

## Incident Summary (5604643)

SUPPORTING INFORMATION	Incident Date		September 6, 2016	
	Location		Abbotsford	
	Regulated industry sector		Low voltage electrical system (30V to 750V)	
	Impact	Injury	Qty injuries	0
			Injury description	N/A
			Injury rating	None
	Damage	Damage	Damage description	Electrical arcing damage to a child's play tent, a portable fan's attachment cord, and a cablevision outlet. Fire damage to the bed, play tent, and fire and smoke damage to the contents of a bedroom in a house.
			Damage rating	Moderate
	Incident rating		Moderate	
Incident overview		<p>A child woke to find his bed on fire. He called out to his mother who evacuated the family from the house and called the fire department.</p> <p>The fire occurred near an electrical outlet that a portable fan was plugged into and a cable vision outlet that were located on the wall adjacent to the bed.</p>		
INVESTIGATION CONCLUSIONS	Site, system and components		<p>A portable fan was plugged into a receptacle that was rated at 15 Amperes and 120 Volts. The fan cord attachment blades are intended to be fully inserted into a receptacle to provide positive electrical contact with the receptacle contacts and to prevent the cord end's blades from being energized and exposed to accidental contact with persons or objects.</p> <p>A child's play tent was stored between the bed and the wall in close proximity to an electrical outlet. The tent has a metal frame covered by a nylon type material.</p> <p>Circuit breakers are intended to trip when there is an overload or over current condition on a branch circuit. When breakers trip it is an indication that there has been an overload or overcurrent condition that has caused it to trip that may require further investigation prior to resetting the breaker.</p>	
	Failure scenario(s)		<p>A portable fan was plugged into a receptacle located on a wall adjacent to a bed where a child's collapsible play tent was stored.</p> <p>The fan's attachment cord was not fully plugged into the receptacle leaving just enough space for the conductive metal frame of the play tent to come into contact with the energized blade of the attachment cord.</p> <p>At the same time the metal frame of the tent was in contact with a grounded cablevision outlet.</p> <p>A circuit was completed between the energized cord blade, the metal frame of the play tent, and the metal end of a cablevision outlet located approximately 900mm away from the receptacle.</p> <p>The resulting short circuit caused an electrical arc at the cablevision outlet and created heat that ignited the tent material, the adjacent combustible bedding material and the bed.</p>	
	Facts and evidence		<p>Interview with the child's mother (upper floor tenant):</p> <ul style="list-style-type: none"> <li>- She noticed the lights flicker off then back on in the hallway and bathroom.</li> <li>- She heard her child calling for her help from his bedroom.</li> <li>- She entered the room to find her child's bed on fire adjacent to the wall.</li> </ul>	

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	<ul style="list-style-type: none"> <li>- She stated two collapsible child’s play tents were stored between the bed and the adjacent wall. See figure 7.</li> <li>- She indicated the fan was plugged in but not turned on at the time of the incident.</li> </ul> <p>Interview with the owners (live in the basement suite):</p> <ul style="list-style-type: none"> <li>- The owners heard a breaker trip in the electrical panel in the suite. See figure #14.</li> <li>- The owner reset the breaker and it immediately tripped again.</li> <li>- The owner reset the breaker again and immediately heard screaming from the tenant on the upper floor of the house.</li> <li>- The owner immediately turned off all the breakers in the panel.</li> </ul> <p>Fire department investigator area of origin determination:</p> <ul style="list-style-type: none"> <li>- The fire department investigator Indicated the fire pattern showed that the fire started at or in close proximity to the cablevision outlet on the wall. See figure #9.</li> <li>- No other sources of ignition were identified in the area of origin.</li> </ul> <p>Observations at the scene:</p> <ul style="list-style-type: none"> <li>- The bed was pushed against the wall at the cablevision outlet and receptacle locations. See figure 2 and 3.</li> <li>- The thin metal frames of the play tents were located between the bed and the wall adjacent to the receptacle and cablevision outlets. See figure 4 and 6.</li> <li>- A piece of the tent material was observed in the area between the bed and the wall. See figure 6.</li> <li>- There were arcing marks on the metal cablevision outlet, on the metal tent frame, and on the attachment cord blade of the fan from an electrical arcing event. See figure 5, 8, 10 – 12.</li> <li>- The receptacle was connected to 15A rated branch circuit wiring that was terminated to a 15A breaker in the electrical panel. See figure 15</li> <li>- The cablevision outlet was bonded with a copper conductor at the cablevision demarcation box which provided a path to ground for the short circuit fault current to flow. See figure 13 and 16.</li> </ul> <p>Additional analysis of the evidence and the incident components:</p> <ul style="list-style-type: none"> <li>- A materials engineering firm conducted a laboratory test evaluation of the fan attachment cord, a piece of the metal tent frame, and the cablevision outlet. The test determined there was an electrical arc between the metal tent frame, the attachment cord blade, and the cable vision outlet. Iron and alloy materials were transferred between the components at the contact points confirming electrical contact between the components tested. See figures 5, 10 - 12.</li> <li>- The metal frame of the play tent was conductive. A continuity and resistance test was conducted on the metal that showed the material was very conductive. Test results with an electrical multi-meter was 0 Ohms on an approx. 300mm length of the metal.</li> <li>- The play tent had a collapsible metal frame covered by the tent material that allowed it to be quickly set up and also quickly folded for storage. The material is very thin, could have been damaged or ripped, and would not be intended for use as an electrical insulator. See figure 7.</li> </ul>
<p>Causes and contributing factors</p>	<p>It is very likely that the cause of this incident is the conductive metal frame of a children’s play tent contacting the energized attachment cord blade from a plugged in fan and a grounded cablevision outlet. A short circuit between the attachment cord blade and the cablevision outlet caused an electrical arc and the resulting heat that ignited the tent material and the bed.</p>



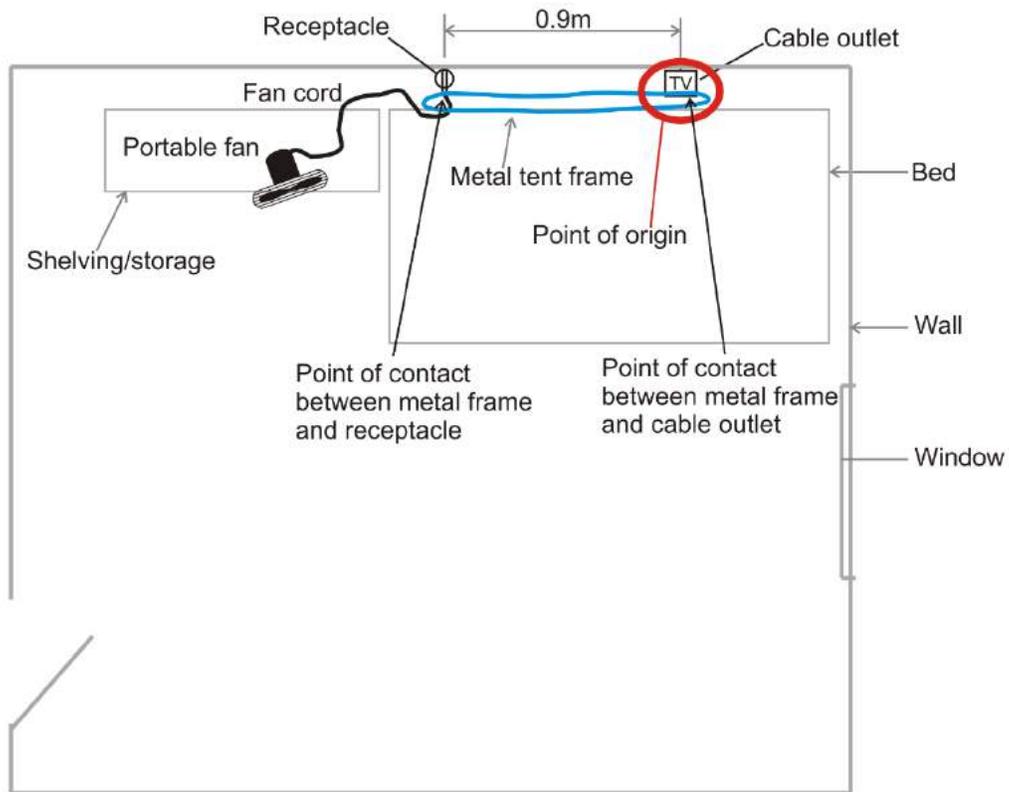
FIGURE 1

Front of house where incident occurred. The red arrow shows the upper floor bedroom window. This is the room where the incident occurred.

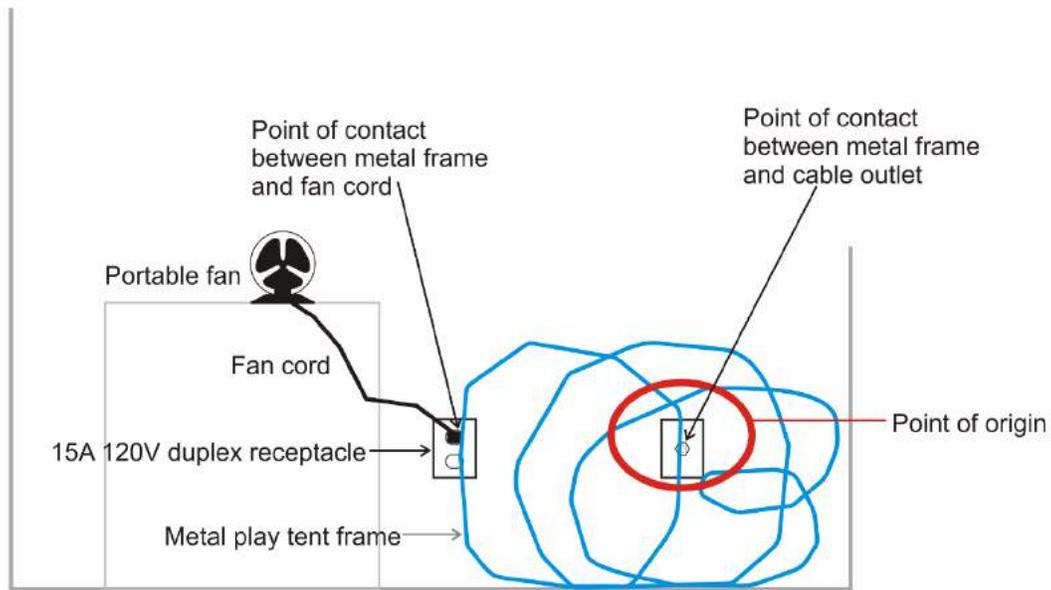


FIGURE 2

The red oval shows the area of origin where the bed is located adjacent to the wall. This is the area where the cable vision outlet is located. The red arrow shows the approximate location of the 15A 120V receptacle which is approximately 900mm away from the cable outlet.



Bedroom layout



Wall view of bedroom

**FIGURE 3 – BASIC LAYOUT OF THE INCIDENT SITE (OVERHEAD VIEW AND WALL VIEW).** THE LAYOUTS ARE INCLUDED FOR ILLUSTRATIVE PURPOSES ONLY AND ARE NOT TO SCALE.



FIGURE 3

This is the receptacle that the fan cord was plugged into. The red arrow shows the thin metal frame of the child's play tent. The area of contact between the metal and the cord attachment blade is outlined by the red oval.



FIGURE 4

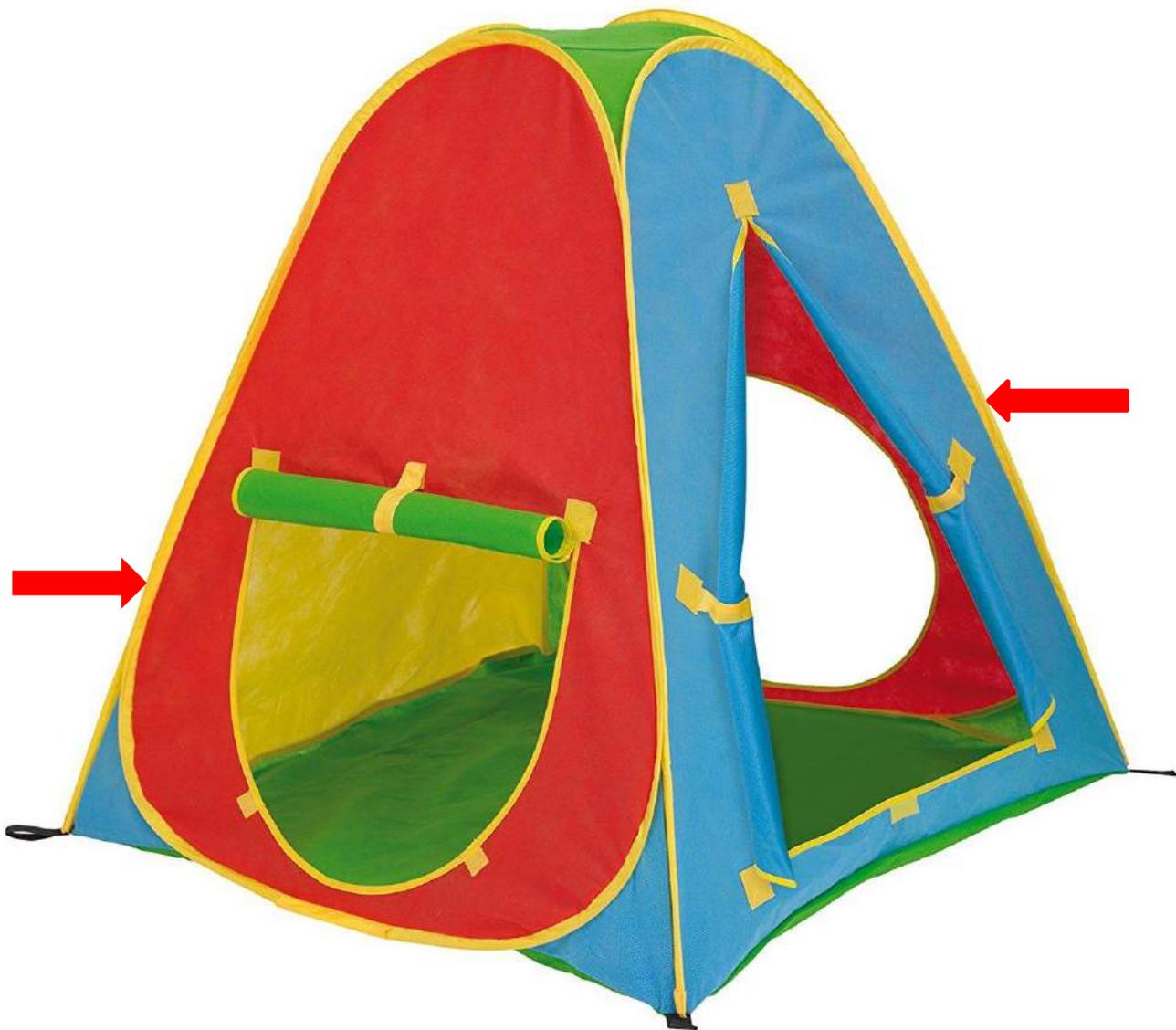
The red oval shows the electrical arcing damage to the attachment cord blade where contact was made with the tent's metal frame.

A materials engineering firm conducted a laboratory test evaluation of the components involved in the incident. Iron and alloy materials were transferred between the components at the contact points confirming electrical contact between the fan cord attachment blade (shown in the photo) and the metal frame of the play tent.



FIGURE 5

The red arrows show the location of the receptacle and the cablevision outlets that were approximately 900mm apart. The green arrows shows the metal frame from the child's play tent. The blue arrow shows remnants of the material from the play tent.



**FIGURE 6**

A photo of a child's play tent is included for reference only. This photo shows an exemplar collapsible play tent similar to the tents referenced in this report. There are numerous variations of this product widely available in the market place, in various colours and with various images and characters from popular children's stories and TV shows. This type of tent is generally made with lightweight materials with a flexible metal frame sewn into the edges (see red arrows). The tents fold flat for storage when not in use. Two similar tents were stored by the tenants between the south wall and the child's bed prior to the incident.



FIGURE 7

The red oval shows the location of the electrical arcing contact between the energized metal frame of the play tent and the grounded cable vision outlet.



FIGURE 8

The red oval shows the location of the cable vision outlet which was the point of origin of this fire. With the bed and other materials removed from the area of origin the fire pattern was more visible.



FIGURE 9

This photo shows electrical arc damage on the metal cable vision outlet where contact was made with the play tent's metal frame. The beading and pooling indicates the metal was heated to a molten state at the time of the arc.

A materials engineering firm conducted a laboratory test evaluation of the components involved in the incident. Iron and alloy materials were transferred between the components at the contact points confirming electrical contact between the cablevision outlet (shown in the photo) and the metal frame of the play tent.

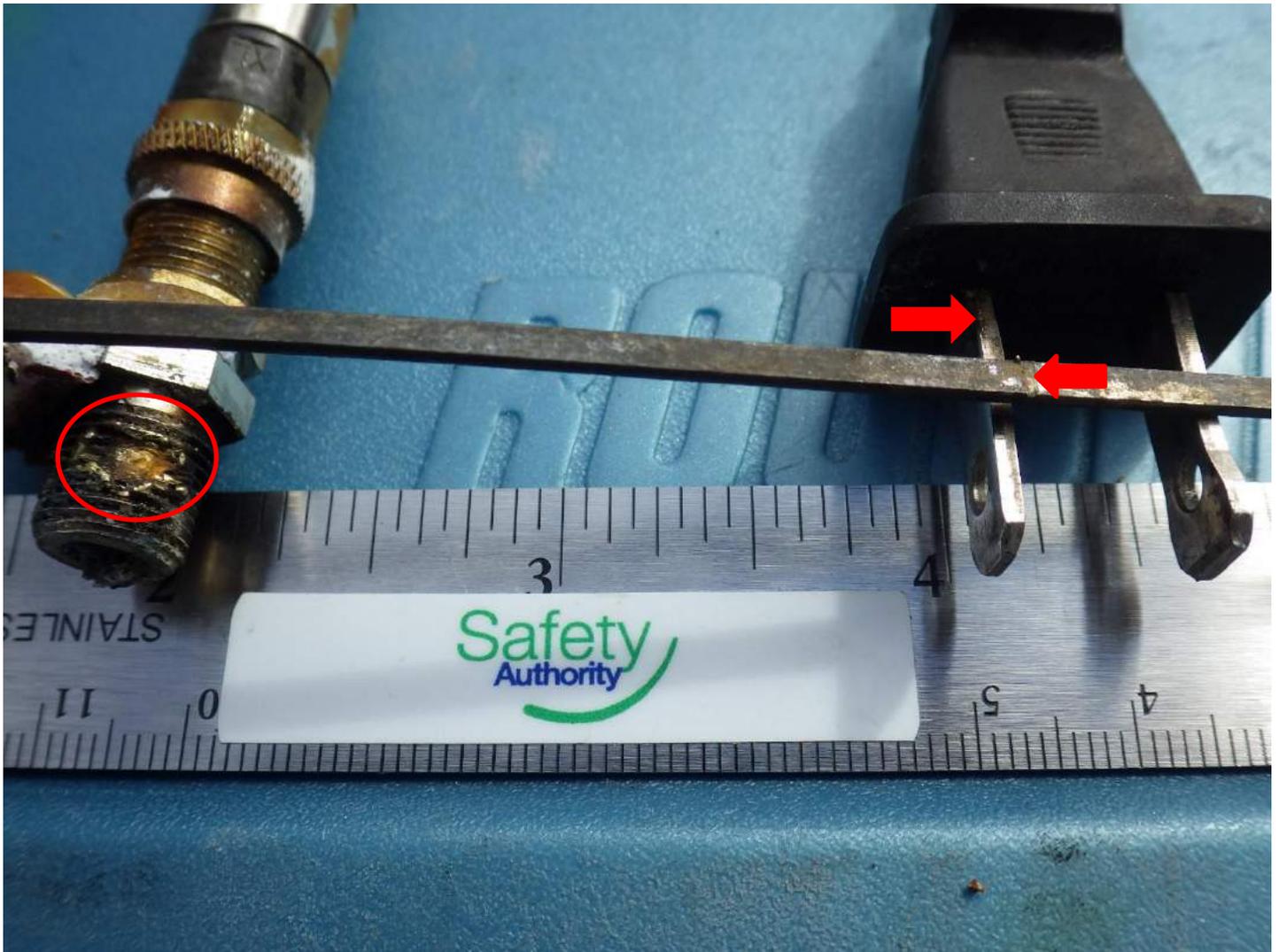
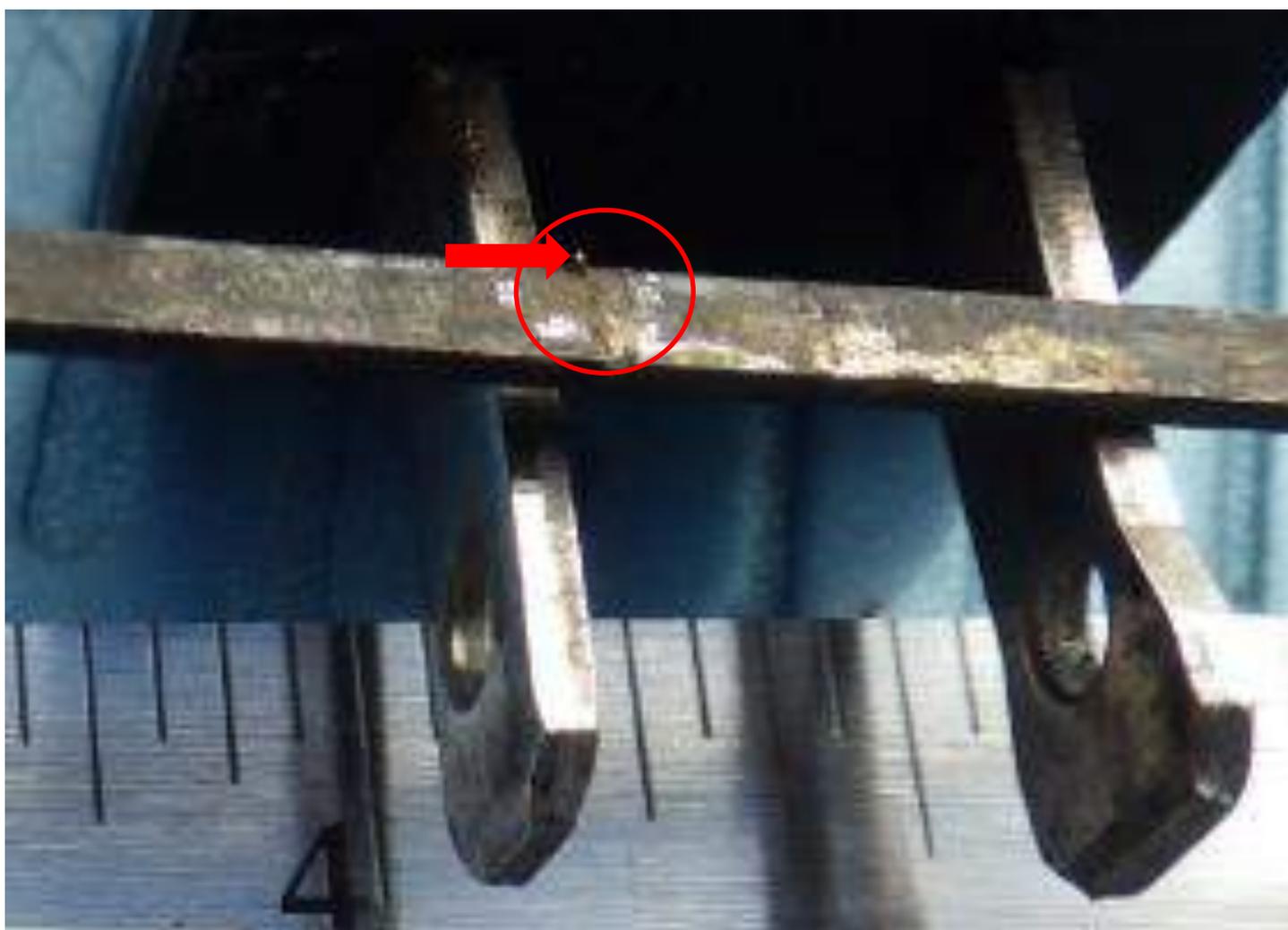


Figure 10

This photo shows the components involved in the incident and the locations of the electrical arcing damage.

A materials engineering firm conducted a laboratory test evaluation of the components involved in the incident. Iron and alloy materials were transferred between the components at the contact points confirming electrical contact between the components tested.



**FIGURE 11**

The red oval shape shows the area on the metal frame of the play tent that was damaged by the electrical arc from coming into contact with the receptacle blade. The red arrow shows a bead that was formed from the arc.

A materials engineering firm conducted a laboratory test evaluation of the components involved in the incident. Iron and alloy materials were transferred between the components at the contact points confirming electrical contact between the metal frame of the play tent (shown in the photo) and the attachment cord blade.

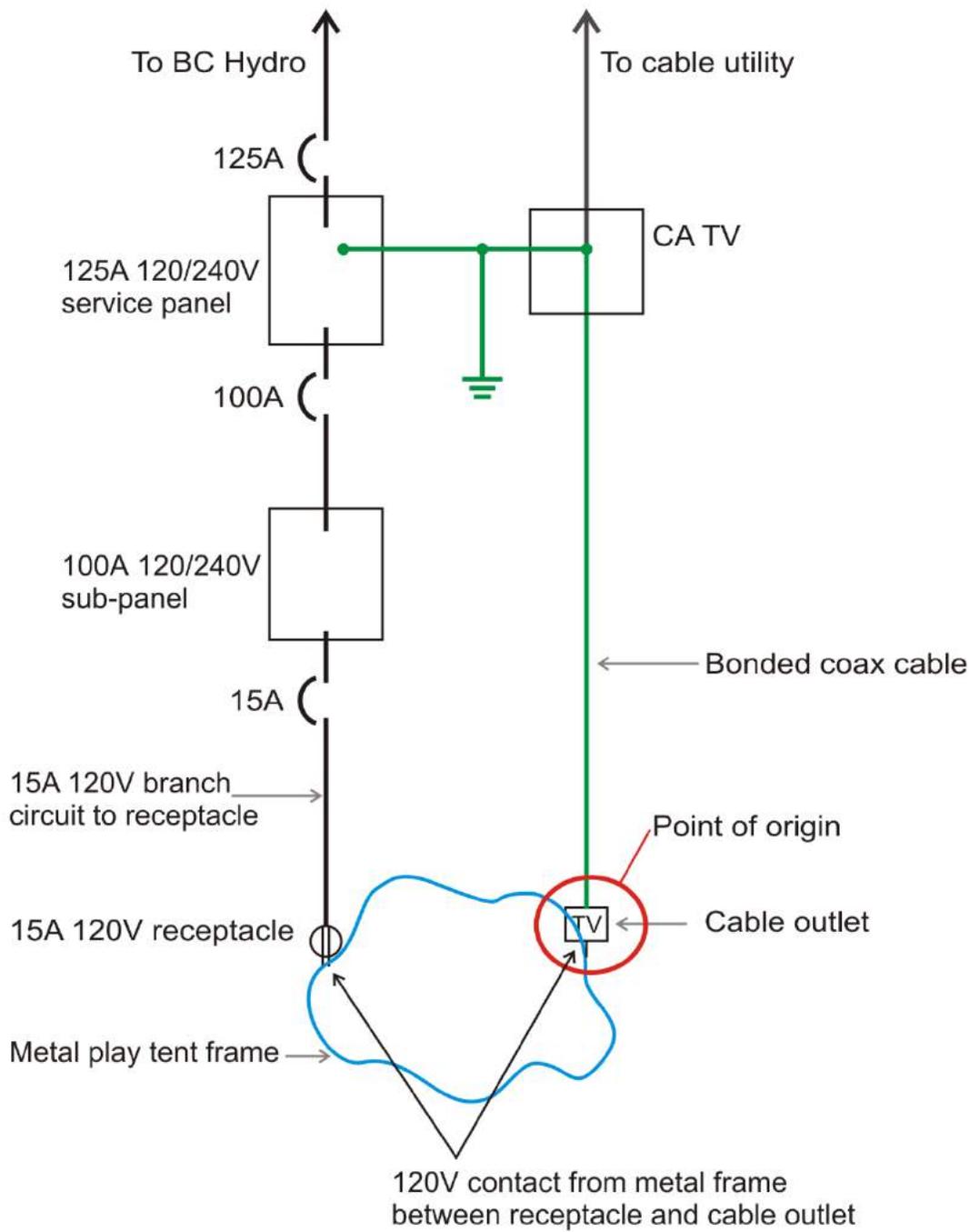


FIGURE 12 - CIRCUIT DIAGRAM. THE DIAGRAM IS INCLUDED FOR ILLUSTRATIVE PURPOSES ONLY AND IS NOT TO SCALE.

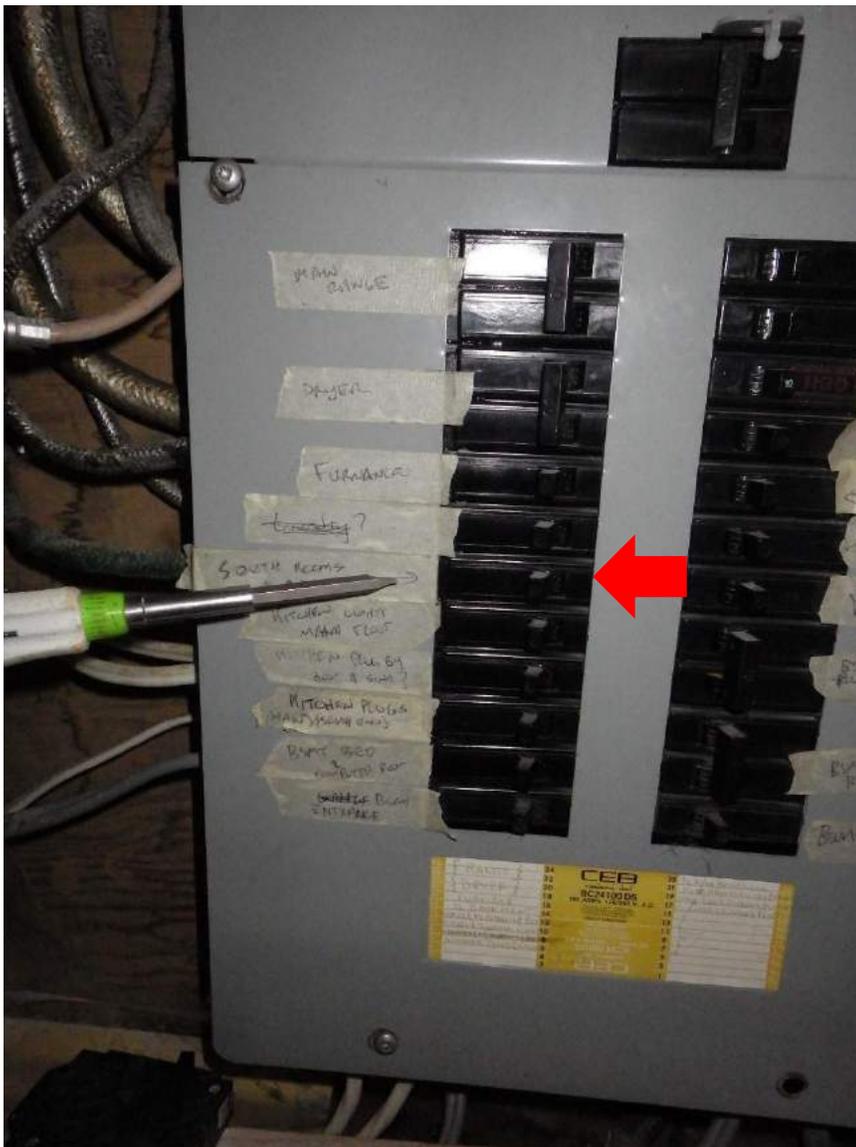


FIGURE 14

This photo shows the 15A rated circuit breaker that was tripping just prior to the incident occurring. The circuit breaker was circuit #12 and was labeled “south rooms & bath”.

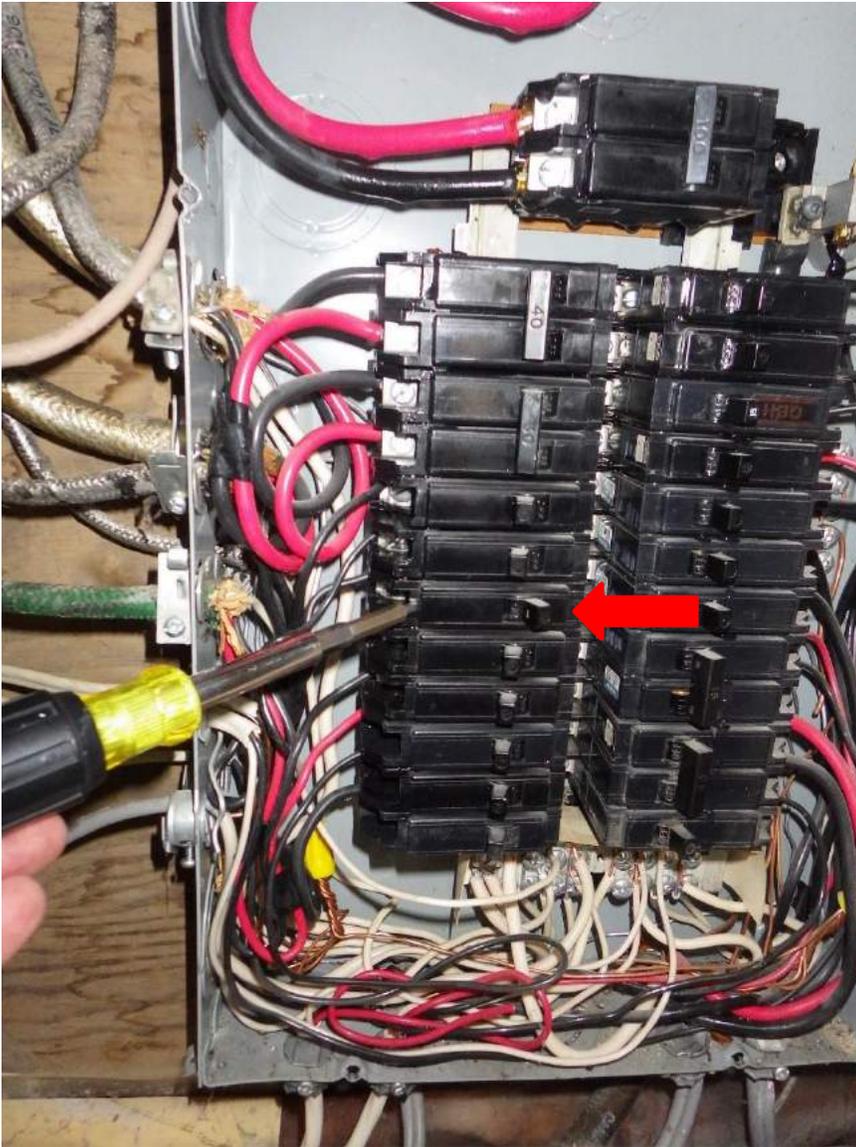


FIGURE 15

The branch circuit conductors (#12 awg aluminum) were properly terminated in the panel and at the receptacle (#14 awg copper). No evidence of previous problems with the circuit breaker or the branch circuit wiring was observed.



FIGURE 16

The cable vision cable was found to be bonded to the house electrical system at the cable utilities demarcation box with a green #10 awg copper bonding conductor. This conductor installed between the demarcation box and the main electrical system ground (shown by the red arrow) provided a path to ground for the current to flow during the fault between the attachment cord blade and the cable outlet.