



Entergy Operations, Inc.
River Bend Station
5485 U.S. Highway 61N
St. Francisville, LA 70775
Tel 225-381-4374

William F. Maguire
Site Vice President
River Bend Station

RBG-47895

August 15, 2018

Attn: Document Control Desk
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852-2738

SUBJECT: Supplement to the Response to License Amendment Request (LAR) for Review and Approval Of Relocation Of The Reactor Core Isolation Cooling (RCIC) Injection Point NRC Request for Additional Information (RAI)
River Bend Station, Unit 1
Docket No. 50-458
License No. NPF-47

RB1-18-0168

References: 1) Entergy Letter: License Amendment Request (LAR) (RBG-47823 dated January 29, 2018) (ADAMS Accession No. ML18029A187)
2) NRC email: River Bend Station, Unit 1, Request for Additional Information dated May 24, 2018 (ADAMS Accession No. ML18149A288)
3) Entergy Letter: RAI Response (RBG-47876 dated June 21, 2018) (ADAMS Accession No. ML18172A142)

Dear Sir or Madam:

In Reference 1, Entergy Operations, Inc (Entergy) submitted a request for the review and approval of relocation of the RCIC Injection Point from the Reactor Vessel Head Spray Nozzle to the 'A' Feedwater Line via the 'A' Residual Heat Removal (RHR) Shutdown Cooling Return Line. In an email dated May 24, 2018, (Reference 2) the NRC staff made a request for additional information, needed to complete the license amendment request. On June 21, 2018 Entergy submitted responses to the RAI (Reference 3). A clarification call for the RAI response was held with the NRC on July 17, 2018 where it was determined additional information was required by the NRC.

Enclosure 1 provides the additional information requested during the July 17, 2018 clarification call with the NRC. Attachment 1 contains the original load cases and thermal modes table from calculation AX-017D Revision 3. Attachment 2 contains the thermal transient table from AX-17D Addendum 3K. Attachment 3 contains Cumulative Usage Factor (CUF) Summaries for AX-17D Rev 3, Addendum 3J, and Addendum 3K. Attachment 4 contains the cover pages from AX-17D Addendum 3J and 3K. Attachment 5 contains Addendum 3J Stress/CUF comparison with Addendum 3B

This letter does not contain any new commitments.

If you require additional information, please contact Mr. Tim Schenk at (225) 381-4177 or tschenk@entergy.com.

In accordance with 10 CFR 50.91(b)(1), Entergy is notifying the State of Louisiana and the State of Texas by transmitting a copy of this letter to the designated State Official.

I declare under penalty of perjury that the foregoing is true and correct. Executed on August 15, 2018.

Sincerely,



WFM/BJ

- Enclosure 1: Supplement to the Request for Additional Information (ML18172A142)
Attachment 1: Original Load Cases and Thermal Modes Table from AX-017D
Attachment 2: Thermal Transient Loss of Feed Water Pumps Aux Power Trip without Bypass
and Reactor Core Isolation Cooling (RCIC) Injection AX-17D Rev 3K
Attachment 3: Cumulative Usage Factor (CUF) Summaries AX-17D Rev 3, Addendum 3J, and
Addendum 3K
Attachment 4: Addendum 3J and 3K Cover Pages
Attachment 5: Addendum 3J Stress/ Cumulative Usage Factor (CUF) comparison with
Addendum 3B

cc: U.S. Nuclear Regulatory Commission
Region IV
1600 E. Lamar Blvd.
Arlington, TX 76011-4511

U.S. Nuclear Regulatory Commission
Attn: Ms. Lisa M. Regner, Project Manager
09-D-14
One White Flint North
11555 Rockville Pike
Rockville, MD 20852

NRC Senior Resident Inspector
Attn: Mr. Jeff Sowa
5485 U.S. Highway 61, Ste. NRC
St. Francisville, LA 70775

Department of Environmental Quality
Office of Environmental Compliance
Radiological Emergency Planning and Response Section
Ji Young Wiley
P.O. Box 4312
Baton Rouge, LA 70821-4312

Public Utility Commission of Texas
Attn: PUC Filing Clerk
1701 N. Congress Avenue
P. O. Box 13326
Austin, TX 78711-3326

RBG-47895

Enclosure 1

Supplement to the Request for Additional Information (ML18172A142)

Supplement to the Request for Additional Information (ML18172A142)
RIVER BEND STATION, UNIT 1
DOCKET NO.: 50-458

Background

The NRC staff would like to have a clarification call with you concerning your RAI response dated June 21, 2018. Specifically, the staff would like to discuss the below topics to determine if a follow-up RAI is needed: In your response dated June 21, 2018, you explained that the Cumulative Usage Factors (CUF) reduced significantly from 0.35 to 0.16 at point 1W and from 0.59 to 0.23 at point 71W as indicated in Table 3.6A-9a of the Updated Safety Analysis Report (USAR), as a result of installing a nozzle check valve into the feedwater system instead of using a swing check valve. The staff notes that the CUF for the piping system is from thermal transients.

Question

What thermal modes or transient changes and loading condition changes occurred since the cumulative usage factors and stresses decreased?

The reason for this significant CUFs reduction should be explained in detail including:

- old/new transients curves/cycles,
- fatigue stresses/cycles (S-N) combination summary, and
- the method to combine the CUFs for:
 - before the change (from 1986 beginning of the operation to the modification) and
 - after the change (after the modification to end of the operating license period).

Response

MR 96-0069 rerouted the Reactor Core Isolation Cooling (RCIC) Injection point from the Reactor Head Spray connection to the "A" Loop of Feedwater via the "A" Reactor Heat Removal (RHR) Shutdown Cooling return. This modification issued addendum 3K to calculation AX-017D (Pipe Stress Calculation for Feedwater Piping in Reactor and Auxiliary Bldgs, West Loop, Normal/Upset Condition Class 1 Analysis) to analyze the changes made to the feedwater piping system with the RCIC injection connection. Addendum 3K also administratively incorporated the approved AX-017D addenda 3B, 3E, 3F, 3G, 3H, and 3J. The changes made by each of these addenda are summarized below:

Addendum 3B revised the temperature drop during the feedwater heater loss event from 322 deg F to 320 deg F. This change was associated with LAR 88-006 and analyzed operation with lower feedwater temperature associated with operation in Single Loop Operation with Feedwater Heaters Out of Service. This change increased the severity of this transient and increased stresses and CUF. A summary of the class 1 stresses and CUF values can be seen below on the Addendum 3J Stress/CUF comparison with Addendum 3B.

Addendum 3E evaluated a change in a 3' segment of pipe from Sch. 60 to Sch. 80 associated

with plant modification MR 91-0080. The resulting stresses, moments and loads due to the upgrade of the piping to schedule 80 from schedule 60 were determined to be within the allowable limits. The model changes associated with this addendum were incorporated into addendum 3K.

Addendum 3F evaluated the effects of smaller mass (500 lb to 275 lb) on a valve actuator/ valve center accelerations, pipe stress, usage factor, pipe support loads, penetration loads, and the potential impact on stress reports caused by a lighter weight motor installed on outboard feedwater valve FWS-MOV7A. Based on an assessment of relative reduction of mass and increase of valve natural frequency it was concluded that the deadweight and combined dynamic loads for the new configuration were bounded by the corresponding loads of the old configuration.

Addendum 3G evaluated the addition of a 12" sch 60 to 12" sch 60 field weld between nodes 108 and 109. The stresses and CUF for the new weld fall between those of the two previously analyzed adjacent nodes as they were both previously analyzed and qualified as weld points.

Addendum 3H reduced the total combined normal/upset and faulted accelerations computed for FWS-MOV065A by applying Code Case N-411 damping spectra. This change was superseded by addendum 3K because all of the seismic and hydraulic events were analyzed using N-411 damping curves in addendum 3K.

Addendum 3J reduced the dynamic loads for OBE, SRV 1V, SRV 2V, and SRV 16V load cases by using Code Case N-411 damping in the stress analysis. Attachment 4 contains the cover page to AX-017D Addendum 3J for reference. The analyzed Class 1 stresses and CUF were reduced as a result. The reduction of stresses and CUF due to the use of Code Case N-411 damping values are shown below on the Addendum 3J Stress/CUF comparison with Addendum 3B, see Attachment 5. As can be seen, stresses and CUF for most of the class 1 node points analyzed were reduced significantly.

3K incorporated the changes made by addenda 3B, 3E, 3F, 3G, 3H, and 3J. Addendum 3K evaluated the Feedwater piping for the new function of RCIC injection in addition to the existing Feedwater functions. Attachment 4 contains the cover page to AX-017D Addendum 3K for reference. The added check valve FWS-V3052 was added to the model and new thermal mode 36 was introduced for the injection of 40 deg F RCIC into the feedwater piping. This new thermal transient includes 10 postulated events with 3 injections per event (total of 30 cycles) with no feedwater flowing. In addition to these 10 injection sequences, there are 40 postulated spurious injections with feedwater flowing. The spurious injection of RCIC with feedwater flowing events were excluded from the analysis as the contribution to stress is minimal due to the low change in feedwater temperature. The thermal transient diagram for the new thermal transient is shown in Attachment 2.

Due to the changes made by MR 96-0069 (RCIC Reroute to Feedwater) and the aggregate of the incorporated addenda 3B, 3E, 3F, 3G, 3H, and 3J, there was a net decrease in stresses and CUF of the break points reported out on RBS USAR tables 3.6A-9a and 10a. However, this decrease is largely due to the use of Code Case N-411 damping on the dynamic transient cases. It can be seen from a comparison of the results of addendum 3J (re-evaluated dynamic load cases with N-411 damping curves) to addendum 3K (MR 96-0069 RCIC Reroute Modification) that the stresses and CUF values of break points 60AW, BW, CW (corresponds

with AX-017D Node Point 82), 70W (corresponds with AX-017D Node point 97), and 71W (corresponds with AX-017D Node Point 85) increased from the results of 3J. This increase is caused by the aggregate of the incorporated changes made by addenda 3B, 3E, 3F, and 3G and the change to the routing of the RCIC system.

The reason for this significant CUFs reduction should be explained in detail including:

- ***old/new transients curves/cycles,***

The load cases and thermal modes from Revision 3 of AX-017D are located in Attachment 1. A new thermal transient was added with addendum 3K, the transient curve can be found in Attachment 2.

- ***fatigue stresses/cycles (S-N) combination summary***

Attachment 3 shows the original CUF values from AX-017D; the load combination summary and stress/CUF combinations for node points 82, 85, and 87 from AX-017D addendum 3J (implemented Code Case N-411 damping curves; and the load combination summary and stress/CUF combinations for node points 82, 85, and 87 from AX-017D addendum 3K (MR 96-0069 and addenda incorporation)

- ***the method to combine the CUFs for:***
 - ***before the change (from 1986 beginning of the operation to the modification) and***
 - ***after the change (after the modification to end of the operating license period).***

The piping model analyzes the cumulative effects of postulated transients and normal operating conditions on the piping system. The change associated with MR 96-0069 added a new transient to the feedwater piping system (spurious injection of RCIC). The new thermal transient was added with a postulated number of occurrences of 10. This new thermal transient was added to the model and was added to the calculated stresses and CUF. For this change it was not necessary to break out the stresses that would have occurred before and after this modification.

If a situation were to occur where a physical change to the plant reduced the severity of a postulated transient, but that transient had already occurred X number of times prior to the physical change then that transient would need to be broken out into two different transients. One would track or estimate the stress/usage caused by the transients that had occurred under the previous configuration and one would track the stress/fatigue due to the new postulated, but less severe transient.

RBG-47895

Attachment 1

Original Load Cases and Thermal Modes Table from AX-017D

Original Load Cases Table from AX-017D:

STONE & WEBSTER ENGINEERING CORPORATION

CALCULATION SHEET

| CALCULATION IDENTIFICATION NUMBER | | | | PAGE <u>163</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------------------|--|-----------------------------|--------------------|-----------------|---------------------|-------------|----------------------------------|--|---|--|---|--|---|--|---|--|---|---|---|--|---|---|---|---|---|---|----|---|----|---|----|------------------------|----|------------------------|----|------------------------|----|--|----|--|----|---|----|--------------------------------------|----|--|----|---------------------------------------|----|--------------------------------------|----|---|----|---------------------------------------|----|---|----|---|----|---|----|--|----|--|----|---------------------------------------|----|-------------------------------------|----|-----------------------------------|----|---|----|--------------------------------------|----|---|----|--|----|---|----|---|----|---|----|---|----|---|
| JO. OR WO. NO. 12210 | DIVISION & GROUP NP(C) | CALCULATION NO. AX-17D-4 | OPTIONAL TASK CODE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| REF. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 5.0 <u>LOADING CONDITIONS ANALYZED</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 5.1 <u>DESCRIPTION FOR LOAD CASES</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table border="0"> <thead> <tr> <th>LOAD CASE NUMBER</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td colspan="2">Normal/upset condition (Run 004)</td> </tr> <tr> <td>1</td> <td>FT= FLUID TRANSIENT TIME HISTORY (3-PUMP-TRIP)</td> </tr> <tr> <td>2</td> <td>OBEI= OBE INERTIA.....GROUPING BY STD SRSS</td> </tr> <tr> <td>3</td> <td>SSEI= SSE INERTIA.....GROUPING BY STD SRSS</td> </tr> <tr> <td>4</td> <td>SRV (1V,2V,SRVCO2V).....GROUPING BY STD SRSS</td> </tr> <tr> <td>5</td> <td>SRV (16V,SRVCO16V).....GROUPING BY STD SRSS</td> </tr> <tr> <td>6</td> <td>COCH= CONDENS.OSCILL & CHUGGING.....GROUPING BY STD SRSS</td> </tr> <tr> <td>7</td> <td>PS= POOL SWELL.....GROUPING BY STD SRSS</td> </tr> <tr> <td>8</td> <td>APMSB= ANNULUS PRESSURIZATION M.S.B... GROUPING BY STD SRSS</td> </tr> <tr> <td>9</td> <td>APRCB= ANNULUS PRESSURIZATION R.C.B....GROUPING BY STD SRSS</td> </tr> <tr> <td>10</td> <td>APFWB= ANNULUS PRESSURIZATION P.W.B....GROUPING BY STD SRSS</td> </tr> <tr> <td>11</td> <td>DL= DEADWEIGHT ANALYSIS: TLOAD=3,(F05H = COLDSET LOAD)</td> </tr> <tr> <td>12</td> <td>X-DIR OBE ANCHOR MVMTS</td> </tr> <tr> <td>13</td> <td>Y-DIR OBE ANCHOR MVMTS</td> </tr> <tr> <td>14</td> <td>Z-DIR OBE ANCHOR MVMTS</td> </tr> <tr> <td>15</td> <td>THERM 1= NORMAL OPERATING: (12) PPG @ 420/420/420 F RPV @ 552/528/528</td> </tr> <tr> <td>16</td> <td>THERM 2= TURB ROLL COLD: (4A-1...) PPG @ 70/70/70 F RPV @ 552/552/450</td> </tr> <tr> <td>17</td> <td>THERM 3= BOLT-UP, LEAK TEST: (3A-1...) 70-100</td> </tr> <tr> <td>18</td> <td>THERM 4= HYDROTEST: (2A) 100-180-100</td> </tr> <tr> <td>19</td> <td>THERM 5= START-UP:{UP} (3A-2...) 100-486</td> </tr> <tr> <td>20</td> <td>THERM 6= START-UP:{UP} (3B-2) 100-486</td> </tr> <tr> <td>21</td> <td>THERM 7= TURB ROLL: (4A-2...) 70-325</td> </tr> <tr> <td>22</td> <td>THERM 8= TURB ROLL: (4B-1+2) 180-70-325</td> </tr> <tr> <td>23</td> <td>THERM 9= TURB ROLL: (4A-3...) 325-420</td> </tr> <tr> <td>24</td> <td>THERM 10= DAILY PWR REDCTN : (5-1+2...) 420-354</td> </tr> <tr> <td>25</td> <td>THERM 11= DAILY PWR INCR : (5-3...) 354-420</td> </tr> <tr> <td>26</td> <td>THERM 12= WEEKLY PWR REDCTN : (6-1+2) 420-326</td> </tr> <tr> <td>27</td> <td>THERM 13= FW HTR LOSS: (9-1+2) 420-352</td> </tr> <tr> <td>28</td> <td>THERM 14= FW HTR RESTORTN: (9-3) 352-420</td> </tr> <tr> <td>29</td> <td>THERM 15= SCRAMS: (22-1+2...) 420-275</td> </tr> <tr> <td>30</td> <td>THERM 16= PWR REDUCTN: (13) 420-190</td> </tr> <tr> <td>31</td> <td>THERM 17= HOT STDBY: (14A) 190-70</td> </tr> <tr> <td>32</td> <td>THERM 18= HOT STDBY: (14B-1...) 190-435</td> </tr> <tr> <td>33</td> <td>THERM 19= HOT STDBY: (14B-2) 435-190</td> </tr> <tr> <td>34</td> <td>THERM 20= SHUT-DOWN INITIATN: (15B-1) 435-156</td> </tr> <tr> <td>35</td> <td>THERM 21= SHUT-DOWN INITITN:{UP} (15B-2) 156-395</td> </tr> <tr> <td>36</td> <td>THERM 22= VESSEL FLOODING: (16A-1) 70-157</td> </tr> <tr> <td>37</td> <td>THERM 23= VESSEL FLOODING: (16A-3...) 167-108</td> </tr> <tr> <td>38</td> <td>THERM 24= VESSEL FLOODING: (16A-4...) 108-167</td> </tr> <tr> <td>39</td> <td>THERM 25= VESSEL FLOODING: (16B-1+2) 149-66-152</td> </tr> <tr> <td>40</td> <td>THERM 26= SHUT-DOWN, UNBOLT: (17A...) 167-100</td> </tr> </tbody> </table> | | | | LOAD CASE NUMBER | DESCRIPTION | Normal/upset condition (Run 004) | | 1 | FT= FLUID TRANSIENT TIME HISTORY (3-PUMP-TRIP) | 2 | OBEI= OBE INERTIA.....GROUPING BY STD SRSS | 3 | SSEI= SSE INERTIA.....GROUPING BY STD SRSS | 4 | SRV (1V,2V,SRVCO2V).....GROUPING BY STD SRSS | 5 | SRV (16V,SRVCO16V).....GROUPING BY STD SRSS | 6 | COCH= CONDENS.OSCILL & CHUGGING.....GROUPING BY STD SRSS | 7 | PS= POOL SWELL.....GROUPING BY STD SRSS | 8 | APMSB= ANNULUS PRESSURIZATION M.S.B... GROUPING BY STD SRSS | 9 | APRCB= ANNULUS PRESSURIZATION R.C.B....GROUPING BY STD SRSS | 10 | APFWB= ANNULUS PRESSURIZATION P.W.B....GROUPING BY STD SRSS | 11 | DL= DEADWEIGHT ANALYSIS: TLOAD=3,(F05H = COLDSET LOAD) | 12 | X-DIR OBE ANCHOR MVMTS | 13 | Y-DIR OBE ANCHOR MVMTS | 14 | Z-DIR OBE ANCHOR MVMTS | 15 | THERM 1= NORMAL OPERATING: (12) PPG @ 420/420/420 F RPV @ 552/528/528 | 16 | THERM 2= TURB ROLL COLD: (4A-1...) PPG @ 70/70/70 F RPV @ 552/552/450 | 17 | THERM 3= BOLT-UP, LEAK TEST: (3A-1...) 70-100 | 18 | THERM 4= HYDROTEST: (2A) 100-180-100 | 19 | THERM 5= START-UP:{UP} (3A-2...) 100-486 | 20 | THERM 6= START-UP:{UP} (3B-2) 100-486 | 21 | THERM 7= TURB ROLL: (4A-2...) 70-325 | 22 | THERM 8= TURB ROLL: (4B-1+2) 180-70-325 | 23 | THERM 9= TURB ROLL: (4A-3...) 325-420 | 24 | THERM 10= DAILY PWR REDCTN : (5-1+2...) 420-354 | 25 | THERM 11= DAILY PWR INCR : (5-3...) 354-420 | 26 | THERM 12= WEEKLY PWR REDCTN : (6-1+2) 420-326 | 27 | THERM 13= FW HTR LOSS: (9-1+2) 420-352 | 28 | THERM 14= FW HTR RESTORTN: (9-3) 352-420 | 29 | THERM 15= SCRAMS: (22-1+2...) 420-275 | 30 | THERM 16= PWR REDUCTN: (13) 420-190 | 31 | THERM 17= HOT STDBY: (14A) 190-70 | 32 | THERM 18= HOT STDBY: (14B-1...) 190-435 | 33 | THERM 19= HOT STDBY: (14B-2) 435-190 | 34 | THERM 20= SHUT-DOWN INITIATN: (15B-1) 435-156 | 35 | THERM 21= SHUT-DOWN INITITN:{UP} (15B-2) 156-395 | 36 | THERM 22= VESSEL FLOODING: (16A-1) 70-157 | 37 | THERM 23= VESSEL FLOODING: (16A-3...) 167-108 | 38 | THERM 24= VESSEL FLOODING: (16A-4...) 108-167 | 39 | THERM 25= VESSEL FLOODING: (16B-1+2) 149-66-152 | 40 | THERM 26= SHUT-DOWN, UNBOLT: (17A...) 167-100 |
| LOAD CASE NUMBER | DESCRIPTION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Normal/upset condition (Run 004) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | FT= FLUID TRANSIENT TIME HISTORY (3-PUMP-TRIP) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | OBEI= OBE INERTIA.....GROUPING BY STD SRSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | SSEI= SSE INERTIA.....GROUPING BY STD SRSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | SRV (1V,2V,SRVCO2V).....GROUPING BY STD SRSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | SRV (16V,SRVCO16V).....GROUPING BY STD SRSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | COCH= CONDENS.OSCILL & CHUGGING.....GROUPING BY STD SRSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | PS= POOL SWELL.....GROUPING BY STD SRSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | APMSB= ANNULUS PRESSURIZATION M.S.B... GROUPING BY STD SRSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | APRCB= ANNULUS PRESSURIZATION R.C.B....GROUPING BY STD SRSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | APFWB= ANNULUS PRESSURIZATION P.W.B....GROUPING BY STD SRSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | DL= DEADWEIGHT ANALYSIS: TLOAD=3,(F05H = COLDSET LOAD) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | X-DIR OBE ANCHOR MVMTS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Y-DIR OBE ANCHOR MVMTS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | Z-DIR OBE ANCHOR MVMTS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | THERM 1= NORMAL OPERATING: (12) PPG @ 420/420/420 F RPV @ 552/528/528 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16 | THERM 2= TURB ROLL COLD: (4A-1...) PPG @ 70/70/70 F RPV @ 552/552/450 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 17 | THERM 3= BOLT-UP, LEAK TEST: (3A-1...) 70-100 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18 | THERM 4= HYDROTEST: (2A) 100-180-100 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 19 | THERM 5= START-UP:{UP} (3A-2...) 100-486 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 20 | THERM 6= START-UP:{UP} (3B-2) 100-486 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 21 | THERM 7= TURB ROLL: (4A-2...) 70-325 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 22 | THERM 8= TURB ROLL: (4B-1+2) 180-70-325 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 23 | THERM 9= TURB ROLL: (4A-3...) 325-420 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 24 | THERM 10= DAILY PWR REDCTN : (5-1+2...) 420-354 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25 | THERM 11= DAILY PWR INCR : (5-3...) 354-420 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 26 | THERM 12= WEEKLY PWR REDCTN : (6-1+2) 420-326 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 27 | THERM 13= FW HTR LOSS: (9-1+2) 420-352 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 28 | THERM 14= FW HTR RESTORTN: (9-3) 352-420 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 29 | THERM 15= SCRAMS: (22-1+2...) 420-275 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 30 | THERM 16= PWR REDUCTN: (13) 420-190 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | THERM 17= HOT STDBY: (14A) 190-70 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 32 | THERM 18= HOT STDBY: (14B-1...) 190-435 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 33 | THERM 19= HOT STDBY: (14B-2) 435-190 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 34 | THERM 20= SHUT-DOWN INITIATN: (15B-1) 435-156 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 35 | THERM 21= SHUT-DOWN INITITN:{UP} (15B-2) 156-395 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 36 | THERM 22= VESSEL FLOODING: (16A-1) 70-157 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 37 | THERM 23= VESSEL FLOODING: (16A-3...) 167-108 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 38 | THERM 24= VESSEL FLOODING: (16A-4...) 108-167 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 39 | THERM 25= VESSEL FLOODING: (16B-1+2) 149-66-152 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 40 | THERM 26= SHUT-DOWN, UNBOLT: (17A...) 167-100 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Original Load Cases Table from AX-017D, pg. 2:

STONE & WEBSTER ENGINEERING CORPORATION

CALCULATION SHEET

| CALCULATION IDENTIFICATION NUMBER | | | | PAGE <u>164</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------------------|--|-----------------------------|--------------------|-----------------|-----------------------------------|--------------------|----|---|----|---|----|---|----|--|----|---|----|--|----|--------------------------------|----|------------------------------------|----|------------------------------------|----|---|----|---|----|---|----|-------------------------------------|----|--|----|--|----|---|----|---|----|---|----|--|----|---|----|--|
| JO. OR WO. NO. 12210 | DIVISION & GROUP NP(C) | CALCULATION NO. AX-17D-4 | OPTIONAL TASK CODE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| REF. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 5.0 <u>LOADING CONDITIONS ANALYZED</u> (CONT'D) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 5.1 <u>DESCRIPTION FOR LOAD CASES</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table border="0"> <thead> <tr> <th style="text-align: left;"><u>LOAD CASE</u> <u>NUMBER</u></th> <th style="text-align: left;"><u>DESCRIPTION</u></th> </tr> </thead> <tbody> <tr><td>41</td><td>THERM 27= LOSS OF FW PUMP:{UP} (20-1..) 420-573-485</td></tr> <tr><td>42</td><td>THERM 28= PIPE RUPTURE: (27-1+2) 420-259-70</td></tr> <tr><td>43</td><td>THERM 29= START-UP:{DN} (3A-3..) 486-70</td></tr> <tr><td>44</td><td>THERM 30= START-UP:{DN} (3B-3) 486-180</td></tr> <tr><td>45</td><td>THERM 31= SHUT-DOWN INITIATION:{DN} (15B-3) 395-149</td></tr> <tr><td>46</td><td>THERM 32= LOSS OF FWP:{DN} (20-13+14) 485-70</td></tr> <tr><td>47</td><td>THERM 33= TMODE 2 WITH P=0 PSI</td></tr> <tr><td>48</td><td>THERM 34= TMODE 15 WITH P=1516 PSI</td></tr> <tr><td>49</td><td>THERM 35= TMODE 15 WITH P=1175 PSI</td></tr> <tr><td>50</td><td>X+Y DIR. OBE ANCHOR MVMTS.....CASES 12+13 BY SRSS</td></tr> <tr><td>51</td><td>OBEA= X+Y+Z EARTHQUAKE ANCHOR MVMTS....CASES 12+13+14 BY SRSS</td></tr> <tr><td>52</td><td>SRV= (SRV MAX).....CASES 4+5 BY MAXIMUM VALUE</td></tr> <tr><td>53</td><td>SRSS(SRV,FT).....CASES 52+1 BY SRSS</td></tr> <tr><td>54</td><td>SRSS(OBEI,OCU)= SRSS(OBEI,SRV,FT)...CASES 2+52+1 BY SRSS</td></tr> <tr><td>55</td><td>OBE= ABS(OBEI + OBEA).....CASES 2+51 BY ABS. SUM</td></tr> <tr><td>56</td><td>SRSS(OBE,OCU)= SRSS(ABS(OBEI+OBEA),SRV,FT)..CASES 55+53 BY SRSS</td></tr> <tr><td>57</td><td>SRSS(OBEI,FT).....CASES 1+2 BY SRSS (FOR 9CN CARD ONLY)</td></tr> <tr><td>58</td><td>FT= FLUID TRANSIENT TIME HISTORY(3 PUMP-TRIP)....(FOR SUMMARY ONLY)</td></tr> <tr><td>59</td><td>OBEI= OBE INERTIA (CASE REPEATED FOR SUMMARY ONLY)</td></tr> <tr><td>60</td><td>SRV(1V,2V,SRVCO2V).....(CASE REPEATED FOR 9N CARD ONLY)</td></tr> <tr><td>61</td><td>SRV(16V.SRVCO16V).....(CASE REPEATED FOR 9N CARD ONLY)</td></tr> </tbody> </table> | | | | <u>LOAD CASE</u> <u>NUMBER</u> | <u>DESCRIPTION</u> | 41 | THERM 27= LOSS OF FW PUMP:{UP} (20-1..) 420-573-485 | 42 | THERM 28= PIPE RUPTURE: (27-1+2) 420-259-70 | 43 | THERM 29= START-UP:{DN} (3A-3..) 486-70 | 44 | THERM 30= START-UP:{DN} (3B-3) 486-180 | 45 | THERM 31= SHUT-DOWN INITIATION:{DN} (15B-3) 395-149 | 46 | THERM 32= LOSS OF FWP:{DN} (20-13+14) 485-70 | 47 | THERM 33= TMODE 2 WITH P=0 PSI | 48 | THERM 34= TMODE 15 WITH P=1516 PSI | 49 | THERM 35= TMODE 15 WITH P=1175 PSI | 50 | X+Y DIR. OBE ANCHOR MVMTS.....CASES 12+13 BY SRSS | 51 | OBEA= X+Y+Z EARTHQUAKE ANCHOR MVMTS....CASES 12+13+14 BY SRSS | 52 | SRV= (SRV MAX).....CASES 4+5 BY MAXIMUM VALUE | 53 | SRSS(SRV,FT).....CASES 52+1 BY SRSS | 54 | SRSS(OBEI,OCU)= SRSS(OBEI,SRV,FT)...CASES 2+52+1 BY SRSS | 55 | OBE= ABS(OBEI + OBEA).....CASES 2+51 BY ABS. SUM | 56 | SRSS(OBE,OCU)= SRSS(ABS(OBEI+OBEA),SRV,FT)..CASES 55+53 BY SRSS | 57 | SRSS(OBEI,FT).....CASES 1+2 BY SRSS (FOR 9CN CARD ONLY) | 58 | FT= FLUID TRANSIENT TIME HISTORY(3 PUMP-TRIP)....(FOR SUMMARY ONLY) | 59 | OBEI= OBE INERTIA (CASE REPEATED FOR SUMMARY ONLY) | 60 | SRV(1V,2V,SRVCO2V).....(CASE REPEATED FOR 9N CARD ONLY) | 61 | SRV(16V.SRVCO16V).....(CASE REPEATED FOR 9N CARD ONLY) |
| <u>LOAD CASE</u> <u>NUMBER</u> | <u>DESCRIPTION</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 41 | THERM 27= LOSS OF FW PUMP:{UP} (20-1..) 420-573-485 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 42 | THERM 28= PIPE RUPTURE: (27-1+2) 420-259-70 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 43 | THERM 29= START-UP:{DN} (3A-3..) 486-70 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 44 | THERM 30= START-UP:{DN} (3B-3) 486-180 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 45 | THERM 31= SHUT-DOWN INITIATION:{DN} (15B-3) 395-149 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 46 | THERM 32= LOSS OF FWP:{DN} (20-13+14) 485-70 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 47 | THERM 33= TMODE 2 WITH P=0 PSI | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 48 | THERM 34= TMODE 15 WITH P=1516 PSI | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 49 | THERM 35= TMODE 15 WITH P=1175 PSI | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 50 | X+Y DIR. OBE ANCHOR MVMTS.....CASES 12+13 BY SRSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 51 | OBEA= X+Y+Z EARTHQUAKE ANCHOR MVMTS....CASES 12+13+14 BY SRSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 52 | SRV= (SRV MAX).....CASES 4+5 BY MAXIMUM VALUE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 53 | SRSS(SRV,FT).....CASES 52+1 BY SRSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 54 | SRSS(OBEI,OCU)= SRSS(OBEI,SRV,FT)...CASES 2+52+1 BY SRSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 55 | OBE= ABS(OBEI + OBEA).....CASES 2+51 BY ABS. SUM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 56 | SRSS(OBE,OCU)= SRSS(ABS(OBEI+OBEA),SRV,FT)..CASES 55+53 BY SRSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 57 | SRSS(OBEI,FT).....CASES 1+2 BY SRSS (FOR 9CN CARD ONLY) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 58 | FT= FLUID TRANSIENT TIME HISTORY(3 PUMP-TRIP)....(FOR SUMMARY ONLY) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 59 | OBEI= OBE INERTIA (CASE REPEATED FOR SUMMARY ONLY) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 60 | SRV(1V,2V,SRVCO2V).....(CASE REPEATED FOR 9N CARD ONLY) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 61 | SRV(16V.SRVCO16V).....(CASE REPEATED FOR 9N CARD ONLY) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | (RUN 007) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 1 SETTLE1 = BLDG. SETTLEMENT ... REACTOR BLDG. SETTLES DOWN BY .66" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 2 SETTLE2 = BLDG. SETTLEMENT ... AUX. BLDG. SETTLES DOWN BY .18" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Original Load Cases (Emergency/Faulted) Table from AX-017D

STONE & WEBSTER ENGINEERING CORPORATION

CALCULATION SHEET

| CALCULATION IDENTIFICATION NUMBER | | | | PAGE <u>165</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|-----------------------------|--------------------|-----------------|---------------------|-------------|--|--|---|--|---|--|---|--|---|--|---|---|---|---|---|---|---|---|---|---|----|---|----|--|----|---|----|-------------------------------------|----|--|----|---|----|--|----|---|----|---|----|---|----|-------------------------------------|----|--|----|--|----|--|----|---|
| JO. OR WO. NO. 12210 | DIVISION & GROUP NP(C) | CALCULATION NO. AX-17D-4 | OPTIONAL TASK CODE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| REF. | <p>5.0 <u>LOADING CONDITIONS ANALYZED</u> (CONT'D)</p> <p>5.1 <u>DESCRIPTION FOR LOAD CASES</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; width: 20%;">LOAD CASE NUMBER</th> <th style="text-align: left;">DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td colspan="2" style="padding-top: 10px;">EMERGENCY & FAULTED CONDITIONS (Run 005)</td> </tr> <tr><td>1</td><td>FT= FLUID TRANSIENT TIME HISTORY (3-PUMP-TRIP)</td></tr> <tr><td>2</td><td>OBEI= OBE INERTIA.....GROUPING BY STD SRSS</td></tr> <tr><td>3</td><td>SSEI= SSE INERTIA.....GROUPING BY STD SRSS</td></tr> <tr><td>4</td><td>SRV (1V,2V,SRVCO2V).....GROUPING BY STD SRSS</td></tr> <tr><td>5</td><td>SRV (16V,SRVCO16V).....GROUPING BY STD SRSS</td></tr> <tr><td>6</td><td>COCH= CONDENS. OSCILL & CHUGGING.....GROUPING BY STD SRSS</td></tr> <tr><td>7</td><td>PS= POOL SHELL.....GROUPING BY STD SRSS</td></tr> <tr><td>8</td><td>APHSB= ANNULUS PRESSURIZATION H.S.B... GROUPING BY STD SRSS</td></tr> <tr><td>9</td><td>APRCB= ANNULUS PRESSURIZATION R.C.B... GROUPING BY STD SRSS</td></tr> <tr><td>10</td><td>APFNB= ANNULUS PRESSURIZATION F.H.B... GROUPING BY STD SRSS</td></tr> <tr><td>11</td><td>DL= DEADHEIGHT ANALYSIS: TLOAD=3, (PASH = COLDSET LOAD)</td></tr> <tr><td>12</td><td>SRV= (SRV MAX).....CASES 4+5 BY MAXIMUM VALUE</td></tr> <tr><td>13</td><td>SRSS(SRV,FT).....CASES 12+1 BY SRSS</td></tr> <tr><td>14</td><td>SRSS(OBEI,SRV,FT).....CASES 2+12+1 BY SRSS</td></tr> <tr><td>15</td><td>SRSS(OBEI,OCCE)=SRSS(OBEI,SRV,FT,COCH).....CASES 2+12+1+6 BY SRSS</td></tr> <tr><td>16</td><td>SRSS(SSEI,SRV,FT).....CASES 3+12+1 BY SRSS</td></tr> <tr><td>17</td><td>MAX(COCH,PS).....CASES 6+7 BY MAX VALUE</td></tr> <tr><td>18</td><td>MAX(APHSB,APRCB).....CASES 8+9 BY MAX VALUE</td></tr> <tr><td>19</td><td>AP= ANNULUS PRESS:MAX AP(HSB,RCB,FHB)...CASES 8+9+10 BY MAX VALUE</td></tr> <tr><td>20</td><td>SRSS(SSEI,FT).....CASES 3+1 BY SRSS</td></tr> <tr><td>21</td><td>SRSS(SSEI,OCCE1)=SRSS(SSEI,SRV,FT,MAX(COCH,PS))..CASES 3+12+1+17 BY SRSS</td></tr> <tr><td>22</td><td>SRSS(SSEI,OCCE2)=SRSS(SSEI,FT,AP).....CASES 3+1+19 BY SRSS</td></tr> <tr><td>23</td><td>SSEI= SSE INERTIA.....(CASE REPEATED FOR SUMMARY ONLY)</td></tr> <tr><td>24</td><td>COCH= CONDENS. OSCILL & CHUGGING...(CASE REPEATED FOR SUMMARY ONLY)</td></tr> </tbody> </table> | | | | LOAD CASE NUMBER | DESCRIPTION | EMERGENCY & FAULTED CONDITIONS (Run 005) | | 1 | FT= FLUID TRANSIENT TIME HISTORY (3-PUMP-TRIP) | 2 | OBEI= OBE INERTIA.....GROUPING BY STD SRSS | 3 | SSEI= SSE INERTIA.....GROUPING BY STD SRSS | 4 | SRV (1V,2V,SRVCO2V).....GROUPING BY STD SRSS | 5 | SRV (16V,SRVCO16V).....GROUPING BY STD SRSS | 6 | COCH= CONDENS. OSCILL & CHUGGING.....GROUPING BY STD SRSS | 7 | PS= POOL SHELL.....GROUPING BY STD SRSS | 8 | APHSB= ANNULUS PRESSURIZATION H.S.B... GROUPING BY STD SRSS | 9 | APRCB= ANNULUS PRESSURIZATION R.C.B... GROUPING BY STD SRSS | 10 | APFNB= ANNULUS PRESSURIZATION F.H.B... GROUPING BY STD SRSS | 11 | DL= DEADHEIGHT ANALYSIS: TLOAD=3, (PASH = COLDSET LOAD) | 12 | SRV= (SRV MAX).....CASES 4+5 BY MAXIMUM VALUE | 13 | SRSS(SRV,FT).....CASES 12+1 BY SRSS | 14 | SRSS(OBEI,SRV,FT).....CASES 2+12+1 BY SRSS | 15 | SRSS(OBEI,OCCE)=SRSS(OBEI,SRV,FT,COCH).....CASES 2+12+1+6 BY SRSS | 16 | SRSS(SSEI,SRV,FT).....CASES 3+12+1 BY SRSS | 17 | MAX(COCH,PS).....CASES 6+7 BY MAX VALUE | 18 | MAX(APHSB,APRCB).....CASES 8+9 BY MAX VALUE | 19 | AP= ANNULUS PRESS:MAX AP(HSB,RCB,FHB)...CASES 8+9+10 BY MAX VALUE | 20 | SRSS(SSEI,FT).....CASES 3+1 BY SRSS | 21 | SRSS(SSEI,OCCE1)=SRSS(SSEI,SRV,FT,MAX(COCH,PS))..CASES 3+12+1+17 BY SRSS | 22 | SRSS(SSEI,OCCE2)=SRSS(SSEI,FT,AP).....CASES 3+1+19 BY SRSS | 23 | SSEI= SSE INERTIA.....(CASE REPEATED FOR SUMMARY ONLY) | 24 | COCH= CONDENS. OSCILL & CHUGGING...(CASE REPEATED FOR SUMMARY ONLY) |
| LOAD CASE NUMBER | DESCRIPTION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| EMERGENCY & FAULTED CONDITIONS (Run 005) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | FT= FLUID TRANSIENT TIME HISTORY (3-PUMP-TRIP) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | OBEI= OBE INERTIA.....GROUPING BY STD SRSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | SSEI= SSE INERTIA.....GROUPING BY STD SRSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | SRV (1V,2V,SRVCO2V).....GROUPING BY STD SRSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | SRV (16V,SRVCO16V).....GROUPING BY STD SRSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | COCH= CONDENS. OSCILL & CHUGGING.....GROUPING BY STD SRSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | PS= POOL SHELL.....GROUPING BY STD SRSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | APHSB= ANNULUS PRESSURIZATION H.S.B... GROUPING BY STD SRSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | APRCB= ANNULUS PRESSURIZATION R.C.B... GROUPING BY STD SRSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | APFNB= ANNULUS PRESSURIZATION F.H.B... GROUPING BY STD SRSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | DL= DEADHEIGHT ANALYSIS: TLOAD=3, (PASH = COLDSET LOAD) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | SRV= (SRV MAX).....CASES 4+5 BY MAXIMUM VALUE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | SRSS(SRV,FT).....CASES 12+1 BY SRSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | SRSS(OBEI,SRV,FT).....CASES 2+12+1 BY SRSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | SRSS(OBEI,OCCE)=SRSS(OBEI,SRV,FT,COCH).....CASES 2+12+1+6 BY SRSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16 | SRSS(SSEI,SRV,FT).....CASES 3+12+1 BY SRSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 17 | MAX(COCH,PS).....CASES 6+7 BY MAX VALUE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18 | MAX(APHSB,APRCB).....CASES 8+9 BY MAX VALUE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 19 | AP= ANNULUS PRESS:MAX AP(HSB,RCB,FHB)...CASES 8+9+10 BY MAX VALUE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 20 | SRSS(SSEI,FT).....CASES 3+1 BY SRSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 21 | SRSS(SSEI,OCCE1)=SRSS(SSEI,SRV,FT,MAX(COCH,PS))..CASES 3+12+1+17 BY SRSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 22 | SRSS(SSEI,OCCE2)=SRSS(SSEI,FT,AP).....CASES 3+1+19 BY SRSS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 23 | SSEI= SSE INERTIA.....(CASE REPEATED FOR SUMMARY ONLY) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 24 | COCH= CONDENS. OSCILL & CHUGGING...(CASE REPEATED FOR SUMMARY ONLY) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Original Thermal Modes Table from AX-017D

STONE & WEBSTER ENGINEERING CORPORATION

CALCULATION SHEET

| CALCULATION IDENTIFICATION NUMBER | | | | PAGE <u>166</u> |
|-----------------------------------|---|---|--------------------|-----------------|
| JO. OR WO. NO. | DIVISION & GROUP | CALCULATION NO. | OPTIONAL TASK CODE | |
| 12210 | NP(C) | AX-17D-4 | | |
| REF. | | | | |
| | 5.0 <u>LOADING CONDITIONS ANALYZED</u> (CONT'D) | | | |
| | 5.2 <u>DESCRIPTION FOR THERMAL MODES</u> | | | |
| | <u>MODE</u> <u>NUMBER</u> | <u>DESCRIPTION</u> | | |
| | 1 | THERM 1= NORMAL OPERATING: (12) PPG @ 420/420/420 F RPV @ 552/528/528 | | |
| | 2 | THERM 2= TURB ROLL COLD: (4A-1..) PPG @ 70/70/70 F RPV @ 552/552/450 | | |
| | 3 | THERM 3= BOLT-UP, LEAK TEST: (3A-1..) 70-100 | | |
| | 4 | THERM 4= HYDROTEST: (2A) 100-180-100 | | |
| | 5 | THERM 5= START-UP:{UP} (3A-2..) 100-486 | | |
| | 6 | THERM 6= START-UP:{UP} (3B-2) 100-486 | | |
| | 7 | THERM 7= TURB ROLL: (4A-2..) 70-325 | | |
| | 8 | THERM 8= TURB ROLL: (4B-1+2) 180-70-325 | | |
| | 9 | THERM 9= TURB ROLL: (4A-3..) 325-420 | | |
| | 10 | THERM 10= DAILY PWR REDCTN : (5-1+2..) 420-354 | | |
| | 11 | THERM 11= DAILY PWR INCR : (5-3..) 354-420 | | |
| | 12 | THERM 12= WEEKLY PWR REDCTN : (6-1+2) 420-326 | | |
| | 13 | THERM 13= FW HTR LOSS: (9-1+2) 420-352 | | |
| | 14 | THERM 14= FW HTR RESTORTN: (9-3) 352-420 | | |
| | 15 | THERM 15= SCRAMS: (22-1+2..) 420-275 | | |
| | 16 | THERM 16= PWR REDUCTN: (13) 420-190 | | |
| | 17 | THERM 17= HOT STDBY: (14A) 190-70 | | |
| | 18 | THERM 18= HOT STDBY: (14B-1..) 190-435 | | |
| | 19 | THERM 19= HOT STDBY: (14B-2) 435-190 | | |
| | 20 | THERM 20= SHUT-DOWN INITIATN: (15B-1) 435-156 | | |
| | 21 | THERM 21= SHUT-DOWN INITITN:{UP} (15B-2) 156-395 | | |
| | 22 | THERM 22= VESSEL FLOODING: (16A-1) 70-157 | | |
| | 23 | THERM 23= VESSEL FLOODING: (16A-3..) 167-108 | | |
| | 24 | THERM 24= VESSEL FLOODING: (16A-4..) 108-167 | | |
| | 25 | THERM 25= VESSEL FLOODING: (16B-1+2) 149-66-152 | | |
| | 26 | THERM 26= SHUT-DOWN, UNBOLT: (17A..) 167-100 | | |
| | 27 | THERM 27= LOSS OF FW PUMP:{UP} (20-1..) 420-573-485 | | |
| | 28 | THERM 28= PIPE RUPTURE: (27-1+2) 420-259-70 | | |
| | 29 | THERM 29= START-UP:{DN} (3A-3..) 486-70 | | |
| | 30 | THERM 30= START-UP:{DN} (3B-3) 486-180 | | |
| | 31 | THERM 31= SHUT-DOWN INITITN:{DN} (15B-3) 395-149 | | |
| | 32 | THERM 32= LOSS OF FWP:{DN} (20-13+14) 485-70 | | |
| | 33 | THERM 33= TMODE 2 WITH P=0 PSI | | |
| | 34 | THERM 34= TMODE 15 WITH P=1516 PSI | | |
| | 35 | THERM 35= TMODE 15 WITH P=1175 PSI | | |

RBG-47895

Attachment 2

Thermal Transient Loss of Feed Water Pumps Aux Power Trip without Bypass and
Reactor Core Isolation Cooling (RCIC) Injection AX-17D Rev 3K

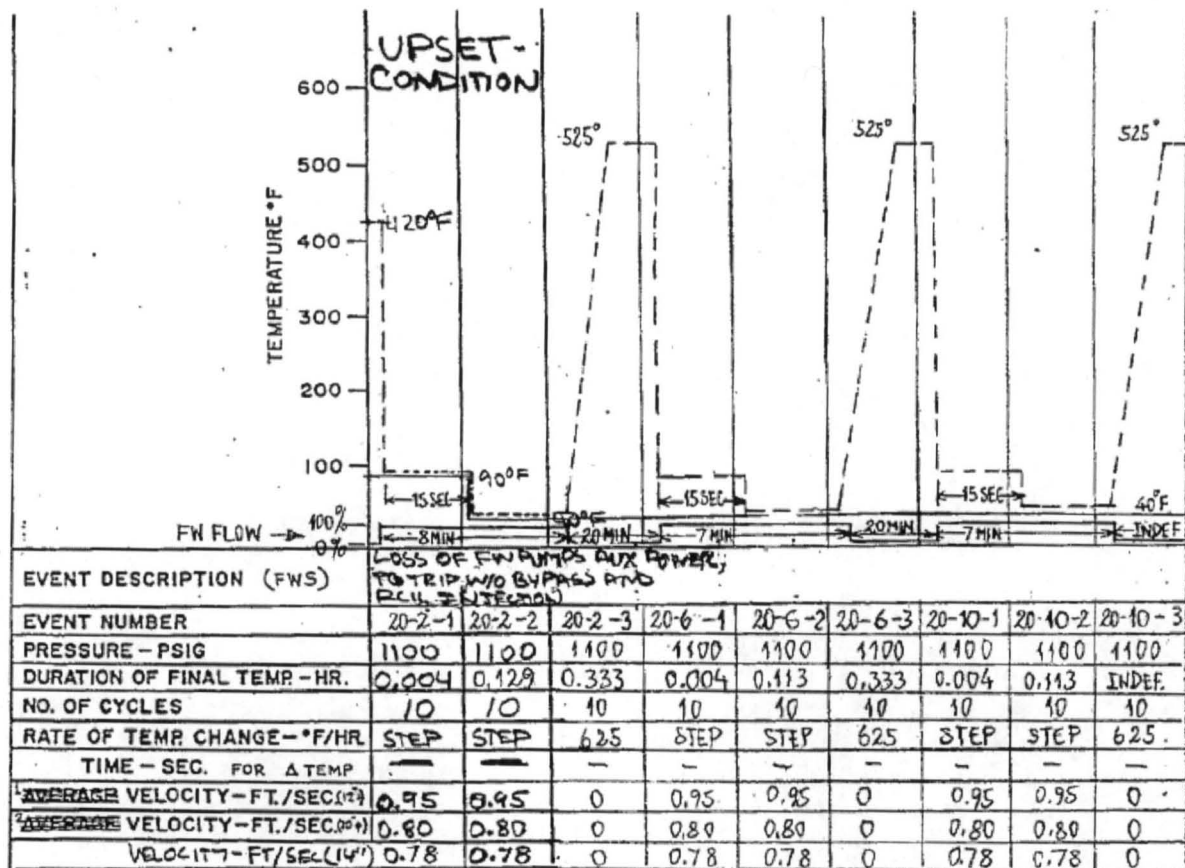
Thermal Transient Loss of FW Pumps Aux Power Trip without Bypass and RCIC injection.

AX-17D REV. 3K PAGE 10

PICLCN 17-01

PICL AP-17

ATTACHMENT A, PAGE 127a



NOTE:

FLOW IS RCIC INJ. WATER AND EXISTS ONLY
DOWNSTREAM OF LINE RHS-010-65-2 IN
FEEDW. LOOP A.

**THERMAL TRANSIENTS
FEEDWATER SYSTEM (FWS)**



12210-SK-TRI7-A-2

RBG-47895

Attachment 3

Cumulative Usage Factor (CUF) Summaries AX-17D Rev 3, Addendum 3J, and
Addendum 3K

Original CUF from Calc Rev. 3

STONE & WEBSTER ENGINEERING CORPORATION

CALCULATION SHEET

| CALCULATION IDENTIFICATION NUMBER | | | | PAGE <u>226</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------------------|---|-----------------------------|-------------------------|-----------------|------------|-----------------|-------------------------|-------------------------|-----|---------|---|-----|-------|-------|-------|--|----|-----|-------|-------|-------|--|----|-----|-------|-------|-------|--|----|-----|------|-------|-------|--|----|------|------|-------|-------|--|----|------|-------|-------|-------|--|----|------|-------|-------|-------|--|----|------|-------|-------|-------|--|----|------|-------|-------|-------|--|----|------|-------|-------|-------|--|----|------|-------|-------|-------|--|----|------|-------|-------|-------|--|----|------|-------|-------|-------|--|-----|-----|-------|-------|-------|--|-----|-----|-------|-------|-------|--|-----|------|-------|-------|-------|--|-----|------|-------|-------|-------|--|
| JO. OR WD. NO. 12210 | DIVISION & GROUP NP(C) | CALCULATION NO. AX-17D-4 | OPTIONAL TASK CODE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| REF. | <p>9.0 <u>SUMMARY OF RESULTS (CONT'D)</u></p> <p>9.5 <u>CUMULATIVE USAGE FACTOR (CUF)</u></p> <p>9.5.1 <u>CUF FOR OTHER THAN BREAK EXCLUSION AREAS</u> Selected Points: ELB & CUF > .02</p> <p style="margin-left: 100px;">Allowable CUF = 1.0 (Ref. 1 NB-3600)</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Node Point</th> <th style="text-align: center;">Type of Element</th> <th style="text-align: center;">Equation 12 (Ref. 1)</th> <th style="text-align: center;">Equation 13 (Ref. 1)</th> <th style="text-align: center;">CUF</th> <th style="text-align: center;">Remarks</th> </tr> </thead> <tbody> <tr><td style="text-align: center;">4</td><td style="text-align: center;">ELB</td><td style="text-align: center;">30043</td><td style="text-align: center;">24156</td><td style="text-align: center;">.0212</td><td></td></tr> <tr><td style="text-align: center;">10</td><td style="text-align: center;">ELB</td><td style="text-align: center;">26592</td><td style="text-align: center;">22726</td><td style="text-align: center;">.0144</td><td></td></tr> <tr><td style="text-align: center;">45</td><td style="text-align: center;">ELB</td><td style="text-align: center;">27084</td><td style="text-align: center;">26309</td><td style="text-align: center;">.0185</td><td></td></tr> <tr><td style="text-align: center;">70</td><td style="text-align: center;">ELB</td><td style="text-align: center;">4271</td><td style="text-align: center;">21321</td><td style="text-align: center;">.0048</td><td></td></tr> <tr><td style="text-align: center;">80</td><td style="text-align: center;">GRUN</td><td style="text-align: center;">1953</td><td style="text-align: center;">20547</td><td style="text-align: center;">.0178</td><td></td></tr> <tr><td style="text-align: center;">83</td><td style="text-align: center;">GRUN</td><td style="text-align: center;">13062</td><td style="text-align: center;">19698</td><td style="text-align: center;">.0268</td><td></td></tr> <tr><td style="text-align: center;">85</td><td style="text-align: center;">GELB</td><td style="text-align: center;">46162</td><td style="text-align: center;">22499</td><td style="text-align: center;">.5908</td><td></td></tr> <tr><td style="text-align: center;">86</td><td style="text-align: center;">GELB</td><td style="text-align: center;">46620</td><td style="text-align: center;">21932</td><td style="text-align: center;">.5378</td><td></td></tr> <tr><td style="text-align: center;">87</td><td style="text-align: center;">GELB</td><td style="text-align: center;">43990</td><td style="text-align: center;">22566</td><td style="text-align: center;">.3598</td><td></td></tr> <tr><td style="text-align: center;">88</td><td style="text-align: center;">GRUN</td><td style="text-align: center;">18905</td><td style="text-align: center;">21862</td><td style="text-align: center;">.0370</td><td></td></tr> <tr><td style="text-align: center;">95</td><td style="text-align: center;">GRUN</td><td style="text-align: center;">11783</td><td style="text-align: center;">22970</td><td style="text-align: center;">.0216</td><td></td></tr> <tr><td style="text-align: center;">97</td><td style="text-align: center;">GRUN</td><td style="text-align: center;">18783</td><td style="text-align: center;">21000</td><td style="text-align: center;">.0390</td><td></td></tr> <tr><td style="text-align: center;">98</td><td style="text-align: center;">GRUN</td><td style="text-align: center;">46688</td><td style="text-align: center;">21895</td><td style="text-align: center;">.0641</td><td></td></tr> <tr><td style="text-align: center;">100</td><td style="text-align: center;">ELB</td><td style="text-align: center;">47850</td><td style="text-align: center;">19386</td><td style="text-align: center;">.0603</td><td></td></tr> <tr><td style="text-align: center;">105</td><td style="text-align: center;">ELB</td><td style="text-align: center;">40465</td><td style="text-align: center;">19118</td><td style="text-align: center;">.0342</td><td></td></tr> <tr><td style="text-align: center;">106</td><td style="text-align: center;">GRUN</td><td style="text-align: center;">38522</td><td style="text-align: center;">21718</td><td style="text-align: center;">.0336</td><td></td></tr> <tr><td style="text-align: center;">109</td><td style="text-align: center;">GRUN</td><td style="text-align: center;">25187</td><td style="text-align: center;">25151</td><td style="text-align: center;">.0173</td><td></td></tr> </tbody> </table> | | | | Node Point | Type of Element | Equation 12 (Ref. 1) | Equation 13 (Ref. 1) | CUF | Remarks | 4 | ELB | 30043 | 24156 | .0212 | | 10 | ELB | 26592 | 22726 | .0144 | | 45 | ELB | 27084 | 26309 | .0185 | | 70 | ELB | 4271 | 21321 | .0048 | | 80 | GRUN | 1953 | 20547 | .0178 | | 83 | GRUN | 13062 | 19698 | .0268 | | 85 | GELB | 46162 | 22499 | .5908 | | 86 | GELB | 46620 | 21932 | .5378 | | 87 | GELB | 43990 | 22566 | .3598 | | 88 | GRUN | 18905 | 21862 | .0370 | | 95 | GRUN | 11783 | 22970 | .0216 | | 97 | GRUN | 18783 | 21000 | .0390 | | 98 | GRUN | 46688 | 21895 | .0641 | | 100 | ELB | 47850 | 19386 | .0603 | | 105 | ELB | 40465 | 19118 | .0342 | | 106 | GRUN | 38522 | 21718 | .0336 | | 109 | GRUN | 25187 | 25151 | .0173 | |
| Node Point | Type of Element | Equation 12 (Ref. 1) | Equation 13 (Ref. 1) | CUF | Remarks | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | ELB | 30043 | 24156 | .0212 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | ELB | 26592 | 22726 | .0144 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 45 | ELB | 27084 | 26309 | .0185 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 70 | ELB | 4271 | 21321 | .0048 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 80 | GRUN | 1953 | 20547 | .0178 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 83 | GRUN | 13062 | 19698 | .0268 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 85 | GELB | 46162 | 22499 | .5908 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 86 | GELB | 46620 | 21932 | .5378 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 87 | GELB | 43990 | 22566 | .3598 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 88 | GRUN | 18905 | 21862 | .0370 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 95 | GRUN | 11783 | 22970 | .0216 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 97 | GRUN | 18783 | 21000 | .0390 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 98 | GRUN | 46688 | 21895 | .0641 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 100 | ELB | 47850 | 19386 | .0603 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 105 | ELB | 40465 | 19118 | .0342 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 106 | GRUN | 38522 | 21718 | .0336 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 109 | GRUN | 25187 | 25151 | .0173 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Original CUF from Calc Rev. 3 pg. 2

STONE & WEBSTER ENGINEERING CORPORATION

CALCULATION SHEET

| CALCULATION IDENTIFICATION NUMBER | | | | PAGE <u>227</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------------------|---|-----------------------------|-------------------------|-----------------|------------|-----------------|-------------------------|-------------------------|-----|---------|-----|-----|-------|-------|-------|--|-----|------|-------|-------|-------|--|-----|------|-------|-------|-------|--|-----|-------------------------|-------|-------|-------|--|-----|------|------|-------|-------|--|-----|-------------------------|------|-------|-------|--|-----|-------------------------|------|-------|-------|--|-----|-----|------|-------|-------|--|--|--|--|--|--|--|----|-----|-------|-------|-------|--|--|--|--|--|--|--|-----|------|------|-------|-------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| J.O. OR W.O. NO. 12210 | DIVISION & GROUP NP(C) | CALCULATION NO. AX-17D-4 | OPTIONAL TASK CODE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| REF. | <p>9.0 <u>SUMMARY OF RESULTS (CONT'D)</u></p> <p>9.5 <u>CUMULATIVE USAGE FACTOR (CUF)</u></p> <p>9.5.1 <u>CUF FOR OTHER THAN BREAK EXCLUSION AREAS</u></p> <p style="text-align: center;">Allowable CUF = 1.0 (Ref. 1 NB-3600)</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 20px;"> <thead> <tr> <th>Node Point</th> <th>Type of Element</th> <th>Equation 12 (Ref. 1)</th> <th>Equation 13 (Ref. 1)</th> <th>CUF</th> <th>Remarks</th> </tr> </thead> <tbody> <tr><td>115</td><td>ELB</td><td>44761</td><td>22105</td><td>.0386</td><td></td></tr> <tr><td>116</td><td>GRUN</td><td>45450</td><td>24445</td><td>.0467</td><td></td></tr> <tr><td>117</td><td>GRUN</td><td>22832</td><td>22848</td><td>.0493</td><td></td></tr> <tr><td>119</td><td>GRUN_(AHEAD)</td><td>46486</td><td>32653</td><td>.4034</td><td></td></tr> <tr><td>122</td><td>GRUN</td><td>4768</td><td>22442</td><td>.0279</td><td></td></tr> <tr><td>125</td><td>GRUN_(AHEAD)</td><td>3908</td><td>32121</td><td>.0647</td><td></td></tr> <tr><td>140</td><td>GRUN_(AHEAD)</td><td>4611</td><td>21796</td><td>.0341</td><td></td></tr> <tr><td>145</td><td>ELB</td><td>9984</td><td>17497</td><td>.0073</td><td></td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td>82</td><td>TEE</td><td>29393</td><td>31388</td><td>.3479</td><td></td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td>286</td><td>GRUN</td><td>3985</td><td>17953</td><td>.0318</td><td></td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table> <p style="margin-top: 20px;">NOTE : For Nodes 20,941 & 143 see attachment #7.</p> | | | | Node Point | Type of Element | Equation 12 (Ref. 1) | Equation 13 (Ref. 1) | CUF | Remarks | 115 | ELB | 44761 | 22105 | .0386 | | 116 | GRUN | 45450 | 24445 | .0467 | | 117 | GRUN | 22832 | 22848 | .0493 | | 119 | GRUN _(AHEAD) | 46486 | 32653 | .4034 | | 122 | GRUN | 4768 | 22442 | .0279 | | 125 | GRUN _(AHEAD) | 3908 | 32121 | .0647 | | 140 | GRUN _(AHEAD) | 4611 | 21796 | .0341 | | 145 | ELB | 9984 | 17497 | .0073 | | | | | | | | 82 | TEE | 29393 | 31388 | .3479 | | | | | | | | 286 | GRUN | 3985 | 17953 | .0318 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Node Point | Type of Element | Equation 12 (Ref. 1) | Equation 13 (Ref. 1) | CUF | Remarks | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 115 | ELB | 44761 | 22105 | .0386 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 116 | GRUN | 45450 | 24445 | .0467 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 117 | GRUN | 22832 | 22848 | .0493 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 119 | GRUN _(AHEAD) | 46486 | 32653 | .4034 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 122 | GRUN | 4768 | 22442 | .0279 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 125 | GRUN _(AHEAD) | 3908 | 32121 | .0647 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 140 | GRUN _(AHEAD) | 4611 | 21796 | .0341 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 145 | ELB | 9984 | 17497 | .0073 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 82 | TEE | 29393 | 31388 | .3479 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 286 | GRUN | 3985 | 17953 | .0318 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Original CUF from Calc Rev. 3 pg. 3

STONE & WEBSTER ENGINEERING CORPORATION

CALCULATION SHEET

| CALCULATION IDENTIFICATION NUMBER | | | | PAGE <u>228</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------------------|--|-----------------------------|-------------------------|-----------------|------------------|------------|-----------------|-------------------------|-------------------------|-----|---------|-----|-----|-------|-------|-------|--|-----|------|------|-------|-------|--|-----|------|------|-------|-------|--|-----|------------------------|------|-------|-------|--|-----|------------------------|------|-------|-------|--|-----|------|------|-------|-------|--|-----|------|------|-------|-------|--|-----|------|------|-------|-------|--|-----|------|------|-------|-------|--|-----|------|-----|------|-------|--|-----|------|------|-------|-------|--|-----|------------------------|------|-------|-------|------------------|-----|------------------------|------|-------|-------|--|-----|-----|------|-------|-------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| JO. OR WO. NO. 12210 | DIVISION & GROUP NP(C) | CALCULATION NO. AX-17D-4 | OPTIONAL TASK CODE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| REF. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 9.0 <u>SUMMARY OF RESULTS</u> (CONT'D) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 9.5 <u>CUMULATIVE USAGE FACTOR (CUF)</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 9.5.2 <u>CUF FOR BREAK EXCLUSION AREAS</u> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Allowable CUF = 0.1 (Ref. 1 NB-3600) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="width: 10%;">Node Point</th> <th style="width: 10%;">Type of Element</th> <th style="width: 15%;">Equation 12 (Ref. 1)</th> <th style="width: 15%;">Equation 13 (Ref. 1)</th> <th style="width: 10%;">CUF</th> <th style="width: 40%;">Remarks</th> </tr> </thead> <tbody> <tr><td>150</td><td>ELB</td><td>13888</td><td>18042</td><td>.0095</td><td></td></tr> <tr><td>152</td><td>GRUN</td><td>8474</td><td>16886</td><td>.0213</td><td></td></tr> <tr><td>153</td><td>GRUN</td><td>8255</td><td>16503</td><td>.0202</td><td></td></tr> <tr><td>155</td><td>GRUN_(HAND)</td><td>8703</td><td>22108</td><td>.0418</td><td></td></tr> <tr><td>159</td><td>GRUN_(HAND)</td><td>6859</td><td>21232</td><td>.0752</td><td></td></tr> <tr><td>161</td><td>GRUN</td><td>6611</td><td>17146</td><td>.0572</td><td></td></tr> <tr><td>162</td><td>GRUN</td><td>6037</td><td>15432</td><td>.0374</td><td></td></tr> <tr><td>163</td><td>GRUN</td><td>3956</td><td>11738</td><td>.0294</td><td></td></tr> <tr><td>171</td><td>GRUN</td><td>1481</td><td>13385</td><td>.0386</td><td></td></tr> <tr><td>173</td><td>GRUN</td><td>899</td><td>9251</td><td>.0291</td><td></td></tr> <tr><td>202</td><td>GRUN</td><td>1312</td><td>18507</td><td>.0761</td><td></td></tr> <tr><td>205</td><td>GRUN_(HAND)</td><td>1307</td><td>27326</td><td>.0911</td><td>← See p. 271-272</td></tr> <tr><td>215</td><td>GRUN_(HAND)</td><td>1250</td><td>24542</td><td>.0514</td><td></td></tr> <tr><td>280</td><td>FIN</td><td>1583</td><td>17525</td><td>.0040</td><td></td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table> | | | | | Node Point | Type of Element | Equation 12 (Ref. 1) | Equation 13 (Ref. 1) | CUF | Remarks | 150 | ELB | 13888 | 18042 | .0095 | | 152 | GRUN | 8474 | 16886 | .0213 | | 153 | GRUN | 8255 | 16503 | .0202 | | 155 | GRUN _(HAND) | 8703 | 22108 | .0418 | | 159 | GRUN _(HAND) | 6859 | 21232 | .0752 | | 161 | GRUN | 6611 | 17146 | .0572 | | 162 | GRUN | 6037 | 15432 | .0374 | | 163 | GRUN | 3956 | 11738 | .0294 | | 171 | GRUN | 1481 | 13385 | .0386 | | 173 | GRUN | 899 | 9251 | .0291 | | 202 | GRUN | 1312 | 18507 | .0761 | | 205 | GRUN _(HAND) | 1307 | 27326 | .0911 | ← See p. 271-272 | 215 | GRUN _(HAND) | 1250 | 24542 | .0514 | | 280 | FIN | 1583 | 17525 | .0040 | | | | | | | | | | | | | | | | | | | |
| Node Point | Type of Element | Equation 12 (Ref. 1) | Equation 13 (Ref. 1) | CUF | Remarks | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 150 | ELB | 13888 | 18042 | .0095 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 152 | GRUN | 8474 | 16886 | .0213 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 153 | GRUN | 8255 | 16503 | .0202 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 155 | GRUN _(HAND) | 8703 | 22108 | .0418 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 159 | GRUN _(HAND) | 6859 | 21232 | .0752 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 161 | GRUN | 6611 | 17146 | .0572 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 162 | GRUN | 6037 | 15432 | .0374 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 163 | GRUN | 3956 | 11738 | .0294 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 171 | GRUN | 1481 | 13385 | .0386 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 173 | GRUN | 899 | 9251 | .0291 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 202 | GRUN | 1312 | 18507 | .0761 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 205 | GRUN _(HAND) | 1307 | 27326 | .0911 | ← See p. 271-272 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 215 | GRUN _(HAND) | 1250 | 24542 | .0514 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 280 | FIN | 1583 | 17525 | .0040 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Load Combinations for location 82 Tee (Break Points 60AW, BW, and CW) Addendum 3J

CLASS 1 CODE COMPLIANCE ANALYSIS

ME101/N4 RB/562367

07/17/96 HT5513 PAGE 8

RUN NO.2 FOR NODE POINTS 82, 85, 87, 100, 105, 110 & 125 OF AX-17D

LOAD TABLE FOR EQ. 11 AT LOCATION 82 (TEE)

| LOAD SET NO. | LOAD SET DESCRIPTION | NO. OF CYCLES | P | LEG | X | Y | Z | DT1 | DT2 | TA | TB |
|--------------|----------------------|---------------|-------|-----|-------|--------|--------|-------|-------|-------|-------|
| 1 | 1 DWT,DYNTTL*2 | 45 | .000 | RUN | .0 | .0 | .0 | .0 | .0 | 420.0 | 420.0 |
| | | | | RUN | .0 | .0 | .0 | | | | |
| | | | | BRA | .0 | .0 | .0 | | | | |
| 2 | 2 DWT,SRVFT*2 | 45 | .000 | RUN | .0 | .0 | .0 | .0 | .0 | 420.0 | 420.0 |
| | | | | RUN | .0 | .0 | .0 | | | | |
| | | | | BRA | .0 | .0 | .0 | | | | |
| 3 | 3 DWT,SRV*2 | 7875 | .000 | RUN | .0 | .0 | .0 | .0 | .0 | 420.0 | 420.0 |
| | | | | RUN | .0 | .0 | .0 | | | | |
| | | | | BRA | .0 | .0 | .0 | | | | |
| 4 | 4 P,THMD28,DYNTTL | 1 | .020 | RUN | .0 | 221.6 | 18.1 | -66.0 | -14.0 | 70.0 | 104.0 |
| | | | | RUN | .0 | .0 | .0 | | | | |
| | | | | BRA | 413.2 | 432.2 | -131.8 | | | | |
| 5 | 5 P,THMD15,DYNTTL | 4 | .020 | RUN | .0 | 530.0 | 50.0 | -60.0 | -9.0 | 70.0 | 88.0 |
| | | | | RUN | .0 | .0 | .0 | | | | |
| | | | | BRA | 897.8 | 1095.5 | -306.2 | | | | |
| 6 | 6 P,THMD15,SRVFT | 5 | .020 | RUN | .0 | 530.0 | 50.0 | -60.0 | -9.0 | 70.0 | 88.0 |
| | | | | RUN | .0 | .0 | .0 | | | | |
| | | | | BRA | 897.8 | 1095.5 | -306.2 | | | | |
| 7 | 7 P,THMD15,SRV16V | 191 | .020 | RUN | .0 | 530.0 | 50.0 | -60.0 | -9.0 | 70.0 | 88.0 |
| | | | | RUN | .0 | .0 | .0 | | | | |
| | | | | BRA | 897.8 | 1095.5 | -306.2 | | | | |
| 8 | 8 P,THMD34,SRV16V | 1 | 1.516 | RUN | .0 | 530.0 | 50.0 | -60.0 | -9.0 | 70.0 | 88.0 |
| | | | | RUN | .0 | .0 | .0 | | | | |
| | | | | BRA | 897.8 | 1095.5 | -306.2 | | | | |
| 9 | 9 P,THMD35,SRV16V | 98 | 1.175 | RUN | .0 | 530.0 | 50.0 | -60.0 | -9.0 | 70.0 | 88.0 |
| | | | | RUN | .0 | .0 | .0 | | | | |
| | | | | BRA | 897.8 | 1095.5 | -306.2 | | | | |
| 10 | 10 P,THMD35,SRV1V | 92 | 1.175 | RUN | .0 | 530.0 | 50.0 | -60.0 | -9.0 | 70.0 | 88.0 |
| | | | | RUN | .0 | .0 | .0 | | | | |
| | | | | BRA | 897.8 | 1095.5 | -306.2 | | | | |
| 11 | 11 P,THMD32,SRV1V | 10 | .120 | RUN | .0 | 530.0 | 50.0 | -16.0 | -2.0 | 70.0 | 95.0 |
| | | | | RUN | .0 | .0 | .0 | | | | |
| | | | | BRA | 897.8 | 1095.5 | -306.2 | | | | |
| 12 | 12 P,THMD31,SRV1V | 15 | .200 | RUN | .0 | 418.7 | 39.5 | -40.0 | -6.0 | 70.0 | 90.0 |
| | | | | RUN | .0 | .0 | .0 | | | | |
| | | | | BRA | 709.3 | 865.4 | -241.9 | | | | |
| 13 | 13 P,THMD23,SRV1V | 126 | .050 | RUN | .0 | 113.6 | 9.3 | -20.0 | -3.0 | 70.0 | 77.0 |
| | | | | RUN | .0 | .0 | .0 | | | | |
| | | | | BRA | 211.9 | 221.6 | -67.6 | | | | |
| 14 | 14 P,THMD29,SRV1V | 106 | 1.100 | RUN | .0 | 530.0 | 50.0 | .0 | .0 | 70.0 | 70.0 |
| | | | | RUN | .0 | .0 | .0 | | | | |
| | | | | BRA | 897.8 | 1095.5 | -306.2 | | | | |

TABLE CONTINUED

Load Combinations for location 82 Tee (Break Points 60AW, BW, and CW) Addendum 3J pg. 2

CLASS 1 CODE COMPLIANCE ANALYSIS

ME101/N4 RB/562367

07/17/96 HT5513 PAGE

9

RUN NO.2 FOR NODE POINTS 82, 85, 87, 100, 105, 110 & 125 OF AX-17D

LOAD TABLE FOR EQ. 11 AT LOCATION 82 (TEE)

| LOAD | NO. OF | | | | | | | | | | | |
|------------------------------|--------|-------|-----|--------|--------|--------|-------|------|-------|-------|--|--|
| SET NO: LOAD SET DESCRIPTION | CYCLES | P | LEG | X | Y | Z | DT1 | DT2 | TA | TB | | |
| 15 :15 P, THMD26, SRV1V | 249 | .000 | RUN | .0 | 122.7 | 10.0 | -1.0 | .0 | 70.0 | 71.0 | | |
| | | | RUN | .0 | .0 | .0 | | | | | | |
| | | | BRA | 228.8 | 239.4 | -73.0 | | | | | | |
| 16 :16 P, THMD20, SRV1V | 15 | .700 | RUN | .0 | 445.2 | 42.0 | -49.0 | -7.0 | 70.0 | 97.0 | | |
| | | | RUN | .0 | .0 | .0 | | | | | | |
| | | | BRA | 754.2 | 920.2 | -257.2 | | | | | | |
| 17 :17 P, THMD04, SRV1V | 40 | 1.250 | RUN | .0 | 74.1 | 22.3 | .0 | .0 | 180.0 | 180.0 | | |
| | | | RUN | .0 | .0 | .0 | | | | | | |
| | | | BRA | 29.6 | 162.6 | -19.7 | | | | | | |
| 18 :18 P, THMD02, SRV1V | 442 | 1.100 | RUN | .0 | 530.0 | 50.0 | .0 | .0 | 70.0 | 70.0 | | |
| | | | RUN | .0 | .0 | .0 | | | | | | |
| | | | BRA | 897.8 | 1095.5 | -306.2 | | | | | | |
| 19 :19 P, THMD07 | 307 | 1.100 | RUN | .0 | 371.2 | 114.3 | 57.0 | 8.0 | 97.0 | 70.0 | | |
| | | | RUN | .0 | .0 | .0 | | | | | | |
| | | | BRA | 75.1 | 864.4 | -92.2 | | | | | | |
| 20 :20 P, THMD22 | 96 | .050 | RUN | .0 | 109.1 | 8.9 | 28.0 | 4.0 | 80.0 | 70.0 | | |
| | | | RUN | .0 | .0 | .0 | | | | | | |
| | | | BRA | 203.4 | 212.8 | -64.9 | | | | | | |
| 21 :21 P, THMD08 | 15 | 1.100 | RUN | .0 | 371.2 | 114.3 | 55.0 | 8.0 | 90.0 | 70.0 | | |
| | | | RUN | .0 | .0 | .0 | | | | | | |
| | | | BRA | 75.1 | 864.4 | -92.2 | | | | | | |
| 22 :22 P, THMD14 | 70 | 1.100 | RUN | .0 | 31.6 | 140.9 | 27.0 | 4.0 | 81.0 | 70.0 | | |
| | | | RUN | .0 | .0 | .0 | | | | | | |
| | | | BRA | -270.3 | 767.9 | -2.7 | | | | | | |
| 23 :23 P, THMD11 | 9999 | 1.100 | RUN | .0 | 31.6 | 140.9 | 2.0 | .0 | 71.0 | 70.0 | | |
| | | | RUN | .0 | .0 | .0 | | | | | | |
| | | | BRA | -270.3 | 767.9 | -2.7 | | | | | | |
| 24 :24 P, THMD18 | 30 | 1.050 | RUN | .0 | 30.7 | 136.6 | 22.0 | 3.0 | 91.0 | 70.0 | | |
| | | | RUN | .0 | .0 | .0 | | | | | | |
| | | | BRA | -262.2 | 744.9 | -2.6 | | | | | | |
| 25 :25 P, THMD21 | 15 | .700 | RUN | .0 | 28.5 | 126.8 | 26.0 | 4.0 | 92.0 | 70.0 | | |
| | | | RUN | .0 | .0 | .0 | | | | | | |
| | | | BRA | -243.3 | 691.1 | -2.5 | | | | | | |
| 26 :26 P, THMD27 | 10 | 1.335 | RUN | .0 | .0 | .1 | 3.0 | 1.0 | 70.0 | 70.0 | | |
| | | | RUN | .0 | .0 | .0 | | | | | | |
| | | | BRA | -312.1 | 800.4 | -4.2 | | | | | | |
| 27 :27 P, THMD24 | 207 | .050 | RUN | .0 | 79.7 | 23.9 | 20.0 | 3.0 | 77.0 | 70.0 | | |
| | | | RUN | .0 | .0 | .0 | | | | | | |
| | | | BRA | 31.8 | 174.8 | -21.2 | | | | | | |

*NOTE: OBE AND SAM MOMENTS ARE INCLUDED IN RANGE VALUE CALCULATIONS NOT IN THESE SINGLE SET COMBINED MOMENTS.

CUF Summary for location 82 Tee (Break Points 60AW, BW, and CW) Addendum 3J

CLASS 1 CODE COMPLIANCE ANALYSIS

ME101/N4 RB/562367

07/17/96 HT5513 PAGE 13

RUN NO.2 FOR NODE POINTS 82, 85, 87, 100, 105, 110 & 125 OF AX-17D

SUMMARY OF CALCULATIONS OF CUMULATIVE USAGE FACTOR AT LOCATION 82 (TEE)

| LOAD PAIR: | EQ.11 | | EQ.14 | OCCURENCE | | SET | CYCLES LEFT | ALLOW. | FATIGUE |
|------------|---------|-------|---------|-----------|------|------------------|-------------|--------|---------|
| I : J | S-P | K-E | SP*KE/2 | N-I | N-J | ELIM- INATED: | N-I | N-J | N-D |
| 5 : 17 | 110.618 | 1.278 | 70.688 | 4 | 40 | 4 : 5, 5 | 0 | 36 | 1560 |
| 8 : 27 | 114.409 | 1.117 | 63.908 | 1 | 207 | 1 : 8, 8 | 0 | 206 | 2116 |
| 6 : 17 | 105.304 | 1.099 | 57.861 | 5 | 36 | 5 : 6, 6 | 0 | 31 | 2872 |
| 7 : 17 | 104.913 | 1.086 | 56.954 | 191 | 31 | 31 : 17, 17 | 160 | 0 | 3015 |
| 4 : 19 | 102.164 | 1.055 | 53.886 | 1 | 307 | 1 : 4, 4 | 0 | 306 | 3575 |
| 7 : 26 | 103.322 | 1.000 | 51.661 | 160 | 10 | 10 : 26, 26 | 150 | 0 | 4070 |
| 9 : 27 | 99.310 | 1.000 | 49.655 | 98 | 206 | 98 : 9, 9 | 0 | 108 | 4589 |
| 7 : 22 | 97.888 | 1.000 | 48.944 | 150 | 70 | 70 : 22, 22 | 80 | 0 | 4782 |
| 10 : 27 | 97.096 | 1.000 | 48.548 | 92 | 108 | 92 : 10, 10 | 0 | 16 | 4894 |
| 7 : 19 | 96.828 | 1.000 | 48.414 | 80 | 306 | 80 : 7, 7 | 0 | 226 | 4932 |
| 11 : 19 | 84.396 | 1.000 | 42.198 | 10 | 226 | 10 : 11, 11 | 0 | 216 | 7297 |
| 13 : 18 | 83.494 | 1.000 | 41.747 | 126 | 442 | 126 : 13, 13 | 0 | 316 | 7524 |
| 18 : 27 | 81.278 | 1.000 | 40.639 | 316 | 16 | 16 : 27, 27 | 300 | 0 | 8124 |
| 15 : 18 | 81.176 | 1.000 | 40.588 | 249 | 300 | 249 : 15, 15 | 0 | 51 | 8153 |
| 18 : 20 | 80.354 | 1.000 | 40.177 | 51 | 96 | 51 : 18, 18 | 0 | 45 | 8393 |
| 14 : 20 | 80.354 | 1.000 | 40.177 | 106 | 45 | 45 : 20, 20 | 61 | 0 | 8393 |
| 12 : 19 | 78.891 | 1.000 | 39.445 | 15 | 216 | 15 : 12, 12 | 0 | 201 | 8860 |
| 16 : 19 | 60.394 | 1.000 | 30.197 | 15 | 201 | 15 : 16, 16 | 0 | 186 | 19614 |
| 14 : 25 | 54.973 | 1.000 | 27.487 | 61 | 15 | 15 : 25, 25 | 46 | 0 | 28304 |
| 14 : 24 | 38.532 | 1.000 | 19.266 | 46 | 30 | 30 : 24, 24 | 16 | 0 | 118363 |
| 14 : 19 | 34.341 | 1.000 | 17.171 | 16 | 186 | 16 : 14, 14 | 0 | 170 | 198889 |
| 1 : 1 | 27.725 | 1.000 | 13.863 | 45 | 45 | 45 : 1, 1 | 0 | 0 | 521826 |
| 19 : 23 | 21.741 | 1.000 | 10.870 | 170 | 9999 | 170 : 19, 19 | 0 | 9829 | >1.E6 |
| 21 : 23 | 20.312 | 1.000 | 10.156 | 15 | 9829 | 15 : 21, 21 | 0 | 9814 | >1.E6 |
| 2 : 2 | 16.195 | 1.000 | 8.097 | 45 | 45 | 45 : 2, 2 | 0 | 0 | >1.E6 |
| 3 : 3 | 15.242 | 1.000 | 7.621 | 7875 | 7875 | 7875 : 3, 3 | 0 | 0 | >1.E6 |

TOTAL USAGE FACTOR= .1543

Load Combinations for location 85 (Break Point 71W) Addendum 3J

CLASS 1 CODE COMPLIANCE ANALYSIS

ME101/N4 RB/562367

07/17/96 HT5513 PAGE 14

RUN NO.2 FOR NODE POINTS 82, 85, 87, 100, 105, 110 & 125 OF AX-17D

LOAD TABLE FOR EQ.11 AT LOCATION 85 (CURB)

| LOAD | NO. OF | | | | | | | | | | |
|-----------------------------|-------------|---|---------|---------|---------|--------|--------|--------|--------|--|--|
| SET NO:LOAD SET DESCRIPTION | CYCLES | P | X | Y | Z | DT1 | DT2 | TA | TB | | |
| 1 : 1 DWT,DYNTTL*2 | 45: .000: | | .0: | .0: | .0: | .0: | .0: | 420.0: | 420.0: | | |
| 2 : 2 DWT,SRVFT*2 | 45: .000: | | .0: | .0: | .0: | .0: | .0: | 420.0: | 420.0: | | |
| 3 : 3 DWT,SRV*2 | 7875: .000: | | .0: | .0: | .0: | .0: | .0: | 420.0: | 420.0: | | |
| 4 : 4 P,THMD28,DYNTTL | 1: .020: | | 413.2: | -48.0: | -139.8: | -57.0: | -10.0: | 70.0: | 70.0: | | |
| 5 : 5 P,THMD15,DYNTTL | 4: .020: | | 897.8: | -118.4: | -411.6: | -36.0: | -5.0: | 70.0: | 70.0: | | |
| 6 : 6 P,THMD15,SRVFT | 5: .020: | | 897.8: | -118.4: | -411.6: | -36.0: | -5.0: | 70.0: | 70.0: | | |
| 7 : 7 P,THMD15,SRV16V | 191: .020: | | 897.8: | -118.4: | -411.6: | -36.0: | -5.0: | 70.0: | 70.0: | | |
| 8 : 8 P,THMD34,SRV16V | 1:1.516: | | 897.8: | -118.4: | -411.6: | -36.0: | -5.0: | 70.0: | 70.0: | | |
| 9 : 9 P,THMD35,SRV16V | 98:1.175: | | 897.8: | -118.4: | -411.6: | -36.0: | -5.0: | 70.0: | 70.0: | | |
| 10 :10 P,THMD35,SRV1V | 92:1.175: | | 897.8: | -118.4: | -411.6: | -36.0: | -5.0: | 70.0: | 70.0: | | |
| 11 :11 P,THMD32,SRV1V | 10: .120: | | 897.8: | -118.4: | -411.6: | -12.0: | -2.0: | 70.0: | 70.0: | | |
| 12 :12 P,THMD31,SRV1V | 15: .200: | | 709.3: | -93.6: | -325.2: | -30.0: | -4.0: | 70.0: | 70.0: | | |
| 13 :13 P,THMD23,SRV1V | 126: .050: | | 211.9: | -24.6: | -71.7: | -13.0: | -2.0: | 70.0: | 70.0: | | |
| 14 :14 P,THMD29,SRV1V | 106:1.100: | | 897.8: | -118.4: | -411.6: | .0: | .0: | 70.0: | 70.0: | | |
| 15 :15 P,THMD26,SRV1V | 249: .000: | | 228.8: | -26.6: | -77.4: | -3.0: | .0: | 70.0: | 70.0: | | |
| 16 :16 P,THMD20,SRV1V | 15: .700: | | 754.2: | -99.5: | -345.8: | -36.0: | -5.0: | 70.0: | 70.0: | | |
| 17 :17 P,THMD04,SRV1V | 40:1.250: | | 29.6: | -8.6: | -88.8: | .0: | .0: | 180.0: | 180.0: | | |
| 18 :18 P,THMD02,SRV1V | 442:1.100: | | 897.8: | -118.4: | -411.6: | .0: | .0: | 70.0: | 70.0: | | |
| 19 :19 P,THMD07 | 307:1.100: | | 75.1: | -46.3: | -505.0: | 31.0: | 4.0: | 70.0: | 70.0: | | |
| 20 :20 P,THMD22 | 96: .050: | | 203.4: | -23.7: | -68.8: | 19.0: | 3.0: | 70.0: | 70.0: | | |
| 21 :21 P,THMD08 | 15:1.100: | | 75.1: | -46.3: | -505.0: | 31.0: | 4.0: | 70.0: | 70.0: | | |
| 22 :22 P,THMD14 | 70:1.100: | | -270.3: | -16.6: | -546.5: | 15.0: | 2.0: | 70.0: | 70.0: | | |
| 23 :23 P,THMD11 | 9999:1.100: | | -270.3: | -16.6: | -546.5: | 1.0: | .0: | 70.0: | 70.0: | | |
| 24 :24 P,THMD18 | 30:1.050: | | -262.2: | -16.1: | -530.1: | 16.0: | 2.0: | 70.0: | 70.0: | | |
| 25 :25 P,THMD21 | 15: .700: | | -243.3: | -14.9: | -491.9: | 17.0: | 3.0: | 70.0: | 70.0: | | |
| 26 :26 P,THMD27 | 10:1.335: | | -312.1: | -25.8: | -597.5: | 3.0: | .0: | 70.0: | 70.0: | | |
| 27 :27 P,THMD24 | 207: .050: | | 31.8: | -9.3: | -95.5: | 13.0: | 2.0: | 70.0: | 70.0: | | |

*NOTE: OBE AND SAM MOMENTS ARE INCLUDED IN RANGE VALUE CALCULATIONS NOT IN THESE SINGLE SET COMBINED MOMENTS.

CUF Summary for location 85 (Break Point 71 W) Addendum 3J

07/17/96 HT5513 PAGE 17

RUN NO.2 FOR NODE POINTS 82, 85, 87, 100, 105, 110 & 125 OF AX-17D

SUMMARY OF CALCULATIONS OF CUMULATIVE USAGE FACTOR AT LOCATION 85 (CURB)

| LOAD PAIR: | | EQ.11 | K-E | EQ.14 | OCCURENCE | | N | SET | CYCLES LEFT | | ALLOW. | FATIGUE |
|------------|----|---------|-------|---------|-----------|------|------|------------------|-------------|------|--------|---------|
| I | J | S-P | | SP*KE/2 | N-I | N-J | | ELIM- INATED: | N-I | N-J | CYCLES | USAGE |
| | | | | | | | | | | | | FACTOR |
| 5 | 26 | 122.449 | 1.138 | 69.654 | 4 | 10 | 4 | 5, 5 | 0 | 6 | 1624 | .0025 |
| 6 | 26 | 106.705 | 1.000 | 53.353 | 5 | 6 | 5 | 6, 6 | 0 | 1 | 3686 | .0014 |
| 7 | 26 | 106.629 | 1.000 | 53.314 | 191 | 1 | 1 | 26, 26 | 190 | 0 | 3694 | .0003 |
| 7 | 22 | 103.506 | 1.000 | 51.753 | 190 | 70 | 70 | 22, 22 | 120 | 0 | 4047 | .0173 |
| 7 | 24 | 102.375 | 1.000 | 51.188 | 120 | 30 | 30 | 24, 24 | 90 | 0 | 4186 | .0072 |
| 7 | 23 | 99.903 | 1.000 | 49.952 | 90 | 9999 | 90 | 7, 7 | 0 | 9909 | 4512 | .0199 |
| 4 | 23 | 99.293 | 1.000 | 49.646 | 1 | 9909 | 1 | 4, 4 | 0 | 9908 | 4591 | .0002 |
| 8 | 25 | 98.410 | 1.000 | 49.205 | 1 | 15 | 1 | 8, 8 | 0 | 14 | 4710 | .0002 |
| 9 | 25 | 93.735 | 1.000 | 46.868 | 98 | 14 | 14 | 25, 25 | 84 | 0 | 5411 | .0026 |
| 11 | 23 | 91.062 | 1.000 | 45.531 | 10 | 9908 | 10 | 11, 11 | 0 | 9898 | 5876 | .0017 |
| 9 | 27 | 89.750 | 1.000 | 44.875 | 84 | 207 | 84 | 9, 9 | 0 | 123 | 6124 | .0137 |
| 10 | 27 | 87.926 | 1.000 | 43.963 | 92 | 123 | 92 | 10, 10 | 0 | 31 | 6493 | .0142 |
| 12 | 23 | 84.395 | 1.000 | 42.197 | 15 | 9898 | 15 | 12, 12 | 0 | 9883 | 7298 | .0021 |
| 16 | 23 | 81.435 | 1.000 | 40.717 | 15 | 9883 | 15 | 16, 16 | 0 | 9868 | 8080 | .0019 |
| 18 | 27 | 77.671 | 1.000 | 38.835 | 442 | 31 | 31 | 27, 27 | 411 | 0 | 9280 | .0033 |
| 18 | 23 | 74.465 | 1.000 | 37.233 | 411 | 9868 | 411 | 18, 18 | 0 | 9457 | 10520 | .0391 |
| 14 | 23 | 74.465 | 1.000 | 37.233 | 106 | 9457 | 106 | 14, 14 | 0 | 9351 | 10520 | .0101 |
| 13 | 23 | 63.650 | 1.000 | 31.825 | 126 | 9351 | 126 | 13, 13 | 0 | 9225 | 16778 | .0075 |
| 15 | 23 | 62.078 | 1.000 | 31.039 | 249 | 9225 | 249 | 15, 15 | 0 | 8976 | 18073 | .0138 |
| 20 | 23 | 59.884 | 1.000 | 29.942 | 96 | 8976 | 96 | 20, 20 | 0 | 8880 | 20154 | .0048 |
| 1 | 1 | 43.433 | 1.000 | 21.716 | 45 | 45 | 45 | 1, 1 | 0 | 0 | 72123 | .0006 |
| 17 | 23 | 40.325 | 1.000 | 20.162 | 40 | 8880 | 40 | 17, 17 | 0 | 8840 | 96840 | .0004 |
| 21 | 23 | 28.791 | 1.000 | 14.396 | 15 | 8840 | 15 | 21, 21 | 0 | 8825 | 440221 | .0000 |
| 19 | 23 | 28.791 | 1.000 | 14.396 | 307 | 8825 | 307 | 19, 19 | 0 | 8518 | 440221 | .0007 |
| 2 | 2 | 15.333 | 1.000 | 7.667 | 45 | 45 | 45 | 2, 2 | 0 | 0 | >1.E6 | 0 |
| 3 | 3 | 14.855 | 1.000 | 7.427 | 7875 | 7875 | 7875 | 3, 3 | 0 | 0 | >1.E6 | 0 |

TOTAL USAGE FACTOR- .1653

Load Combinations for location 87 (Break Point 70W) Addendum 3J

CLASS 1 CODE COMPLIANCE ANALYSIS

ME101/N4 RB/562367

07/17/96 HT5513 PAGE 18

RUN NO.2 FOR NODE POINTS 82, 85, 87, 100, 105, 110 & 125 OF AX-17D

LOAD TABLE FOR EQ.11 AT LOCATION 87 (CURE)

| LOAD : | NO. OF : | | | | | | | | |
|------------------------------|----------|--------|--------|---------|---------|--------|-------|--------|--------|
| SET NO:LOAD SET DESCRIPTION: | CYCLES: | P : | X * : | Y * : | Z * : | DT1 : | DT2 : | TA : | TB : |
| 1 : 1 DWT,DYNTTL*2 | 45: | .000: | .0: | .0: | .0: | .0: | .0: | 420.0: | 420.0: |
| 2 : 2 DWT,SRVFT*2 | 45: | .000: | .0: | .0: | .0: | .0: | .0: | 420.0: | 420.0: |
| 3 : 3 DWT,SRV*2 | 7875: | .000: | .0: | .0: | .0: | .0: | .0: | 420.0: | 420.0: |
| 4 : 4 P,THMD28,DYNTTL | 1: | .020: | 34.3: | -317.9: | -150.1: | -46.0: | -8.0: | 70.0: | 103.0: |
| 5 : 5 P,THMD15,DYNTTL | 4: | .020: | 66.1: | -649.7: | -359.0: | -21.0: | -3.0: | 70.0: | 80.0: |
| 6 : 6 P,THMD15,SRVFT | 5: | .020: | 66.1: | -649.7: | -359.0: | -21.0: | -3.0: | 70.0: | 80.0: |
| 7 : 7 P,THMD15,SRV16V | 191: | .020: | 66.1: | -649.7: | -359.0: | -21.0: | -3.0: | 70.0: | 80.0: |
| 8 : 8 P,THMD34,SRV16V | 1: | 1.516: | 66.1: | -649.7: | -359.0: | -21.0: | -3.0: | 70.0: | 80.0: |
| 9 : 9 P,THMD35,SRV16V | 98: | 1.175: | 66.1: | -649.7: | -359.0: | -21.0: | -3.0: | 70.0: | 80.0: |
| 10 : 10 P,THMD35,SRV1V | 92: | 1.175: | 66.1: | -649.7: | -359.0: | -21.0: | -3.0: | 70.0: | 80.0: |
| 11 : 11 P,THMD32,SRV1V | 10: | .120: | 66.1: | -649.7: | -359.0: | -9.0: | -1.0: | 70.0: | 94.0: |
| 12 : 12 P,THMD31,SRV1V | 15: | .200: | 52.2: | -513.3: | -283.6: | -21.0: | -3.0: | 70.0: | 91.0: |
| 13 : 13 P,THMD23,SRV1V | 126: | .050: | 17.6: | -163.0: | -77.0: | -8.0: | -1.0: | 70.0: | 75.0: |
| 14 : 14 P,THMD29,SRV1V | 106: | 1.100: | 66.1: | -649.7: | -359.0: | .0: | .0: | 70.0: | 70.0: |
| 15 : 15 P,THMD26,SRV1V | 249: | .000: | 19.0: | -176.0: | -83.1: | .0: | .0: | 70.0: | 70.0: |
| 16 : 16 P,THMD20,SRV1V | 15: | .700: | 55.5: | -545.7: | -301.6: | -25.0: | -4.0: | 70.0: | 94.0: |
| 17 : 17 P,THMD04,SRV1V | 40: | 1.250: | 2.3: | -2.0: | -24.5: | .0: | .0: | 180.0: | 180.0: |
| 18 : 18 P,THMD02,SRV1V | 442: | 1.100: | 66.1: | -649.7: | -359.0: | .0: | .0: | 70.0: | 70.0: |
| 19 : 19 P,THMD07 | 307: | 1.100: | -1.3: | 76.7: | -119.2: | 17.0: | 3.0: | 81.0: | 70.0: |
| 20 : 20 P,THMD22 | 96: | .050: | 16.9: | -156.5: | -73.9: | 12.0: | 2.0: | 78.0: | 70.0: |
| 21 : 21 P,THMD08 | 15: | 1.100: | -1.3: | 76.7: | -119.2: | 17.0: | 3.0: | 81.0: | 70.0: |
| 22 : 22 P,THMD14 | 70: | 1.100: | -30.2: | 383.9: | -21.0: | 8.0: | 1.0: | 75.0: | 70.0: |
| 23 : 23 P,THMD11 | 9999: | 1.100: | -30.2: | 383.9: | -21.0: | 1.0: | .0: | 70.0: | 70.0: |
| 24 : 24 P,THMD18 | 30: | 1.050: | -29.3: | 372.4: | -20.3: | 11.0: | 2.0: | 90.0: | 70.0: |
| 25 : 25 P,THMD21 | 15: | .700: | -27.2: | 345.5: | -18.9: | 12.0: | 2.0: | 90.0: | 70.0: |
| 26 : 26 P,THMD27 | 10: | 1.335: | -47.1: | 449.7: | -38.4: | 2.0: | .0: | 72.0: | 70.0: |
| 27 : 27 P,THMD24 | 207: | .050: | 2.5: | -2.1: | -26.3: | 8.0: | 1.0: | 75.0: | 70.0: |

*NOTE: OBE AND SAM MOMENTS ARE INCLUDED IN RANGE VALUE CALCULATIONS NOT IN THESE SINGLE SET COMBINED MOMENTS.

CUF Summary for location 87 (Break Point 70W) Addendum 3J

CLASS 1 CODE COMPLIANCE ANALYSIS

MR101/N4 RB/562367

07/17/96 HT5513 PAGE 21

RUN NO.2 FOR NODE POINTS 82, 85, 87, 100, 105, 110 & 125 OF AX-17D

SUMMARY OF CALCULATIONS OF CUMULATIVE USAGE FACTOR AT LOCATION 87 (CURE)

| LOAD PAIR: | EQ.11 | | BQ.14 | OCCURENCE | | SET | CYCLES LEFT | ALLON. | FATIGUE |
|------------|---------|-------|---------|-------------|--------------|------------------|-------------|-----------------|---------------------|
| I : J | S-P | K-E | SP*KE/2 | N-I : N-J | N | ELIM- INATED: | N-I : N-J | CYCLES : N-D | USAGE : FACTOR : |
| 5 : 26 | 116.448 | 1.032 | 60.069 | 4 : 10 | 4 : 5, 5 | 0 : | 6 : | 2560 : | .0016 : |
| 6 : 24 | 107.363 | 1.000 | 53.681 | 5 : 30 | 5 : 6, 6 | 0 : | 25 : | 3617 : | .0014 : |
| 7 : 24 | 107.052 | 1.000 | 53.526 | 191 : 25 | 25 : 24, 24 | 166 : | 0 : | 3649 : | .0068 : |
| 7 : 26 | 106.937 | 1.000 | 53.469 | 166 : 6 | 6 : 26, 26 | 160 : | 0 : | 3661 : | .0016 : |
| 8 : 25 | 103.054 | 1.000 | 51.527 | 1 : 15 | 1 : 8, 8 | 0 : | 14 : | 4102 : | .0002 : |
| 7 : 22 | 102.808 | 1.000 | 51.404 | 160 : 70 | 70 : 22, 22 | 90 : | 0 : | 4132 : | .0169 : |
| 7 : 25 | 101.398 | 1.000 | 50.699 | 90 : 14 | 14 : 25, 25 | 76 : | 0 : | 4312 : | .0032 : |
| 7 : 23 | 99.464 | 1.000 | 49.732 | 76 : 9999 | 76 : 7, 7 | 0 : | 9923 : | 4569 : | .0166 : |
| 4 : 23 | 97.942 | 1.000 | 48.971 | 1 : 9923 | 1 : 4, 4 | 0 : | 9922 : | 4774 : | .0002 : |
| 11 : 23 | 97.159 | 1.000 | 48.580 | 10 : 9922 | 10 : 11, 11 | 0 : | 9912 : | 4885 : | .0020 : |
| 12 : 23 | 98.400 | 1.000 | 44.200 | 15 : 9912 | 15 : 12, 12 | 0 : | 9897 : | 6394 : | .0023 : |
| 9 : 23 | 87.226 | 1.000 | 43.613 | 98 : 9897 | 98 : 9, 9 | 0 : | 9799 : | 6643 : | .0148 : |
| 16 : 23 | 86.759 | 1.000 | 43.379 | 15 : 9799 | 15 : 16, 16 | 0 : | 9784 : | 6745 : | .0022 : |
| 10 : 23 | 84.983 | 1.000 | 42.492 | 92 : 9784 | 92 : 10, 10 | 0 : | 9692 : | 7155 : | .0129 : |
| 18 : 23 | 75.581 | 1.000 | 37.791 | 442 : 9692 | 442 : 18, 18 | 0 : | 9250 : | 10064 : | .0439 : |
| 14 : 23 | 75.581 | 1.000 | 37.791 | 106 : 9250 | 106 : 14, 14 | 0 : | 9144 : | 10064 : | .0105 : |
| 13 : 23 | 56.410 | 1.000 | 28.205 | 126 : 9144 | 126 : 13, 13 | 0 : | 9018 : | 25549 : | .0049 : |
| 15 : 23 | 54.364 | 1.000 | 27.182 | 249 : 9018 | 249 : 15, 15 | 0 : | 8769 : | 29585 : | .0084 : |
| 20 : 23 | 53.661 | 1.000 | 26.831 | 96 : 8769 | 96 : 20, 20 | 0 : | 8673 : | 31153 : | .0031 : |
| 23 : 27 | 41.342 | 1.000 | 20.671 | 8673 : 207 | 207 : 27, 27 | 8466 : | 0 : | 87718 : | .0024 : |
| 1 : 1 | 34.312 | 1.000 | 17.156 | 45 : 45 | 45 : 1, 1 | 0 : | 0 : | 199658 : | .0002 : |
| 17 : 23 | 30.989 | 1.000 | 15.495 | 40 : 8466 | 40 : 17, 17 | 0 : | 8426 : | 315988 : | .0001 : |
| 21 : 23 | 28.768 | 1.000 | 14.384 | 15 : 8426 | 15 : 21, 21 | 0 : | 8411 : | 441844 : | .0000 : |
| 19 : 23 | 28.768 | 1.000 | 14.384 | 307 : 8411 | 307 : 19, 19 | 0 : | 8104 : | 441844 : | .0007 : |
| 2 : 2 | 14.504 | 1.000 | 7.252 | 45 : 45 | 45 : 2, 2 | 0 : | 0 : | >1.E6 : | 0 : |
| 3 : 3 | 13.928 | 1.000 | 6.964 | 7875 : 7875 | 7875 : 3, 3 | 0 : | 0 : | >1.E6 : | 0 : |

TOTAL USAGE FACTOR= .1572

Load Combinations for location 82 Tee (Break Points 60AW, BW, and CW) Addendum 3K (M96-0069)

AX-17D REV. 3K ATTACHMENT "D" PAGE 64 OF 156

1

CLASS 1 CODE COMPLIANCE ANALYSIS

MR101/N4 RB/562367

06/13/97 IP2010 PAGE 8

RUN NO.2 FOR NODE POINTS 82, 85, 87, 100, 105, 110 & 125 OF AX-17D

LOAD TABLE FOR EQ. 11 AT LOCATION 82 (TEE)

| LOAD | NO. OF | LEG | X | Y | Z | DT1 | DT2 | TA | TB |
|---------------------------------------|--------|------------|--------|---------|---------|--------|--------|--------|--------|
| SET NO: LOAD SET DESCRIPTION: CYCLES: | P | | | | | | | | |
| 1 : 1 DWT, DYNITL*2 | 45 | .000:RUN: | .0: | .0: | .0: | .0: | .0: | 420.0: | 420.0: |
| | | :BRA: | .0: | .0: | .0: | | | | |
| 2 : 2 DWT, SRVFT*2 | 45 | .000:RUN: | .0: | .0: | .0: | .0: | .0: | 420.0: | 420.0: |
| | | :BRA: | .0: | .0: | .0: | | | | |
| 3 : 3 DWT, SRV*2 | 7545 | .000:RUN: | .0: | .0: | .0: | .0: | .0: | 420.0: | 420.0: |
| | | :BRA: | .0: | .0: | .0: | | | | |
| 4 : 4 P, THMD35, DYNITL | 5 | 1.050:RUN: | .0: | 664.7: | 60.2: | -75.0: | -12.0: | 70.0: | 94.0: |
| | | :BRA: | 965.3: | 1081.8: | -306.5: | | | | |
| 5 : 5 P, THMD35, SRVFT | 5 | 1.050:RUN: | .0: | 664.7: | 60.2: | -75.0: | -12.0: | 70.0: | 94.0: |
| | | :BRA: | 965.3: | 1081.8: | -306.5: | | | | |
| 6 : 6 P, THMD15, SRV16V | 200 | .020:RUN: | .0: | 644.8: | 58.4: | -60.0: | -9.0: | 70.0: | 88.0: |
| | | :BRA: | 936.4: | 1049.3: | -297.3: | | | | |
| 7 : 7 P, THMD17, SRV16V | 96 | 1.050:RUN: | .0: | 644.8: | 58.4: | -60.0: | -9.0: | 70.0: | 88.0: |
| | | :BRA: | 936.4: | 1049.3: | -297.3: | | | | |
| 8 : 8 P, THMD29, SRV16V | 106 | 1.100:RUN: | .0: | 644.8: | 58.4: | .0: | .0: | 70.0: | 70.0: |
| | | :BRA: | 936.4: | 1049.3: | -297.3: | | | | |
| 9 : 9 P, THMD32, SRV1V | 10 | .120:RUN: | .0: | 644.8: | 58.4: | -16.0: | -2.0: | 70.0: | 95.0: |
| | | :BRA: | 936.4: | 1049.3: | -297.3: | | | | |
| 10 : 10 P, THMD33, SRV1V | 632 | 1.100:RUN: | .0: | 644.8: | 58.4: | .0: | .0: | 190.0: | 190.0: |
| | | :BRA: | 936.4: | 1049.3: | -297.3: | | | | |
| 11 : 11 P, THMD34, SRV1V | 1 | 1.516:RUN: | .0: | 644.8: | 58.4: | -60.0: | -9.0: | 70.0: | 88.0: |
| | | :BRA: | 936.4: | 1049.3: | -297.3: | | | | |
| 12 : 12 P, THMD35, SRV1V | 190 | 1.175:RUN: | .0: | 644.8: | 58.4: | -60.0: | -9.0: | 70.0: | 88.0: |
| | | :BRA: | 936.4: | 1049.3: | -297.3: | | | | |
| 13 : 13 P, THMD26, SRV1V | 249 | .000:RUN: | .0: | 624.8: | 56.6: | -1.0: | .0: | 70.0: | 71.0: |
| | | :BRA: | 907.4: | 1016.9: | -288.1: | | | | |
| 14 : 14 P, THMD29, SRV1V | 15 | 1.030:RUN: | .0: | 555.2: | 69.8: | 3.0: | 1.0: | 70.0: | 70.0: |
| | | :BRA: | 621.0: | 963.1: | -216.3: | | | | |

TABLE CONTINUED

Load Combinations for location 82 Tee (Break Points 60AW, BW, and CW) Addendum 3K (M96-0069) pg. 2

AX-17D REV. 3K ATTACHMENT "D" PAGE 65 OF 156

1

CLASS 1 CODE COMPLIANCE ANALYSIS

ME101/N4 RB/562367

06/16/97 IP2010 PAGE 9

RUN NO.2 FOR NODE POINTS 82, 85, 97, 100, 105, 110 & 125 OF AX-17D

LOAD TABLE FOR EQ. 11 AT LOCATION 82 (TEE)

| LOAD | NO. OF | LEG | X | Y | Z | DT1 | DT2 | TA | TB |
|-------------------------------------|--------|------------|---------|---------|---------|--------|--------|-------|--------|
| SET NO:LOAD SET DESCRIPTION:CYCLES: | P | | | | | | | | |
| 15 :15 P,THMD20,SRVIV | 15 | .700:RUN: | .0: | 578.4: | 72.7: | -49.0: | -7.0: | 70.0: | 97.0: |
| | | :RUN: | .0: | .0: | .0: | | | | |
| | | :BRA: | 646.8: | 1003.3: | -225.4: | | | | |
| 16 :16 P,THMD28,SRVIV | 1 | .020:RUN: | .0: | 323.9: | 40.7: | -66.0: | -14.0: | 70.0: | 104.0: |
| | | :RUN: | .0: | .0: | .0: | | | | |
| | | :BRA: | 362.2: | 561.8: | -126.2: | | | | |
| 17 :17 P,THMD31,SRVIV | 15 | .200:RUN: | .0: | 537.9: | 67.7: | -46.0: | -6.0: | 70.0: | 90.0: |
| | | :RUN: | .0: | .0: | .0: | | | | |
| | | :BRA: | 601.5: | 933.0: | -209.6: | | | | |
| 18 :18 P,THMD06 | 15 | 1.100:RUN: | .0: | 113.6: | 137.1: | 26.0: | 4.0: | 92.0: | 70.0: |
| | | :RUN: | .0: | .0: | .0: | | | | |
| | | :BRA: | -245.7: | 777.0: | -2.7: | | | | |
| 19 :19 P,THMD07 | 307 | 1.100:RUN: | .0: | 439.0: | 109.1: | 57.0: | 8.0: | 97.0: | 70.0: |
| | | :RUN: | .0: | .0: | .0: | | | | |
| | | :BRA: | 110.6: | 851.7: | -90.4: | | | | |
| 20 :20 P,THMD08 | 15 | 1.100:RUN: | .0: | 439.0: | 109.1: | 55.0: | 8.0: | 90.0: | 70.0: |
| | | :RUN: | .0: | .0: | .0: | | | | |
| | | :BRA: | 110.6: | 851.7: | -90.4: | | | | |
| 21 :21 P,THMD11 | 9999 | 1.100:RUN: | .0: | 109.2: | 131.8: | 2.0: | .0: | 71.0: | 70.0: |
| | | :RUN: | .0: | .0: | .0: | | | | |
| | | :BRA: | -236.2: | 747.1: | -2.6: | | | | |
| 22 :22 P,THMD14 | 70 | 1.100:RUN: | .0: | 109.2: | 131.8: | 27.0: | 4.0: | 81.0: | 70.0: |
| | | :RUN: | .0: | .0: | .0: | | | | |
| | | :BRA: | -236.2: | 747.1: | -2.6: | | | | |
| 23 :23 P,THMD18 | 30 | 1.050:RUN: | .0: | 108.1: | 130.5: | 22.0: | 3.0: | 91.0: | 70.0: |
| | | :RUN: | .0: | .0: | .0: | | | | |
| | | :BRA: | -233.9: | 739.6: | -2.6: | | | | |
| 24 :24 P,THMD21 | 15 | .700:RUN: | .0: | 102.7: | 123.9: | 26.0: | 4.0: | 92.0: | 70.0: |
| | | :RUN: | .0: | .0: | .0: | | | | |
| | | :BRA: | -222.1: | 792.3: | -2.5: | | | | |
| 25 :25 P,THMD22 | 96 | .050:RUN: | .0: | 159.8: | 26.7: | 28.0: | 4.0: | 80.0: | 70.0: |
| | | :RUN: | .0: | .0: | .0: | | | | |
| | | :BRA: | 143.7: | 281.8: | -53.3: | | | | |
| 26 :26 P,THMD23 | 126 | .050:RUN: | .0: | 137.2: | 10.7: | -20.0: | -3.0: | 70.0: | 77.0: |
| | | :RUN: | .0: | .0: | .0: | | | | |
| | | :BRA: | 213.8: | 223.6: | -65.0: | | | | |
| 27 :27 P,THMD24 | 207 | .050:RUN: | .0: | 65.5: | 79.1: | 20.0: | 3.0: | 77.0: | 70.0: |
| | | :RUN: | .0: | .0: | .0: | | | | |
| | | :BRA: | -141.7: | 448.3: | -1.6: | | | | |
| 28 :28 P,THMD27 | 10 | 1.335:RUN: | .0: | 111.4: | 134.4: | 3.0: | 1.0: | 70.0: | 70.0: |
| | | :RUN: | .0: | .0: | .0: | | | | |
| | | :BRA: | -241.0: | 762.1: | -2.7: | | | | |

TABLE CONTINUED

Load Combinations for location 82 Tee (Break Points 60AW, BW, and CW) Addendum 3K (M96-0069) pg. 3

AX-17D REV. 3K ATTACHMENT "D" PAGE 66 OF 156

1

CLASS 1 CODE COMPLIANCE ANALYSIS

ME101/N4 RB/562367

06/18/97 IP2010 PAGE 10

RUN NO.2 FOR NODE POINTS 82, 85, 87, 100, 105, 110 & 125 OF AX-17D

LOAD TABLE FOR EQ. 11 AT LOCATION 82 (TEE)

| : LOAD : | : NO. OF : | : : | : : | : : | : : | : : | : : | : : | : : | : : | : : |
|------------|--------------------------|--------------|---------|-----------|------------|------------|-----------|-----------|----------|----------|--------|
| : SET NO : | : LOAD SET DESCRIPTION : | : CYCLES : | : P : | : LEG : | : X * : | : Y * : | : Z * : | : DT1 : | : DT2 : | : TA : | : TB : |
| : 29 : | : 29 P, THMD36, SRV16V : | : 20:1.050 : | : RUN : | : .0 : | : 664.7 : | : 60.2 : | : -75.0 : | : -12.0 : | : 70.0 : | : 94.0 : | : : |
| : : | : : | : : | : RUN : | : .0 : | : .0 : | : .0 : | : : | : : | : : | : : | : : |
| : : | : : | : : | : BRA : | : 965.3 : | : 1081.8 : | : -306.5 : | : : | : : | : : | : : | : : |

*NOTE: OBE AND SAM MOMENTS ARE INCLUDED IN RANGE VALUE CALCULATIONS NOT IN THESE SINGLE SET COMBINED MOMENTS.

CUF Summary for location 82 Tee (Break Points 60AW, BW, and CW) Addendum 3K

AX-17D REV. 3K ATTACHMENT "D" PAGE 71 OF 156

1

CLASS 1 CODE COMPLIANCE ANALYSIS

ME101/N4 RB/562367

06/18/97 IP2010 PAGE 15

RUN NO.2 FOR NODE POINTS 82, 85, 87, 100, 105, 110 & 125 OF AX-17D

SUMMARY OF CALCULATIONS OF CUMULATIVE USAGE FACTOR AT LOCATION 92 (TEE)

| LOAD PAIR: | | EQ.11 | : | EQ.14 | : | OCCURENCE | : | SET | : | CYCLES LEFT | : | ALLOW | : | FATIGUE |
|---------------------|----|----------|--------|---------|-------|-----------|-------|-----------------|------|-------------|--------|--------|-------|---------------------|
| I : J : | | S-P | : | SP*KE/2 | : | N-I : N-J | : | ELIM- INATED | : | M-I : N-J | : | N-D | : | USAGE : FACTOR : |
| 4 | 27 | 103.823: | 1.257: | 63.278: | 5: | 207: | 5: | 4, 4 | 0: | 202: | 1983 | .0025: | | |
| 11 | 27 | 112.568: | 1.055: | 59.387: | 1: | 202: | 1: | 11, 11 | 0: | 201: | 2651 | .0004: | | |
| 5 | 27 | 98.334: | 1.079: | 53.171: | 5: | 201: | 5: | 5, 5 | 0: | 196: | 3725 | .0013: | | |
| 27 | 29 | 98.504: | 1.078: | 53.104: | 196: | 20: | 20: | 29, 29 | 176: | 0: | 3739 | .0053: | | |
| 6 | 18 | 99.899: | 1.052: | 52.548: | 200: | 15: | 15: | 18, 18 | 185: | 0: | 3862 | .0039: | | |
| 6 | 28 | 103.066: | 1.000: | 51.543: | 185: | 10: | 10: | 28, 28 | 175: | 0: | 4098 | .0024: | | |
| 6 | 22 | 98.205: | 1.000: | 49.102: | 175: | 70: | 70: | 22, 22 | 105: | 0: | 4738 | .0148: | | |
| 6 | 23 | 96.852: | 1.013: | 49.078: | 105: | 30: | 30: | 23, 23 | 75: | 0: | 4745 | .0063: | | |
| 12 | 27 | 97.469: | 1.000: | 48.734: | 190: | 176: | 176: | 27, 27 | 14: | 0: | 4841 | .0364: | | |
| 6 | 19 | 97.222: | 1.000: | 48.611: | 73: | 307: | 75: | 6, 6 | 0: | 232: | 4876 | .0154: | | |
| 12 | 25 | 96.701: | 1.000: | 48.351: | 14: | 96: | 14: | 12, 12 | 0: | 82: | 4951 | .0028: | | |
| 8 | 16 | 94.192: | 1.000: | 47.096: | 106: | 1: | 1: | 16, 16 | 105: | 0: | 5336 | .0002: | | |
| 7 | 25 | 93.420: | 1.000: | 46.710: | 96: | 82: | 82: | 25, 25 | 14: | 0: | 5463 | .0150: | | |
| 9 | 19 | 84.855: | 1.000: | 42.428: | 10: | 232: | 10: | 9, 9 | 0: | 222: | 7186 | .0014: | | |
| 7 | 26 | 83.197: | 1.000: | 41.599: | 14: | 126: | 14: | 7, 7 | 0: | 112: | 7601 | .0018: | | |
| 13 | 19 | 83.005: | 1.000: | 41.502: | 249: | 222: | 222: | 19, 19 | 27: | 0: | 7652 | .0290: | | |
| 8 | 26 | 81.585: | 1.000: | 40.792: | 105: | 112: | 105: | 8, 8 | 0: | 7: | 8037 | .0131: | | |
| 13 | 20 | 81.576: | 1.000: | 40.788: | 27: | 15: | 15: | 20, 20 | 12: | 0: | 8040 | .0019: | | |
| 10 | 26 | 79.310: | 1.000: | 39.655: | 632: | 7: | 7: | 26, 26 | 625: | 0: | 8721 | .0008: | | |
| 13 | 21 | 78.348: | 1.000: | 39.174: | 12: | 9999: | 12: | 13, 13 | 0: | 9987: | 9044 | .0013: | | |
| 17 | 21 | 72.651: | 1.000: | 36.325: | 15: | 9987: | 15: | 17, 17 | 0: | 9972: | 11321 | .0013: | | |
| 10 | 24 | 55.382: | 1.000: | 27.691: | 625: | 15: | 15: | 24, 24 | 610: | 0: | 27495 | .0005: | | |
| 15 | 21 | 54.490: | 1.000: | 27.245: | 15: | 9972: | 15: | 15, 15 | 0: | 9957: | 29315 | .0005: | | |
| 10 | 21 | 30.154: | 1.000: | 15.077: | 610: | 9957: | 610: | 10, 10 | 0: | 9347: | 357409 | .0017: | | |
| 1 | 1 | 26.979: | 1.000: | 13.489: | 45: | 45: | 45: | 1, 1 | 0: | 0: | 580146 | .0001: | | |
| 14 | 21 | 26.066: | 1.000: | 13.033: | 15: | 9347: | 15: | 14, 14 | 0: | 9332: | 689158 | .0000: | | |
| 2 | 2 | 17.585: | 1.000: | 8.792: | 45: | 45: | 45: | 2, 2 | 0: | 0: | >1.26 | 0 : | | |
| 3 | 3 | 17.511: | 1.000: | 8.756: | 7545: | 7545: | 7545: | 3, 3 | 0: | 0: | >1.26 | 0 : | | |
| TOTAL USAGE FACTOR= | | | | | | | | | | | | | .1603 | |

Load Combinations for location 85 (Break Point 71W) Addendum 3K

AX-17D REV. 3K ATTACHMENT "D" PAGE 72 OF 156

1

CLASS 1 CODE COMPLIANCE ANALYSIS

ME101/N4 RB/562367

06/18/97 IP2010 PAGE 16

RUN NO.2 FOR NODE POINTS 82, 85, 87, 100, 105, 110 & 125 OF AX-17D

LOAD TABLE FOR EQ.11 AT LOCATION 85 (CURB)

| LOAD : | NO. OF : | DT1 : | DT2 : | TA : | TB : |
|-------------------------------------|-------------|---------|---------|---------|---------------------------|
| SET NO:LOAD SET DESCRIPTION:CYCLES: | P : | X * : | Y * : | Z * : | |
| 1 : 1 DWT,DYNITL*2 | 45: .000: | .0: | .0: | .0: | 420.0: 420.0: |
| 2 : 2 DWT,SRVET*2 | 45: .000: | .0: | .0: | .0: | 420.0: 420.0: |
| 3 : 3 DWT,SRV*2 | 7545: .000: | .0: | .0: | .0: | 420.0: 420.0: |
| 4 : 4 P,THMD35,DYNITL | 5:1.050: | 965.3: | -117.3: | -374.9: | -50.0: -8.0: 70.0: 96.0: |
| 5 : 5 P,THMD35,SRVET | 5:1.050: | 965.3: | -117.3: | -374.9: | -50.0: -8.0: 70.0: 96.0: |
| 6 : 6 P,THMD15,SRV16V | 200: .020: | 936.4: | -113.8: | -363.6: | -36.0: -5.0: 70.0: 70.0: |
| 7 : 7 P,THMD17,SRV16V | 96:1.050: | 936.4: | -113.8: | -363.6: | -36.0: -5.0: 70.0: 70.0: |
| 8 : 8 P,THMD29,SRV16V | 106:1.100: | 936.4: | -113.8: | -363.6: | .0: .0: 70.0: 70.0: |
| 9 : 9 P,THMD32,SRV1V | 10: .120: | 936.4: | -113.8: | -363.6: | -12.0: -2.0: 70.0: 70.0: |
| 10 : 10 P,THMD33,SRV1V | 632:1.100: | 936.4: | -113.8: | -363.6: | .0: .0: 190.0: 190.0: |
| 11 : 11 P,THMD34,SRV1V | 1:1.516: | 936.4: | -113.8: | -363.6: | -36.0: -5.0: 70.0: 70.0: |
| 12 : 12 P,THMD35,SRV1V | 190:1.175: | 936.4: | -113.8: | -363.6: | -36.0: -5.0: 70.0: 70.0: |
| 13 : 13 P,THMD26,SRV1V | 249: .000: | 907.4: | -110.3: | -352.4: | -3.0: .0: 70.0: 70.0: |
| 14 : 14 P,THMD19,SRV1V | 15:1.050: | 621.0: | -85.2: | -401.7: | -22.0: -4.0: 70.0: 70.0: |
| 15 : 15 P,THMD20,SRV1V | 15: .700: | 646.8: | -88.8: | -418.4: | -36.0: -5.0: 70.0: 70.0: |
| 16 : 16 P,THMD28,SRV1V | 1: .020: | 362.2: | -49.7: | -234.3: | -57.0: -10.0: 70.0: 70.0: |
| 17 : 17 P,THMD31,SRV1V | 15: .200: | 601.5: | -82.5: | -389.1: | -30.0: -4.0: 70.0: 70.0: |
| 18 : 18 P,THMD06 | 15:1.100: | -245.7: | -13.4: | -540.6: | .3: .1: 70.0: 70.0: |
| 19 : 19 P,THMD07 | 307:1.100: | 110.6: | -42.8: | -482.1: | 31.0: 4.0: 70.0: 70.0: |
| 20 : 20 P,THMD08 | 15:1.100: | 110.6: | -42.8: | -482.1: | 31.0: 4.0: 70.0: 70.0: |
| 21 : 21 P,THMD11 | 9999:1.100: | -236.2: | -12.9: | -519.8: | 1.0: .0: 70.0: 70.0: |
| 22 : 22 P,THMD14 | 70:1.100: | -236.2: | -12.9: | -519.8: | 15.0: 2.0: 70.0: 70.0: |
| 23 : 23 P,THMD18 | 30:1.050: | -233.9: | -12.8: | -514.6: | 16.0: 2.0: 70.0: 70.0: |
| 24 : 24 P,THMD21 | 15: .700: | -222.1: | -12.1: | -488.6: | 17.0: 3.0: 70.0: 70.0: |
| 25 : 25 P,THMD22 | 96: .050: | 143.7: | -20.8: | -126.4: | 19.0: 3.0: 70.0: 70.0: |
| 26 : 26 P,THMD23 | 126: .050: | 213.8: | -23.7: | -71.4: | -13.0: -2.0: 70.0: 70.0: |
| 27 : 27 P,THMD24 | 207: .050: | -141.7: | -7.7: | -311.9: | 13.0: 2.0: 70.0: 70.0: |
| 28 : 28 P,THMD27 | 10:1.335: | -241.0: | -13.1: | -530.2: | 3.0: .0: 70.0: 70.0: |
| 29 : 29 P,THMD36,SRV16V | 20:1.050: | 965.3: | -117.3: | -374.9: | -50.0: -8.0: 70.0: 96.0: |

*NOTE: OBE AND SAM MOMENTS ARE INCLUDED IN RANGE VALUE CALCULATIONS NOT IN THESE SINGLE SET COMBINED MOMENTS.

CUF Summary for location 85 (Break Point 71W) Addendum 3K
AX-17D REV. 3K ATTACHMENT "D" PAGE 75 OF 156

1

CLASS 1 CODE COMPLIANCE ANALYSIS

ME101/M4 RB/562367

06/18/97 IP2010 PAGE 19

RUN NO.2 FOR NODE POINTS 82, 85, 87, 100, 105, 110 & 125 OF AX-17D

SUMMARY OF CALCULATIONS OF CUMULATIVE USAGE FACTOR AT LOCATION 85 (CURB)

| LOAD PAIR: | EQ.11 : | | EQ.14 : | OCCURENCE : | | SET : | CYCLES LEFT : | ALLOW. : | FATIGUE : |
|------------|----------|--------|-----------|-------------|-------|--------------|---------------|----------|-----------|
| I : J : | S-P : | K-E : | SP*KE/2 : | N-I : | N-J : | ELIM- : | INATED: | N-I : | N-J : |
| | | | | | | | | | |
| 4 : 27 : | 123.386: | 1.109: | 68.435: | 5: | 207: | 5: 4, 4 : | 0: | 202: | 1715 : |
| 5 : 27 : | 109.099: | 1.000: | 54.550: | 5: | 202: | 5: 9, 5 : | 0: | 197: | 3443 : |
| 27 : 29 : | 109.080: | 1.000: | 54.540: | 197: | 20: | 20: 29,29 : | 177: | 0: | 3445 : |
| 6 : 28 : | 104.127: | 1.000: | 52.064: | 200: | 10: | 10: 28,28 : | 190: | 0: | 3974 : |
| 6 : 22 : | 103.648: | 1.000: | 51.824: | 190: | 70: | 70: 22,22 : | 120: | 0: | 4030 : |
| 6 : 23 : | 102.975: | 1.000: | 51.487: | 120: | 30: | 30: 23,23 : | 90: | 0: | 4112 : |
| 6 : 18 : | 100.761: | 1.000: | 50.380: | 90: | 15: | 15: 18,18 : | 75: | 0: | 4396 : |
| 11 : 27 : | 100.742: | 1.000: | 50.371: | 1: | 177: | 1: 11,11 : | 0: | 176: | 4398 : |
| 6 : 21 : | 100.045: | 1.000: | 50.023: | 75: | 9999: | 75: 6, 6 : | 0: | 9924: | 4493 : |
| 12 : 27 : | 96.067: | 1.000: | 48.034: | 190: | 176: | 176: 27,27 : | 14: | 0: | 5045 : |
| 12 : 24 : | 93.741: | 1.000: | 46.870: | 14: | 15: | 14: 12,12 : | 0: | 1: | 5410 : |
| 7 : 24 : | 93.105: | 1.000: | 46.552: | 96: | 1: | 1: 24,24 : | 95: | 0: | 5516 : |
| 9 : 21 : | 91.493: | 1.000: | 45.747: | 10: | 9924: | 10: 9, 9 : | 0: | 9914: | 5797 : |
| 13 : 21 : | 89.054: | 1.000: | 44.527: | 249: | 9914: | 249: 13,13 : | 0: | 9665: | 6261 : |
| 7 : 21 : | 85.925: | 1.000: | 42.963: | 95: | 9665: | 95: 7, 7 : | 0: | 9570: | 6933 : |
| 8 : 21 : | 76.012: | 1.000: | 38.006: | 106: | 9570: | 106: 8, 8 : | 0: | 9464: | 9896 : |
| 10 : 21 : | 74.897: | 1.000: | 37.448: | 632: | 9464: | 632: 10,10 : | 0: | 8832: | 10341 : |
| 16 : 21 : | 74.731: | 1.000: | 37.368: | 1: | 8832: | 1: 16,16 : | 0: | 8831: | 10409 : |
| 17 : 21 : | 74.692: | 1.000: | 37.346: | 15: | 8831: | 15: 17,17 : | 0: | 8816: | 10425 : |
| 15 : 21 : | 71.702: | 1.000: | 35.851: | 15: | 8816: | 15: 15,15 : | 0: | 8801: | 11772 : |
| 14 : 25 : | 62.868: | 1.000: | 31.434: | 15: | 96: | 15: 14,14 : | 0: | 81: | 17406 : |
| 21 : 26 : | 56.475: | 1.000: | 28.237: | 8801: | 126: | 126: 26,26 : | 8675: | 0: | 25434 : |
| 21 : 25 : | 52.266: | 1.000: | 26.133: | 8675: | 81: | 81: 25,25 : | 8594: | 0: | 34588 : |
| 1 : 1 : | 40.008: | 1.000: | 20.004: | 45: | 45: | 45: 1, 1 : | 0: | 0: | 99915 : |
| 20 : 21 : | 28.853: | 1.000: | 14.426: | 15: | 8594: | 15: 20,20 : | 0: | 8579: | 436018 : |
| 19 : 21 : | 28.853: | 1.000: | 14.426: | 307: | 8579: | 307: 19,19 : | 0: | 8272: | 436018 : |
| 2 : 2 : | 16.381: | 1.000: | 8.191: | 45: | 45: | 45: 2, 2 : | 0: | 0: | >1.26 : |
| 3 : 3 : | 16.338: | 1.000: | 8.169: | 7545: | 7545: | 7545: 3, 3 : | 0: | 0: | >1.26 : |

TOTAL USAGE FACTOR= .2345

Load Combinations for location 87 (Break Point 70W) Addendum 3K
AX-17D REV. 3K ATTACHMENT "D" PAGE 76 OF 156

1

CLASS 1 CODE COMPLIANCE ANALYSIS

ME101/N4 RB/562367

06/18/97 IP2010 PAGE 20

RUN NO.2 FOR NODE POINTS 82, 85, 87, 100, 105, 110 & 125 OF AX-17D

LOAD TABLE FOR EQ.11 AT LOCATION 87 (CURE)

| LOAD : | NO. OF : | | | | | | | | | | | | |
|---------|-----------------------|-------------|-----|--------|---------|---------|--------|-------|--------|--------|--|--|--|
| SET NO: | LOAD SET DESCRIPTION: | CYCLES: | P : | X * : | Y * : | Z * : | DT1 : | DT2 : | TA : | TB : | | | |
| 1 | 1 DWT,DYNITL*2 | 45: .000: | | .0: | .0: | .0: | .0: | .0: | 420.0: | 420.0: | | | |
| 2 | 2 DWT,SRVFT*2 | 45: .000: | | .0: | .0: | .0: | .0: | .0: | 420.0: | 420.0: | | | |
| 3 | 3 DWT,SRV*2 | 7545: .000: | | .0: | .0: | .0: | .0: | .0: | 420.0: | 420.0: | | | |
| 4 | 4 P,THMD36,DYNITL | 5:1.050: | | 68.5: | -736.1: | -366.3: | -50.0: | -8.0: | 70.0: | 96.0: | | | |
| 5 | 5 P,THMD36,SRVFT | 5:1.050: | | 68.5: | -736.1: | -366.3: | -50.0: | -8.0: | 70.0: | 96.0: | | | |
| 6 | 6 P,THMD13,SRV16V | 200: .020: | | 66.5: | -714.0: | -355.3: | -21.0: | -3.0: | 70.0: | 80.0: | | | |
| 7 | 7 P,THMD17,SRV16V | 96:1.050: | | 66.5: | -714.0: | -355.3: | -21.0: | -3.0: | 70.0: | 80.0: | | | |
| 8 | 8 P,THMD29,SRV16V | 106:1.100: | | 66.5: | -714.0: | -355.3: | .0: | .0: | 70.0: | 70.0: | | | |
| 9 | 9 P,THMD32,SRV1V | 10: .120: | | 66.5: | -714.0: | -355.3: | -9.0: | -1.0: | 70.0: | 94.0: | | | |
| 10 | 10 P,THMD33,SRV1V | 632:1.100: | | 66.5: | -714.0: | -355.3: | .0: | .0: | 190.0: | 190.0: | | | |
| 11 | 11 P,THMD34,SRV1V | 1:1.516: | | 66.5: | -714.0: | -355.3: | -21.0: | -3.0: | 70.0: | 80.0: | | | |
| 12 | 12 P,THMD35,SRV1V | 190:1.175: | | 66.5: | -714.0: | -355.3: | -21.0: | -3.0: | 70.0: | 80.0: | | | |
| 13 | 13 P,THMD26,SRV1V | 249: .000: | | 64.4: | -691.9: | -344.3: | .0: | .0: | 70.0: | 70.0: | | | |
| 14 | 14 P,THMD19,SRV1V | 15:1.050: | | 43.7: | -431.6: | -264.2: | -22.0: | -4.0: | 70.0: | 91.0: | | | |
| 15 | 15 P,THMD20,SRV1V | 15: .700: | | 45.5: | -449.6: | -275.2: | -25.0: | -4.0: | 70.0: | 94.0: | | | |
| 16 | 16 P,THMD28,SRV1V | 1: .020: | | 25.5: | -251.8: | -154.1: | -46.0: | -8.0: | 70.0: | 103.0: | | | |
| 17 | 17 P,THMD31,SRV1V | 15: .200: | | 42.3: | -418.1: | -256.0: | -21.0: | -3.0: | 70.0: | 91.0: | | | |
| 18 | 18 P,THMD06 | 15:1.100: | | -23.9: | 356.1: | -23.4: | .3: | .1: | 71.0: | 70.0: | | | |
| 19 | 19 P,THMD07 | 307:1.100: | | 4.0: | 31.6: | -121.9: | 17.0: | 3.0: | 81.0: | 70.0: | | | |
| 20 | 20 P,THMD08 | 15:1.100: | | 4.0: | 31.6: | -121.9: | 17.0: | 3.0: | 81.0: | 70.0: | | | |
| 21 | 21 P,THMD11 | 9999:1.100: | | -23.0: | 342.4: | -22.5: | 1.0: | .0: | 70.0: | 70.0: | | | |
| 22 | 22 P,THMD14 | 70:1.100: | | -23.0: | 342.4: | -22.5: | 8.0: | 1.0: | 75.0: | 70.0: | | | |
| 23 | 23 P,THMD18 | 30:1.050: | | -22.7: | 339.0: | -22.3: | 11.0: | 2.0: | 90.0: | 70.0: | | | |
| 24 | 24 P,THMD21 | 15: .700: | | -21.6: | 321.9: | -21.2: | 12.0: | 2.0: | 90.0: | 70.0: | | | |
| 25 | 25 P,THMD22 | 96: .050: | | 11.1: | -92.9: | -65.2: | 12.0: | 2.0: | 78.0: | 70.0: | | | |
| 26 | 26 P,THMD23 | 126: .050: | | 16.8: | -167.7: | -77.3: | -8.0: | -1.0: | 70.0: | 75.0: | | | |
| 27 | 27 P,THMD24 | 207: .050: | | -13.8: | 205.4: | -13.5: | 8.0: | 1.0: | 75.0: | 70.0: | | | |
| 28 | 28 P,THMD27 | 10:1.335: | | -23.4: | 349.2: | -23.0: | 2.0: | .0: | 72.0: | 70.0: | | | |
| 29 | 29 P,THMD36,SRV16V | 20:1.050: | | 68.5: | -736.1: | -366.3: | -50.0: | -8.0: | 70.0: | 96.0: | | | |

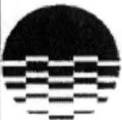
*NOTE: OBE AND SAM MOMENTS ARE INCLUDED IN RANGE VALUE CALCULATIONS NOT IN THESE SINGLE SET COMBINED MOMENTS.

RBG-47895


Attachment 4

Addendum 3J and 3K Cover Pages:

Addendum 3J Cover Page:

| | | | | |
|---|--|--|----------------------------|-------------|
|  <p style="text-align: center;">CALCULATION TITLE PAGE ENGINEERING DEPARTMENT ENTERGY OPERATIONS INCORP.</p> | | 1. CALCULATION NUMBER | | REV OR ADD: |
| | | AX-17D | | 3J |
| | | JB1 NO. G13.18.10.2 | | |
| | | PAGE 1 OF 365 | | |
| 2. CALCULATION TITLE: ME101 class 1 pipe stress analysis using Code Case N-411 damping for selected components | | | 3. SUPERSEDES: N/A | |
| | | | SUPPLEMENTS: AX-17D REV. 3 | |
| 4. OBJECTIVE OF CALCULATION: The objective of this addendum is to reduce the dynamic loads for OBE and SRV 1V, 2V and 16V cases by using the Code Case N-411 damping in stress analysis, then to perform the class 1 pipe stress analysis for the critical piping components such as elbow, reducer, tee, taper transition, and RPV nozzle. | | | | |
| 5. CALCULATION METHOD / ASSUMPTIONS: See page 3 | | | | |
| 6. SOURCES OF DATA/EQUATIONS (REFERENCES): (1) Calculation AX-17D Rev. 3 (2) ME101 Computer Program, Version N4 (3) G13.18.1.5*08 Rev. 1 Peak-spread ARS for Seismic Events Including Curves with N-411-1 Damping (4) Code Case N-411-1 Alternative Damping Values for Response Spectra Analysis of Class 1, 2, and 3 Piping Section III, Division 1, dated Feb. 20, 1986 | | | | |
| 7. CONCLUSIONS: 1. The class 1 results from ME101C1 analysis are consistent with those from NUPIPE analysis. The Class 1 stresses as well as CUF went down slightly as expected. There is no need to revise the support loads, equipment loads, and valve accelerations in this addendum. 2. Stress report for feedwater system SR-504 needs not to be revised per the above reasons. | | | | |
| <p>RECEIVED</p> <p>NOV 07 1996</p> | | | | |
| 8. REASON FOR REVISION (IF APPLICABLE): This calculation is used as a basis for the class 1 qualification of some fittings affected by flow accelerated corrosion (FAC) to determine the remaining life. | | | | |
| 9. RELATED DOCUMENTS: N/A | | 10. Q-CLASS <input checked="" type="checkbox"/> 1 - NUCLEAR SAFETY RELATED <input type="checkbox"/> 2 <input type="checkbox"/> 3 QAPA ? Y <input type="checkbox"/> N <input checked="" type="checkbox"/> | | |
| 11. <i>Y. S. Sun</i> Y. SUN 0667 9/5/96 PREPARED KCN DATE | 12. <i>Hung K. Lee</i> Hung K. Lee KCN 0996 9/10/96 CHECKER/REVIEWER DATE | 13. <i>Lothar Kuhn</i> Lothar Kuhn KCN 1105 9/11/96 INDEPENDENT REVIEWER DATE | | |
| 14. DATA REQUIRING CONFIRMATION: DATA CONFIRMED BY: _____ DATE _____ | | 15. APPROVED: <i>Lothar Kuhn</i> ^{FOR Rg} (086) 10/31/96 SIGNATURE KCN DATE | | |

Addendum 3K Cover Page:


| | | | |
|---|---|--|---|
|  ENTERGY | CALCULATION COVER PAGE ENGINEERING DEPARTMENT RIVER BEND STATION | | CALC. NO. - REV. ADDENDUM AX-17D, Revision 3K |
| | | | ATTACHMENT NO.: JBI NO.: G13.10.2.2 <i>Am 7/1/98</i> |
| | | | PAGE 1 OF 2040 <i>539</i> |
| | TITLE: Pipe Stress Analysis for FWS-Piping in Reactor and Auxiliary Bldgs (West Loop) | | SUPERSEDES: Rev. 3B, E, F, G, H, J SUPPLEMENTS: AX-17D, Rev. 3 |
| CALCULATION STATUS: <input type="checkbox"/> APPROVED <input checked="" type="checkbox"/> PENDING <input type="checkbox"/> CANCELED | | | |
| SYSTEM NO.: 107 | | MARK NO.: | |
| CLASSIFICATION: <input checked="" type="checkbox"/> SAFETY RELATED | | NON-SAFETY RELATED: <input type="checkbox"/> QAPA <input type="checkbox"/> NON-QAPA | |
| PURPOSE / SCOPE / OBJECTIVE: MR 96-0069 reroutes the RCIC Injection Line from its original connection to the RPV Head to the FWS system through a short portion of the RHS piping. The objective of Revision 3K is to evaluate the FWS piping for the new function of RCIC injection in addition to the existing FWS function. A new check valve is to be added in the Auxiliary Building (see worksheet). The piping is to be evaluated for thermal and fluid transient events associated with RCIC Injection into feedwater loop A. The information contained in Revisions 3B, 3E, 3F, 3G, 3H, and 3J has been incorporated into the input file. See also comment cards in the input listings. Class 1 piping analysis covers only the critical components such as Reducer, Tee, Taper Transition (Valve), Elbow, and RPV nozzle junction. | | | |
| <div style="border: 1px solid black; padding: 5px; display: inline-block;"> RECEIVED JUL 01 1998 SDC </div> | | | |
| CONCLUSION: The analysis demonstrates the acceptability of the piping for MR 96-0069. | | | |
| SOFTWARE USED FOR CALCULATION: <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO SDDF #: 6229.400-100-001A Manufacturer: Bechtel Name: ME101 Version/Release No. N4 | | | |
| CONFIRMATIONS REQUIRED: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO | | CONFIRMATION COMPLETE: <input type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> N/A | |
| KEYWORDS: MR 96-0069, PIPE STRESS, FWS, ICS, N411 | | | |
| REVIEW & APPROVAL | | | |
| <i>y-s Sun (0667) 6-19-97</i> (Signature/Date) Preparer (Printed Name, KCN, or SSN) | <i>Renu Lu (0956) 6-19-97</i> (Signature/Date) <input type="checkbox"/> Reviewer (Non-Safety) <input type="checkbox"/> Design Verification Reviewer (Printed Name, KCN, or SSN) | <i>Rajesh Gupta 11-20-97</i> (Signature/Date) Supervisor (Printed Name, KCN, or SSN) RAJESH GUPTA | |

RBG-47895

Attachment 5

Addendum 3J Stress/ Cumulative Usage Factor (CUF) comparison with Addendum 3B

Addendum 3J Stress/CUF comparison with Addendum 3B

| | | |
|---|---|-------------------------|
|  ENTERGY | <h2>CALCULATION WORK SHEET</h2> <p>ENTERGY OPERATIONS INCORP.</p> | EOI CALCULATION NUMBER: |
| | | AX-17D Rev. 3J |
| | | JBI No. PAGE 24 of |

SUMMARY OF RESULTS (continued)

CLASS I STRESS COMPARISON Rev. 3J vs Rev. 3B

| N.P. | EQ. 9 (psi) | | EQ. 10 (psi) | | | EQ. 12 (psi) | | | EQ. 13 (psi) | | CUF | | |
|------|-------------|-------|--------------|---------|-------|--------------|---------|-------|--------------|-------|--------|---------|--------|
| | 3J | 3B | 3J | 3J | 3B | 3J | 3J | 3B | 3J | 3B | 3J | 3J | 3B |
| | | | | inc3.3% | | | inc3.3% | | | | | inc3.3% | |
| 2 | 11101 | 9577 | 39074 | 40363 | 37894 | | | | | | 0.0142 | 0.0147 | 0.0189 |
| 4 | 18361 | 16971 | 52562 | 54297 | 49781 | | | | | | 0.0116 | 0.0120 | 0.0213 |
| 6 | 17417 | 16472 | 50785 | 52461 | 48087 | | | | | | 0.0099 | 0.0102 | 0.0182 |
| 10 | 17158 | 15898 | 47934 | 49516 | 46011 | | | | | | 0.0081 | 0.0084 | 0.0145 |
| 12 | 16113 | 15851 | 43694 | 45136 | 44357 | | | | | | 0.0048 | 0.0050 | 0.0096 |
| 35 | 19991 | 20729 | 47543 | 49112 | 48198 | | | | | | 0.0060 | 0.0062 | 0.0138 |
| 45 | 18212 | 18586 | 54237 | 56027 | 53924 | | | | | | 0.0079 | 0.0082 | 0.0186 |
| 58 | 15032 | 15849 | 32984 | 34072 | 35051 | | | | | | 0.0096 | 0.0099 | 0.0178 |
| 59 | 15372 | 15693 | 37159 | 38385 | 35451 | | | | | | 0.0161 | 0.0166 | 0.0175 |
| 65 | 14770 | 19879 | 37991 | 39245 | 44172 | | | | | | 0.0031 | 0.0032 | 0.0058 |
| 70 | 14077 | 19203 | 37154 | 38380 | 42829 | | | | | | 0.0028 | 0.0029 | 0.0050 |
| 82 | 18183 | 20548 | 67590 | 69820 | 70498 | 26034 | 26893 | 29393 | 29533 | 31388 | 0.1543 | 0.1594 | 0.6490 |
| 85 | 15493 | 16056 | 72596 | 74992 | 77836 | 41302 | 42665 | 46162 | 21027 | 24027 | 0.1653 | 0.1708 | 0.6512 |
| 87 | 14651 | 15084 | 68996 | 71273 | 71289 | 41599 | 42972 | 43990 | 20622 | 23946 | 0.1572 | 0.1624 | 0.3722 |
| 100 | 12723 | 13656 | 67082 | 69296 | 67257 | | | | | | 0.0348 | 0.0359 | 0.0604 |
| 105 | 12684 | 13455 | 61324 | 63348 | 59836 | | | | | | 0.0186 | 0.0192 | 0.0343 |
| 110 | 14670 | 16324 | 51770 | 53478 | 46983 | | | | | | 0.0106 | 0.0109 | 0.0161 |
| 115 | 13909 | 15696 | 63300 | 65389 | 61591 | | | | | | 0.0327 | 0.0338 | 0.0386 |
| 119 | 13073 | 13934 | 71583 | 73945 | 74505 | 40462 | 41797 | 46486 | 27701 | 32653 | 0.2802 | 0.2894 | 0.4038 |
| 125 | 10800 | 11483 | 56865 | 58742 | 60116 | | | | | | 0.0461 | 0.0476 | 0.0657 |
| 140 | 10283 | 10191 | 45867 | 47381 | 46369 | | | | | | 0.0318 | 0.0328 | 0.0346 |
| 145 | 14325 | 14040 | 45513 | 47015 | 45871 | | | | | | 0.0064 | 0.0066 | 0.0074 |
| 150 | 14408 | 14449 | 46576 | 48113 | 47032 | | | | | | 0.0089 | 0.0092 | 0.0097 |
| 155 | 10332 | 10479 | 46919 | 48467 | 47823 | | | | | | 0.0390 | 0.0403 | 0.0424 |
| 159 | 9522 | 9670 | 46636 | 48175 | 54351 | | | | | | 0.0381 | 0.0394 | 0.0763 |
| 205 | 12239 | 12968 | 56705 | 58576 | 67775 | | | | | | 0.0424 | 0.0438 | 0.0940 |
| 215 | 10239 | 10416 | 52147 | 53868 | 55567 | | | | | | 0.0326 | 0.0337 | 0.0522 |

Note:

The thermal stresses from ME101 run would be expected to be nearly identical to those from NUPIPE. However, in the ME101 model the nozzle elements (nodes 1-2 & 119-120) were not included. As a result, the piping is slightly stiffer. This explains why EQ. 9 & 10 stresses are different from those of the NUPIPE analysis. The purpose of this addendum is to provide a reference for wall thinning analysis (FAC), and critical wall thickness calculation.