WASTE MATERIAL DISPOSITION SUMMARIES

Fill out tables below.
Unit of measurement is "tons"
Use conversion factors provided below.
If different conversion number is used, please provide.
If tonnage information is not available, estimates can be provided in "cubic yards"

Part I. DEMOLITION MATERIALS (tons)					
Material Type	**Disposed in Class III Landfill**	**Taken to Inert Fills**	**Other Disposal (describe)**	**Reduced, Recycled, or Salvaged**	**How Diverted? (e.g. reused as aggregate)**
Concrete					
Asphalt					
Dirt					
Wood					
Metals					
Mixed Waste					
Other (describe)					
Total Tons	**A=**	**B=**	**C=**	**D=**	

Demolition Materials Diversion Rate: (D/(A+B+C+D) = _____

Additional Notes/Comments:

Part II. CONSTRUCTION MATERIALS (tons)					
Material Type	**Disposed in Landfill**	**Taken to Inert Fills**	**Other Disposal (describe)**	**Reduced, Recycled, or Salvaged**	**How Diverted? (e.g. reused as aggregate)**
Concrete					
Asphalt					
Dirt					
Wood					
Metals					
Mixed Waste					
Other (describe)					
Total Tons	**A=**	**B=**	**C=**	**D=**	

Construction Materials Diversion Rate: (D/(A+B+C+D) = _____

Additional Notes/Comments:

DISPOSAL FACILITIES:

Name of disposal facilities (e.g., landfill or inert facility name) materials are taken to:

Facility Name: _____ Total Tons: _____

Facility Name: _____ Total Tons: _____

Facility Name: _____ Total Tons: _____

Facility Name: _____ Total Tons: _____

RECYCLING FACILITIES:

Name of recycling facilities or recycler (materials given or sold to):

Recycler/Recycling Facility Name:_____ Total Tons: _____

Recycler/Recycling Facility Name:_____ Total Tons: _____

Recycler/Recycling Facility Name:_____ Total Tons: _____

TRANSFORMATION FACILITIES:

Name of transformation facility:

Transformation Facility Name: _____ Total Tons: _____

To the best of my knowledge, above estimates are an accurate representation of disposition of construction and demolition materials generated on-site at construction job.

I understand that Owner may audit disposal and recycling documentation related to this survey.

_____ _____

Print Name Signature

Additional Notes/Comments:

SECTION 017500

STARTING OF SYSTEMS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Procedures for Starting of Systems.

1.02 SUBMITTALS

A. Submit preliminary schedule listing times and dates for start-up of each item of equipment in sequence two (2) weeks prior to proposed dates.

B. Submit manufacturer's representative reports within one (1) week after start-up, listing satisfactory start-up dates.

1.03 PROJECT CONDITIONS

A. Building enclosure is complete and weather-tight.

B. Excess packing and shipping bolts are removed.

C. Interdependent systems have been checked and are operational.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that Project conditions comply with requirements.

B. Verify that status of Work meets requirements for starting of equipment and systems.

3.02 PREPARATION

A. Coordinate sequence for start-up of various items of equipment and systems.

B. Notify Construction Manager, in writing, a minimum of fourteen (14) calendar days prior to start-up of each item of equipment and each system.

C. Have Contract Documents, shop drawings, product data, and operation and maintenance data at hand during entire start-up process.

D. Verify that each piece of equipment has been checked for proper lubrication, drive rotation, belt tension, control sequence, and other conditions which may cause damage.

E. Verify control systems are fully operational in automatic mode.

F. Verify that tests, meter readings, and specific electrical characteristics agree with those specified by electrical equipment manufacturer.

G. Bearings: Inspect for cleanliness; clean and remove foreign matter. Verify alignment; take corrective measures.

H. Drives: Inspect for tension on belt drives, adjustment of varipitch sheaves and drives, alignment, proper equipment speed, and cleanliness. Take corrective action.

I. Motors: Verify that motor amperage agrees with nameplate value. Inspect for conditions which produce excessive current flow and which exist due to equipment malfunction. Take corrective action.

3.03 STARTING SYSTEMS

A. Execute start-up under supervision of responsible Contractor personnel.

B. Place equipment in operation in proper sequence in accordance with sequencing schedule. Systems may be started on each floor, partially on each floor, or simultaneously on each floor (partial or entire system).

** END OF SECTION **

SECTION 017550
TESTING, ADJUSTING AND BALANCING OF SYSTEMS

PART 1 - GENERAL

1.01 RELATED REQUIREMENTS

A. General Conditions: Inspections, tests and approvals required by public authorities.

B. Section 15990: Testing, Adjusting and Balancing.

1.02 SUBMITTALS

A. Prior to start of work, submit name of organization proposed to perform services. Designate managerial responsibilities for coordination of entire testing, adjusting and balancing.

B. Submit documentation to confirm organization qualifications.

C. Submit three (3) preliminary specimen copies of each of the report forms proposed for use.

D. Fifteen (15) calendar days prior to completion, submit three (3) copies of final reports. Submit reports of testing, adjusting, and balancing which is postponed due to seasonal, climatic, occupancy, or other reasons beyond Contractor's control, promptly after execution of those services.

1.03 PROCEDURES, GENERAL

A. Comply with procedural standards of certifying association under whose standards service will be performed.

B. Notify Construction Manager, in writing, a minimum of fourteen (14) calendar days prior to beginning of operations.

C. Accurately record date for each step.

D. Report to Construction Manager any defects or deficiencies noted during performance of services.

1.04 FINAL REPORTS

A. Organization having managerial responsibility shall make reports.

B. Each Form: Bear signature of recorder, and that of supervisor of reporting organization.

C. Identify each instrument used, and latest date of calibration of each.

1.05 CONTRACTOR RESPONSIBILITIES

A. Prepare each system for testing and balancing.

B. Coordinate with testing organization, provide access to equipment and systems. Operate systems at designated times, and under conditions required for proper testing, adjusting, and balancing.

C. Notify testing organization fourteen (14) calendar days prior to time system will be ready for testing, adjusting and balancing.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 PREPARATION

A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Construction Manager to facilitate spot checks during testing. Retain possession of instruments and remove at completion of services.

B. Verify installation of system to be tested is complete and in continuous operation.

C. Verify ambient conditions and related facilities are in full operation.

** END OF SECTION **

SECTION 017700

CLOSEOUT PROCEDURES

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. Comply with requirements stated in Conditions of the Contract and in Specifications for administrative procedures in closing out the Work.

B. Related Requirements in Other Parts of the Project Manual:
1. Fiscal provisions, legal submittals and additional administrative requirements: Conditions of the Contract.

C. Related Requirements Specified in Other Sections:
1. Section 017836: Guarantees, Warranties, Bonds, Service & Maintenance Contracts
2. Section 017413: Cleaning.
3. Section 017839: Project Record Documents.
4. Closeout Submittals Required of Trades.
5. California Code Regulations, Title 24, Part 1 and Part 2, 2007 Edition.

1.02 SUBSTANTIAL COMPLETION

A. Substantial Completion is defined in the General Conditions.

B. When Contractor considers the Work is substantially complete, he shall submit to Architect:
1. A written notice that the Work, or designated portion thereof, is substantially complete.
2. A list of items to be completed or corrected.

C. Within a reasonable time after receipt of such notice, Architect will make an inspection to determine the status of completion.

D. Should Architect determine that the Work is not substantially complete:
1. Architect will promptly notify the Contractor in writing, giving the reasons therefor.
2. Contractor shall remedy the deficiencies in the Work, and send a second written notice of substantial completion to the Architect.
3. Architect will reinspect the Work.

E. When Architect concurs that the Work is substantially complete, he will:
1. Prepare a Certificate of Substantial Completion on AIA Form G704, accompanied by Contractor's list of items to be completed or corrected, as verified and amended by the Architect.
2. Submit the Certificate to Owner and Contractor for their written acceptance of the responsibilities assigned to them in the Certificate.

1.03 FINAL INSPECTION

A. When Contractor considers the Work is complete, he shall submit written certification that:
1. Contract Documents have been reviewed.
2. Work has been inspected for compliance with Contract Documents.
3. Work has been completed in accordance with Contract Documents.
4. Equipment and systems have been tested in the presence of the Owner's representative and are operational.
5. Work is completed and ready for final inspection.

B. Architect will make an inspection to verify the status of completion with reasonable promptness after receipt of such certification.

C. Should Architect consider that the Work is incomplete or defective:
1. Architect will promptly notify the Contractor in writing, listing the incomplete or defective Work.
2. Contractor shall take immediate steps to remedy the stated deficiencies, and send a second written certification to Architect that the work is complete.
3. Architect will reinspect the Work.

D. When the Architect finds that the Work is acceptable under the Contract Documents, he shall request the Contractor to make closeout submittals.

1.04 REINSPECTION FEES

A. Should Architect perform reinspections due to failure of the Work to comply with the claims of status of completion made by the Contractor:
1. Owner will compensate Architect for such additional services.
2. Owner will deduct the amount of such compensation from the final payment to the Contractor.

1.05 CONTRACTOR'S CLOSEOUT SUBMITTALS TO ARCHITECT

A. Evidence of compliance with requirements of governing authorities:
1. Certificate of Occupancy.
2. Certificates of Inspection: As required by the respective sections of the Specification.
3. Final approvals required by California Code of Regulations, Title 24, Part 1 and Part 2.

B. Project Record Documents: To requirements of Section 017839.

C. Operating and Maintenance Data, Instructions to Owner's Personnel: To requirements of respective sections of Specifications and Maintenance Contracts.

D. Warranties and Bonds: Conditions of the Contract and respective sections of Specifications.
1. Provide written certificates for special warranties as listed in respective specification sections and as listed below:

E. Keys and Keying Schedule: To requirements of Section 013300, Door Hardware.

F. Spare Parts and Maintenance Materials: To requirements of Sections of Specifications.

G. Evidence of Payment and Release of Liens: To requirements of General and Supplementary Conditions.

H. Certificate of Insurance for Products and Completed Operations.

1.06 FINAL ADJUSTMENT OF ACCOUNTS

A. Submit a final statement of accounting to Architect.

B. Statement shall reflect all adjustments to the Contract Sum:
1. The original Contract Sum.
2. Additions and deductions resulting from:
   a. Previous Change Orders.
   b. Deductions for uncorrected work.
   c. Penalties and Bonuses
   d. Deductions for liquidated damages

e. Deductions for reinspection payments
f. Other adjustments.

3. Total Contract Sum, as adjusted.
4. Previous payments.
   a. Sum remaining due.

C. Architect will prepare a final Change Order, reflecting approved adjustments to the Contract Sum which were not previously made by Change Orders.

1.07 FINAL APPLICATION FOR PAYMENT

A. Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the Conditions of the Contract and Section 012910, Applications and Certificates for Payment.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

** END OF SECTION **

SECTION 017823

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Format and Content of Manuals.

B. Instruction of Owner's Personnel.

1.02 QUALITY ASSURANCE

A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

1.03 FORMAT

A. Prepare data in the form of an instructional manual.

B. Binders: Commercial quality, 8-1/2 x 11 inch three-ring binders with hardback, cleanable, plastic covers; one inch minimum ring size. When multiple binders are used, correlate data into related consistent groupings.

C. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; list title of Project and Separate Building; identify subject matter of contents.

D. Arrange content by systems, under section numbers and sequence of Table of Contents of this Project Manual.

E. Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

F. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.

G. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

1.04 CONTENTS, EACH VOLUME

A. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Construction Manager's Consultant and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

B. For Each Product or System: List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

C. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.

D. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

E. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 017500.

F. Warranties and Bonds: Bind in copy of each.

1.05 MANUAL FOR MATERIAL AND FINISHES

A. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size composition, and color and texture designations.

B. Instruction for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precaution against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture-protection and Weather-exposed Products: Include product data listing applicable reference standards, chemical composition, and detail of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional Requirements: As Specified in individual Specifications sections.

1.06 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Job Instructions: Provide and install, where directed, printed sheet under clear plastic cover, giving concise operating and maintenance instruction for equipment.

B. Record Instructions: Forward to Construction Manager, upon completion of work, and before work will be considered for acceptance, numbers, as set forth in various division, of complete bound sets of instructions of entire plant and component parts, including manufacturers' certificates, warranty slips, parts lists, descriptive brochures, and maintenance and operating instructions. Print information on heavy white paper. Tab properly and identify for each reference. Submit drafts for review before preparing final sets, six (6) required.

C. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Give function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

D. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications.

E. Include as-installed color coded wiring diagrams.

F. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequence. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

G. Maintenance Requirements: Include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

H. Provide servicing and lubrication schedule, and list of lubricants required.

I. Include manufacturer's printed operation and maintenance instructions.

J. Include sequence of operation of controls by manufacturer.

K. Provide original manufacturer's parts list, illustration, assembly drawings, and diagrams required for maintenance.

L. Provide as-installed control diagrams by controls manufacturer.

M. Provide Contractor's coordination drawings, with as-installed color coded piping diagrams.

N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

O. Include test and balancing reports as specified in Section 017823.

P. Additional Requirements: As specified in individual Specifications sections.

1.07 INSTRUCTION OF OWNER PERSONNEL

A. Explanation to Owner: Explain to Construction Manager in full and to his/her complete understanding, procedures necessary to operate and maintain equipment and systems on continuing basis. Provide training of staff if required.

B. Before final inspection, instruct Owner's designated personnel in operation, adjustment, and maintenance of products, equipment, and systems, at agreed upon times. For equipment requiring seasonal operation, perform instructions for other seasons within six (6) months.

C. Use operation and maintenance manuals as basis of instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

D. Prepare and insert additional data in Operation and Maintenance Manual when need for such data becomes apparent during instruction.

1.08 SUBMITTALS

A. Submit two (2) copies of preliminary draft or proposed formats and outlines of contents before start of Work. Construction Manager's Consultant will review draft and return one (1) copy with comments.

B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten (10) calendar days after acceptance.

C. Submit one (1) copy of completed volumes in final form fifteen (15) calendar days prior to final inspection. Copy will be returned after final inspection, with Construction Manager's comment. Revise content of documents as required prior to final submittal.

D. Submit three (3) copies of revised volumes of data in final form within ten (10) calendar days after final inspection.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

SECTION 017836

GUARANTEES, WARRANTIES, BONDS, SERVICE & MAINTENANCE CONTRACTS

PART 1 - GENERAL

1.1 GENERAL

A. Guarantees from Subcontractors shall not limit Contractor's warranties and guarantees to Owner. Whenever possible, Contractor shall cause warranties of Subcontractors to be made directly to Owner. If such warranties are made to Contractor, Contractor shall assign such warranties to Owner prior to final payment.

1.2 FORM OF GUARANTEE

A. Submit written guarantees, in the form contained at the end of this SECTION.

1.3 SUBMITTAL REQUIREMENTS

A. Assemble required guarantees, bonds, and service and maintenance contracts.

B. Number of original signed copies required: 2 each.

C. Table of Contents: Neatly typed and in orderly sequence. Provide complete information for each item as follows:

1. Product or Work item.
2. Firm name, address, and telephone number; and name of principal.
3. Scope.
4. Date of beginning of guarantee, bond, or service and maintenance contract.
5. Duration of guarantee, bond, or service and maintenance contract.
6. Contractor's name, address, and telephone number; and name of principal.
7. Provide information for Owner's personnel:
   a. Proper procedure in case of failure.
   b. Circumstances which might affect the validity of guarantee or bond.

1.4 FORM OF SUBMITTALS

A. Prepare in duplicate packets.

B. Format:

1. Size 8 1/2-inch x 11-inch sheets punched for 3-ring binder. Fold larger sheets to fit into binders.

2. Identify each packet on the cover with typed or printed title, "GUARANTEES AND BONDS", and the following:

a. Title of Project.

b. Name of Contractor.

3. Binders: Commercial quality, 3-ring, with durable and cleanable plastic covers.

1.5 TIME OF SUBMITTALS

A. Within 10 days after date of Substantial Completion, prior to request for final payment.

B. For Work activities, where Final Completion is delayed materially beyond the date of Substantial Completion, provide updated submittal within 10 days after Final Completion, listing the date of Final Completion as the start of the Guarantee To Repair Period.

1.6 SUBMITTALS REQUIRED

A. Submit guarantees, bonds, and service and maintenance contracts specified in the individual SECTIONS.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

GUARANTEE

Project Name:_____

Project Location:_____

Project Number:_____ DATE: _____

GUARANTEE FOR _____ (the "Contract"),
(Specification SECTION and Contract No.)

between Desert Community College District ("Owner") and

_____("Contractor")

_____
(Name of Contractor or Subcontractor)

hereby guarantees to Owner that the portion of the Work described as follows:

_____

_____

_____

_____

which it has provided for the above-referenced Project, is of good quality; free from defects; free from any liens, claims, and security interests; and has been completed in accordance with Specification SECTION _____ and the other requirements of the Contract.

The undersigned further agrees that, if at any time within ____ months after the date of the guarantee the undersigned receives notice from Owner that the aforesaid portion of the Work is unsatisfactory, faulty, deficient, incomplete, or not in conformance with the requirements of the Contract, the undersigned will, within 10 days after receipt of such notice, correct, repair, or replace such portion of the Work, together with any other parts of the Work and any other property which is damaged or destroyed as a result of such defective portion of the Work or the correction, repair, or replacement thereof; and that it shall diligently and continuously prosecute such correction, repair, or replacement to completion.

In the event the undersigned fails to commence such correction, repair, or replacement within 10 days after such notice, or to diligently and continuously prosecute the same to completion, the undersigned, collectively and separately, do hereby authorize Owner to undertake such correction, repair, or replacement at the expense of the undersigned; and Contractor will pay to Owner promptly upon demand all costs and expenses incurred by Owner in connection therewith.

SUBCONTRACTOR

Signed:_____ Title:_____

Typed Name:_____

Name of Firm:_____

Contractor License Classification & Number: _____

Address: _____

_____

Telephone Number:_____

CONTRACTOR

Signed:_____ Title:_____

Typed Name:_____

Name of Firm:_____

** END OF SECTION **

SECTION 017839

PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Administrative and procedural requirements for preparing, maintaining and submitting project record documents.

B. Maintain at the site for the Owner one record copy of:
   1. Record Drawing Prints.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other Modifications to the Contract.
   5. Architect/Engineer Field Orders or written instructions.
   6. Approved Shop Drawings, Product Data and Samples.
   7. Field Test records.
   8. Contractor's completed Request For Information (RFI).

C. Related Requirements in Other Parts of the Project Manual:
   1. Conditions of the Contract.

D. Related Requirements Specified in Other Sections:
   1. Separate Sections Requiring Record Drawings.
   2. Section 013300: Submittal Procedures

1.02 MAINTENANCE OF DOCUMENTS AND SAMPLES

A. Store documents and samples in contractor's field office apart from documents used for construction.
   1. Provide files and racks for storage of documents.
   2. Provide secure storage space for storage of samples.

B. Maintain documents in a clean, dry, legible condition and in good order.
   1. Do not use record documents for construction purposes.

C. Make documents and samples available at all times for inspection by Architect.

1.03 RECORDING

A. Label each document "PROJECT RECORD" in neat large printed letters.

B. Record information concurrently with construction progress.
   1. Do not conceal work until required information is recorded.

C. Review status of project record documents with Architect, Construction Manager and/or Inspector prior to submittal of each monthly pay application.

D. Drawings: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.
   1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
      a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
      b. Accurately record information in an understandable drawing technique.
      c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
   2. Content: Types of items requiring marking include, but are not limited to, the following:
      a. Dimensional changes to Drawings.
      b. Revisions to details shown on Drawings.
      c. Depths of foundations below first floor.
      d. Locations and depths of underground utilities.
      e. Revisions to routing of piping and conduits.
      f. Revisions to electrical circuitry.
      g. Actual equipment locations.
      h. Duct size and routing.
      i. Locations of concealed internal utilities.
      j. Changes made by Change Order.
      k. Changes made following Architect's written orders.
      l. Details not on the original Contract Drawings.
      m. Field records for variable and concealed conditions.
      n. Record information on the Work that is shown only schematically.

   3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
   4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
   5. Mark important additional information that was either shown schematically or omitted from original Drawings.
   6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

E. Record Prints: Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Architect and Construction Manager. When authorized, prepare a full set of corrected prints of the Contract Drawings and Shop Drawings.
   1. Incorporate changes and additional information previously marked on Record Prints. Erase, redraw, and add details and notations where applicable.
   2. Refer instances of uncertainty to Architect through Construction Manager for resolution.
   3. Owner will furnish Contractor one set of prints of the Contract Drawings for use in recording information.

F. Upon completion of work, obtain Owner's Inspector's signature on the record set verifying information.

G. Specifications and Addenda:
   1. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
      a. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
      b. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including approved substitutions and product options selected.
      c. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.

d. Note related Change Orders[, Record Product Data,] and Record Drawings where applicable.

H. Miscellaneous Record Submittals:
1. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

1.04 SUBMITTAL

A. Record Drawings: Comply with the following:
1. Number of Copies: Submit copies of Record Drawings as follows:
a. Initial Submittal: Submit one set of marked-up Record Prints. Architect will initial and date each sheet and mark whether general scope of changes, additional information recorded, and quality of drafting are acceptable. Architect will return prints for organizing into sets, printing, binding, and final submittal.
b. Final Submittal: Submit one set of marked-up Record Prints, print each Drawing, whether or not changes and additional information were recorded.
1) Electronic Media: CD-R.
2. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.

B. Accompany submittal with transmittal letter in duplicate, containing:
1. Date.
2. Project title and number.
3. Contractor's name and address.
4. Title and number of each record document.
5. Signature of Contractor or his authorized representative.

C. Submit a copy of the transmittal letter to the Architect.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

** END OF SECTION **

SECTION 017900

SYSTEMS DEMONSTRATION

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Procedures for Demonstration of Equipment Operation and Instruction of Owner's Personnel.

1.02 RELATED REQUIREMENTS

A. Section 017500 - Starting of Systems.

B. Section 017823 - Operation and Maintenance Data.

C. Individual Sections: Specific requirements for demonstrating systems and equipment.

1.03 QUALITY ASSURANCE

A. Equipment installed under this contract shall operate quietly and free of vibration. Adjust, repair, balance properly, or replace equipment producing objectionable noise or vibration in occupied areas of building. Provide additional brackets, bracing, etc., to prevent such noise or vibration. Systems shall operate without humming, surging or rapid cycling.

B. Owner will provide list of personnel to receive instructions, and will coordinate their attendance at agreed-upon times.

1.04 SUBMITTALS

A. Submit preliminary schedule for Construction Manager's approval, listing times and dates for demonstration of each item of equipment and each system, two (2) weeks prior to proposed dates.

B. Submit reports within one (1) week after completion of demonstrations, that demonstrations and instructions have been satisfactorily completed. Give time and date of each demonstration, and hours devoted to demonstration, with a list of persons present.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 PREPARATION

A. Verify equipment has been inspected and put into operation.

B. Have copies of completed operation and maintenance manual at hand for use in demonstrations instruction.

3.02 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of equipment and systems to Owner's personnel two (2) weeks prior to date of final inspection. For equipment requiring seasonal operation, perform instructions for other seasons within six (6) months.

B. Use operation and maintenance manuals as basis of instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

C. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled times, at equipment location.

D. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instructions.

END OF SECTION

SECTION 018113

LEED REQUIREMENTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A Section includes general requirements and procedures for compliance with certain USGBC LEED prerequisites and credits needed for Project to obtain LEED Certified certification based on LEED 2009 for New Construction and Major Renovations

1. Other LEED prerequisites and credits needed to obtain LEED certification depend on material selections and may not be specifically Identified as LEED requirements. ·
   a. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.

2. Additional LEED prerequisites and credits needed to obtain indicated LEED certification depend on Architect's design and other aspects of Project that are not part of Work of Contract.

B. Related Sections:

1. Divisions 1 through 16 Sections for LEED requirements specific to Work of each of these Sections.
   a. Requirements may or may not include reference to LEED.

1.03 DEFINITIONS

A. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles· and Criteria for Forest Stewardship". .

1. Certificates shall include evidence that manufacturer is certified for chain of Custody by FSC-accredited certification body.

B. LEED: Leadership in Energy & Environmental Design.

C. Recycled Content: Recycled content value of material assembly shall be determined by weight.

1. Recycled fraction of assembly is then multiplied by cost of assembly to determine recycled content value.
   a. Post-Consumer Material: Defined as waste material generated by households or by commercial, Industrial, and institutional facilities in their role as end users of product, which can no longer be used for its intended purpose.

b. Pre-Consumer Material: Defined as material diverted from waste stream during manufacturing process.
   1) Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within same process that generated it.

D. Recycled Content: Percentage by weight of constituents that have been recovered or otherwise diverted from solid waste stream, either during manufacturing process (pre-consumer), or after consumer use (post-consumer).
   1. Spills and scraps from original manufacturing process that are combined with other constituents after minimal amount of reprocessing for use in further production of same product are not recycled materials.
   2. Discarded materials from one manufacturing process that are used as constituents hi another manufacturing process are pre-consumer recycled materials.

1.04 SUBMITTALS

A. General: Additional LEED submittals required by other Specification Sections.

B. LEED submittals are in addition to other submittals.
   1. If submitted Item is identical to that submitted to comply with other requirements, submit duplicate copies as separate submittal to verify compliance with indicated LEED requirements.

C. Project Materials Cost Data: Provide statement Indicating total cost for materials used for Project.
   1. Costs exclude labor, overhead, and profit.
   2. Maintain list of actual material costs, excluding labor and equipment, for Divisions 2 through 10 –

D. LEED Action Plans: Provide preliminary submittals within 60 days of date established for Notice to Proceed indicating how following requirements will be met:
   1. MR Credit 2: Waste Management Plan complying with Section 01524
   2. MR Credit 4: List of proposed materials with recycled content.
      a. Indicate cost, post-consumer recycled content, and pre-consumer recycled content for each product having recycled content.
   3. MR Credit 5: Regional Materials
   4. MR Credit 7: List of proposed certified wood products.
      a. Indicate each product containing certified wood, including its source and cost of certified wood products.
   5. IEQ Credit 1: Outdoor Air Delivery Monitoring
   6. IEQ Credit 3.1 and IEQ Credit 3.2: Construction Indoor Air Quality Management Plan.

E. LEED Progress Reports: concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with LEED action plans for following:
   1. MR Credit 2: Waste reduction progress reports complying with Section 015.24
   2. MR Credit 4: Recycled content.
   3. MR Credit 7: Certified wood products.

F. LEED Documentation Submittals:

1. EA Credit 1: Optimize Energy Performance
   a. Demonstrate percentage of improvement in proposed building performance rating compared 'with baseline building performance rating
2. MR Credit 2: Comply with Section 01524
3. MR Credit 4: Product data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content per Article 2.04 A
   a. Include statement indicating costs for each product having recycled content.
4. MR Credit 5: Regional Materials .
   a. Product data for building materials that have been extracted, harvested, recovered, or manufactured within 500 miles of Project Site for minimum of 10 or 20 percent based on cost of total material value
   b. Include statement Indicating cost for each regional material.
5. MR Credit 7: Product data and chain of custody certificates for products containing certified wood.
   a. Include statement Indicating cost for each certified wood product per Article 2.02 A. ,
6. IEQ Credit 1; Outdoor Air Delivery Monitoring
   a. Documentation of permanent monitoring systems installed to ensure that ventilation systems maintain design minimum requirements.
   b. Documentation that monitoring equipment has been configured to generate alarm when airflow values or carbon dioxide levels vary by 10 percent or more from design levels via either building automation system alarm to building operator or visual or audible alert to building occupants
7. IEQ Credit 3.1: . .
   a. Construction indoor-air-quality management plan.
   b. Product data for temporary filtration· media.
   c. Product data for filtration media used during occupancy.
   d. Construction Documentation: Six photographs at three different times during construction period, along with brief description of SMACNA approach employed; .documenting implementation of indoor air quality management measures, such as protection of ducts and· on-site stored or installed absorptive materials.
8. IEQ Credit 3.2: ·. ..
   a. Signed statement describing building air flush-out procedures including dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.
   b. Product data for filtration media used during flush-out and during occupancy.
   c. Report from testing and inspecting agency indicating results of indoor air quality testing and documentation showing compliance with Indoor air quality testing procedures and requirements.
9. IEQ Credit 4:
   a. Product data for adhesives and sealants used inside weatherproofing system indicating VOC content of each product used.
      1) Indicate VOC content in g/L calculated according to California Air Resources Board (CARS) regulations dated June, 2008.
   b. Product data for paints and coatings used inside weatherproofing system indicating chemical composition and VOC content of each product used.
      1) Indicate VOC content in g/L calculated according to California Air

Resources Board (CARB) regulations dated June, 2008.

c. Product data submittal requirements for carpet and carpet tile adhesives as specified in Section 09680.

d. Product data for products containing composite wood or agrifiber products or wood glues indicating that they do not contain urea-formaldehyde resin.

1.05 QUALITY ASSURANCE

A. LEED Coordinator: Engage experienced LEED Accredited Professional to coordinate LEED requirements.
   1. LEED coordinator may also serves as waste management coordinator.

B. Contractor Responsibilities:
   1. Responsible for tracking, tallying, and uploading of required LEED documentation to LEED Forms non-Line.

PART 2 PRODUCTS

2.01 RECYCLED CONTENT OF MATERIALS

A. MR Credit 4: Provide building materials with recycled content such that post-consumer recycled content plus one-half of pre-consumer recycled content constitutes minimum of 10 percent of cost of materials used for Project.
   1. Cost of post-consumer recycled content of an item shall be determined by dividing weight of post-consumer recycled content in Item by total weight of item and multiplying by cost of item.
   2. Cost of pre-consumer recycled content of an item shall be determined by dividing weight of pre-consumer recycled content in item by total weight of item. and multiplying by cost of item.
   3. Do not include furniture, plumbing, rnechanical and electrical components, and specialty items such as elevators and equipment in calculation.

2.02 CERTIFIED WOOD

A. MR Credit 7: Provide minimum of 50 percent (by cost) of wood-based materials that are produced from wood obtained from forests certified by an FSC-accredlted certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship".
   1. Wood-based materials include, but are riot limited to, following materials when made from wood, engineered wood products, or wood-based panel products:
      a. Rough carpentry.
      b. Architectural woodwork.
      c. Furniture.

2.03 LOW-EMITTING MATERIALS

A. IEQ Credit 4: ~or low-emitting materials
   1. For field applications that are inside weatherproofing system, use adhesives and sealants that comply with limits for VOC content when calculated according to California Air Resources Board (CARB) regulations dated June, 2008.
   2. For field applications that are inside weatherproofing system, use paints and coatings that comply with following limits for VOC content when calculated according to California Air Resources Board (CARB) regulations dated June, 2008.
   3. VOC content limits for carpet tile adhesives are specified in Section 09680.

4. Do not use composite wood or agrifiber products or adhesives that contain urea-formaldehyde resin:-

PART 3 EXECUTION

3.01 CONSTRUCTION WASTE MANAGEMENT

A. M R Credit 2: Comply with Section 01524.

3.02 CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT -•

A. IEQ Credit 3.1: Comply with SMACNA "IAO Guideline for Occupied Buildings under Construction", 2nd Edition 2007, ANSI/SMACNA 008~2008 (Chapter 3).
   1. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period as specified in Section 01500, install filter media having a MERV 8 according to ASI::JRAE 52.2 at each return-air inlet for air handling system used during construction.
   2. Replace air filters immediately prior to occupancy.
   3. Protect stored onsite and installed absorptive materials from moisture damage.
   4. Maintain a detailed photo log of the construction IAQ management plan practices followed during construction.

B. IEQ Credit 3.2: Comply with one of following requirements:
   1. After construction ends, prior to occupancy and with interior finishes installed, perform building flush-out by supplying a total volume of 14,000 cu. ft. of outdoor air per sq. ft. of floor area while maintaining an intern~ l temperature of at least 60 degrees F and relative humidity no higher than 60 percent.
   2. If occupancy is desired prior to flush-out completion, space may be occupied following delivery of minimum of 3,500 cu. ft. of outdoor air per sq. ft. of floor area to space.
      a. Once a space is occupied, it shall be ventilated at minimum rate of 0.30 cfm per sq. ft. of outside air or design minimum outside air rate determined in IEQ Prerequisite 1, whichever is greater.
      b. During each day of flush-out period, ventilation shall begin minimum of three hours prior to occupancy and continue during occupancy.
         1} These conditions shall be maintained until total of 14,000 cu. ft./sq. ft. of outside air has been delivered to space.
   3. Air-Quality Testing:
      a. Conduct baseline indoor air quality testing, after construction ends and prior to occupancy, using testing protocols consistent with EPA "Compendium of Methods for Determination of Air Pollutants in Indoor Air", and as additionally detailed in USGBC "LEED~NC Reference Guide".
      b. Demonstrate that contaminant maximum concentrations listed below are not to exceeded:
         1) Formaldehyde: 50 ppb.
         2) Particulates (PM10): 50 micrograms/cu. m.
         3) Total Volatile Organic Compounds (TVOC}: 500 micrograms/cu. m.
         4) 4-Phenylcyclohexene (4-PH): 6.5 micrograms/cu. m.
         5) Carbon Monoxide: 9 ppm and no greater than 2 ppm above outdoor levels.

c. For each sampling point where maximum concentration limits are exceeded, conduct additional flush-out with outside air and retest specific parameters exceeded to indicate requirements are achieved.
   1) Repeat procedure until requirements have been met.
   2) When retesting noncomplying building areas, take samples from same locations as in first test.

d. Air-.sample testing shall be conducted as follows:
   1) Measurements shall be conducted prior to occupancy but during normal occupied hours, and with building ventilation system starting at normal dally start time and operated at minimum outside airflow rate for occupied mode throughout duration of air testing. .
   2) Building shall have interior finishes installed including, but not limited to, millwork, doors, paint, carpet, and acoustic tiles.
      i. Non-fixed furnishings such as workstations and partitions are encouraged, but not required, to be in place for testing.
   3) Number of sampling locations will vary depending on size of building and number of ventilation systems.
      i. For each portion of building served by separate ventilation system, number of sampling points shall not be less than one per 25,000 sq. ft. or for each contiguous floor area, whichever is larger, and shall include areas with least ventilation and greatest presumed source strength .
   4) Air samples shall be collected between 3 and 6 feet from floor. to represent breathing zone of occupants, and over minimum four-:- hour period.

END OF SECTION -

SECTION 019113

GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. The work described in this section includes the formal and comprehensive commissioning process.

1. This work shall include review of the Owner Project Requirements (OPR) & Basis of Design (BOD) documents for clarity & completeness, design/construction document review, systems/equipment submittal review, installation inspections, pre-functional & functional performance testing on systems/equipment, review of record drawings, review of operations & maintenance data, assembly of a systems manual, review of operations staff training procedures, and final systems check approximately 10 months after substantial completion of the construction phase.

B. The commissioning process is not intended to conflict with applicable building codes. Apparent conflicts shall be brought to the attention of the owner.

C. Commissioning is the process which documents and verifies for the owner that systems, equipment, and controls function properly together to meet performance requirements and design intent specified in the contract documents.

D. Details of the commissioning process & procedures will be incorporated into a final Commissioning Plan. The plan will be designed, coordinated, and implemented by the Commissioning Authority (CA). CA will be provided under the HVAC scope of work.

E. While the CA has the overall responsibility for planning and coordinating the commissioning process with the Commissioning Team, all parties participate. This includes the owner, consultants, construction manager, facility operator, architect, engineer, construction manager, subcontractors, specialty subcontractors, OGC's (other general contractors), equipment suppliers, vendors, building authorities and others entities as required.

F. Scheduling: The CA will coordinate the commissioning activities schedule with the Construction Manager and Commissioning Team members in accordance with the communication protocols established in this section.

1. The CA will provide a list of the primary commissioning events at the initial commissioning kickoff meeting that need to be included in the Construction Manager's construction schedule. As construction progresses, detailed schedules will be updated by the Construction Manager and Commissioning Team.

G. The Construction Manager and each Prime Trade Contractor shall designate one person to represent and make decisions on behalf of their company as the Commissioning Coordinator. Each Commissioning Coordinator shall participate as a member of the Commissioning Authority's 'Commissioning Team' in addition to others employed of contracted through the CA. A backup person shall be designated to fill-in for the Commissioning Coordinator when there are absences.

H. In addition to the other (numerous) commissioning activities specified in this section, the CA and commissioning team shall comply with specific duties set forth in the USGBC (United States Green Building Council) LEED for New Construction Version 2.2 Rating System:

1. Section EA Fundamental Commissioning (Prerequisite-1)

2. Section EA Enhanced Commissioning (Credit-3)

I. Construction phasing requirements that affect the commissioning process will be addressed in the Commissioning Plan and adhered to by the Contractor.

J. The CA and commissioning team shall develop and implement a real-time method, where practical, of reporting the commissioned status of each piece of equipment to be commissioned. The system shall be designed to key systems/equipment identifiers with drawings, equipment submittals, O&M data, and maintenance logs.

1.2 COMMISSIONING STANDARDS

A. ASHRAE Guideline 0-2005; The Commissioning Process

B. 2005 ACG Commissioning Guideline

C. 2008 NEBB Procedural Standards for Building Systems Commissioning

D. Building Commissioning Association (BCA) Guidelines on New and Existing Buildings

1.3 RELATED DOCUMENTS

A. All provisions of the Contract Documents (drawings and specifications) apply to the work in this section. Conflicting requirements shall be brought to the owner's attention in writing prior to completion of the bidding phase. The owner shall provide clarification in a timely manner.

B. This section includes general commissioning requirements that apply to the implementation of commissioning without regard to specific systems, assemblies, or components. Additional commissioning requirements may be included in individual specification sections.

C. The following specifications contain additional installation, testing and acceptance requirements in addition to the commissioning requirements of this Section:

1. Division 01 - General Requirements
2. Division 15 - Mechanical
3. Division 16 - Electrical

Note: Interpretation of the referenced specifications by themselves will not provide relief from the requirements stated in all other areas of the Contract Documents.

1.4 SYSTEMS TO BE COMMISSIONED:

A. Mechanical Systems:

1. Air handling units (Supply fans, return fans, package units, specialized fan systems)
2. Heating/Boiler systems (equipment, piping and controls)
3. Cooling systems (equipment, piping and controls)
4. Exhaust and ventilation fans (restrooms, electrical rooms, and mechanical areas)
5. Smoke Control systems
6. Stair Pressurization Systems
7. Variable-air-volume (VAV) units

8. Fan coil units & Terminal units (air and water)
9. Fuel oil system pumps and leak monitoring system
10. Building Instrumentation and Control System (DDC)

B. Electrical Systems:

1. Emergency Generators
2. Transformers & Main Switch Boards
3. Automatic Transfer Switches
4. Variable Frequency Drive (VFD) and Motor Starters
5. Lighting & Daylighting Controls
6. Public Address System
7. Fire Alarm & Life Safety interface with HVAC systems

C. Medical Gas Systems (alarm functions only)

D. Plumbing/Piping Systems:

1. Submersible Sump pump systems
2. Elevator Pit pump systems
3. Domestic Main Water Service Backflow Prevention Device
4. Domestic Water Booster Pump system
5. Domestic Hot Water Heaters and circulation pumps
6. Fire Pump and Cistern system

E. Ductwork and Air Distribution Systems:

1. Intake/Exhaust Systems
2. Duct Leakage
3. Filter Systems
4. Balance Dampers
5. Smoke/Fire Dampers

1.5 ABBREVIATIONS

A. A/E: Architectural/Engineering design team
B. AHJ: Authority having jurisdiction
C. BOD: Basis of Design
D. CA or CxA: Commissioning Authority
E. CC: Controls Contractor
F. CM: Construction Manager (the Owner's Representative)
G. Cx: Commissioning
H. DOR: Document of Requirements
I. EC: Electrical Contractor
J. EE: Electrical Engineer
K. FPT: Functional Performance Test
L. GC: General (Prime) Contractor
M. MC: Mechanical Contractor
N. ME: Mechanical Engineer
O. MEP: Mechanical/Electrical/Plumbing
P. NTP: Notice to Proceed
Q. O&M: Operations and maintenance
R. OPR: Owners Project Requirements
S. PFC: Pre-functional Checklist
T. PM: Project Manager (Owner or Company Representative)
U. RE: Resident Engineer
V. Sub: Subcontractor

W. TAB: Testing, Adjusting, and Balancing
X. TE: Test Engineer
Y. VAV: Variable air volume
Z. VFD: Variable frequency drive

1.6 DEFINITIONS

A. Acceptance Phase: The phase of construction after startup and initial checkout when functional performance tests, O&M documentation review and training occurs.

B. Architect/Engineer: The prime consultant (architect) and sub-consultants (engineers) who comprise the design team.

C. Areas of Conflict: Where commissioning requirements conflict with technical design provisions or other requirements of the Contract Documents, prompting the contractor to issue a request for clarification.

D. Basis of Design: A document that records concepts, calculations, decisions, and product selections used to meet the Owner's Project Requirements (OPR) and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

E. Commissioning Authority: An individual or entity designated to lead, review and oversee the completion of the commissioning process activities. The Commissioning Authority leads the Commissioning Team and implements the Commissioning Plan.

F. Commissioning: Documented confirmation that building systems function in compliance with criteria set forth in the Contract Documents and owner operational criteria.

G. Commissioning Plan: A document prepared by the CA that outlines the Cx team organization, communication paths, schedule, allocation of resources, matrix of responsibilities, and documentation requirements (guidelines) of the commissioning process. The plan can be developed before or after the bidding process, but must be implemented by the CA at the start of the construction. The plan shall be updated by the CA as the construction process evolves.

H. Contract Documents: The documents binding on parties involved in the construction of this project (drawings, specifications, change orders, amendments, contracts, Cx plan, etc.).

I. Contractor: The Prime Trade Contractor and its subcontractors.

J. Contractor's Pre-Commissioning Checklists: Includes installation and start-up items as specified to be completed by the appropriate contractors independent of the CA Commissioning Plan.

K. Control System: The central building energy management control system.

L. Construction Manager: The owner's representative.

M. Deferred Functional Tests: Tests that are performed after substantial completion due to partial occupancy, equipment, seasonal requirements, design or other site conditions that disallow the test from being performed. Deferred functional tests must be approved by the CA.

N. Deficiency: A condition in the installation or function of a component, piece of equipment or system that is not in compliance with the contract documents.

O. Design Intent: a dynamic document that provides the explanation of the ideas, concepts and criteria that are considered to be very important to the owner. It is initially the outcome of the programming and conceptual design phases.

P. Final Commissioning Report: Document prepared by the CA, which details the actual Cx procedures performed, inspection and testing results, and the final version of the deficiencies list indicating that all issues discovered through the Cx process have been verified as resolved or accepted. The report also includes key items for maintenance staff, such as fan & pump curves for equipment furnished. A copy of the final report is furnished to the owner as a menu-driven CD for future reference.

Q. Functional Performance Test (FPT): The FPT checklists are prepared by the CA and used to test the dynamic function and operation of systems/equipment by using manual (direct observation) or monitoring methods. The CA develops the written functional test procedures form in a sequential format based on the approved sequence of operation, and then coordinates, oversees and documents the actual testing which is usually performed by the installing controls contractor or vendor. Functional performance testing takes place after pre-functional checklists (installation and start-up) have been completed.

R. Prime Trade Contractor: the prime contractor and responsible for the work of its subcontractors.

S. Issues Log: A list of systems/equipment or procedural deficiencies and issues that have been noted. The list is prepared by the CA and includes the current disposition of each issue and the date of final resolution. Deficiencies include products/material, installation, service, or systems/equipment performance that do not comply with the Contract Documents and/or Commissioning Plan.

T. Monitoring: Recording parameters (i.e. flow, current, status, pressure, etc.) of equipment operation using data loggers or the trending capabilities of control systems.

U. O&M Manuals: Manuals used for the training, operations and maintenance of systems & equipment. Contractor should reference additional requirements in the individual systems/equipment specification sections.

V. Owner: Contracting officer or entity with the highest level of responsibility for directing the project.

W. Owner-Contracted Tests: Tests paid for by the owner outside the contractor's contract and for which the CA does not oversee.

X. Owner's Representative: Construction Manager or other individuals with the authority to make contractual decisions on behalf of the owner. The Commissioning Plan should be kept up to date with the names and contact information for each of the owner's representatives.

Y. Owner's Project Requirements (OPR): Non-technical document developed under by the facility owner, and usually with assistance from the A/E team. It states the concepts, budget, and performance criteria (including functional requirements) to which the completed project must conform. It includes expectations of how the building will be used and operated. This document is the basis for building commissioning and includes items such as project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information. It is used by the engineers to develop their basis of design/design intent documentation.

Z. Pre-functional Checklist (PFC): The PFC sheets are prepared by the CA and used to verify systems/equipment that installation and start-up activities comply with the Contract Documents and equipment submittals. CA verification can include inspections, tests and procedures to prepare equipment for initial start-up and proper/continuous operation (such as

cleanliness, belt tension, oil levels OK, labels affixed, gages in place, sensors calibrated, initial settings, etc.). Operationally, the checksheets shall be used to verify system set points, operating strategies, required component testing, correct rotation, and damper positions prior to functional performance tests. They shall incorporate manufacturers' start-up instructions. The checksheets require final sign-off by the contractor and CA prior to continuing the commissioning process.

AA. Project Manager (PM): A staff position for a particular entity with decision making authority.

BB. Seasonal Performance Tests: Functional performance tests that are deferred until system design conditions can be replicated or simulated.

CC. Specifications: The construction specifications are a part of the contract documents and supplement the design drawings. Specifications can also include procedures implied in the Commissioning Plan.

DD. Start-up: The initial start-up or activation of dynamic equipment.

EE. Subcontractor: Members of the construction team providing a service or product that are contracted by the GC.

FF. Substantial Completion: Project milestone whereby the CA can recommend to the Owner that the commissioned systems are installed & function properly, record documents are approved, and maintenance staff have received the specified training to operate the systems.

GG. Training: Instructions and hands-on demonstration of operating and maintaining systems and equipment.

HH. Trending: Monitoring of equipment and sequences using the building control system or data loggers.

II. Vendor: Supplier of equipment of service.

1.7 THE COMMISSIONING TEAM

A. The commissioning team consists of all members necessary to execute the approved Commissioning Plan. The team includes the CA, Construction Manager, Prim Trade Contractor, subcontractors, suppliers, vendors, owner, operations staff, CM, A/E team, certification agencies, members of the local building authority having jurisdiction and other specialists deemed appropriate to execute the Commissioning Plan.

B. Commissioning Coordinators are appointed by each Subcontractor and approved by the Construction Manager. The Commissioning Coordinators are the individuals having the authority to make decisions on behalf of their company.

1. The Cx team is explicitly organized to implement the commissioning process through coordinated efforts.

C. Members appointed by Owner:

1. Commissioning Authority
2. Facility user's staff members
3. Operation & maintenance personnel
4. Architect and engineering design professionals

1.8 OVERVIEW OF THE COMMISSIONING PROCESS

A. CA shall interface with the owner and A/E team to understand and implement systems/equipment operating and performance expectations along with systems/equipment acceptance criteria.

B. CA shall review the OPR, BOD, drawings, specifications, mechanical schedules and systems sequence of operations.

C. CA shall provide a written report to the Architect within 30 days of construction NTP documenting a thorough understanding of the owner's project expectations/requirements, systems design, construction schedule, systems acceptance criteria, training requirements, warranty limitations, and project Substantial Completion requirements.

D. CA shall document significant interactions and coordination meetings concerning the commissioning aspects of the project. The Commissioning Coordinators are to be included in the meetings and copied with exchange of coordination materials.

E. CA shall develop draft Commissioning Plan prior to the bidding phase and finalize the Commissioning Plan during the construction phase.

F. CA shall develop, where practical, a real-time method of reporting the commissioned status of each piece of equipment to be commissioned.

G. Conduct a selective review of contractor submittals of commissioned equipment.

H. CA shall prepare PFC and FPT checksheets and provide to the contractor for use with execution of the Commissioning Plan.

I. CA will conduct a site pre-installation commissioning "kick-off" meeting with the Commissioning Coordinators shortly after award of the construction contract. The CA shall provide an overview of findings from CA's preliminary review of the construction documents and owner requirements. The CA will explain the Cx process in detail and identify specific commissioning-related responsibilities of the contractor.

J. Code compliance remains the responsibility of the local code authorities. The CA shall document code tests completed by the code authority.

K. On-going Cx status meetings will be scheduled to occur during the construction phase to monitor progress and to help facilitate the Cx process. The Contractor's Commissioning Coordinators will be required to attend these meetings.

L. Once contractors have provided the CA with written verification indicating the installation and start-up PFC checksheets have been completed, the CA will conduct an on-site inspection of the specific systems and equipment. The CA will provide the PFC checksheets to the contractor.

M. Upon confirmation of system readiness, the CA will schedule with the contractors to perform functional performance tests to verify compliance with the contract documents. The CA will provide the FPT checksheets to the contractor and oversee the process for these tests.

N. Deficiencies will be documented by the CA on the Issues Log. When easily corrected, issues will be resolved by the contractor at the time of discovery. All other issues will be resolved by the responsible contractor in a timely manner. All deficiencies will be noted by the CA as either resolved or pending resolution. When resolved, contractor shall notify the CA for re-check and acceptance.

O. The construction phase Cx process will be complete when all noted deficiencies have been corrected, proven to comply with the Contract Documents or otherwise resolved to the satisfaction of the owner.

P. The CA shall provide documentation in the Final Commissioning Report that a thorough review of the Contractor's as-built Record Documents has been completed by the A/E.

Q. Following Substantial Completion, 10-months into the Warranty period, the CA shall review the systems performance with the building occupants and Owner's operations staff. Operational issues shall be identified and a resolution plan shall be developed to make the necessary corrections. The CA shall provide the owner with a written report including summary of findings and resolutions.

1.9 COMMISSIONING AUTHORITY'S RESPONSIBILITIES

A. The primary role of CA is to develop, implement, and coordinate execution of the Commissioning Plan through organization and leadership of the Commissioning Team.

B. The CA is not responsible for the design concept, design criteria, code compliance, code inspections, specialty tests, construction scheduling, cost estimating, or construction management.

C. Provide a draft and final Commissioning Plan.

D. Review Cx-related specifications, submittals, design, and construction documents. Communicate noted deficiencies and concerns to the owner and/or owner's representative.

E. Review and approve training curriculum as developed by the contractor.

F. Develop detailed and specific operational and functional testing procedures for equipment and systems to be commissioned (including project-specific construction checklists).

G. Coordinate Cx meetings as necessary to facilitate the Cx process, maintain the project schedule, assist with resolving identified issues, and provide meeting minutes to Cx team.

H. Review the TAB specifications and reports, and spot-check the TAB process. Roughly 10% of the TAB report will be randomly checked for accuracy by the CA.

I. Perform site inspections and verify contractor readiness for the operational and functional testing process. Document observed conditions in site visit reports.

J. Verify the execution of Cx process activities. Verification will include, but is not limited to, equipment submittals, construction checklists, training, operating and maintenance data, random sampling, tests, and test reports to verify compliance with the OPR.

K. Prepare and maintain the commissioning issues log.

L. Witness contractor-performed systems, assemblies, equipment, and component startup whenever scheduled in advance or required by the owner.

M. Collect all Final Report documentation including the contractor's start-up forms, flush-out verification, pressure tests, test & balance data, PFC checksheets (installation & startup), FPT checksheets, site visit reports, issues log, and any other forms used to document the commissioning process. Review the closeout documentation with the mechanical/electrical engineers for completeness. Prepare a list of action items necessary to complete the commissioning process.

N. Review warranty certificates.

O. Recommend acceptance of systems/equipment to the owner after all commissioning activities have been successfully completed.

P. Provide the owner with a Final Commissioning Report to document the Cx process and to verify that the Cx process has been completed. Provide a menu-driven CD of all Cx documentation to the Owner.

Q. Compile test data, inspection reports, and certificates; include them in the Systems Manual per the LEED EA Enhanced Commissioning Credit-3 requirements.

R. After substantial completion, provide a 10-month review of systems/equipment per LEED EA Enhanced Commissioning Credit-3 requirements.

1.10 OWNER'S RESPONSIBILITIES

A. Initiate participation of owner's chosen representatives as required to complete the commissioning and LEED certification processes.

B. Provide the OPR documentation to the Cx team for information and use.

C. Assign O&M personnel and schedule them to participate in Cx team activities.

D. Provide the BOD documentation, prepared by the architect/engineer and approved by the owner, to the CA and contractor for use in developing the Cx plan, systems manual, and O&M training plan.

1.11 ARCHITECT/ENGINEER'S RESPONSIBILITIES

A. Participate with the owner in developing the OPR and BOD documentation. Review and revise as necessary throughout the project duration.

B. Review the Cx documentation and provide comments as necessary to the CA and the owner.

C. The architect/engineering team shall provide, in a timely manner, the necessary representatives from the design team as required for completing the commissioning and LEED certification processes.

D. Design team members shall provide prompt replies to RFI requests issued during the Cx process.

E. Review and approve all commissioned equipment/system submittals provided by the contractor. Transmit review comments to the owner and CA.

F. Participate in determination of final controls system input/output points list and sequences of operation as required to complete functional test procedures with the owner's representative, CA, and controls contractor.

G. Assist the Cx team in resolving technical problems that arise during construction, start-up and functional testing.

1.12 CONSTRUCTION MANAGER'S RESPONSIBILITIES

A. Construction Manager shall require each Prime Trade Contractor to designate a Commissioning Coordinator. The Commissioning Coordinator shall have the authority on behalf of their company to make decisions pertaining to the commissioning process.

B. Prepare equipment submittals for review by A/E and CA. Equipment submittals shall represent the materials, equipment and systems operation as specified by the Construction Document. Submittals that are in difference with the intent of the Construction Documents shall include either a 'Request for Clarification' or 'Substitution Request'.

C. Evaluate installation and performance deficiencies, recommend corrective actions, and coordinate the necessary corrective measures with the appropriate subcontractors/vendors.

D. Cooperate with the CA for resolution of deficiencies recorded in the issues log.

E. Attend Cx meetings as required to facilitate the Cx process.

F. Integrate and coordinate Cx process activities with Master Construction Schedule. As a minimum, include the following completion milestones for each commissioned equipment/system:

1. Pre-functional checklists (installation & startup)
2. Preliminary TAB report
3. Functional performance tests
4. Performance periods (coordinate with building purge, occupancy schedules and seasonal tests)
5. Training sessions (subcontractor and vendor provided)

G. Coordinate all subcontractor/vendor training requirements

H. Coordinate all subcontractor/vendor activities necessary to identify and correct deficiencies during the Warranty period.

1.13 MECHANICAL CONTRACTOR'S RESPONSIBILITIES

A. Coordinate participation of all the Contractors in the Cx process. This shall include but not be limited to HVAC, Piping, Plumbing, Medical Gas, Fire Protection and all other disciplines.

B. Coordinate installation of mechanical systems and equipment with equipment suppliers, mechanical subcontractors, and electrical contractor. Verify that coordination, installation, quality control, and final subcontractor testing have been completed such that installed systems and equipment comply with construction documents.

C. Notify the CA and GC as soon as possible of any issues identified during construction that may affect the Cx process or final system performance.

D. Complete PFC and FPT documents required.

E. Distribute the CA issues log to the appropriate parties for timely resolution.

F. Perform start-up and testing of mechanical equipment and systems and document as required with start-up reports.

G. Lead Cx meetings as required to facilitate the Cx process.

H. Operate equipment and systems as required for operational and functional performance testing.

I. Participate in the fine tuning or troubleshooting of systems or equipment for proper performance.

J. Provide complete operation and maintenance information and final record drawings to the Construction Manager for verification, organization, and distribution.

K. Provide training for the systems specified. Submit the training plan and agenda, at least two weeks in advance of the scheduled trainings, for approval, through appropriate parties. Training shall not be performed until the Cx process is 100% complete and the training plan and agenda have been approved.

1.14 ELECTRICAL CONTRACTOR'S RESPONSIBILITIES

A. Coordinate participation of the electrical subcontractors in the Cx process.

B. Coordinate the installation of electrical systems and equipment with equipment suppliers, electrical subcontractors, and mechanical contractor.

C. Verify that coordination, installation, quality control, and final subcontractor testing have been completed such that installed systems and equipment comply with construction documents.

D. Notify the CA and GC immediately of any issues identified during construction that may affect the commissioning process or final system performance.

E. Complete PFC and FPT documents provided by the CA as required.

F. Distribute the CA issues log to the appropriate parties for timely resolution of deficiencies. Notify the CA when issues are ready to be rechecked.

G. Perform start-up and testing of electrical system equipment and systems as required, document with start-up reports, and submit to the CA.

H. Operate equipment and systems as required for FPT.

I. Participate in fine-tuning or troubleshooting of system performance if either of these measures becomes necessary.

J. Provide complete operation and maintenance information and final record drawings to the Construction Manager for verification, organization and distribution.

K. Provide training for the systems specified. Submit the training plan and agenda, up to two weeks in advance of the scheduled trainings, to the CA for approval. Training shall not be performed until the Cx process is 100% complete and the training plan and agenda have been approved by the CA.

1.15 FIRE ALARM CONTRACTOR'S RESPONSIBILITIES

A. Provide CA and control contractor with fire alarm system and wiring diagrams, narrative sequences of operation prior to Cx.

B. Participate in any required efforts to finalize sequences of operations with the owner, designers, and CA.

C. Coordinate installation of fire alarm system with equipment suppliers, mechanical subcontractors, and electrical contractor. Verify that coordination, installation, quality control, and final subcontractor testing have been completed such that installed systems and equipment comply with construction documents.

D. Notify the CA, designers and construction manager as soon as possible of any system installation issues identified during construction that may compromise system control capability.

E. Participate in start-up and operational and functional testing as required. This shall require the fulltime support of the contractor with the CA during the operational and functional tests.

F. Provide complete contractor supporting documentation as required demonstrating completion of fire alarm system installation, point verification, start-up and testing, and submit to the CA.

G. Attend Cx meetings as required to facilitate the Cx process.

H. Provide the CA and construction manager with final documentation for all installed conditions, including final record drawings and detailed narrative sequences of operation as determined during Cx process.

I. Provide training for the systems specified. Submit the training plan and agenda, up to two weeks in advance of the scheduled trainings, to the CA for approval. Training shall not be performed until the Cx process is 100% complete and the training plan and agenda have been approved by the CA.

1.16 CONTROLS CONTRACTOR'S RESPONSIBILITIES

A. Provide CA and mechanical contractor with controls system and wiring diagrams, narrative sequences of operation, and software documentation printout of actual programmed sequences prior to equipment start-up and testing.

B. Participate in any required efforts to finalize sequences of operations with the owner, designers, subcontractors and CA.

C. Coordinate installation of controls system with equipment suppliers, mechanical subcontractors, and electrical contractor. Verify that coordination, installation, quality control, and final subcontractor testing have been completed such that installed systems and equipment comply with construction documents.

D. Notify the CA, designers and construction manager as soon as possible of any system installation issues identified during construction that may compromise system control capability.

E. Participate in start-up and operational and functional testing as required. This shall require dedicated, full time support to the CA in operational and functional testing efforts during Cx.

F. Complete contractor pre-commissioning checklist and other supporting documentation as required demonstrating completion of control system installation, point-to-point verification (including sensor calibration), start-up and testing, and submit to the CA.

G. Review and provide comment as necessary of CA furnished functional performance test sheets for adherence to the approved sequence of operation.

H. Participate in FPT of mechanical equipment. Place specific systems as directed by CA into test modes for FPT.

I. Attend Cx meetings as required to facilitate the Cx process.

J. Participate in the controls integration meetings to discuss control sequences, devices, scope of work and owner's operation of the systems.

K. Participate in fine-tuning or troubleshooting of system performance if either of these measures becomes necessary.

L. Provide the CA and construction manager with final documentation for all installed conditions, including final record drawings and detailed narrative sequences of operation as determined during Cx process.

M. Provide training for the systems specified. Submit the training plan and agenda, up to two weeks in advance of the scheduled trainings, to the CA for approval. Training shall not be performed until the Cx process is 100% complete and the training plan and agenda have been approved by the CA.

1.17 TEST, ADJUST, AND BALANCE (TAB) CONTRACTOR'S RESPONSIBILITIES

A. Review the Cx plan, schedule, and functional test procedures. Provide the input required to develop final plans and procedures.

B. Coordinate balancing activities with those of the mechanical and controls contractors. Verify that coordination, installation, quality control, and final subcontractor testing have been completed to allow proper balancing work to be performed.

C. Notify the CA, designers and construction manager as soon as possible of any system installation or performance issues that may compromise the ability of the system to be balanced.

D. Participate in start-up and testing as required.

E. Attend Cx meetings as required to facilitate the Cx process.

F. Provide preliminary TAB report, indicating all actual field values recorded, to the CA, designer and construction manager, prior to initiation of operational and functional testing. A preliminary TAB report shall be submitted within seven (7) working days after completion of the balancing work. If job conditions require the TAB work be divided by logical systems, the preliminary TAB report will be submitted in logical sections within seven (7) working days after completion of the balancing work on each system.

G. Assist during the operational and functional testing as required.

H. Coordinate with CA a minimum of 10% verification of selected systems identified by the CA.

I. Participate in fine-tuning or troubleshooting of system performance if either of these measures becomes necessary.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. All standard testing equipment required for performing PFC and FPT on each piece of equipment or system shall be provided by the responsible contractor.

B. Special or proprietary equipment, tools and instruments (only available from vendor or specific to a piece of equipment) required for testing equipment shall be included in the contractor's base bid price and left onsite as required for use by the CA.

C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances indicated in the specifications. Equipment shall have been calibrated within the last year and in accordance with the manufacturer's specifications. In addition, equipment shall either be re-calibrated immediately or removed from the site whenever dropped or damaged. Calibration certificates shall be readily available upon request by the CA.

D. All test equipment shall utilize the I.P. standard (or S.I.-Metric) measurement system unless otherwise required by the Commissioning Authority.

2.2 SYSTEM PFC AND FPT CHECKSHEETS

A. The PFC and FPT checksheets are formatted and provided to the GC by the CA. The checksheets include fields that must be filled in by the construction team and verified by the CA as required in the Commissioning Plan. Examples of information requested the checksheets include:

1. Design values
2. Electrical data
3. Equipment identification numbers
4. Manufacture make & model numbers
5. Submittal data
6. Sequences of operation
7. Installation verification
8. Start-up and operational verification
9. Acceptance test procedures
10. Functional verification

PART 3 - EXECUTION

3.1 NOTIFICATION OF SYSTEM COMPLETION AND RE-INSPECTION COSTS

A. Two weeks prior to the beginning of start-up or test activities for each system, the contractor shall provide a detailed look-ahead schedule. This schedule shall be updated weekly and shall provide information to include date, time, beginning location, and anticipated duration of each start-up or test activity. Contractor shall notify the CA in writing at least 72 hours in advance of any changes to this schedule. The CA will witness the equipment start-up by the manufacturer's representative per the specifications.

B. When systems are ready for final Cx verification, contractor shall notify the CA, in writing, at least 72 hours in advance.

C. Should the initial verification test for systems/equipment reveal items that are not performing as specified, the CA shall provide one re-inspection of the item at no additional cost to the contractor. The Construction Manager shall be liable for re-inspection and other related costs incurred by CA if the second and subsequent systems/equipment verification tests do not perform as specified.

3.2 VERIFICATION OF PERFORMANCE

A. Verification of performance will take place after formal notice from the contractor that the prefunctional checklist (installation and operational) sheets have been signed-off.

B. Performance demonstration will be done by the systems and equipment trade representatives and shall be witnessed by the CA.

C. Verification will include demonstration of performance listed in the functional testing data sheets.

D. The specified, submitted and other data will be entered on the equipment data sheets prior to the verification.

E. The witnessed performance data will be added to the data sheet at the time of verification.

F. Notify the CA and CM as soon as possible of any issues identified during construction that may affect the Cx process or final system performance.

3.3 COMMISSIONING DOCUMENTATION

A. The contractor shall complete all PFC and FPT checksheets for all systems/equipment and provide documentation that testifies the checksheets are accurate.

B. The contractor shall provide the approved O&M manuals to the owner and CA prior to commencement of training. The manuals shall contain at a minimum the following information:

1. Design data
2. Operating data
3. Performance curves
4. Acceptance criteria
5. Control sequence of operations
6. Start-up reports
7. TAB reports
8. Maintenance recommendations and requirements
9. Warranty certificates

C. The CA shall review record drawings, O&M manuals, and resolution of items listed on the CA Issues Log for completeness prior to approval of the training schedule.

D. The contractor shall provide training to the owner's operations & maintenance personnel (and, if applicable, contracted maintenance vendors) prior to substantial completion of the project.

E. The CA will document and communicate deficiencies with the PFC & FPT checksheets, O&M manuals, Record Drawings, and readiness for commencement of systems/equipment training directly to the owner.

F. The CA shall distribute all commissioning documentation (i.e. meeting minutes, site observation reports, Issues Logs, Final Reports, etc.) in electronic format to the Owner and Construction Manager. If hard copies are requested, the requesting party shall reimburse the CA for all labor and material copying costs.

G. The Owner shall provide the CA, upon request, with one hard copy and one electronic copy of all documents that are required to complete the commissioning process.

3.4 TRAINING THE OWNER'S OPERATIONS & MAINTENANCE STAFF

A. The owner's operations & maintenance personnel (and, if applicable, the owner's contracted maintenance vendors) shall be given comprehensive training in the understanding of the systems and the operation, maintenance, and repair of each major piece of equipment and system per the approved agenda and curriculum.

B. The Construction Manager, in cooperation with the CA, will be responsible for coordinating and scheduling the training. Hands-on training shall include start-up, operation in all modes possible, repair, safety, shutdown and emergency procedures, if any.

C. On-site classroom training sessions shall be scheduled as part of the training requirements.

D. The contractor or his representative shall conduct all sessions and shall add to each session any special information relating to the details of installation of the equipment as it might impact the operation, maintenance, and repair.

E. Training shall include a review of the record as-built drawings and O&M data.

F. Each contractor and vendor responsible for training shall submit a written training plan to the CA for review and approval prior to training. The training plan shall cover the following elements:

1. Equipment included in each training session
2. Location of the equipment
3. Intended audience including names and contact information
4. Location, date/time and duration of each training session
5. Topics and learning objectives
6. Instructor's qualifications for each topic, and individual's contact information
7. All training methods shall include a classroom lecture and an actual operational demonstration of start up, turn-down and maintenance procedures

G. Video taping is required and shall be the responsibility of the GC for all training sessions. Tapes or DVD's shall be cataloged and added to the O&M manuals. The GC shall submit samples of video/audio quality for approval prior to commencement of the first training session.

3.5 COMMISSIONING ACCEPTANCE CRITERIA

A. The CA acceptance criteria will be developed from the plans, specifications, and equipment manufacturer's operating criteria.

B. The contractor is responsible for meeting contractual requirements found in the plans and specifications. The contractor is reminded of their responsibility for furnishing a working system. All items logged as deficient need to be corrected per the plans and specifications.

3.6 FINAL COMMISSIONING REPORT REQUIREMENTS

A. The CA will submit a final report to the owner which includes a statement that the project meets the owner's design intent and a narrative of the results of the completed inspections, operational and functional testing.

B. The final report shall include an outline of the deficiency list and dates identifying items found and dates items corrected. All open items will be identified in the report.

C. Technical data from the equipment shall be included along with test results; manufacturer's startup sheets; and testing, adjusting, & balancing (TAB) reports.

D. At the conclusion of the commissioning process, the CA will prepare a memorandum addressed to the Owner to formally recommend systems and equipment performance acceptance.

E. All documentation included in the final report shall be assembled on a CD in a menu-driven electronic format. The owner and contractor shall each receive a copy of the final report on a CD, and the Owner shall receive one hard-copy of the final report.

F. The final commissioning report shall be organized with tabs as follows:

1. Executive summary
2. Commissioning plan

3. Document reviews
4. Commissioning site visit reports
5. Issues Log (cleared and open items)
6. Pre-functional Checklists (installation and startup)
7. Functional Performance Test sheets
8. TAB report
9. Training record and evaluations
10. Trend Log review
11. LEED documents

G. At the conclusion of the commissioning process, the CA will formally recommend accepting equipment and systems performance to the owner.

** END OF SECTION **