Welcome to Mechanical Commissioning (Cx) / System Acceptance

Moderator: Charysse Knotts, Black & Veatch
Speaker:
• Dawn Landon, P.E., Commissioning SME, NAVFAC EURAFSWA
Topics

Acceptance Testing

- UFC 1-200-03
- ASHRAE 189.1
- ECB 2018-03

What Cx SME does

- Acceptance Testing-DALT, TAB, ACATS
- Commissioning Oversight

When to engage Cx SME *

- Chart
UFC 1-200-02 HPSB

UFC 1-200-02 with Change 03

High Performance & Sustainable Building Requirements

07 SEP 2018
1-4  UFC APPLICABILITY

This UFC applies to all planning, design and construction, renovation, repair, operations and maintenance, and affixed equipment installation in new and existing buildings, regardless of funding source, that result in DOD real property assets. Table 1-“Compliance/Requirements Thresholds” is applicable to all methods of project delivery and levels of construction.

Apply this UFC to the following construction activities to the greatest extent practical:

- Buildings outside of United States and U.S. territories.
- Buildings supporting contingency
- Non-permanent buildings.
- Projects with DD1391marked “austere”.
- Military Operations in Urban Terrain (MOUT) buildings (i.e., mock villages)

Comply with Table 1-1:
### Table 1-1 Compliance Requirement/Thresholds

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Thresholds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 1</td>
<td>All design and construction activity(^1); and assessments of existing buildings larger than 5,000 SF.</td>
</tr>
<tr>
<td>Chapter 2</td>
<td>All design and construction activity(^1)</td>
</tr>
<tr>
<td>Chapter 3</td>
<td>Assessments of existing building assets larger than 5,000 SF.</td>
</tr>
</tbody>
</table>
| Chapter 4 Tracking\(^1\) of HPSB Guiding Principles Compliance (use Component HPSB Checklist\(^2\))/\(^1\) | 1. Each new building\(^1\)/\(^1\)/  
2. Each renovation\(^3\) in an existing building larger than 5,000 SF, with \(^1\)\(^\text{total}\)/\(^1\)/ cost greater than $3M\(^5\) and 50\% ERC\(^6\), and with comprehensive replacement\(^3\) (include additions that are part of the building renovation)  
3. Assessments of existing building assets over 5,000 SF. \(^1\)\(^V1\)/  
1. Each new building larger than 5,000 SF, with construction cost greater than $3M\(^5\), unless Component policy is more stringent\(^7\).  
2. Each renovation\(^3\) in an existing building larger than 5,000 SF, with \(^1\)\(^\text{total}\)/\(^1\)/cost greater than $3M\(^5\) and 50\% ERC\(^6\), and with comprehensive replacement\(^3\) (include additions that are part of the building renovation). |
| Appendixes                                        | All projects as applicable.                                                                                                             |
Table 1.1 Note 1

New work under 5000 SF, additions, sustainment, modernization, and restoration building improvements must comply with UFC requirements relevant to the scope of the project/work, as determined by the Project Delivery Team as early as possible during project process.

PDT includes GOVT stakeholders.
DEFINITION OF TERMS, per DOE Guidance 42 USC 8253(f)

**Commissioning:** “The commissioning process ensures that all of the **equipment and systems** within a facility are currently **operating and functioning properly**, and identifies items that need to be fixed or adjusted, typically in a low or no cost fashion.”

**Recommissioning:** “The process of commissioning a **previously commissioned facility or system** after expiration of the project development and warranty phase. The primary goal of recommissioning is to optimize facility performance, in accordance with design or operating needs, over the useful life of the facility.”

**Retrocommissioning:** “The retroactive commissioning of **equipment or a system that was not commissioned at the time of installation** or during the warranty phase. Typically, retrocommissioning is performed long after the facility is constructed and place into service.”
2-1.2 Work in Existing Buildings

For existing building renovation, operations and maintenance; sustainment, restoration, and modernization, the goal is to improve the performance of the existing building inventory with every investment. Project teams must meet the requirements of this UFC relative to systems and components …
2-2.2 Commissioning.
In order to verify design and performance, and ensure that the Government requirements are met, employ commissioning practices *appropriate to the size and complexity* of the building and its system components. This *must* include an experienced commissioning provider, who *should be independent of the project design and construction team*, and the operations team. The choice of either contracted services or Government personnel to serve as the commissioning provider will be determined at project level.

Meet the requirements of **ASHRAE 189.1 Section 10.3.1.2** (Building Project Commissioning), with the following modifications:

- For buildings and systems that are less complex, commissioning may be tailored as determined by the DOD Component AHJ.
- “**Schematic design**” is the design charrette or similar conceptual design activity prior to completion of 35% design.
UFC 1-200-02

For buildings and systems that are less complex, commissioning may be tailored as determined by the DOD Component AHJ.

UFGS 01 91 00.00 15

Very small or non-complex projects may not require commissioning to the extent called for in this specification section. In such cases, coordinate with the Government PM to determine the appropriate level of commissioning and edit the specification accordingly.
Appendix B

B-6.2 TPC Training

It is highly recommended that all designers and construction managers take one of the online training webinars for third party certification or validation programs, offered by third party vendors.
Standard for the Design of High-Performance Green Buildings
10.3.1.2 Building Project Commissioning.

For buildings that exceed 5000 ft² (500 m²) of gross floor area, commissioning shall be performed in accordance with this section using *generally accepted engineering standards* and handbooks acceptable to the AHJ. Buildings undergoing the Cx process will be deemed to comply with the requirements of Section 10.3.1.1, “Building Acceptance Testing.”
10.3.1.1 Building Acceptance Testing.

Acceptance testing shall be performed on all buildings in accordance with this section using generally accepted engineering standards and handbooks acceptable to the authority having jurisdiction (AHJ).

An acceptance testing process shall be incorporated into the design and construction of the building project that verifies systems specified in this section perform in accordance with construction documents.
Acceptance Testing of Critical Systems
System acceptance is an end-to-end process that begins at receipt of initial design submittals and is completed with final performance testing of the system prior to beneficial occupancy.
Technical Oversight and Acceptance Testing of Critical Systems

NAVFAC has identified five critical systems:

- HVAC
- Electrical
- Fire protection/life safety
- Roofing
- Underwater structures
Technical Oversight and Acceptance Testing of Critical Systems

HVAC critical sub-systems:

a. Ductwork Air Leakage and Tests (DALT) of all air moving systems.

b. Testing, Adjusting, and Balancing (TAB) of all HVAC systems.

c. Performance Verification Testing (PVT) of all energy consuming systems and HVAC control systems.

d. Interface HVAC control systems with cyber requirements
Acceptance Testing Terminology

Quality Control
• Means The Contractor Uses To Ensure Construction Complies With Contract Requirements
• Commissioning Is A Contractor Quality Control Function
• Contractor Quality Control Occurs Before Government Quality Assurance

Quality Assurance
• Means The Government Uses To Validate Contractor’s Quality Control
• Acceptance Program Is A Government Quality Assurance Function
• Government Quality Assurance Occurs After Contractor Quality Control
# Acronyms

## Acceptance Program Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DALT</td>
<td>Ductwork Air Leakage Test</td>
</tr>
<tr>
<td>TAB</td>
<td>Testing, Adjusting, &amp; Balancing</td>
</tr>
<tr>
<td>ACATS</td>
<td>Automatic Controls Acceptance Tests</td>
</tr>
<tr>
<td>PVT</td>
<td>Performance Verification Test</td>
</tr>
</tbody>
</table>

## Other Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cx</td>
<td>Commissioning</td>
</tr>
<tr>
<td>CxA</td>
<td>Commissioning Authority</td>
</tr>
<tr>
<td>FPT</td>
<td>Functional Performance Test</td>
</tr>
<tr>
<td>TABS</td>
<td>Testing, Adjusting, Balancing, &amp; Start-up</td>
</tr>
</tbody>
</table>
Supported Systems / Sub-systems

Mechanical Systems:

Ductwork Leakage Testing (DALT) For All Air Moving Systems

Automatic Controls And Testing (ACATS) For HVAC Hot Water, Chilled Water, Geothermal, Energy Recovery, And Air Moving Systems

Test and Balance Acceptance (TAB) Testing For All Air Moving Systems, All Water Moving Systems, And Facility Pressurization
Technical Oversight and Acceptance Testing of Critical Systems

• Reference: (a) ECB 2007-01
  – Proper use of Military Construction Funds, 13 October 2006
• BMS
• Cancels 2008-03
Systems Acceptance Program Defined

- **Technical Resource** to **Construction Managers** for Issues During Construction for Supported Systems / Subsystems

- Provide Supplemental **Quality Assurance** focused on ensuring that KTR’s Contractor Quality Control (CQC) Program delivers high quality and functioning systems.

- Provide Facility **Acceptance Recommendation** to Construction Manager **After Completion** of Acceptance Field Work, Prior to Beneficial Occupancy
Systems Acceptance Program Defined

Pre-Field Work Tasks Include:

- Perform Limited **Contract Document Review** Focusing On DALT, ACATS, And TAB Issues
- Perform DALT, ACATS, And TAB **Submittal Reviews**

Field Work Tasks Include:

- Ductwork Air Leakage Tests (DALT’s)
- Automatic Controls And Tests (ACATS or PVT)
- Test And Balance (TAB) Verification

Post Field Work Tasks Include:

- Document Issues Identified During Field Work
- Provide **Acceptance Recommendation**
## How to read it

<table>
<thead>
<tr>
<th>UFCs</th>
<th>RFP Sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-401-01 Mechanical Engineering</td>
<td>Pt 3 1.0 Project Description</td>
</tr>
<tr>
<td>3-410-01 HVAC Systems</td>
<td>Pt 3 2.3.4 Building Commissioning</td>
</tr>
<tr>
<td>4-010-01 ATFP</td>
<td>Pt 3 ESRs D20, D30, G30, Z10</td>
</tr>
</tbody>
</table>
How to read it

UFGS Sections

• 01 33 00.05 20—Construction Submittal Procedures
• 01 33 10.05 20—Design Submittal Procedures
• 01 45 00.05 20—Quality Control
• 01 91 00.15—Total Building Commissioning

• 23 00 00—Air Supply, Distribution, Ventilation and Exhaust Systems
• 23 05 93—TAB for HVAC
• 23 09 00—Instrumentation and Control for HVAC
Limitations

Contract Enforcement:

• Limited To Serving As A *Technical Resource* To Construction Managers For DALT, ACATS, And TAB Contract Issues

• Construction Managers *Perform Contract Enforcement*

Technical Corrections:

• Limited To Providing Issue Description, Identification Of Contract Or Building Code Requirement, And Evaluation Of Proposed Correction

• Contractor Responsible For Design And Installation Corrections
Commissioning Tasks

Regardless of Contract Type

- Develop Cx Plan
- Review Contract Documents
- Observe and Document System Installation
- Prepare and Oversee PFC
- Prepare and Oversee FPT
- Prepare Final Cx Report
Commissioning Oversight

- Reviews the Cx Plan for contract compliance
- Verifies KTR understanding of the requirements
- Supports scheduling of critical AT activities
- Monitors KTR Cx efforts with Cx team
- Monitors Cx issues to resolution

**Recommended actions:**
- Present Cx and AT requirements at PAK/CDW meeting
- QA Site Observation to coincide with DALT
- Focus on Sequence of Operations early as possible
Why Does PVT Fail?

» SCHEDULE!!!
  – Cx timeline
  – TAB and CxA

» Planning
  – PVT test plan
  – Familiarity

» “Not knowns”
  – Contract
  – References
  – NAVFAC expectations

» Quality deficiencies
  – Qualifications
  – Trade practices
  – Coordination

Change
  – “We’ve always done it this way.”
  – “We never had to before.”
  – Assume requirements

» Fear
  – Budget
  – Schedule
  – Perception
# Who does what, by Cx Level

<table>
<thead>
<tr>
<th>NAVFAC terminology, recommended</th>
<th>BASIC</th>
<th>FUNDAMENTAL</th>
<th>ENHANCED</th>
<th>CRITICAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMACNA terminology</td>
<td>Level 1 Basic</td>
<td>Level 2 Comprehensive</td>
<td>Level 3 Critical</td>
<td></td>
</tr>
<tr>
<td>LEED terminology</td>
<td></td>
<td>Fundamental</td>
<td>Enhanced</td>
<td>Enhanced</td>
</tr>
<tr>
<td>funding source:</td>
<td>SIOH</td>
<td>PCAS</td>
<td>PCAS</td>
<td>PCAS</td>
</tr>
</tbody>
</table>

| Cx Provider                  | qualified ktr | disinterested 3rd party | independant 3rd party independant 3rd party |

| CxA/Provider hired by:       | KTR           | KTR                 | KTR or GOVT      | GOVT              |
| GOVT Liaison-Design          | PM/DM         | PM/DM               | PM/DM/SME        | PM/DM/SME         |
| GOVT Liaison-Construction    | CM/ET         | CM/ET               | CM/ET/SME        | CM/ET/SME         |
| DALT/TAB/ACATS submittal review | SME       | SME                 | SME              | SME               |
| DALT field test              | CM/ET         | CM/ET               | SME              | SME               |
| TAB verification             | CM/ET         | CM/ET               | SME              | SME               |
| ACATS/DDC                    | N/A           | SME                 | SME              | SME               |
| GOVT Liaison-Acceptance      | CM            | SME                 | SME              | SME               |
## Typical Support Provided

### Document Development
- **RFP Preparation**
  - Basic: SME
  - Fundamental: SME
  - Enhanced: SME
  - Critical: SME

### Design Support-in-house, AE or KTR team
- **Mechanical Systems Acceptance Testing**
  - Basic: DM
  - Fundamental: DM
  - Enhanced: SME
  - Critical: SME
- **Mechanical Design Support**

### Construction Support
- **Quale/Cert acceptance-Cx, MOCS, TAB, DDC**
  - Basic: Y
  - Fundamental: SME
  - Enhanced: SME
- **Construction Baseline Schedule review, Cx tasks**
  - Basic: Y
  - Fundamental: SME
  - Enhanced: SME
- **PreCon MUM**
  - Basic: N
  - Fundamental: SME
  - Enhanced: SME
  - Critical: SME
- **SOO MUM**
  - Basic: N
  - Fundamental: SME
  - Enhanced: SME
  - Critical: SME
- **Periodic QA Inspections**
  - Basic: Y
  - Fundamental: SME
  - Enhanced: SME
- **Commissioning MUM**
  - Basic: Y
  - Fundamental: SME
  - Enhanced: SME
  - Critical: SME
- **DALT-Plan, Witness, Report**
  - Basic: SME
  - Fundamental: SME
  - Enhanced: SME
  - Critical: SME
- **Red Zone**
  - Basic: Y
  - Fundamental: SME
  - Enhanced: SME
- **Commissioning Plan**
  - Basic: N
  - Fundamental: SME
  - Enhanced: SME
- **Pull Planning Schedule**
  - Basic: N
  - Fundamental: SME
  - Enhanced: SME
- **TAD-Plan, TAD Verification, Report**
  - Basic: SME
  - Fundamental: SME
  - Enhanced: SME
  - Critical: SME
- **ACATS**
  - Basic: SME
  - Fundamental: SME
  - Enhanced: SME
  - Critical: SME
- **Trend Reports**
  - Basic: SME
  - Fundamental: SME
  - Enhanced: SME
  - Critical: SME
- **Punchlist**
  - Basic: SME
  - Fundamental: SME
  - Enhanced: SME
  - Critical: SME
- **Final Inspection**
  - Basic: SME
  - Fundamental: SME
  - Enhanced: SME
  - Critical: SME
- **PVF-Plan, Witness, Report**
  - Basic: SME
  - Fundamental: SME
  - Enhanced: SME
  - Critical: SME
- **Commissioning Report**
  - Basic: SME
  - Fundamental: SME
  - Enhanced: SME
  - Critical: SME

### Required Documents for Support:
- **Conformed RFP w/ Proposal, Part 1 (pre-award RFIs)**
- **IFC Plans, Specs, BOD**

### Key:
- SME: Mandatory support
- Y: Recommended SME engagement
- o: Optional SME engagement
- N: None expected
- Y: Minimum activity for SME
- ○: Required by ECB 2009-03
## Typical Cx Support – Pre-Construction

<table>
<thead>
<tr>
<th>Cx Effort: Basic Fundamental Enhanced Critical</th>
<th>Basic</th>
<th>Fundamental</th>
<th>Enhanced</th>
<th>Critical</th>
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</thead>
<tbody>
<tr>
<td><strong>Document Development</strong></td>
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<tr>
<td>RFP Preparation ♥</td>
<td>SME</td>
<td>SME</td>
<td>SME</td>
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<tr>
<td><strong>Design Support-In-house, AE or KTR team</strong></td>
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<tr>
<td>Mechanical Systems Acceptance Testing</td>
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<td>SME</td>
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<tr>
<td>Mechanical Design Support</td>
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</table>
## Typical Cx Support – Construction

<table>
<thead>
<tr>
<th>Activity</th>
<th>SME</th>
<th>SME</th>
<th>SME</th>
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<tbody>
<tr>
<td>Quals/Certs acceptance-CxA, MQCS, TAB. DDC</td>
<td>o</td>
<td>Y</td>
<td>SME</td>
<td>SME</td>
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<tr>
<td>Construction Baseline Schedule review, Cx tasks</td>
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<td>o</td>
<td>o</td>
<td>SME</td>
</tr>
<tr>
<td>PreCon MUM ♥</td>
<td>N</td>
<td>SME</td>
<td>SME</td>
<td>SME</td>
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<tr>
<td>SOO Mum ♥</td>
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<td>SME</td>
<td>SME</td>
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<td>Periodic QA Inspections</td>
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<td>o</td>
<td>Y</td>
<td>SME</td>
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<tr>
<td>Commissioning MUM</td>
<td>o</td>
<td>Y</td>
<td>SME</td>
<td>SME</td>
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<td>DALT-Plan, Witness, Report ♥ ☽</td>
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<td>SME</td>
<td>SME</td>
<td>SME</td>
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<tr>
<td>Red Zone</td>
<td>o</td>
<td>o</td>
<td>Y</td>
<td>SME</td>
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<td>Commissioning Plan</td>
<td>N</td>
<td>o</td>
<td>SME</td>
<td>SME</td>
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<tr>
<td>Pull Planning Schedule</td>
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<td>o</td>
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<td>SME</td>
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<td>TAB-Plan, TAB Verification, Report ♥ ☽</td>
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<td>ACATS ♥ ☽</td>
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<td>SME</td>
<td>SME</td>
<td>SME</td>
</tr>
<tr>
<td>Punchlist</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>SME</td>
</tr>
<tr>
<td>Final Inspection</td>
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<td>o</td>
<td>o</td>
<td>SME</td>
</tr>
<tr>
<td>PVT-Plan, Witness, Report ♥ ☽</td>
<td>CM/ET</td>
<td>SME</td>
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<td>N</td>
<td>o</td>
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## Cx Support Legend

### Required Documents for support:

<table>
<thead>
<tr>
<th>Key</th>
<th>SME</th>
<th>Mandatory support</th>
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<tbody>
<tr>
<td>Y</td>
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<td>Recommended SME engagement</td>
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<tr>
<td>o</td>
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<td>optional SME engagement</td>
</tr>
<tr>
<td>N</td>
<td></td>
<td>none expected</td>
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<tr>
<td>♥</td>
<td></td>
<td>minimum activity for SME</td>
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<tr>
<td>☀</td>
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<td>required by ECB 2009-03</td>
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- **Conformed RFP w/ Proposal, Part 1 (pre-award RFIs)**: Y
- **IFC Plans, Specs, BOD**: o
## Cx Guidelines by Facility Type

<table>
<thead>
<tr>
<th>Facility Type</th>
<th>BASIC</th>
<th>FUNDAMENTAL</th>
<th>ENHANCED</th>
<th>CRITICAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Vehicle Storage Garage</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aircraft Maintenance Facility</td>
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<tr>
<td>Fire Station</td>
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<td>Warehouse</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Data Processing Center</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Hospital/Health Care facility</td>
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<td>x</td>
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<tr>
<td>Laboratories</td>
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<td>Fitness Centers</td>
<td></td>
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<td>x</td>
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<tr>
<td>Aircraft Hangers</td>
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<tr>
<td>Laundries &amp; Dry Cleaners</td>
<td></td>
<td>x</td>
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<td></td>
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<tr>
<td>Dining Facilities/Commercial Kitchen</td>
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<td>x</td>
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<tr>
<td>Child Development Center</td>
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<tr>
<td>Housing/Quarters (hotel style)</td>
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<tr>
<td>Headquarters/office</td>
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<tr>
<td>Parking Structure</td>
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<tr>
<td>Classrooms</td>
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<tr>
<td>Residential</td>
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## Cx Guidelines by System Type, simple to complex

<table>
<thead>
<tr>
<th>System Type</th>
<th>BASIC</th>
<th>FUNDAMENTAL</th>
<th>ENHANCED</th>
<th>CRITICAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating only (no AC)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single or Split AC Units - Small room AC</td>
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<tr>
<td>Roof top package unit(s)</td>
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<tr>
<td>Central Station Air Handler</td>
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<tr>
<td>Central Station Air Handler w/LEED</td>
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<tr>
<td>Chilled Water Systems</td>
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<tr>
<td>Chilled Water Systems w/LEED</td>
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<tr>
<td>Standalone Control Systems</td>
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<tr>
<td>Central Control Systems (Networked ie: AWEMS)</td>
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<tr>
<td>Central Plant</td>
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<tr>
<td>Critical Facilities ie: HQ, Hospital, Data Processing Facility</td>
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<tr>
<td>High Pressure/Volume Duct System ie: shops</td>
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# Cx Guidelines by System Type, grouped by effort

<table>
<thead>
<tr>
<th>System Type</th>
<th>BASIC</th>
<th>FUNDAMENTAL</th>
<th>ENHANCED</th>
<th>CRITICAL</th>
</tr>
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<tbody>
<tr>
<td>Heating only (no AC)</td>
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<tr>
<td>Single or Split AC Units - Small room AC</td>
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<tr>
<td>Roof top package unit(s)</td>
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<td>Central Station Air Handler</td>
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<td>Central Control Systems (Networked ie: AWEMS)</td>
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<tr>
<td>High Pressure/Volume Duct System ie: shops</td>
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<td>Central Plant</td>
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<tr>
<td>Critical Facilities ie: HQ, Hospital, Data Processing Facility</td>
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</table>
## Cx Guidelines by Equipment & Features

<table>
<thead>
<tr>
<th></th>
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<th>FUNDAMENTAL</th>
<th>ENHANCED</th>
<th>CRITICAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simplest controls-switch, Tstat</td>
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<tr>
<td>Exhaust fan</td>
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<tr>
<td>Reheat/Energy Recovery</td>
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<td>x</td>
<td></td>
<td></td>
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<tr>
<td>Economizer</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Redundant systems</td>
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<tr>
<td>Humidification</td>
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<tr>
<td>Ground Coupled Heat Pumps</td>
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<tr>
<td>VAV AHU</td>
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<tr>
<td>Chiller</td>
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<tr>
<td>Boiler</td>
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<tr>
<td>Natural Ventilation</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Intermittent Operation</td>
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</tbody>
</table>
More Information

- NAVFAC Portal HQ CI Menu:
  CI Divisions>
  Engineering Communities>
  Mechanical>
  CIME Acceptance Testing

“Mechanical Acceptance Testing Program”
Mechanical Acceptance Testing Program

Reasons the Systems Acceptance Program Exists: To assist in meeting the requirements of Engineering and Construction Bulletin (ECB) 2008-03 – Acceptance Testing of Critical Systems to provide quality assurance through in-house acceptance testing of critical systems. The Acceptance Process is managed by Acceptance Engineers tasked with:

- Being a technical resource to Construction Managers for issues during construction
- Providing supplemental quality assurance to ensure the effectiveness of contractor’s quality control program and contractor’s commissioning process
- Providing a facility acceptance recommendation to Construction Manager after completion of field work and prior to establishing beneficial occupancy date

Supported Systems: The Acceptance Program supports quality assurance in-house testing of mechanical systems focusing on the following areas:

- Ductwork Air Leakage Testing (DALT) for all air moving systems
- Automatic Controls And Tests (ACATS) for HVAC hot water, chilled water, geothermal, energy recovery, and air moving systems
- Testing, Adjusting, and Balancing (TAB) verification for all air moving systems, all water moving systems, and facility pressurization

Acceptance Program Funding: Acceptance Program is funded from a portion of one-half of the funds reserved for Post Construction Award Services (PCAS) applicable to in-house technical oversight and acceptance testing identified in ECB 2008-03.

Acceptance Program Tasks: Acceptance Program tasks focus on issues related to DALT, ACATS, and TAB verification. These tasks include:

- Limited contract document review focusing on DALT, ACATS, and TAB issues
- Submittal reviews related to DALT, ACATS, and TAB
- Field work related to DALT, ACATS, and TAB
- Recommendation Acceptance

HVAC Acceptance Training

Acceptance Program training includes two modules presenting topics of interest unique to two groups. Copies of these modules can be obtained from NAVFAC Atlantic.

Module number one is Acceptance Engineer training typically lasting two hours that includes topics of interest to Acceptance Engineers who oversee the Acceptance Process that focuses on: Reasons the Systems Acceptance Program exists, Systems Acceptance Program defined, Commissioning, Systems Acceptance Program funding, Systems Acceptance Program resources

Module number two is Acceptance Program training typically lasting one hour that includes topics of interest to Project, Design, and Construction Managers that focuses on: Reasons the Systems Acceptance Program exists, Systems Acceptance Program defined, Commissioning, Systems Acceptance Program funding, Tracking the Systems Acceptance Program

Mechanical COP Pages

- Mechanical Home
- Criteria & Policy
- Design Resources
- Technical Knowledge
- Design Management
- CAD Details
- Acceptance Testing
- Community Management
- Training
- Mid-Atlantic CIME Page

Mechanical Acceptance POCs

- Tommy Norris, PE
- Mark Archer, PE
- Brian Derby, PE

Links and Resources

- UFGS 23 05 93 Testing, Adjusting, and Balancing for HVAC Incorporates DALT and TAB acceptance testing and submittal requirements
- UFGS 23 05 00 Instrumentation and Control for HVAC Incorporates PVT acceptance testing and submittal requirements
- ECB 2015-03 Technical Oversight and Acceptance Testing of Critical Systems
- BMS 1-6.7.1 Acceptance Testing for 5 Critical Areas
Commissioning Contact

Dawn Landon, P.E.

Dawn.Landon@eu.navy.mil

DSN 314.626.5610

Comm +39 081-568-5610

Cell +39 (348) 385-6687
UFGS 01 45 00 Quality Control

Commissioning Authority
Quality Control Manager
QC Specialists:

Mechanical
Elevator
Boiler
Building Envelope
Roofing
NOTE: This specification section was constructed to support Total Building Commissioning in accordance with UFC 1-200-02 using a commissioning specialist hired by the General/Prime Contractor.

This specification is intended to be provided with design-bid-build construction specifications or with design-build request for proposal specifications.

Very small or non-complex projects may not require commissioning to the extent called for in this specification section. In such cases, coordinate with the Government PM to determine the appropriate level of commissioning and edit the specification accordingly.

select the tailoring option for NAVY ACCEPTANCE ENGINEER
select the BUILDING ENVELOPE COMMISSIONING
select the systems to be commissioned
Mechanical QC Specialist

- **Area of Responsibility**
  - Testing of mechanical systems

- **Qualifications**
  - Registered Mechanical Engineer, (PE)

- **Frequency**
  - Required full-time during testing
  - Strongest recommendation to use throughout Design – Build
Mechanical QC Specialist

Specific duties

- Be thoroughly familiar with all contractual mechanical requirements stated in the RFP, Section D30 of the Performance Technical Specifications, UFC 3-400-10N, UFC 4-010-01, UFGS 23 05 93, UFGS 23 09 23 and CPRs.
- Provide Quality Control Surveillance of all aspects of mechanical testing including, but not limited to, piping hydrostatic testing, DDC Point-To-Point check-out, DDC PID Loop Tuning, Test, Adjust, Balance (TAB), and Building Commissioning.
- Be an active participant at all DDC, TAB, and Commissioning Meetings.
- Assist the Project QCM with oversight of mechanical system for compliance with contract criteria.
- Assist the Commissioning Agent and Mechanical Designer with review of the Test-Adjust-Balance Report and DDC Trend Analysis.
- Recommend 5 years NAVFAC Design-Build experience.
References

• ECB 2018-3

• RFP (ESR and PTS)
  – D20 Plumbing
  – D30 HVAC
  – G20 Utilities
  – Z10 General Requirements

• Local
  – Overseas
  – Host Nation
  – Base Exterior Architectural Plan
  – Base Architectural and Engineering Guide

• UFC ‘s
  – 3-401-01 Mechanical Engineering
  – 3-410-01 HVAC
  – 3-420-01 Plumbing
  – 4-010-01 ATFP

• UFGS’s
  – 01 45 00 QC
  – 01 91 00 TBC
  – 23 05 93 TAB
  – 23 09 23 DDC