



USAF Built Infrastructure Inventory and Assessments Manual

Appendix for Foundations (A10)

July 2017

This document includes information that shall not be disclosed outside the Government and shall not be duplicated, used or disclosed-in whole or in part-for any other purpose than the United States Air Force Built Infrastructure Assessment Program.

Table of Contents

- I. Overview.....3**
 - A. A10 Foundations Description.....3
 - 1. UNIFORMAT II definition.....3
 - 2. Major components.....3
 - 3. Lifecycle characteristics.....3
- II. Inventory.....3**
 - A. General A10 Inventory Guidance3
 - B. Inventory A1010 Standard Foundations.....4
 - C. Inventory A1020 Special Foundations4
 - D. Inventory A1030 Slab on Grade5
- III. Assessment.....5**
 - A. General A10 Assessment Guidance5
 - B. Assessment A1010 Standard Foundations7
 - C. Assessment A1020 Special Foundations 10
 - D. Assessment A1030 Slab on Grade 10
- IV. Inventory and Assessment Rules of Thumb.....11**
 - A.** Assessor Qualifications 11
 - B.** Year Installed 11
 - C.** Inventory/Assessment..... 12
- V. Inventory / Assessment Data Collection Sheet.....12**
- VI. A10 UNIFORMAT II Minimum Component Reference Table 12**

I. Overview

This manual covers the inventory and assessment process for the building “Foundations (A10)” building system and components. This is an abbreviated manual and does not contain the same level of detail found in expanded manuals. Please see the SMS Playbook for additional information including:

- BUILDER™ Sustainment Management System Concepts
- Overview of ASTM E 1557 UNIFORMAT II Standard Classification for BUILDER™
- BUILDER™ Inventory Overview
- BUILDER™ Assessment Overview
- BUILDER™ Remote Entry Database (BRED™)
- Working with Web-Based BUILDER™
- Quality Assurance
- Site Visit Preparation and Execution
- Site Visit Safety

A. A10 Foundations Description

1. UNIFORMAT II definition

- Building foundations are structural components supporting other building structural components such as slabs, columns and walls. Foundations will be near or below grade.

2. Major components

- Standard Foundations (A1010) – Includes spread and strip footings supporting the building structure.
- Special Foundations (A1020) – Includes piers, piles and buttresses supporting the building structure. Special foundations are typically found on larger buildings or where soil conditions are not favorable such as coastal areas.
- Slab on Grade (A1030) – The slab on grade (SOG) may also assist in supporting the building structure when designed for foundation support often with a “turn down” footing typically found in smaller structures. The SOG may also serve as the interior finished floor surface when not covered, such as in a warehouse, or provides substrate for floor finishes (ceramic tile, wood, carpet).

3. Life Cycle characteristics

- Foundations are classified as very long-lived structural building components. Foundations show slow rates of deterioration.

II. Inventory

A. General A10 Inventory Guidance

This section presents common UNIFORMAT II A10 Foundations Inventory Component Sections found across USAF installations as a guide for entering into the BUILDER™ SMS or BRED™ software. Inventory items are arranged by BUILDER™ SMS system with Material Category, Component Subtype, Quantity and Inventory Notes. Section VI (A10 UNIFORMAT II Minimum Component Reference Table) provides a

complete listing of the minimum components inventoried and assessed for A10. Bases may elect to inventory and assess additional components.

NOTE: Currently, only slab on grade foundations for Munitions Storage facilities (including attached loading docks) and arresting system anchorages are required MINIMUM systems to be inventoried and assessed in BUILDER™ SMS for A10 for the USAF. Recommend inventorying and assessing visible hangar, warehouse, and other slabs on grade. Bases may elect to inventory and assess other foundation component sections. Inventory and assessment is required by the current AFCAMP Playbook as project support documentation for consideration in the project prioritization process.

Component Subtypes General, Other, and Unknown require a Section Name to further describe the Component Sections.

It is critical to confirm the year installed (default from Real Property Assets Database (RPAD)) or estimate the year installed. BUILDER™ SMS uses the Install Date, life cycle degradation curves and assessment observations to establish Condition Index (CI) for each Component Section. If the assessor suspects the RPAD default date is not accurate or an addition or renovation has taken place, check the RPAD record for year renovated or check local as-built/renovation drawings to help determine the year installed. Estimated Install Dates decrease the Expected Service Life significantly. Every effort should be made to establish an Install Date and avoid the use of estimated.

If this is an initial assessment and no foundations inventory has previously been entered into BUILDER™ SMS, an inventory is required. When foundations are not visible, as-built drawings should be used to identify and quantify the foundation component sections. If as-built drawings are not available, the assessor may use experience to make an assumption for the foundation types and quantities based on similar construction of nearby buildings, consultation with local staff and other resources such as www.inspectapedia.com.

B. Inventory A1010 Standard Foundations

Typical inventory at USAF bases includes the following Component Subtypes:

- Wall Foundations SF
- Column Foundations & Pile Caps EA

Standard Foundations A1010 Inventory Hints

- Material is almost always concrete.
- Quantity is total of all footings for the entire building.
- Inventory Comments should be recorded to clarify component description if Section Name is insufficient.
- If foundations are not visible, an Inspection Comment must be provided.

C. Inventory A1020 Special Foundations

Typical inventory at USAF bases includes the following Component Subtypes:

- Drilled Caissons CY
- Pile Foundations LF

Special Foundations A1020 Inventory Hints

- Material is almost always concrete.
- Pile Foundations are typically concrete or steel.
- Quantity is total of all footings for the entire facility.
- Inventory Comments should be recorded to clarify Component Section description if Section Name is insufficient.
- If a foundation is not visible, an Inspection Comment must be provided.

D. Inventory A1030 Slab on Grade

Typical inventory at USAF bases includes:

- Slab on Grade (SOG) SF

Slab on Grade A1030 Inventory Hints

- As a business rule to simplify data entry for USAF bases, a SOG is always entered under inventory item A1030 whether the SOG provides a foundation or not. SOG is not entered under B1010 Floor Construction.
- Inventory Comments should be recorded to clarify Component Section description if Section Name is insufficient.

1. Material Category: A103002 Structural Slab on Grade
Component Subtype: General
Quantity: SF Year Built/Renewed: RPAD
Painted/Coated: No
Year Painted/Coated: Normally Estimated
Paint/Coating Type: Best Guess
Inventory Notes:
 - Structural SOG Loading Dock
 - Slab continues inside



III. Assessment

A. General A10 Assessment Guidance

Foundation component sections are assessed using Direct Condition Rating (DCR). Much of the time foundations are not visible. When Component Sections are not visible, no assessment is required and an Age-Based Rating is given by BUILDER™ SMS. In this case BUILDER™ SMS will use the inventory year installed and software life cycle degradation curves to establish the CI.

When foundation Component Sections are visible, they should be assessed.

Under no circumstances should age be factored into a DCR or Distress Survey assessment. Ratings are based on condition, operability and/or survivability only. BUILDER™ SMS already factors in the age from the Install Date when BUILDER™ calculates Condition Index (CI).

The following conditions or events can accelerate deterioration:

- Improper construction or installation
- Settlement or subsidence
- Material damage
- Flooding
- Earthquake
- Landslide
- Soil erosion
- Moisture infiltration

The assessor may observe conditions in the visible foundation major components such as cracking, displacement or other damage. These conditions may also be visible in interior or exterior walls and the floor. In these cases the assessor shall evaluate the impact of observations and use judgment to provide a DCR using the DCR chart below. **The assessor must provide an Inspection Comment for any Amber+ or lower DCR or BUILDER™ calculated Distress Survey rating. Photographs documenting defects must be taken and attached to the assessment.**

Following the BUILDER™ SMS assessment, the assessor should inform the appropriate base facility manager of any new issues discovered.

NOTE: Red highlighted text is provided as an example of a life cycle of typical components and should be adjusted as needed to represent other various components.

Direct Condition Rating (DCR) Definitions	
Rating	Observation
Green (+)	Fully Operational - Free of Known or Observable Defects Keep doing PM required to maintain warranty - no action required
Green	Fully Operational - Slight Deterioration or Minimal wear Keep doing PM - no action required
Green (-)	Fully Operational – Normal wear and/or serviceability defects Keep doing PM- need to start planning for rehabilitation
Amber (+)	Reduced Operation – Minor wear and/or serviceability defects Repairs could be accomplished and replacement planned within next eight to ten years (Investment of resources could extend life)

Amber	Reduced Operation – Moderate wear and/or serviceability defects Repairs could be accomplished and replacement planned within next six to seven years (Investment of resources could extend life)
Amber (-)	Reduced Operation – Significant wear and/or serviceability defects Repairs could be accomplished and replacement planned within next three to five years (Investment of resources could extend life)
Red (+)	Loss of Operation – Moderate wear and/or serviceability failure Repairs could be accomplished and replacement planned within next two years (Run to failure -further investment unwise)
Red	Loss of Operation – Significant wear and/or serviceability failure Repairs could be accomplished and replacement planned within the next year (Run to failure -further investment unwise)
Red (-)	Loss of Operation – Complete wear and/or serviceability failure Replacement needs to be planned immediately

Below are assessment hint questions to help the assessor determine the most appropriate DCR.

Foundations Assessment Hints

- If assessment rating is **Amber +** or below, enter an Inspection Comment to describe the reason. Attach a photograph(s) of the defects documenting the defect(s). An Inspection Comment should also be entered regardless of rating if a significant localized issue needs to be highlighted which may not necessarily impact the overall Component Section DCR.
- If foundations are not visible an Inspection Comment must be provided.

B. Assessment A1010 Standard Foundations

Normally, Standard Foundations will normally not be visible. No assessment will be entered unless the assessor observes distresses noted above or has access to an engineering report allowing BUILDER™ to Age-Base the Rating.

Examples of typical Standard Foundation distresses or conditions include:

1. Typical Distress: Cracked Foundation Wall



2. Typical Distress: Cracked Foundation



3. Typical Distress: Crumbling Foundation Wall and Exposed Rebar



4. Typical Distress: Foundation Cracks & Spalls



5. Typical Distress: Foundation Cracks



6. Typical Distress: Spalling Concrete Foundation



C. Assessment A1020 Special Foundations

Special Foundations will normally not be visible with the exception of pile caps or piers in a space below floor level. No assessment will normally be entered unless the assessor can observe some portion of the Special Foundation, observe distresses noted above, or has access to an engineering report. When Component Sections are not visible, no assessment is required and an Age-Based Rating is given by BUILDER™ SMS. In this case BUILDER™ SMS will use the inventory year installed and software life cycle degradation curves to establish the CI.

D. Assessment A1030 Slab on Grade

SOG's will normally not be visible if a floor finish has been applied. Examples of visible SOG include Hangars, Warehouses and Maintenance Shops. No assessment will normally be entered on covered SOG's allowing BUILDER™ SMS to give an Age-Based Rating unless the assessor observes distresses, noted above, or has access to an engineering report. Visible SOG's will be assessed as described in paragraph III. A., above.

Examples of typical SOG distresses or conditions include:



2. Typical Distress: Cracked Slab-on-Grade



IV. Inventory and Assessment Rules of Thumb

A. Assessor Qualifications

- The architectural/structural assessor should have a combination of 8+ years of general building construction, facilities maintenance and planning/estimating experience related to building foundations, structure, enclosure and interior construction or be equivalent to a Journeyman, a V Level Technician, an Architect or a Civil Engineer. The assessor should have a working knowledge of the ASTM E 1557 Standard Classification for Building Elements UNIFORMAT II and a basic understanding of other building systems such as HVAC, Plumbing, Fire Protection and Electrical. The assessor should be able to identify common building materials, techniques and structural/architectural system types/elements, be proficient at reading drawings and engineering reports and have experience identifying common problems related to architectural/structural systems. The lead architectural/structural assessor may be supported by less experienced staff during the inventory and assessment.

B. Year Installed

- In some cases foundation sections may be replaced as an individual repair or partial replacement. These areas would have a different age. The RPAD construction and renovation dates should be confirmed. If they are not appropriate, the foundations age must be estimated. The building occupants or other facilities staff may be able to provide some information.
- If construction drawings or as-builts are available, look for date published to assist with determining age of materials.
- Additions, new wings or major renovations likely require identifying separate foundation component sections with a different age.
- In the case of foundations, the assessor must use judgment in sectioning foundations in the manner they are generally managed. If there are new

foundations, a separate section for a single new foundation is not necessary. However, if there are two major types or ages of foundations, then separate sectioning is required.

C. Inventory/Assessment

- If as-builts can be located, they should indicate foundation type, material, and quantity.

V. Inventory / Assessment Data Collection Sheet

Many assessors use floor plans or a notebook. Use whatever collection method works best for the individual assessor.

VI. A10 UNIFORMAT II Minimum Component Reference Table

The following table provides SMS MINIMUM inventory and condition assessment requirements. The table effectively provides a list of WHAT will be inventoried, WHERE within the SMS the component inventory will reside and HOW a component is to be condition assessed. The structure of the list is within UNIFORMAT II to be consistent with BUILDER™ SMS. Currently all components are DCR assessed. Eventually, Distress Survey assessments may be conducted on selective components.

PM Inspection/Testing Directive column gives information on any Air Force applicable publication providing Preventative Maintenance (PM) actions that, once conducted, may provide information that may be used to determine a component's DCR assessment. PMTLs or other inspections may be considered a Distress Survey type assessment in the future for some components.

Condition assessment frequency is not to exceed 5 years. Condition assessments conducted as part of a PMTL may be entered into SMS but should not be more often than an annual assessment.

AMP reflects the AMP to which the component is assigned:

T: Transportation Networks and Pavements AMP

F: Facilities AMP

A SUBSTRUCTURE				DEFINITION							
Unf L1	Unf L2	Unf L3	WBS L4		This system includes all work below the lowest floor construction (usually slab-on-grade) and the enclosing horizontal and vertical elements required to form a basement, together with the necessary mass excavation and backfill.	In Builder/ Fueler/ Paver/ Railer/ Utility	PM Inspection/ Testing Directive	Insp Freq	SMS Type Insp	Assessment Method	AMP/ Sub-AMP
	A10	FOUNDATIONS			Foundations includes the following Standard Foundations: wall and column foundations; foundation walls up to level of top of slab on grade; pile caps; foundation excavation, backfill, and compaction; footings and bases; perimeter insulation; perimeter drainage; anchor plates; and dewatering. Special Foundations include pile foundations, caissons, underpinning, dewatering, raft foundations, and pressure injected grouting. Slab on grade includes standard slab on grade, structural slab on grade, inclined slab on grade, trenches, pits and bases, and foundation drainage.						
		A1010	STANDARD FOUNDATIONS		Continuous footings, spread footings, grade beams, foundation walls, pile caps, and column piers.						
			A101090	OTHER STANDARD FOUNDATIONS	Standard foundations not described by the assembly categories listed above. Includes foundation, vault and enclosure for arresting system anchorages.	B	N/A	5 yr	Direct	Visual	T/
		A1030	SLAB ON GRADE		A slab poured on earth, whether on undisturbed or fill soil.						
			A103001	STANDARD SLAB ON GRADE	Standard slab-on-grade is supported by compacted earth or gravel fill. The soil bearing capacity is sufficient to support the slab. Assemblies include fine grade, gravel fill, underslab insulation, edge forms, termite treatment (interior slabs only), vapor barrier, reinforcing, expansion joints, control joints, and finish and curing. Assemblies are based on thickness of slab.	B	N/A	5 yr	Direct	Visual	F/S & F
			A103002	STRUCTURAL SLAB ON GRADE	A structural slab-on-grade is not supported by compacted earth or gravel fill. The soil bearing capacity is insufficient to support the slab. A structural slab is generally a minimum of eight inches thick and will be reinforced with reinforcing bars rather than welded wire fabric. Assemblies include fine grade, gravel fill, underslab insulation, edge forms, termite treatment, (interior slabs only), vapor barrier, reinforcing, expansion joints, control joints, and finish and curing.	B	N/A	5 yr	Direct	Visual	F/S & F