

Incident Summary #II-1588168-2023 (#37421) (FINAL)

SUPPORTING INFORMATION	Incident Date	August 4, 2023	
	Location	Christina Lake	
	Regulated industry sector	Electrical - Low voltage electrical system (30V to 1000V)	
	Injury	Qty injuries	0
		Injury description	N/A
		Injury rating	None
	Impact Damage	Damage description	A conductor junction failed resulting in a short circuit between the conductor junction component and the bonded-to-ground junction box enclosure. The short circuit arcing and heating condition created localized conductor insulation damage, junction box enclosure damage, and fire damage to the ground cover layer directly below the junction box.
		Damage rating	Minor
Incident rating	Minor		
Incident overview	A recreation vehicle park electrical installation featured copper conductors and aluminum conductors that were connected by mechanical terminal lugs housed in an aluminum junction box. The terminal lugs were wrapped with insulating material. One of the conductor junctions failed, creating an electrical arcing condition within the junction box enclosure. The arcing condition created a hole in the junction box which allowed molten metal to drop down through the hole and ignite dry grass directly below and around the junction box.		
INVESTIGATION CONCLUSIONS	Site, system and components	A 120/240-volt 600-amp service housed in a central power shed supplies electrical features throughout an RV park, campground. Sub-distribution copper conductor cables route from the service equipment through the power shed to the exterior where they junction to aluminum conductor cables. The aluminum conductor cables are routed below grade to recreational vehicle site receptacle locations. The copper to aluminum junctions is housed in aluminum junction boxes installed on the shed exterior at grade level.	
	Failure scenario(s)	<p>At the site, copper and aluminum conductor junctions had been completed in an inconsistent fashion, employing various types of mechanical terminals, creating junctions with integrity and junctions displaying deterioration due to galvanic action between dis-similar conductor alloys.</p> <p>On the afternoon of August 04, 2023, recreation vehicle owners energized their recreation vehicle from the corresponding site receptacle the vehicle was parked in. The recreation vehicle required a large amount of electric energy to operate on board cooling equipment. The large electric load affected an already compromised conductor junction resulting in an overtemperature condition at the junction, a breakdown of the junction insulating material resulting in an electrical arcing condition between the junction and the electrically bonded metallic junction box damaging the components and starting a small fire on the ground.</p>	

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<p>Facts and evidence</p>	<p>Interviews, images reviews and examination of existing and repaired equipment were conducted with the property owner/park manager and the operating permit Field Safety Representative three weeks after the incident.</p> <p>An interview with the property owner/manager detailed that on the afternoon of the incident date:</p> <ul style="list-style-type: none"> • The recreation vehicle owners were assisted with parking their vehicle at site 22 (Image 1) and were directed to the corresponding site power supply receptacle. • The vehicle was cord-connected to the site receptacle and directly after turning on the on-board cooling equipment other park patrons at adjacent sites noticed an issue at the southeast corner of the power shed and discovered a small grass fire at the shed exterior (Image 2). • The patrons obtained a fire extinguisher and immediately quenched the grass fire. • The property owner/manager noted an electrical relationship to the grass fire and contacted the operating permit Field Safety Representative for assistance and to effect repair. <p>An interview and review of images with the operating permit Field Safety Representative detailed:</p> <ul style="list-style-type: none"> • The site was assessed on the afternoon of the incident date for other damage, none discovered. • The sub-distribution equipment was assessed, and observations and testing revealed that the overcurrent fuses protecting the supply conductors to recreation vehicle sites 17 through 22 involved in the incident operated effectively; tested 'open'. • The conductor junctions in the exterior junction box were examined and the arcing condition between the conductor junction and the junction box was discovered (Image 3). • Examination of other unaffected conductor junctions revealed that unapproved mechanical termination lugs were employed to junction the conductors and displayed extensive corrosion/oxidation at the contact areas between the copper and the aluminum conductors. • The junction box was replaced, the conductor junctions were cleaned, liberal amount of non-oxidizing compound was applied to the conductors then re-terminated with approved connectors, new overcurrent fuses were installed (Image 4 and Image 5). • The supply to the recreation vehicle site was re-energized when repairs were completed.
<p>Causes and contributing factors</p>	<p>The cause of the incident was a degraded aluminum to copper connection which overheated under electrical load.</p> <p>Contributing factors to the incident were:</p> <ol style="list-style-type: none"> 1. The use of unapproved mechanical connectors 2. Insufficient non-oxidizing compound used on aluminum connections. 3. The high current load draw from cooling equipment in the RV.

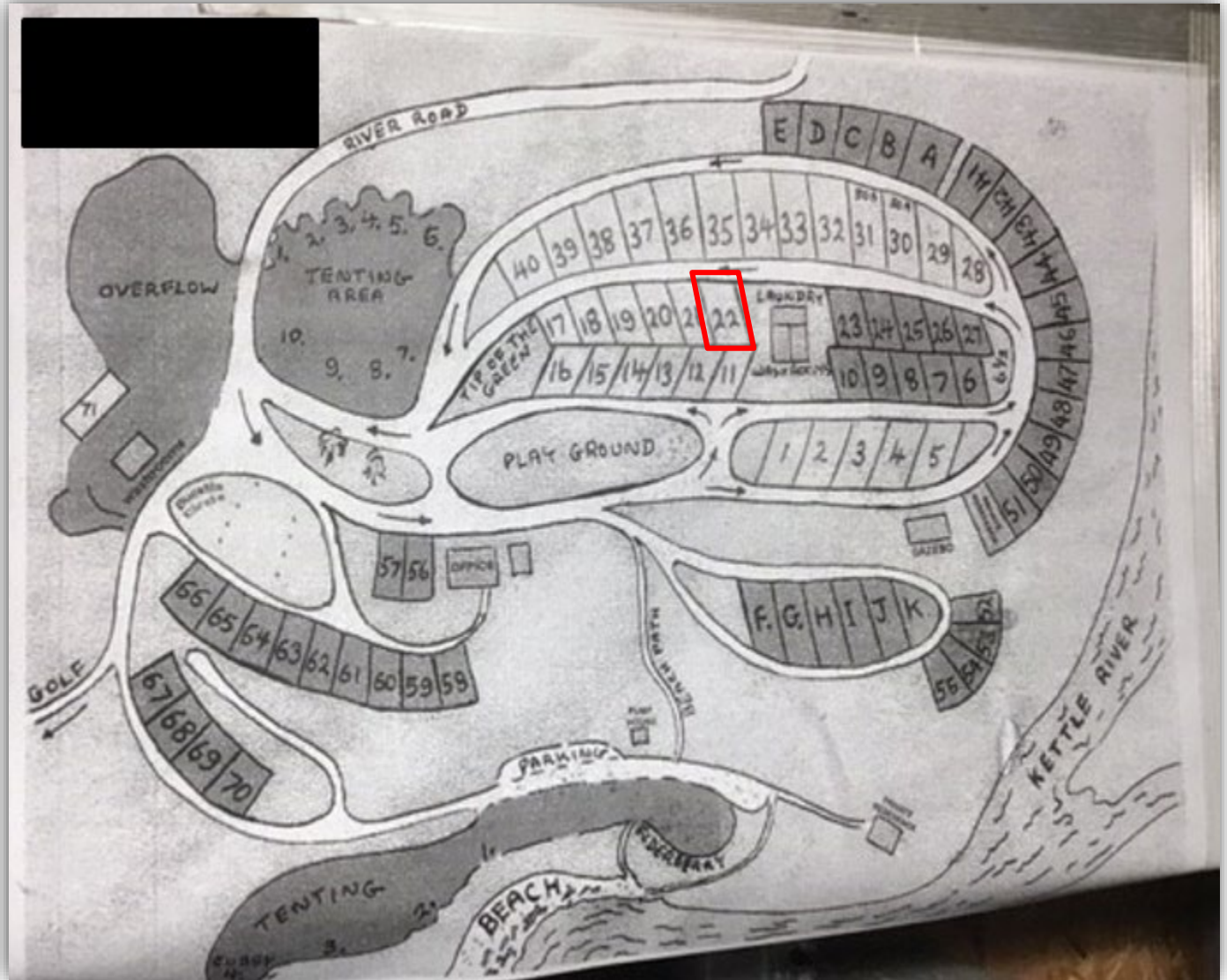


Image 1 – Site map - recreation vehicle parked in site 22.



Image 2 – Southeast corner of power shed - grass fire occurred below exterior junction box.



Image 3 – Termination lug involved in arcing incident.



Image 4 – Junction box replaced, conductors re-terminated, re-insulated.



Image 5 – New fuses installed for supply to sites 17 through 22.