

Corrosion Control Document Systems

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Corrosion Control Document Systems

1 Scope

This recommended practice (RP) provides users with the basic elements for developing, implementing, and maintaining a Corrosion Control Document (CCD) for refining, and at the owner's discretion, may be applied at petrochemical and chemical process facilities.

A CCD is a document or other repository or system that contains all the necessary information required to understand materials damage susceptibility issues in a specific type of operating process unit at a plant site. CCDs are a valuable addition to an effective Mechanical Integrity Program. They help to identify the damage mechanism susceptibilities of pressure-containing piping and equipment, factors that influence damage mechanism susceptibilities, and recommended actions to mitigate the risk of loss of containment or unplanned outages.

This RP serves as the basis for CCD development, implementation, and maintenance to maintain consistency and to integrate the CCD work process with other plant integrity programs, such as Management of Change (MOC), Process Hazards Analysis (PHA), and Reliability Centered Maintenance (RCM). Some of these programs have significant overlap with the development of CCDs, including Risk-based Inspection studies (see API Recommended Practice 580 and API Recommended Practice 581), Integrity Operating Windows (see API Recommended Practice 584), in-house unit corrosion reviews, circuitization/systemization programs, and similar types of corrosion studies. Development of CCDs can serve as a useful starting point for establishing these programs if they have not been undertaken.

This document provides the owner-operator with information and guidance on the work processes for development and implementation of CCDs for the owner-operator process units. While some generic examples are provided in the text and in [5.9](#), this document does not contain a complete list of unit-specific CCDs or operating plant variables for the numerous types of hydrocarbon processing units in the industry.

The rigor of review, the level of documentation, and even the need to develop a CCD will depend on the complexity of the process unit under consideration and the inherent risk associated with the process. It is the responsibility of the facility owner-operator to determine the level of detail contained within their CCD.

The scope of this standard includes:

- descriptions of CCDs and definitions of related terminology;
- creating, establishing, and maintaining CCDs;
- data and information typically needed to create CCDs;
- descriptions of the various types of CCDs needed for process units;
- documenting and implementing CCDs;
- reviewing, changing, and updating CCDs;
- integrating CCDs with other risk management practices;
- roles and responsibilities in the CCD work process; and
- knowledge transfer to all stakeholders.

Typical CCDs cover the pressure-containing components of fixed equipment. The types of equipment and associated components typically covered by CCDs are:

- pressure vessels,
- process piping,
- storage tanks atmospheric and pressurized,
- process heaters pressurized components, and
- heat exchangers.

The following equipment is not typically covered by CCDs, but may be at the user's option:

- instrument and control systems,
- pressure relief devices,
- pressure vessel internals,
- machinery components,
- pump casings and valve bodies,
- stacks/flues,
- electrical systems, and
- structural systems.

However, these systems and components may be covered by other types of Risk-based Inspection (RBI) or risk assessment work processes, such as RCM.

This RP outlines the essential elements in defining, monitoring, and maintaining CCDs as a vital component of corrosion management (damage mechanism control strategies) and inspection planning, including RBI.

This RP does not address process operating windows established for normal process control, for the purposes of maintaining product quality, or for other operating factors unrelated to control for the purpose of maintaining equipment integrity and reliability. However, the contents of a comprehensive, good quality CCD can be the basis for establishing Integrity Operating Windows (IOWs) in accordance with API Recommended Practice 584.

This RP is a guideline document for organizing Corrosion Control Documents. The owner-operator of this RP may also develop internal documents that detail how their company will create and implement the processes suggested herein. [Section 5](#) contains key points for establishing a site procedure that documents the CCD work process.

NOTE Even though CCDs are labeled “Documents” for the purposes of this RP, it is recognized that much of the suggested content of a CCD may, in fact, reside in separate repository systems. These separate repository systems are considered suitable alternatives to creating a separate or standalone CCD. It is not the intention of this RP to require operators to create a new document, but instead to have the components discussed in this document available for use in a work process covering integrity management.

2 Normative References

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any addenda) applies.

API Recommended Practice 571, *Damage Mechanisms Affecting Fixed Equipment in the Refining Industry*

API Recommended Practice 584, *Integrity Operating Windows*

3 Terms, Definitions, Acronyms, and Abbreviations

3.1 Terms and Definitions

For the purposes of this document, the following terms, definitions, and acronyms apply.

3.1.1

alarm

Primary method of communication for IOW Critical limit and some higher level IOW Standard limit exceedances. Typically, an audible sound (e.g. horn, buzzer, beep) along with a visual signal (e.g. flashing light) in the control room, that alerts operators to a potential deviation in a process condition that needs immediate attention.

3.1.2

circuit

A subsection of a system (see 3.1.4 for definition of “CCD system”) that includes piping, equipment and components that are exposed to a process environment of similar corrosivity and expected damage mechanisms and is of similar design conditions and construction material where by the expected type and rate of damage can reasonably be expected to be the same.

NOTE 1 Complex process units or piping systems may be divided into piping circuits to manage the necessary inspections, data analysis, and record keeping.

NOTE 2 When establishing the boundary of a piping circuit, it may be sized to provide a practical package for record keeping and performing field inspection.

3.1.3

corrosion control document (CCD)

A document or other repository or system that contains the necessary information to understand materials damage susceptibility issues in a specific type of operating process unit at a plant site. Generic CCDs can also be developed that provide generic guidance upon which to build a unit-specific CCD, but generic CCDs are not as useful as unit-specific CCDs that are based on actual hardware configurations, actual process conditions and actual materials of construction.

3.1.4

CCD system (systemization)

An assembly of interconnected piping and equipment that typically are subject to the same (or nearly the same) process fluid composition or operating conditions, or both. The term corrosion loop is also used by some owner-operators to describe a CCD system.

3.1.5

corrosion materials diagram (CMD)

A modified process flow diagram (PFD) or database list containing relevant equipment and piping damage mechanisms, operating conditions, materials of construction, systems/circuits, and other information that the CCD Team determines to be useful for each portion of a process unit, as well as the usual PFD information.

3.1.6

integrity operating window (IOW)

Established limits for process variables (parameters) that can affect the integrity of the equipment if the process operation deviates from the established limits for a predetermined amount of time (includes Critical, Standard and Informational IOWs). Guidance on setting IOWs is given in API Recommended Practice 584.

3.1.7

IOW critical limit

An established IOW level which, if exceeded, could cause rapid deterioration such that the operator should take immediate predetermined actions to return the process variable to the acceptable IOW range to prevent significant

defined risks of potential equipment damage or hazardous fluid release could occur in a short timeframe. Other terminology has been used in place of Critical Limit, such as Safe Operating Limit, Key Operating Limit, Standard Reliability Limit, or Reliability Operating Limit.

3.1.8

IOW standard limit

An established IOW level, defined as one that if exceeded over a specified period of time, could cause increased damage rates, or introduce new damage mechanisms beyond those anticipated. Since the timing of the impact from an exceedance of a Standard IOW Limit can vary significantly, the notification and response to an exceedance can vary. For higher risk exceedances, alarms or alerts are potentially needed and the operator can have some predetermined actions to take. For lower risk exceedances, alerts are only needed for eventual interaction with operating supervisors or appropriate other technical personnel (SMEs).

NOTE Other terminology for standard limits includes Key Operating Limit, Standard Reliability Limit or Reliability Operating Limit.

3.1.9

IOW information limit (IIL)

An established limit or standard operating range for other integrity parameters that are used primarily by SMEs (e.g. process engineer, inspector, corrosion specialist) to predict or control the long-term integrity/reliability of the equipment. These "Informational" IOWs are typically only tracked by the appropriate SMEs and can have alarms or alerts associated with their exceedances. In some cases, the Informational IOWs are used for parameters that cannot be directly (or indirectly) controlled by operators, whose primary duty would be to make sure any exceedances are communicated to the designated SME for attention and corrective action, if necessary.

NOTE Other terminology can be used in place of an Informational Limit, such as Corrosion Control Limit or Reliability Limit.

3.1.10

management of change (MOC)

A documented management system for review and approval of changes in process, equipment or piping systems prior to implementation of the change.

3.1.11

mechanical integrity (MI)

The management systems, work practices, methods and procedures established to protect and preserve the integrity of operating equipment, i.e. avoid loss of containment due to the effect of equipment damage mechanisms.

3.1.12

notification

A message to an operator/SME that an IOW exceedance has occurred which does not necessarily have an alarm associated with it but needs a specific action and response from an operator or SME.

3.1.13

OEMI

Operations, Engineering, Maintenance, Inspection, an acronym sometimes used to describe the makeup of a team formed to address tasks that are best handled through a multidisciplinary approach.

3.1.14

piping and instrumentation diagram (P&ID)

A diagram identifying the piping and instrumentation associated with a piece (or pieces) of equipment in a process.

3.1.15**positive materials identification (PMI) testing**

Any physical evaluation or test of a material, including welds, to confirm that the material, which has been, or will be, placed into service, is consistent with the selected or specified alloy material designated by the owner-operator. These evaluations or tests provide either qualitative or quantitative information that is sufficient to verify the nominal alloy composition. See also API Recommended Practice 578.

3.1.16**process flow diagram (PFD)**

A simplified diagram of a process unit showing the main pieces of equipment and piping, with limited details of process design and operating parameters.

3.1.17**process hazards analysis (PHA)**

A work process to assess and document the hazards and risks associated with operating a process unit and to make recommendations on what actions are necessary to mitigate unacceptable risks.

3.1.18**process variables**

Parameters of the process fluids (chemical and physical) that need to be controlled.

3.1.19**process safety management (PSM)**

The implementation of the work practices, procedures, management systems, training, and process safety information necessary to prevent the release of hazardous substances from process equipment.

3.1.20**pressure equipment**

Stationary or fixed equipment for containing process fluids under pressure, not including rotating equipment. Pressure equipment includes, but is not limited to, such items as piping, vessels, heat exchangers, reactors, tanks, pressure relief devices, columns, towers, heater tubes and filters.

3.1.21**risk-based inspection (RBI)**

A risk assessment and management process that is focused on loss of containment of pressurized equipment in processing facilities due to material deterioration. These risks are managed primarily through equipment inspection.

3.1.22**subject-matter expert (SME)**

One who has in-depth knowledge and experience on a specific subject as it relates to CCDs. Various types of SMEs are necessary to establish CCDs for each process unit, e.g. corrosion/materials SME, process SME, operations SME, equipment type SME, and inspection SME.

3.1.23**stakeholder**

Any individual, group, or organization that affect, be affected by, or perceive itself to be affected by the corrosion issues documented in a CCD, e.g. operations, process engineering, engineering services, maintenance, and inspection.

3.1.24**work process**

A series of activities or steps aimed at achieving a set objective, with inputs and outputs, e.g. the CCD work process to create and implement CCDs.

3.2 Acronyms and Abbreviations

The following acronyms and abbreviations are not found in the terms and definitions but are used in the document.

CUI	Corrosion Under Insulation
DCS	Distributed Control System
HSAS	Heat Stable Amine Salts
HTHA	High Temperature Hydrogen Attack
IDMS	Inspection Data Management System
MAT	Minimum Allowable Temperature
MDMT	Minimum Design Metal Temperature
NDE	Non-destructive Examination
PRV	Pressure Relief Valve
PTCV	Process Chemical Treatment Vendor
TAN	Total Acid Number

4 Introduction to Corrosion Control Documents/Systems

4.1 Characteristics

The outcome of a CCD work process is a living repository with the following characteristics:

- a damage control source document or repository or system, available to all stakeholders who have some responsibility for process/asset integrity management;
- a document or repository of information which contains or provides links to key process information, unit specific damage mechanisms, materials used to construct the piping and equipment, inspection history overview, lessons learned, and records of relevant process change/creep; and
- a document or repository of information that serves as the basis for aiding the development of inspection plans, corrosion-related IOWs, RBI strategies, and maintenance planning.

4.2 Key Components of a CCD

The key components of a CCD system could include the following items.

- A description of the purpose and operation of the process unit, including when the unit was constructed and details of subsequent major revamp or expansion projects.
- The actual operating conditions (temperature, pressure, and other operating parameters) of the relevant components in the unit that can affect or promote damage mechanisms.
- Process stream compositions for the components in the unit.
- Equipment and circuits included in the unit with materials of construction.
- Process flow diagram (PFD) or CMD.
- An explanation of how each damage mechanism is prevented, detected, controlled, monitored, or otherwise managed, including documentation of the types of inspections or other monitoring methods used and a description of where inspection or other monitoring records, or both, are kept.

- A list of injection and mix points to be monitored; a listing of deadlegs that require specific monitoring (beyond the normal pipe inspection program; a listing of alloy spec breaks and bimetallic welds that require specific monitoring.
- A list and description of any key operating concerns such as history of excursions, start-up, shutdown, or other auxiliary processes (steam-out, hydrogen stripping), or a combination thereof, that can affect or promote damage mechanisms.
- A list and description of any specific maintenance concerns such as soda ash washing or other layup/outage procedures, special welding precautions, special equipment handling requirements, e.g. to prevent brittle fracture.
- A list and description of significant failures, repairs or replacements, or a combination thereof, that were a consequence of damage mechanisms.
- A list and description of any key company or industry lessons learned regarding damage mechanisms associated with the unit.
- A list and description of recommended actions developed as a result of the review process.
- A list of IOW limits developed to monitor key process parameters that affect damage and the recommended actions required if limits are exceeded.

4.3 Target Audience

The primary audience for API Recommended Practice 970 is engineering and inspection personnel who have a major role in maintaining the mechanical integrity of equipment covered by this RP. However, while an organization's Corrosion/Materials Engineering group can champion the CCD program, the creation and use of CCDs is not exclusively a Corrosion/Materials Engineering group activity. A CCD program developed in accordance with this RP needs the involvement of various segments of the organization, such as Inspection, Process Engineering, Maintenance and Operations.

The implementation of the resulting CCD product (e.g. plant-wide use as a reference for process descriptions, corrosion/damage mechanisms, IOWs, project planning, and MOC) often rests with more than one segment of the organization. CCDs need the commitment and cooperation of the total plant operating organization. In this context, while the primary users are corrosion/materials engineering and inspection personnel, other stakeholders who are likely to be involved in the CCD development, maintenance and implementation process should be familiar with the concepts and benefits offered by CCDs.

4.4 Inspection Program

Historically, inspection plans in most process plants have been based upon the prior recorded/known history of equipment condition and the requirements of API 510, API 570, and API 653. A fundamental understanding of the process/operating conditions and resulting damage mechanisms is needed to establish and maintain an inspection program that yields the highest probability of detecting potential damage.

Inspection plans should be dynamic and account for changing process conditions and current equipment condition. A fundamental step is the timely alignment with a developed knowledge base of the materials of construction with the operation of the equipment, its inspection history, relevant damage mechanisms, measured corrosion/erosion rates and known industry incidents. It is vital to identify and track process information that validates or suggests changes to existing inspection plans. Changing process conditions should be communicated to the Corrosion/Materials/ Inspection group for inspection plans to be adjusted, when necessary, to account for those changes. For more information on inspection planning, refer to Section 5 of API 510 and API 570.

Establishing and using information collected during the CCD creation process will help improve and sustain a properly structured inspection program. A detailed CCD can become part of the front-end data input to the RBI process.

Inadequately controlled processes/operations can result in unanticipated damage that inspection programs are generally not designed to find. Under past practices, inspection programs generally assumed that the next inspection interval (calculated based on prior damage rates from past operating experience) should be scheduled on the basis of what is already known and predictable about equipment damage from previous inspections.

Without effective process control based on an accurate and complete list of IOWs, inspections may need to be scheduled on a less than optimum time-based interval just to look for damage occurring from lack of adequate process control. API Recommended Practice 584 should be used in conjunction with this document when creating and implementing IOWs. The work processes are very similar.

4.5 Process Unit Integrity

For purposes of this document, maintaining the integrity of the process unit means avoiding loss of containment, and reliability means avoiding malfunctions of the pressure equipment that might impact the process unit performance (meeting its intended function for a specified time-frame). In that sense, integrity is a part of the larger issue of pressure equipment reliability, since most breaches of containment will impact reliability.

Pressure equipment is generally fabricated from the most cost effective materials of construction to meet specific design criteria for the equipment's intended life based on the intended operation and process conditions. The operating process conditions are then controlled within limits (IOWs) to avoid unacceptable construction material damage and enable damage control, monitoring, and inspection activities to safely predict if and when repairs or replacements will be needed.

5 CCD Work Process

5.1 General

In this section, a general work process is outlined for establishing, implementing, and maintaining CCDs. An example of a more detailed CCD implementation checklist and work flow process appears in [Annex A](#).

The CCD work process can be applied to an overall process unit, multiple equipment items in a group (system), or to a single equipment item. The work process can be standalone or part of an integrated mechanical integrity management work process. The outline in this section and content of [Annex A](#) are intended to be examples for implementing a CCD system. Other work process, (e.g. asset strategy process), containing the same elements, are equally effective at meeting the intent of this RP.

For examples that closely follow the flow outlined in this section, see [Annex E](#).

A site or corporate procedure should document the CCD work process or how the elements of a CCD fit into a mechanical integrity management program work process. It typically contains statements addressing the following elements:

- the details of the basis/assumptions concerning CCD Work Process;
- the CCD implementation by a multidisciplinary team of SMEs (the CCD Team);
- the roles, responsibilities, and qualifications for the team members;
- how data and information is reviewed for accuracy;
- how the design and operating parameters are analyzed (e.g. as ranges of operation or discrete values);
- how the unit will be divided into systems;
- what information should be compiled for a system;

- how the damage mechanisms will be determined;
- what is the premised run time;
- the details on how the CCDs are to be implemented;
- the details on how the CCDs will be documented and updated;
- how CCDs will be integrated with existing PSM and operational programs;
- how an existing RBI program interfaces with CCDs;
- the details on how CCDs can be used as a basis for establishing IOWs; and
- the method of deployment, distribution, and training on the CCD for each process unit.

A generic flowchart for an overall work process is depicted in [Figure 1](#). Different companies can assign different roles to different personnel and choose to progress through the stages of the work process in an order that differs from this chart. The CCD work process can be stand-alone or part of an integrated mechanical integrity management work process.

NOTE An example of a more detailed work process/responsibilities flowchart is included in [Annex A](#).

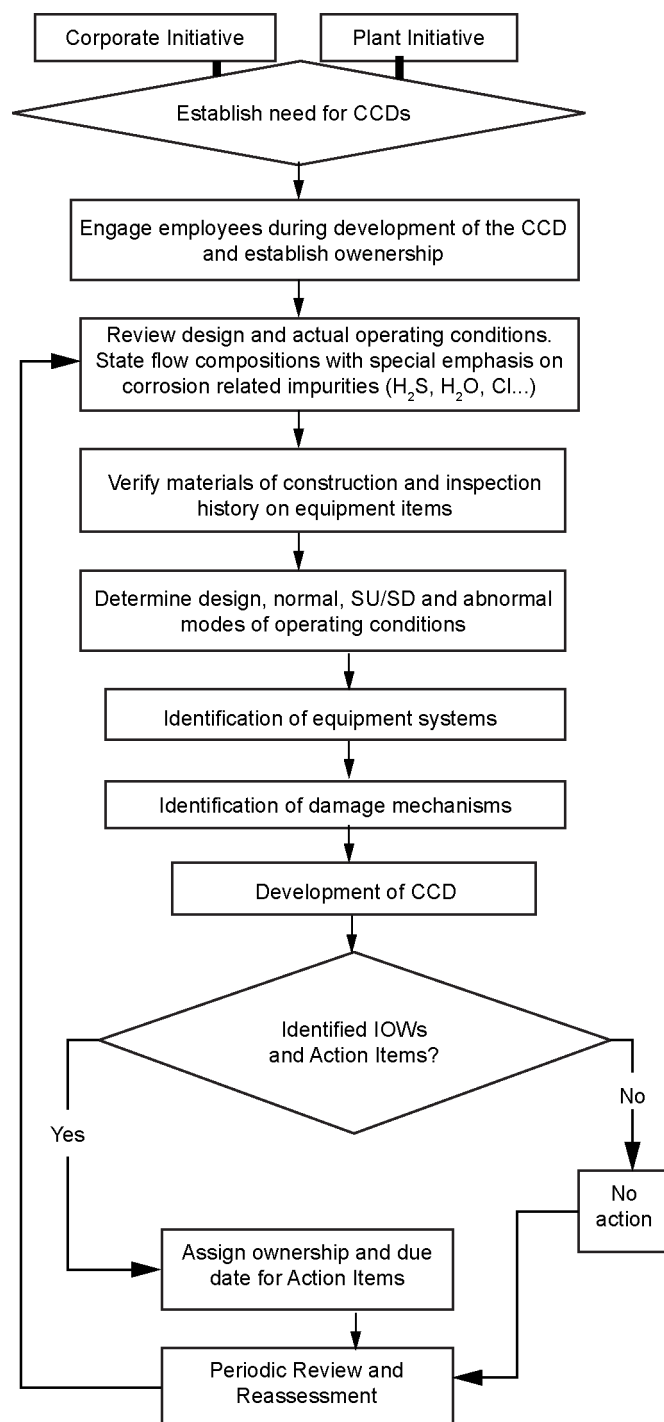


Figure 1—Work Process Map—CCD Development, Review, and Update

5.2 Basis and Assumptions Concerning the CCD Work Process

The first step in the work process is defining the basis. The basis for the CCD work process can change and have a significant impact on the damage mechanism development and assessment. Some of the possible changes could be as follows:

- discovery of materials of construction that are different from those stated on U-1 forms or P&IDs,
- revisions in safety and environmental laws and regulations,

- c) change in feed amount or composition,
- d) changes in operating conditions,
- e) change in unit operating lengths between maintenance turnarounds, and
- f) changes in inspection codes/standards.

5.3 CCD Team Members

To develop the necessary information and identify potential damage mechanisms and failure scenarios along with consideration for future operating conditions and business objectives, the combined efforts of a multi-disciplinary team are required and SMEs consulted as needed.

The quality of the CCD development process, and therefore the quality of the resultant CCD output, is highly dependent upon an interactive, collaborative effort between qualified, experienced, and knowledgeable team members. Typically, this team will consist of:

- site corrosion/materials specialist;
- unit process engineer/technologist;
- unit inspector;
- experienced unit operations representative(s);
- facilitator knowledgeable in the CCD work process;
- unit-fixed equipment engineer (as needed, ad hoc);
- laboratory personnel (as needed, ad hoc);
- specialists for Licensed Technology (as needed, ad hoc);
- control systems specialist (as needed, ad hoc); and
- process chemical treatment vendor (as needed, ad hoc).

External Subject Matter Experts (SMEs) should be included on the team if the site does not have sufficiently experienced personnel. Some individuals can fulfill multiple roles based on the list referenced in [5.3](#).

The CCD development process needs significant participation by a corrosion/materials specialist (or corrosion SME). In addition, the CCD support team needs team members that are fully committed to the CCD development and implementation project. Without that commitment to participate in team meetings and follow-up action items, the quality of the CCD work process and final product will suffer.

[Table 1](#) presents documentation categories that are needed to adequately develop a CCD.

Table 1—CCD Documentation Responsibilities

Documentation	Typical Responsible Person
Management of changes	PHA Coordinator or MOC Coordinator
Capital projects	Project/Process Manager or Fixed Equipment Inspector, or Both
Inspection records and history	Fixed Equipment Inspector
CCD and revision logs ^a	Corrosion/Materials Specialist or Fixed Equipment Inspector
Redlined CMD and revision logs ^a	Corrosion/Materials Specialist or Fixed Equipment Inspector
Outstanding CCD action items ^a	Corrosion/Materials Specialist or Fixed Equipment Inspector
Outstanding PHA action items	PHA Coordinator or MOC Coordinator
^a If a previous CCD or CMD, or both, have been generated.	

5.4 Roles, Responsibilities, and Accountabilities for the CCD Work Process

Numerous personnel at the plant site have roles and responsibilities for CCD creation, implementation, and maintenance. Plant Management support is needed for this effort to be successful. Management should specify the individuals accountable for the development and ownership of the CCDs and ensure the process is embedded into the site's work processes. The CCD work effort needs to be adequately staffed with knowledgeable, experienced SMEs and needs to be completed and implemented in a timely manner. Management should also ensure that all necessary training on CCDs is conducted.

Corrosion/Materials Specialists have a role to identify damage mechanisms for the CCD team. A corrosion/materials specialist is typically responsible to supply/develop the CMDs (where they are available and the site decides to include them as part of the CCD) and estimated damage/corrosion rates (when appropriate or where measured rates for the current operating conditions are not available or not credible, or a combination thereof). They also have a role in understanding the impact of IOW exceedances and advising inspection personnel on how inspection activities may need to be revised to account for the exceedance, if any, as well as advising process engineers on process issues that may need to be considered to avoid long-term materials damage issues. This person will also be involved with systemization/circuitization. A corrosion/materials specialist will typically have the role and responsibility of facilitating the CCD team, as well as documenting and distributing the results of the CCD work process. The corrosion/materials specialist can also have a role in providing operator training on CCDs.

The Unit Process Engineer provides process design, actual operating conditions (this includes current, past, and future operating data if changes are planned), and engineering data to the CCD team. The unit process engineers are typically responsible for ensuring that the operating and processing aspects of the CCD for their unit are properly implemented in the manner specified in the CCD documentation.

Inspection Personnel provide historical inspection and maintenance information, as well as information on equipment failures and experience in the service. The information is used by the CCD team to create and update CCDs. The CCD is also used to adjust inspection activities for a variety of reasons, including when new information is received, when unexpected results are obtained, and when IOW exceedances are reported. Inspection personnel can also serve as NDE SMEs for the CCD process, bringing knowledge of the use and applicability of various NDE methods used to detect types of damage typically experienced in refineries and petrochemical plants. Inspectors should also bring the results of inspections conducted for ongoing special emphasis inspection programs that often provide significant information about damage mechanisms in the process unit.

The Operations Representative is responsible for providing operational data and information about current and past operating practices to the CCD team. He or she will also have information about the frequency of upset or abnormal conditions. He or she will also have a good knowledge of how actual unit operating practices are

from the design operating practices. Additionally, the Operations Representative will provide input on start-up and shutdown procedures that can affect damage mechanisms (e.g. soda ash washing, reactor hot hydrogen stripping, wet catalyst dumping).

The CCD Team Facilitator is often an experienced corrosion/materials or mechanical integrity specialist, either from the plant, a central office, or a third party. It is the responsibility of the team facilitator to organize and lead multidisciplinary team discussions. One of the facilitator's roles should be to elicit information about what is actually happening in the field relative to what is in the documented records or what is "thought to be happening" by those who are not operators. A skilled facilitator will ask the right probing questions in order that the team fully understand issues that impact the CCD work process. It is the responsibility of the team facilitator to document the discussions during the CCD review process and to finalize the necessary revisions and maintain documentation concerning the identified updates of the CCD and CMD in the site's document management system.

The Process Chemical Treatment Vendor (PCTV), in many plants, has a role in tracking and interpreting process chemical treating variables and making recommendations that affect unit corrosion and IOWs. The PCTV can also have a role in operator training for controlling these variables. In these cases, the PCTV becomes a technical resource for the Unit Process Engineer or the Corrosion/Materials Engineer and can be an ad hoc member of the CCD team.

Laboratory Personnel implement, record and report sample analyses used for both corrosion and IOW monitoring in a timely manner, per the CCD documentation requirements.

Control Systems Personnel have a role in designing, purchasing, installing, and maintaining any control and monitoring systems for IOWs recommended per the CCDs.

Fixed Equipment Engineers share responsibility with corrosion/materials engineers and inspectors in identifying previous equipment failures and repair experiences and are responsible for carrying out fitness-for-service or managing fitness-for-service evaluations, as required.

5.5 Data Needed for the Team Meetings

5.5.1 Data Needed Prior to the Team Meetings

Considerable information is needed by the team to construct each unit-specific set of CCDs. To facilitate the effectiveness and efficiency of the CCD work process, this information is often collected/developed, reviewed for accuracy, and provided to the CCD team prior to the meeting to the extent possible. This information typically includes the latest revision of:

- system/circuit boundaries;
- process summaries and reactive chemistry descriptions;
- process flow diagrams to systematically review the process during CCD team meetings;
- P&IDs that show sample points, instruments, and analyzers (that can be used to monitor IOWs);
- drawings that identify injection points, mix points, deadlegs, material spec breaks, heat tracing, insulated locations and other piping or equipment details that affect the inspection program;
- existing integrity operating windows that are already be in effect;
- identification of start-up lines, temporary use lines and normally-closed valves;
- relevant operating and maintenance procedures;
- process chemical treatment programs;