NACE SP0407-2013
Item no. 21123

Standard Practice

Format, Content, and Other Guidelines for Developing a Materials Selection Diagram

Revised 2013-10-04
Approved 2007-06-22
NACE International
1440 South Creek Drive
Houston, Texas 77084-4906
+1 281-228-6200

ISBN 1-57590-212-5

Foreword

This standard practice provides format, content, and other guidelines for developing a materials selection diagram (MSD). An MSD documents the materials selection of new equipment and piping for the refinery, process chemical, power, and other industries.

This standard is intended for use by the owner/operators, licensors, and the contractor/fabricators of petroleum refineries, process chemical plants, power plants, and other industrial processing plants as a reference guide for developing an MSD to identify the materials of construction and the process conditions and other key technical issues that influence the selection of materials for use during the development and construction phases of projects.

This standard was originally prepared in 2007 and revised in 2013 by Task Group (TG) 302, "Refining and Chemicals Material Selection Diagrams: Standard." TG 302 is administered by Specific Technology Group (STG) 34, "Petroleum Refining and Gas Processing," and is sponsored by STG 36, "Process Industry: Materials Performance in Chemicals." This standard is issued by NACE under the auspices of STG 34.

In NACE standards, the terms *shall, must*, *should,* and *may* are used in accordance with the definitions of these terms in the *NACE Publications Style Manual.* The terms *shall* and *must* are used to state a requirement, and are considered mandatory. The term *should* is used to state something good and is recommended, but is not considered mandatory. The term *may* is used to state something considered optional.

Standard Practice

Format, Content, and Other Guidelines for Developing a Materials Selection Diagram

Contents

Section 1: General

1.1 An MSD summarizes material requirements for process equipment and piping in the refining, chemical processing, power, and other industries, and provides information needed for the development of piping and instrumentation diagrams (P&IDs), piping material specifications, and equipment mechanical data sheets. In its simplest form, a typical MSD consists of a marked-up or overlaid version of a simplified process flow diagram (PFD) that shows relevant operating conditions and process data, materials selection information, and application(s) of other material degradation preventive measures.

1.2 The scope of this standard is to provide format, content, and other guidelines for developing an MSD. The minimum and optional information to be included on the MSD are defined. Each user of this standard can decide whether and when the optional information shall be shown. Guidance is also provided on key issues that arise when materials are selected.

1.3 This standard does not define how to evaluate specific corrosion and materials degradation mechanisms or how to select materials for specific processes.

1.4 Sample MSDs are included in Appendix A (nonmandatory) of this standard to show format and content examples.

1.5 The intended use of MSDs is primarily associated with new capital projects, retrofit projects, and expansion projects (especially in cases in which process conditions may have changed). Because information stated on the MSD may change during project execution (because of optimizations, issues during fabrication, etc.), the MSD may become out of date. Some projects use the MSDs throughout the project, updating it as changes occur and making it "as-built," while other projects use the MSDs only in the initial project stages. This standard covers primarily the initial MSD preparation.

1.6 The format and content of the initial MSD, its use, and its update philosophy should be agreed on by the owner/operator and the contractor/fabricator/licensor in the initial phases of the project, and meet any local regulatory requirements.

1.7 The person specifying materials of construction must be familiar with corrosion and materials degradation mechanisms particular to the type of unit being designed.

1.8 Suitable tools (e.g., NACE standards, API[(1)] standards including API RP 571,[1] public domain isocorrosion diagrams, company proprietary corrosion data, company standards, prior operating experience, etc.) shall be used as necessary in selecting materials.

Section 2: Equipment and Materials Information to Be Shown on MSD

2.1 Equipment and Piping Component Information to Be Shown on the MSD:

2.1.1 Materials of construction (minimum alloy requirement) for the equipment and piping components shown in Table 1. Equipment should be identified by name or tag number. A materials legend should be used as described in paragraph 2.2.

Table 1
Information to Be Shown on MSD

Type Of Equipment Or Piping	Components (As Applicable)	Mandatory/Optional (M/O)
Heat Exchanger (Shell and Tube)	Shell	M
	Channels	M
	Baffles/Cages	O
	Tubes	M
	Tubesheets	M
	Type of tube-to-tubesheet joint	O
Heat Exchanger (Plate and Frame)	Plates	M
	Frame	O
	Gaskets	O
Air Cooler	Headers	M
	Tubes	M

(1) American Petroleum Institute (API), 1220 L St. NW, Washington, DC 20005-4070.