

**Attachment A**  
**List of Incidents with Probable Violations**

PUC ID	Date	Address	Utility	Investigative Findings	Code Violations
G20170112-2136	01/12/2017	<p>██████████ ██████████ ██████, Yuba City</p>	PG&E	<p>1. <u>49 CFR §192.273, General, states in part:</u></p> <p><i>“(a) The pipeline must be designed and installed so that each joint will sustain the longitudinal pull-out or thrust forces caused by contraction or expansion of the piping or by anticipated external or internal loading.”</i></p> <p>SED reviewed the failure analysis report by Exponent. The report states:</p> <p><i>“The butt fusion may initially have held gas, but over time, the pressure inside the pipe, and particularly within the growing crack, separated the joint faces and the leak ultimately developed. The lack of fusion could be related to insufficient heat, but given the appearance of the cutting tool marks, it is more likely that the upstream pipe was poorly (i.e., not squarely or fully) faced and did not fully contact the heating plate. Thus, that area of the upstream pipe did not fuse and formed an initial leak-tight crack that ultimately grew through the pipe wall.”</i></p> <p>The evidence reviewed indicates that the pipeline was not installed so that the joint involved in the incident could sustain the anticipated internal loading. Therefore, SED finds PG&amp;E in violation of CPUC General Order No. 112-C, 49 CFR §192.273 (a).</p>	49 CFR 192.273
				<p>2. <u>49 CFR §192.281 Plastic Pipe states in part:</u></p> <p><i>“(a) General. Each plastic pipe joint must be made in accordance with written procedures that have been proven by destructive burst test to produce joints at least as strong as the pipe being joined. A plastic pipe joint that is joined by solvent cement, adhesive, or heat fusion may not be disturbed until it has properly set. Plastic pipe may not be joined by a threaded joint or miter joint.”</i></p> <p>SED reviewed <u>PG&amp;E Gas Standard D-21 Heat Fusion Joining Of Polyethylene Pipe</u> dated March 3, 1972<sup>1</sup>. The scope of Gas Standard D-21, which was in effect at the time of installation, was “to establish requirements for, and to</p>	49 CFR 192.281

<sup>1</sup> Data Response Index 10788 received 5/17/2017

*define the limitations of, the fusion process for joining gas distribution polyethylene pipe. Included in this standard are instructions for the preparation of materials and the use of tools in the fusion process.”<sup>2</sup>*

PG&E Gas Standard D-21 Section 3.4.2 Butt Fusion states:

*“(a) General*

*This technique consists of heating the ends of matching surfaces by holding them against a heating plate until fusion temperature is reached, then slamming the two soft ends against each other and allowing the joint to cool. Since the surface area of the pipes to be joined is rather small, it is essential that the ends of the pipe are properly aligned. An approved butt fusion machine capable of holding the pipe in alignment must be used. A special heating plate capable of heating the two ends of the pipe simultaneously is required.*

*(b) Technique*

- 3. Heat the tool equipped with the proper size heating plates to approximately 310°F (± 25°).*
- 4. Place pipe ends into proper size joining unit.*
- 5. Plane the ends of pipes to smooth, flat faces with special facing tool.*
- 6. Bring the pipe ends together and carefully check alignment and fit. If either is incorrect, repeat step 3 as necessary. With coiled pipe, it is necessary to use short liners in the joining machine clamps. It may also be necessary to twist the pipe in the jig to accomplish alignment.*
- 7. Bring the pipe ends to bear on the heating element with light force (70 inch pounds). To insure uniform heating at all points on both pipe ends, fusion should not be attempted until a bead of melt has rolled out on the heater face completely around the circumference of both pipe ends. See Table I for the approximate fusion melt cycle.*
- 8. Snap the traveling carriage back and remove the heater plate.*
- 9. Slam the two pipe ends together. Apply sufficient force to cause the fusion bead to roughly double its size.*
- 10. The joint must be held in place in the carriage to allow it to set up. It may then be removed from the carriage, but it should not be worked or tested until it has had time to cool. (See Table I for set-up and cooling time.)*
- 11. Clean heater faces, being careful not to damage the coating.”*

<sup>2</sup> PG&E Gas Standard D-21 dated 3/3/1972

SED reviewed the failure analysis report by Exponent. The report states:

*“The lack of weld bead is evidence that, in the region that failed to fuse, the upstream side was solid when contacted with the downstream side. The downstream side must have been molten, as evidenced by its interior weld bead. The cold upstream side left an imprint of its striations in the molten downstream side. Thus, it appears that a circular facing tool was used during fabrication, but the facing was incomplete and left a portion of the surface that was below the plane of the cut. This lower portion failed to contact the heater plate sufficiently to melt. Thus, when the pipe ends were brought together to form the fusion, the upstream unmolten region deformed the molten downstream region but did not adhere to it.”*

The failure analysis report further indicated:

*“The direct cause of the leak was a fabrication error during original installation of the main in late 1973 or early 1974. Specifically, the end of the upstream pipe comprising the joint had not been fully faced flat and square with the axis of the pipe. Thus, when this pipe was butt-fused to the downstream pipe, a portion of the contact plane failed to melt and fuse, forming a crack-like defect open to the interior of the pie on the eastern side of the joint.”*

The evidence reviewed indicated a lack of weld bead and that a portion of the surface plane failed to contact the heater plate sufficiently to melt. PG&E Gas Standard D-21 Section 3.4.2 (b) (5) states that *“fusion should not be attempted until a bead of melt has rolled out on the heater face completely around the circumference of both pipe ends.”*

SED therefore finds PG&E in violation of CPUC General Order No. 112-C, 49 CFR §192.281 (a) because it failed to make the joint in accordance with PG&E Gas Standard D-21.