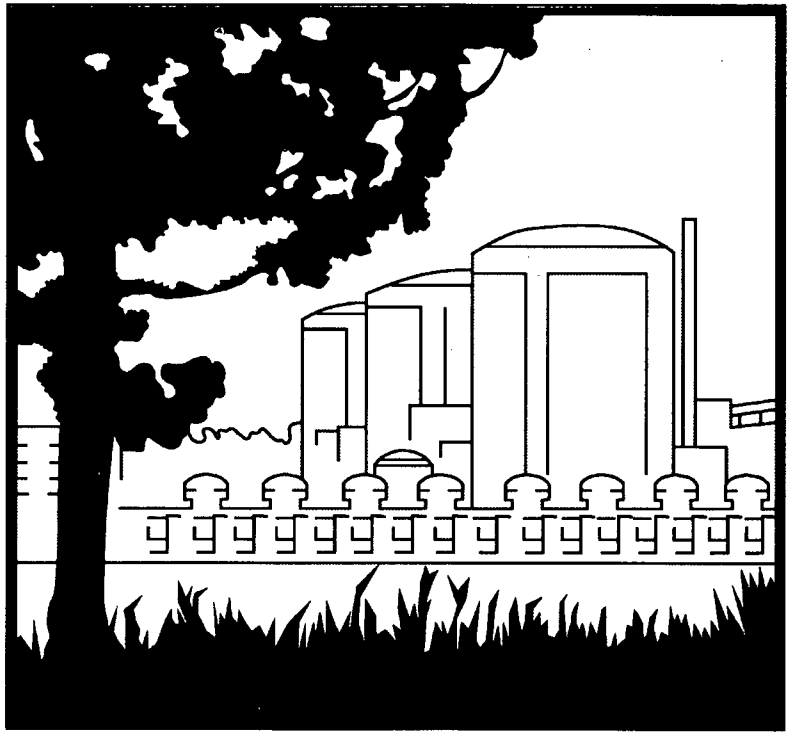
Duke Energy SM



Duke Energy
Oconee Nuclear Station
Tornado/HELB Mitigation
Strategies Meeting

NRR Offices
Rockville, MD
March 20, 2007
10:00 a.m. – 4:00 p.m.

Duke Attendees

- Mike Glover
- Rich Freudenberger
- George McAninch
- Tim Brown
- Allen Park
- Jim Sumpter
- Bill Patton
- Bert Spear

Duke Energy SM

Agenda

- Opening Remarks
- Meeting Objectives
- Open HELB Issues
- Next Steps
- Description of PSW in Planned LARs
- Closing Remarks

Resolution Categories

1. Common Understanding - No further action required

2. Common Understanding - Additional information/detail to be provided in a LAR

3. Common Understanding - Additional information/detail to be provided in a Supplement to the 11/30/06 Letter

4. Open Item

Main Steam Terminal End Break Location (Sketch 1)

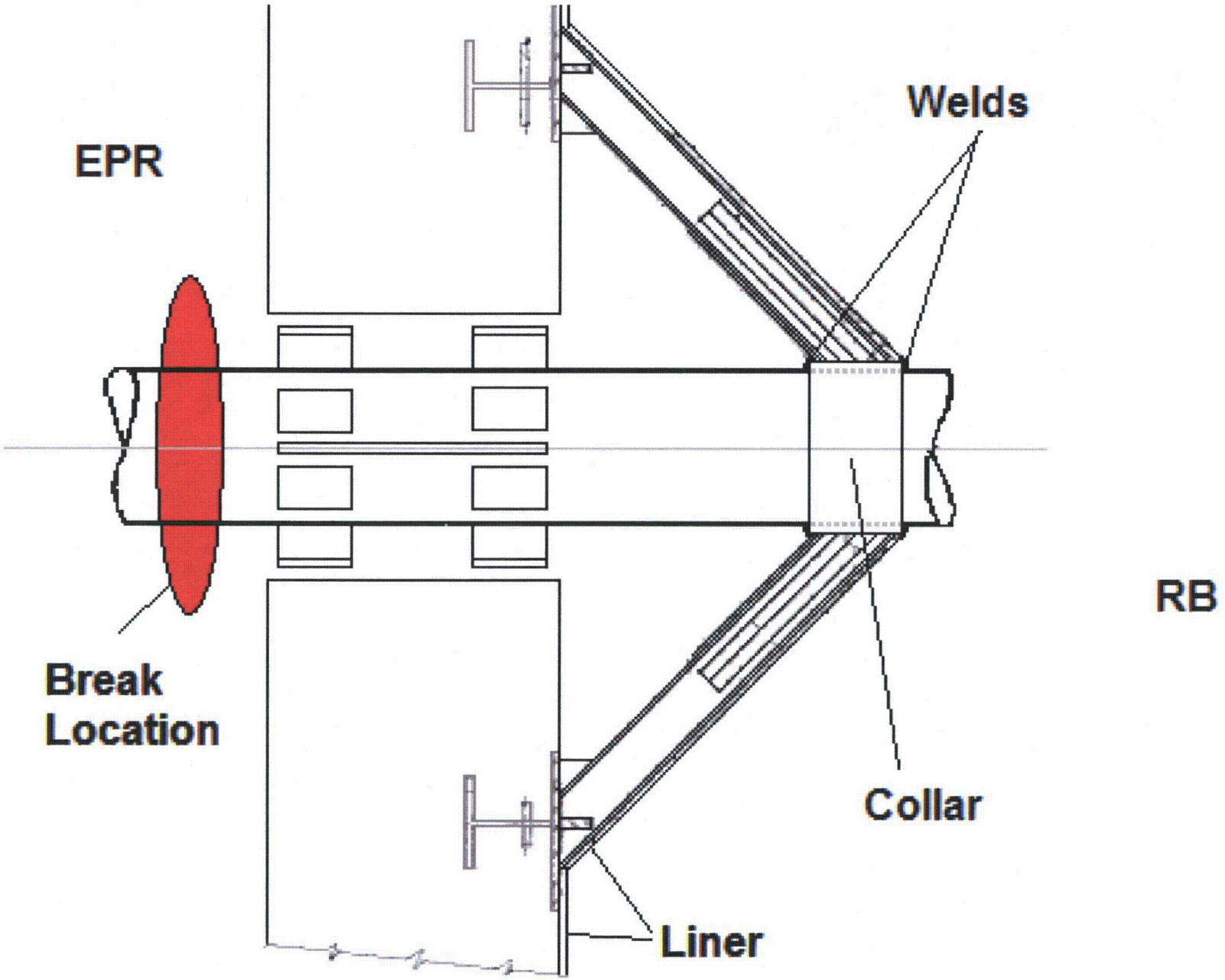
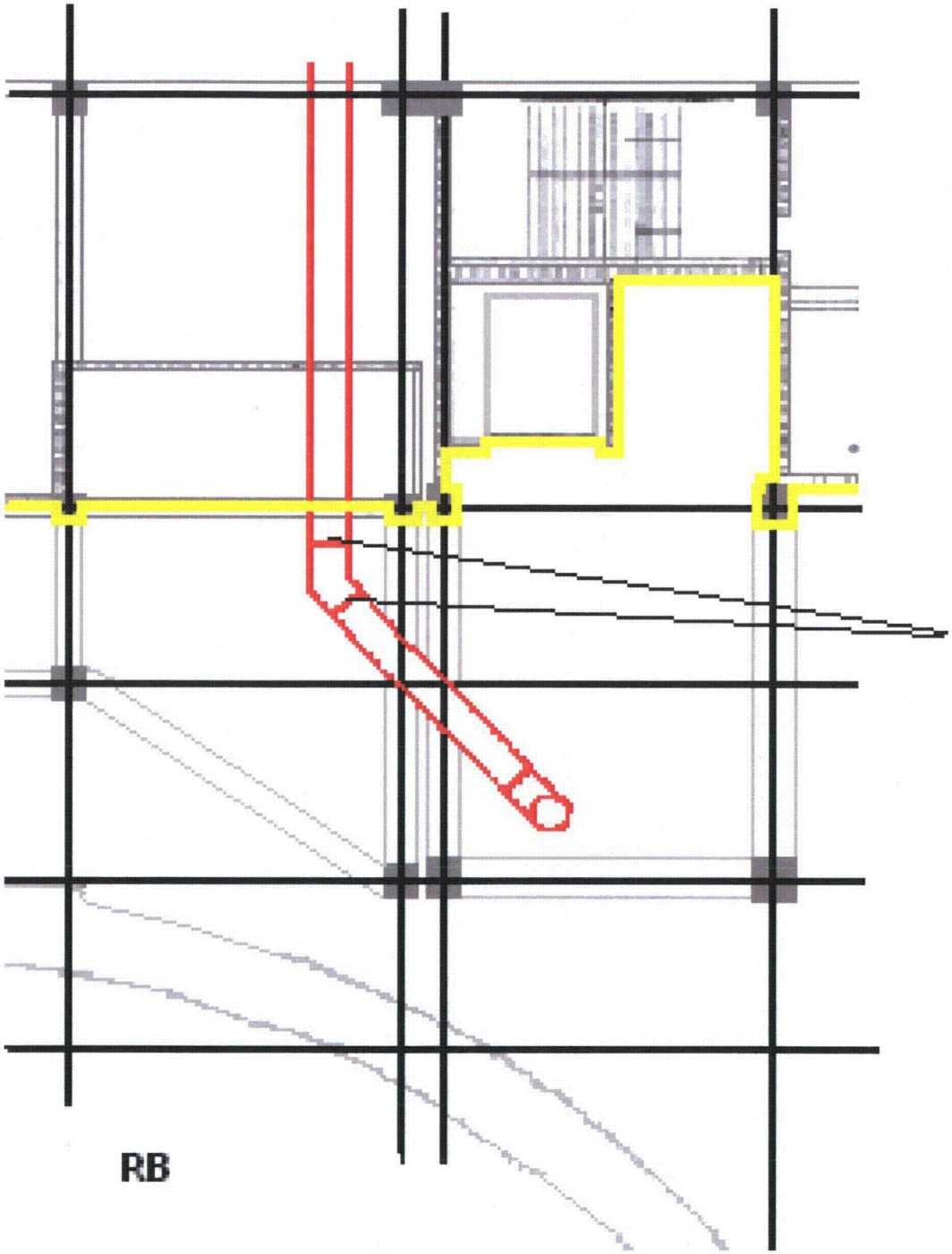


Chart 1
Unit 1 Main Feedwater East Penetration Room Critical Crack Locations

Identifier	Header	Description	Crack No.	Crack Description	Actual Stress (ksi)	Crack Threshold Stress (ksi)	% Actual above Threshold	Comment
FDW-057-CR	B (South)	Elbow Between valve 1FDW-46 & Containment Penetration	1	Elbow side Inlet Weld (C23A)	17.403	15.000	16.02%	
	B (South)	Elbow Between valve 1FDW-46 & Containment Penetration	2	Elbow side Outlet Weld (C23B)	18.942	15.000	26.28%	Inside rupture restraint guard pipe, inaccessible for inspection. Bounded by Terminal End Break
	B (South)	Elbow Between valve 1FDW-46 & Containment Penetration	3	Straight pipe side Outlet Weld (C23B)	16.107	15.000	7.38%	Inside rupture restraint guard pipe, inaccessible for inspection. Bounded by Terminal End Break
FDW-058-CR	B (South)	First Elbow in EPR from TB	1	Elbow side Inlet Weld (C20A)	17.766	15.000	18.44%	
	B (South)	First Elbow in EPR from TB	2	Elbow side Outlet Weld (C20B)	17.219	15.000	14.79%	

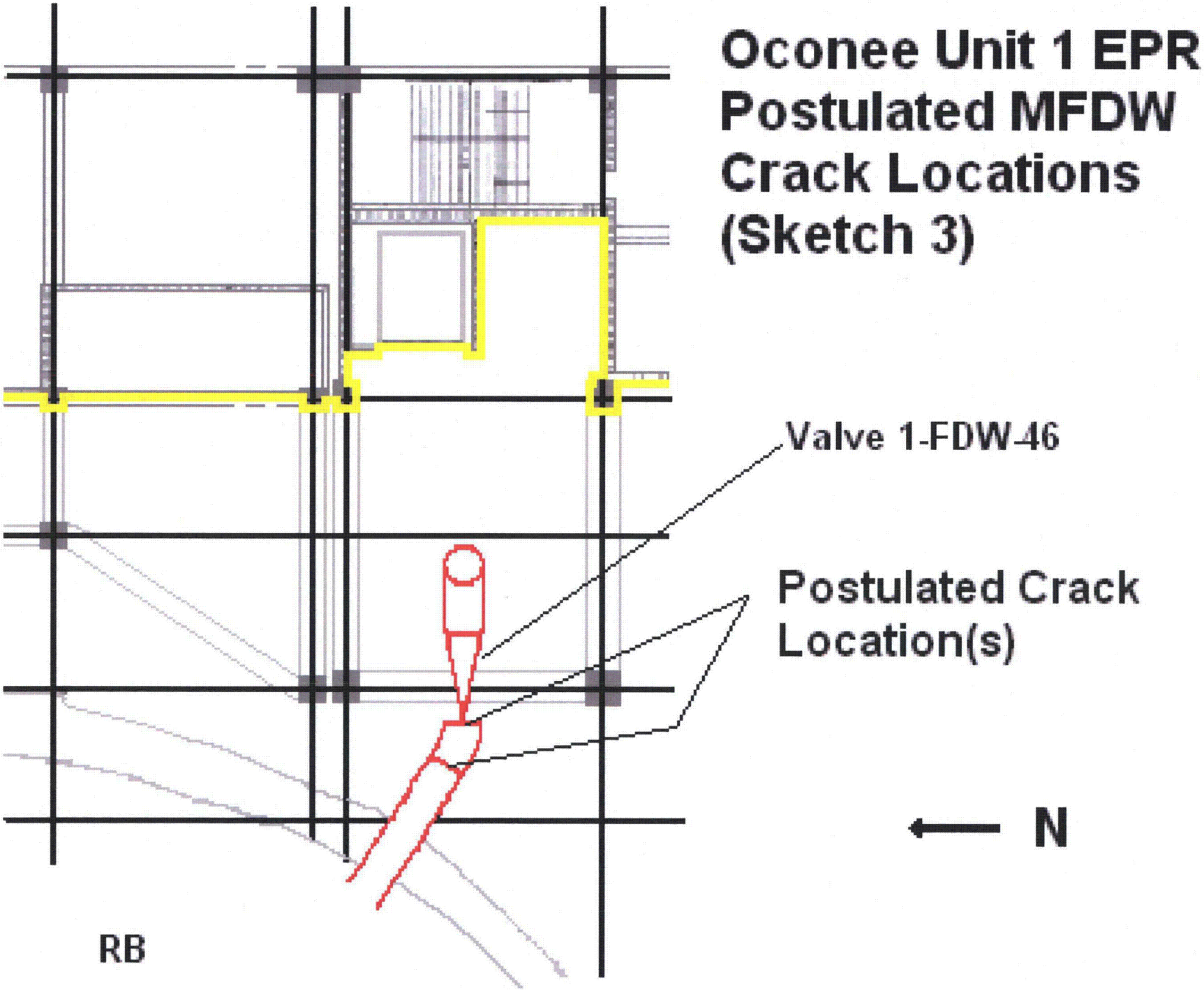


Oconee Unit 1 EPR Postulated MFDW Crack Locations (Sketch 2)

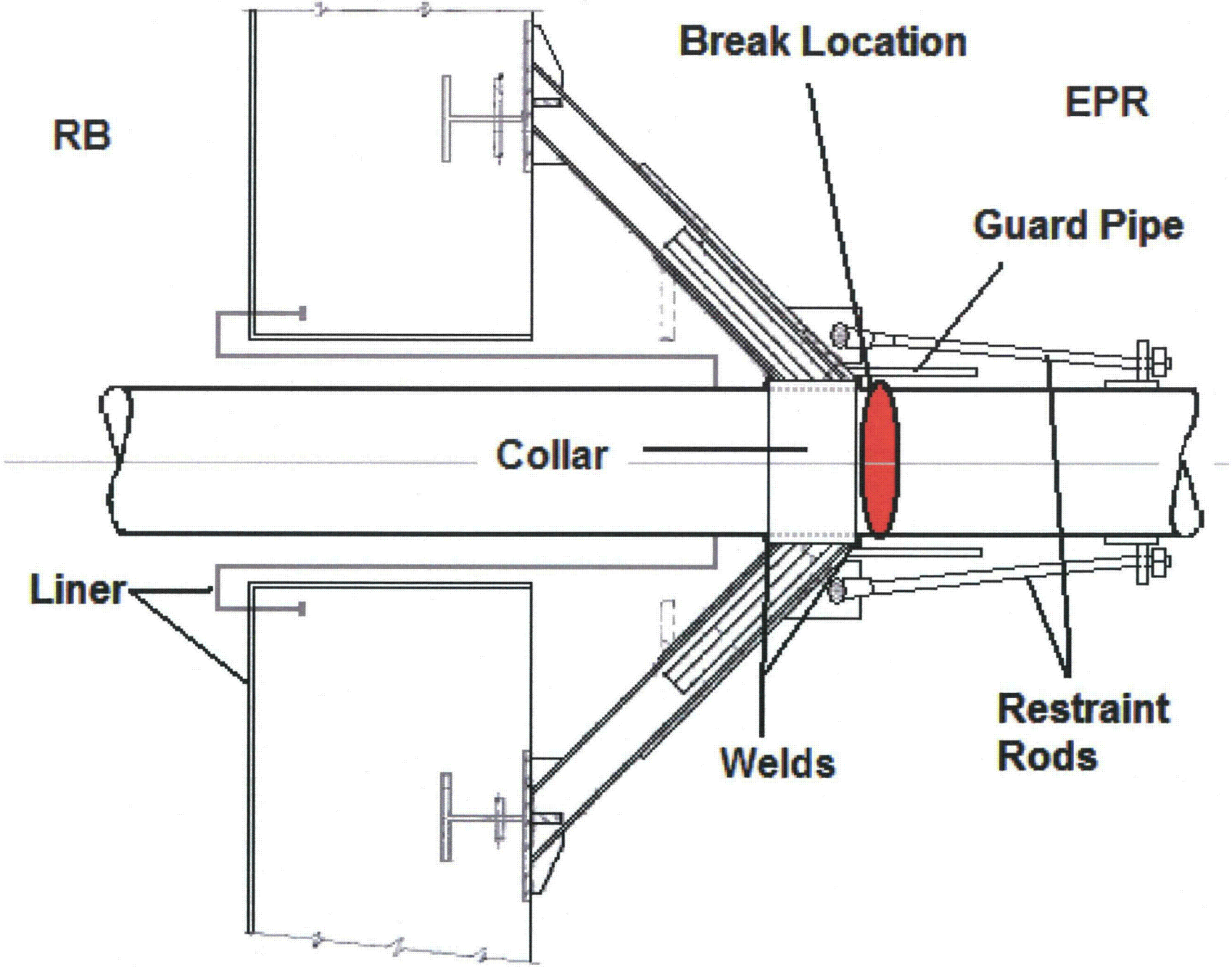
Postulated Crack Location(s)

← N

Oconee Unit 1 EPR Postulated MFDW Crack Locations (Sketch 3)



Main Feedwater Terminal End Break Location (Sketch 4)



Item #	NRC Issue	Duke Comments	Resolution of Item
H1	**Volumetric Inspections of Piping in lieu of Protection of Equipment** "In Attachment 4 to the November 2006 letter, Duke proposes to use periodic volumetric examinations in lieu of evaluating the effects of pipe rupture at most of the pipe rupture locations in the turbine and auxiliary buildings. The proposed alternative to use periodic volumetric examinations in lieu of pipe rupture evaluation is not part of the criteria contained in the Giambusso letter or the criteria contained in BTP MEB 3-1. BTP MEB 3-1 requires 100% volumetric examination of all welded connections between the containment isolation valves in addition to meeting the stress limits specified in B.1.b of the BTP MEB 3-1. The basis for the BTP MEB 3-1 criteria is to provide a high level of assurance that breaks do not occur in the critical area between the containment isolation valves. BTP MEB 3-1 does not contain a provision for performing periodic volumetric examinations as an alternative to postulating the pipe cracks and ruptures at the locations required by BTP MEB 3-1."	East Penetration Room Main Steam The single Main Steam line located in each unit's EPR is seismically analyzed. A review of the Unit 1 stress analysis indicates that there are currently no locations that exceed the stress thresholds (per MEB 3-1) for intermediate break or crack postulation. It is expected that the other units will have similar results, based on similarity of the pipe routing and support/restraint system; however this result will be confirmed. The only postulated Unit 1 MS break in the EPR is the terminal end break, located at the face of the Reactor Building wall (see Sketch 1). We do not plan to implement inspections of this location, in lieu of protection. Since there are no intermediate break or crack locations in the EPR there is no need to perform periodic volumetric inspections of the MS line. However, as previously committed, we plan to perform initial and later, periodic volumetric inspections (UT) of the MS girth welds located in the EPR, as well as surface inspections of attachment welds. There are three MS girth welds in each of the Units 2 & 3 EPR(s), and four MS girth welds in the Unit 1 EPR. Each unit has one attachment weld on the MS line in the EPR. The initial inspections of the MS welds will be performed during the upcoming Unit 2 outage slated to begin in April of this year. We will also endeavor to inspect the MS longitudinal welds located in the EPR, if the welds can be located. As noted previously, the longitudinal welds were made in the shop. Following that the welds were volumetrically inspected by radiographs. The shop fabricated pipe sections were then heat treated such that the longitudinal welds may have become indistinguishable from the base metal. However, as part of the upcoming Unit 2 inspection activities, we will try to locate these welds and determine whether future inspections can be performed. Main Feedwater Both of the Main Feedwater lines routed through each unit's EPR are seismically analyzed. A review of the Unit 1 stress analysis indicates that there are no locations that exceed the stress threshold for intermediate break postulation. However, the review indicates that there are five locations that exceed the stress threshold for crack postulation (See Chart 1). All the postulated cracks are contained within the B (bravo) header (see Sketches 2 & 3). Sketches 2 and 3 show a partial plan of the Unit 1 East Penetration Room. The Main Feedwater bravo header is shown in red. Sketch 2 shows the plan of the lower portion of the bravo header. The Turbine Building is at the top of the page, with the Reactor Building at the bottom. North is to the left of the page. Two of the five postulated cracks are located at the inlet and outlet welds of the first elbow as the bravo header enters the room from the Auxiliary Building. Sketch 3 shows the upper portion of the bravo header. The third of the five postulated cracks is located at the outlet weld of the Main Feedwater isolation check valve (1FDW-46). The remaining two postulated cracks are actually covered by the Main Feedwater rupture restraint guard pipe (see Sketch 4). The effects from these postulated cracks are bounded by the postulated terminal end break at this location, so no inspections are planned. However, it should be noted that visual inspections (via a fiberscope) of the collar outboard attachment weld located inside the guard pipe have been completed for Units 1 & 3. The	

		inspection of the Unit 2 attachment weld will be completed during the upcoming Unit 2 outage slated to begin in April of this year. Periodic inspections of these welds have been incorporated into the station ISI program. The maximum stresses of these three postulated crack locations exceed the crack threshold stress by approximately 18% (See Chart 1). We expect that the results for the other units will be similar. These three postulated cracks are at weld locations that by previous commitment are receiving periodic volumetric inspections. Our plan, going forward, is to continue these inspections as previously committed, in lieu of providing protection. This philosophy is justified based on the low number of locations where inspections will be credited in lieu of protection, the fact that the lines are seismically analyzed and thus the stresses in the pipe are accurately known, and the slight amount that the actual stresses at the crack locations exceed the crack threshold stress. <u>Turbine Building</u> In the Unit 1 Turbine Building, we have evaluated 174 postulated break locations where a pipe whip could strike a building structural member. At 140 break locations the structural member(s) impacted were shown to be acceptable (i.e. met structural criteria). At 34 break locations the structural members(s) impacted did not meet the structural criteria. A review of the 34 locations indicated that the consequences of a structural failure were acceptable for 10 locations. In these cases, the postulated member failure did not affect systems and components necessary to reach safe shutdown, or systems and components necessary to reach cold shutdown. More analysis is needed to determine the consequences of the remaining 24 break locations and whether systems and components necessary to reach safe shutdown and those required to reach cold shutdown are affected. The 24 break locations affect 14 different structural members, 11 TB columns and 3 TB floor beams. The extent of collateral damage that could occur from a failure of these structural members and the degree to which systems and components necessary to reach safe shutdown and later cold shutdown is difficult to project. So, instead of pursuing the extent of the collateral damage, Oconee is proposing that inspections of these 24 locations would allow early detection of pipe flaws that may have been present since original plant construction, or service induced flaws that could result in a break or crack, and by doing so prevent, by repair/replacement activities, an actual break or crack. The NRC has suggested that such a strategy does not address the potential for seismically induced breaks or cracks. The HELB licensing basis should be clear on the number of postulated breaks and or cracks that must be assumed concurrently. The prevailing wisdom suggests that only one break and or crack should be postulated at a time and that the failure is postulated irrespective of the potential causes of the event. There is a body of knowledge that indicates that normally supported power plant piping systems do not fail during seismic events. Indeed, the NRC has previously agreed that pipe failures during a seismic event are not required to be postulated for Oconee. If one disagrees that seismic events can not cause pipe failures, then it logically follows that a seismic event can cause multiple failure locations in multiple non-seismically supported systems. However, this assertion is contrary to the assumption that only one break and or crack should be postulated at a time.	

H16	**Justification of 100% Humidity Non-Condensing** "The environmental profile is determined based upon analysis of the actual conditions that will exist following the pipe break, and the assumption that the environment is "non-condensing" must be justified and supported by the analysis." "The environmental profile is determined based upon analysis of the actual conditions that will exist following the pipe break, and the assumption that the environment is "non-condensing" must be justified and supported by the analysis."	• The Giambusso and Schwencer letters established EQ requirements for HELBs outside containment. The requirement found in item 13 of the Giambusso letter as amended by the Schwencer letter is: *"Environmental qualification should be demonstrated by test for that electrical equipment required to function in the **steam-air** [emphasis added] environment resulting from a high energy fluid line break."* • Per the ONS Environmental Qualification Criteria Manual (EQCM), the Auxiliary Building/Penetration Room steam-air environment consists of 20 - 100% maximum relative humidity. • A special announced inspection of the ONS Environmental Qualification for electrical equipment was conducted by the NRC during February 22-26, 1988. The inspection examined the ONS qualification documentation files (including the EQCM), reviewed procedures for controlling the EQ program and verified the adequacy and accuracy of the program for maintaining the qualified status of the applicable equipment. Plant walkdowns of the electrical penetration assemblies (EPAs) - both inside and outside containment - were performed. The inspection reviewed the qualification documents for the Viking penetrations and the inspection report indicated that "File review resulted in no concerns." and "...no moisture protection credit is taken for the boxes." and "The inspector considers the Viking EPAs to be environmentally qualified for their use at Oconee." • For additional information, see Duke letter dated Nov. 30, 2006 Attachment 5, Issue 6 pp. 19-23. • ONS has committed to several corrective actions regarding the electrical penetration material condition including restoration of enclosure hardware, interior inspections and creation of a preventative maintenance procedure. To date, all enclosure covers and fasteners for Units 1, 2 and 3 have been repaired and/or replaced. This will minimize the likelihood of water entry into the enclosures. Enclosure inspections for Units 1 and 3 are complete. Unit 2 inspections will be completed during the Spring 2007 RFO. Existing plant procedures have been revised to include explicit guidance on restoration of enclosure covers and fasteners. A new penetration preventative maintenance procedure has been created.	