

CALIFORNIA PUBLIC UTILITIES COMMISSION
Safety and Enforcement Division
Electric Safety and Reliability Branch

Incident Investigation Report

Report Date: 04/08/2022

Incident Number: E 20191030-05

Utility: SCE

Date and Time of the Incident: 10/30/2019, 06:10:00 AM

Location of the Incident: 200 Block of West Los Angeles Avenue
Simi Valley, CA
County: Ventura

Summary of Incident:

A relay on SCE's Moorpark-Royal #1 66 kV distribution circuit operated and interrupted the circuit during red flag warnings. Shortly after, a fire named Easy-Fire was reported by Ventura County Fire department (VCFD). My investigation found that a suspension insulator attached to an energized 66 kV conductor swung into an SCE's steel power pole, resulting in an arc which may have ignited the fire.

Fatality / Injury: There were three injuries (Fire Fighters)

Property Damage: Two (2) houses were damaged.

Utility Facilities involved: Moorpark-Royal, 66 kV Circuit.

Witnesses:

<i>Name</i>	<i>Title</i>	<i>Phone</i>
1. Saimon Islam	CPUC Investigator	(213) 266-4733
2. James Miller	CPUC Investigator	(213)-266-4715
3. Paul Pimentel	SCE's Senior Manager	(626) 302-5830
4. Scott Hayashi	SCE's Senior Investigator	(626) 302-6032
5. Christine Saqui	VCFD's Fire Investigator	(805)-384-4774

Evidence:

<i>Source</i>	<i>Description</i>
1. SCE	Initial Report
2. SCE	315 Letter
3. SCE/CPUC	Photographs
4. SCE	Overhead Detailed Inspection Records
5. SCE	Annual Grid Patrol Records
6. SCE	Interruption Log
7. VCFD	Investigation Report

Observations and Findings:

On October 30, 2019, at 06:07 AM, a relay on Moorpark-Royal, 66 kV circuit operated and interrupted the circuit during red flag warnings. At 6:09 AM, Ventura County Fire department (VCFD) reported a fire that was referred to as Easy fire near the vicinity of Easy Street, Simi Valley, CA. The VCFD report indicated that the wind speed at the time of the fire was 17 mph with a wind gust of 31 mph. The fire burned 1,806 acres and damaged two houses. The fire was completely extinguished by November 2, 2019. Three fire fighters were injured in the process of extinguishing the fire.

On November 3, 2019, I visited the incident site and met with the VCFD investigators who were investigating the source of the fire ignition. VCFD investigators indicated to me that the span of conductors between poles numbered 4244905 E and 4244906 E on an SCE H Frame transmission structure was the origin of the ignition that may have caused the fire. The span of conductors was part of the Moorpark-Royal, 66 kV Circuit. At the request of VCFD, SCE conducted a LIDAR survey at the same location, removed one of the steel poles in the H-Frame structure, two (2) polymer suspension insulators, and a bond wire from Moorpark-Royal, 66 kV Circuit.

SCE poles numbered 4244905 E and 4244906 E, as shown in Figure A, were 100-foot-long lightweight tubular steel poles creating an H-frame. These poles supported 3 sets of double dead end 20-foot composite crossarms. The north side of the crossarms contained 3 polymer suspension insulators that supported no. 954 Aluminum Conductor Steel Reinforced (ACSR) primary conductors. The south side of the crossarms contained 8 polymer pin insulators that supported no. 336 ACSR primary conductors. Additionally, this H-Frame contained 2 bond wires and a fault return conductor.

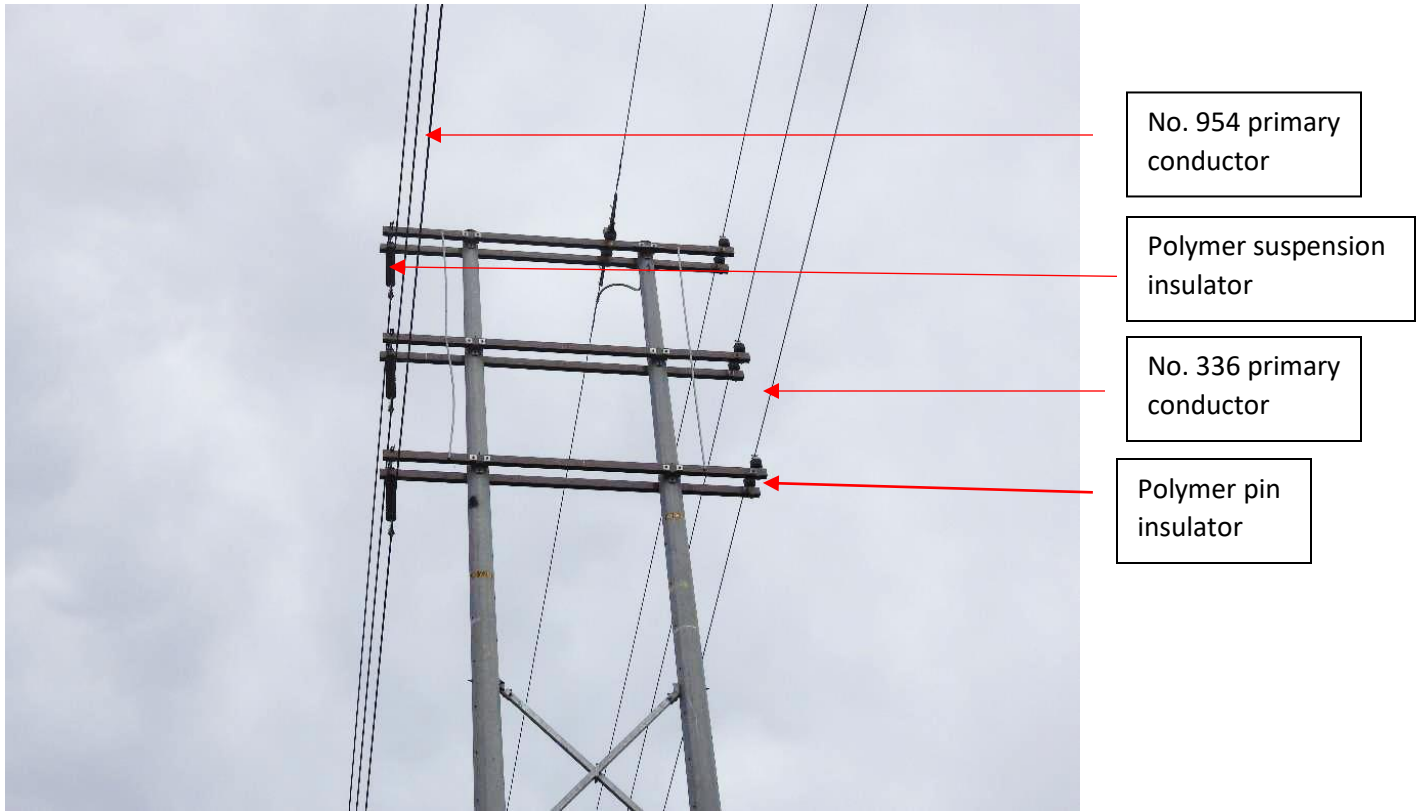


Figure A: SCE poles numbered 4244905 E and 4244906 E

While on the site of the incident, I observed a black burning mark on pole number 4244905 E, and discoloration and deformation on the lowest suspension insulator (Figure 1). Both the pole and the suspension insulator were in proximity of the origin of the fire and the observed damage appeared to be the result of an arc between the insulator's clamp (where the conductor is attached) and the steel pole.





Figure 1: The damaged insulator, burning mark on the pole and cables (marked red)



Figure 2: The damaged insulator shoe (suspension clamp) ¹

In a letter dated February 3, 2020, SCE stated that the LIDAR survey showed the horizontal clearance between the lowest portion of the clamp (that is attached to the bottom of the insulator) and the pole was 3.68 feet.

In a letter dated August 26, 2020, SCE indicated that a phase to ground fault (phase B to ground) occurred on the Royal circuit with fault currents of 1,918 A and 2,340.34 A for Moorpark circuit around the time of the incident.

The last two Annual Grid Patrols (AGP) for poles numbered 4244905 E and 4244906 E were completed on 5/09/2018 and 6/27/2019 respectively and Overhead Detailed Inspection (ODI) was completed on 5/8/2018 with no pending/open work orders.

VCFD incident report (case number: 19CAVNC089158, Case Name: Easy) indicates that at the time of the incident the sky was clear with minimal cloud cover, the ambient temperature was 57 degrees Fahrenheit with 7 percent relative humidity and seventeen (17) miles per hour (mph) winds with wind gust up to thirty-one (31) miles per hour. Additionally, the VCFD report stated that the fire occurred when an insulator attached to high voltage power lines swung into a steel power pole. The insulator revealed damage consistent with the insulator grounding to the steel tower. The 66 kV conductors, as well as suspended insulators, were swinging with the wind. Also, the VCFD report concluded that “the SCE owned, and operated power equipment was the cause of the Easy Fire.” ²

¹ Magnified picture taken by Vollmer Gray Engineering Laboratories. CPUC received the test pictures through data request

² VCFD investigation Report (Case # 19CAVNC089158, Case Name: Easy)

Suspension insulator strings supporting transmission conductors, either at tangent or angle structures, are usually free to swing about their points of support. Therefore, it is necessary to ensure that when the insulators do swing, clearances are maintained to structures and guy wires.³

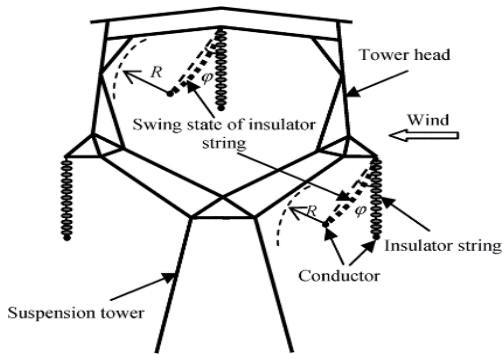


Figure 2: Suspension Insulator with swing angle⁴

In a letter dated December 14, 2020, SCE stated that they determined the maximum swing angle of suspension insulators by designing the structure and insulators with a Computer-Aided Design (CAD). They do so by rotating the insulator until the energized portion of the insulator encroaches the minimum allowable clearance in GO 95 Tables 1 & 2. The swing angle is measured from the plumb centerline of the insulator to the swung portion of the insulator. Additionally, structure geometry, span length, weight span, wind span, insulator weight, insulator geometry, wind pressure, line angle, horizontal tension, and similar factors are also considered.

GO 95, Rule 37, Table 1, Case 8, Column F requires “*Supply Conductors and Supply Cables of 22.5 - 300 kV (whether attached or unattached)*” to maintain a minimum distance of 18 inches from the center line of the pole.

Unlike some of the clearances in Table 1 that should always be maintained, the 18 inches distance in Table 1, Case 8, Column F, is only applicable at a temperature of 60 degrees F and no wind load condition.

The National Electric Safety Code also has a specific provision entitled, “Protection against arcing and other damage while installing and maintaining insulators and conductors,” which requires that “precautions shall also be taken to prevent, as far as is practical, any arc from forming and to prevent any arc that might be formed from injuring or burning any parts of the supporting structures, insulators, or conductors.”⁵

³ Design Manual for High Voltage Transmission Lines, United States Department of Agriculture, Rural Utilities Service, Electric Staff Division, Bulletin 1724E-200, December 2, 2015,, p. 7-1. Available as of October, 2022, at: <https://www.rd.usda.gov/resources/regulations/bulletins>.

⁴ Numerical Study on Dynamic Swing of Suspension Insulator String in Overhead Transmission Line under Wind Load by Bo Yan, Xuesong Lin, Wei Luo, Zhida Chen, and Zhongquan Liu

⁵ National Electric Safety Code (NESC), 2017, Section 44, Rule 447, p. 316.

General Order (GO) 95, 31.1, Design, Construction and Maintenance, states in part:

Electrical supply and communication systems shall be designed, constructed, and maintained for their intended use, regard being given to the conditions under which they are to be operated, to enable the furnishing of safe, proper, and adequate service.

For all particulars not specified in these rules, design, construction, and maintenance should be done in accordance with accepted good practice for the given local conditions known at the time by those responsible for the design, construction, or maintenance of communication or supply lines and equipment.

A supply or communications company is in compliance with this rule if it designs, constructs, and maintains a facility in accordance with the particulars specified in General Order 95, except that if an intended use or known local conditions require a higher standard than the particulars specified in General Order 95 to enable the furnishing of safe, proper, and adequate service, the company shall follow the higher standard.

The insulators and conductors on the Moorpark Royal No.1 66 kV were installed on May 13, 2019, and the span involved in this incident was in Tier 3 of High Fire-Threat District. The above rule requires SCE to design and maintain its conductors and insulators safely and adequately. In order to accomplish this, SCE should have installed and maintained its insulator and conductor in such a way to prevent them from contacting the steel pole in case they swung during conditions that are normal to the area, thus avoiding unsafe and dangerous conditions. It is industry standard and good practice to maintain structure clearances from suspension insulators so that when the insulators swing, they do not come too close to create an arc or contact any structures. SCE is in violation of GO 95, Rule 31.1, for failing to install and maintain its 66 kV conductor and suspension insulator in a way to prevent them from contacting the steel pole or to come too close to the steel pole to create an arc during wind conditions that are normal to the area.

Preliminary Statement of Pertinent General Order, Public Utilities Code Requirements, and/or Federal Requirements:

<i>General Order</i>	<i>GO Rule</i>
1. GO95	31.1

Conclusion:

My investigation revealed that SCE is in violation of GO 95, Rule 31.1, for not installing and maintaining its 66 kV conductor and insulator adequately and safely to prevent them from contacting the steel pole or from coming too close to the steel pole when swinging during conditions that are normal to the area and creating an arc.