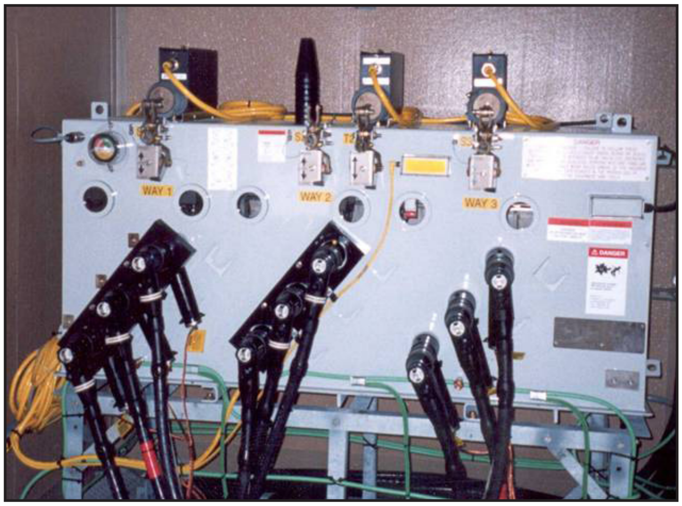
Case Study

Government Agency Bridge Upgrade

Challenge

An inland waterway bridge built in the 1950's was in serious need of an upgrade. It was originally constructed as a two lane bridge but upgraded to four lanes in the 1960's. The electrical system was at 5 kV and required utility personnel to manually isolate faults and restore power. A capital improvement project was approved to repair the bridge and upgrade the electrical system. The bridge handled up to 30,000 cars a day and was a major hurricane evacuation route. This project presented several challenges. Since the new system had to be installed on a bridge, space was limited. The number of cars using the bridge and its importance in emergencies meant that the power could not be shut off during the changeover. Finally, there were different utility systems on each side of the bridge to work with. The goal was to upgrade the existing manual system with a new automated system, meet the space limitations, have no disturbances, and work with both utilities.



Automated RFI style padmount switch.

Solution

G&W Electric, along with Canada Power Products (CPP), and the engineering consultant worked with the customer and contractor to design the best Lazer® Automation Solution for the bridge authority. The solution included 11 fully automated 27kV switches with SEL-351S relays and Survalent master control station. Nine of the vault style switches were installed on the bridge structure with the other two as main utility feeders on the North and South shores.

All of the switches were front access, three position RFI designs with a combination of load break switches and fault interrupters. All line ways were monitored by current transformers that were used to locate faults. SEL-351S relays provided protection and monitoring for the circuit and acted as Remote Terminal Units (RTU's) for local communication and data gathering. The switches were linked together with two pairs of fiber optic cables, one for the protection circuit and one for the SCADA communication. The protection communication circuit which functioned to isolate faulted line sections and restore power was run from relay to relay using SEL MIRRORED-BITS™* protocol. MIRRORED BITS was ideal for this application because of its proven reliability and high speed performance in peer-to-peer applications.

The SCADA communication back to the Survalent master station used DNP 3.0 protocol over the other set of fiber optic cables. It allowed detailed information about each switch to be recorded and analyzed. Each switch also contained a Survalent multi-way motor controller that provided the ability to open and close the switches locally or remotely.

The Lazer solution was capable of handling both utility power outages and faults along the bridge. A loss of power on either utility feed would be detected by the on shore switch at the beginning of the circuit. It would open after a pre-set period of time disconnecting the lost feed from the bridge circuit. The open tie switch in the middle of the bridge would then close restoring power to the whole bridge from the active utility feed. If a fault were to occur somewhere in the system the onshore switch at the beginning of the circuit would open to interrupt it.

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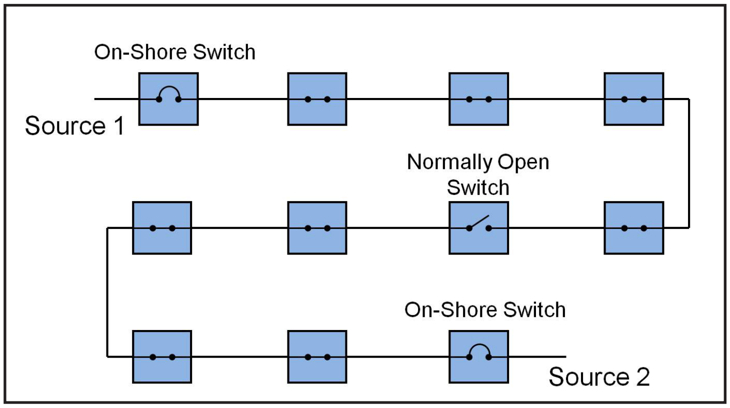
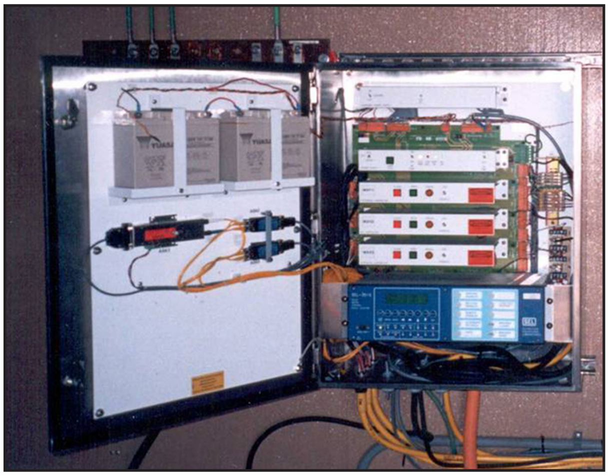


System diagram.



Control cabinet with SEL-351 relay and Survalent motor control.

Information from the current transformers on each switch would be used to determine where the fault was based on what switches detected it. The two closest switches would open to isolate the faulted section, the normally open point would close, and the on-shore switch would also close to restore power. This was all accomplished in less than the 30 second specification requirement.

Conclusion

To ensure proper performance, all components including switches and controls, were laid out and tested as a system prior to shipment. The customer specified a very detailed Factory Acceptance Test (FAT) plan to ensure proper performance before anything was shipped to the site. All switches, relays, and the master station passed the factory acceptance test by isolating simulated faults and restoring power to all non faulted sections. G&W Electric and CPP provided thorough onsite supervision and commissioning of the system to ensure it was installed correctly and fully operational. The power was switched over from the existing manual switches to the new automated system without any problems.

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