TELEDYNE
ENGINEERING SERVICES

Enclosure I

RESPONSES TO NRC REQUEST FOR INFORMATION

MARK 1 TORUS PROGRAM PLANT UNIQUE REPORT

YANKEE ATOMIC ELECTRIC COMPANY

VERMONT YANKEE NUCLEAR STATION

JUNE 10, 1983

ITEM 1

QUESTION

Provide a summary of the analysis and the results for the following penetrations:

- Vent pipe torus intersection
- Vacuum breaker line and RCIC torus penetration

ANSWER

The vent pipe is isolated from the torus at their intersection by a large diameter bellows. Therefore, the torus shell is essentially isolated from the vent pipe Mark 1 torus loads. The bellows deflections from the original and Mark 1 loads are approximately 10 percent of the allowable design deflections. Therefore, the combined effect of loads defined by the LDR does not produce stresses greater than 10 percent of the allowable value and no further evaluation is required.

The TES Torus Attached Piping Technical Report (TR-5319-2) is scheduled for release by Yankee Atomic Electric Company during the fall of 1983. This report will contain a summary of the analysis and results for all torus attached piping penetrations, including the drywell/wetwell vacuum breaker line and RCIC piping penetrations.

ITEM 2

QUESTION

Comment on the effect of the neglected loads indicated on page 66 of Reference 4 on the stress results for the drywell-to-vent penetration.

ANSWER

The original loads on the drywell-vent pipe intersection, due to seismic and thermal response of the drywell, were not available when the PUA for the torus was issued. The effects of seismic and thermal response using original calculation methods has now been considered with torus loads without exceeding code allowables in that area.

The next revision to the PUA report will include the Seismic and Thermal in the stress summary. The following is a summary of the local membrane stress to be reported:

P_l = 23108 psi $<$ 28950 psi, Allowable

ITEM 3

QUESTION

Provide evidence that the fatigue criteria for the bellows, as required by Paragraph NE-3365-2, Section III of the ASME B&PV Code, are met.

ANSWER

TES has reported that the maximum calculated differential motion across the bellows is less than 10% of the rated movements for the rated cycles ($\sim$1000). Based on EJMA (*) fatigue data of unreinforced austenitic bellows, the permissible cycles for the present condition are well in excess of the endurance limit ($\sim(10)^6$ cycles). Therefore, the condition does not impact the fatigue acceptability of the bellows.

(*) Standard of the Expansion Joint Manufacturers Assoc., Inc. Fifth Edition, 1980.

ITEM 4

QUESTION

Provide a summary of the analysis with regard to the vacuum breaker valves; indicate whether they are considered Class 2 components as required by the criteria (1).

ANSWER

The work recently completed for the wetwell/drywell vacuum breaker valves indicates that they do not actuate during a chugging event at Vermont Yankee. Therefore, no additional analysis beyond the original plant design scope is required at the present time.

The USNRC is in the process of reviewing the Mark 1 wetwell/drywell vacuum breaker valve loading transients. Any revisions to the loading transients which may result from this review will be evaluated for the Vermont Yankee vacuum breaker valves when the NRC review is completed.

ITEM 5

QUESTION

Provide analyses of the piping systems not included in this report.

ANSWER

The analysis techniques used, piping stresses, support loads and required modifications will be summarized within TES Technical Report TR-5319-2. This report is scheduled for release during the fall of 1983.

ITEM 6

QUESTION

Provide details of the construction of the SRV line as it exists in the Vermont Yankee plant, specifically in the region of the elbow support, if any.

ANSWER

The details of the Safety Relief Valve Discharge Line elbow support and a typical isometric of an SRVDL are included for your review. Note that all four SRVDL's are identical from the vent pipe penetration to the quencher support.

ITEM 7

QUESTION

Describe the end conditions assumed for the beam model of the vent header deflector shown in page 4-5, how these were derived, and the sensitivity of maximum calculated stresses to boundary assumptions.

ANSWER

The Vermont Yankee Vent Header Deflector is a continuous structure through the 16 torus bays. Figures 2-6 and 2-7 of the PUA Report (TR-5319-1) illustrate the end connection details. The 16-inch deflector pipe slides into a short stub which is welded to the vertical deflector support plate. This connection arrangement does not allow moment transfer; therefore, analysis was performed assuming each span was simply supported.

Figure 4-5 of the same report was intended primarily to show the level of load that is applied to the V.Y. vent header model. It creates a misleading impression regarding the analysis assumptions that were used.

The analysis was actually performed for the uniform 2.9 Kip per foot load applied to a simply supported beam 19.5 feet long. This non-vent bay analysis bounds that of the vent bay and was used for both.

ITEM 8

QUESTION

Provide a detailed sketch of the actual diagonal brace-catwalk attachment, together with its stress analysis results.

ANSWER

We are including, as a part of this package, a set of catwalk drawings which contain the actual diagonal brace-catwalk attachment. Item 9 below discusses stress/buckling results for this structure. A summary of the stress analysis results for other major components appear in Section 7.0 of the PUAR.

ITEM 9

QUESTION

Provide the results of the buckling analysis, including the margin of safety for the catwalk components, i.e., the 4-inch diameter schedule 80 pipe supports and the 2-inch pipe brace.

ANSWER

The buckling analysis results for the Vermont Yankee catwalk supports are as follows:

1. The new vertical support leg, four-inch schedule 80 pipe, has a maximum compressive load of 9.2 K with an allowable buckling capacity of 132.0 K. The margin of safety is equal to 13.35.

2. The new diagonal braces, all four per bay, are four-inch schedule 80 pipe, have a maximum compressive load of 15.3 K with and allowable buckling capacity of 77.6 K. The margin of safety is equal to 4.07.

ITEM 10

QUESTION

Provide full justification for the stress values shown as representative of those that may occur in the containment shell mitre joint. Establish limits of maximum possible error.

ANSWER

Early in the Mark 1 program it was decided that not modeling the four-inch offset strip between the ring girder and mitre joint was technically justified, and, in fact, might produce more accurate results if it was omitted.

A technical concern that was avoided by omitting this four-inch strip was one related to the substantial change in grid size and pattern. The torus model responds primarily to ring and cylinder modes of the shell. We knew from early experience with this model, that the combination of the thin shell and very high water mass produced sensitive mode shapes. Our concern was that the transition from a very small grid near the ring girder to the much larger grid that would be required on the free shell might affect these sensitive modes and would have an uncertain effect on all results. It was not practical to carry the refined mesh throughout the entire model.

In fact, the four-inch wide strip is closer to two inches wide. The four-inch dimension includes half the saddle thickness, the saddle-to-shell weld and the mitre joint weld. We attempted to instrument this region in one of our in-plant SRV tests, but did not have room to install the strain gages.

In addition to these practical limitations, we believe the assumption is technically justified based on the following information regarding shell stresses.

The stress analysis that TES has completed confirms the following:

- All major loadings on the torus shell are in the form of a uniform or hydrostatic pressure distribution.

- The primary membrane stress can be calculated using basic strength of materials and will be maximum at mid-bay bottom dead center of the torus shell.

- It follows that the maximum membrane stress cannot occur in the four-inch offset strip of shell in question.

- All bending stresses in the region of the ring girder or mitre joint, including the four-inch offset strip may be considered to be secondary because of the gross structural discontinuity.

- Since there is no primary bending, it follows that the maximum primary local plus bending stress in this region must be less than the maximum membrane stress and will therefore meet the increased allowable.

- The maximum total stress (primary plus secondary) range occurs in the region of the shell adjacent to the ring girder. Since the membrane stresses are reduced in this region, the range of stress would result from the local bending produced by the increased stiffness of the saddle and ring girder.

- The bending of the shell would be symmetric about the two sides of the ring girder if the four-inch offset strip was not present.

- The torus structure may be considered a beam fixed at the ring girder for purposes of this discussion. The increased stiffness of the mitre joint should, therefore, result in lower bending stresses in the torus shell to the mitre side of the ring girder. A review of the shell analysis results adjacent to the ring girder for the five TES plants was completed. The margin of safety on total stress for the plants ranges from .27 to 1.31. The additional margin is more than adequate to support any unexpected increase in total stress which may occur in the four-inch offset strip.

- It follows that the range of total stress on the mitre side of the ring girder must be less than the range reported to the opposite side which was analyzed.

- The fatigue evaluation was completed with a stress intensification factor of four (the maximum SIF required by the Code). All elements analyzed exhibited usage factors less than 10 percent of the allowable, remote from the torus attached piping penetrations.

The conclusion of this study is that it is not possible to produce a stress intensity within the four-inch offset strip between the ring girder and mitre joint which will exceed those allowable values reported.

ITEM 11

QUESTION

Provide a list of the component materials and their corresponding metal temperatures used for the stress limit selection.

ANSWER

The torus structure and major components were evaluated at a temperature of 200°F. This temperature conservatively bounds the maximum temperature obtained from the Plant Unique Load Definition (Reference 10 of PUA) at 172°F.

The major component materials are as follows:

A 516 Gr 70

Torus
- Shell
- Support Columns
- Ring Girder
- Saddle Support
- Earthquake Restraints

Drywell Vent System
- Vent Pipe
- Vent Header
- Downcomers

A 333 Gr 1

Vent Header Support Columns

A 333 Gr 6

Vent Header Deflector

ITEM 12

QUESTION

Indicate whether each torus attached piping and its supports have been classified as Class 2 or Class 3 piping, Class 2 or Class 3 component supports, and essential or non-essential piping systems. Also, indicate whether a pump or valve associated with the piping mentioned above is an active or inactive component, and is considered operable.

ANSWER

All Vermont Yankee Torus Attached Piping systems have been classified as essential Class 2 piping systems and all components associated with these systems are considered active, for purposes of these analyses and evaluations.

ITEM 13

QUESTION

With reference to Table 1 of Appendix B, indicate whether all loads have been considered in the analysis and/or provide justification, if any load has been neglected.

ANSWER

All loads shown on Table 1 of Appendix B in the PUA report have been considered in the analysis, except those that were specifically identified and discussed in the report. Discussion of these exceptions follows:

CONTAINMENT STRUCTURE ANALYSIS

All loads were analyzed on the torus shell with the exception of the post chugging load. Analysis done on one of the TES plants produced very low stresses and loads that were bounded by pre-chug values. Additional work published (Ref. 12 PUA Report) showed that pre-chug bounded [illegible] chug (to 50 Hz) for column and saddle loads. It also showed that P1 + Pb [illegible]s due to post chug exceeded pre-chug by 53%. TES analysis for post chug used the pre-chug stress values which may be increased by 53% and still meet allowable stress. (Taken from Section 3.0 of the PUAR).

The attached piping reaction loads on the torus shell will be considered in the Torus Attached Piping (TAP) Technical Report (TR-5319-2). These loads are a function of the final piping configuration. The local stresses will be added to the existing state of stress for the appropriate region of the torus shell.

VENT HEADER SYSTEM (The following are taken from Section 4.0 of the PUAR).

The following vent system loads were not analyzed:

- Pool Swell Drag LOCA Jet Forces

  The vent header support columns are loaded by forces from LOCA-Jet and LOCA-Bubble drag. By inspection, it was concluded that LOCA-Jet loads would not combine with water impact on the vent system due to differences in timing and, therefore, would not contribute to the maximum stress calculations.

- Submerged Structure Drag (Support Columns Only)

  Examination of the load combinations that include chugging makes it clear that these cannot control maximum stress level in the support columns; combinations that include vent header water impact will produce much higher stresses. For this reason, stresses in the vent header support columns were not calculated for chugging drag.

- Drag Forces on Support Columns

  Inspection of approximate total loads on support columns due to CO, CH and pool swell showed that condensation oscillation would not contribute to the maximum column load, due to differences in timing.

- Condensation Oscillation - IBA

  Stresses and loads resulting from IBA condensation oscillation are bounded in all cases by either DBA condensation oscillation or chugging.

OTHER STRUCTURES (The following are taken from Section 7.0 of the PUAR).

All direct loads were applied to the torus catwalk. Indirect effects, due to motion of the ring girder at attachment points were considered, but judged to be negligible. Except for the handrails, the entire catwalk is submerged before froth loads reach this part of the torus; because of this, froth was only considered on the handrails.

The internal spray header is attached to the ring girders and to a penetration on the shell. The motion of the ring girder that results from pool swell loads on the shell was considered but judged to be a negligible input to the spray header. Shell displacement at the nozzle connections was input to the computer analysis. The spray header is high enough in the torus so it does not experience direct water impact; froth is the only pool swell related load that was applied.

ITEM 14

QUESTION

Provide a summary of the analyses for the new modifications yet to be supplied; these include items 5, 6, 10, 12 and 15 of the key for Figures 2.3 and 2.4 of Reference 4. In addition, if the final configuration of the catwalk is to be changed, update the analysis accordingly.

ANSWER

Items 6, 10, 12 and 15 on Figures 2.3 and 2.4 of the PUA pertain to Torus Attached Piping analyses. These items will be summarized in the TAP Technical Report TR-5319-2 scheduled to be issued in the fall of 1983.

Item 5, the Vent Header to Downcomer Stiffener stresses are bounded by those summarized in Section 4.4.1 of the PUA. The detailed vent header model as shown in Figure 4-1 includes the stiffeners.

Since the PUAR was issued, a decision was made to remove most of the catwalk at Vermont Yankee. The catwalk has been removed from fourteen bays and only remains in the two bays where the access hatches exist. The non-vent bay portion of the 1/16 STARDYNE model was removed and the vent bay portion has been re-analyzed. A list of the catwalk modifications follows:

1. 4 x 4 angle support legs changed to four-inch schedule 80 pipe, pinned at both ends.

2. Addition of four four-inch schedule 80 pipe diagonal braces, pinned at both ends.

3. Additional 7 x 1/2 plate welded to the existing 4 x 3 angle for lateral stiffness.

4. Additional 3/4 inch steel rod or equivalent, added to increase horizontal stiffness.

5. New cable handrails and posts.

6. Additional hold-down plates for grating.

7. Removal of the ladders during plant operation.

The report will be revised to reflect the new stress results. A summary of these results are as follows:

- Main Frame

  Pool Swell + SRV + Seismic + Weight (Case 25)
  Bending + Axial Stress = 24,400 psi, 40,600 psi allowable

- Support Columns, Support Diagonal Braces and End Joints

  Pool Swell + SRV + Seismic + Weight (Case 25)
  Bending Stress of Outboard Diagonal Brace = 18,445 psi, 42,000 psi allowable

- Welds to Ring Girder

  Pool Swell + SRV + Seismic + Weight (Case 25)
  Tensile Stress = 18,264 psi, 42,000 psi allowable

ITEM 15

QUESTION

Provide details of fatigue analysis for piping systems.

Indicate whether the fatigue usage factors for the SRV piping and the torus attached piping are sufficiently small that a plant-unique fatigue analysis is not warranted for piping. The NRC is expected to review the conclusions of a generic presentation (6) and determine whether it is sufficient for each plant-unique analysis to establish that the expected usage factors for piping are small enough to obviate a plant-unique fatigue analysis of the piping.

ANSWER

TES has provided typical fatigue information to the Mark 1 Owners' Group generic study for all five of the plants for which we are analyzing torus attached piping. Therefore, the conclusion of the generic presentation to the NRC, which established that the fatigue usage factors are small enough to obviate a plant-unique fatigue analysis, applies. We anticipate NRC agreement with the generic presentation, shortly.

ITEM 16

QUESTION

Submit a summary of the analysis for the miscellaneous internal piping.

ANSWER

The following is a summary of the maximum stresses associated with the miscellaneous torus internal piping:

Item	Maximum Stress	Type	Allowable (PSI)	Load Conditions
Main Junction Box (No. 855)	12850	Bending	21600	DL + SSE I + FRTH1A
Thermocouple Junction Box	18080	Bending	27000	DL + SSE I + FRTH1A
Dewcell Support	2117	Bending	21600	DL + SSE I
RTD Support	10690	Bending	27000	DL + SSE I
Thermocouple Support	17874	Bending	27600	DL + SSE I + IMP + DRG + MH
3/4" ϕ Conduit Supports on Ring Girders	18641	Bending	27000	DL + SSE I + FRTH1A
Support for Main Power Cables (from penetration to main junction box)	3891	Tension	16000	DL + SSE I + FRTH1A
1½" ϕ Conduit Supports on Monorail	18606	Bending	27000	DL + SSE I

*Definitions

DL - Deadload

SSE I - Safe Shutdown Inertia

FRTH1A - Froth Load (Region 1A)

IMP - Impact Load

DRG - Drag (Submerged Structure)

MH - Hydrodynamic Load (Associated with Impact)

ITEM 17

QUESTION

The ASME Code provides an acceptance procedure for computing fatigue usage when a member is subject to cyclic loadings of random occurrence, such as might be generated by excitations from more than one type of event (SSE and SRV discharge, for example). This procedure requires correction of the stress-range amplitudes considered and of the associated number of cycles in order to account for the interspersion of stress cycles of unlike character. State whether or not the reported usages reflect use of this method. If not, indicate the effect on reported results.

ANSWER

The fatigue analysis of the torus shell does correct the stress-range amplitudes and associated number of cycles to account for the interspersion of stress cycles of unlike character. The reported usage factors do reflect the use of this method.

It should be pointed out, however, that the usage factors reported do not contain the fatigue usage factors at the Torus Attached Piping Penetrations. The fatigue analysis for the TAP penetrations will be discussed in detail in TES Technical Report TR-5319-2 scheduled for issue in the fall of 1983.

ITEM 18

QUESTION

Justify the reason for not considering skew symmetric boundary conditions in the analysis of the torus shown in Figure 3.1. Evaluate the effect of the thus neglected modes.

ANSWER

It has been our position that the geometry of the torus structure, the nature of the loads imposed, and the constraints imposed by the support saddles and ring girder will force the symmetric modes to dominate shell response to the extent that asymmetric modes can be omitted; the logic follows:

The nature of the loads was considered first. Most Mark 1 loads are both vertical and uniform. For these loads, asymmetric modes clearly are not excited. The loads which do not satisfy this description are SRV, asymmetric chugging and horizontal earthquake.

Of these loads, earthquake is a static load, so the question of mode shapes does not apply. (Seismic analysis of the restraint system was done on a 360^{o} model (ref. Figure 3.4, PUAR). Chugging consists of two components, pre-chug and post chug; the post chug component of chugging is a small load and is bounded by pre-chug for all stresses controlled by gross structural response (ref. para. 3.0, PUAR). Therefore, SRV and asymmetric pre-chug are the two loads which must be addressed.

Although these loads are not uniform, they always produce pressures that are in-phase in adjacent bays. Such a loading will produce response controlled primarily by symmetric modes. This is especially true if we consider the fact that both these loads can exist anywhere within a frequency band, but must be assumed to reside at the single worst frequency in that range. Because of the in-phase characteristic of the load, that worst single frequency will be one associated with a symmetric mode, not an asymmetric one. On this basis, asymmetric modes were considered to be unnecessary.

It is also true that the use of symmetric boundary conditions implies that the load is uniform, and because of that, introduces some conservatism in results. We believe this conservatism more than compensates for the small error that may be associated with neglecting asymmetric mode shapes.

ITEM 19

QUESTION

Specific comments addressing the method of summation used and its compliance with the probability of non-exceedance (PNE) criteria of 84% stated in para. 6.3b of Reference 1 should be incorporated into the text.

ANSWER

As we understand the question, it relates to use of the cumulative distribution function in combining dynamic load effects. The cumulative distribution function method of combining any two structural responses has not been used for any analysis. All combinations of two separate dynamic loads were done by absolute sum.

ITEM 20

QUESTION

Provide justification for analyzing only one SRV discharge line, as shown in Section 6.0 of Reference 4. Indicate whether all discharge lines are identical in configuration to the one modeled, and whether the model investigated is conservative enough to represent all lines.

ANSWER

Analysis of the SRV discharge line has been done and will be reported as two separate analyses. Analysis of the quencher, quencher supports and piping in the torus is reported in TES Technical Report TR-5319-1. Analysis of the vent pipe penetration and all upstream piping and supports will be reported in TR-5319-2, scheduled for release later this year.

This separation is possible because stresses in the piping and structure in the torus are controlled by water clearing and pool drag loads alone. Stresses in the penetration and the drywell are affected by all loads, including gas clearing. The separation of analysis was made to provide early results for torus wetwell piping, which previously had been identified by the NRC as an area of concern.

The portion of the SRVDL shown in Figure 6-1 of the PUAR is identical for all Vermont Yankee discharge lines.

ITEM 21

QUESTION

Submit a summary of the analysis for the vacuum breaker and its penetration.

ANSWER

The vacuum breaker piping and penetration analysis for the torus and vent pipe penetrations will be contained in the Torus Attached Piping Technical Report TR-5319-2 scheduled for release by Yankee Atomic Power Company in the fall of 1983.

ITEM 22

QUESTION

Justify that the 45^{o} model of the vent header and downcomer used in the analysis is adequate to meet the intent of the criteria which requires at least 180^{o}.

Justify the reasons for not considering skew symmetric boundary conditions to evaluate the effect of the resulting modes.

ANSWER

A generic analysis was performed using a 180^{o} segment vent system beam model with symmetric boundary conditions for the appropriate asymmetric loading cases. The two loading cases considered are synchronized chugging and static seismic.

The static seismic values of 0.17g horizontal and 0.1g vertical used envelop the original plant design seismic spectra for the five TES plants analyzed (Nine Mile Point, Millstone, Vermont Yankee, Fitzpatrick and Pilgrim).

The combined seismic and chugging stresses of the 180^{o} segment model are less than the combined stresses of the 45^{o} segment model because of the conservative assumptions used to apply the anti-symmetric chugging load on the 45^{o} model.

The ratios of the combined seismic and chugging stress of the 180^{o}/45^{o} models are:

970 psi/7851 psi = 0.13 for the downcomers

3630 psi/6020 psi = 0.6 for the vent headers

Therefore, the combined stress analysis reported in the PUAR using the results from the 45^0 model is conservative.

ITEM G1

QUESTION

Describe fully the procedures used to assess cumulative fatigue damage. In particular, address:

1. Where departures from standard code procedure were introduced.

2. How critical points were selected and how stress (or stress intensity) ranges were computed.

3. Which cyclic loads were omitted, if any, in these computations. For example, were thermal transients given consideration?

4. Whether cyclic amplitudes and the associated number of cycles were adjusted to account for the interspersion of cycles of unlike character.

5. How the cumulative usage factor was computed.

6. What impact departures from code procedures have on the margins of safety shown for each component for which cumulative usage was computed.

ANSWER

The following items highlight the major considerations used to assess the cumulative fatigue damage for the torus structure. A description of the actual procedure used is described in Section 3.2.7 Fatigue Analysis of the

PUAR. The Fatigue Analysis of the torus was completed using the procedures set forth in Section NE-3221.5 "Analysis for Cyclic Operation" of the ASME BPVC.

- The cumulative fatigue usage factors were conservatively calculated using the maximum stress intensification factor recognized by the ASME BPVC of 4.0.

- The maximum alternating stress intensity for a particular loading event is calculated independently of other loading events (Sa = Sr/2). The alternating stress intensities are then conservatively combined by absolute summation. We are, therefore, assuming that each loading case will increase the magnitude of the stress range for the number of cycles over which it acts.

- Critical points were chosen based on the stress analysis. Those elements in the region of the torus shell which exhibited the maximum membrane, bending and total stress intensity as shown in Figure 3-9 of the PUA were analyzed for fatigue.

- Section 3.2.3.2 on Post Chugging indicated that pre-chug stress values for the torus bounded post chug. Therefore, the fatigue analysis was completed using the pre-chugging stresses. The duration of loading for both chugging events is identical.

- Thermal transients were not given consideration. Item G2 addresses this subject.

- The torus attached piping penetrations will be addressed for fatigue in TES Technical Report TR-5319-2.

- As discussed in Item 17, adjustments to the cyclic amplitudes and the associated number of cycles were made.

ITEM G2

QUESTION

Is the method described in Section 4.3.6 of Reference 4 for assessing thermal stress typical of all evaluations made in the report?

Please discuss the tacit assumption that either:

1. Thermal equilibrium is achieved before other significant mechanical loads are experienced by the structure.

   or

2. Maximum transient thermal stresses are conservatively bounded by the assumptions made.

ANSWER

The resultant alternating stress intensity from one cycle of LOCA thermal transient event will not significantly affect the magnitude of the cumulative fatigue usage factor. The following discussion is provided to support our decision not to consider the thermal transient events and complete our fatigue analysis with steady state thermal results where required.

The ASME BPVC NE 3221.5 Analysis for Cyclic Operation, Section (d) Vessels not Requiring Analysis for Cyclic Service, Number (4) Temperature Difference - Similar Material states:

A temperature difference fluctuation shall be considered to be significant if its total algebraic range exceeds the quantity

$$S/E\,\alpha$$

where S is the value of Sa obtained from the applicable design fatigue curve for $(10)^6$ cycles.

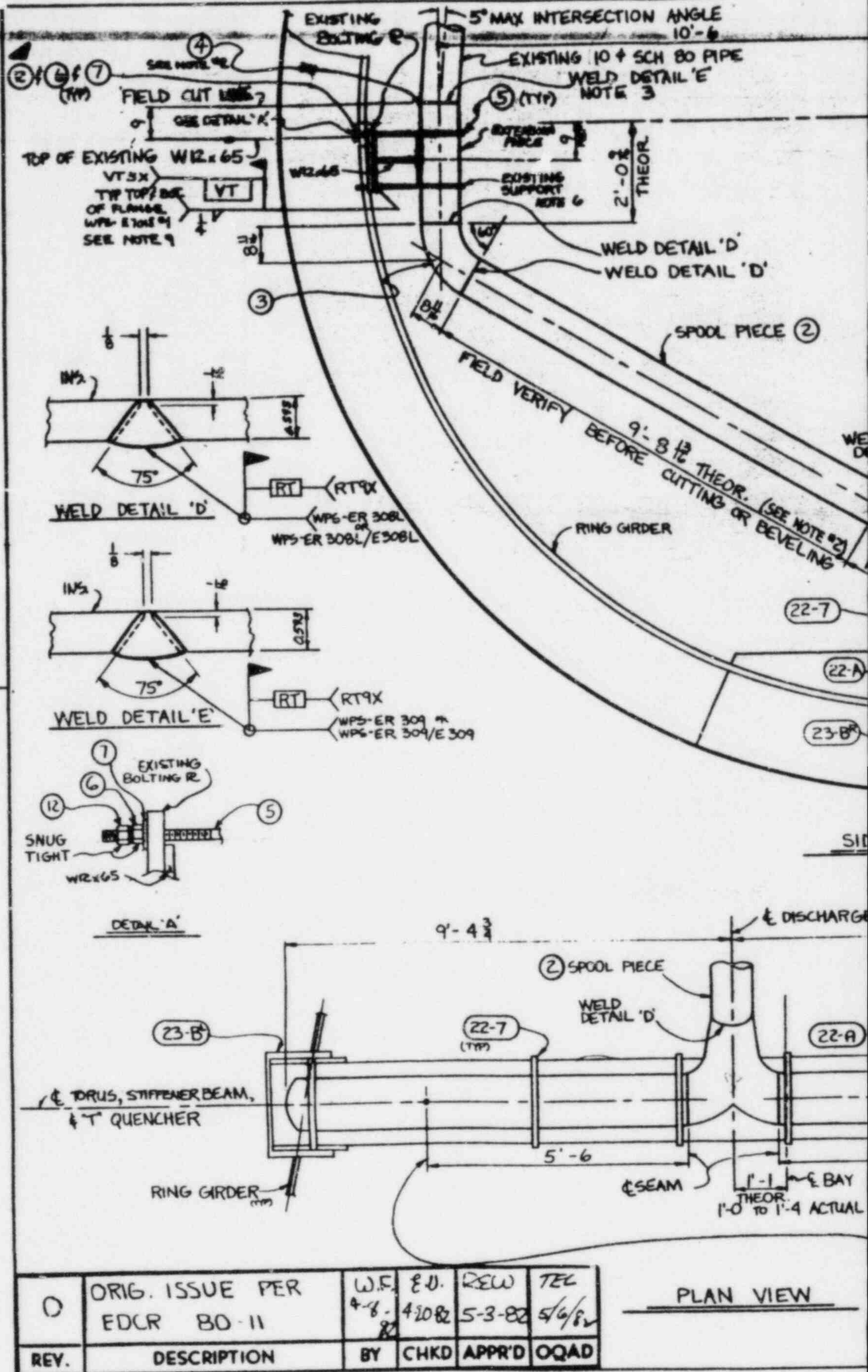
For carbon steel, this quantity is approximately 70°F.

The PULD temperature transients for the five plants which were analyzed by TES were reviewed with the following results:

- All wetwell and drywell temperature transients for the SBA and IBA events were less than 70°F.
- All wetwell temperature transients for the DBA events were less than 70°F.
- The maximum DBA drywell transient of the five plants considered was 217°F.

Therefore, the only transient of concern is the DBA drywell temperature. The major portion of the DBA transient occurs very early in the event (within the first 1.5 seconds) while pool swell is still in progress. Since the PUAAG does not require that the DBA pool swell events be considered for the fatigue analysis or primary plus secondary stress intensity range, the temperature transient may be excluded from further consideration.

The effects of the Transient Thermal Conditions associated with the LOCA related events can, therefore, be excluded from further consideration.



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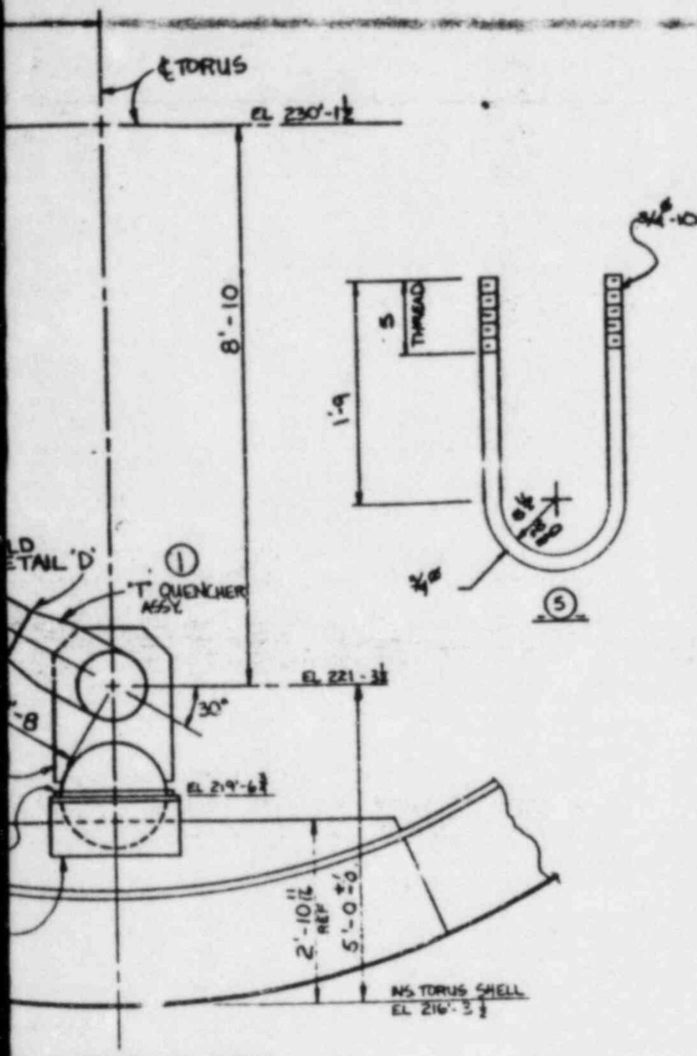
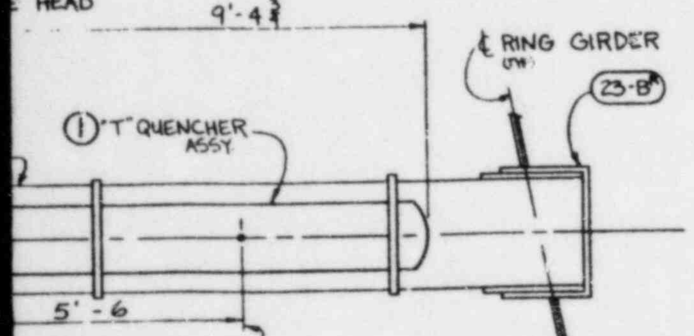




	4	32-1	12" T QUENCHER ASSY.				*	A
			SUPPLIED BY G.E.					
			INSTALLED BY CBI					
	1	32-2 / 32-4	RUN 10ϕ SCH 80 PIPE	RANDOM LENGTHS			*	A
			SUPPLIED BY VERMONT YANKEE					
			INSTALLED BY CBI					
	4	32-3	10ϕ SCH 80 LR 90° ELBOW				*	A
			SUPPLIED BY VERMONT YANKEE					
			INSTALLED BY CBI					
	16	32-10	1ϕ STUD (SUPPLIED BY VERMONT YANKEE)	0	4⅝		**	C
	32	32-11	1ϕ HVY HEX NUT				**	C
			(SUPPLIED BY VERMONT YANKEE)					
4 EXTRA	20	32-7	¾ϕ HVY PLAIN STD WASHER				**	C
2 EXTRA	10	32-5	¾ϕ U-BOLT x SK				**	C
4 EXTRA	20	32-6	¾ϕ HVY HEX NUTS (10-UNC-2B)				**	C
	16	32-12	¾ϕ HVY HEX NUTS OR ¾ϕ STD NUTS				**	C
			SUPPLIED BY VERMONT YANKEE					
	16	32-13	FLAT WASHER 2 x ⅛ @ 1⅛ϕ HOLE	0	2		***	C
			(SUPPLIED BY VERMONT YANKEE)					

MATERIAL:
FITTINGS: SA 403 WP 304L
** A325 OR EQUAL *** A36
NOTES: * PIPE: SA 312 TYPE 304

1) WORK THIS DWG W/ DWGS 21-25 & 30
2) DIMENSION TO BE DETERMINED IN FIELD, CUT EXTENSION PIPE & SPOOL PIECE TO SUIT AND BEVEL PER WELD DETAIL 'E'.
3) FIELD BEVEL EXISTING PIPE PER WELD DETAIL 'E'
4) SEE DWG 21 FOR SHIMMING OF T-QUENCHER AT SUPPORTS (32-7)
5) FIELD CUT (4) SRV LINE EXTENSION PIECE FROM 10' RUN
6) FIELD INSTALL INSULATOR (ASBESTOS CLOTH PAD, OR EQUIVALENT) BETWEEN U-BOLT AND STAINLESS PIPE. INSULATOR MATERIAL TO BE FURNISHED BY VERMONT YANKEE.
7) PIECE MARKS NOTED BY (8) ARE SHOWN FOR IDENTIFICATION PURPOSES
8) REPLACE EXISTING U-BOLT, NUTS & WASHERS WITH ⑤, ⑥, ⑦ & ⑫.
9) FIELD MOVE EXISTING BOLTING PL AS REQUIRED TO INSTALL NEW U-BOLTS. CUT EXISTING FILLET WELDS AND REPLACE WITH FILLET WELD SHOWN IN SIDE ELEVATION VIEW.

CBI CONTRACT NO. 03581 (SHOP) & 03583 (FIELD)

Chicago Bridge & Iron Company

FIELD INSTALLATION DETAILS FOR SRV LINE AND 'T QUENCHER

VERMONT YANKEE

Revisions: ADDED 32-13 REVISED PIPE MATL; ADDED DETAIL 'C' ⑤ ⑥; ADDED FILLET WELD BOLTING PL TO W12

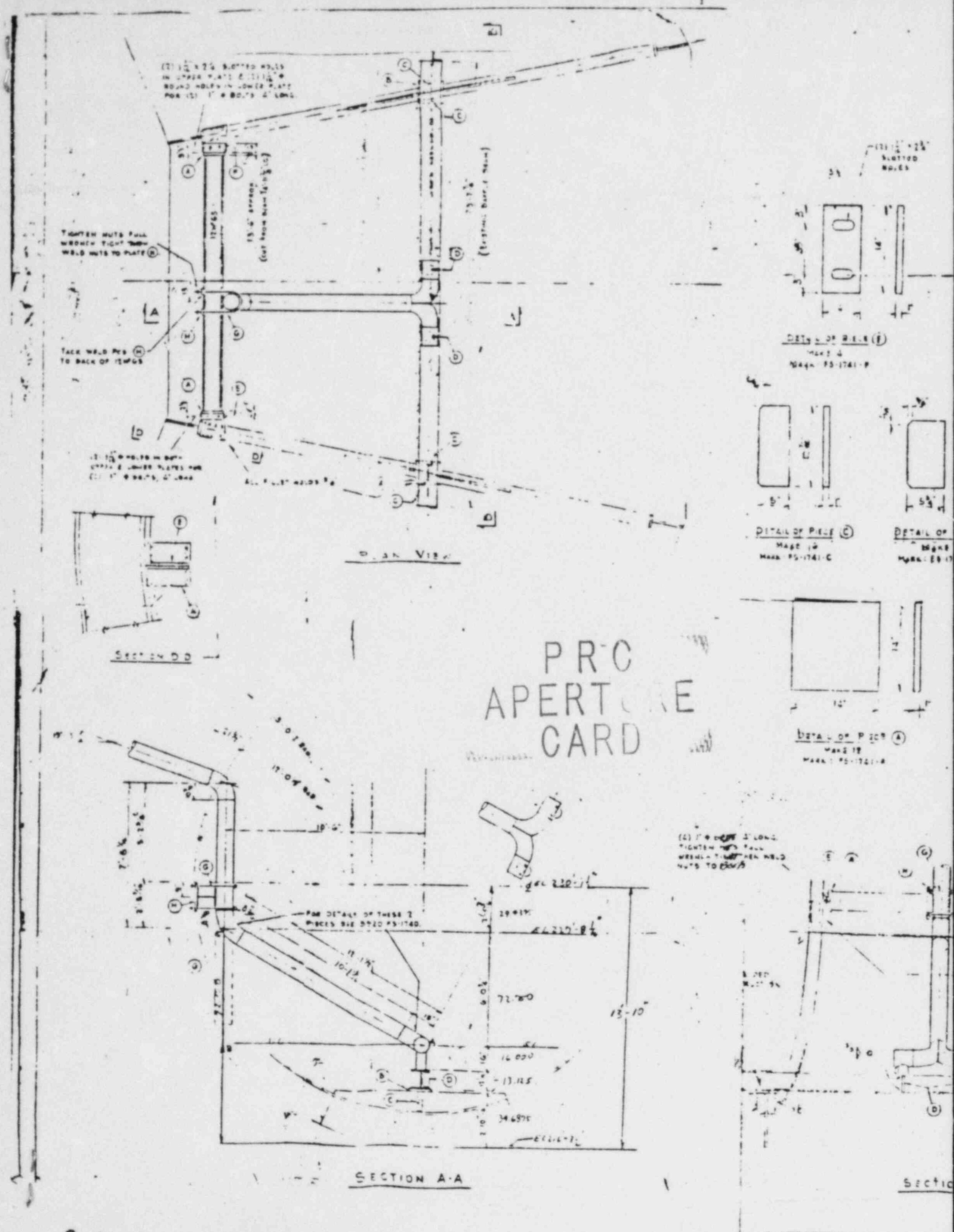
CJM — BLE — 5-28-80 — PROJECT No. 03580 — DWG No. 32

▶ INDICATES CHANGE FROM PREVIOUS ISSUE

5920-9113

V.Y ITEM 6

8306220053-01



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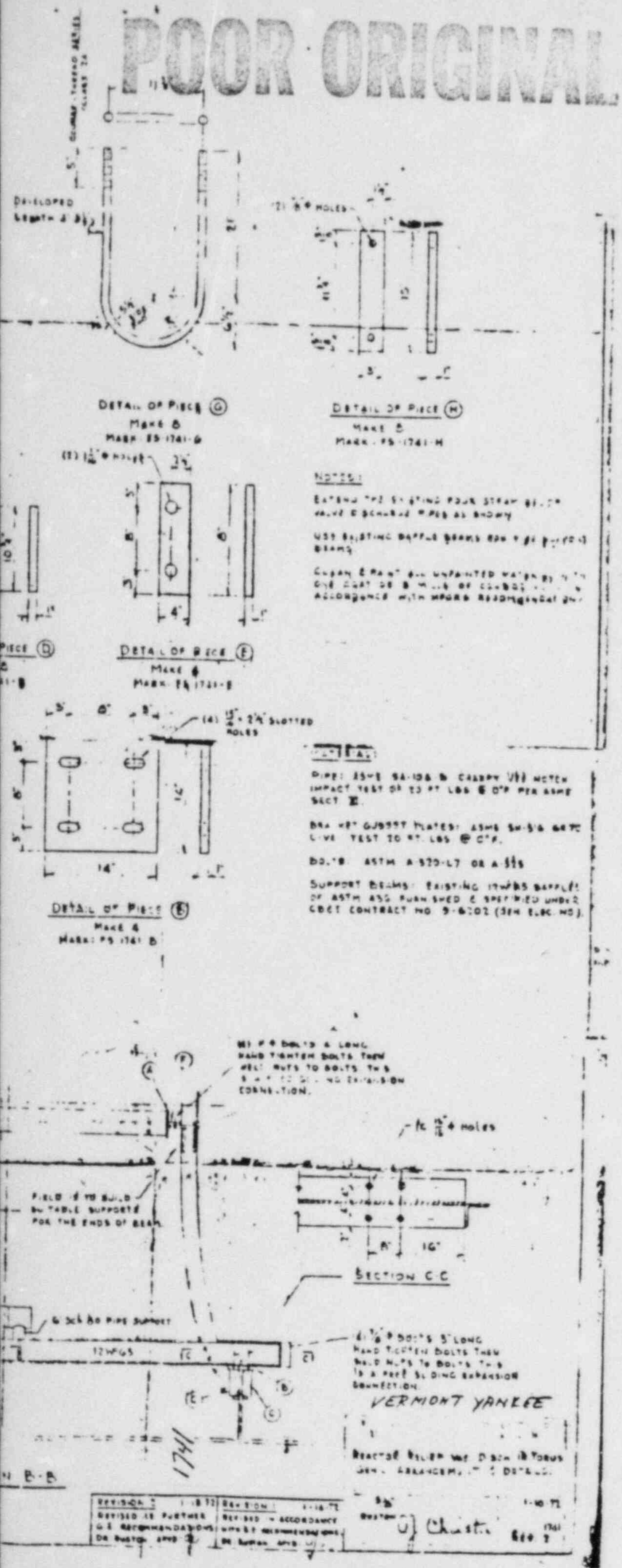


V. Y.
ITEM 6

Also Available On
Aperture Card

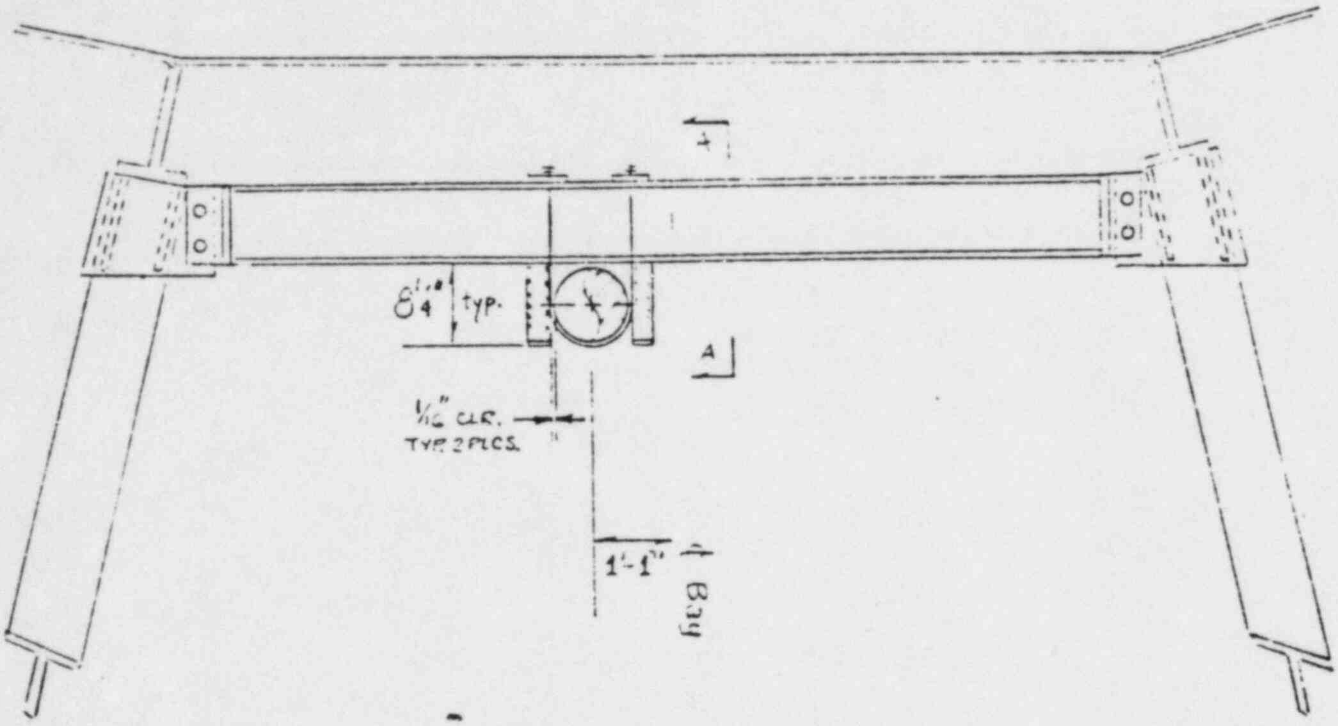
TELEDYNE ENGINEERING SERVICES

BY P.W.P. DATE 3-11-83
CHKD. BY FTC DATE 3-17-83

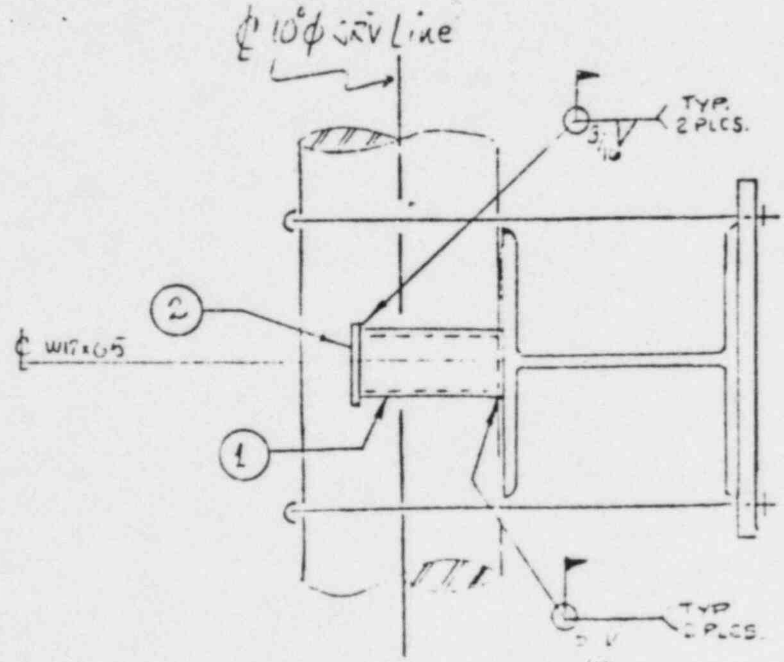
Vermont Yankee
Internal SRV Support

PROJ. NO. 5349C.

Support Modification



Plan View



Section A-A

Support Modification

Bill of Materials

Item No	Description / Material		Quantity
1	3"⌀ Sch. 40 pipe × 8" LG. /	ASTM-A36	2
2	1/4" × 4" O.D. ℞ /	ASTM-A36	2

Notes:

1.) Support modification is typical at 4 SRV line locations