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| **~~~~ SPECIFIER NOTES ~~~~~**  This specification guidelines, its sections, and text included, is intended to be used in the preparation of Contract Documents. It contains **Specifier Notes** which shall guide editing by the A/E consultant for the uniqueness of each project during the preparation of the Project Manual. Where **[Optional]** appears in this document, it indicates requirements which may/may not be relevant to the subject project depending upon the project complexity, scope, and unique conditions. For **DRAFT** specifications prepared during the design process, use Microsoft Word, Track Changes. Set Criteria so that deletion show as strikethrough. Deletions and additions are to be in red text.  Notes unique to this section:  *1. This section, and related commissioning provisions, is based on the following assumptions:*  *A. An independent Commissioning Agent will be engaged to prepare the Commissioning Plan, Commissioning Schedule, and the Training Plan; conduct reviews of the O&M data; prepare and approve filled-out Prefunctional Checklists; and prepare Functional Test procedures and witness Functional Tests.*  *B. The Contractor is responsible for startup reports, submitting the Prefunctional Checklists, and performing Functional Tests on each item to be commissioned. It is also assumed that Commissioning Plan, Prefunctional Checklists, and Functional Test procedures are not complete at the time of award of the construction contract.*  *2. This section was prepared for only broad general commissioning processes. It is the responsibility of the A/E, in coordination with the independent Commissioning Agent for fully integrating the project commissioning procedures and requirements throughout the Contract Documents.*  *3. When the project is planned to be completed before a system can be fully commissioned due to seasonal operation requirements, include necessary language in the 01 2000 for the Schedule of Values for the costs to be held until follow-on seasonal commissioning can be completed. Also address the incomplete work in section 01 7800 Closeout Submittals and Procedures as it will need to be addressed at Substantial and Final Completion.*  *4. If the project is to include Post Occupancy Commissioning due to Owner needs, or Commissioning Agent recommendations, discuss with DES PM if this work is to be included in the construction contact or provided by other means. If it is to be included, it must be clearly address in this section. Revise language as necessary in 01 2000 for the Schedule of Values for the costs for Post Occupancy commissioning. Also address the issue in section 01 7800 Closeout Submittals and Procedures as it will relate to achievement of Substantial and Final Completion.*  ***~~~ END OF SPECIFIER NOTES ~~~~*** |

SECTION 01 9113 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Commissioning is intended to achieve the following specific objectives; this section specifies the Contractor's responsibilities for commissioning:

1. Verify that the work is installed in accordance with Contract Documents and the manufacturer’s recommendations and instructions, and that it receives adequate operational checkout prior to startup: Startup reports and Prefunctional Checklists executed by Contractor are utilized to achieve this.

2. Verify and document that functional performance is in accordance with Contract Documents: Functional Tests executed by Contractor and witnessed by the Commissioning Agent are utilized to achieve this.

3. Verify that operation and maintenance manuals submitted to Owner are complete: Detailed operation and maintenance (O&M) data submittals by Contractor are utilized to achieve this.

4. Verify that the formal training, as required by the Contract Documents, has been presented to the Owner's operating personnel. Formal training conducted by Contractor is utilized to achieve this.

B. Commissioning, including Functional Tests, O&M documentation review, and training, is to occur after startup and initial checkout and be completed before Substantial Completion.

C. The Commissioning Agent directs and coordinates all commissioning activities; this section describes some but not all the Commissioning Agent's responsibilities.

D. The Commissioning Agent is employed by Owner.

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| **~~~~ SPECIFIER NOTES ~~~~~**  *A/E shall edit the following article to include a list of the systems, equipment, and other items to be commissioned. A sample list is included below. HVAC commissioning scope can also be defined in Section 23 0800 - Commissioning of HVAC.*  ***~~~ END OF SPECIFIER NOTES ~~~~*** |

1.02 SCOPE OF COMMISSIONING

A. The following are to be commissioned:

B. Building envelope:

1. Thermal and moisture integrity

2. Air tightness

C. Structural systems

D. Elevating and conveying systems

E. Fire Protection Systems

F. Plumbing Systems:

1. Water heaters

2. Booster pumps

3. Laboratory gas systems

4. Medical gas systems

5. Landscape irrigation

G. HVAC System, including:

1. Major and minor equipment items

2. Piping systems and equipment

3. Ductwork and accessories

4. Terminal units

5. Control system

6. Sound control devices

7. Vibration control devices

8. Variable frequency drives

H. Special Ventilation:

1. Fume hoods

2. Laboratory pressurization

3. Specialty fans

4. Egress pressurization

I. Electrical Systems:

1. Power quality

2. Grounding and bonding

3. Emergency standby power systems

4. Uninterruptible power systems

5. Lighting controls other than manual switches

6. Circuit breaker trip settings where electrical equipment includes adjustable settings

J. Electronic Safety and Security:

1. Security system, including doors and hardware

2. Fire and smoke alarms

3. Distributed Antenna Systems (DAS)

K. Communications:

1. Voice and data systems

2. Public address/paging

L. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.

M. Sound Transmission Class-rated interior partitions

1.03 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including the General Conditions for Washington State Facilities Construction and other Division 01 specification sections, apply to this section.

B. Section 01 3216 - Construction Progress Schedule: For incorporating Commissioning Schedule.

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| **~~~~ SPECIFIER NOTES ~~~~~**  *This section was prepared for use with meeting current required LEED format. If any other LEED or sustainable certification agency is to be used. A/E shall revise as appropriate.*  ***~~~ END OF SPECIFIER NOTES ~~~~*** |

C. Section 01 3329.02 - Sustainable Design Reporting - LEED: Reporting requirements relating to commissioning.

D. Section 01 7800 - Closeout Submittals and Procedures: Scope and procedures for operation and maintenance manuals and project record documents.

E. Section 01 9114 - Commissioning Agent Responsibilities.

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| **~~~~ SPECIFIER NOTES ~~~~~**  *Delete/revise the following article as appropriate.*  ***~~~ END OF SPECIFIER NOTES ~~~~*** |

F. Section 23 0800 - Commissioning of HVAC: HVAC control system testing; other requirements.

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| **~~~~ SPECIFIER NOTES ~~~~~**  *A/E shall edit/revise the following as appropriate for the scope of commissioning activities.*  ***~~~ END OF SPECIFIER NOTES ~~~~*** |

1.04 REFERENCE STANDARDS

A. [ANSI/RESNET/ICC 380](http://shop.iccsafe.org/ansi-resnet-icc-380-2016-standard-for-testing-airtightness-of-building-enclosures-airtightness-of-heating-and-cooling-air-distribution-systems-and-airflow-of-mechanical-ventilation-systems-1.html) - Standard for Testing Airtightness of Building Enclosures, Airtightness of Heating and Cooling Air Distribution Systems, and Airflow of Mechanical Ventilation Systems; 2016.

B. [ASHRAE Std 202](https://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=ASHRAE%20STD%20202) - Commissioning Process for Buildings and Systems; 2018.

C. [ASTM E336](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=ASTM%20E336) - Standard Test Method for Measurement of Airborne Sound Attenuation between Rooms in Buildings; 2019.

D. [ASTM E779](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=ASTM%20E779) - Standard Test Method for Determining Air Leakage Rate by Fan Pressurization; 2010 (Reapproved 2018).

E. [ASTM E1827](https://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=ASTM%20E1827) - Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door; 2011 (Reapproved 2017).

F. [CSI/CSC MF](http://www.csinet.org/Main-Menu-Category/CSI-Store/6) – Master Format; 2016.

G. [NEBB S110](http://www.nebb.org/resources/procedural_standards_for_whole_building_systems_technical_commissioning/) - Whole Building Technical Commissioning Of New Construction; 2018.

H. ANSI/NETA ATS-2017 Standard Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.

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| **~~~~ SPECIFIER NOTES ~~~~~**  When permanently installed electric welding equipment in community and technical college instructional facilities is part of the project scope, add the following reference standard:   1. ANSI Z49.1 – Standard for Safety in Welding, Cutting, and Allied Processes, 2012.   ***~~~ END OF SPECIFIER NOTES ~~~~*** |

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| **~~~~ SPECIFIER NOTES ~~~~~**  *A/E shall coordinate with the Commissioning Agent, for list of submittals to be provided by Contractor and incorporate into the following section.*  ***~~~ END OF SPECIFIER NOTES ~~~~*** |

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures; except:

B. See Section 01 9114 - Commissioning Agent Responsibilities for other submittal requirements.

PART 2 PRODUCTS

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| **~~~~ SPECIFIER NOTES ~~~~~**  *A/E shall coordinate with the Commissioning Agent, any testing equipment to be provided by Contractor. Edit the following section as appropriate for project scope and provide a complete list.*  ***~~~ END OF SPECIFIER NOTES ~~~~*** |

2.01 TEST EQUIPMENT

A. Provide all standard testing equipment required to perform startup and initial checkout and required Functional Testing; unless otherwise noted such testing equipment will NOT become the property of Owner.

B. Provide all standard testing equipment required to perform building envelope air tightness testing; unless otherwise noted such testing equipment will NOT become the property of Owner.

C. Calibration Tolerances: Provide testing equipment of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified. If not otherwise noted, the following minimum requirements apply:

1. Temperature Sensors and Digital Thermometers: Certified calibration within past year to accuracy of 0.5 degrees F and resolution of plus/minus 0.1 degrees F.

2. Pressure Sensors: Accuracy of plus/minus 2.0 percent of the value range being measured (not full range of meter), calibrated within the last year.

3. Calibration: According to the manufacturer’s recommended intervals and when dropped or damaged; affix calibration tags or keep certificates readily available for inspection.

D. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

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| **~~~~ SPECIFIER NOTES ~~~~~**  *The following articles are highly generalized. A/E, in coordination with the independent Commissioning Agent shall carefully review and prepare appropriate Execution specifications as appropriate for the project scope and complexity.*  ***~~~ END OF SPECIFIER NOTES ~~~~*** |

PART 3 EXECUTION

3.01 COMMISSIONING PLAN

A. Commissioning Agent will prepare the Commissioning Plan.

1. Attend meetings called by the Commissioning Agent for purposes of completing the commissioning plan.

2. Require attendance and participation of relevant subcontractors, installers, suppliers, and manufacturer representatives.

B. Contractor is responsible for compliance with the Commissioning Plan.

C. Commissioning Plan: The commissioning schedule, procedures, and coordination requirements for all parties in the commissioning process.

D. Commissioning Schedule:

1. Commissioning Schedule is to be included as a discreet component of Construction Progress Schedule.

2. Submit anticipated dates of startup of each item of equipment and system to Commissioning Agent within 60 days after award of Contract.

3. When equipment or systems required seasonal operation or cannot be fully commissioned due to seasonal conditions during the Contract Time, provide a separate commissioning schedule for all work necessary after Substantial Completion.

a. Owner will prepare a Change Order to address commissioning work provided outside of the Contract Time. No additional compensation will be due the Contractor for work associated with the Change Order.

4. Re-submit anticipated startup dates monthly, but not less than 4 weeks prior to startup.

5. Prefunctional Checklists and Functional Tests are to be performed in sequence from components, to subsystems, to systems.

6. Provide sufficient notice to Commissioning Agent for delivery of relevant Checklists and Functional Test procedures, to avoid delay.

3.02 STARTUP PLANS AND REPORTS

A. Startup Plans: For each item of equipment and system for which the manufacturer provides a startup plan, submit the plan not less than 8 weeks prior to startup.

B. Startup Reports: For each item of equipment and system for which the manufacturer provides a startup checklist (or startup plan or field checkout sheet), document compliance by submitting the completed startup checklist prior to startup, signed and dated by responsible entity.

C. Submit directly to the Commissioning Agent.

3.03 PREFUNCTIONAL CHECKLISTS

A. A Prefunctional Checklist is required to be filled out for each item of equipment or other assembly specified to be commissioned.

1. No sampling of identical or near-identical items is allowed.

2. These checklists do not replace manufacturers' recommended startup checklists, regardless of apparent redundancy.

B. Contractor is responsible for filling out Prefunctional Checklists, after completion of installation and before startup; witnessing by the Commissioning Agent is not required unless otherwise specified.

1. Submit completed Checklists to Commissioning Agent within two days of completion.

C. Commissioning Agent is responsible for furnishing the Prefunctional Checklists to Contractor.

D. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.

1. If difficulty in correction would delay progress, report deficiency to the Commissioning Agent immediately.

3.04 FUNCTIONAL TESTS

A. A Functional Test is required for each item of equipment, system, or other assembly specified to be commissioned, unless sampling of multiple identical or near-identical units is allowed by the final test procedures.

B. Contractor is responsible for execution of required Functional Tests, after completion of Prefunctional Checklist and before closeout.

C. Commissioning Agent is responsible for witnessing and reporting results of Functional Tests, including preparation and completion of forms for that purpose.

D. Contractor is responsible for correction of deficiencies and re-testing at no extra cost to Owner; if a deficiency is not corrected and re-tested immediately, the Commissioning Agent will document the deficiency and the Contractor's stated intentions regarding correction.

1. Contractor shall bear the cost of Owner and Commissioning Agent personnel time witnessing re-testing if the test failed due to failure to execute the relevant Prefunctional Checklist correctly; if the test failed for reasons that would not have been identified in the Prefunctional Checklist process, Contractor shall bear the cost of the second and subsequent re-tests.

E. Deferred Functional Tests: Some tests may need to be performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions; performance of these tests remains the Contractor's responsibility regardless of timing.

3.05 SENSOR AND ACTUATOR CALIBRATION

A. Calibrate all field-installed temperature, relative humidity, carbon monoxide, carbon dioxide, and pressure sensors and gauges, and all actuators (dampers and valves) on this piece of equipment shall be calibrated. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.

3.06 TEST PROCEDURES - GENERAL

A. Provide skilled technicians to execute starting of equipment and to execute the Functional Tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.

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| **~~~~ SPECIFIER NOTES ~~~~~**  *A/E shall edit the following as appropriate.*  ***~~~ END OF SPECIFIER NOTES ~~~~*** |

3.07 BUILDING ENVELOPE COMMISSIONING

A. General: Comply with the following procedural requirements:

1. [NEBB S110](http://www.nebb.org/resources/procedural_standards_for_whole_building_systems_technical_commissioning/) Whole Building Technical Commissioning of New Construction.

2. [ASTM E779](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=ASTM%20E779) Standard Test Method for Determining Air Leakage Rate by Fan Pressurization.

3. [ASTM E1827](https://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=ASTM%20E1827) Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door.

4. [ANSI/RESNET/ICC 380](http://shop.iccsafe.org/ansi-resnet-icc-380-2016-standard-for-testing-airtightness-of-building-enclosures-airtightness-of-heating-and-cooling-air-distribution-systems-and-airflow-of-mechanical-ventilation-systems-1.html) Standard for Testing Airtightness of Building Enclosures, Airtightness of Heating and Cooling Air Distribution Systems, and Airflow of Mechanical Ventilation Systems.

B. Verify that the building envelope has been sufficiently completed for testing to commence.

C. Conduct ongoing inspections as construction progresses to document satisfactory installation conditions. related to thermal and moisture integrity of the building envelope that become concealed upon completion of construction.

3.08 FIELD TESTING AND COMMISSIONING OF PARTITIONS FOR NOISE ISOLATION

A. Conduct testing of partitions requiring a specific STC class indicated on drawings and/or in various specifications sections. Comply with [ASTM E336](http://global.ihs.com/doc_detail.cfm?rid=BSD&document_name=ASTM%20E336) for testing methods, including requirements of Annex A1 for reduction of flanking sound transmission.

B. Confirm that the FSTC values are not less than 67 percent of design STC values.

C. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.

1. If difficulty in correction would delay progress, report deficiency to the Commissioning Agent immediately.

3.09 OPERATION AND MAINTENANCE MANUALS

A. See Section 01 7800 - Closeout Submittals and Procedures for additional requirements.

B. Add design intent documentation furnished by A/E to manuals prior to submission to Owner.

C. Submit manuals related to items that were commissioned to Commissioning Agent for review; make changes recommended by Commissioning Agent.

D. Commissioning Agent will add commissioning records to manuals after submission to Owner.

END OF SECTION 01 9113 - GENERAL COMMISSIONING REQUIREMENTS