of the following drawings:

1. Wiring Diagrams
   480V reactor MOV board 1A1-A
   Connection diagram-conpt 5A
   No. 45B1766-5A

2. Wiring Diagrams
   480V reactor MOV board 1A1-A
   Connection diagram-conpt 10F
   No. 45B1766-10F

ATTACHMENT 1

LIST OF W-2 SWITCHES

Switch No.	Drawing No.	Item Controlled	Reason for Not Modifying
HS-1-4A	600-1-5, 6, 7	SG 1 MS Hdr Isol Vlv	Failure of these switches occurs in the safe direction of controlled device
HS-1-11A	600-1-5, 6, 7	SG 2 MS Hdr Isol Vlv	"
HS-1-22A	600-1-5, 6, 7	SG 3 MS Hdr Isol Vlv	"
HS-1-29A	600-1-5, 6, 7	SG 4 MS Hdr Isol Vlv	"
HS-1-7/181	600-1-3	SG 1 Bldn Hdr Flow	"
HS-1-14/182	600-1-3	SG 2 Bldn Hdr Flow	"
HS-1-25/183	600-1-3	SG 3 Bldn Hdr Flow	"
HS-1-32/184	600-1-3	SG 4 Bldn Hdr Flow	"
HS-1-103A	600-1-1	Stm Dump Cntrl Off-On Bypass A	Auto position not necessary for safe shutdown of the plant.
HS-1-103B	600-1-1	Stm Dump Cntrl Off-On Bypass B	
HS-13-204	760-74-2	TR-A MOV Fire Prot Trip Cntl	Manually operated switches--auto function is not used
HS-13-205	760-67-8, 10 760-70-4, 5	TR-B MOV Fire Prot Trip Cntl	
HS-26-1A	760-26-1	HP Fire Pump 1A-A Cntl	Nonsafety related
HS-26-4A	760-26-1	HP Fire Pump 1B-B Cntl	Nonsafety related
HS-26-9A	760-26-1	HP Fire Pump 2A-A Cntl	Nonsafety related
HS-26-11A	760-26-1	HP Fire Pump 2B-B Cntl	Nonsafety related
HS-30-63A	Westinghouse	Phase A and Cont. Vent Isol	The neutral switch position is not used in the performance of a safety function.
HS-30-63B	7246D11	Phase A and Cont. Vent Isol	
HS-30-64A	"	Phase B and Cont. Vent Isol	"
HS-30-64B	"	Phase B and Cont. Vent Isol	"
HS-30-68A	"	Phase B and Cont. Vent Isol	"
HS-30-68B	"	Phase B and Cont. Vent Isol	"
HS-31-6A	760-31-10	Contr Bldg Emer Pres Fan A-A Sw	To be modified under significant condition report No. WBN EEB 8526 in accordance with IE Bulletin 80-20.
HS-31-5A	760-31-10	Contr Bldg Emer Pres Fan B-B Sw	
HS-31-11A	760-31-12	MCR AHU B-B Suction Dmpr SW	The neutral switch position is not used in the performance of a safety function.
HS-31-12A	760-31-11	MCR AHU A-A Suction Dmpr SW	
HS-31-30A	760-31-13	Elec Bd Rm A AHU Sw	"
HS-31-31A	760-31-14	Elec Bd Rm B AHU Sw	"
HS-31-1A	760-31-9	Contr Bldg Press Fan A-A	"
HS-31-2A	760-31-9	Contr Bldg Press Fan B-B	The neutral position contact used to perform the safety function is a lateral contact. Therefore, there is no chance of an open circuit.
HS-31-7A	760-31-9	Contr Bldg Emer CU Fan B-B	
HS-31-8A	760-31-9	Contr Bldg Emer CU Fan A-A	

Switch No.	Drawing No.	Item Controlled	Reason for Not Modifying
HCS-46-57	600-46-6	Auto Man Remote Sw for F1C-46-57 F1C-46-57 = Aux Fpt Flow Cntlr	The neutral contact for this switch is always made except when used manually
HS-47-24	600-47-2	Turbine Trip	The neutral switch position is not used in the performance of a safety function.
HS-57-44A	760-211-2	6.9-kV Unit Bd 1B Shdn Bd 1A-A Cntl Sw	Manually operated switches--auto function is not used
HS-57-68A	760-211-19	6.9-kV Unit Bd 1C Shdn Bd 1B-B Cntl Sw	"
HS-57-41A	760-211-3	CSSI C to 6.9-kV SD Bd 1A-A Cntl Sw	"
HS-57-71A	760-211-20	CSSI D to 6.9-kV SD Bd 1B-B Cntl Sw	"
HS-57-97A	760-211-18	CSSI D to 6.9-kV SD Bd 1A-A Cntl Sw	"
HS-57-97B	760-211-18	CSSI D to 6.9-kV SD Bd 1A-A Cntl Sw	"
HS-57-98A	760-211-21	CSSI C to 6.9-kV SD Bd 1B-B Cntl Sw	"
HS-57-98B	760-211-21	CSSI C to 6.9-kV SD Bd 1B-B Cntl Sw	"
HS-57-41B	760-211-3	CSSI C to 6.9-kV SD Bd 1A-A Cntl Sw	"
HS-57-44B	760-211-2	6.9-kV Unit Bd 1B Shdn Bd 1A-A Cntl Sw	"
HS-57-68B	760-211-19	6.9-kV Unit Bd 1C Shdn Bd 1B-B Cntl Sw	"
HS-57-71B	760-211-20	CSSI D to 6.9-kV SD Bd 1B-B Cntl Sw	"
HS-62-140A	600-62-3	CVCS Makeup Start/Stop	Auto function not used for safety-related application
HS-62-230A	760-62-4	BA Trans Pmp 1A-A Cntl	Equipment not necessary for safe shutdown of the plant
HS-62-232A	760-62-4	BA Trans Pmp 1B-B Cntl	
HS-63-133A	600-99-1	SIS Train A & B Actuate	The neutral switch position is not used to perform a safety function.
HS-63-133B	600-99-1	SIS Train A & B Actuate	
HS-70-130A	760-70-9	Thrm Barr Bstr Pmp B-B Mtr Cntl	Equipment not necessary for safe shutdown of the plant
HS-70-131A	760-70-9	Thrm Barr Bstr Pmp A-A Mtr Cntl	
HS-72-13A	760-72-2	Cont Spr Pmp B Recirc Flow Vlv Sw	The neutral switch position is not used to perform a safety function.
HS-72-34A	760-72-2	Cont Spr Pmp A Recirc Flow Vlv Sw	

Switch No.	Drawing No.	Item Controlled	Reason for Not Modifying
HS-82-13	760-82-6	SPD Set (Rem) Raise-Lower Gen 1A-A	Manually operated switches--auto function is not used
HS-82-43	760-82-6	SPD Set (Rem) Raise-Lower Gen 1B-B	"
HS-82-73	760-82-6	SPD Set (Rem) Raise-Lower Gen 2A-A	"
HS-82-103	760-82-6	SPD Set (Rem) Raise-Lower Gen 2B-B	"
HS-82-12	760-82-6	DG 1A-A Volt Reg RA/LWR	"
HS-82-42	760-82-6	DG 1B-B Volt Reg RA/LWR	"
HS-82-72	760-82-6	DG 2A-A Volt Reg RA/LWR	"
HS-82-102	760-82-6	DG 2B-B Volt Reg RA/LWR	"
HS-82-14	760-82-6	DG 1A-A Cntl Sw	"
HS-82-44	760-82-6	DG 1B-B Cntl Sw	"
HS-82-74	760-82-6	DG 2A-A Cntl Sw	"
HS-82-104	760-82-6	DG 2B-B Cntl Sw	"
HS-82-15	760-82-6	DG Emergency Start	"
RT-1	600-99-1	Reactor Trip Reset	Failure of this switch occurs in the safe direction
RT-2	600-99-1	Reactor Trip Reset	
N33A	Westinghouse	Source Rng Mon Blk/Unblk A	Lateral contacts--no chance of undesirable opening
N33B	7246D11	Source Rng Mon Blk/Unblk B	

ATTACHMENT 2

PROCUREMENT SPECIFICATION LIST FOR EEB PROCURED VALVES

UNID No.	Contract No.
FSV-31-1	822829
PSV-31-1A	822829
PSV-31-1B	822829
FSV-31-2	822829
PSV-31-2A	822829
PSV-31-2B	822829
FCV-31-3	828284
FCV-31-4	828284
FCV-31-36	828284
FCV-31-37	828284
PCV-31-172	822836
FSV-31-173	822673
PCV-31-197	822836
FSV-31-198	822673
HCV-31-20	822829
TCV-31-108	83522-1
TCV-31-112	83522-1
PCV-31-115	822836
FSV-31-116	822673
TCV-31-138	83522-1
TCV-31-142	83522-1
PCV-31-145	822836
FSV-31-146	826736
FCV-43-2	85629
FCV-43-3	85629
FCV-43-11	85629
FCV-43-12	85629
FCV-43-22	85629
FCV-43-23	85629
FCV-77-127	820248
FCV-77-128	820248
FCV-70-85	83577
FCV-43-75	85629
FCV-43-77	85629
FCV-43-34	85629
FCV-43-35	85629
FCV-43-54D	87374
FCV-43-55	85629
FCV-43-56D	87374
FCV-43-58	85629
FCV-43-59D	87374
FCV-43-61	85629
FCV-43-63D	87374
FCV-43-64	85629
FCV-90-107	85629
FCV-90-108	85629
FCV-90-109	85629
FCV-90-110	85629
FCV-90-111	85629
FCV-90-113	85629

PROCUREMENT SPECIFICATION LIST FOR EEB PROCURED VALVES (Continued)

UNID No.	Contract No.
FCV-90-114	85629
FCV-90-115	85629
FCV-90-116	85629
FCV-90-117	85629
FCV-3-35A	826860
FCV-3-48A	826860
FCV-3-90A	826860
FCV-3-103A	826860
FCV-3-236	822950
FCV-3-239	822950
FCV-3-242	822950
FCV-3-245	822950
LCV-3-148	83577
LCV-3-148A	87379
LCV-3-156	83577
LCV-3-156A	87379
LCV-3-164	83577
LCV-3-164A	87379
LCV-3-171	83577
LCV-3-171A	87379
LCV-3-172	83577
LCV-3-173	83577
LCV-3-174	83577
LCV-3-175	83577
FSV-61-202	827137
FSV-61-212	827137
FSV-61-222	827137
FSV-61-232	827137
FSV-61-242	827137
FSV-61-252	827137
FSV-61-262	827137
FSV-61-272	827137
FSV-61-282	827137
FSV-61-292	827137
FSV-61-302	827137
FSV-61-312	827137
FSV-61-322	827137
FSV-61-332	827137
FSV-61-342	827137
FSV-61-352	827137
FSV-61-362	827137
FSV-61-372	827137
FSV-61-382	827137
FSV-61-392	827137
FSV-61-402	827137
FSV-61-412	827137
FSV-61-422	827137
FSV-61-432	827137
FSV-61-442	827137
FSV-61-452	827137

PROCUREMENT SPECIFICATION LIST FOR EEB PROCURED VALVES (Continued)

UNID No.	Contract No.
FSV-61-462	827137
FSV-61-472	827137
FSV-61-482	827137
FSV-61-492	827137
PCV-26-18	820025
FCV-1-7	832045
FCV-1-14	832045
FCV-1-25	832045
FCV-1-32	832045
FCV-1-181	832045
FCV-1-182	832045
FCV-1-183	832045
FCV-1-184	832045
FCV-67-9A	823859
FCV-67-9B	823859
FCV-67-10A	823859
FCV-67-10B	823859
TCV-67-84	83577
TSV-67-84	83577
TCV-67-85	83577
TSV-67-85	83577
TCV-67-86	83577
TSV-67-86	83577
TCV-67-92	83577
TSV-67-92	83577
TCV-67-93	83577
TSV-67-93	83577
TCV-67-94	83577
TSV-67-94	83577
TCV-67-100	83577
TSV-67-100	83577
TCV-67-101	83577
TSV-67-101	83577
TCV-67-102	83577
TSV-67-102	83577
TCV-67-108	83577
TSV-67-108	83577
TCV-67-109	83577
TSV-67-109	83577
TCV-67-110	83577
TSV-67-110	83577
TCV-67-129	83577
TSV-67-129	83577
TCV-67-132	83577
TSV-67-132	83577
TCV-67-137	83577
TSV-67-137	83577
TCV-67-140	83577
TSV-67-140	83577
TCV-67-158	824662

PROCUREMENT SPECIFICATION LIST FOR EEB PROCURED VALVES (Continued)

UNID No.	Contract No.
FCV-67-162	83577
FSV-67-162	83577
FCV-67-164	83577
FSV-67-164	83577
FCV-67-168	83577
FSV-67-168	83577
FCV-67-170	83577
FSV-67-170	83577
FCV-67-172	83577
FSV-67-172	83577
FCV-67-176	83577
FSV-67-176	83577
FCV-67-182	83577
FSV-67-182	83577
FCV-67-184	83577
FSV-67-184	83577
FCV-67-186	83577
FSV-67-186	83577
FCV-67-188	83577
FSV-67-188	83577
FCV-67-190	83577
FSV-67-190	83577
FCV-67-213	83577
FSV-67-213	83577
FCV-67-215	83577
FSV-67-215	83577
FCV-67-217	83577
FSV-67-217	83577
FCV-67-219	83577
FSV-67-219	83577
FCV-67-336	83577
FCV-67-338	83577
FCV-67-342	83577
FSV-67-342	83577
FCV-67-344	83577
FSV-67-344	83577
FCV-67-346	83577
FSV-67-346	83577
FCV-67-348	83577
FSV-67-348	83577
FCV-67-350	83577
FSV-67-350	83577
FCV-67-352	83577
FSV-67-352	83577
FCV-67-354	83577
FSV-67-354	83577
FCV-67-356	83577
FSV-67-356	83577

ATTACHMENT 3

ADDITIONAL INFORMATION REQUESTED BY NRC ON JULY 18, 1985

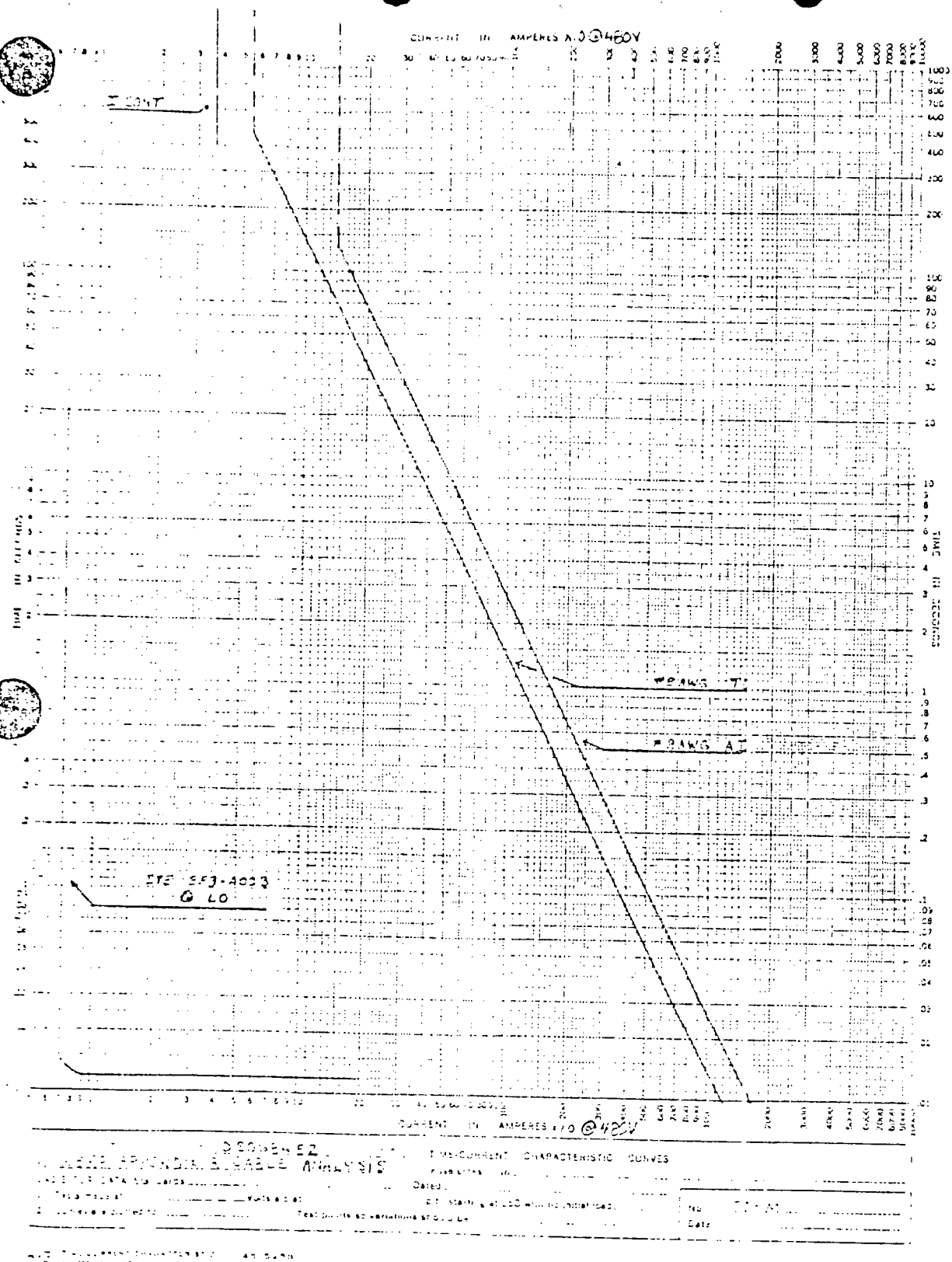
480V REACTOR MOV BOARD 1-1-A

SHEET	COMPT	CURVE	PASS/FAIL	REMARKS
B178	2A	75	P1	
B179	2B	M11	P2	
B180	2C	M9	~~FAIL~~ P2	change OL to T44
B181	18A	77	P1	
B182	2F1	15	P1	
B183	3A	75	P1	
B184	3E	M2	P1	
B185	3D	M11	P1	
B186	4A	75	P1	
B187	4E	42	P1	
B188	5A	M1	P1	
B189	18D	M21	P1	
B190	5E	42	P1	
B191	5F	18	P1	
B192	6D	M21	P1	
B193	6F	42	P1	
B194	7A	41	P1	
B195	7B	41	P1	
B196	7D	M11	P1	
B197	7F	18	P1	
B198	8A	18	P1	
B199	8B	41	P1	
B200	8F	18	P1	
B201	9A	41	P1	
B202	9B	41	P1	
B203	9F	15	P1	
B204	18B	18	P1	
B205	18F	42	P1	
B206	11A	41	P1	
B207	11B	15	P1	
B208	11D	41	P1	
B209	11E	15	P1	
B210	12A	41	P1	
B211	12B	18	P1	
B212	12D	M1	P1	
B213	12E	41	P1	
B214	13A	41	P1	
B215	13B	15	P1	
B216	13E	15	P1	
B217	14A	15	P1	
B218	14B	M3	~~FAIL~~	~~specify T45 OL to pass~~
B219	14D	42	P1	
B220	14E	41	P1	
B221	16D	42	P1	
B222	16E	M2	P1	
B223	17B	18	P1	
B224	17D	18	P1	
B225	19A	M2	FAIL P2	~~Specify T51 OL to pass~~
B226	19E	18	P1	

SHEET E17 OF E35

COMPUTED R.L. Lam DATE 7-13-84

CHECKED J.N. Wirth DATE 7-19-84



DRAWING E2

POWER SPECTRUM ELECTRICAL ANALYSIS

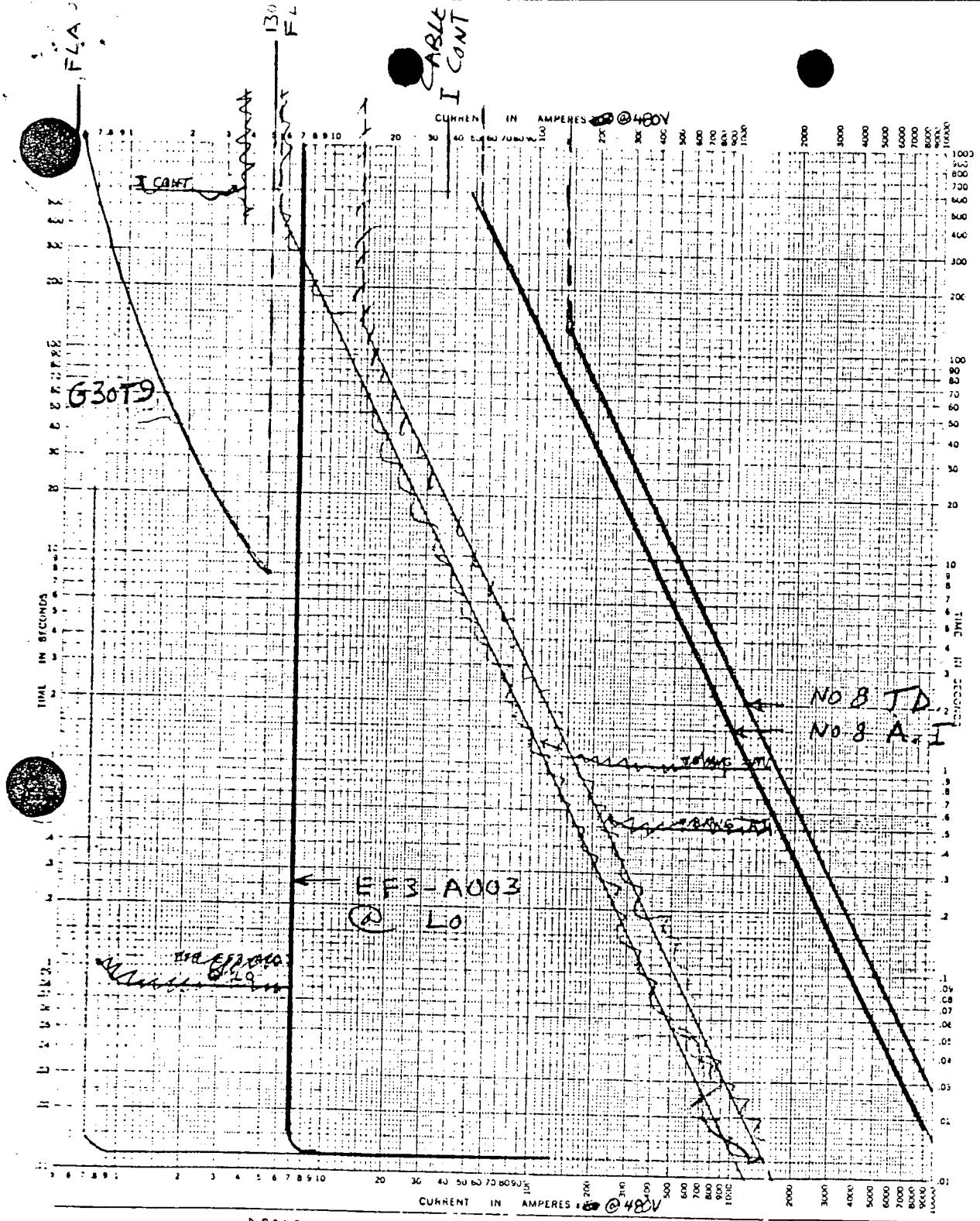
TIME-CURRENT CHARACTERISTIC CURVES

Dated:

Date

DS0684E

SHEET C55 OF C122



DS0684E2

TIME-CURRENT CHARACTERISTIC CURVES

FOR NENP APPENDIX R CABLE ANALYSIS

BASIS FOR DATA Standards

Fuse Links

Dated

1. Tests made at Volts a.c. at p.f., starting at 25C with no initial load

2. Curves are plotted to Test points so variations should be

No. T1-A11

Date

NOTE TIME CURRENT CHARACTERISTIC 48 5258

L -003 @ LO

1+P 0.125

FLA 0.39A

COMPUTED DATE 6-14-84

CHECKED DATE

DS0684EL

SHEET C55 OF C122

A/SA

ATTACHMENT #3

SHORT CIRCUIT PROTECTION IN MOTOR CIRCUITS

Motor circuits generally require a disconnecting means, a branch circuit protective device, a motor-running protective device, and a motor controller or starter. It is common practice to combine the disconnecting means and the branch circuit protective device by using a circuit breaker and to combine the motor running protective device and the motor controller by using a motor starter which includes a set of overload relays.

The overload relays (motor running protective device) provide protection to the motor and the branch circuit conductors against sustained overloads. The circuit breaker (branch circuit protective device) provides protection to the motor, branch circuit conductors, and motor starter against short circuits.

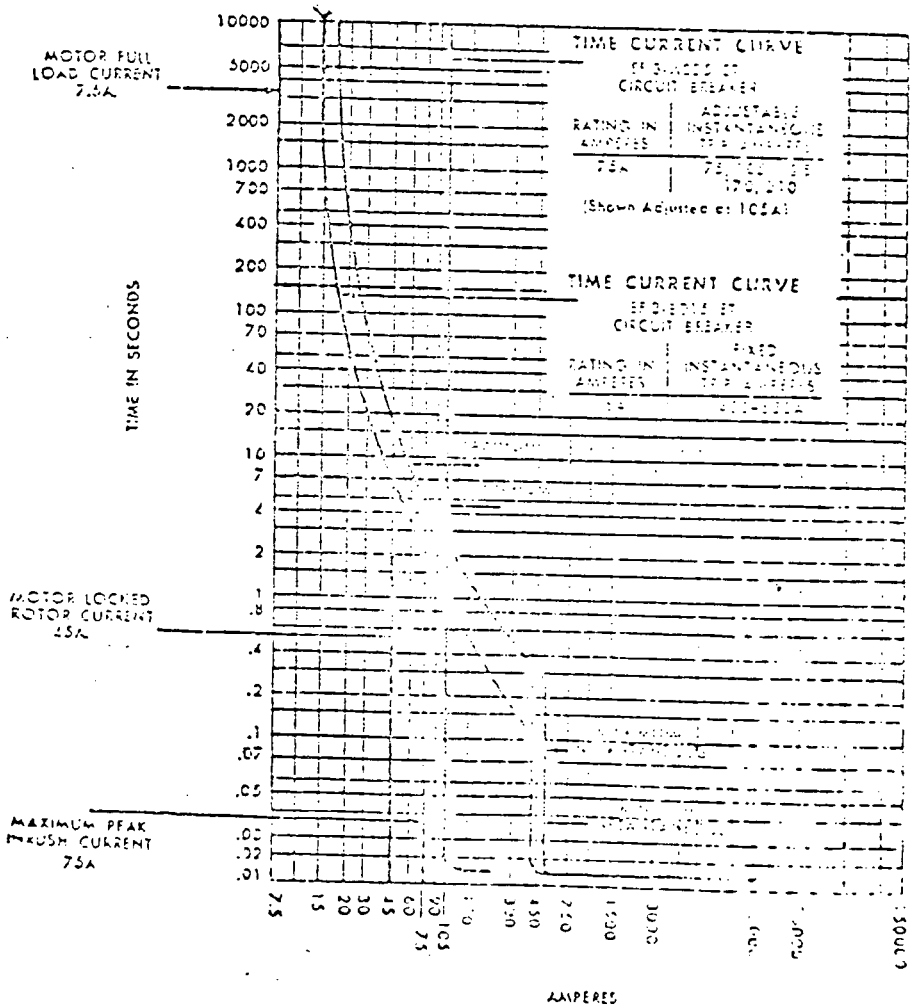
For most motors, the starting current is approximately 6 to 7 times motor full load current and the peak motor inrush current is approximately 9 to 10 times motor full load current. Therefore, the short circuit protective device should be set to operate at approximately 11 times motor full load current. This setting allows the motor to start without nuisance tripping of the breaker but assures instantaneous opening of the circuit for any value of fault current from 11 times motor full load current to the interrupting rating of the breaker.

In applications where E, EH and EF frame thermal magnetic breakers are used, the instantaneous trip is set to trip the breaker at a predetermined, fixed current value. Usually the fixed value is far in excess of the motor inrush current, thus adequate protection of the motor and starter is not always obtained under short circuit conditions.

For example: A 15 ampere ET breaker is recommended for use with a motor starter for a 5 horsepower 460 volt ac motor, whose full load current is 7.5 amperes (See page 19, Chart 2). The instantaneous trip setting of the 15 ampere breaker is preset at approximately 500 amperes. It can readily be seen from curve below that there is a wide gap between the desirable trip setting of 11 times motor full load current and the fixed setting of 500 amperes. A high resistance fault producing a short circuit current of less than 500 amperes could do permanent damage to circuit components in the time required for the thermal devices to trip the breaker.

A 25 ampere ETI breaker, when applied as the branch circuit protective device for the above example in accordance with the table on page 18, Chart 1, would have an instantaneous trip setting of 100 amperes. Adequate short circuit protection is thus obtained.

Comparisons of ETI Vs ET Instantaneous Trip Characteristics



This will give you some of the basic reasons we decided to go to the ETI for our needs.

RPP

SELECTION AND APPLICATION

PROTECTION OF CONDUCTORS—EXCEPT MOTOR CIRCUITS

Match the current rating of the circuit breaker to the ampacity of the conductor. See Table 1 on page 223 for conductor ratings. If ampacity of conductor falls between standard breaker ratings, select the higher breaker-current rating.

Check voltage and interrupting rating of circuit breaker to assure that they are adequate for the electrical system.

PROTECTION OF MOTOR CIRCUITS

General

Molded Case circuit breakers are used in motor circuits as a disconnecting means and for short-circuit protection, and should be used in conjunction with motor-running over-current-protection devices. The circuit breaker should have a continuous-current rating of not less than 115% of the motor full-load current, and its characteristics should permit the motor to start without nuisance tripping from motor-inrush current.

When Breaker is Mounted Immediately Ahead of Motor Starter

ETI instantaneous-trip circuit breakers are recommended for use in combination motor starters to provide selective short-circuit protection for the motor branch circuit. The adjustable instantaneous-trip feature of the ETI circuit breaker provides for a trip setting slightly above the peak motor-inrush current. With this setting, no delay is introduced in opening the circuit when a fault occurs. This circuit breaker has no time-delay trip element and therefore must be used in conjunction with, and immediately ahead of, the motor-running overcurrent protective device.

CHART 1—ETI CIRCUIT BREAKERS (instantaneous trip only) for branch-circuit use with alternating-current combination full voltage motor starters.

3-PHASE INDUCTION-TYPE MOTORS

Horsepower Rating of Motor					Circuit Breaker Data								Trip Setting Position				
115 Volts	200 Volts	230 Volts	460 Volts	575 Volts	Breaker Frame	Catalog Number	Continuous Amperes	Adjustable Trip Range Lo	2	3	4	Hi	115 Volts	200 Volts	230 Volts	460 Volts	575 Volts
—	—	—	[illegible]	[illegible]	EF	EF3-A003	3	7	10	12	16	21	—	—	—	3	2
	—	—	—	1		EF3-A003	3	7	10	12	16	21		—	—	4	3
			1	1½		EF3-A003	3	7	10	12	16	21	—	—	—	—	4
	—	—	1½	2		EF3-A005	5	14	18	22	29	41		4	3	3	3
						EF3-A005	5	14	18	22	29	41		—	—	4	4
			2	3		EF3-A010	10	27	36	45	58	84	3	3	2	2	3
		1	3	—	EF	EF3-A010	10	27	36	45	58	84	Hi	4	3	4	—
—			—	—		EF3-A010	10	27	36	45	58	84	—	Hi	4	—	—
	2	2	—	5		EF3-A010	10	27	36	45	58	84	Hi	Hi	Hi	—	Hi
—	—	—	5	—		EF3-A025	25	75	105	125	170	210	—	—	—	2	—
	3	3				EF3-A025	25	75	105	125	170	210	2	3	2	3	2
—	5	5	10	10	EF	EF3-A025	25	75	105	125	170	210	4	Hi	4	4	3
—	—	—	—	15		EF3-A025	25	75	105	125	170	210	—	—	—	—	Hi
—	7½	7½	15	20		EF3-L050	50	160	210	260	330	420	—	4	3	3	3
—	10	10	20	25		EF3-L050	50	160	210	260	330	420	—	Hi	4	4	4
	15	15	25	30		EF3-H050	50	320	400	475	565	670		4	3	2	2
	—	—	30	40		EF3-H050	50	320	400	475	565	670		—	—	3	3
—	20	20	40	50	EF	EF3-A100	100	475	600	750	930	1125	—	3	2	2	2
	25	25	50	60		EF3-A100	100	475	600	750	930	1125		4	3	3	3
	30	30	60	75		EF3-A100	100	475	600	750	930	1125		Hi	4	4	4
	40	40	75	100	EF, FJ	EF3-H150	150	960	1200	1400	1700	2000		3	2	2	2
—	50	50	100	125	or	FJ3-A225	225	960	1200	1650	1850	2000	—	3	3	3	3
	60	60	125	150	JL	JL3-A225	225	960	1200	1450	1800	2000		3	3	3	3
	—	75	150	200		JL3-L400	400	1900	2300	2700	3100	3500		Lo	Lo	Lo	Lo
—	100	100	200	250		JL3-L400	400	1900	2300	2700	3100	3500		3	2	2	2
	125	125	250	300	JL	JL3-L400	400	1900	2300	2700	3100	3500	—	Hi	4	3	3
	150	150	300	400		JL3-H400	400	3800	3600	4100	5100	5600		Lo	2	Lo	2
	150	150	300	400		KM3-L800	800	3200	3600	4100	5100	5600		3	Lo	Lo	2
—	—	[illegible]	[illegible]	500	KM	KM3-L800	800	3200	3600	4100	[illegible]	[illegible]	—	—	4	3	3
	—	[illegible]	[illegible]	—		KM3-H800	800	5000	[illegible]	[illegible]	7400	[illegible]		—	3	2	—

SELECTION AND APPLICATION

The recommended ETI circuit breakers listed in Chart 1 have continuous-current ratings of at least 115% of motor full-load currents, and the trip-setting positions are approximately 11 times motor full-load currents.

Note: For all applications check interrupting rating of circuit breaker to assure that it is at least equal to available fault current.

When Breaker Is Mounted At A Distance From Motor Starter

ET thermal-magnetic circuit breakers conform to the National Electrical Code requirements for motor branch and feeder circuit protection when properly applied in conjunction with motor-running overcurrent protective devices. The recommended circuit-breaker ratings in Chart 2 provide adequate time delay for starting the majority of three-phase induction motors.

Motor Feeder Circuit Protection

To determine the ampere rating of the ET breaker to protect a motor feeder, add the rating of the ET breaker used to protect the largest motor branch circuit in the group to the full-load currents of the remaining motors in the group.

Interrupting Ratings

For normal commercial purposes, available fault currents can conveniently be obtained from Table 5 on page 226. Interrupting ratings of all breakers are listed in the selection guide on pages 20–23. All breakers selected for a system should have an interrupting rating at least equal to the available fault current at the point of application.

CHART 2—EQ AND ET CIRCUIT BREAKERS (thermal-magnetic trip) for branch breaker use with alternating-current combination motor starters.

3-PHASE INDUCTION-TYPE MOTORS

Motor Horsepower Rating	200 and 208 V Motors			230 V Motors			460 V Motors			575 V Motors		
	240 V Circuit Breaker Data‡			240 V Circuit Breaker Data‡			480 V Circuit Breaker Data‡			600 V Circuit Breaker Data‡		
	Breaker Frame	Catalog Number	Rating Amperes	Breaker Frame	Catalog Number	Rating Amperes	Breaker Frame	Catalog Number	Rating Amperes	Breaker Frame	Catalog Number	Rating Amperes
½	QP*	QP3-B015	15	QP*	QP3-B015	15	EH	EH3-B015	15	EF	EF3-B015	15
¾		QP3-B015	15		QP3-B015	15		EH3-B015	15		EF3-B015	15
1		QP3-B015	15		QP3-B015	15		EH3-B015	15		EF3-B015	15
1½		QP3-B015	15		QP3-B015	15		EH3-B015	15		EF3-B015	15
2		QP3-B020	20		QP3-B015	15		EH3-B015	15		EF3-B015	15
3		QP3-B030	30		QP3-B020	20		EH3-B015	15		EF3-B015	15
5	QP*	QP3-B040	40	QP*	QP3-B030	30	EH	EH3-B015	15	EF	EF3-B015	15
7½		QP3-B060	60		QP3-B050	50		EH3-B030	30		EF3-B020	20
10		QP3-B070	70		QP3-B070	70		EH3-B030	30		EF3-B030	30
15		QP3-B100	100		QP3-B090	90		EH3-B040	40		EF3-B035	35
20		QJ3-B125	125		QP3-B100	100		EH3-B050	50		EF3-B050	50
25	QJ	QJ3-B150	150	QJ	QJ3-B125	125	EH	EH3-B070	70	EF	EF3-B060	60
30		QJ3-B175	150		QJ3-B150	150		EH3-B090	90		EF3-B070	70
40		QJ3-B200	200		QJ3-B175	175		EH3-B100	100		EF3-B090	90
50		QJ3-B225	225		QJ3-B200	200		EH3-B100	100		EF3-B100	100
60	JD	JD3-B300	300	QJ	QJ3-B225	225	EH, FJ or JL†	EH3-B125 FJ3-B125 JL3-B125	125	EF	EF3-B100	100
75	JD	JD3-B400	400	JD	JD3-B350	350	FJ or JL†	FJ3-B175 JL3-B175	175 175	FJ or JL†	FJ3-B125 JL3-B125	125 125
100	JD	JD3-B400	400	JD	JD3-B400	400	JL†	FJ3-B200 JL3-B200	200 200	FJ or JL†	FJ3-B175 JL3-B175	175 175
125	LL or KM	LL3-B600 KM3-B500	600	LL or KM	LL3-B500 or KM3-B500	500	FJ or JL†	FJ3-B225 JL3-B225	225 225	FJ or JL†	FJ3-B200 JL3-B200	200 200
150	LL or KM	LL3-B600 or KM3-B600	600	KM	LL3-B600 or KM3-B600	600	JL†	JL3-B300	300	JL†	FJ3-B225 JL3-B225	225 225
200	KM	KM3-B800	800	KM	KM3-B800	800	JL†	JL3-B350	350	JL†	JL3-B300	300
250	–	–	–	–	–	–	JL†	JL3-B400	400	JL†	JL3-B400	400
300	–	–	–	–	–	–	LL or KM	LL3-B600 or KM3-B600	600	JL†	JL3-B400	400
350	–	–	–	–	–	–	KM	KM3-B700	700	LL or KM	LL3-B500 or KM3-B500	500
400	–	–	–	–	–	–	KM	KM3-B800	800	LL or KM	LL3-B600 or KM3-B600	600
500	–	–	–	–	–	–	–	–	–	KM	KM3-B800	800

‡Notes: The selection of breakers for this table is in accordance with Article 430, 1978 National Electric Code.

Recommended circuit breakers are for full voltage starting and special ratings shall be necessary for reduced voltage starting.

For environments with instantaneous trip settings of FJ, JD, JL and KM frame breakers, see Table ETI breakers on opposite page.

For 600 V applications, substitute the BD breaker for the QP, or an E frame breaker in the EF Molded

For 600 V applications, substitute the JL breaker for the JL

LIMITORQUE MOTORS

The application of motor actuators to valves requires unique performance characteristics from both the actuator and the motor. There are numerous approaches to actuator design; however, all motor designs for valve operator service must have a number of common characteristics.

Valve actuator torque requirements are not totally predictable. There are many philosophies regarding the equations used to determine the force (thrust or torque) required to seat/unseat or stroke a valve. Each valve design could have a distinct set of load characteristics entirely different from other valves in the same general family, or similar types or designs even within the same valve manufacturer.

The following data represents typical operating criteria for a valve actuator and how this data should be used in a motor design.

GATE AND GLOBE VALVE REQUIREMENTS

Seating/Unseating

All formulae currently used by gate and globe valve manufacturers in determining the forces required to operate their valves are centered around seating or unseating the gate or plug against a differential pressure. This seating/unseating force occurs in the last couple of turns of the actuator (or first couple of turns unseating) and builds up to its maximum (calculated force) in 50 to 2000 milliseconds depending on the speed of operation and the rigidity of the valve.

The seating/unseating force requires the most torque out of the valve actuator motor (see Figure 1). Because of the very short time this force is experienced, as compared to the total stroke time, Limitorque uses the " stall torque" or "starting torque"potential of the motor (less a safety factor) to produce it. This means that a valve actuator motor current (amps) may approach its locked rotor value while seating or unseating a valve.

SELECTING OVERLOAD PROTECTION

The standard thermal overload relay, if selected by routine commercial methods, will not adequately protect a short time duty rated motor primarily because it was designed for motors used in continuous duty applications and not applications which have run times of ten seconds to two minutes such as commonly found on valve actuators.

To select a thermal overload relay, one must look at the stroke time for the application and protect the motor accordingly. Usually the best method for selecting a thermal overload is to ensure that the motor will trip the overload device while at locked rotor current in 10 seconds for A.C. (3-phase) and 8 seconds for D.C. and single phase.

There are "quick trip" overload relays commercially available which are ideal for valve actuator motors. These overloads allow the motor to run at nameplate (rated full load) current indefinitely; however, trip within five seconds at locked rotor current (usually 600 to 300% of nameplate current).

Built-in motor thermal contacts are not an extremely dependable means of protecting medium and large valve operator motors. Most valve operator motor failures occue due to being stalled too long or too often. Motor winding hot spots develop under a stalled condition which cannot be handled adequately by motor thermal contacts; especially if less than three (for 3-phase) are used. Motor rotors (which are the center of the heat build-up) may experience softening and distortion long before a thermal contact operates, but well within a "quick trip" or correctly selected "bi-metallic" overload response time.

It should be pointed out that it is not uncommon to experience motor current draws in excess of the motor nameplate in any valve actuator application. Limitorque motors are designed with a "saturated" field which means that overvoltage will create overcurrent. This may be further magnified with such conditions as an overly tight valve stuffing box, dirty or unlubricated valve stem. Although this condition is more than adequately covered by the motor thermal rating, it may cause nuisance tripping on thermal overload devices.

Before increasing the size of the motor overload devices, check all of the operating conditions to ensure a problem does not exist in the valve itself.