SEQUOIA® INSURANCE COMPANY

RISK MANAGEMENT GUIDE

Understanding Risks Associated with Zinsco™ Circuit Breakers

Overview

Zinsco™ or GTE-Sylvania™ Zinsco (or Kearney) circuit breakers and electrical panels, manufactured until the 1970s, may not offer reliable protection against fire, shock, and other hazards related to circuit overload. Industry reports indicate that as many as 25%-75% of all Zinsco™ circuit breakers could fail to trip in response to an over-current or short circuit. (The normal rate of failure for circuit breakers in residential electrical panels is less than one percent.) Though these breakers may sometimes trip properly during normal over-current conditions, failure to trip becomes increasingly likely over time, and overheating and burning occurs frequently. Burning and overheating can damage the circuit breaker so that it no longer operates properly and fails to trip when needed in an over-current situation, increasing the risk of fire. In some cases, all the circuits remained energized even after the main breaker or individual circuits had been shut off; in other cases, current continued to flow to the circuits even after the corresponding circuit breakers had been shut off. One report described a situation where the device had been wired incorrectly; a properly-functioning breaker would have tripped, but the Zinsco™ breaker did not. Incident reports also describe arcing, burn-outs at the contact points, and even some blow-outs of the panel box where the circuit breakers are housed.

Identification of Zinsco™ Circuit Breakers

The affected circuit breakers and panels are labeled with various brand names, including any of the following, alone or in combination: Zinsco™, Sylvania™, GTE™, GTE-Sylvania™, Magnetrip™, and Kearney™. Most have a silver, or silver and blue, foil label. The words "Zinsco," Sylvania," or "Magnetrip" may be stamped or embossed on the panel. (Figures 1, 2, 3, and 4) Inside the panel box, the circuit breakers often have bright blue, red, and green tabs.

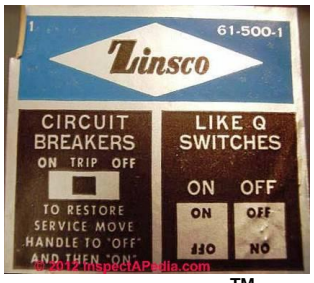

Fig. 1. Zinsco™ Panel ID Plate
Image provided courtesy of InspectAPedia.com

Fig. 2. GTE Sylvania Zinsco™ Panel ID Plate
Image provided courtesy of InspectAPedia.com

Fig. 3. Sylvania™ Panel ID Plate
Image provided courtesy of InspectAPedia.com

Fig. 4. GTE-Sylvania™ Panel ID Plate
Image provided courtesy of SCM Engineering

Performance Problems in Zinsco™ Circuit Breakers

Circuit breakers are designed to break, or interrupt, an electrical current when there is too much current for the electrical line to carry safely, or when other unsafe conditions exist, such as during a power surge or return of power after an outage.

When the circuit breaker fails to trip, uncontrolled current may flow through the system, causing overheating and increasing the risk of fire and damage to electrical equipment and electronic systems, and increasing the risk of injury or death to persons working on the equipment, or present in the building. (Figures 5-10)

Most brands and models of circuit breakers sold in the United States function properly, and provide reliable protection for many years in the buildings where they are installed. However, industry experts have identified a few older brands that under normal conditions can fail to function correctly. Published reports indicate that one line of circuit breakers and electrical panels known as Zinsco™ (also known as GTE-Sylvania™ Zinsco or Kearney™, referred to hereafter simply as "Zinsco™") do not provide adequate protection against over-currents or short-circuits, thus creating hazardous conditions in the buildings where they are installed.

Hazardous conditions and events have been reported where Zinsco™ electrical panels and circuit breakers are in use, including:

- Corrosion of the bus bars (corrosion seems to occur more readily than in other brands)
- Loose breakers, poor connection, and arcing between breakers and bus bars
- Improper tripping, especially delayed tripping or failure to trip
- Overheating, burning, and melting
- Blow-out of the circuit breaker case during an "arc explosion"
- Possible failure to cut power when the breakers are switched off

Though production of Zinsco™ electrical panels and circuit breakers ended in the mid-1970s, they remain in use in many homes and other buildings throughout the United States. Industry reports indicate that as many as 25% of all Zinsco™ circuit breakers could fail to trip in response to an over-current or short circuit.

Fig. 5. Zinsco™ Breaker Side Blowout with Breaker Contact Exposed.
Image provided courtesy of InspectAPedia.com

Fig. 6. Zinsco™ Double Pole Breaker in Place, with Panel Bus Exposed.
Image provided courtesy of InspectAPedia.com

Fig. 7. Burned-Out GTE Sylvania Zinsco™ Circuit Breaker.
Image provided courtesy of InspectAPedia.com

The normal rate of failure for circuit breakers in residential electrical panels is *less than one percent*. While all products will experience some failures due to aging, Zinsco™ products are reported to fail at much higher rates than comparable products of standard design and by other manufacturers.

According to published technical reports, the critical problem with Zinsco™ breakers is a failure at the point where the circuit breaker contacts clip to the electrical panel bus. Zinsco™ breakers and panels appear to be more vulnerable both to corrosion and to loosening over time, making the connections unreliable and dangerously unpredictable. These conditions can cause arcing and overheating even during normal use.

The circuit may carry an overload for a long time without tripping as it is designed to do. During the prolonged overload that occurs as a result of failure to trip, the circuit breaker will overheat. The heat can cause the breaker to melt, sometimes fusing to the bus bar at the contact point, and in extreme cases, fusing the breakers together. When this happens, the circuit breakers cannot function to break the current that is flowing in from the outside, and the overheating will continue, leading to fire in the panel box and beyond.

This scenario is most likely to occur on breakers for circuits that power major appliances (such as clothes dryers, electric ranges, electric water heaters, etc.), or those that feed power to rooms where circuits are often overloaded (such as kitchen or bathroom).

The problem is also more likely in panels where the bus bars are made of aluminum, though problems have also occurred in panels with copper bus bars. These products are also reported to be more than usually vulnerable to the effects of moisture, which accelerates corrosion and thus increases the hazard.

Most Zinsco™ breakers and panels in active use today are obsolete. The technical standards that were in place in the 1960s and 1970s have long since been updated to strengthen requirements for safety and quality, and the Zinsco™ products so not meet these upgraded standards.

Visual inspection cannot identify defective circuit breakers, unless they are already burned or corroded. Property owners should engage a licensed, qualified electrician to conduct a comprehensive electrical inspection and make recommendations.

Fig. 8. Zinsco™ Double-Pole Thin Style Breaker, Light Green Toggles, with Burn and Arcing Flash Marks.
Image provided courtesy of InspectAPedia.com

Fig. 9. Burned Zinsco™ Circuit Breaker.
Image provided courtesy of InspectAPedia.com

Fig. 10. Burned Zinsco™ Main Circuit Breaker and Burned Zinsco™ Electrical Panel Bus.
Image provided courtesy of InspectAPedia.com

Take Action When Zinsco™ Circuit Breakers Are Present

Potential defects in Zinsco™ circuit breakers are not visually apparent, and a visual inspection cannot determine whether the breaker is working correctly or not, even when the panel cover is removed.

Obvious signs of overheating (scorch marks, burns, darkened or discolored areas, soot inside the case, melted parts or insulation); indicate that the breakers are not functioning properly and that the situation is imminently hazardous. However, there may be no sign that overheating, damaged or loosened circuits, or other damage has occurred. *The absence of burns, scorches, etc., does not imply that the circuit breakers are free from defect and functioning properly*.

Other warning signs of hazardous conditions that may precede a failure of the breakers and other components may include corrosion or oxidation; humming, buzzing, popping, cracking, other abnormal sounds, or strange odors.

Toggling the ON-OFF switch does not test the ability of the breaker to function in actual overload or short-circuit conditions and cannot reliably identify which units are functional and which are not. Only live-current functional tests – evoking overload and short circuit conditions for each breaker (one pole at a time for two-pole breakers) – can determine the operating status of each breaker. Field electricians, inspectors, and property owners are not trained or equipped to do this sort of testing. In addition, the cost of this sort of testing would likely exceed the cost of replacing the entire panel with newer, safer equipment.

The condition of the circuit breakers is best assessed by a qualified, licensed electrician during a comprehensive electrical inspection. If Zinsco™ panels are present, ask the electrician to assess their condition and make a recommendation to ensure the safety and reliability of the electrical system in the building.

The Electrical Safety Foundation International suggests that an electrical inspection should include more than a simple visual check. A careful inspection might include the items shown in the checklist on the next page. If the electrician conducts *only* a visual inspection, seek another electrician who will carry out the testing described above.

Replacing the entire circuit breaker panel with all-new equipment may be the safest, easiest, and most cost-effective solution for properties where these circuit breakers and boxes are still in operation. (Figure 11) Property owners will need to

CAUTION!

Only a qualified, licensed electrician should attempt to move or remove any of the circuit breakers or other components inside the box, especially a panel on the exterior of the building. If there is no main breaker, then the power supply must be disconnected by the power company before the circuit breakers can be removed for inspection. Remember that in some cases, Zinsco™ panels may appear to be shut off but may still be "hot."

CAUTION!

Live-current functional testing can be extremely hazardous, as it creates dangerous current overload conditions in the building. In addition, running an overload test on a Zinsco™ breaker can actually intensify its inherent hazard, as the overload may cause the breaker to jam, increasing the risk that it will fail to trip in the future.

Fig. 11. Replacement Panel.
Photo courtesy SCM Engineering, © 2012. Used with permission.

cover the replacement costs (typically $750 to $3000). This may include coordinating with local utility company to suspend service to the building during replacement. (The work must be done be a licensed electrician.) However, your electrician may suggest other courses of action.

While it may be tempting to replace individual Zinsco™ breakers with "replacement" or "compatible" Zinsco™ breakers, this is *not advised*. Do not use "refurbished" or "replacement" Zinsco™ breakers; many of these are salvaged and not safe to use. Do not use "new old stock;" this is the original product; that is, it's the same as the product that needs to be replaced. *Use only new UL-listed equipment from a reliable manufacturer.* The entire panel may need to be removed and replaced.

Property owners who choose replacement will need to cover the costs (typically $750 to $3000). This may include coordinating with local utility company to ensure suspension of service to the building during replacement.

An Electrical Inspection Involves More Than a Visual Check

- ☐ Check the condition and capacity of the electrical service to the building and perform a load analysis. Is the present service adequate for present and foreseen demands?
- ☐ Inspect and verify proper grounding and bonding of main electrical service.
- ☐ Inspect all outdoor electrical components for "rain proofing" and circuit protection.
- ☐ Inspect entire main electrical service for proper terminations and safety.
- ☐ Check the age and type of various components of the electrical system.
- ☐ Check for appropriate surge suppression equipment; in lightning-prone areas, consider installing a surge arrester.
- ☐ Measure for voltage drop.
- ☐ Identify the type of wiring (aluminum or copper) and check for the proper size of conductors and the presence of over-current protection.
- ☐ Identify the type of wiring insulation (e.g., cloth or thermoplastic), assess its condition, and check its temperature rating.
- ☐ Check the quality of the exposed wiring including the service entrance, if it is above ground.
- ☐ Verify that wiring to any detached structure is installed properly and safely.
- ☐ Verify that the main breaker panel is properly labeled.
- ☐ Verify that all junction boxes are properly installed.
- ☐ Inspect the panel box and check that all connections are safe.
- ☐ Inspect any sub-panels for proper terminations and safety.
- ☐ Verify that all branch circuit breakers are sized properly.
- ☐ Verify that required circuits have lock-outs or disconnects installed and accessible.
- ☐ Verify that existing circuits are distributed properly for the required load.
- ☐ Conduct an infrared scan of the circuit breaker panel to identify any hidden problems.
- ☐ Check the wiring of receptacles, switches, and light fixtures, and check for proper lamp wattages.
- ☐ Check polarity and ground wiring at the receptacles.
- ☐ Inspect switches and outlets for signs of overheating, damage, abuse and loose terminations.
- ☐ Check for required ground fault circuit interrupters (GFCIs) and inspect and test each.
- ☐ Verify proper grounding of switches, outlets and lighting fixtures.

References

The information in this technical paper was adapted from the published, publicly-available sources listed below. Readers are advised to consult a licensed professional electrician or engineer in matters relating to the topics described herein.

“Advice for Owners - Zinsco Electrical Panel Advice for Homeowners and Home Buyers.” InspectAPedia. http://www.inspectapedia.com/electric/Zinsco.htm

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“How to Identify a Zinsco Electrical Panel.” Ugly Panel Contest. http://www.uglypanel.com/zinsco_id.html

“Replacement Electrical Panels: Options for Replacing Zinsco Electric Panels & Zinsco-Sylvania Electric Panels.” InspectAPedia. http://www.inspectapedia.com/electric/Zinscoreplace.htm

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“The Zinsco Electrical Panel, Zinsco Circuit Breakers - Hazard Information Website.” InspectAPedia. http://www.inspectapedia.com/electric/Zinsco.htm

“The Zinsco Electrical Panel, Zinsco Circuit Breakers - Is This Product OK to Use?” InspectAPedia. http://www.inspectapedia.com/electric/Zinsco_OK_Opinion.htm

“Zinsco Panels May Leave Homes and Homeowners at Risk.” Is My Panel Safe? Information All Homeowners Deserve to Know. http://ismypanelsafe.com/zinsco.aspx

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