ALBERTA INFRASTRUCTURE AND TRANSPORTATION

TECHNICAL STANDARDS BRANCH

B401 – JULY 00

SPECIFICATION FOR PAINT FOR USE ON STRUCTURAL STEEL BRIDGE COMPONENTS

1.0 GENERAL

1.1 INTRODUCTION

This specification covers the supply of liquid paint for use on structural steel bridge components. The contractor who may be required, by the special provisions, to be a licensed applicator shall supply the paint. Testing of the paint shall be carried out by approved private laboratory. The costs and arrangements for testing are the responsibility of the paint supplier.

1.1.1 Need for Bridge Categories

The failure mechanisms for paint are affected by varying bridge site conditions such as humidity, temperature, presence of salt, exposure to ultraviolet radiation; rock chips and direct salt spray. Individual bridges will be classified into categories according to certain site conditions. Each proposed paint will be tested for resistance to the major failure mechanisms. The evaluation of paints for each bridge category will be based on the typical site conditions that significantly influence failure for that category of bridge. Thus, a paint may be approved in some bridge categories and not in others. The approval categories will be divided into two groups on the basis of whether the existing lead based paint is being encapsulated to reduce removal costs or is being entirely removed to a commercial blast SP6 condition. Paints may be tested in either of these broad groups or both, at the discretion of the supplier.

1.1.2 Acceptance of Test Data

Test results will only be accepted from private laboratories that are approved by Alberta Infrastructure and Transportation for this type of work. The test procedures include a cyclic durability test that is not commonly available in many testing laboratories. In addition to this special equipment, the integrity of the testing laboratory must be above reproach. AI reserves the right to reject data from non-approved testing labs. The supplier should consult with AI prior to initiating any private testing.

1.2 TYPES OF PAINT

This specification is intended to approve paints on the basis of performance and life-cycle economics, both of which are dependent on stressors that vary from one bridge to another. All paints that conform to volatile organic content (VOC) requirements, and are without hazardous chemicals, including lead, are eligible to compete in this testing against other paints for usage on various types of bridges that have different primary failure mechanisms, which will influence the decision making process for paint approval.

1.3 SUPPORTING DOCUMENTS

The following documents will be used in conjunction with Specification B401:
AT&U Procedure for Evaluating Paint Test Data

ASTM G53-88	Practice for operating light - and water-exposure apparatus (fluorescent UV-condensation type) for exposure of non-metallic materials.
ASTM D2369-90	Standard Test Method for Volatile Content of Coatings.
ASTM D3359-90	Test methods for measuring adhesion by tape test.
ASTM D523-89 (60 degrees)	Test method for specular gloss.
ASTM D2244-89	Test method for calculation of color differences from instrumentally measured color coordinates.
ASTM D3170-91	Test method for chipping resistance of coatings.
SAE J400 Jun80	Chip resistance
Envirotest Practice Draft #1(4-10-92)	Standard practice for conducting cyclic immersion/atmospheric exposure tests.
ASTM D2247-87	Practice for testing water resistance of coatings in 100% relative humidity.

ASTM D714-87	Test method for evaluating degree of blistering of paints.
ASTM D610-89	Test method for evaluating degree of rusting on painted steel surfaces.

Michigan Department of Transport Paint Application Evaluation Guidelines.

2.0 PROCEDURE FOR APPROVAL

2.1 OVERVIEW

Approval will be based on a combination of laboratory testing and field performance. The onus for obtaining approval is on the manufacturer or supplier to arrange for private testing in accordance with this specification to demonstrate the durability of his paint to various deterioration mechanisms and to demonstrate successful field application and compliance with other requirements for VOC, user friendliness, etc. During the testing process the test data belongs to the manufacturer/supplier. If, at the conclusion of testing, the manufacturer/supplier chooses to submit the data to AT&U for evaluation, the test results become the property of AI and can be published or disseminated at the discretion of AI.

2.1.1 Selection of Testing Laboratory

The approved testing laboratories are:

2.1.1.1 Powertech Labs Inc., Attn: Lab Manager
12388 - 88th Ave., Surrey, British Columbia V3W 7R7
Phone: 604/590-7500

2.1.1.2 KTA-Tator, Inc., Attn: Lab Manager
115 Technology Drive, Pittsburg, PA, USA 15275
Phone: 412/788-1300

2.1.2 Encapsulation or Replacement

The manufacturer shall instruct the laboratory on whether the paint is to be tested as an alkyd encapsulation product or as replacement paint to be applied on SP6 commercially sandblasted steel panels.

2.1.3 Field Performance

Paint application is more difficult in the field than in the laboratory. Some application problems may not be detected in this test program. Manufacturers shall submit a list of major paint jobs with names and phone numbers of applicators with field experience. Successful new paints without a record of field performance will be allowed limited approval status so as to acquire this record under somewhat controlled conditions.

2.2 MANUFACTURER'S INSTRUCTIONS TO LABORATORY

2.2.1 Description of Material from Approved Lists

The manufacturer shall provide the name of the complete paint system as well as generic descriptions and product names for all individual layers.

2.2.2 Application Instructions

The Manufacturer shall supply the testing laboratory all pertinent instructions concerning application, coverage rates, thinning, special equipment, wet film thicknesses, drying times, etc.

2.2.3 Witnessing of Sample Application

If the Manufacturer wishes to have his representative witness the test sample application, he should so notify the laboratory at the time he is arranging for the testing.

3.0 TESTING PROCEDURES

3.1 PRELIMINARY REQUIREMENTS

3.1.1 Hazardous Chemicals

The manufacturer shall supply the testing laboratory with documentation of the paint ingredients prior to testing. No lead or hazardous chemicals will be allowed.

3.1.2 Volatile Organic Content

The maximum allowable VOC shall be based on SCAQMD, Rule 1113 or CGSB, whichever is lower. At present, the maximum allowable VOC from the liquid form shall be 340 g/litre for solvent reduced, and 250 g/litre for water reduced products. Water reduced systems are excluded from this testing. The VOC content shall be measured in accordance with ASTM D2369-90 and reported by the laboratory. The Manufacturer's data on VOC content will not be considered sufficiently accurate without this independent verification. The VOC content shall be representative of the content at the spray nozzle, not necessarily the amount in the container prior to application.

3.1.3 Applied VOC Limit

VOC in the liquid form is only one way to reduce site pollution. Products that conform to the liquid limit can be applied to different dry thicknesses that yield varying amounts of pollution. An applied VOC limit of 130 g/m^2 of painted surface shall be required. This limit will be based on the sum of VOC's in all layers of a paint system. It is anticipated that the applied limit will be progressively reduced in the future. Tentatively, the limit will be 100 g/m^2 by May 1, 1997.

3.1.4 Gloss

Top coats may be glossy or non-glossy at the discretion of the paint supplier.

3.1.5 Colour

The standard colour for laboratory testing shall be blue, CGSB 1-GP-112 502-106.

3.1.6 Identification of Paints

All paint test data submissions shall include FTIR fingerprint analysis (no ID) performed on dry film. In the event that the paint system consists of several coats involving different materials, each different material shall be fingerprinted separately.

3.2 DURABILITY TESTING

Three durability tests will be used to evaluate the paint resistance to different failure mechanisms. These tests are rock chip (ASTM D3170), water resistance (ASTM D2247) and Envirotest. The rock chip and envirotest procedures shall be continued until the paint has failed. The exposure hours to create failure shall be reported. Evaluation of test data will be as per Section 4, recognizing the slightly different requirements for different bridge categories.

3.2.1 Test Panels

It is important that all paints be evaluated in uniform laboratory conditions. Test panels shall be made from Grade A569 hot rolled steel, 16 gauge. Mill Certificates shall be included in the final report.

3.2.2 Test Panel Preparation

There will be two types of test panels for the testing of either lead-based alkyd encapsulation paints or paints to be applied on commercially blasted steel surfaces. The DFT of each layer of the applied system shall be within 15% of the manufacturer's specifications in order for the test data to be accepted.

3.2.2.1 Commercially Blasted Panels

These panels shall be blast cleaned with a nickel slag abrasive or equivalent producing a profile of 1.5 to 2.0 mils.

3.2.2.2 Encapsulation Panels

The panels will be the same as commercially blasted ones except that the M-50 Alkyd System shall be applied and weathered as follows:

- 4 hours exposure to UV-B ultraviolet at 60^{o}C followed by 4 hours condensation at 40^{o}C for a total of 500 hours test in UV-CON.

3.2.3 Definition of Failure

Paint failure will be determined in accordance with the current versions of rusting (ASTM D610) and blistering (ASTM D714).

3.2.4 Rock Chip Test

The test shall be done at 23^{o}C according to the current versions of ASTM D3170 and SAE J400. Test panels shall be the same, SP6 commercially blasted surface, regardless of whether the paint is an encapsulation or replacement type. Performance shall be evaluated on the basis of surface condition at the conclusion of the test.

3.2.5 Water Resistance Test

This test shall be done according to the current version of ASTM D2247. The test shall end at paint failure or 1000 hours, whichever occurs first. Products surviving 1000 hours shall be dried and tested for adhesion according to the current version of ASTM D3359. Inspection intervals shall be 24 hours. Results shall be reported to the nearest 24 hour interval.

3.2.6 Envirotest

The test shall be done according to "Standard Practice for Conducting Cyclic Immersion/Atmospheric Exposure Tests", Envirotest Practice Draft #1 (April

10, 1992). Variable parameters shall be UV-B Light, temperature 60°C, salt concentration 4% by weight, cycling: 420° rotation every 2 hours.

3.2.7 Colour and Gloss Retention

This test shall be done by 500 hours exposure of test panels in UV-CON, using the same conditions and times as Section 3.2.2.2. The colour and gloss retention properties shall be evaluated . . . (How?) or by what ASTM Specs?

3.3 USER FRIENDLINESS TESTING

Four aspects of user friendliness will be evaluated by the laboratory in accordance with the latest version of Michigan Department of Transport Paint Application Evaluation Guidelines. These aspects are mixing, sagging, settling, and brushability/sprayability. Several other paint characteristics will be considered in the user friendliness evaluation to be done by AT&U. These includes number of coats, number of paint components mixed at site, temperature and humidity limitations, and water vs. solvent reduced paint.

4.0 EVALUATION OF DATA BY ALBERTA INFRASTRUCTURE AND TRANSPORTATION

The laboratory shall supply an official copy of test data to Alberta Infrastructure and Transportation when so instructed by the manufacturer. The data evaluation shall be done according to the latest version of the document "AI Procedure for Evaluating Paint Test Data" for various bridge categories and the two separate modes of encapsulation of existing alkyd or replacement of existing alkyd.

5.0 SUBMISSION OF TEST RESULTS TO ALBERA INFRASTRUCTURE AND TRANSPORTATION

Certified copies of test results should be submitted to:

Alberta Infrastructure and Transportation
Technical Standards Branch
2nd Floor, 4999 - 98 Avenue
Edmonton, Alberta T6B 2X3.
Attention: Clarence Wong, Bridge Materials Engineer
Telephone: (403)415-1029 FAX: (403)422-5426

Test results shall include a complete description of the applied system, all test results, mode of application (encapsulation or replacement), date of completion of testing, mill certificates of test panels, names of responsible people conducting the tests, etc.

6.0 QUALITY CONTROL

Following approval, paints may be deleted from approved status if field problems suggest poor quality control with inconsistent results from the paint. Quality control of approved paints is the responsibility of the manufacturer. AI has an interest in seeing that the manufacturer has a proper quality control program in place.

6.1 ISO 9000 Requirements

As of January 1, 1996, certification within the framework of the ISO 9000 will be a requirement for all manufacturers of paint for supply to AT&U. The manufacturer must show evidence of current certification of ISO 9002 (ANSI/ASQC Q92) or ISO 9001 (ANSI/ASQC Q91) for the manufacturing facility that will provide paint to AT&U. Other paints will remain on the approved status list as subject to other provisions in this specification.