ENCLOSURE 1

TENNESSEE VALLEY AUTHORITY

WATTS BAR NUCLEAR PLANT

PIPE SUPPORT MINIMUM DESIGN LOAD EVALUATION

PHASE I AND PHASE II REPORT

PREPARED BY: L. Stanish DATE: 4/11/91

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EXECUTIVE SUMMARY

PROBLEM DESCRIPTION - Specific requirements were incorporated in the Watts Bar pipe support design criteria WB-DC-40-31.9, Revision 7, to close an employee concern regarding pipe support stiffness and deflection requirements (specifically Sections 2.3.6 and 3.7.1). Revision 9 to this criteria revised portions of the documents which had been added for the employee concern closure. TVA did not coordinate this change with the Employee Concern Program (ECP) Manager. Further, the completed pipe support evaluations for the piping in the large bore 79-14 reanalysis effort used Revision 9 and later revisions of this criteria for design and qualification of new and modified support structures.

RESOLUTION - To resolve this issue with the ECP, TVA has initiated a three-phased program to demonstrate that the changes made by Revision 9 (and later) neither impact the closure of the employee concern nor compromise the adequacy of the pipe supports at the Watts Bar Nuclear Plant.

- Phase I: Screening of design load vs. minimum design load (MDL)

- Phase II: Engineering evaluation of supports having a design load less than the MDL; check deflection using MDL

- Phase III: Refined analysis for supports falling out of Phase II; issuance of any required modifications

This report covers only Phases I and II of the action plan, Phase III results will be reported separately.

For the Hanger and Analysis Update Program (HAAUP) 8552 pipe supports were qualified using Revision 9 or later of WB-DC-41-31.9, as listed in the Hanger Tracking Program (HTP). The breakdown of the supports is as follows:

Screened in Phase I	8552 supports
Evaluated in Phase II	5015
Require Phase III evaluation	50

CONCLUSIONS - The results of Phases I and II have demonstrated:

a) Compliance with the minimum design load provisions of WB-DC-40-31.9, Revision 7, has been demonstrated for 99.4% of the HAAUP pipe supports. Compliance for the remaining 0.6% will be achieved at the conclusion of Phase III and the issuance of any required modifications.

b) That the later revisions to the design criteria provide comparable structural designs to those designed using Revision 7, and do not invalidate the closure of the employee concern.

ACTIONS TO BE COMPLETED

1) A revised summary response to ECP Manager will be sent following completion of Phase III and the submittal of supporting calculations to the TVA records system.

2) WB-DC-40-31.9 will be revised. Section 2.3.6 will be restored to read as it did in Revision 7 and will apply for all future Category I pipe support designs.

RECURRENCE CONTROL - TVA has instituted a "Source Noting" requirement for criteria and related design documents and procedures (Reference 11). A note will be added to the sections of the documents which were added or revised to resolve an employee concern, condition adverse to quality report, or fulfill a NRC commitment.

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1.0 BACKGROUND

During the November, 1990 NRC audit of Amendment 64 of the Watts Bar FSAR, the minimum design load requirements for pipe supports were subject to review. Revision 7 of WB-DC-40-31.9, "Criteria for Design of Piping Supports and Supplemental Steel in Category I Structures" specified, in response to an employee concern (Reference 12), a minimum design load (MDL) for pipe supports.

Section 2.3.6 of Revision 7 defined MDL as, "The larger of 150 pounds or the weight of a standard water-filled ANSI B31.1 span". In Revision 9 of the same document, this requirement was altered such that the MDL equaled 150 pounds and was applied only to new supports in the minus vertical direction. This criteria remains through the current revision, 11, (see Attachment A for a comparison of Revision 7 and 9).

The Revision 9 changes concerning MDL were not coordinated with the Employee Concern Program (ECP) prior to implementation. The Hanger and Analysis Update Program qualified supports to Revision 9 or later of the design criteria. The investigation documented in this report was undertaken to determine what effect the changes in design criteria, relative to minimum design load, had on the concern brought to the ECP.

2.0 PURPOSE

The purpose of this task is to demonstrate compliance with the minimum design load requirements of Revision 7 for the population of pipe supports completed under the Hanger and Analysis Update Program (HAAUP).

3.0 SCOPE

The scope for the three-phase evaluation encompasses the HAAUP supports contained within the 319 rigorously analyzed large bore piping problems as listed in the Hanger Tracking Program (HTP). Although pipe sizes 1" in diameter and smaller were exempted from the minimum design load criteria, they were considered within the scope of this task. The Phase I scope is 8552 supports.

4.0 REFERENCES / DATA SOURCES

1. TVA memorandum from R.O.Hernandez to R.V.Pierce, Feb.27,1991, "Minimum Loads for Pipe Supports," RIMS B26910227100

2. WB-DC-40-31.9, Rev.7, "Criteria for Design of Piping Supports Supplemental Steel in Category I Structures," RIMS B41880113001

3. WB-DC-40-31.9, Rev.9, "Criteria for Design of Piping Supports Supplemental Steel in Category I Structures," RIMS B26881229006

4. WB-DC-40-31.9, Rev.11, "Criteria for Design of Piping Supports Supplemental Steel in Category I Structures," RIMS B26900605076

5. Base Design Change Notices (DCN) for the 319 rigorously analyzed large bore piping problems

6. As-built packages for the 319 piping problems

7. Piping analysis computer run of record for the 319 problems

8. Pipe support calculations of record for the HAAUP rigorously analyzed pipe supports

9. Hanger Tracking Program (HTP), date 12-6-90

10. Design Input Memorandum to WB-DC-40-31.9, DIM-WB-DC-40-31.9-12, RIMS B26900206079

11. Administrative Site Procedure/Instructions, AI-3.1, Rev.24

12. Employee Concern Report ECP-87-KX-165-01, RIMS L12 880329 976

5.0 METHODOLOGY

The minimum load evaluation is comprised of three distinct phases as follows:

5.1 Phase I - Screening

Phase I is a two step screening process to identify the pipe supports which were not designed to the minimum design load. (The HAAUP pipe supports were qualified in accordance with WB-DC-40-31.9, Revision 9 or later revision.)

Step one involves screening the pipe supports for the deflection criteria of Section 3.7.1.a of WB-DC-40-31.9. Step two screens for load capacity based on the current piping analysis design loads.

The screening methodology used in Phase I followed the steps identified below (refer to the flow chart on the next page):

1. Identify all piping analysis calculation packages as defined by HTP and within the scope of the HAAUP.

2. Tabulate the maximum dynamic and faulted piping loads for each support point's design restrained direction. These loads are entered into a central database which is derived from the HTP database.

3. Steps 4 thru 10 below evaluate the deflection criteria for MDL.

4. Divide all tabulated faulted loads by a factor of 2.0 to assure that the MDL check will account for the dynamic deflection allowable of 1/16", since the faulted load was checked against 1/8" (in accordance with the design criteria).

5. Using the pipe diameters from the HTP database and the MDL defined in WB-DC-40-31.9, Revision 7, calculate and tabulate the MDL for each support point and direction.

6. Compare the maximum of the plus and minus dynamic load tabulated in step 2 with the MDL tabulated in step 5.

7. The deflection criteria screening has been met if the maximum dynamic load is greater than or equal to the MDL. Load capacity will now be screened (go to step 11).

8. If the maximum dynamic load is less than the MDL, compare the maximum of the plus and minus factored faulted load from step 4 with the step 5 MDL.

9. The deflection criteria screening has been met if the maximum factored faulted load is greater than or equal to the MDL. The load capacity will now be screened (go to step 11).

10. The support does not pass the Phase I screening for deflection if the maximum factored faulted load is less than the MDL.

11. All supports must now undergo a Phase I load capacity screening.

12. Compare the maximum plus faulted load tabulated in step 2 with the MDL.

13. The support does not pass the load capacity screening if the maximum plus faulted load is less than the MDL. A support which has a tabulated faulted load of zero in the plus Y direction is assumed to be a uni-directional support (i.e. restrained for minus Y load only). See Section 6.3 for more information.

14. If the maximum plus faulted load is greater than or equal to the MDL, compare the absolute value of the maximum minus faulted load tabulated in step 2 with MDL.

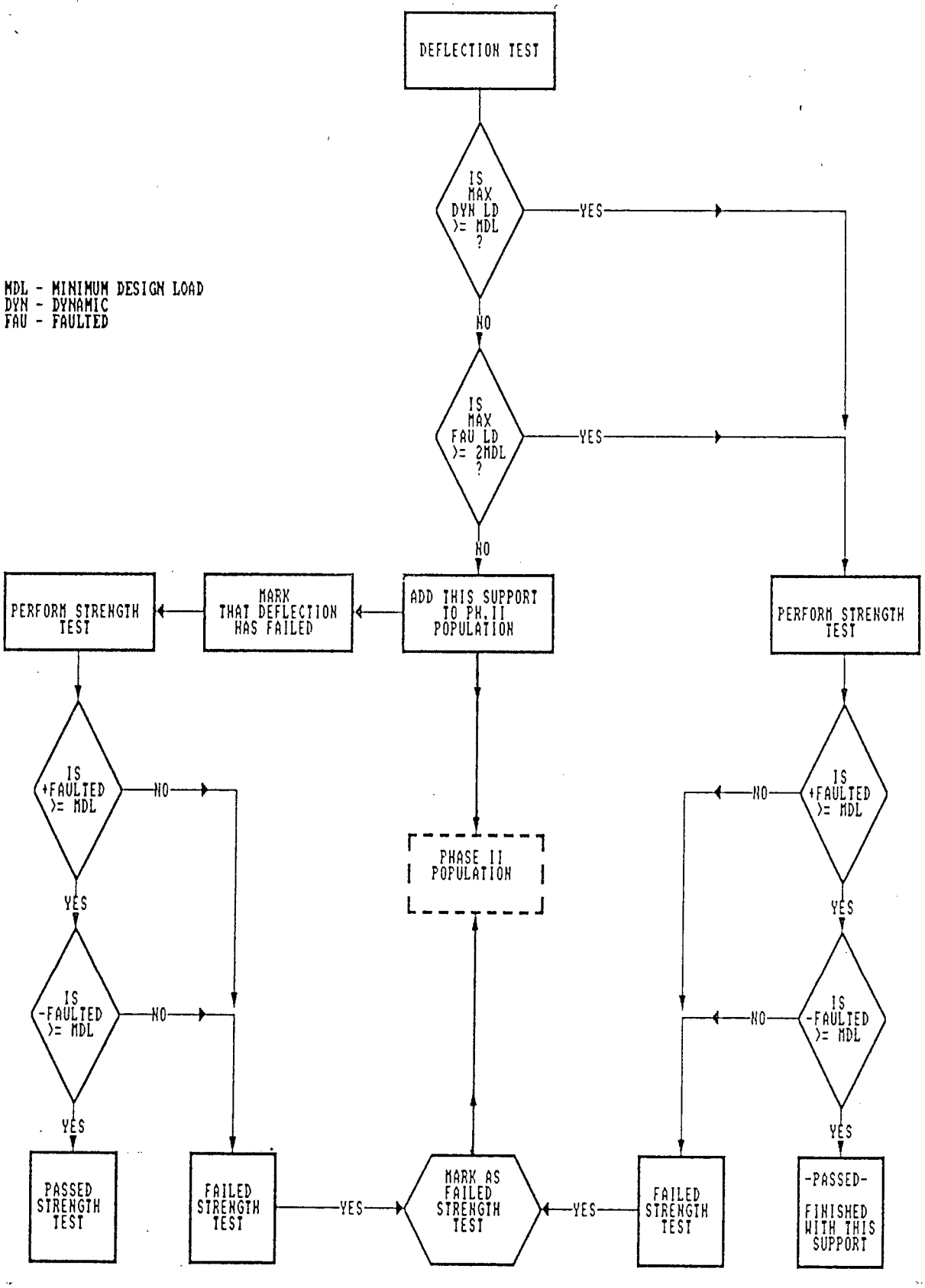
15. The support passes the load capacity screening if the absolute value of the maximum minus faulted load is greater than or equal to the MDL.

16. The support does not pass the load capacity screening if the absolute value of the maximum minus faulted load is less than the MDL.

17. Supports which meet the deflection screening process of either steps 7 or 9 and the load capacity screening of steps 14 and 15 pass Phase I screening and no Phase II engineering evaluation is required.

18. Supports which do not pass the Phase I screening process (either deflection, load capacity, or both) will receive an engineering evaluation in Phase II.

PHASE I O[redacted]MINIMUM SUPPORT LOAD EV[redacted]UATION



5.2 Phase II - Engineering Evaluation

When a support did not meet the Phase I screening process for deflection and/or load capacity, a Phase II engineering evaluation was performed. This phase made an engineering determination as to whether a support met the criteria of Revision 11, if it was loaded in the design restrained direction with the MDL calculated in step 5 of Phase I.

The engineering evaluation process used in the Phase II program consists of the following steps: (For gang supports see Sec. 6.5)

1. A copy of the latest pipe support drawing was obtained from either the base DCN issued against a particular piping problem or the walkdown package.

2. An engineer reviewed the pipe support drawing and determined whether adequate design margin exists (per WB-DC-40-31.9, Revision 11) when the MDL defined in WB-DC-40-31.9, Revision 7, is applied to the support in the design restrained direction.

   This review considered such parameters as structural steel member size and length, weld size, plate thickness and size, anchor bolt number, size and type, if applicable, etc. Also, calculations may have been generated to further verify the engineer's determination. This additional calculation becomes a part of the "Minimum Support Design Load Review Sheet" package. Each support which did not pass the Phase I screening has one of these sheets.

3. If the engineer determined that adequate design margin exists in step 2, the support passes the Phase II evaluation and no additional work is required.

4. When the engineer could not make a determination that adequate design margins exist, the pipe support calculation of record was retrieved.

5. The calculation was reviewed and, if necessary, additional calculations were generated to determine whether adequate margins exist. If adequate design margins were calculated, the support passed the Phase II engineering evaluation and no additional work was required on that support.

6. Phase II engineering evaluations are be documented on the "Minimum Support Design Load Review Sheet" and independently verified by another engineer.

7. At this time if a determination could not be made that adequate design margins exist with the MDL, the support was identified for Phase III disposition.

5.3 Phase III - Disposition of Remaining Supports

When a support does not pass the Phase II engineering evaluation, it enters into Phase III. In Phase III refined analysis will be performed to demonstrate that each pipe support meets the current design criteria with the MDL applied. Any supports which do not satisfy the design criteria will be modified.

6.0 SPECIAL CASES

6.1 Tieback Supports

Tieback supports are "internal" supports modelled in the piping analysis which connect a run pipe to a branch pipe. The structural property of the modelled support must be met or exceeded by the tieback design per WB-DC-40-31.9. Since the support moves with the piping and the deflections of the support are included in the piping analysis, no deflection check is required as long as the structural property requirement is met. Therefore, the MDL does not apply to tieback supports, and all tieback supports that required Phase II evaluation were marked as "not applicable" or "NA" on the Phase II sheets. No further evaluation is required.

6.2 Variable and Constant Supports

The flexibility of variable supports (i.e. the ability to allow thermal movement) makes a deflection evaluation not applicable. Since design loads for variable/constant support is based on piping stress analysis (i.e. a function of static equilibrium of piping system in deadweight load case) and verified by field measurement, the MDL is not applicable. A strength evaluation was performed for this population of supports. No further evaluation is required.

6.3 Uni-directional Supports

In cases where piping analysis had determined that positive vertical loads (+Y) cannot overcome deadweight (-Y), the associated support design may be for "-Y" only. For these "-Y" supports, such as frames with no members on top of the pipe or rod assemblies, the deflection and strength screen is not applicable for the +Y direction. These support types were considered acceptable in Phase II for the +Y direction. The -Y direction was evaluated. No further evaluation for +Y is required.

6.4 Supports Adjacent to the Strain Sensitive Equipment

Special effort was made to search through the 319 HAAUP large bore piping analysis problems in order to identify all supports adjacent to strain sensitive equipment. A total population of 196 supports was evaluated for maximum deflection of 1/16" based on the maximum of the current design load or the MDL, which satisfies the requirements of Revision 11 of WB-DC-40-31.9.

6.5 Gang Supports

Gang supports are structures supporting more than one pipe attachment. Gang supports have been qualified to Revision 11 of WB-DC-40-31.9 (see References 4 and 10). Section 3.7.1.e states,

"For supports with a common member (i.e. gang supports) the deflection at the point under consideration due to the simultaneous application of each pipe's deadweight and thermal loads added algebraically shall be evaluated to determine the maximum deflection for both the hot and cold pipe conditions. The deflection at the point under consideration resulting from simultaneous application of each pipe's dynamic loads shall be determined by SRSS method. The total deflection due to deadweight plus thermal, and dynamic loads shall be evaluated based on absolute summation of the two deflections calculated above."

There are 822 gang structures identified in the HTP, which are tracked by the main support or "master" support whose calculations qualify the main structure. These 822 calculations cover over 2000 individual supports. Gang supports were evaluated as follows:

PHASE I - The total design loads in each restrained direction were screened (in the same manner as in Section 5.1) against the largest applicable MDL or an appropriate combination of the MDL for the same restrained direction. Those supports which pass the Phase I screening were considered acceptable for the MDL. However, to assure that each individual attachment was acceptable the master support calculation package was reviewed in Phase II.

PHASE II - All master support calculation packages and drawings were reviewed as discussed in Section 5.2. There is one evaluation sheet for each gang support showing both Phase I and Phase II applicability. Any gang supports not passing Phase II will be evaluated in Phase III.

The totals given in this report for Phases I and II include gang supports.

7.0 RESULTS (Phase I and Phase II only)

For the MDL evaluation the results of Phase I and Phase II are:

Phase I - 8552 pipe support design loads were screened against the appropriate MDL and 3537 supports are acceptable with no further evaluation. 5015 supports were identified for engineering evaluation in Phase II.

Phase II - Engineering evaluations were performed for the 5015 pipe supports using the appropriate MDL. 4965 were shown to be acceptable with no further evaluation required. Fifty (50) pipe supports will be further evaluated in Phase III.

The Phase I and Phase II evaluation and results will be documented in the form of a calculation package.

8.0 CONCLUSIONS

This review has demonstrated that of the 8552 pipe supports evaluated in HAAUP scope, 0.6% were found to deviate from the minimum design load requirements of WB-DC-40-31.9, Revision 7.

TVA concludes that the pipe supports are adequately designed, and has demonstrated that 99.4% of the HAAUP supports meet the minimum design load of Revision 7. The remaining 0.6% will be dispositioned by the Phase III activity, scheduled to be completed by July 15, 1991.

Additionally, TVA has instituted a "Source Noting" requirement for criteria and related document changes per Reference 12. This instruction requires a notation to be added to revised document sections and identifies the source of the change, such as an employee concern, a condition adverse to quality report, or an NRC commitment. This has placed administrative control on critical portions of documents and serves to prevent recurrence of similar situations in the future.

ATTACHMENT A

MINIMUM DESIGN LOADS - COMPARISON OF REV. 7 AND 9 OF WB-DC-40-31.9

This table serves two purposes: 1) to identify major differences between Revisions 7 and 9 of WB-DC-40-31.9 relative to stiffness/deflection of pipe supports, and 2) identify key areas in the two revisions which are relevant to minimum loads, even though they may not have changed in the later revisions.

REVISION 7	REVISION 9
2.3.6 Minimum Load Design The larger of 150 pounds or the weight of a standard water-filled ANSI B31.1 span.	2.3.6 Minimum Load Design A faulted load equal to 150 pounds in the negative vertical direction. The minimum load is only applicable to new support designs.
3.4.4 All Category I and I(L) pressure boundary retention supports and support elements (both vertical and lateral) on piping larger than 1" shall be designed for a minimum design load (References Section 2.3.6). (The minimum design load does not apply to tubing supports or piping less than or equal to 1".)	3.4.4 All Category I and I(L) pressure boundary retention supports and support elements (both vertical and lateral) on piping larger than 1" shall be designed for a minimum design load (References Section 2.3.6). (The minimum design load does not apply to tubing supports or piping less than or equal to 1".)
3.5.1 The following rules shall be followed for application of friction loads to pipe support design:	3.5.1 The following rules shall be followed for application of friction loads to pipe support design:
d. The friction force shall be calculated by multiplying the static coefficient of friction by the greater of the normal operating or minimum design load which acts perpendicular to the contact surface.	d. The friction force shall be calculated by multiplying the static coefficient of friction by the greater of the normal operating or minimum design load which acts perpendicular to the contact surface.

REVISION 7	REVISION 9
g. Friction loads shall be used in conjunction with the greater if the normal load or minimum design load in checking allowable stresses.	g. Friction loads shall be used in conjunction with the greater if the normal load or minimum design load in checking allowable stresses.
3.7 Stiffness/Deflection Criteria	3.7 Stiffness/Deflection Criteria
Pipe support stiffness and deflection limitations are required for seismic Category I and I(L) pressure boundary retention supports to ensure that piping dynamic seismic response is not amplified by the pipe support structure.	Pipe support stiffness and deflection limitations are required for seismic Category I and I(L) pressure boundary retention supports.
3.7.1 The following criteria shall be used for support stiffness requirements:	3.7.1 The following criteria shall be used for support stiffness requirements:
a. All supports, except as described below, will be designed to have a maximum deflection of 1/10" at the point of load application in each restrained direction. This analysis shall be performed using the greater of normal, upset, emergency, faulted design load, or the minimum design load per paragraph 2.3.6.	a. All pipe support structural steel, except as described below, will be designed to limit the maximum deflection to 0.0625" or less (based on the seismic/dynamic load components of the upset or faulted loading conditions). In addition, the maximum deflection shall be limited to 0.125" or less (based on the total design load). These analyses shall be performed independently for each restrained direction (axis) at the point of load application.

REVISION 7	REVISION 9
b. In addition, the first two rigid support locations adjacent to a pump, compressor, or turbine nozzle will be designed to a maximum deflection of 1/16" under the load conditions described above.	b. The first dynamic support in each lateral direction adjacent to strain sensitive equipment (i.e. pump, compressor, or turbine nozzle) will be designed to limit the maximum deflection to 0.0625" or less (based on the total design load). This analysis shall be performed independently for each restrained direction (axis) at the point of load application.
c. Baseplate rotation or deflection due to baseplate flexibility and anchor bolt movement shall not be considered for this evaluation.	c. Except for the unbraced cantilevers, baseplate rotation or deflection due to baseplate flexibility are considered insignificant and, therefore shall not be considered. Anchor bolts stiffness need not be considered for this evaluation.
d. The flexibility (deflection) of building steel, concrete structures, SCV, conduit supports, cable tray supports, HVAC supports, etc., to which pipe supports are attached shall not be considered.	d. The flexibility (deflection) of building steel, concrete structures, and SCV to which pipe supports are attached shall not be considered.
e. For supports with a common member (i.e. gang supports), the stiffness/deflection limitation must be met at the point of each individual load application. Concurrent horizontal load combinations from all supports shall not be applied for determination of stiffness/deflection requirements. Vertical loads shall be concurrently applied.	e. For supports with a common member (i.e. gang supports), the stiffness/deflection limitation must be met at the point of each individual load application with all loads applied independently (i.e. with one load per direction acting at a time).

Note: Revision 11 agrees with Revision 9 except for Section 3.7.1 e. which states:

For supports with a common member (i.e. gang supports) the deflection at the point under consideration due to the simultaneous application of each pipe's deadweight and thermal loads added algebraically shall be evaluated to determine the maximum deflection for both the hot and cold pipe conditions. The deflection at the point under consideration resulting from the simultaneous application of each pipe's dynamic loads shall be determined by SRSS method. The total deflection due to deadweight plus thermal, and dynamic loads shall be evaluated based on absolute summation of the two deflections calculated above.

ATTACHMENT B

SUPPORT MINIMUM DESIGN LOADS

PIPE SIZE	MDL BASED ON B31.1 SPAN* (LBS)	MDL USED FOR PHASE I SCREENING (LBS)
1/4	3.29	150
3/8	4.55	150
1/2	6.88	150
3/4	9.53	150
1	14.37	150
1 1/4	20.44	150
1 1/2	32.40	150
2	51.08	150
2 1/2	86.56	150
3	129.36	150
3 1/2	174.07	174
4	228.20	228
5	372.48	372
6	535.16	535
8	954.56	955
10	1640.76	1641
12	2267.00	2267
14	2857.00	2857
16	3825.00	3825
18	4810.00	4810
20	6138.00	6138
22	7221.00	7221
24	8909.00	8909
26	10243.00	10243
28	11635.00	11635
30	13537.00	13537
36**	21500.00	21500

* B31.1 span weights are developed from a water-filled standard wall pipe

** For pipe sizes greater than 30" in diameter, the MDL for a 36" pipe is used

ATTACHMENT C: LISTING OF SUPPORTS FOR PHASE III

PROBLEM NUMBER	ATTRIBUTE					PER PROBLEM TOTALS
	A	B	C	D	E	
2000410	1					1
2000807	1					1
2000901	1					1
N3-03-01A	1					1
N3-03-05A	5	1				6
N3-26-03A	1					1
N3-30-03R	1					1
N3-31-09A		1				1
N3-31-11A	1	1				2
N3-61-08R	1	2				3
N3-62-27A	1					1
N3-62-40A				1		1
N3-63-03A					1	1
N3-67-09A	7					7
N3-67-16A	1					1
N3-67-53A	1					1
N3-70-04A	1					1
N3-70-05R	1					1
N3-70-08A			1			1
N3-70-30A	1					1
N3-77-01R	1					1
N3-78-13A	1					1
N3-82-08D	1					1
Gang Supports	13					13
TOTALS	**42**	**5**	**1**	**1**	**1**	**50**

LEGEND: A=Deflection; B=Base Plate Stress; C=Member Stress; D=+Y Load on U-SHAPE Supt.; E=+Y Load on Rod Hanger

ATTACHMENT D - EXAMPLE OF PHASE I EVALUATION SHEET

03/03/91

PHASE I MIN LOAD REVIEW

RESULT FROM REVIEW OF DBASE (ANAL) BY PROGRAM (ANAL13)

PROB NO | JT NO SUPPORT NO	PIPE HWARE	SCREEN LOAD	+X DYN NOR UPS FAU	-X DYN NOR UPS FAU	+Y DYN NOR UPS FAU	-Y DYN NOR UPS FAU	+Z DYN NOR UPS FAU	-Z DYN NOR UPS FAU	PH 1A	PH 1B	PH 2
** PROBLEM NUMBER N33115A											
N33115A 150	060	535							FD	FS	
47A92038002	F		412	412	1210	1210	677	677			
			28	7	1567	2099	55	128			
			240	219	2221	2754	409	482			
			441	420	2777	3309	733	806			
N33115A 290	060	535							FD	FS	
47A92038005	F		422	422	313	313	287	287			
			200	230	1738	1261	253	204			
			415	444	1902	1425	402	353			
			623	652	2051	1574	541	492			
N33115A 30	060	535							FD	FS	
47A92038008	F		227	227	783	783	0	0			
			119	135	948	2487	0	0			
			236	251	1373	2912	0	0			
			347	362	1732	3271	0	0			
N33115A 430	060	535								FS	
47A92038006	F		599	599	0	0	537	537			
			0	308	0	0	90	31			
			151	616	0	0	371	312			
			443	908	0	0	628	569			
N33115A 60	060	535							FD		
47A92038012	F		499	499	0	0	553	553			
			169	159	0	0	2073	207			
			426	416	0	0	2362	496			
			668	658	0	0	2626	760			

** Subtotal **

DATE RUN 03/02/91

WATTS BAR NUCLEAR PLANT UNIT 1
MINIMUM SUPPORT DESIGN LOAD REVIEW SHEET

GENERAL INFO: ANALYSIS FOR UNIT: 1 SYSTEM: 31 TVA PIPE CLASS: M

ANALYSIS INFO: PROBLEM NO: N33115A
RIMS: B18901113001
JOINT NO: 290
ISO DWG NO: 47W920214
FICHE NO: TVA-F-G090430 CAF: 042
ISO DCA: DCA-P04519

SUPPORT INFO: SUPPORT NO: 47A92038005
RIMS NO: B18900331047
PIPE DIAM: 060
BLDG & ELEV: A752A12T
SUPP TYPE: F
GANG SUPP: -NOT GANGED-

PHASE I - REVIEW BY ANALYSIS LOADS:

SCREENING LOAD: 535 (DESIGN LOAD / SCREEN LOAD)=(DL/SL)

DEFLECTION EVALUATION:

DESIGN LOAD	+X	(DL/SL)	-X	(DL/SL)	+Y	(DL/SL)	-Y	(DL/SL)	+Z	(DL/SL)	-Z	(DL/SL)
DYNAMIC	422	.789	422	.789	313	.585	313	.585	287	.536	287	.536
FAULTED/2	623	.582	652	.609	2051	PASS	1574	PASS	541	.506	492	.460

STRENGTH EVALUATION:

DESIGN LOAD	+X	(DL/SL)	-X	(DL/SL)	+Y	(DL/SL)	-Y	(DL/SL)	+Z	(DL/SL)	-Z	(DL/SL)
FAULTED	623	PASS	652	PASS	2051	PASS	1574	PASS	541	PASS	492	.920

YES NO
PASSED PHASE I - [ ] [XX]
SUPPORT FAILING - [FD] [FS]

PHASE II:

a. SUPPORT DRAWING REVIEWED: Support is braced in "both" lateral directions and was previously qualified for higher loads as shown on drawing : O.K

b. SUPPORT CALCUALTION REVIEWED: _____

YES NO
PASSED PHASE II - [✓] [ ]

PREPARED BY: K Kbatla DATE: 3/13/91 CHECKED BY: [signature] DATE: 3/19/91

E1

ATTACHMENT - EXAMPLE OF PHASE II EVALUATION SHEET