



**A POWER QUALITY REVIEW  
FOR  
A Fast Food Restaurant**

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**I. GENERAL**

This report is predicated upon information and data obtained on June 28, 2005 during a walk through inspection of the Fast Food Restaurant located in Georgia. A Meter-Treater, Inc. Representative conducted the walk through inspection to obtain some information and understand the site's vulnerability to lightning and other Power Quality anomalies.

**II. SCOPE**

The Scope of this report is to list findings, uncovered during the walk through inspection and to make recommendations for enhancing Power Quality to the site.

**NOTE:** The information presented herein is based upon a simple walk through inspection and is not to be confused with a detailed Engineering Analysis or Power Quality Audit. It is intended for reference only.

**III. BACKGROUND/HISTORY**

The installation is a single-story structure with detached service ports for drive up service (photos 1 & 2).

There is a very recent history of lightning induced damage and/or disruption to electronic operations within the facility. Restaurant personnel are concerned with ways to reduce risk and enhance uptime performance and equipment reliability...



**IV. FINDINGS**

**A. Building Description**

This is a two plus year old stucco facility that appears to be in a good to excellent condition. Externally, there is no structural lightning protection system installed and there are no trees overhanging the building or even in close proximity.

The site is not situated on top of a hill nor is it the tallest building in the vicinity.

**B. Utility AC Service**




**Power Entering Facility**

A 300kV transformer supplies ac power to the site (photo # 3). The main facility entrance is a Square D High Line Panelboard, (photo # 4). The main ground rod was not located.

**C. Main AC Service**

The main ac distribution panel or panelboard is located internally along a wall in the restaurant (photo# 4). Panelboard ratings are 1kA for 277/480 volt 3phase service.

**NOTE:** No ground measurements were acquired at either the utility transformer or the main ac service panel. No service panel doors or dead fronts were removed to determine ground resistance in sub-panels.

		
<p># 3: Utility Transformer</p>	<p># 4: Main Panel Board</p>	<p># 5: 120/240 Panel</p>

**AC Sub-Panels:**

There are two branch service panels within the facility. The first sub-panel, located in the office, is labeled LP1 and is rated as a 225Amp, 3phase, 120/208Volt Wye. This panel services outdoor lighting, signs etc.




The second panel (photo # 5) is rated as a 125 Amp 120/240Volt, Split Phase Wye device. This panel, labeled for computer use, appears to service the office-networked equipment (photos #6 – 10).

No power protection was located anywhere within the facility, however there was a UPS system attached to the computer.

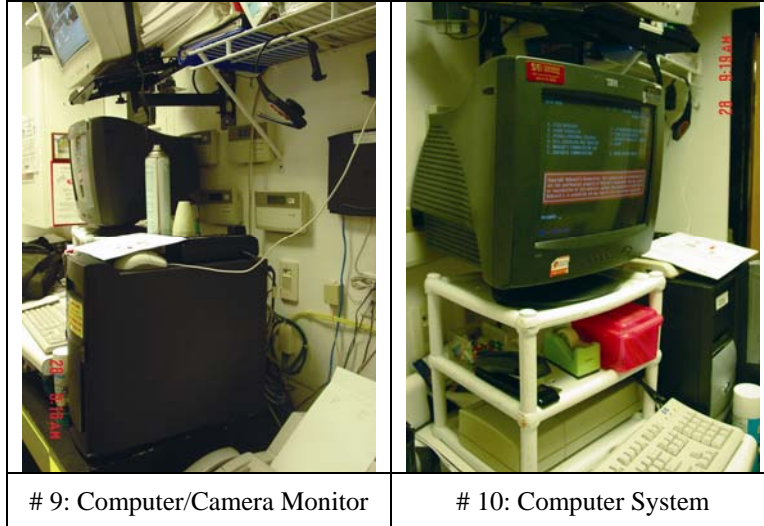
**D. Key Network Equipment**

**1. Telephony:**

- a. Primary (incoming) Lines: The telephony demark is located next to the main ac panel board and has primary protection in place (see photo # 4); however; there is no evidence of any secondary protection for modems and like equipment.

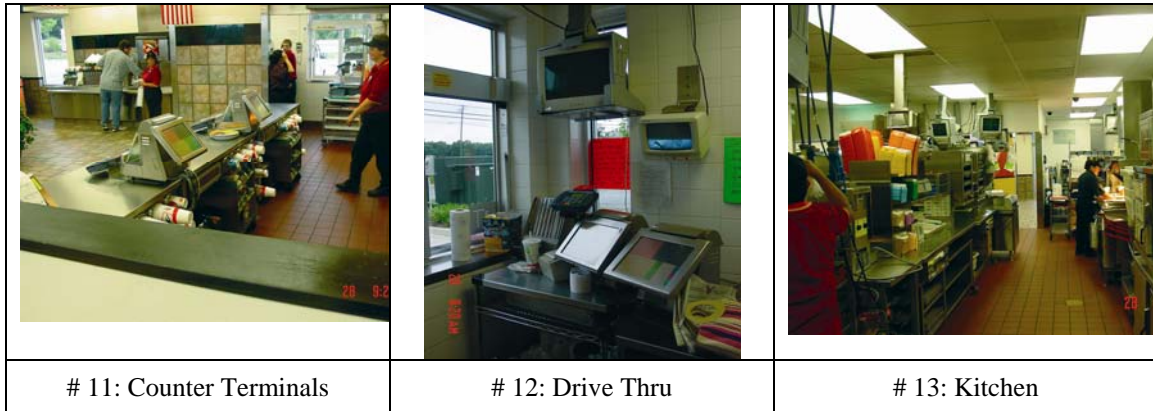
		
<p># 6: Cat5</p>	<p># 7: Muzak</p>	<p># 8: Telephony (Modems)</p>

2. **Video/Security/Sound System:** The video monitor/recording system is not properly bonded to the facility ground and it is not protected from surge voltages. According to on site personnel the equipment had received damage from the last storm/surge event. The security/alarm system was not reviewed (see photo #6).
3. **Computer:** The computer located in the office is critical to daily operations. It must be able to communicate with the outside world via its modems. It is provided with a UPS backup system but there is no protection evident on the modem interface.



**B. Restaurant & Kitchen Equipment**

There was no power quality protection noted on any of the other operating sections of the restaurant. Point-of-sale terminals, fryers, and drink equipment were noted as not protected.



The drive through window provides transients an excellent ingress into the facility.

**V. RECOMMENDATIONS**

**A. SERVICE ENTRANCE**

**1. Main Service Entrance AC Power Panel**

Install a Hardwire Surge Protection Device, suitable for service entrance locations, on the main AC Panel (Model RCHW, MST, BPT or MPT).

**Rational:** Placement of such a device will divert externally generated transient energies, caused by such things as lightning and utility load factor corrections, to ground, thereby, keeping high voltage transients from propagating throughout the facility's internal wiring system.

**Note:** Use of plug-in surge protectors and UPS systems within the facility can actually draw high surge currents into the site causing damage and/or disruption to unprotected networked equipment. The reason for this is because lightning energies are seeking a low impedance path to earth/ground and the installed protector/UPS provides that path through their suppression components. Therefore, a device plugged into the protector/UPS may remain functional while other equipment may suffer disruption or failure.

By coordinating primary (building entrance) protection with secondary (point-of-use) protection, it is possible to eliminate the propagation of transients on internal building wiring.

## 2. Secondary AC Panels

Install additional Surge Protection Devices on each of the two sub-panels (Model RCHW, MST or BPT).

**Rational:** These additional protectors are recommended because the sub-panels feed either one or more of the following: outside lighting and signs, air conditioning and/or sensitive electronic systems.

**NOTE:** Any external feed equipment has to be treated as if the feeding panel is itself an entrance panel. The protector(s) is to stop surges from propagating onto the buildings internal wiring. Panels feeding inductive loads like the motors on air and refrigeration units should be protected to keep the transients they routinely produce from coupling onto internal building wiring.

The building and collapsing of magnetic fields can create large surges on a facility's networked wiring system. The turning on and off of fluorescent light switches can produce a surge of several hundred volts directly onto the facility's power line.

## 3. Grounding

Test confirmation of the site's ground system from the utility transformer to the main panelboard and in turn to both ac sub-panels should be accomplished as soon as possible.

**Rational:** The establishment of a single point ground system back to the building's utility ground is essential for the proper performance of any installed power protection. The creation of single point ground helps to eliminate ground and current loops that can allow unwanted surge energies to freely negotiate the facility's building wiring.

In addition, the creation of an equipotential ground system eliminates ground differentials and eliminates the free flow of stray surge currents.

## B. General Building Equipment

It would be prudent to place point-of-use surge protective devices on all pos terminals, drink machines and any other sensitive equipment. This recommendation is for both the ac power and the data/signal ports (Model TST, HLP and TrippLite SPDs).

**Rational:** If protection is placed at only one end of the line, such as in the utility room, it could prove to be costly to the unprotected ends of other equipment. This happens when

the surge energy is equalized or balanced between the ground and the control or operating lines. The equalization is due to the need to overcome the potential difference between critical modes.

***Additional Notes***

The location of the restaurant, in relationship to power lines and adjacent structures, can have significant impact on the transient environment.

<p># 12: Light at Drive-Up</p>	<p># 13: Restaurant Sign</p>	<p># 14: Lighting Rod on Light Pole</p>

In photo 12, a parking lot light stands over the drive-up area. This represents a 2-prong threat to the facility's internal wiring. One area of concern is direct feedback to the AC panel feeding the light and the other is an induced effect to the communications link via the drive thru.

Photo 13 shows the close proximity of the restaurant's sign to utility power poles and other signs. The sign is power directly from a service panel with the building, making it a direct entry for transients.

Photo 14 shows a parking lot light from the next lot across from the drive thru. This light pole has, what appears to be, a lightning rod mounted on top of it. This could attract a lightning strike that would induce transients into the restaurant.

**VI. CONCLUSIONS**

- A. It is always important to keep dangerous, high-energy, transients from gaining entrance into the facility. Once ingress is achieved, transients will propagate throughout the entire internal wiring system. This in turn, will affect all wiring connected or referenced to the common ground buss.
- B. *It is critical that a good ground be present in order for any SPD/TVSS device to be effective.* This applies for all AC, Telephone, Data, Signal, Security and Cable connections.

**For more information on Surge Protection Recommendations for Restaurants  
Visit [http://www.metertreater.com/Restaurant\\_Protection.html](http://www.metertreater.com/Restaurant_Protection.html)**