



# Standard Guide for Assessing the Condition of Aged Coatings on Steel Surfaces<sup>1</sup>

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## 1. Scope

1.1 This guide describes general procedures for conducting a detailed assessment of the condition of aged coatings on steel structures and the extent of rust breakthrough of the coated surface. Additional assessment may be required to support coating failure analyses or other job specific needs.

1.2 This guide does not address the problem of determining the structural condition of a steel substrate. It provides procedures to determine the percent of the surface rusted, but not the severity, condition, or cause of such rusting.

NOTE 1—A more comprehensive condition assessment procedure, Practice F 1133, based upon two sets of visual standards, one for level and one for extent of deterioration, has been developed for determining the condition of coatings on ship hulls.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Referenced Documents

### 2.1 ASTM Standards:

- D 610 Test Method for Evaluating Degree of Rusting on Painted Steel Surfaces<sup>2</sup>
- D 660 Test Method for Evaluating Degree of Checking of Exterior Paints<sup>3</sup>
- D 714 Test Method for Evaluating Degree of Blistering of Paints<sup>3</sup>
- D 1186 Test Methods for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to a Ferrous Base<sup>3</sup>
- D 3359 Test Methods for Measuring Adhesion by Tape Test<sup>3</sup>
- D 4214 Test Methods for Evaluating Degree of Chalking of Exterior Paint Films<sup>3</sup>
- D 4541 Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers<sup>2</sup>

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 06.02.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 06.01.

D 5702 Practice for Field Sampling of Coating Films for Analysis of Heavy Metals<sup>2</sup>

D 6206 Practice for Sampling of Coating Films<sup>2</sup>

F 1133 Practice for Inspecting the Coating System of a Ship's Underwater Hull and Boottop During Drydocking<sup>4</sup>

2.2 *Steel Structures Painting Council Standard*:<sup>5</sup>

SSPC-PA-2 Measurement of Dry Paint Thickness with Magnetic Gages

## 3. Summary of Practice

3.1 This practice for assessing the condition of coatings consists of identifying general types of components of a structure and assessing each separately for commonly occurring modes of coating deterioration and rust breakthrough of the coating using visual standards and simple evaluation tools. A form for recording the results of the assessment procedure (Fig. 1) is provided.

## 4. Significance and Use

4.1 Assessment of the condition of aged coated surfaces strengthens decisions on when coating maintenance is required, aids in the selection of effective coating maintenance procedures, and provides a means to characterize performance of coating systems.

## 5. Procedure

5.1 Survey the structure to (1) determine the general types of unique components (for example, for fuel tanks the components may be shell, roof, ladders, and piping) and the service exposure environment for each, (2) visually identify areas having a typical level of coating deterioration and rust breakthrough for each component and (3) identify areas having a much greater visual level of deterioration than typical and unique environmental conditions that may correspond to these areas (for example, bridge expansion joints). Record a description of the components and their general environment on an inspection form and describe areas having greater deterioration, as well as any unique associated environments in the remarks column. A suggested general format for data collection is shown in Fig. 1. Modification of the form (for example,

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 01.07.

<sup>5</sup> Available from SSPC: The Society for Protective Coatings, 40 24th St., Sixth Floor, Pittsburgh, PA 15222-4643, ([www.sspc.org](http://www.sspc.org))

Condition Assessment										
Structure	Date	Inspector						Overall Environment		
Original Coating System		1st Maintenance Coating System			2nd Maintenance Coating System					
Surface Preparation		Surface Preparation				Surface Preparation				
Year Applied		Year Applied				Year Applied				
Primer		Primer				Primer				
Midcoat		Midcoat				Midcoat				
Midcoat		Midcoat				Midcoat				
Topcoat		Topcoat				Topcoat				
Structure	Description	Ratings						Measurements		
Component	Local Environment	Rust <sup>A</sup>	Under film Condition <sup>A</sup>	Peeling	Blistering	Cracking	Chalking	Thickness	Adhesion	Remarks

<sup>A</sup>Rusting corresponds to Test Methods D 610, that is, that observed upon visual inspection of the coated surface while underfilm condition corresponds to substrate condition under an intact coating as described in Section 4.

**FIG. 1 Example 1 Report Form**

adding or deleting specific items) will be required for each specific application.

5.2 Based upon the knowledge of what constitutes typical deterioration for each component as determined in the initial survey, examine the condition of the coating on a representative sample of each component. Rate the condition of the coatings using the appropriate ASTM visual standard for rust breakthrough (Test Method D 610), blistering (Test Method D 714), peeling (use Test Methods D 610 to report amount), chalking (Test Methods D 4214), and cracking/checking (Test Method D 660) of the coating film or other appropriate procedures as agreed upon between interested parties. Record the rating in the appropriate column of the report form for each component. Determine and record the type of peeling, for example, intercoat delamination. Rate the condition in enough areas to ensure that for each component the coating evaluation is representative of the condition over the entire structure. If additional areas of greater deterioration are detected during this assessment, make note of them in the remarks column.

NOTE 2—For the purpose of an initial general assessment, cracking and checking can be assessed as one type of failure, using the pictorial standards in Test Method D 660 to define type and extent.

5.3 When rusting beneath an intact coating film is suspected, remove the coating and examine the condition of the underlying substrate. Remove apparently intact coatings using chemical strippers or closely spaced parallel knife cuts. For structural steel, determine the type of previous surface preparation from the presence of millscale or profile. Identify evidence of corrosion from the presence of pits, black anodic spots or corrosion scale. Record the results of the examination on the report form.

5.4 Using one of the procedures described in Test Methods D 1186, determine the coating thickness in enough areas of each component (refer to SSPC-PA-2 for guidance) to ensure a representative measure. Record the measured thicknesses.

5.5 If a measure of coating adhesion is desired, use one of the procedures described in Test Methods D 3359 or D 4541. Determine coating adhesion in enough areas of each component to ensure a representative measure. Record the adhesion reading and the type of procedure and equipment used.

NOTE 3—The number of areas in which coating thickness and adhesion is measured will depend upon the desired precision of the measurement. More measurements would be made on structures in which precise knowledge of the thickness and adhesion of the coating is required. SSPC-PA-2 states the required number of thickness measurements as a function of coating area for conformance of thickness to a specification.

5.6 If required for a maintenance decision, identify the generic type(s) of the existing coating film component from records or by analyzing a sample of paint in the laboratory. Collect the paint sample in accordance with Practice D 6206. To the extent possible, each layer of the film should be characterized.

5.7 If required for a maintenance decision, determine the concentration of heavy metals in the coating from a field sample. Collect the paint samples in accordance with the requirements of Practice D 5702.

**6. Report**

6.1 Prepare an inspection report. Fig. 1 provides an example of the types of information to be included.

**7. Keywords**

7.1 assessment; coatings; condition; field; paint; weathered

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