PACIFIC GAS AND ELECTRIC COMPANY
San Bruno Gas Transmission Line Incident
Data Response

PG&E Data Request No.:	NTSB_054-004-Amended		
PG&E File Name:	San Bruno GT Line Incident_DR_NTSB_054-004-Amended		
Request Date:	March 11, 2011	Requesting Party:	NTSB
Date Amended:	May 12, 2011	Requestor:	Operations (Hersman/Chhatre/ Nicholson)

QUESTION 4

Provide facts that support a DSAW welding problem. [See March 1, 2011 Transcript, page 205, lines 19-23.]

ANSWER 4 - AMENDED

There is no evidence to suggest that this is a systemic issue, but rather it appears to be a unique problem associated with pups 1 through 3 of the portion of failed pipe (Segment 180) associated with the San Bruno incident. PG&E is in the process of performing due diligence on 34 miles of 30" diameter pipe that was installed prior to 1962 using cameral inspection to determine if there are any other sections of this type of pipe that may be missing an inside weld.

As described in NTSB 035-002 and NTSB 035-016-Amended-2, PG&E's record research leads us to believe that the pipe that failed came from 1 of 3 purchase orders of pipe purchased from Consolidated Western Pipe: 1948 (~100,000 ft for L132 project); 1949 (~100,000 ft for the L153 project); and 1953 (~37,000 ft for the L131 project). The language used at the time in the 3 purchase orders to describe the required long seam design was "electric welded". This is understood to mean a submerged arc welding process of the long seam. Neither 49 CFR Part 192 nor ASME B31.8 differentiate between Double Submerged Arc welded and Single Submerged Arc welded pipe and these documents (49CFR Part 192 and ASME B31.8) have established a joint efficiency of 1 for the Submerged Arc Welded long seam. PG&E's focus is on whether the submerged arc welding process was used in general for the long seams of the pipe that failed and specifically whether this section of failed pipe was DSAW.

A Moody Engineering Mill Inspection Report states that the pipe was purchased in 1949 from Consolidated Western. A copy of this report was provided in NTSB_035-002. On page 2 of the inspection report the welding of the long seams is described as follows:

> "…The cylinders are then progressed through the Berkley Welding Units, where the longitudinal seam is automatically on the outside by the "Unionmelt" Electric Fusion method. A similar "Unionmelt" weld is also made along this seam on the inside by the Inside Welding Units. Each of these welds is regulated to penetrate to a minimum of 2/3 of the plate thickness from each side, thereby resulting in an overlap, or tie, of these two welds in the middle third of the wall thickness of the cylinder."

The metallurgical report refers to the long seam welding process as electric fusion welding process which is what is described in the Moody Report quoted above and is now referred to as the submerged arc welding process. Additionally, figure 45 of the NTSB metallurgical report shows a weld from the outside that penetrated 2/3 of the way through the plate for pup 1 which is the pup where the failure originated.

Pups 4 and 5 show evidence that the outside weld was made in the same way as that of pup 1 but the inside welds were welded by hand using an electrode. This suggests that it was understood a weld was required for both the inside and outside. All of the other long seams have welds from the inside and outside. Also, in figure 51 in the metallurgical report (a cross section of the long seam for pup 6), you can see the fusion effect from the bottom weld hides the bottom portion of the top weld. This is evidence that the weld on the inside was welded after the outside weld, confirming the description of the welding sequence set forth in the Moody Engineering report referenced above.

The above supports the conclusion that the process for welding a long seam was to weld on the inside as well as the outside of the pipe. The metallurgy report provides evidence of where the welding occurred and where welding was omitted. PG&E considers this omission of the inside weld to be an error in the manufacture of the subject pipe. There is no evidence, circumstantial or otherwise, to support the conclusion that the long seam was any other type other than one meeting the submerged arc welding definition which requires an inside and outside weld that penetrates to a minimum of 2/3 of the plate thickness from each side.