GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station

PROJECT INITIATION

Date: 11/22/71

Project Title: Electron Microprobe and Chemical Analyses

Project No.: A-232-393

Project Director: Mr. W. R. Tooke

Sponsor: Hartline-Thomas, Inc.

Effective November 17, 1971 Estimated to run until: Open

Type Agreement: Purchase Order No. 12686 Amount: $ 800.00

Reports: As required

Contact Person: R. F. Hartline, Vice President
Hartline-Thomas, Inc.
2546 Gresham Road, S. E.
Atlanta, Georgia 30316

Assigned to Chemical Sciences & Materials Division

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A-232-593

GEORGIA INSTITUTE OF TECHNOLOGY
EXPERIMENT STATION 225 North Avenue, Northwest · Atlanta, Georgia 30332

13 December 1971

Hartline-Thomas, Inc.
2546 Gresham Road, S.E.
Atlanta, Georgia 30316

Attention: Mr. R. F. Hartline, Vice President

Subject: Technical Report, Project A 232-593
Painting Inspection and Analysis

Gentlemen:

On November 12, 1971, Mr. W. R. Tooke, Jr., of the Georgia Tech Engineering Experiment Station visited for several hours at the site of Delta Air Lines Jet Base Expansion, Atlanta Airport. The structural steel was examined throughout the job, film thicknesses were measured at numerous locations, sample film scrapings were obtained, film was tested for adhesion and integrity by knife blade scraping and probing, and color photographs were made at typical views of the steelwork. Findings from the on-site inspection were supplemented by optical microscopic examination of paint chips, and by electron microprobe analysis of chips to compare the paint used with known structural steel paints. These findings are summarized in the several categories as follows:

ON-SITE INSPECTION

I. General Appearance

The Erwin-Newman steelwork was generally characterized by a flat, faded red-brown appearance, a significant incidence of mud and dirt on the surface, with numerous areas of paint flaking (exhibiting rusted steel), and with some areas of rough texture as though the primer were applied to loose mill scale.

The Batson-Cook steelwork showed a somewhat less flat and faded appearance of the primer, negligible dirt, and less flaking and rust.

II. Physical Examination

Specific columns in the building were examined for film thickness, integrity, adhesion, and flexibility. Paint chips were removed from each site. Findings are summarized below:

Specimen	Site	Contract	Thickness (mils)	Average Prime Integrity	Adhesion	Flexibility
A	Col. R, Bay 8	E-M	-	Poor	Poor	Poor
B	Col. R, Bay 9	E-M	1.5	Poor	Poor	Poor
C	West Wall, Col. S, Bay 1	E-M	1.0	Poor	Poor	Poor
P	South Wall, Ground	B-C	-	Fair	Fair	Poor
E	South Wall, 2nd Floor	B-C	-	Fair	Fair	Poor

The condition of the Batson-Cook steel is somewhat better than the Erwin-Newman steel, but the shop priming of neither can be regarded as satisfactory for the service conditions of this job. The film thickness is generally too low, and film integrity, adhesion and flexibility are unsatisfactory.

LABORATORY FINDINGS

I. Optical Microscopy

All specimens of paint were examined under a binocular microscope at 50X power. The following general observations were made:

1. Almost all chips were mill scale flakes faced with paint.
2. Only occasional separation of paint from mill scale was observed.
3. Rust was observed on under (steel side) face of mill scale.
4. No rust immersed in paint was observable.

Specific observations applicable to specimens:

1. Rust stains under chips of Specimen C were especially copious.
2. Considerable dirt and silica particles accompanied the paint chips in Specimens A, B, and C, but not D and E.

II. Electron Microprobe Analysis

Chips of paint identified as Specimens A, B, C, D, and E were subjected to electron microprobe analysis along with well-known specification primers. The findings are summarized as follows:

1. Specimens A, B, and C contained no detectable quantities of lead, chromium, or zinc elements.

2. Specimens D and E contained a small amount of lead, and chromium at perhaps half the level of Federal Specification TT-P-57, Type I primer.

Technical details of this analysis are included in a memo report attached herewith.

CONCLUSIONS

1. The job specifications for shop priming surface preparation, paint and painting as set forth in Division 5, p. 5A-3, Section 70, are inadequate to meet the service environmental conditions of the job regardless of exposure and time elements in erection.

2. Extensive in-place surface preparation will be required before the steel can receive a satisfactory prime coat.

3. Inadequate surface preparation and priming of this erected steel would cause the owner continuing problems of rusty, discolored painted surfaces, and flaking and falling paint, mill scale, and rust.

COMMENTS ON SPECIFICATIONS

1. For the aggressive conditions of condensing moisture observed often on this steel, the specifications should have required removal of all mill scale.

2. The specifications for the shop prime paint were not sufficiently explicit to convey meaningful information as to the properties of the intended coating. The phrase, "approved zinc chromate or zinc oxide primer," is not definitive.

3. The Erwin-Newman steel shop primer was not found to contain any zinc chromate or zinc oxide, but even if it had, the prospects for successful performance over mill scale in this environment would be very poor.

RECOMMENDATIONS

In my judgment as a maintenance painting engineer, your orderly progress on this job has been suspended because of a condition caused by others, and over which you had absolutely no control. I fully support your position that you could not undertake the repair and repriming of this steel under your contract, and that to attempt to blindly fulfill your contract in the circumstances would have been grossly irresponsible. I recommend that you seek fair compensation for

all of your unanticipated costs including professional services, all of which have been incurred in the proper interests of both the general contractor and the owner.

Yours very truly,

[redacted]

W. R. Tooke, Jr.
Project Director

Approved:

[redacted]

Albert P. Sheppard, Chief
Chemical Sciences and
Materials Division

cc: Georgia Tech Research Institute

Enclosure: Memo, Paint Samples dated 12/10/71
James Johnson to W. R. Tooke

ENGINEERING
GEORGIA INSTITUTE OF TECHNOLOGY
EXPERIMENT STATION 225 North Avenue, Northwest · Atlanta, Georgia 30332

December 10, 1971

MEMORANDUM

TO: Mr. W. R. Tooke

FROM: James Johnson

SUBJECT: Paint Samples - A 232-593

Listed below are the microprobe counts from your paint samples and paint standard samples.

Paint Standard Samples

	2	3	20	21	50	51	52
Ca	134	66	106	81	181	199	136
Fe	3204	3704	30330	3703	5888	32618	4508
Cr	123	162	160	324	3584	6691	168
Zn	307	265	2877	67	2265	4095	241
Pb	4444	4924	339	68	116	274	4170
Si	376	255	1179	1736	1350	1672	2582
Al	182	207	168	161	120	136	503
Mg	74	84	96	508	320	606	598

Unknown Paint Samples

	A	B	C*	D	E
Ca	489	556	205	531	389
Fe	19616	14658	246	20012	13272
Cr	470	386	62	2111	1623
Zn	585	434	54	1471	139
Pb	206	180	60	301	186
Si	5149	6407	2608	10464	4486
Al	1845	849	121	2864	1271
Mg	748	1593	998	1068	1300

* White Sample

These results seem to bear out your idea that there might be agglomerates, voids, etc. To cause discrepancies in the data. This is the reason that the count data is presented. If time permitted, several counts could be taken at several different spots on the sample thus giving better statistics and better analysis. This can be done in the next few days if it is desired.

JWJ/ao

[redacted]