

SECTION 017700

TURNOVER AND CLOSEOUT PROCEDURES

PART 1 GENERAL

1.1 TURNOVER PROCEDURE

A. SUBJECT

1. The turnover process occurs when operational and maintenance responsibility for a system, area, building or component is turned over from the University Project Management Team to the University organization responsible for the operation and maintenance of that asset. This typically happens in conjunction with Substantial Completion and Beneficial Occupancy and may occur at stages prior to TCO where client needs to mobilize their internal equipment infrastructure.

B. PURPOSE

1. The Turnover Process is designed to detail the action of transferring projects, new buildings, renovated buildings, partial building renovations, phased turnover, etc. It provides a set of standard procedures and protocols supporting the process. Completion of the independent commissioning effort is also part of the turnover process.

C. PROCESS

1. The Turnover Process is the means by which the Project Team works with the applicable University Facilities & Operations organization and other University clients throughout the project duration; beginning at the start of the design effort and through the turnover process. The following are examples of efforts, processes and record documents of which the Contractor is responsible for in order to support the Turnover Process:
 - a. Provide input to the design.
 - b. Participate in reviews during the construction and commissioning efforts.
 - c. Create Training syllabus.
 - d. Schedule training dates and agenda of the curriculum.
 - e. Turnover Letter (includes Warranty Start Date, listing of covered items, contact information for warranty execution, and System Deliverables.)
 - f. Copy of current Punch List (indicating exceptions if Contractor is to be responsible for the continued maintenance and upkeep of specific systems and equipment).
 - g. Operating and Maintenance Manuals.
 - h. Transfer all existing and relevant service contracts put in place during construction.
 - i. Assignment of Fire Safety Directors by TCO date.
 - j. Create Architect's Field Observation Procedures.
 - k. Identify incomplete work, deficient work and other work which require attention and responsibility of the Contractor for full acceptance of same.
 - l. Punch-list remedy.
 - m. Project contact list for all phases of same. Completed Balance and Testing Reports:
 - 1.) Air Balance Reports.

- 2.) Water Balance Reports.
- 3.) Hydrostatic Test Reports.
- 4.) X-Ray Test Reports.

- n. Electrical short circuit study and arc flash hazard analysis calculations and report.
- o. Electromagnetic fields inference and conduction test reports (if applicable.)
Medium voltage transformers snubber circuit design report.
- p. Medium voltage substation(s) ground grid analysis and design showing safe step and touch potentials.
- q. Letter to confirm that all protective relays and circuit breakers are set, mapped and adjusted to satisfactorily match the short circuit study.
- r. Annotated and Current Basis of Design.
- s. Annotated and Current Project Specifications.
- t. Commissioning Inspection Reports (including functional performance test and As-Built Sequence of Operations) for MEP, BMS, SCADA, fire alarm, fire protection, acoustics (if applicable), and any associated control systems
- u. 3D Model (if available/applicable.)
- v. BIM files: they should be organized by building system and represent the final as-constructed building and components configuration, including Architectural Supplemental Instructions, Change Notices, and field changes. In addition, all interior walls must be modeled to their correct heights.

1.) The final delivery of the BIM and associated data to Columbia will be in the form of:

- i. Design Models: Record BIMs must be submitted in Revit, Civil 3D and other native formats. All equipment schedules must be generated from the parameters embedded in the Revit model objects.
- ii. Construction Models: Fully coordinated architectural, structural, civil and MEPF 3D models to be submitted in Revit or DWG format. The files need to be maintained live in BIM 360 Glue.
- iii. MEP/FP system models will include unique asset identification numbers that link them and match University standards.
- iv. Naming conventions for equipment types should be useful, descriptive and shall match University standard and sequence control. The names provided shall allow for easy identification and be easily understood in order to facilitate the operation, repair and maintenance of Columbia equipment.
- v. MEPF systems must be defined within Revit such that each system can be isolated and viewed separately.
- vi. All Design and Construction Models to be provided with all sheets, details, layouts and links.
- vii. Models will contain all families and components used for model generation.
- viii. The Design and Construction Team Members are responsible for documenting and providing the Model Naming Conventions for their final BIM Deliverables. This should be included within the BIM execution Plan upon project turnover.
- w. Final As-Built Drawings:

- 1.) AutoCAD files Format: All drawings shall be in AutoCAD 2017 DWG format or later. DXF and DWF are not acceptable.
- 2.) Sheets: Each sheet in the drawing set must be saved as an individual file. Multiple drawing sheets combined and saved in a single file will not be accepted. Drawing names should be identical to PDF drawing sheet number (e.g. A-100.0.dwg, E-100.00.dwg). Special characters within the file name should be limited to dashes.
- 3.) Support files: Deliver all necessary to recreate output that matches deliverables. Support files include, but are not limited to, the following: external references (XREFs), plot configurations (.ctb, .pc3), blocks, write blocks, images (logos), shapes (.shx) and fonts. Deliver files to the Owner free of any copyrighted or other material whose distribution is prohibited.
- 4.) External references: Each XREF file will have an insertion point of 0, 0, 0; scale factor of 1; rotation angle of 0; and reside on a separate layer within the dependent file. In addition, XREF files must be included with each deliverable and located in the same directory as the dependent file. The 'Insert' and 'Bind' options for XREFs will not be accepted.

x. Drafting:

- 1.) All lines shall be snapped, and all polygons shall be closed.
- 2.) Drawings shall not contain multiple overlaid lines or lines with multiple segments unless overlaid lines or adjacent line segments are assigned to different layers.
- 3.) Drawings shall be purged of empty, unused, or non-essential drawing data.
- 4.) All drawings will be developed in full scale format and will be maintained as an integrated whole with individual drawings plotted using paper space.
- 5.) Entity colors shall be defined "by layer."
- 6.) Blocks and attributes shall be created on layer 0. Use 1:1 scale to create blocks and insert at the appropriate scale.
- 7.) AIA layering standards are recommended.
- 8.) Only native AutoCAD fonts, line types, and hatch pattern shall be used.

y. PDF Files:

- 1.) Submit one PDF for each drawing sheet file named identically to correspond with drawing name.
- 2.) The PDF document size is to be the same as the full-size drawing sheet size.
- 3.) PDFs should be produced from the native program of origin wherever possible. No scanned images.

z. Metadata:

- 1.) An Excel matrix including the following shall be provided for all applicable submitted files.
- 2.) File name.
- 3.) Corresponding drawing name.
- 4.) Description.
- 5.) All Layer names and descriptions.
- 6.) XREF file names and descriptions.
- 7.) Data sources.
- 8.) Project description information including dates and contact information.

- aa. Warranty Information.
- bb. Spare Parts and Material (Attic Stock.)
- cc. Alarm Points and Set Points (Complete As-Built Inventory.)
- dd. Signed Off Permits.
- ee. Final Cleaning and Commissioning Requirements:
 - 1.) Window stickers removed/windows cleaned.
 - 2.) Filters replaced, lubrication, indicator bulbs.
 - 3.) Brick cleaning.
 - 4.) Site cleaning.
 - 5.) Elevator As-Built wiring diagrams and test results.
- 2. Elevator tests and Certificate (where installed.)
- 3. Mechanical and plumbing letter re: tests, adjustments.
- 4. Fire Department Certificate of Approval for fire protection systems.
- 5. Certificate of electrical inspections.
- 6. Test records of fire alarm system and devices.
- 7. Equipment Use Permits.

1.2. TURNOVER PROCEDURE PACKAGE

- A. The Turnover Procedure Package is a record of the information required to properly operate and maintain the system, area, building or component that is being turned over from the University project management team to the University Facilities & Operations organization or other internal users. The documented turnover has the following benefits as summarized below and identified as the TURNOVER PROCEDURE PACKAGE OF NEW BUILDINGS FROM Contractor to University BUILDING FACILITIES & OPERATIONS:
 - 1. The Contractor is responsible for ensuring O&M manuals, as-built drawings and other documentation as noted herein is formally provided to the University in accordance with the required timeframe/milestones. (Note: Inspection Report, Building Location Survey and Specifications should be forwarded to the “BIM 360 Field” coordinator at the beginning of the project noted on this list as a reference.) The following list is a sample of required material but not limited to:
 - a. O&M Manuals (Provide 2 paper copies and a digital copy in word, word perfect, PDF or TIFF in Unifier Turnover Folder.
 - b. As-built/Record drawings – Upload in Unifier Turnover Folder and provide 2 sets full size (D 36" x 24") paper copies plus a labelled USB Drive with AutoCAD and PDF versions (underground utility drawings should be on E size 34" x 44"). All transactions shall be formally transmitted for record within Unifier.
 - c. Maintenance service contracts executed during construction

- d. Observation Punch List.
 - e. Commissioning Punch List.
 - f. Day 2 Work.
 - g. Training Syllabus.
 - h. Substantial Completion Certificate.
 - i. Warranties.
 - j. Attic Stock List.
 - k. Inspection Certificates.
 - l. Equipment Use Permits.
 - m. Preventive Maintenance and Service History records.
 - n. Final cleaning confirmation.
 - o. Etc.
2. Twelve (12) Months Prior to Temporary Certificate of Occupancy (TCO)
- a. In consultation with the end-users, the Contractor shall support and perform (whereby indicated via contract):
 - 1.) Signage requirements
 - 2.) Final FF&E inventory
 - 3.) Additional User electrical requirements
 - 4.) Move coordination logistics
 - 5.) IT requirements (ensure phone jack is installed in the elevator machine room and two phone lines at fire command center equipment location). Submit Elevator phone line request to CUIT project manager gl2502@columbia.edu, 347 920-8317 and MDG project manager.
 - b. The Contractor shall arrange a preliminary tour for the University Facilities & Operations staff.
 - c. The Contractor shall submit a project specific training syllabus to the University Facilities & Operations for review and approval
3. Six (6) Months Prior to Temporary Certificate of Occupancy (TCO)
- a. The Contractor shall comprehend the turnover process by attending University and User meetings.
 - b. The Contractor shall attend commissioning meetings to ensure schedules are adhered to and/or impact of amendments is discussed and information disseminated. Facilities & Operations and Commissioning Agent representative are required to attend.
 - c. The Contractor shall provide construction schedule information to the University CUIT Services and Public Safety in order to make supporting departments aware of the construction schedules and occupancy timeline.
 - d. O & M packages turned over
 - e. Detailed training syllabus and schedule for proposed training submitted to the University Facilities and Operations Division
 - f. Submit all maintenance records for all equipment requiring same
 - g. Identify warranties, service contracts and procedure to execute, contractors list in CU VMS
 - h. Submit Pull-the-Plug test script
4. Four (4) Months Prior to Temporary Certificate of Occupancy (TCO)

- a. The Contractor shall arrange another walk through for University Facilities & Operations staff. Consultants shall be present to respond to questions. Request punch-list of noted items from this tour within one week from Architect.
 - b. The Contractor shall demonstrate that life safety system devices are accessible and perform as designed; including all equipment shutdown sequences of operation to the University. Demonstration of functioning system applies to Fire Alarm system, smoke evacuation, fire pump performance, automatic transfer switches (ATS) and respective equipment shutdown & startup sequences of operation, etc.
 - c. Arrange for high tension electrical system training at local Utility, when applicable.
 - d. Submit records of maintenance completed on permanent equipment that was operated during construction.
 - e. Review list with the University Facilities & Operations and MDG PM. Forward to consultant team. The Contractor shall ensure issues are responded to and /or resolved.
 - f. Provide Fire Plan to be maintained at main desk
 - g. Provide full list of fire alarm points and documentation representing NFPA testing cycle reports and NFPA maintenance requirement.
5. One (1) Month Prior to Temporary Certificate of Occupancy (TCO)
- a. Perform final construction cleanup of building (including mechanical and electrical rooms- MCC's & transformers). The Contractor shall arrange a walk through with the University Facilities & Operations Division to identify potential concerns and ensure they are addressed prior to the turnover at occupancy.
 - b. The Contractor shall coordinate with the University Facilities & Operations Locksmiths to ensure keying of the building is on track for occupancy.
 - c. The Contractor shall arrange a walk through with the University Fire Safety Director (FSD) staff to review what access the Fire Department requires in the event of an emergency.
 - d. The Contractor shall ensure the University Fire Safety Director representative receives a copy of the Certificate of Inspection for each elevator and that any deficiencies have been rectified by the Contractor. Elevator emergency telephones to be programmed to connect through to the University designated contact.
 - e. Ensure all training for mechanical and electrical equipment demonstrations have taken place. Invitations must be issued to the University Facilities & Operations one week in advance. The Contractor shall attend demonstrations, take attendance, and note dates on Turnover Checklist. Demonstrations should consist of two parts:
 - f.
 - 1.) Classroom style to explain design and theory.
 - 2.) Demonstration of project specific equipment and systems.
 - 3.) Provide up to date punch list of noted items list and building turnover checklist for discussion at turnover meeting.
 - 4.) During the turnover meeting, identify outstanding punch list of noted items to be reviewed at the follow up meeting after three months from the turnover session.
6. 2 Weeks Prior to Temporary Certificate of Occupancy (TCO)
- a. PRELIMINARY OCCUPANCY WALKTHROUGH: Fire Safety Director (FSD) and staff is included in the occupancy walk through with the Fire Department (FDNY). The Contractor shall provide the fire alarm system Sequence of Operation

in advance to the University. The Contractor shall provide verification that the fire alarm system is remotely monitored and operational by a central station entity. The FDNY requires a copy of the completed verification report and a copy of the device list in word text format (programmers report.) The Contractor shall provide a copy of the electrical, as built drawings from the subcontractor. Ensuring these requirements are met will facilitate a timely turnover.

7. Prior to Temporary Certificate of Occupancy (TCO)

- a. FINAL OCCUPANCY WALKTHROUGH: Occupancy Permit issued by DOB
- b. The Contractor shall provide full and detailed listing of all work not completed in progress or in need of remediation including schedule to close, demonstrate functionality and commissioning
- c. The Contractor shall provide a second list of active punch-list with detailed schedule for completion.
- d. The Contractor shall support the University when arranging for a security review with the University Public Safety Division and the Users prior to occupancy.
- e. Provide summary of all warranty start dates
- f. The Contractor shall demonstrate ADDITIONAL TESTING REQUIRED FOR NEW BUILDINGS:
 - 1.) PULL THE PLUG TEST. The main power switch to the building to be turned off by the Contractor - in coordination with the University Facilities & Operations Division. This test will check the emergency generator system, confirm what is on emergency power and more importantly allow start up the building, after an outage, under controlled conditions.
 - 2.) FULL SUPPLY FAN-OFF TEST. This test verifies operation, interlocks and ensures that all doors are able to be opened in the event of an emergency.
 - 3.) FULL FIRE ALARM TEST. Perform by activating a pull station or other alarm activating device. This test allows a physical check of the FA sequence of operation under an alarm condition.
 - 4.) ELEVATOR FIRE ALARM RECALL. Complete operational test of elevator Fire Alarm Recall system.
 - 5.) Ensure that all systems, regardless of power source, respond appropriately and return to service as intended upon restoration of electrical source of power.

8. Occupancy

- a. Establish deficiency protocol with the University to establish clear line of communication of building deficiencies as noted during occupancy; while satisfying open punch-list and addressing deficient items.
- b. The Contractor shall communicate with the University to arrange for takeover of operational responsibility for the building.
- c. The Contractor shall perform warranty and post occupancy review with the University and the Architect. The Contractor shall assist the University to the full contractual obligation, with significant warranty issues requiring attention during the respective warranty periods.
- d. For work which is identified as incomplete or deficient, the Contractor shall continue to address and remedy as the lead entity while the University accepts all fully satisfied work other than systems/equipment noted to be deficient or incomplete. In cases

whereby systems or equipment are deemed incomplete or deficient the University presence shall serve to monitor and operate (to the extent permitted while deficient) until satisfied and complete by the Contractor.

- e. Upon attainment of Certificate of Occupancy, the University shall assume operational responsibility for the completed work. In cases whereby systems or equipment are deemed incomplete or deficient the University presence shall serve to monitor and operate (to the extent permitted while deficient) until satisfied and complete by the Contractor.

9. One to Two (1 – 2) Weeks Post Occupancy

- a. The Contractor shall continue to coordinate turnover to the University.
- b. The Contractor shall arrange a security review with the University.

10. Two to Three (2 – 3) Months Post Occupancy

- a. While the Contractor's, subcontractors de-mobilize; the Contractor shall ensure that the appropriate summary of warranty information is provided. Information shall include the warranty process.
- b. The Contractor shall consolidate all deficiency lists into one master list and manage issues through to resolution. The Contractor shall coordinate with the University to deploy subcontractors and request assistance as required.
- c. The Contractor shall coordinate all unsatisfied seasonal commissioning obligations with the University to ensure that all systems are commissioned and functioning properly.
- d. The Contractor shall ensure that all documentation on the Turnover Checklist is formally transmitted to the University via the electronic project control system. In addition, the Contractor shall provide as-built documentation in proper order in an indexed file outside of Unifier; or the current University, electronic project control system.

11. Three (3) Month Follow-up Post Occupancy

- a. The Contractor shall coordinate follow-up meetings to review the deficiency list and address newly identified deficiencies or non-compliant issues.
- b. The University shall provide a final, commissioning deficiency list for systems not seasonably tested at occupancy. Final list to detail schedule and the Contractor shall work to resolve open obligations concerning same.

12. Twelve to Eighteen (12 – 18) Months Follow-up Post Occupancy

- a. The University shall provide the Contractor with an authorized, commissioning signoff letter. Systems and equipment of which are determined to be deficient or incomplete shall be identified as a qualifying note to the letter and the Contractor shall remain obligated to remedy and address same.
- b. The University shall initiate the project close-out process.

2.1 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting Architect's Field Observation for certification of Substantial Completion, the Contractor shall complete the following (list exceptions):

1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show one hundred percent completion for the portion of the Work claimed as substantially complete.
2. Include supporting documentation for completion as indicated in the Contract Documents and a statement showing an accounting of changes to the Contract Sum.
3. If one hundred percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.
4. Obtain and submit releases and waiver of liens enabling the University unrestricted use of the Work and access to services and utilities. Obtain, pay for, and submit original building permits, certificate of occupancy, operating certificates, and similar releases.
5. Submit two (2) copies of specific guarantees, warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents as required by the technical sections. Submit the warranties as required by the technical sections and the General Conditions. Bind all guarantees, warranties, bond, agreements, certifications and similar documents in a notebook with a corresponding notebook log.
6. Advise the University of pending insurance changeover requirements.
7. Inventory, and deliver, tools, spare parts, extra stock, attic stock and similar items to the University. Provide formal transmittals, signed by University personnel, indicating receipt of tools, spare parts, extra stock, attic stock and similar items.
8. Make final changeover of permanent locks and transmit keys to the University. Submit a copy of the signed transmittals for all building keys, including a key cabinet provided in the specifications, and deliver to the University. Advise the University's personnel of changeover in security provisions.
9. A complete list of all subcontractors and suppliers with addresses, phone numbers and contact persons.
10. Complete testing, adjusting and balancing of systems and that they are fully operational. Submit air and water balancing report including one set of reproducible prints and two sets of non-reproducible prints of the as-built air balance drawings.
11. Submit a certified duct leakage test on all ductwork.
12. Submit a comprehensive valve chart.
13. Documentation of all storm and roof drains being cleaned out immediately prior to substantial completion.
14. Certification of domestic water sterilization. Hydronic systems of which require flushing shall be performed in the presence of the University's representative.
15. Documentation of acceptable water lead levels. The University will contract with an

independent consultant to perform water lead testing. If additional tests or time are required to correct or uncover deficiencies caused by the Contractor, then the Contractor will be responsible for the consultant's fee provided such deficiencies are not design related.

16. All equipment startup sheets as completed by the manufacturer's representative. The University will conduct a performance test on one or more HVAC unit(s) selected at random after equipment startup is complete. If the unit(s) fail to perform as specified, the Contractor shall be required to test all unit(s) and perform the necessary corrective work in order to comply with the Contract Documents.
 17. Documentation of acceptable performance of the electrical service systems. The University will contract with an independent consultant to perform electrical service testing. If additional time is required to correct or uncover deficiencies, then the Contractor shall be responsible for the consultant's fee provided such deficiencies are not design related.
 18. Complete instruction of the University's operation and maintenance personnel. Discontinue and remove construction facilities and temporary controls from the site, along with mockups, construction tools, and similar elements.
 19. Complete final cleanup requirements, including touchup painting.
 20. Touch up and otherwise repair and restore marred, exposed finishes.
 21. Submit one complete set of all final submittals, as-built drawings, record specifications, record product data, surveys, and similar final record information with a final submittal log.
 22. Provide a certified building location survey provided by a professional engineer.
 23. Submit three (3) copies of final project photographs.
 24. Submit one (1) electronic copy and 2 prints of as-built drawings in DWG and PDF format including architectural, structural, plumbing, fire protection, elevator, mechanical, and electrical drawings. The as-builts shall include modifications made to the specifications, schedules and details, and all changes initiated by requests for information and field orders.
 25. Submit three (3) bound copies and one electronic copy of operation and maintenance manuals on a compact disk format.
- D. Architect's Field Observation Procedures: Prior to requesting the Architect's Field Observation the Contractor shall perform its own inspection and evaluation. The Contractor's inspection and evaluation (punch list) shall be prepared, organized by room number for interior work and in sequence around the building for exterior work.
1. On receipt of a request for Architect's Field Observation, the Architect will either proceed with observations or advise the Contractor of unfulfilled requirements. The Architect will prepare a list of items, materials and systems for replacement or additional work by the Contractor as an overview of Contractor's inspection and evaluation (punch list) report and shall deliver same to the University for execution.
 2. The Architect will prepare the Certificate of Substantial Completion following his Field Observation or advise the Contractor of construction that must be completed or corrected

before the certificate will be issued.

3. Results of the completed Field Observation by the Architect will form the basis of requirements for final acceptance.

2.2 FINAL ACCEPTANCE

- A. Preliminary Procedures: Before requesting final field observation for certification of final acceptance and payment, complete the following. The Architect's Final Field Observation shall be performed only after all outstanding and deficient items are rectified. List exceptions in the request.
 1. Submit the final Application for Payment in accordance with requirements stated of the General Conditions. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required.
 2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
 3. Submit a certified copy of the Architect's Final Field Observation list of items to be completed or corrected, endorsed and dated by the Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and shall be endorsed and dated by the Architect.
 4. Submit certification that work has been completed in accordance with the Contract Documents.
 5. Submit certification that the work has been inspected for compliance with the Contract Documents.
 6. Submit certification that all mechanical and electrical equipment and systems have been tested in the presence of the University and are operational.
 7. Submit certification that as-built drawings have been reviewed and are accurate.
 8. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the date of Substantial Completion or when the University took possession of and assumed responsibility for corresponding elements of the Work.
 9. Submit completed consent of surety to final payment document (AIA G707 Consent of Surety Company to Final Payment".
 10. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 11. LEED Submittals shall be provided prior to final payment.
- B. Final Field Observation Procedure: The Architect will re-observe the Work upon receipt of notice that the Work, including listed items from earlier observations, has been completed, except for items whose completion is delayed under circumstances acceptable to the Architect.

1. Upon completion of Final Field Observations, the Architect will prepare a certificate of final acceptance. If the Work is incomplete, the Architect will advise the Contractor and the University of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
2. If necessary, re-observation will be repeated subject to the following:
 - a. If Architect is required to perform re-inspection due to failure of the Work to comply with the claims of status of completion made by the Contractor, the University shall compensate Architect for such Additional Services and the University shall deduct the amount of such compensation from Final Payment to Contractor.

2.3 RECORD DOCUMENT SUBMITTALS

- A. General: Refer to General Conditions, for requirements applicable to Record Documents. Do not use record documents for construction purposes. Maintain record documents in good order at the site. Protect record documents from deterioration from soiling and moisture and from loss in a secure, fire-resistant location. Provide access to record documents for the Architect and the University reference during normal working hours. Acceptance of such record documents by the Architect or the University shall not be a waiver of any deviation from the Contract Documents or the shop drawings or in any way relieve the Contractor from his responsibility to perform the Work in accordance with the Contract Documents and the approval actions indicated on the shop drawings.
- B. As-Built Drawings: Maintain at the site a clean, undamaged set of reproducible prints of all Drawings and Shop Drawings. As the Work progresses accurately mark the set to show the actual installation where the installation deviates from the Work as originally shown. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Provide particular attention to concealed elements that would be difficult to measure and record at a later date.
 1. Mark as-built sets neatly and correctly with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work.
 2. Contractor needs to ensure that as-built markups are updated in the final BIM models.
 3. Organize and index as-built drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.
 4. Contractor shall make sure that no Drawings are used with the seal of the Architect, and every Drawing shall bear the following note:
 5. "As-built Drawings" and the date.
 6. This Drawing was prepared by (name of Contractor) to incorporate construction changes and has not been reviewed or approved by the Architect. Care shall be taken in any further use of this Drawing for this Project. This Drawing may not be used for extensions of this Project or for any other project.

7. The As-Built drawings produced by the Contractor shall be used by the University as As-Built documents as provided and will not be reviewed or approved by Architect.
 8. Refer to the MEP and elevator sections for additional requirements related to as-built drawings.
- C. Record Specifications: Maintain one complete copy of the Project Manual, including modifications. Include with the Project Manual one copy of other written construction documents, such as Change Orders and modifications issued in printed form during construction.
1. Neatly and correctly mark these documents to show deviations in actual Work performed in comparison with the text of the Specifications and modifications.
 2. Provide particular attention to substitutions and selection of options and information on concealed construction that cannot otherwise be readily discerned later by direct observation.
 3. Note related record drawing information and Product Data.
- D. Record Product Data: Maintain one copy of each Product Data submittal. Note related Change Orders and markup of as-built drawings and Specifications.
1. Neatly and correctly mark this data to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site and from the manufacturer's installation instructions and recommendations.
 2. Provide particular attention to concealed products and portions of the Work that cannot otherwise be readily discerned later by direct observation.
 3. Upon completion of markup, submit complete set of record Product Data to the Architect for the University's records.
- E. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order, indexed and marked for each Division of the Work, properly identified and suitably bound or filed, ready for continued use and reference. Submit to the Architect for the University's records.
1. Warranties and Guarantees: Warranties and Guarantees are a form of miscellaneous record submittals. Manufacturer's disclaimers and limitations on standard product warranties and guarantees do not relieve the Contractor of the warranty or guarantee on the Work that incorporates the products. Manufacturer's disclaimers and limitations on special project warranties does not relieve suppliers, manufacturers, and subcontractors required to countersign special project warranties with the Contractor.
 - a. Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the University.
 - b. Special project warranties are written warranties required by or incorporated in the

Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the University. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special project warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the University, through the Architect, for approval prior to final signature.

F. Maintenance Manuals: Organize manuals into suitable volumes of manageable size, review them for completeness and submit as directed hereinafter. Manuals shall have table of contents and be assembled to conform to table of contents with tab sheets covering each subject. The instructions shall be legible, easy to read and suitably bound. Manuals shall be hard bound and sheets consistent in size; where oversize drawings are necessary, they shall be folded in. The words "Operation and Maintenance Manual," and the name and location of the building shall appear on the cover. Certify that each of the manuals is complete and accurate. Refer to the MEP and elevator sections for additional requirements related to maintenance manuals. Manuals shall include, but not be limited to, the following data:

1. Detailed description of each system and each of its components, including layout showing piping, valves, controls and other components, and including diagrams and illustrations where applicable.
 - a. Include a word description of each system's design intent and proposed operation at various loads. For air conditioning, the Contractor shall outline operating sequence, number of chillers, boilers, pumps, etc., for heating, cooling and in-between seasons.
2. Wiring and control diagrams with data to explain detailed operation and control of each component.
3. Control sequence describing start-up, operation, and shutdown.
4. Procedure for starting.
5. Procedure for operating.
6. Shut-down instructions.
7. Installation instructions.
8. Maintenance and overhaul instructions.
9. Lubricating schedule, including type, grade, temperature range and frequency.
10. Emergency instructions and safety precautions.
11. Approved product data.
12. Copies of approved certifications and laboratory test reports (where applicable).
13. Copies of warranties.

14. Test procedures.
15. Performance curves and rating data.
16. Parts list, including source of supply, recommended spare parts, and service organization convenient to building site.
17. Name, address, and telephone number of each subcontractor who installed equipment and systems, and local representative for each type of equipment and each system.
18. Other pertinent data applicable to the operation and maintenance of particular systems or equipment and/or other data specified in technical sections of the specification.

END OF SECTION