



# **USAF Built Infrastructure Inventory and Assessments Manual**

## ***Appendix for Plumbing (D20)***

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.

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## I. Overview

This manual covers the inventory and assessment process for the “Plumbing (D20)” building system and components. Please see the SMS Playbook Manual 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. D20 Plumbing Description

#### 1. UNIFORMAT II definition

- The plumbing system of a building provides the supply and distribution of potable water and the removal of waterborne/sanitary wastes and roof rainwater (interior piping). The system includes piping and fixtures for safe distribution and waste removal, and may include energized equipment for heat transfer, water heating, washing or pumping. The system may also contain control valves, relief valves, filters and conditioners. The system is designed to support the function/mission of the building and for comfort and safety of the occupants.

#### 2. Major components

- Plumbing Fixtures (D2010) – A receptor or device having both a water supply connection and a discharge to the drainage system such as toilets, lavatories, showers and sinks.
- Domestic Water Distribution (D2020): The system of pipes, tanks, pumps, filters and water conditioning appliances used for the supply, distribution, heating and filtering of potable water within a building.
- Sanitary Waste (D2030): The system of drain, waste and vent pipes that removes sanitary waste and grey-water from a building and vents the gases produced by the waste. Inventory and assessment is optional.
- Rain Water Drainage (D2030): The piping system within a building (interior) for the removal of rain water collected on the roof. Inventory and assessment is optional.
- Other Plumbing Systems (D2090): Specialty pipe, equipment or appliances that are not part of the potable water distribution system or the drain-waste-vent system. Inventory and assessment is optional.

#### 3. Lifecycle characteristics

- Plumbing systems and components provide reliable service when properly designed, installed, serviced and maintained. These systems generally have a range of service life from 20 - 40 years with plumbing fixtures at the low end of the range and industrial/commercial domestic water heating systems at the high end of the range, if properly maintained. Since plumbing systems are relatively short-lived components, they are

assessed using the Direct Condition Rating (DCR) Definitions chart considering observed defects.

Plumbing fixtures, with accompanying faucets and drain assemblies, have an expected service life of 20 years. This life is greatly affected by use and the maintenance they receive. Fixtures in high/rough use areas will require renewal/replacement in less than 20 years. Fixtures that are well maintained may see a service life beyond 20 years.

Residential style water heaters and equipment used in a light commercial environment have an estimated service life of 20 years, while heavier commercial grade hot water heaters and heat exchangers have an estimated life of 30-40 years.

Piping systems for domestic water and waste/vent piping, if properly installed and insulated (when required), are considered to have a service life beyond 40 years.

One of the most common problems with plumbing systems is that, over time, building mission, equipment and occupancy change. These changes often require plumbing system alterations, additional piping and new fixtures that can result in an overloaded building sanitary waste system, code issues and inaccurate plumbing as-built drawings.

## II. Inventory

### A. General D20 Inventory Guidance

This section presents common UNIFORMAT II D20 plumbing 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 Equipment Category, Component Subtype, Quantity and Inventory Notes. Each building's full or partial inventory can be captured in the field using the Inventory/Assessment Data Collection Sheet(s) included in Section V and in the AFCEC BUILDER™ SharePoint Site Documents Library. Section VI (D20 UNIFORMAT II Minimum Component Reference Table) provides a complete listing of the minimum components inventoried and assessed for D20 for the USAF.

***NOTE: Bases may elect to inventory and assess other plumbing 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 to determine the year installed for each component. 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 or renovation drawings to help estimate the year installed. Estimated Install Dates decrease the Expected Service Life significantly.

If this is an initial assessment and no plumbing inventory has previously been entered into BUILDER™ SMS, an inventory is required. Most plumbing components inventoried for USAF buildings are visible with exception of piping and ductwork components. When plumbing components are not visible (or an area of the building is not accessible), as-built drawings should be used to identify and quantify the plumbing components. If as-built drawings are not available, the assessor may use experience to make an estimate for the plumbing component types and quantities based on similar construction, consultation with local staff and other resources such as <http://www.inspectapedia.com>. Often manufacturer websites will have product information available which can help the assessor determine age, equipment type, capacity and model.

BRED™ currently has an inventory data field “NOT Energy Efficient: Yes/No” used by Defense Logistics Agency (DLA). The field is not currently used by the Air Force. The checkbox is currently just a “flag” to let DLA know a more thorough Level 2 Energy Audit is suggested. The Standard Report simply checks if any sections in the building were flagged. If a section is flagged, the report suggests the building receive a Level 2 Energy Audit and estimates a cost for the audit based on the facility square footage. The flag appears in the report under “Efficiency and Obsolescence.”

The remainder of this section provides photo examples of the most common USAF plumbing inventory items categorized by major components, and accompanied with appropriate Equipment Category, Component Subtype and Quantity from the BRED™ drop down menus. This information is supplemented with general and specific inventory hints as a guide for data entry by the assessor.

#### General Plumbing D20 Inventory Hints

- Assessors for D20 Plumbing and D30 HVAC work closely together. These systems have some similar components. Storage tanks, pumps and piping used for domestic water are covered under D20 Plumbing. Boilers are not covered in D20.
- Backflow preventers for Fire Protection systems are recorded under D40 Fire Protection. Others are recorded under D20 Plumbing, record size.
- Find boiler, pump, backflow and other major equipment nameplates for make, model, serial number, capacity and enter into Section Details.
- Inventory Comments should be recorded to clarify inventory component description if Section Name is insufficient.

### **B. Inventory D2010 Plumbing Fixtures**

Plumbing fixture inventory is a systematic count of building plumbing fixtures such as showers, toilet fixtures (water closets), lavatories, sinks, etc.

Typical plumbing fixture components on USAF installations:

1. Equipment Category: D201001 Waterclosets  
Component Subtype: General  
Quantity: EA      Year Installed/Renewed: EST  
NOT Energy Efficient: Yes/No  
Inventory Notes:  
• Includes floor mounted, wall hung, or tankless.  
• Use component type "Stainless," if required  
• Section Name required



2. Equipment Category: D201002 Urinals  
Component Subtype: General  
Quantity: EA      Year installed/Renewed: EST  
NOT Energy Efficient: Yes/No  
Inventory Notes:  
• Picture shown w/water saving auto flush valve  
• Use component subtype "Stainless," if required  
• Use Section Name "Stall Type" for waist to floor length or floor mounted urinals  
• Section Name required



3. Equipment Category: D201004 Sinks  
Component Subtype: Service Sink  
Quantity: EA      Year Installed/Renewed: EST  
NOT Energy Efficient: Yes/No  
Inventory Notes:  
• Section Name should describe as: Service Sink\_Wall Hung\_Plastic  
• Materials are typically ceramic, enameled cast iron, metal, or plastic



4. Equipment Category: D201004 Sinks

Component Subtype: Service Sink

Quantity: EA      Year Installed/Renewed: EST

Inventory Notes:

- Floor mounted mop sink entered as Service Sink
- Material subtypes include ceramic, plastic, metal
- Section Name should describe sink as Floor Mounted Mop Sink\_Concrete
- Provide backflow prevention vacuum breaker



5. Equipment Category: D201004 Sinks

Component Subtype: Kitchen Sink

Quantity: EA      Year installed/Renewed: EST

Inventory Notes:

- Includes Single and Double Bowl sinks
- Material subtypes include: ceramic, enameled cast iron, or metal
- Section Name should include bowls and material: Kitchen Sink\_Single\_Stainless



6. Equipment Category: D201003 Lavatories

Component Subtype: General

Quantity: EA      Year Installed/Renewed: EST

NOT Energy Efficient: Yes/No

Inventory Notes:

- Ceramic sink set in a counter top
- Section Name includes material: Lav\_Ceramic
- Section Name required



7. M/E Category: D201003 Lavatories

Component Subtype: General

Quantity: EA      Year Installed/Renewed: EST

NOT Energy Efficient: Yes/No

Inventory Notes:

- Enameled metal sink set in a counter top with or without a metal band
- Section Name includes material: Lav\_Cast\_Enamel
- Section Name required



8. Equipment Category: D201003 Lavatories

Component Subtype: General

Quantity: EA      Year Installed/Renewed: EST

NOT Energy Efficient: Yes/No

Inventory Notes:

- One piece sink and counter top; use for all materials including “cultured marble”, solid surface acrylic (“Corian”), or metal
- Section Name includes material: Lav/Counter Combo\_Corian
- Section Name required



9. Equipment Category: D201003 Lavatories

Component Subtype: General

Quantity: EA      Year installed/Renewed: EST

NOT Energy Efficient: Yes/No


Inventory Notes:


- Wall hung lavatory sink
- Usually ceramic, may also see metal
- Section Name includes “wall hung” and material: Lav\_Wall Hung\_Ceramic
- Section Name required





<p>10. Equipment Category: D201004 Sinks</p> <p>Component Subtype: Group Wash Fountain</p> <p>Quantity: EA      Year installed/Renewed: EST</p> <p>Inventory Notes:</p> <ul style="list-style-type: none"> <li>• May be circular or semi-circular</li> <li>• May be stainless steel, concrete or fiberglass</li> <li>• Typically found in gyms</li> <li>• Section Name: Wash Fountain_Stainless</li> </ul>	
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<p>11. Equipment Category: D201005 Showers/Tubs</p> <p>Component Subtype: Shower</p> <p>Quantity: EA      Year installed/Renewed: EST</p> <p>NOT Energy Efficient: Yes/No</p> <p>Inventory Notes:</p> <ul style="list-style-type: none"> <li>• Single faucet and shower head in an enclosure</li> <li>• Enclosure ceramic or fiberglass stall</li> <li>• Multiple shower heads in a common area are counted</li> <li>• Section Name: Shower_Enc: Ceramic</li> <li>• Section Name: Group Shower_Enc: Ceramic</li> </ul>	
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<p>12. Equipment Category: D201005 Showers/Tubs</p> <p>Component Subtype: Shower</p> <p>Quantity: EA      Year installed/Renewed: EST</p> <p>NOT Energy Efficient: Yes/No</p> <p>Inventory Notes:</p> <ul style="list-style-type: none"> <li>• Gang type stainless steel column or pedestal shower</li> <li>• Quantity counted "1" for each column (gang)</li> <li>• Typically found in gyms</li> <li>• Section Name: Shower_Gang</li> <li>• Add comment: "This is a 6 head stainless steel column shower"</li> </ul>	
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<p>13. Equipment Category: D201005 Showers/Tubs</p> <p>Component Subtype: Shower</p> <p>Quantity: EA      Year installed/Renewed: EST</p> <p>NOT Energy Efficient: Yes/No</p> <p>Inventory Notes:</p> <ul style="list-style-type: none"> <li>• Room with multiple shower heads</li> <li>• May be ceramic tile or masonry (CMU walls)</li> <li>• Quantity counted "1" for each head in the area</li> <li>• Section Name: Shower_Group</li> <li>• Add comment "This is a 6 head ceramic tile group shower"</li> </ul>	
<p>14. Equipment Category: D201006 Drinking Fountains and Coolers</p> <p>Component Subtype: Drinking Fountain</p> <p>Quantity: EA      Year installed/Renewed: EST</p> <p>Inventory Notes:</p> <ul style="list-style-type: none"> <li>• Includes interior, exterior, flush, and surface mount</li> <li>• Does not cool water</li> <li>• Generally ceramic or metal</li> <li>• Section Name: Drink Foun_Ceramic</li> <li>• Section Name: Drink Foun_Stainless</li> </ul>	
<p>15. Equipment Category: D201006 Drinking Fountains and Coolers</p> <p>Component Subtype: Water Cooler</p> <p>Quantity: EA      Year installed/Renewed: EST</p> <p>Inventory Notes:</p> <ul style="list-style-type: none"> <li>• Double units (e.g. ADA compliant) count quantity as "2"</li> <li>• Includes compressor to cool water</li> <li>• Do not count freestanding floor mounted coolers</li> <li>• Water Cooler Wall Hung</li> </ul>	

16. Equipment Category: D201090 Other Plumbing Fixtures

Component Subtype: Emergency Eye Wash

Quantity: EA      Year installed/Renewed: EST

Inventory Notes:

- May stand alone or be part of a safety shower/eye wash combination unit
- For combination unit, count as separate items for both Emergency Eye Wash and Safety Shower (see below)
- Do not count portable, un-piped plastic units
- Currently not USAF inventoried



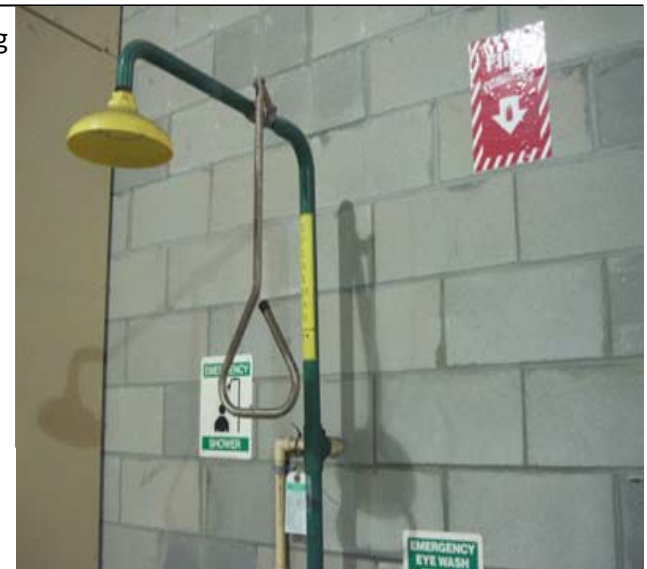
17. Equipment Category: D201090 Other Plumbing Fixtures

Component Subtype: Emergency Shower

Quantity: EA      Year installed/Renewed: EST

Inventory Notes:

- May stand alone or be part of a safety shower/eye wash combination unit
- For combination unit, count separate items for both Emergency Eye Wash and Safety Shower
- Currently not USAF inventoried
- Provide mixing valve to maintain appropriate Temperature
- Check for proper drainage



### C. Inventory D2020 Domestic Water Distribution

Domestic water distribution Component Section inventory includes building equipment and piping used to produce and distribute domestic water. Most of these items will be found in mechanical equipment rooms. Typical system components on USAF installations:

<p>1. Equipment Category: D202002 Valves &amp; Hydrants</p> <p>Component Subtype: Backflow Preventer</p> <p>Quantity: EA    Year installed/Renewed: EST</p> <p>NOT Energy Efficient: N/A</p>	
<p>2. Equipment Category: D202003 Domestic Water Equipment</p> <p>Component Subtype: Water Heaters, Commercial</p> <p>Quantity: EA    Year installed/Renewed: EST</p> <p>NOT Energy Efficient: Yes/No</p> <p>Inventory Notes:</p> <ul style="list-style-type: none"> <li>• Do not count if unit supplies heating hot water, these are counted under HVAC D30</li> </ul>	
<p>3. Equipment Category: D202003 Domestic Water Equipment</p> <p>Component Subtype: Water Heaters, Commercial</p> <p>Quantity: EA    Year installed/Renewed: EST</p> <p>NOT Energy Efficient: Yes/No</p> <p>Inventory Notes:</p> <ul style="list-style-type: none"> <li>• Large tank with shell and tube heat exchanger</li> <li>• May be steam or hot water generated</li> <li>• Found in large, high occupancy buildings- dormitories, gyms, etc.</li> </ul>	

<p>4. Equipment Category: D202003 Domestic Water Equipment</p> <p>Component Subtype: Water Heaters, Commercial</p> <p>Quantity: EA      Year installed/Renewed: EST</p> <p>NOT Energy Efficient: Yes/No</p> <p>Inventory Notes:</p> <ul style="list-style-type: none"> <li>• Add comment, "Tankless gas (elect) fired unit"</li> <li>• Usually gas fired, may be electric fired</li> <li>• Usually wall mounted, sometimes found freestanding</li> <li>• High capacity unit, do not confuse with "point of use" tankless units that serve 1 or 2 fixtures which are not counted</li> </ul>	
<p>5. Equipment Category: D202003 Domestic Water Equipment</p> <p>Component Subtype: Water Heaters, Residential, Electric</p> <p>Quantity: EA      Year installed/Renewed: EST</p> <p>NOT Energy Efficient: Yes/No</p> <p>Inventory Notes:</p> <ul style="list-style-type: none"> <li>• Vertical tank, may be gas fired or electric</li> <li>• Do not count units less than 20 gallons</li> <li>• Typically found in small administrative buildings with low occupancy</li> <li>• Include size in Section Name</li> </ul>	
<p>6. Equipment Category: D202003 Domestic Water Equipment</p> <p>Component Subtype: Water Heaters, Commercial</p> <p>Quantity: EA      Year installed/Renewed: EST</p> <p>NOT Energy Efficient: Yes/No</p> <p>Inventory Notes:</p> <ul style="list-style-type: none"> <li>• Large vertical tank type units often with circulating pump</li> <li>• Found in buildings with high occupancy, photo shows quantity (2)</li> </ul>	



7. Equipment Category: D202003 Domestic Water Equipment

Component Subtype: Booster Pump - ...

Quantity: EA Year installed/Renewed: EST

NOT Energy Efficient: Yes/No

Inventory Notes:

- Booster pumps for increasing water pressure
- Most often seen as a “package” unit assembly in mechanical room serving a dormitory or building complex
- Photo shows quantity (2)



8. Equipment Category: D202003 Domestic Water Equipment

Component Subtype: Other

Quantity: EA Year installed/Renewed: EST

NOT Energy Efficient: Yes/No

Inventory Notes:

- Inventory of expansion tanks is optional
- Expansion Tank < 100 Gal
- Do not count small pipe mounted units less than 5 gallons
- May have rubber bladder inside tank with air charging valve visible on top
- Describe in Section Name: Expansion Tank\_<100gal
- Section Name required



9. Equipment Category: D202003 Domestic Water Equipment

Component Subtype: Storage Tank –Glass lined, PE, 2285 gallon

Quantity: EA      Year installed/Renewed: EST

NOT Energy Efficient: Yes/No

Inventory Notes:

- Large insulated tank, enter by capacity
- May be vertical or horizontal
- Does not contain a heat exchanger



11. Equipment Category: D202001 Pipes & Fittings

Component Subtype: Black / Galvanized Steel <1" Pipe

Quantity: LF      Year installed/Renewed: EST

NOT Energy Efficient: Yes/No

Inventory Notes:

- Threaded steel pipe, may have brass valves
- Galvanized exterior, may be painted
- Black steel pipe is not used for potable water
- Estimate quantity for entire building
- Currently not USAF inventoried



12. Equipment Category: D202001 Pipes & Fittings

Component Subtype: Copper 1" – 2" Pipe

Quantity: LF      Year installed/Renewed: EST

Inventory Notes:

- Soldered joints, brass valves
- Estimate quantity for entire building
- Currently not USAF inventoried




## D. Inventory D2030 Sanitary Waste

Sanitary waste Component Section inventory includes sanitary waste piping of all types. The BRED™ dropdowns also include backflow preventers under D2030 though they are normally associated with domestic water distribution.

Inventory is optional.

Typical system components on USAF installations:

<p>1. Equipment Category: D203001 Waste Pipe &amp; Fittings</p> <p>Component Subtype: General</p> <p>Quantity: LF      Year installed/Renewed: EST</p> <p>Inventory Notes:</p> <ul style="list-style-type: none"><li>• Old cast iron is “Bell &amp; Spigot”, spigot end is inserted into bell end and is sealed, branches under 3” are galvanized</li><li>• Newer cast iron is “No Hub”; pipe end is straight and joined by stainless steel band</li><li>• Branches are “No Hub” with occasional galvanized or copper branches</li><li>• Estimate quantity for entire building</li><li>• Section Name: Cast Iron Waste Pipe</li><li>• Section Name required</li></ul>	
<p>2. Equipment Category: D203001 Waste Pipe &amp; Fittings</p> <p>Component Subtype: Waste Piping 4”</p> <p>Quantity: LF      Year installed/Renewed: EST</p> <p>Inventory Notes:</p> <ul style="list-style-type: none"><li>• White plastic pipe with glued joints</li><li>• Includes schedule 40 DWV</li><li>• Inventory black plastic (ABS) in this category</li><li>• Estimate quantity for entire building</li><li>• Section Name: PVC Waste Piping</li></ul>	

### **E.      Inventory D2040 Rain Water Discharge**

Rain water discharge component section inventory includes interior metal or plastic piping from roof drains. It does not include exterior rain gutters or exterior piping.

Inventory is optional.

Typical system components on USAF bases are:



1. Equipment Category: D204001 Pipe & Fittings

Component Subtype: General

Quantity: LF      Year installed/Renewed: EST

Inventory Notes:

- Typically cast iron, bell & spigot in older buildings, no hub band in newer buildings
- May also be plastic
- Section Name: Rain Water Drain – Interior
- Section Name required



## F. Inventory D2090 Other Plumbing Systems

There are no D2090 Other plumbing systems components inventoried or assessed. These items are normally considered process or mission related.

## III. Assessment

### A. General D20 Assessment Guidance

Plumbing Component Sections are assessed using Direct Condition Rating (DCR). Most plumbing Component Sections will be 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 life cycle degradation curves built-in to the software to establish the Condition Index (CI).

When plumbing Component Sections are visible, they should be assessed. The on-site assessment is determined based on the assessor's observations compared to the Direct Condition Rating (DCR) Definitions chart for major components D2010, D2020, D2030 and D2040. The "Rating" reflects observed deterioration, impact on operation, and repair requirements based on the chart (next page), and the assessor's professional judgment. When determining the "Rating," the assessor should consider the quantity and severity of conditions or distresses observed.

**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™ SMS calculates condition.**

The following conditions or events can accelerate plumbing component deterioration and should be considered by the assessor:

- Improper construction or installation
- Damage or misuse
- Corrosion
- Lack of preventive maintenance
- Water treatment issues

Boiler and Unfired Pressure Vessels are inventoried in D30 – HVAC. Refer to that section.

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

Some thought may be required regarding deterioration and operational loss along with level of repair. Total operational loss may occur due to some minor reason (e.g. failed switch, failed pump motor, etc.). In these cases the overall component section condition may be “Green” when only a minor fix will correct the problem.

## B. Assessment D2010 Plumbing Fixtures

Below are assessment hint questions to help the assessor determine the most appropriate DCR and examples of common distresses.

### D2010 Assessment Hint Questions

- What distresses or problems are observed?
- What is the quantity and severity of the distresses?
- Is the plumbing system/component operating properly?
- Will repairs preserve or extend the remaining service life of the component?

Based on above:

- Select a DCR from the chart.
- If assessment "Rating" is **Amber +** or below, enter an Inspection Comment to describe the reason. Photographs documenting the defects must be taken and attached to the assessment. An Inspection Comment should also be entered regardless of DCR if a significant localized issue needs to be highlighted, which may not necessarily impact the overall Component Section DCR.

Note: A large building will have a significant number of plumbing fixtures; the assessor should use judgment in assigning the "Rating" based on the overall condition of fixtures of a specific Component Section. Do not assign a low rating based on a single damaged fixture. Consider entering a damaged fixture as a separate Component Section.

Examples of typical plumbing fixture distresses or conditions include:

1. Typical Distress: Broken/Damaged	2. Typical Distress: Displaced
	

3. Typical Distress: Corrosion, Missing Housing



4. Typical Distress: Operationally Impaired



5. Typical Distress: Leaking Watercloset



6. Typical Distress: Operationally Impaired – Broken Valve



### C. Assessment D2020 Domestic Water Distribution

Below are assessment hint questions to help the assessor determine the most appropriate DCR and examples of common distresses.

### D2020 Assessment Hint Questions

- What distresses or problems are observed?
- What is the quantity and severity of the distresses?
- Does the system operate properly?
- Will repairs preserve or extend the remaining service life of the component?

Based on above:

- Select a DCR "Rating" from the chart.
- If assessment "Rating" is **Amber +** or below, enter an Inspection Comment to describe the reason. Photographs documenting the defects must be taken and attached to the assessment. An Inspection Comment should also be entered regardless of DCR, if a significant localized issue needs to be highlighted, which may not necessarily impact the overall Component Section DCR.

Examples of typical domestic water distribution system distresses or conditions include:

1. Typical Distress: Leaks, Insulation Missing



2. Typical Distress: Failed Water Heater Flue Vent Gas Vapor Accumulation in Mechanical Room





3. Typical Distress: Leaking Pump



4. Typical Distress: Corroded



5. Typical Distress: Hose Bib Leaking



6. Typical Distress: Corroded & Leaking



6. Typical Distress: Water Heater PRV not Correctly Plumbed



7. Typical Distress: Corroded & Leaking



## D. Assessment D2030 Sanitary Waste

Below are assessment hint questions to help the assessor determine the most appropriate DCR and examples of common distresses.




### D2030 Assessment Hint Questions

- What distresses or problems are observed?
- What is the quantity and severity of the distresses?
- Does the system operate properly?
- Will repairs preserve or extend the remaining service life of the system?

Based on above:

- What are the SRM needs for preventive maintenance, repairs, rehabilitation, or replacement? (See DCR definitions chart).
- Is serviceability or reliability reduced? (See DCR definitions chart).
- Select a DCR from the chart.
- If assessment "Rating" is **Amber +** or below, enter an Inspection Comment to describe the reason. Photographs documenting the defects must be taken and attached to the assessment. An Inspection Comment should also be entered regardless of DCR, if a significant localized issue needs to be highlighted, which may not necessarily impact the overall Component Section DCR.

Examples of typical sanitary waste system distresses or conditions include:

1. Typical Distress: Corrosion	2. Typical Distress: Broken Pipe
	
3. Typical Distress: Leak	
	

## E. Assessment D2040 Rain Water Drainage Sections

Below are assessment hint questions to help the assessor determine the most appropriate DCR and examples of common distresses.

### D2040 Assessment Hint Questions

- What distresses or problems are observed?
- What is the quantity and severity of the distresses?
- Does the system operate properly?
- Will repairs preserve or extend the remaining service life of the system?

Based on above:

- What are the SRM needs for preventive maintenance, repairs, rehabilitation, or replacement? (See DCR definitions chart).
- Is serviceability or reliability reduced? (See DCR definitions chart).
- Select a DCR from the chart.
- If assessment "Rating" is **Amber +** or below, enter an Inspection Comment to describe the reason. Photographs documenting the defects must be taken and attached to the assessment. An Inspection Comment should also be entered regardless of DCR, if a significant localized issue needs to be highlighted, which may not necessarily impact the overall Component Section DCR.

Examples of typical rainwater drainage system distresses or conditions include:

#### 1. Typical Distress: Ponding due to Clogged Roof Drain



## F. Assessment D2090 Other Plumbing Systems Sections

There are no D2090 components currently inventoried or assessed.

## IV. Inventory and Assessment Rules of Thumb

### A. Assessor Qualifications

- The assessor should have 5+ years of experience related to building plumbing systems or be equivalent to a Journeyman, a V Level Technician, or Civil or Mechanical Engineer. The assessor should be able to identify common plumbing system components, including domestic water systems, understand how they



operate and have experience planning or performing plumbing systems maintenance, improvements or repairs.

## **B. Year Installed**

- In some cases plumbing 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 component age must be estimated. The building facility manager, occupants or shop staff may be able to provide some information.
- Additions, new wings or major renovations likely require identifying a separate plumbing section with a different age.
- Toilets: Low flow toilets (1.6 gallons per flush, 1.6 gpf) and urinals (1 gpf) date from the mid– 1990's when water conservation picked up. The fixture will be stamped 1.6gpf or 1gpf accordingly.
- Toilets: Toilets often have the date of manufacture embossed or stamped in the tank just under the lid.
- Water Heaters: Most water heaters have the date of manufacture coded into the serial number. For date decoding check: <http://www.rmnahi.org/WaterHeaterSerialNumberDecoder.pdf> and <http://www.fastwaterheater.com/waterheatermodels.asp>. and for Lochinvar: <http://www.lochinvar.com/linefiles/WARR-14.pdf>
- Water Distribution Pipe: Galvanized pipe was used through the 1950's. Copper came into use in the 1960's and is still used today. Plastic (PVC, CPVC and PE) came into use in the 1970's and is still used today.
- Sanitary Waste: Bell & Spigot cast iron pipe (3" and up) with galvanized pipe branches (1-1/4" to 2") was used through the 1950's. Copper came into use in the 1960's and is still used today though not often due to cost. Plastic (PVC white and ABS black) pipe came into use around 1970. Many commercial buildings today are piped with cast iron No Hub Band.

## **C. Inventory/Assessment**

- Typical section names used to describe the major areas of the building include: 1FL, 2FL, BASEMENT, MEZZANINE, ROOF, WING "X", etc.
- Typical Section Names used to describe plumbing components may be used where capacity is not included in the BUILDER™ SMS dropdown or a unique component exists such as PUMP-1, etc.
  - An emergency eyewash and safety shower combination unit count as both an eyewash and a safety shower.
  - A combination tub and shower unit count as both a tub and a shower.
  - Do not inventory:
    - Water heaters less than 20 gallons
    - Point of use (flash) water heaters
    - Floor mounted (free standing) water coolers
    - Small (less than 5 gallon) expansion tanks
    - Plastic (fiberglass) laundry sinks

- Washer hook-ups (include in piping estimate)
- Free standing fixtures that serve the mission not the building such as kitchen 3 compartment sinks, galley steam kettles, scullery dishwashers, clothes washers
- Air compressors
- Kitchen Sinks are often double bowl which is not an option in BUILDER™ SMS. Add an Inventory Comment indicating the unit is a single or double bowl.
- ABS (black plastic drain, waste, vent pipe) is not an option in BUILDER™ SMS. Enter as PVC (white plastic DWV pipe) as these are similar in cost and longevity.
- Group Shower—Two or more shower fixtures in a common shower room (often ceramic tile) are considered a group shower with the quantity being the number of shower heads and finish for example: “This is a 6 shower head, ceramic tile, group shower”.
- Very large hot water tanks can be water heaters or hot water storage tanks. A water heater will have a pair of steam or hot water pipes entering the tank into a shell and tube heat exchanger to transfer heat to the water in the tank, as well as an inlet and outlet pipe. A hot water storage tank will only have an inlet and outlet pipe.
- Large Tank Volume: For large water heater tanks or storage tanks the volume can be calculated by measuring the length or height and the radius (1/2 the diameter) and using the following formula  $\pi (3.142) \times \text{Radius}^2 \times \text{Length (or Height)} / 7.48$  (Gal/Ft<sup>3</sup>). A graphic calculator is available at: <http://www.mathopenref.com/cylindervolume.html>
- Even though boilers can provide domestic hot water or heating hot water; they are all entered in D30. Check for labeling on the unit or the piping and coordinate with assessor covering D30 HVAC.

## V. Inventory / Assessment Data Collection Sheets

The following data collection forms are included as a recommendation and may also be found in the AFCEC BUILDER™ SharePoint Site Documents Library. Many assessors also use floor plans or a notebook. Use whatever collection method works best for the individual assessor.

(See Next Page)

<b>Building #:</b>				<b>Date:</b>					
<b>SF:</b>				<b>24/7:</b>					
<b>Contact:</b>									
<b>Fire:</b>								BRED SCORE	WHY
Pull Stations:									
Smoke Detectors:									
Heat Detectors:									
Duct Detectors:									
Fire Strobes:									
Fire Strobe/Annunciator Combo:									
MNS Strobes:									
MNS Strobe/Annunciator Combo:									
Annunciator:									
Sprinkler Riser:									
Fire Panels:									
Extra Sprinklers:	Area:			SF:					
<b>Water:</b>									
Lavatory:									
Water Closet:									
Urinal:									
Kitchen Sink:									
Shower:									
Mop Sink:									
Water Fountain:									
Water Heaters:	Type:				# Gallons:				
Recirc Pumps:									
Wash Stations:									
Eye Wash Stations:									

## VI. D20 UNIFORMAT II 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 Direct Condition Rating 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, provides information on a component's condition assessment. Preventive Maintenance Task Lists (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 the SMS but should not be more often than an annual assessment.

AMP reflects the AMP to which the component is assigned:

F: Facility AMP

D	SERVICES				DEFINITION						
Unf L1	Unf L2	Unf L3	WBS L4		Includes all methods of conveying, plumbing, HVAC, fire protection, and electrical.	In Builder/ Fueler/ Paver/ Railer/ Utility	PM Inspection/ Testing Directive	Insp/ Assess Freq	SMS Type Insp	Assessment Method	AMP/ Sub-AMP
	D20	PLUMBING			The plumbing system's primary function is the transfer of liquids and gases. This system includes all water supply and waste items within the building.						
		D2010	PLUMBING FIXTURES		All terminal devices on the domestic plumbing system which have water supplied to the fixture. Hot water heaters, hose bibbs, and special equipment are not counted as a fixture.						
			D201001	WATERCLOSETS		B	N/A	5 yr	Direct	Visual	F/FW
			D201002	URINALS		B	N/A	5 yr	Direct	Visual	F/FW
			D201003	LAVATORIES		B	N/A	5 yr	Direct	Visual	F/FW
			D201004	SINKS	Group Wash Fountain, Kitchen, Laboratory, Laundry, Service, Stainless	B	N/A	5 yr	Direct	Visual	F/FW
			D201005	SHOWERS/TUBS	Bathtub, Combo Bath/Tub, Shower	B	N/A	5 yr	Direct	Visual	F/FW
			D201006	DRINKING FOUNTAINS & COOLERS		B	N/A	5 yr	Direct	Visual	F/FW
		D2020	DOMESTIC WATER DISTRIBUTION		This system provides for human health and comfort. The water supply needed is determined by the number of fixtures attached. Hot water heaters and special equipment are not counted as a fixture.						
			D202002	BACKFLOW PREVENTERS	This equipment prevents possibly contaminated / stagnant fire or mechanical system water from flowing back into potable water systems.	B	AFI 32-1066	5 yr	Direct	Visual	F/FW
			D202003	DOMESTIC WATER EQUIPMENT	This assembly includes equipment associated with the domestic water supply, including fittings, and specialties required for hook-up. Assemblies include hot water heaters and water treatment plant; pumps directly associated with domestic water supply; and tanks for the potable hot or cold water system. The unit of measure at the assembly level is pieces of equipment.	B	N/A	5 yr	Direct	Visual	F/FW