ENGINEERING REPORT

Company ABC

PERFORMED BY:
Midwest Electrical Consultants, Inc.
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PROJECT: #C109

January 19, 2005

Attention: Mr. Client

Subject: Engineering report for 2005 infrared inspection & electrical distribution

Enclosed is the engineering report detailing the project that **Midwest Electrical Consultants - MEC** completed on 1-10-05 at……,Chicago, IL. MEC is a full service independent testing company and appreciates the opportunity to provide your electrical testing, engineering and repair services.

Our mission is to provide an independent technical service to enhance the safety, reliability and efficiency of electrical systems and provide a one-stop solution for quality electrical testing, engineering and repair services.

Thank you for the opportunity to provide this service. Please contact us if you have any questions or wish to know more about MEC's services.

Respectfully Submitted,

Bruce Woyna
Project manager
Email: bruce8359@aol.com

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Project **#C109** **2005 Infrared Inspection**

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SECTION I

SCOPE:
On January 10, 2005, *Midwest Electrical Consultants* performed an infrared inspection of the XXXXX facility located in Chicago, IL.

Detailed inspection notes and observations documented during the execution of this project are contained in the thermographic inspection log section of this engineering report. This log contains a listing of all equipment inspected during this project.

PURPOSE:
The purpose of this thermographic inspection is to provide information relative to the physical condition of the electrical distribution system. Loose and poor connections, unbalanced loads and loose bus joints can be located. These conditions are characterized by increased resistance and accompanied by a temperature rise detected by thermographic scanning. This report is intended to assist you in reducing loss to property by bringing your attention to hazards and problems. It is not intended to imply that other hazards or problems may exist at the time of the inspection.

PROCEDURE:
All testing is performed in accordance with MEC's standard procedures including, but not limited to, selected specifications from the following: International Electrical Testing Association (NETA), National Electrical Code (NEC), National Fire Protection Association 70B-Electrical Equipment Maintenance (NFPA 70B), Institute of Electrical and Electronic Engineers (IEEE), American Society for Testing and Materials (ASTM), National Electrical Manufacturer's Association (NEMA), manufacturer's instruction manuals and/or project specifications, unless otherwise noted.

APPRAISAL AND RECOMMENDATIONS:
MEC recommends annual infrared inspections of electrical equipment to assist in identifying deteriorated connections and abnormal operating temperatures prior to equipment failure.

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The enclosed thermographic inspection report contains pictures and recommendations for equipment that was identified as having elevated temperatures and requires corrective actions. The enclosed therrnographic Inspection Log contains a listing of all equipment inspected during this project. Some equipment may be noted as not operating at the time of the inspection or not accessible because of interlocks. This equipment should be inspected during a scheduled outage. MEC tightened loose connections found as practical.

MEC has assigned "repair priority" ratings to each deficiency identified in the thermographic inspection report. These ratings are based on two primary factors: (1) The International Electrical Testing Association (NETA) table 10.18 identifying the various temperature differentials between similar equipment and/or ambient temperature; and (2) The type and critical nature of the equipment and the effect the elevated temperature may have on continued reliable service.

Following all repairs, a thermographic inspection should be scheduled to assure the deficiencies have been adequately repaired. Please contact our office to schedule a follow-up infrared inspection.

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Each thermographic photograph is adjusted for clarity, therefore, the temperature scales of the various pictures are not consistent. Photographs with very slight elevated temperatures may appear to be serious deficiencies based upon the color gradient (isotherm) of the photograph. MEC has provided isometric charts and temperature differential listings to assist in the evaluation of each photograph.

DEFICIENCY TEMPERATURE REFERENCE

Temperature difference based upon comparison between similar components under similar load	Temperature difference based upon comparison between component and ambient temperatures	Recommended action	Repair Priority
1 – 3 °C	1 – 10 °C	Possible deficiency, warrants investigation	1
4 – 15 °C	11 – 20 °C	Indicates probable deficiency, repair as time permits	2
N/A	21 - 40°C	Monitor continuously until corrections are completed	3
> 15 °C	> 40 °C	Critical variance Repair Immediately	4

The above table is taken from the International Electrical Testing Association Maintenance Testing Specification NETA MTS-2001, Table 10.18. This table is provided as a reference providing suggested actions based solely on temperature differences. Actual recommendations may vary from those above based on specific equipment inspected, components showing signs of elevated temperature, criticality of equipment, and likely cause of elevated temperature.

Results and Recommendations:

- MEC recommends REGULAR ELECTRICAL INSPECTIONS, CLEANING AND TESTING of electrical equipment to assist in identifying deteriorated insulation, abnormal operating temperatures and malfunctioning protective devices prior to equipment failure.

- New OSHA requirements have been issued regarding arc flash requirements and personnel safety. New arc flash requirements will require all facilities (industrial, commercial, institutional) to display information about the arc flash availability at each panel, switch or breaker where the equipment is accessible by maintenance/site personnel. The arc flash information on the panel fronts will indicate the level of clothing and level of training required to open and maintain the equipment within the panel or switchboard.

- All electrical protective equipment including ground fault relays, circuit breakers and fused disconnects should be tested, exercised and lubricated on a regular basis. Mechanical equipment may not operate properly when called upon if regular maintenance is neglected.

- The following list of equipment was inspected for elevated thermal levels using a state-of-the-art digital thermal imaging camera. Equipment with elevated levels were photographed and included in this report with recommendations for repair or replacement.