National Manual of Assets and Facilities Management

Volume 3, Chapter 4

Condition Assessment – Analysis and Reports (CAA & CAR)

Document No. EOM-ZC0-PR-000010 Rev 001

Document Submittal History:

Revision:	Date:	Reason For Issue
000	28/03/2020	For Use
001	18/08/2021	For Use

THIS NOTICE MUST ACCOMPANY EVERY COPY OF THIS DOCUMENT

IMPORTANT NOTICE

This document, ("Document") is the exclusive property of Government Expenditure & Projects Efficiency Authority.

This Document should be read in its entirety including the terms of this Important Notice. The government entities may disclose this Document or extracts of this Document to their respective consultants and/or contractors, provided that such disclosure includes this Important Notice.

Any use or reliance on this Document, or extracts thereof, by any party, including government entities and their respective consultants and/or contractors, is at that third party's sole risk and responsibility. Government Expenditure and Projects Efficiency Authority, to the maximum extent permitted by law, disclaim all liability (including for losses or damages of whatsoever nature claimed on whatsoever basis including negligence or otherwise) to any third party howsoever arising with respect to or in connection with the use of this Document including any liability caused by negligent acts or omissions.

This Document and its contents are valid only for the conditions reported in it and as of the date of this Document.

Table of Contents

1.0 PURPOSE

The purpose of the last phase of the Condition Assessment (CA) process, is to produce:

- A well-informed Condition Assessment Analysis (CAA).
- A meaningful and succinct Condition Assessment Report (CAR).
- A basis to inform and direct credible Asset Management decisions relating to asset lifecycle plans.
- A conclusion on the CA procedure, with the aim of potentially supporting repeated cycles of the specific CA, and target assets.

2.0 SCOPE

This procedure takes the output from the CAS in the form of a package of data and information, and analyzes that data and information to produce evaluated data and meaningful reports, for accountable Asset Managers to compile cyclic, strategic decisions for the future.

The data and information are evaluated and measured against standard asset classification parameters, to ensure commonality is achieved. The CA procedure is normally a repeated exercise, cyclic in nature therefore the results must include recommendations with this in mind.

3.0 DEFINITIONS

Term	Definition
Asset	An asset is an item, thing, or entity that has potential or actual value to an organization. The value will vary between different organizations and their stakeholders, and can be tangible or intangible, financial, or non-financial.
Asset Classification	Asset Classification is a term used to refer to a group of assets having a similar nature or function and which, for purposes of disclosure, are shown as a single item.
Asset Condition Register	A list of assets that are held within an Entity, and their respective current condition.
Asset Lifecycle	The phases an asset transitions through, from inception to disposal.
Asset Management	The coordinated activity of an organization to realize the full potential of any asset.
Asset Management System	Any set of interrelated or interacting elements a Company or Entity employs, to keep track of its equipment and inventory, that is vital to the continued operation of its business.
Asset Management Software (AMS)	A software-based, asset management tool or solution, used to record and track an asset throughout its life cycle, from procurement to disposal.
Asset Register (AR)	A list of all assets, often computerized, that contains pertinent details about each asset to track the value, physical location, operating cost, condition, utilization, and all other details, necessary to better manage the asset.
Condition Assessment (CA)	The process of periodic physical inspections, assessments, measurements, and interpretation of the resultant data to indicate the condition of a specific asset.
Forward Maintenance Register	A projection of work/maintenance required, specifically for assets held within the Entity. Also referred to as the Maintenance Plan.
Industry Best Practice	In relation to any undertaking and any circumstances, the exercise of that degree of skill, diligence, prudence and foresight, which would reasonably and ordinarily be expected from a skilled and experienced operator engaged in the same type of undertaking, under the same or similar circumstances.

Term	Definition
International Standards Organization (ISO)	The international, standard-setting body composed of representatives from various national standards organizations.
Lifecycle	The cycle of activities that an asset (or facility) goes through, while it remains an identity as a particular asset, i.e. from planning and design, to decommissioning or disposal
Linear Asset	Linear Assets often connect with each other, defined by the length (or area), and are often part of a network, such as rail lines for trains, water pipes for water and roadways for cars
Non-Linear Asset	Non-Linear Assets occupy a specific space and can be tracked by their location (Buildings, Offices, Plant and Equipment).
Operating context	The environment within which a physical asset or system is expected to operate.
Quality Management	Quality management is the act of overseeing all activities and tasks needed to maintain a desired level of excellence.
Risk Appetite	It is the nature and extent of risks that the Entity is willing to accept, and will impact the asset base and its operating context.
Subject Matter Expert (SME)	An individual who possesses the necessary competence in a subject matter that enables them to offer advice and guidance on all aspects of managing the subject matter in question.
Strategic Asset Management Plan (SAMP)	A documented plan that specifies how the organizational objectives are to be converted into Asset Management activities, the approach for developing Asset Management Plans, and the role of the Asset Management System in supporting the achievement of Asset Management Objectives.
Strategic Plan	A plan containing the long-term goals and strategies of an organization. Strategic plans have a strong external focus, cover major portions of the organization, and identify major targets, actions and resource allocations relating to the long-term survival, value, and growth of the organization.

Table 1: Terms & Definitions

4.0 REFERENCES

- ISO 55000:2014 2.5.3.7 Performance Evaluation
- NMA&FM Volume 2: Asset Management
- NMA&FM Volume 4: Financial Planning
- NMA&FM Volume 10: Health, Safety, Security and Environment
- NMA&FM Volume 12: Risk Management
- NMA&FM Volume 15: Performance Monitoring
- ISO 13372: 2012 Condition monitoring and diagnostics of machines — Vocabulary
- ISO 13374-1:2003 Condition monitoring and diagnostics of machines — Data processing, communication and presentation — Part 1: General guidelines
- ISO 13374-4:2015 Condition monitoring and diagnostics of machine systems — Data processing, communication, and presentation — Part 4: Presentation
- ISO 13379-1:2012 Condition monitoring and diagnostics of machines — Data interpretation and diagnostics techniques — Part 1: General guidelines
- BS ISO 13381-1:2015 – TC Tracked Changes. Condition monitoring and diagnostics of machines. Prognostics. General guidelines
- BS ISO 2041:2018 – TC Tracked Changes. Mechanical vibration, shock and condition monitoring. Vocabulary

5.0 RESPONSIBILITIES

Role	Description
Entity	Each Entity will have the following responsibilities and be accountable for: • Providing support and advice on development and deployment of the Asset Management System • Responsible for developing the risk management system in compliance with Saudi Law, Industry-specific, and local regulations. • Preparing plans for appropriate Condition Assessment (CA). • Ensuring that Condition Assessments are aligned with Government Regulations, and the details laid out in Volume 3 of the NMA&FM. • Identifying or sourcing the appropriate resources to carry out the Asset Management System' tasks. • Training or briefing (whichever is more appropriate depending on resources selected), the selected resources to ensure uniformity across all asset categories, and conformity to the NMA&FM. • Assisting in the compilation of the Condition Assessment Report (CAR), particularly in the prioritization of assets, and possible future requirements for their use. • Planning and implementing recommendations established by the Condition Assessment Report (CAR) • Establishing Entity-specific, Asset Management stewards and Entity champions, to accelerate deployment of Asset Management policy • Establishing Entity-specific asset data management stewards and Entity asset data champions to manage data quality to the highest standards.
Service Delivery Team	• Carries out workplace risk assessments, and supports the development of method statements. Supports risk assessment management across Entities. • Provides detailed reports and advice, based on facts and evidence, in collaboration with the Entity.

Table 2: Responsibilities & Accountabilities

6.0 PROCESS

CA is a form of proactive monitoring and should lead to immediate corrective actions against a scale of priorities, depending on the mode of failure and the criticality created, should that failure be realised.

In the interest of best practices and value for the Entities, the analysis of data and information gathered as part of a CAS, is a critical step to forming credible and cyclic, strategic Asset Management decisions. The provision of a checklist, supplementary data and information is a standard that shall be upheld.

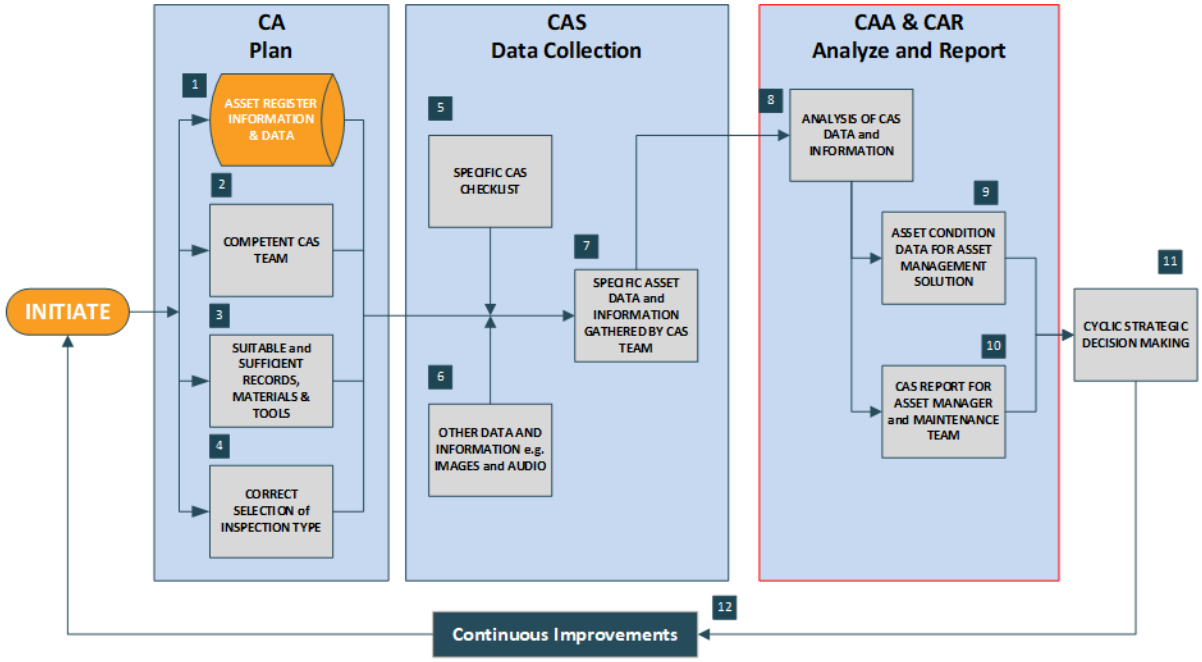


Figure 1: High Level CAA & CAR Process Flow

The quality and reliability of data and information presented by the CAS phase shall meet the requirements of the analyst; these requirements shall have been made clear at the planning phase.

6.1 Analysis (CAA)

Note: For competencies of the Analyst; refer to the National Manual of Assets and Facility Management, Volume 3 Chapter 2, Condition Assessment Planning.

The analyst must first consider what the output requirements are for the CA analysis, to enable cyclic and strategic, decision-making. At the highest level, these are:

- Evaluate the implementation of Asset Management objectives
- The effectiveness of the arrangements for controlling risk
- Enable the identification of the need to restore or improve asset performance

The data and information presented to the analyst shall be a combination of:

- Quantitative data, which is described by numbers, and recorded on a scale. This data must be presented accurately and justifiably.
- Qualitative data, which describes conditions or situations that cannot be recorded numerically. Care must be taken with this type of data, as it can be difficult to relate to other condition measures.

The report shall be analysed whilst considering the context of the asset's other data and information, such as:

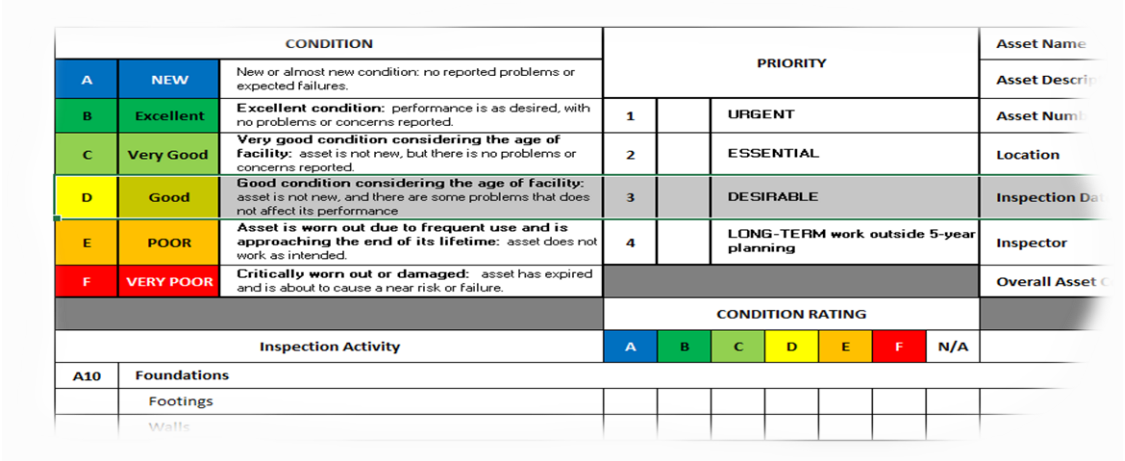
- The Entity's Priorities (for example environmental sustainability, workplace health and safety commitments, community obligations and budget imperatives)
- Functionality
- Utilisation Rate
- Design
- Remaining Life
- Operational Cost Efficiency

6.1.1 Data & Information Inputs for Analysis

Inputs for the analysis of CA is compiled of:

- CA Checklist – Quantitative Data
- Supplementary Information – Typically Qualitative Information

Checklist Analysis:



CONDITION			PRIORITY			Asset Name
A	NEW	New or almost new condition: no reported problems or expected failures.				Asset Descri
B	Excellent	**Excellent condition:** performance is as desired, with no problems or concerns reported.	1		URGENT	Asset Numb
C	Very Good	**Very good condition considering the age of facility:** asset is not new, but there is no problems or concerns reported.	2		ESSENTIAL	Location
D	Good	**Good condition considering the age of facility:** asset is not new, and there are some problems that does not affect its performance	3		DESIRABLE	Inspection Da
E	POOR	**Asset is worn out due to frequent use and is approaching the end of its lifetime:** asset does not work as intended.	4		LONG-TERM work outside 5-year planning	Inspector
F	VERY POOR	**Critically worn out or damaged:** asset has expired and is about to cause a near risk or failure.				Overall Asset C

		CONDITION RATING							
	Inspection Activity	A	B	C	D	E	F	N/A	
A10	Foundations								
	Footings								
	Walls								

Figure 2: Checklist Extract

The advantages of setting out with an asset condition checklist, which has been designed and tailored to the modes of failure relating to the specific asset classification, are:

- The parameters and modes of failure are defined and captured in advance, thus providing consistency across asset classifications, regardless of their location.
- It is populated by a competent and authorized inspector, who is familiar with the asset failure modes, and therefore the likely impact that failure will have on asset performance.
- The results give very credible and quantifiable direction.
- The items that score a Condition Rating of less than "D – Good", whilst having a critical mode of failure, will be subject to focus on their lifecycle objectives.

It is for these reasons that competent and authorized personnel be assigned to compile the checklist, and also to carry out the CAS, which will support the quality of CAA output, and hence the cyclic and strategic decision-making.

Proportional Contributions (%)	Total of 44%							Maximum 20%	Maximum 10%			Maximum 26%	100%
Factors	Condition Factors							Age of Asset	Other Contributing Factors			Severity Factors	Total
Key Condition Assessment Criteria examples:	Parameter 1 Walls	Parameter 2 Structure	Parameter 3 Clear View Panels	Parameter 4 Roof Integrity	Parameter 5 Pathways	Parameter 6 Stairs	Parameter 7 Floors	Age 1 Year = 5% 15 Years = 20%	Loading	Quantity of Defect History	Asset Type	Severity Factors	TOTAL WEIGHTING
% Weighting - Maximum per element	7	6	6	6	6	7	6	20	3	3	4	26	100
EXAMPLE SCORE:	2	2	3	2	4	2	3	10	0	3	2	15	48

Figure 3: Weighted Scoring Parameters Tool

Figure 3 (above), shows the breakdown of an asset, and the manner in which the specific condition scoring can be weighted, to ensure the condition of an asset is captured and rated in a manner that clearly defines the condition rating profile of an asset. The Scoring Elements and Parameters Tool can be shaped according to the profile of the asset or group, provided the “Weighting” is well balanced according to the Asset Classification, and the totals equate to 100%. It can either reside as a function of the AMS, or as part of the CAA and CAR.

6.2 Report (CAR)

Once all data and information are analyzed, a report shall be compiled to the Asset Management team. This can take the form of many iterations however; it shall meet the requirements set out below:

6.2.1 Report Requirements:

- To provide evidence to support acquisition and allocation of funding, for the implementation or enhancement of the existing maintenance program.
- Form an objective view of the relative condition of its assets or facilities, compared to the desired condition necessary for an acceptable level of service delivery, and to undertake any further analysis to refine that knowledge.
- Understand the scope, cost and priority of maintenance work required to rectify the defects identified, or to maintain the asset or Facility to the required condition standard, or better.
- Evidence to support the plan for future funding requirements i.e. major replacements, natural disaster mitigation, repairs and upgrades.
- Development of the Forward Maintenance Register (FMR), and the Asset Condition Register (ACR).
- Development of the existing maintenance program, in support of the SAMP for the following financial year and beyond, and a longer-term strategic plan by Facility and portfolio.
- Initiate engineering and other investigations as required, to further define the scope and severity of defects.
- Where deemed applicable, provide recommendations for future design reviews of specific assets or systems.

The CAR shall provide a current, valuable, and concise form of information to the viewer, that very clearly sets out the condition ratings, and any recommendations made by the CA Team.

6.2.2 Minimum Contents of a Report

- The assigned CAS Team will provide accurate corrective solutions, including emergency actions and other recommendations founded on their subject competence.

- An itemised schedule of recommended maintenance work necessary to bring each asset or Facility, up to, or conserve it at the condition standard. as nominated by the asset owner.
- Cost, or at least an indication of time and resource estimates, for the remedial works identified at a level of detail agreed with individual departments.
- Advice about the longer-term maintenance needs of the asset or Facility, to assist in planning and decision-making, for example, any anticipated major replacements or upgrades.
- An overall asset, Facility or system's CA, in accordance with the rating matrix.
- Feedback on effectiveness and suitability of the applied CAS procedure, and any lessons learned.

In the interest of simplicity and efficiency the CAS Checklist should form the basis of the CAR i.e. wherever possible, it can be one and the same. This saves time and effort in duplicating efforts, and should be reflected in the planning phase of the CA. At checklist design stage, this aspiration should be taken into consideration.

6.3 Asset Condition Rating – Upload to AMS

The Asset condition data results i.e., the condition ratings for specific assets, shall be uploaded into the Asset Management Software (AMS). The method of data transfer from CA to the AMS shall be a fully automated process providing the format, data, parameters, and file structure presented, to meet the data loading requirements of the AMS. These transfers are ordinarily via spreadsheets and will include asset identity and current asset condition rating, as attained in the CAR.

6.4 Summary

As found within the Change Control process, the requirements of a system that evaluates critical information before assigning change to a set configuration must be assured; no part of that system of knowledge can be absent. Therefore, depending on the complexity of the CA, and the level of available CAA competence, it may be necessary to assemble SME to complete the CAA in full.

The control and management of data pertaining to an asset's condition has a direct impact on performance, cost, and risks to the Entities. Poor design, process management, and leadership will culminate in unnecessary financial burdens.