Lake, Louis

From: Lake, Louis L2
Sent: Thursday, December 10, 2009 8:50 AM
To: Thomas, George
Subject: Emailing: NRC Request 17.pdf
Attachments: NRC Request 17.pdf — 18 Pages

Attached is a response to Question #17 for your review. I know you had a follow-up question put I was not sure if you had this info.

Lou

The message is ready to be sent with the following file or link attachments:

NRC Request 17.pdf

Note: To protect against computer viruses, e-mail programs may prevent sending or receiving certain types of file attachments. Check your e-mail security settings to determine how attachments are handled.

Q-9

Information in this record was deleted in accordance with the Freedom of Information Act.
Exemptions 6
FOIA/PA 2010-0116

NRC Request #17: For petrographic analysis, who are the labs and what are their credentials?

Two labs have performed petrographic analyses in accordance with ASTM C 856: MACTEC Engineering & Consulting and CTL Group. MACTEC performed petrographic analysis under their Appendix B program, while CTL performed an informational "comparison" analysis as an additional, independent data point. The resume and qualification package of the Mactec individual who performed the analysis for CR3 is attached, as well as petrography literature from the CTL website.

A third laboratory, PhotoMetrics, is also performing material analysis, although not per the ASTM standard. The material examinations being performed by Dr.Mostafa at the PhotoMetrics laboratory involve methods intended to examine similar conditions and attributes evaluated under petrographic examinations, but using tools and techniques more frequently used in material science, e.g., scanning electron microscope (SEM) and micro-hardness examinations that are more thorough. Information from the PhotoMetrics website is attached.

Response by Craig Miller 11/16/09

MACTEC Information

MACTEC

engineering and constructing a better tomorrow

October 21, 2009

Mr. Paul Fagan
Progress Energy
Crystal River Plant
Via email to Paul.e.fagan@pgnmail.com

Subject: MACTEC Quality Assurance Program
Petrographic Examination of Concrete Cores

Dear Paul:

MACTEC Engineering and Consulting, Inc. (MACTEC) has a quality assurance program meeting the requirements of 10CFR50, Appendix B in place under our materials master agreement with Progress Energy, 2720. Progress Energy has conducted audits of MACTEC's Raleigh, North Carolina office and approved MACTEC as a nuclear safety-related quality supplier.

Under our QA program, MACTEC controls all work for Progress Energy materials testing through the Raleigh office. Mr. Scott Auger is the designated Project Manager, and Mr. J. Allan Tice and Dr. Ufuk Dilek are the project Principals (as appropriate to the work to be performed). Mr. Andrew Kottenstette is the designated Quality Assurance Representative. Work requested by Progress Energy is reviewed and properly qualified personnel are assigned to perform the work.

As for the petrographic examination of concrete cores requested for Crystal River, MACTEC personnel with the special skills required are not always physically located in the Raleigh office. In these cases, those personnel are assigned to perform the tasks using a Work Instruction that includes specific technical and quality standards to be followed. Such personnel are required to be first qualified in accordance with the MACTEC Quality Assurance Project Document (QAPD) and to have QA training appropriate to the task and the QAPD.

David Wilson, who is the person qualified to perform petrographic examinations, has done such work on other nuclear safety-related projects working under MACTEC Raleigh's QAPD for those projects. We are attaching a current MACTEC qualification package for Mr. Wilson.

MACTEC Engineering and Consulting, Inc. NC License F-0653
3301 Atlantic Avenue • Raleigh, NC 27604 • Phone: 919.876.0416 • Fax: 919.831.8136

www.mactec.com

MACTEC appreciates the opportunity to continue assisting Progress Energy on all projects and specifically on nuclear safety-related work. Please contact us if you have any questions about our QA program or the petrographic examination work.

Sincerely,

MACTEC Engineering and Consulting, Inc.

J. Allan Tice, P.E. (NC)
Senior Principal Engineer
Assistant Vice President

R. Scott Auger, P.E. (NC)
Project Manager

for Andrew J. Kottenstette w. th permission
Andrew J. Kottenstette
Project Quality Assurance Representative

Attachment

Certificate of Personnel Qualification

For Nuclear Safety-Related Projects

MACTEC Project Number: To be assigned	**MACTEC Project Name: Petrographic Examination of Concrete Cores - Crystal River Plant**

MACTEC Engineering and Consulting, Inc. (MACTEC)

Employee: David C. Wilson Employer: MACTEC

Activities Certified to Perform: Petrographic examination of concrete cores (ASTM C 856)

Basis of Qualification (See Attachments):

☒ Qualification Checklist, ☒ Registration(s)/Certifications(s), and/or ☒ Resume

☐ Records of experience, education and formal training;

☐ Written, ☐ oral, ☐ practical examination;

☐ Proficiency demonstration.

Employee is qualified at: ☐ Level I; ☒ Level II; ☐ Level III for the above listed technical tasks.

Physical Examination required to provide services specified: ☐ Yes, ☒ No
Specify requirements:

Certificate of Qualification: ☒ Initial or ☐ Re-certification

Period covered by this certification: From: 10/21/09 To: 10/21/10

MACTEC certifies that the employee identified above is qualified to perform the duties and activities as stated above for the project based on the qualifications listed.

Name: J. Allan Tice	Signature: J Allan Tice
Title: Project Principal	Date of Certification: 10/21/09

MACTEC Engineering and Consulting, Inc.

Qualification Checklist

MACTEC Project Number: To be assigned	MACTEC Project Name: **Petrographic Examination of Concrete Cores – Crystal River Plant**
Name: David C. Wilson	Employer: MACTEC
Job Title: Senior Principal Engineer	Date: 10-21-09
Experience in Technical Specialty: (Years) 17	Technical Specialty: Construction Materials Testing
Total Job Experience: 19	
Education: ☐ High School Graduate; or equivalent: (Explain)	
☒ College Graduate; ☐ Graduate School: Indicate Degree, Major and Year – B.S. Applied Arts and Sciences – Civil Engineering, 1992	
Other education or training as applicable:	
Physical Examination results, if required (☐ Yes, ☒ No)	
Registrations, certifications other qualifications: (List, provide copies of certificates, etc.) Professional Engineer – Civil Engineering, CA	
I hereby certify that to the best of my knowledge the preceding information as presented is correct.	
Employee Signature:	Date: 10-21-09
MACTEC Representative Signature:	Date: 10-21-09
Title: Project Principal	

MACTEC

David Wilson PE
Senior Principal Engineer

Total Years of Experience: *19*

Education:

Bachelor of Science Civil Engineering, (b) (6) San Diego State University

Registrations:

Professional Engineer - Civil, CA, earned 1995, #C54734

Certifications and Non Professional Licenses:

Radiation Safety and Use of Nuclear Gauges , , #20148, earned -

Career Summary

As a Senior Principal Engineer in construction materials testing, Mr. Wilson is responsible for insuring the technical quality of tests and inspections; performing engineering investigations of construction failures; providing design and review of concrete and asphalt; and supervision of testing and inspection of concrete, masonry, steel structures, and asphalt and concrete pavements. He is familiar with ASTM, UBC, AASHTO, CALTRANS, and U.S. Army Corps of Engineers testing procedures. He has experience supervising and performing testing of concrete, asphalt, soil, reinforcing steel, and other construction materials, as well as pull testing, load testing, and torque testing of fasteners, and load testing of structures. Mr. Wilson has conducted and supervised numerous soil compaction projects and has designed both rigid and flexible pavements. In addition, he has supervised both field and laboratory operations.

Representative Projects

Steam Generator Replacement Projects for Various Nuclear Generating Sites, Bechtel Corporation

Mr. Wilson performed several petrographic evaluations of coarse and fine concrete aggregates for steam generator replacement projects. This work was performed under the direction of MACTEC's quality assurance program for Nuclear Safety Related work. The projects included

Palo Verde Nuclear Generating Site
Beaver Valley Nuclear Generating Site
Fort Calhoon Nuclear Generating Site
Comanche Peak Nuclear Generating Facility

LEE Nuclear Station, South Carolina

Mr. Wilson performed rapid chloride ion testing of concrete for the foundation of the LEE Nuclear Station. This work was performed under the direction of MACTEC's quality assurance program for Nuclear Safety Related work.

Los Angeles to Pasadena Metro Gold Line light rail, Concrete and Concrete Topping Investigation, Los Angeles, Pasadena, and South Pasadena, California.

Nearing the substantial completion phase of this $726 million dollar design build construction project, cracking of eight of the stations' platform concrete and delamination of a concrete topping mortar was observed by the Los Angeles to Pasadena Metro Construction Authority and eventually was reported in the Pasadena Star News Paper and raised concerns with the Citizens Advisory Committee and the MTA board members and the City Council. Mr. Wilson was engaged as a concrete expert to evaluate the cause of the observed distress and provide recommendations for remediation. Mr. Wilson performed field observations, selected areas for sampling, and performed petrographic

observations on 26 samples and evaluated the cause of the cracking and delamination and provided recommendations for remediation.

Special Investigation and Petrographic Observations
Los Angeles Zoo New Sea lion Exhibit
The project consists of a new sea lion exhibit with associated water storage and treatment facilities. During the placement of the walls for the dry moat, basic recovery, backwash reservoir, and de-aeration tower, the concrete attained initial set in approximately 30 hours. After the forms were removed multiple surface voids and some exposed reinforcing steel was observed. Mr. Wilson performed an investigation of the existing conditions and provided recommendations for repair. Our scope of work was to document the varying conditions observed and perform sampling and non-destructive testing to evaluate the cause and extent of the observed distress. Our investigation included impact echo testing, low frequency ultrasonic testing, and petrographic analysis of concrete cores. Additionally, during repairs we performed observations, adhesion of the repair material to the existing concrete, and additional impact echo and low frequency ultrasonic testing to evaluate the integrity of the repairs.

Special Investigation of Concrete Structure
Pump Station #2, San Diego, CA

The project consists of one of San Diego's main sewage pump stations that was constructed in the 1950's. This pump station is critical to the waste water treatment system of San Diego. The structure was exhibiting concrete distress in the form of concrete cracking and spalling and corrosion of the reinforcing steel. Mr. Wilson performed an investigation of the concrete distress utilizing visual observations, penetrating radar, low frequency ultrasonic testing and impact echo testing. Additionally samples were extracted for petrographic analysis and chemical testing. Based on the results of our testing we provided repair specifications, repair drawings, and bid documents.

St. Jude Medical, Cardiac Pace Maker Manufacturing Clean Room, Sylmar California. Mr. Wilson performed an investigation of a concrete slab for a medical device manufacturing clean room. The existing floor covering was experiencing blistering. The investigation included core sampling, petrographic analysis by Mr. Wilson, and chemical testing.

County of San Diego Emergency Services and Sheriff's ASTREA Helicopter Facility, Gillespie field, El Cajon, California. Mr. Wilson supervised the inspection and testing performed by MACTEC including special inspection of Structural steel erection, field welding, and high strength bolting and building, electrical, plumbing, and mechanical inspections during the construction of the emergency service facility, helicopter maintenance garage and helicopter hanger. Additionally, MACTEC performed on-site geotechnical testing, laboratory testing, and on site inspection of the best management practices (BMPs) for the storm water pollution prevention program (SWPPP). MACTEC performed our services directly for the County of San Diego. The concrete slab-on-grade had been placed prior to MACTEC's services being requested on the project. During the application of the epoxy floor finish for the helicopter maintenance garage Mr.

Wilson was asked to evaluate the concrete surface which the floor coating contractor had reported was soft and needed additional surface preparation at an additional cost to the county. Mr. Wilson performed an evaluation of the concrete slab including sampling and petrographic analysis and recommended that the costly additional surface preparation not be performed saving the county the cost and time of the proposed additional preparation.

Special Inspection and Testing, General Instruments Facility. Mr. Wilson has supervised the special inspection, non-destructive testing technicians, and field technicians for this project including structural steel shop fabrication and erection, concrete, and fireproofing work. His duties included review of concrete mix designs, review of inspector's daily field reports, and review of all laboratory and field testing reports for conformance of the project specifications and the Uniform Building Code. The $47 million project included one four-story SMRF building and one three-story SMRF building totaling 320,000 square feet.

Special Inspection and Testing, Inmate Reception Center (San Diego Central Jail). Mr. Wilson supervised the special inspection, non-destructive testing technicians, and field technicians for this project including concrete, masonry, structural steel erection, and fireproofing work. His duties included review of concrete mix designs, review of inspector's daily field reports, and review of all laboratory and field testing reports for conformance to the project specifications and the Uniform Building Code. The reinforced concrete building consisted of 18 levels in 12 stories (plus 6 mezzanines), the total height of the building is 231 feet, and the total square footage of the building was 413,168 square feet. The jail has bed space for 940 prisoners. The project also included a structural steel roof over the mechanical penthouse and a structural steel bridge over Front Street connecting the jail to the courthouses.

Killer Whale Exhibit, Sea World, San Diego, California. Mr. Wilson supervised the special inspection, non-destructive testing technicians for this project including conventionally reinforced concrete and post-tensioned concrete. His duties included a review of concrete mix designs, review of inspector's daily field reports, and review of all laboratory and field testing reports for conformance to the project specifications and the Uniform Building Code. The project consisted of 1.7-million gallon pool edition to Sea World's Shamu Stadium including life support systems. The pool walls were two feet thick and the pool bottom was two and one-half feet thick. The pool serves as a holding and viewing area for whales during non-performance times.

Geisel Library, University of California at San Diego, La Jolla, California.

Mr. Wilson supervised and performed an investigation of the Geisel Library (Central Library) at the University of California at San Diego. Distress had been observed at various locations of this unique post-tensioned reinforced concrete structure. The purpose of the investigation was to evaluate the condition of the existing structure, evaluate the attachment of concrete sections that covered the post-tensioned dead and live ends and grout injection ports, and evaluate the cause and extent of distress. The field investigation was performed non-destructively utilizing ground penetrating radar, impact echo testing, low frequency ultrasonic testing, half-cell potential testing, and resistivity measurements. Some destructive testing was also performed to verify the non-destructive test results. The penetrating radar was performed with a 1.5 GHz

antenna with a predetermined grid pattern and computer software was utilized to refine the data and produce three dimensional images to aid in our evaluation. Based on the results of the penetrating radar testing that was confirmed with limited destructive testing, several section of concrete were removed and replaced using improved reinforcing details

LA Power Chimney, Rancho Los Amigos, Los Angeles, California.

Mr. Wilson supervised and performed an investigation of a reinforced concrete chimney for an old power plant that was constructed in 1925. Specifications and drawings for the original construction were not available. The purpose of the investigation was to evaluate the construction and reinforcing details of the chimney and the foundation. Because the structure is a registered historic landmark, only very minimal destructive testing could be performed. The majority of the investigation was performed using non-destructive testing methods including penetrating radar, electromagnetic methods, and impact echo testing. Ground penetrating radar utilizing a 1.5 GHz and a 900 MHz antenna was used to evaluate the reinforcing steel layout. Information about the foundation dimensions was obtained utilizing impact echo testing and ground penetrating radar with a 400 MHz and 230 MHz antenna. Information obtained utilizing the non-destructive methods were verified with limited destructive testing and excavations.

San Diego Convention Center Expansion, San Diego, California. Mr. Wilson supervised the special inspectors and soil technicians and was the responsible managing engineer for the required special inspection and materials testing. His duties include field and laboratory supervision, submittal review, review of field inspection, non-destructive testing, and laboratory test reports. MACTEC has had up to 6 inspectors and technicians performing work on this project on a daily basis. In addition to the field services, MACTEC performed quality assurance testing and inspection of the structural steel fabrication in Korea. The expansion project will add approximately 768,081 square feet to the convention center. The project includes 7 million pounds of reinforcing steel, and 36 million pounds of structural steel, 4336 prestressed concrete driven piles, 7,200 lf of welded steel pipe, a box culvert with 2,156 cubic yards of concrete, and Harbor Drive Lowering to 1 foot 9 inches above mean seal level (lowest street in San Diego).

San Diego State University

The Trustees of The California State University
upon recommendation of the Faculty
have conferred upon

David Curtis Wilson

the Degree of

Bachelor of Science in Applied Arts and Sciences
Civil Engineering

with all rights, privileges and honors thereunto appertaining.

Given at San Diego State University this
twenty-fourth day of May, (b)(6)

Chair
Board of Trustees

Chancellor
The California State University

Governor
President of the Board of Trustees

President
San Diego State University

State of California Department of Consumer Affairs

STATE BOARD OF REGISTRATION FOR PROFESSIONAL ENGINEERS AND LAND SURVEYORS

This Is To Certify That Pursuant
To The Provisions of Chapter 7, Division 3 of The Business and Professions Code

David Curtis Wilson

IS DULY REGISTERED AS A

PROFESSIONAL ENGINEER

IN

CIVIL ENGINEERING

In The State of California, and Is Entitled To All The Rights and
Privileges Conferred In Said Code

WITNESS OUR HAND AND SEAL

Certificate No C 54734

This 14th day of July, 1995, at Sacramento, California.

STATE BOARD OF REGISTRATION
FOR PROFESSIONAL ENGINEERS
AND LAND SURVEYORS

Executive Officer

President

EPRENG 08/24/93

THIS CERTIFICATE IS THE PROPERTY OF THE STATE OF CALIFORNIA AND IN THE EVENT OF ITS SUSPENSION, REVOCATION OR INVALIDATION FOR ANY REASON IT MUST UPON DEMAND BE RETURNED TO THE STATE BOARD OF REGISTRATION FOR PROFESSIONAL ENGINEERS AND LAND SURVEYORS

Department of Consumer Affairs
California Board for
Professional Engineers and Land Surveyors

BOARD FOR PROFESSIONAL ENGINEERS AND LAND SURVEYORS

Licensee Name:	WILSON DAVID CURTIS
License Type:	CIVIL ENGINEER
License Number:	54734
License Status:	CLEAR Definition
Expiration Date:	December 31, 2009
Address:	9910 BILTEER DR
City:	SANTEE
State:	CA
Zip:	92071
County:	SAN DIEGO
Actions:	No

Disciplinary Actions

No records returned

This information is updated Monday through Friday - Last updated: OCT-20-2009

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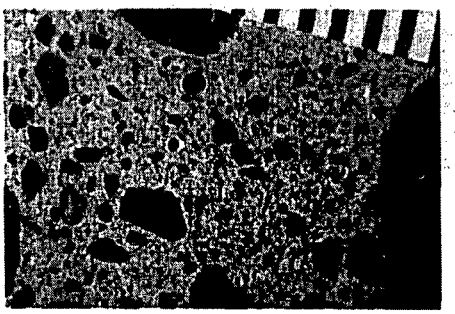
Back

CTL Information

Petrography & Microscopy



CTLGroup has assembled a staff of internationally recognized petrographers and microscopists to help us develop practical solutions to our clients' problems. One of the fastest, least expensive ways to evaluate concrete is the petrographic examination. It is applicable to aggregates, concrete, mortar, grout, plaster, stucco, terrazzo, and similar portland cement mixtures.

Petrographic methods combine unaided visual inspection and examination using stereo, petrographic, and metallographic microscopes. Following guidelines given in ASTM C856, "Standard Practice for Petrographic Examination of Hardened Concrete," CTLGroup's petrographers gather information that includes the condition of material; the causes of inferior quality, distress, or deterioration; probable future performance; and its compliance with project specifications.

Their work leads to a detailed description of concrete, including information such as:

- Degree of cement hydration
- Estimation of water-cement ratio
- Extent of paste carbonation
- Presence and amount of fly ash
- Extent of corrosion of reinforcing steel
- Evidence of alkali-aggregate reaction, sulfate attack, or other chemical attack
- Presence of potentially reactive aggregates
- Evidence of improper finishing
- Estimation of air content
- Evidence of early freezing
- Causes of cracking

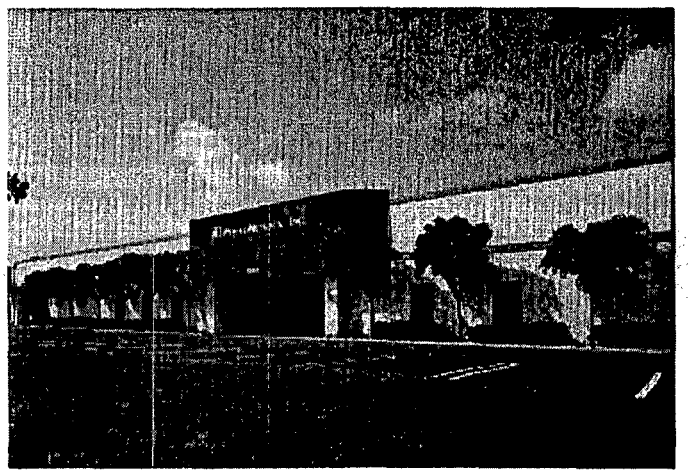
Petrographic examination is often supplemented with chemical analysis, X-ray diffraction analysis, and scanning electron microscopy. Physical tests develop data on compressive strength, volume change, air content of hardened concrete, freeze-thaw durability, and rapid chloride permeability.

RESOURCES:

- Air Void System Analysis
- Petrographic Examination
- Clinker Microscopy
- Materials Characterization
- Petrography: Concrete Under the Microscope

PhotoMetrics Information

PhotoMetrics Inc.



The Material Characterization Laboratory

Since 1970, **PhotoMetrics** has been solving production and failure analysis problems through chemical analysis and materials characterization. We are a commercial analytical laboratory located in Southern California offering state-of-the-art equipment, facilities and instrumentation, including Scanning Auger Microanalysis (SAM), Scanning Electon Microscopy (SEM), Field-Emission SEM for high resolution work, Fourier Transform Infrared Spectroscopy (FTIR), Atomic Force Microscopy (AFM) and DSC and TGA thermal analysis.

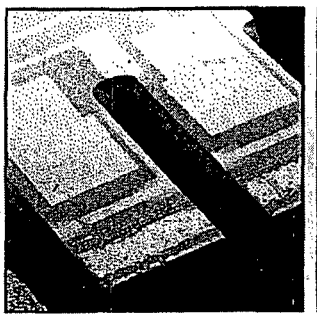
Analytical Capabilities

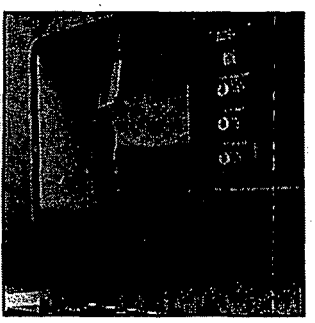
- Microelectronics Failure Analysis - Complete service for construction and failure analysis of semiconductor devices. Obtain accurate line widths, diffusion depths and film thicknesses using precision cross-sectioning and Scanning Electron Microscope imaging.
- Micro-contaminant Analysis - Identification of organic and inorganic micro-particles, liquid and solid films.
- Surface analysis techniques - for thin film characterization. Analyze the top few molecular layers of your sample with depth profiles to 2000 nm. Identify stains, surface oxidation, metal diffusion, catalyst degradation and measure film thicknesses.
- Metallurgical Analysis - Determination of the mode and cause of failure of fractured metals.
- Organic and Inorganic Chemical Analysis - Qualitative and quantitative elemental analysis of compounds as solids, liquids and gases. Polymers are identified from a few nanograms of material, elemental analyses require much less.
- Thermal Analysis
- ISO 9001:2000 Quality System.

PhotoMetrics, Inc.

SEM SCANNING ELECTRON MICROSCOPY

Scanning Electron Microscopy (SEM) provides topographical and elemental information at magnifications of 10X to 100,000X with virtually unlimited depth of field.





Principle of Operation

A finely focused electron beam scanned across the surface of the sample generates secondary electrons, backscattered electrons, and characteristic X-rays. These signals are collected by detectors to form images of the sample displayed on a cathode ray tube (CRT) screen. Features seen in the SEM image may then be immediately analyzed for elemental composition using EDS or WDS.

Secondary Electron Imaging shows the topography of surface features a few nm across. Films and stains as thin as 20 nm produce adequate-contrast images. Materials are viewed at useful magnifications up to 100,000 X without the need for extensive sample preparation and without damaging the sample. Even higher magnifications and resolution are routinely obtained by our Field Emission SEM.

Backscattered Electron Imaging shows the spatial distribution of elements or compounds within the top micron of the sample. Features as small as 10 nm are resolved and composition variations of as little as 0.2 % determined.

Data Output is generated in real time on a CRT monitor. Hard copies are photographed from a high resolution (2000 line pairs) display onto Polaroid film, with negatives available for later production of multiple copies.

Applications include:

Materials Evaluation:

- Grain size
- Surface roughness
- Porosity
- Particle size
- Material homogeneity
- Intermetallic distribution and diffusion

Failure Analysis:

- Contamination location
- Mechanical damage
- Electrostatic discharge
- Micro-crack location

Quality Control Screening:

- "Good" to "bad" sample comparison
- Material thickness determination
- Dimension verification
- Mil Std. screening

Call us for a free consultation concerning your particular application.

PhotoMetrics, Inc.

THE MATERIALS CHARACTERIZATION LAB

lab @ photometrics.net
www.photometrics.net

15801 GRAHAM STREET HUNTINGTON BEACH, CALIFORNIA 92649 714 895 4465 FAX 714 893 4682