

**SECTION 00 91 01  
ADDENDUM NO. 1**

Summary

This document includes requirements that clarify or supersede portions of the Request for Proposal. This Addendum is a Contract Document.

General

The following changes, additions and deletions shall be made to the following document(s); all other conditions shall remain the same.

- A. BID FORM  
N/A
- B. AGREEMENT  
N/A
- C. SPECIFICATIONS

Item No.	Reference	Description
1.	Document 00 01 10	Table of Contents V.2 dated June 4, 2008, attached, supersedes V.1 dated April 29, 2008. V.2 indicates updated and new specification sections.
2.	Document 00 11 19	Instructions to Bidders V.2 dated June 4, 2008, attached, supersedes V.1 dated April 29, 2008. V.2 contains the following revisions: <ul style="list-style-type: none"> <li>- In Paragraph 10, the day of the second pre-bid conference is corrected from Thursday to Wednesday, June 4, 2008.</li> <li>- In Paragraph 14.D.12, language is revised to indicate that the Siemens MXL fire alarm system is to be supplied <b>and installed</b> by the local Siemens branch office.</li> <li>- In Paragraph 23.A, item #7 adds an executed Project Stabilization Agreement Letter of Assent as a required submittal after issuance of Notice of Award.</li> </ul>
3.	Document 00 50 00	Notice to Proceed V.2 dated June 4, 2008, attached, supersedes V.1 dated April 29, 2008. In V.2, item #7 adds an executed Project Stabilization Agreement Letter of Assent as a required submittal after issuance of Notice of Award.
4.	Document 00 51 00	Notice of Award V.2 dated May 30, 2008, attached, supersedes V.1 dated April 29, 2008. In V.2, line 2.f adds an executed Project Stabilization Agreement Letter of Assent as a required submittal after issuance of Notice of Award.
5.	Section 00 91 01	Addendum No. 1 is added to Volume 1 of the Specifications.
6.	Section 01 35 27	Project Labor Agreement V.1 dated June 4, 2008, attached, is added to Volume 1 of the Specifications to clarify that this project is subject to the terms of the Program Stabilization Agreement (PLA) executed between the San Mateo County Community College District and the San Mateo County Buildings and Trades Council.
7.	Section 01 45 23	Testing and Inspection V.2 dated June 4, 2008, attached, supersedes V.1 dated April 29, 2008. V.2 revises Paragraph 1.7.E to reflect the actual tests and inspections required for the project.

8.	Section 01 58 00	Project Identification and Signs V.2 dated June 4, 2008, attached, supersedes V.1 dated April 29, 2008. V.2 provides modified project identification and sign requirements.
9.	Section 01 91 13	General Commissioning Requirements V.2 dated June 4, 2008, attached, supersedes V.1 dated April 29, 2008. V.2 is the more up-to-date version of this section.
10.	Section 01 91 14	Commissioning of HVAC is deleted from Volume 1 of the Specifications.
11.	Section 23 08 00	Commissioning of HVAC, attached, is added to Volume 2 of the Specifications.

D. DRAWINGS  
N/A

E. CLARIFICATIONS  
N/A

END OF ADDENDUM NO. 1

DOCUMENT 00 01 10

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END OF DOCUMENT

## DOCUMENT 00 11 19

**INSTRUCTIONS TO BIDDERS**

Bids are requested for a general construction contract, or work described in general, as follows:

**THE CAÑADA COLLEGE BUILDING 8 PHASE 2 RENOVATION PROJECT**

- 1. RECEIPT OF BIDS.** Sealed Bids will be received by the District at their office (see paragraph 2 below) **no later than 2:00 p.m. on Tuesday, June 17, 2008.** District will receive Bids from pre-qualified contractors in a sealed envelope that is clearly labeled with the name and number of the bid. All Bids will be time stamped to reflect their submittal time. District will reject all Bids received after the specified time and will return such Bids to Bidders unopened. Bidders must submit Bids in accordance with this DOCUMENT 00 11 19.

**2. CONTACT INFORMATION:**

Bid Submittal and Mailing address: San Mateo County Community College District  
Attn: Construction Planning Department  
1700 West Hillsdale Blvd, Building 27  
San Mateo, CA 94402

Contact Name: Jennifer James, Project Coordinator

Telephone: (650) 738-7065

Fax: (650) 358-6837

Email (acceptable for informal communication, but not legal notice): plan@smccd.edu

- 3. BID SUBMISSION.** Bidder should mark its Bid envelope as **BID FOR THE DISTRICT, BID NUMBER 86570, CAÑADA COLLEGE BUILDING 8 PHASE 2 RENOVATION PROJECT.** Bids shall be deemed to include the written responses of the Bidder to any questions or requests for information of District made as part of Bid prior to submission of Bid. Bidder's failure to submit all required documents strictly as required entitles District to reject the Bid as non-responsive.
- 4.** Not used.
- 5.** Not used.
- 6. REQUIRED BID FORMS.** All Bidders must submit Bids using, where applicable, documents supplied in this Project Manual, including without limitation Document 00 43 10 (Indemnity and Release Agreement), Document 00 41 00 (Bid Form), 00 43 13 (Bond Accompanying Bid), Document 00 43 36 (Subcontractors List), Document 00 45 00 (Bidder Certifications), Document 00 43 33 (Schedule of Major Equipment and Material Suppliers), Document 00 45 19 (Non-collusion Affidavit), Document 00 45 14 (Key Personnel), and Document 00 73 17 (OCIP Qualification Form). District will reject as non-responsive any Bid not submitted on the required forms. Bids must be full and complete. Bidders must complete all Bid items and supply all information required by Bidding Sections. District reserves the right in its sole discretion to reject any Bid as non-responsive as a result of any error or omission in the Bid. Bidders may not modify the Bid Form or qualify their Bids. Bidders must submit clearly and distinctly written Bids. Bidders must clearly make any changes in their Bids by crossing out original entries, entering new entries, and initialing new entries. District reserves the right to reject any Bid not clearly written.
- 7. REQUIRED BID SECURITY.** Bidders must submit with their Bids either cash, a cashier's check, or certified check from a responsible bank in the United States, or corporate surety bond furnished by a surety authorized to do business in the State of California, of not less than ten percent of amount of total Bid, including Owner's Allowance, payable to District. All Bidders choosing to submit a surety bond must submit it on the required

form, Document 00 43 13 (Bond Accompanying Bid). District will reject as non-responsive any Bid submitted without the necessary Bid security.

The District may retain Bid securities and Bid bonds of other than the Apparent Low Bidder for a period of ninety (90) Days after award or full execution of the Contract, whichever first occurs. Upon full execution of the Contract, and upon request by Bidder, District will return to the respective unsuccessful Bidders their Bid securities and Bid bonds.

8. **REQUIRED SUBCONTRACTORS LIST.** All Bidders must submit with their Bids the required information on all Subcontractors in Document 00 43 36 (Subcontractors List) for those Subcontractors who will perform any portion of the Work, including labor, rendering of service, or specially fabricating and installing a portion of the Work or improvement according to detailed drawings confined in the plans and specifications, in excess of one half of one percent of total Bid. Violation of this requirement may result in Bid being deemed non-responsive and not being considered.
9. Not used.
10. **MANDATORY PRE-BID CONFERENCES.** District will conduct two (2) Pre-Bid Conferences, one at 1:30 p.m. on Tuesday, June 3, 2008 and the other at 10:30 a.m. on Wednesday, June 4, 2008. Both conferences will be held at Cañada College Building 3, Room 148. **Attendance at one conference is mandatory.** District reserves the right to schedule and organize the conference to minimize congestion and disruption to existing facilities and congestion. Bidders are encouraged to submit written questions in connection with the conference. District will transmit to all parties recorded as having received Bidding documents such Addenda as District in its discretion considers necessary in response to written questions. Bidders shall not rely on oral statements. Oral statements will not be binding or legally effective. Other Pre-Bid Conferences may be scheduled at District's sole discretion, depending on staff availability.
11. **OTHER REQUIREMENTS PRIOR TO BIDDING.** Submission of Bid signifies Bidder's careful examination of Bidding Documents and complete understanding of the nature, extent, and location of Work to be performed. As a condition to Bidding, Bidder must complete tasks listed in Document 00 52 00 (Agreement), Article 5. Submission of Bid shall constitute Bidder's express representation to the District that Bidder has fully completed these tasks.
12. **EXISTING DRAWINGS AND GEOTECHNICAL DATA.** Bidders may examine any available existing conditions information (e.g., record documents, specifications, studies, drawings of previous work) by giving District reasonable advance notice, as well as applicable environmental assessment information (if any) regarding the Project. Document 00 31 19 (Reports, Surveys and Existing Conditions) Reports, Surveys and Existing Conditions) applies to all supplied existing conditions information and geotechnical reports and all other information supplied regarding existing conditions either above ground or below ground. Documents are available for onsite review at the Construction Planning Department office, 1700 West Hillsdale Blvd, Building 27, San Mateo, CA 94402, or on the District's website at:  
[http://www.smccd.edu/accounts/smccd/departments/facilities/CAN\\_Bldg8\\_Renov.shtml](http://www.smccd.edu/accounts/smccd/departments/facilities/CAN_Bldg8_Renov.shtml)
13. **ADDENDA.** Bidders must direct all questions about the meaning or intent of Bidding Documents to District Representative in writing. Interpretations or clarifications considered necessary by District in response to such questions will be issued by Addenda mailed, faxed, or delivered to all parties recorded by District as having received Bidding Documents. Addenda will be written and will be issued to each bidder to the address or fax number supplied District by Bidder. District may not answer questions received less than eight (8) calendar days prior to the date for opening Bids. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.
  - A. Addenda may also be issued to modify the Bidding Documents as deemed advisable by District.
  - B. Addenda shall be acknowledged by number with signature in Document 00 41 00 (Bid Form) and shall be part of the Contract Documents. A complete listing of Addenda may be secured from District.

**14. SUBSTITUTIONS.** Bidders must base Bids on products and systems specified in Contract Documents or listed by name in Addenda.

- A. Except as provided in paragraph 15.c below, District will consider substitution requests on for “or equal items.” Bidders wanting to use “or equal” item(s) may submit Document 00 43 25 (Substitution Request Forms) items no later than thirty (30) days after the date of the Notice to Proceed. After that date, the District will not accept “or equal” substitution requests. To assess “or equal” acceptability of product or system, submittals of substitutions shall contain the information required in Document 00 43 25 (Substitution Request Forms) and set forth in Section 01 60 00 (Product Requirements). Insufficient information will be grounds for rejection of substitution. District shall, within a reasonable period of time after having received a request for substitution, issue in writing its decision as to whether the proposed substitute item is an “or equal” item. District’s decision shall be conclusive on all Bidders.
- B. Approved substitutions shall be listed in Addenda and become part of contact Documents.
- C. Substitutions may be requested after submitting Bids and Award of contract only in accordance with requirements specified in Section 01 60 00 (Product Requirements).
- D. As further limitation on Bidder’s privilege to substitute items, District has found that certain items are designated as District standards and certain items are designated to match existing items in use on a particular public improvement, either completed or in the course of completion, and/or are only available from one source. As to such items, District will not permit substitution. District will not permit substitutions for the following items:

1. Door closers	LCN
2. Door locksets	Schlage
3. Panic door hardware	Von Duprin
4. Window shades	Mechoshades
5. Top set base	Burke
6. Carpet	Collins & Aikman
7. Resilient flooring	Altro Maxis
8. Suspended acoustical tile	USG
9. Ceramic tile	Dal-Tile
10. Paint	Kelly Moore Paint Company
11. Controls	T.A.C. Controls
12. Fire alarm	Siemens MXL fire alarm systems, supplied and installed by the local Siemens Building Technologies, Inc., Hayward direct branch office
13. Toilet accessories	Bobrick
14. Security	Group 4 Technologies AMAG

**15. WAGE RATES.** Copies of the general prevailing rates of per diem wages for each craft, classification, or type of worker needed to execute the contract, as determined by Director of the State of California Department of Industrial Relations, are available through the Department of Industrial Relations and are deemed included in the Bidding Documents. See <http://www.dir.ca.gov/dir/databases.html>. Upon request, District will make available copies to any interested party In addition, Contractor shall post the applicable prevailing wage rates at the Site.

**16. EQUAL EMPLOYMENT OPPORTUNITY.** Contractor shall comply with all applicable federal, state, and local laws, rules, and regulations in regard to nondiscrimination in employment because of race, color, ancestry, national origin, religion, sex, marital status, age, medical conditions, disability, or any other reason.

**17. BID OPENING.** District will open all bidders’ envelopes, initially evaluate them for responsiveness, and determine an Apparent Low Bidder as specified herein.

**18. DETERMINATION OF APPARENT LOW BIDDER.** Apparent Low Bid will be based solely on the total

amount of all Bid items (including any alternates) based on assumptions contained in Document 00 41 00 (Bid Form). All Bidders are required to submit Bids on all Bid items (including any alternates).

19. Not used.

20. **BID EVALUATION.** District may reject any or all Bids and waive any informalities or minor irregularities in the Bids. District also reserves the right, in its discretion, to reject any or all Bids and to re-bid the Project. District reserves the right to reject any or all nonconforming, non-responsive, unbalanced, or conditional Bids, and to reject the Bid of any Bidder if District believes that it would not be in the best interest of Project to make an award to that Bidder, whether because the Bid is not responsive or the Bidder is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criteria established by District. For purposes of this paragraph, an “unbalanced Bid” is one having nominal prices for some work items and enhanced prices for other work items.

- A. In evaluating Bids, District will consider Bidders' qualifications, whether or not the Bids comply with the prescribed requirements, omit prices and other data, as may be requested in Document 00 41 00 (Bid Forms) or prior to the Notice of Award.
- B. District may conduct reasonable investigations and reference checks of Bidder, proposed Subcontractors, suppliers and other persons and organizations as District deems necessary to assist in the evaluation of any Bid; ability qualifications, financial ability proposed Subcontractors, suppliers, and to establish Bidder's responsibility, and other persons and organizations to perform and furnish the Work in accordance with the Contract Documents to District's satisfaction within the prescribed time. Submission of a Bid constitutes Bidder's consent to the foregoing. District shall have the right to consider information provided by sources other than Bidder. District shall also have the right to communicate directly with Bidder's surety regarding Bidder's bonds.
- C. Discrepancies between the multiplication of units of Work and limit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. Discrepancies between written words and figures will be resolved in favor of the words.
- D. Quantities stated in the Bidding Documents are approximate only and are subject to correction upon final measurement of the Work, and are subject further to the rights reserved by the District to increase or diminish the amount of work under any classification as advantages to design or construction needs require.
- E. District may determine whether a Bidder is qualified in its sole discretionary judgment.

21. **AWARD.** If the contract is to be awarded, it will be awarded to the lowest responsible responsive Bidder. Following completion of all required District procedures and receipt of all District approvals, District will issue Document 00 51 00 (Notice of Award) to successful Bidder.

22. **BID PROTEST.** Any Bid protest must be submitted in writing to the District's offices, before 4:00 p.m. of the fifth (5) day following opening of Bidder's Envelopes.

- A. The initial protest document must contain a complete statement of the basis for the protest.
- B. The protest must refer to the specific portion of the document that forms the basis for the protest.
- C. The protest must include the name, address, and telephone number of the person representing the protesting party.
- D. Only Bidders who the District otherwise determines are responsive and responsible are eligible to protest a Bid; protests from any other Bidder will not be considered. In order to determine whether a protesting Bidder is responsive and responsible, District may conduct the same investigation and evaluation as District is entitled to take regarding an Apparent Low Bidder.
- E. The party filing the protest must concurrently transmit a copy of the initial protest document and any attached documentation to all other parties with a direct financial interest that may be adversely affected by

the outcome of the protest. Such parties shall include all other Bidders who appear to have a reasonable prospect of receiving an award depending upon the outcome of the protest.

- F. The procedure and time limits set forth in this paragraph are mandatory and are Bidder's sole and exclusive remedy in the event of Bid protest. Bidder's failure to comply with these procedures shall constitute a waiver of any right to further pursue the Bid protest, including filing a Government Code Claim or legal proceedings. A Bidder may not rely on a protest submitted by another Bidder, but must timely pursue its own protest.
- G. Bid protests shall be submitted directly to the district at their offices located at:

San Mateo County Community College District  
Attn: José D. Nuñez, Vice Chancellor, Facilities Planning, Maintenance & Operations  
3401 CSM Drive  
San Mateo, CA 94402

\* a copy of this protest shall be sent to Jennifer James, Project Coordinator, Construction Planning Department

**23. POST-NOTICE OF AWARD REQUIREMENTS.** After Notice of Award, the successful Bidder must execute and submit the following documents as indicated below.

- A. Submit the following documents to District by 4:00 p.m. of the tenth (10) day following Notice of Award. Execution of Contract by District depends upon approval of these documents:
- 1) Document 00 52 00 (Agreement): To be executed by successful Bidder. Submit two originals, each bearing an original signature.
  - 2) Document 00 61 00 (Construction Performance Bond): To be executed by successful Bidder and surety, in the amount set forth in Document 00 61 00 (Construction Performance Bond). Submit one original.
  - 3) Document 00 62 00 (Construction Labor and Material Payment Bond): To be executed by successful Bidder and surety, in the amount set forth in Document 00 62 00 (Construction Labor and Material Payment Bond). Submit one original.
  - 4) Insurance certificates and endorsements required by Section 00 71 00 (General Conditions) Article 4. Submit one original set.
  - 5) The Guaranty in the form set forth in Document 00 65 36 (Guaranty). Submit one original, bearing an original signature.
  - 6) OCIP Insurance Enrollment Forms as set forth in Section 00 73 17 (Insurance). Submit one original.
  - 7) Project Stabilization Agreement Letter of Assent as set forth in Section 01 35 27 (Project Labor Agreement). Submit one original.
- B. District shall have the right to communicate directly with Apparent Low Bidder's proposed performance bond surety, to confirm the performance bond. District may elect to extend the time to receive performance and labor and material payment bonds.
- C. Successful Bidder's failure to submit the documents required herein, in a proper and timely manner, entitles District to rescind its award, and to cause Bidder's Bid security to be forfeited as provided herein.

**24. FAILURE TO EXECUTE AND DELIVER DOCUMENTS.** If Bidder to whom contact is awarded shall, within the period described in paragraph 23A of this Document 00 11 19, fail or neglect to execute and deliver

all required Contract Documents and file all required bonds, insurance certificates, and other documents, District may, in its sole discretion, foreclose on Bidder's deposit surety bond, or deposit Bidder's cashier's check or certified check for collection, and retain the proceeds thereof as liquidated damages for Bidder's failure to enter into the Contract Documents. Bidder agrees that calculating the damages District may suffer as a result of Bidder's failure to execute and deliver all required Contract Documents would be extremely difficult and impractical and that the amount of Bidder's required Bid security shall be the agreed and presumed amount of District's damages. In addition, upon such failure District may determine the next Apparent Low Bidder and proceed accordingly.

**25. MODIFICATION OF COMMENCEMENT OF WORK.** District expressly reserves the right to modify the date for the Commencement of Work under the Contract and to independently perform and complete work related to the Project.

**26. WITHDRAWAL OF BIDS.** Bidders may withdraw their Bids at any time prior to the Bid opening time fixed in this Document 00 11 19, only by written request for the withdrawal of Bid filed with the District's representative. Bidder or its duly authorized representative shall execute request to withdraw Bid. The submission of a Bid does not commit the District to award a contract for the Project, to pay costs incurred in the preparation of a Bid, or to procure or contract for any goods or services.

**27. PUBLIC RECORDS ACT REQUESTS.**

- A. Per the Public Records Act, District will make available to the public all correspondence and written questions submitted during the Bid period, all Bid submissions opened in accordance with the procedures of this Document 00 11 19, and all subsequent Bid evaluation information. All submissions not opened will remain sealed and eventually be returned to the submitter. Except as otherwise required by law, District will not disclose trade secrets or proprietary financial information submitted that has been designated confidential by Bidder. Any such trade secrets or proprietary financial information that a Bidder believes should be exempted from disclosure shall be specifically identified and identified as such. Blanket-type identification by designating whole pages or section shall not be permitted and shall be invalid. The specific information must be clearly identified as such.
- B. Upon a request for records regarding this Bid, District shall notify Bidder involved within ten (10) Days from receipt of the request of a specific date when the records will be made available for inspection. If the Bidder timely identifies any impropriety, trade secret, or confidential commercial or financial information that Bidder determines is not subject to public disclosure and requests District to refuse to comply with the records request, Bidder shall take all appropriate legal action and defend District's refusal to produce the information in all forums; otherwise, District will make such information available to the extent required by applicable law, without restriction.
- C. Information disclosed to the District and the attendant submissions are the property of District unless Bidder makes specific reference to data that is considered proprietary. Subject to the requirements in the Public Records Act, reasonable efforts will be made to prevent the disclosure of information except on a need-to-know basis during the evaluation process.

**28. CONFORMED CONSTRUCTION DOCUMENTS.** Following Award of Contract, District will prepare a conformed set of Contract Documents reflecting Addenda issued during bidding, which will, failing objection, constitute the approved set of Contract Documents.

**29. DEFINITIONS.** All abbreviations and definitions of terms used in this Document 00 11 19 are set forth in Section 01 42 00 (References and Definitions).

END OF DOCUMENT

DOCUMENT 00 50 00

**NOTICE TO PROCEED**

Dated: \_\_\_\_\_, 20\_\_

To: \_\_\_\_\_  
(Contractor)

Address: \_\_\_\_\_

**CONTRACT FOR:**

**BID NUMBER 86570**

**THE CAÑADA COLLEGE BUILDING 8 PHASE 2 RENOVATION PROJECT**

You are notified that the Contract Time under the above Contract will commence to start on \_\_\_\_\_ 20\_\_. Contractor shall achieve Substantial Completion of the entire Work within **150** days from the date when the Contract Time commences. Contractor shall achieve Final Completion within **45** days from the date of acceptance of Substantial Completion.

**Before you may start any Work at the Site, you must:**

1. Submit certified Safety Program and related information, and comply with all requests of/by **José Nuñez**, the District's safety officer.
2. Submit copies of applicable permits.
3. Submit approved fire protection plan, as required. (Required for all modernization and remodel projects.)
4. Attend preconstruction conference. The preconstruction conference shall be arranged by the Construction Manager.
5. Per Section 01 32 16 (Progress Schedule and Reports), Contractor shall submit to the District:
  - a. The name and the address of the proposed consultant (see Section 01 32 16 (Progress Schedule and Reports), paragraph 1.5).
  - b. Information sufficient to show that the proposed consultant or Contractor's own organization has staff and computer facilities meeting the requirements set forth in Section 01 32 16 (Progress Schedule and Reports) .
  - c. A list of prior projects, with District telephone contact numbers for which the proposed consultant or Contractor's own organization, or staff thereof, has performed services similar to those required for this Contract as set forth in Section 01 32 16 (Progress Schedule and Reports) .
6. Per Section 01 31 23 (Web-based Project Management System), Contractor shall establish an account with the District's selected web based project management program and attend training.
7. Per Section 01 35 27 (Project Labor Agreement), Contractor shall submit the executed Letter of Assent.

SAN MATEO COUNTY COMMUNITY COLLEGE DISTRICT

By : \_\_\_\_\_  
Construction Manager  
Swinerton Management and Consulting

END OF DOCUMENT

DOCUMENT 00 51 00

NOTICE OF AWARD

Dated \_\_\_\_\_

TO: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

CONTRACT NO.: \_\_\_\_\_

CONTRACT FOR:

**THE CAÑADA COLLEGE BUILDING 8 PHASE 2 RENOVATION PROJECT**

The Contract Sum of your contract is \_\_\_\_\_ Dollars (\$\_\_\_\_\_).

1. Two copies of each of the proposed Contract Documents (except Specifications and Drawings) accompany this Notice of Award. Two sets of Specifications and Drawings will be delivered separately or otherwise made available to you immediately.
2. You must comply with the following conditions by 4:00 p.m. on [\_\_day\_\_\_\_], [\_\_date\_\_\_\_].
  - a. Deliver to District two fully executed counterparts of Section 00 52 00 (Agreement).
  - b. Deliver to District one original Section 00 61 00 (Construction Performance Bond), executed by you and your surety.
  - c. Deliver to District one original Section 00 62 00 (Construction Labor and Material Payment Bond), executed by you and your surety.
  - d. Deliver to District one original set of the insurance certificates with endorsements required under Section 00 71 00 (General Conditions) and Section 00 73 17 (Insurance), along with one original copy of the OCIP Contractor Enrollment Form.
  - e. Deliver to District two original copies of Section 00 65 36 (Guaranty), each executed by you.
  - f. Project Stabilization Agreement Letter of Assent as set forth in Section 01 35 27 (Project Labor Agreement). Submit one original.
3. Failure to comply with these conditions within the time specified will entitle District to consider your Bid abandoned, to annul this Notice of Award, and to declare your Bid security forfeited.
4. Within ten (10) Days after you comply with the conditions in paragraph 2 of this Section 00 51 00, District will return to you one fully signed counterpart of Section 00 52 00 (Agreement) with the Contract Documents.
5. Upon commencement of the Work, you and each of your Subcontractors shall certify and make available for inspection payroll records on forms provided by the Division of Labor Standards Enforcement, in accordance with Section 1776 of the California Labor Code.
6. Send all of the required above listed items to San Mateo County Community College District, Construction Planning Department, 1700 West Hillsdale Blvd, Building 27, San Mateo, CA 94402, to the attention of Jennifer James, Project Coordinator.

SAN MATEO COUNTY COMMUNITY COLLEGE DISTRICT ("District")

BY: \_\_\_\_\_  
Project Manager Name  
Construction Planning Department

END OF DOCUMENT

## SECTION 01 35 27

**PROJECT LABOR AGREEMENT**

## 1.01 GENERAL

The San Mateo County Community College District Board of Trustees has approved a Program Stabilization Agreement for this project. The Contractor and all subcontract forces are to comply with the requirements set forth in the executed Project Stabilization Agreement. It is the responsibility of the Contractor and the subcontractors to adhere to the requirements set forth in the Agreement and to comply with its provisions. Any costs for compliance with the Project Stabilization Agreement are to be included in the Contractor's Bid price. Copies of the signed Program Stabilization Agreement are available from the District's Construction Planning Department at 650-358-6785 or on the District's website at:

<http://www.smccd.edu/accounts/smccd/departments/facilities/Community.shtml>

## 1.02 List of Projects covered under Program Stabilization Agreement

- A. Cañada College
  - 1. Building 3, Phase 1 Modernization
  - 2. Building 17 Modernization
  - 3. CAN B16/18 Modernization
  - 4. CAN B7 New Facilities Maintenance Center
  - 5. CAN B5/6 Modernization
  - 6. CAN B1 Gym Modernization
  - 7. CAN B13 Modernization
  - 8. CAN Gateways, Circulation & Parking
  - 9. CAN B8 Phase 2 Renovation
- B. College of San Mateo
  - 1. Regional Public Safety Center
  - 2. Building 18 Seismic Upgrade and Modernization
  - 3. Integrated Science Center
  - 4. Building 1, 5 & 6 Modernization
  - 5. CSM CIP2 DB Project
  - 6. CSM B8 Gym Modernization
  - 7. CSM B12 Modernization
- C. Skyline College
  - 1. Student Union/Science Annex
  - 2. Building 3, 7 & 8 Modernization
  - 3. SKY B7 Allied Health
  - 4. SKY B30 Replacement Facilities Maintenance Center
  - 5. SKY CIP2 DB Project
  - 6. SKY B1 Modernization
  - 7. SKY B2 Modernization Phase 3
- D. Districtwide
  - 1. Utility & Infrastructure Upgrades - TBD

END OF SECTION

LETTER OF ASSENT FOLLOWS ON NEXT PAGE

Exhibit A  
Agreed To Letter of Assent

Date: \_\_\_\_\_

Board of Trustees  
San Mateo County Community College District  
3401 CSM Dr.  
San Mateo, CA 94402

Re: Cañada College Building 8 Phase 2 Renovation Project  
Project Stabilization Agreement – Letter of Assent

Dear Board of Trustees:

The undersigned party confirms that it agrees to be a party to and bound by the Cañada College Building 8 Phase 2 Renovation Project, Project Stabilization Agreement as such Agreement may, from time to time, be amended by the parties or interpreted pursuant to its terms.

By executing this Letter of Assent, the undersigned party subscribes to, adopts and agrees to be bound by the written terms of the legally established trust agreements specifying the detailed basis upon which contributions are to be made into, and benefits made out of, such trust funds and ratifies and accepts the trustees appointed by the parties to such trust funds.

Such obligation to be a party to and bound by this Agreement shall extend to all work covered by said Agreement undertaken by the undersigned party on the Cañada College Building 8 Phase 2 Renovation Project. The undersigned party shall require all of its subcontractors, of whatever tier, to become similarly bound for all their work within the scope of this Agreement by signing an identical Letter of Assent.

This letter shall constitute a subscription agreement, to the extent of the terms of the letter.

CONTRACTOR/SUBCONTRACTOR: \_\_\_\_\_

California State License Number: \_\_\_\_\_

Name and Signature of  
Authorized Person:

\_\_\_\_\_  
(Print Name)

\_\_\_\_\_  
(Title)

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Telephone Number)

\_\_\_\_\_  
(Facsimile Number)

## SECTION 01 45 23

**TESTING AND INSPECTION****PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Contractor's Quality Control
- B. Quality of the Work
- C. Inspections and Tests by Division of State Architect
- D. Inspections and Tests by Serving Utilities
- E. Inspections and Tests by Manufacturer's Representatives
- F. Inspections by Independent Testing and Inspection Agency
- G. Additional Testing and Inspection

**1.2 CONTRACTOR'S QUALITY CONTROL**

- A. Contractor's Quality Control: Ensure that products, services, workmanship and Site conditions comply with requirements of Drawings and Specifications by coordinating, supervising, testing, and inspecting the Work and by utilizing only suitably qualified and appropriately audited, licensed or trained, personnel.
- B. Quality Requirements: Work shall be accomplished in accordance with quality requirements of Drawings and Specifications, including, by reference, all codes, laws, rules, regulations, and standards. When no quality basis is prescribed, the quality and testing procedures shall be in accordance with the best-accepted practices of the construction industry for the locale of the Project, for projects of this type, or standards set by engineering or technical societies (e.g., ASTM or ASHRAE), whichever is more stringent.
- C. Quality Control Personnel: Employ and assign knowledgeable and skilled personnel as necessary to perform quality control functions to ensure that the Work is provided as required.

**1.3 QUALITY OF THE WORK**

- A. Quality of Products: Unless otherwise indicated or specified, all products shall be new, free of defects, and fit for the intended use.
- B. Quality of Installation: All Work shall be produced plumb, level, square and true, or true to indicated angle, and with proper alignment and relationship between the various elements, as shown on or required by Contract Documents.
- C. Protection of Completed Work: Take all measures necessary to preserve completed Work free from damage, deterioration, soiling, and staining, until acceptance by District.
- D. Standards and Code Compliance and Manufacturer's Instructions and Recommendations: Unless more stringent requirements are indicated or specified, comply with manufacturer's instructions and recommendations, reference standards and building code research report requirements in preparing, fabricating, erecting, installing, applying, connecting, and finishing Work.
- E. Deviations from Standards and Code Compliance and Manufacturer's Instructions and Recommendations: Secure District's advanced written consent. Document and explain all deviations from reference standards and building code research report requirements and manufacturer's product installation instructions and recommendations, including acknowledgement by the manufacturer that such deviations are acceptable and appropriate for the Project.
- F. Verification of Quality: Work shall be subject to verification of quality by District in accordance with provisions of the Contract Documents.
  - 1. Cooperate by making Work available for inspection by Division of State Architect Inspector and independent testing and inspection agencies.
  - 2. Such verification may include mill, plant, shop, or field inspection as required.
  - 3. Provide access to all parts of the Work, including plants where materials or equipment are manufactured or fabricated.
  - 4. Provide all information and assistance as required, including that by and from subcontractors, fabricators, materials suppliers and manufacturers, for verification of quality by District.
  - 5. Applicable provisions of the Contract Documents shall govern Contract Modifications, if any, resulting from such verification activities.

- G. Observations by District's Consultants: Periodic and occasional observations of Work in progress will be made by District and District's consultants as deemed necessary to review progress of Work and general conformance with design intent.
- H. Limitations on Inspection, Testing and Observation: Neither employment of independent testing and inspection agency nor observations or tests by District and District's consultants shall in any manner relieve Contractor of obligation to perform Work in full conformance to all requirements of Contract Documents.
- I. District's Acceptance and Rejection of Work: District reserves the right to reject all Work not in conformance to the requirements of the Drawings and Specifications, or otherwise defective.
- J. Correction of Defective Work: Defective Work shall be modified, replaced, repaired or redone by the Contractor at no change in Contract Sum or Contract Time.
- K. Contract Adjustment for Defective Work: Should District determine that it is not feasible or in District's interest to require defective Work to be repaired or replaced, an equitable reduction in Contract Sum shall be made by agreement between District and Contractor, and documented in the form of a contract change order. If equitable amount cannot be agreed upon, a Construction Change Directive will be issued and the amount in dispute resolved in accordance with applicable provisions of Document 00 71 00 (General Conditions).
- L. Non-Responsibility for Defective Work: District and District's consultants disclaim any and all responsibility for Work produced not in conformance with the Drawings and Specifications.
- M. Responsibility for Defective Work: Contractor shall have full responsibility for all consequences resulting from defective work, including without limitation all delays, disruptions, extra inspection and correction costs by Contractor and District and re-Work, and extra time and costs of all types. Contractor waives excuses for defective work relating to District's prior review of Submittals and/or prior failure to notice defective work in place on inspection.

#### **1.4 INSPECTIONS AND TESTS BY GOVERNING AUTHORITIES**

- A. Regulatory Requirements for Testing and Inspection: Contractor shall comply with Part 1, Title 24, Section 4-335, California Code of Regulations and shall cooperate with Inspector in all testing required by the Office of Regulation Services, Division of State Architect. Contractor shall comply with Part 2, Title 24, California Code of Regulations and shall cooperate with Inspector in all inspections, testing and approvals required by the Office of Regulation Services, Division of State Architect. Contractor shall also comply with Uniform Building Code (UBC) requirements and all other requirements of governing authorities having jurisdiction.
- B. Inspections and Tests by Governing Authorities: Contractor shall cause all tests and inspections required by governing authorities having jurisdiction to be made for Work under this Contract.
  - 1. Such authorities may include, but are not limited to, the Division of State Architect, Fire Department, and similar agencies.
  - 2. Except as specifically noted, scheduling, conducting and paying for such inspections shall be solely the Contractor's responsibility.

#### **1.5 INSPECTIONS AND TESTS BY SERVING UTILITIES**

- A. Cause all tests and inspections required by serving utilities to be made for Work under this Contract. Scheduling, conducting and paying for such inspections shall be solely the Contractor's responsibility.

#### **1.6 INSPECTIONS AND TESTS BY MANUFACTURER'S REPRESENTATIVES**

- A. Cause all tests and inspections specified to be conducted by materials or systems manufacturers to be made. Additionally, all tests and inspections required by materials or systems manufacturers as conditions of warranty or certification of Work shall be made, the cost of which shall be included in the Contract Sum.

#### **1.7 INSPECTIONS BY INDEPENDENT TESTING AND INSPECTION AGENCY**

- A. District will select an independent testing and inspection agency or agencies approved by the Architect/Engineer and the Division of State Architect to conduct tests and inspections in accordance with Part 1, Title 24, Section 4-335, California Code of Regulations and as indicated on Drawings, in Specifications and as required by governing authorities having jurisdiction.
- B. Responsibility for time and costs shall be as indicated in schedule below. All time and costs for Contractor's service related to such tests and inspections shall be included in Contract Time and Contract Sum.
- C. Notify District and Inspector in writing (and, if provided, on inspection request form provided by District) and, if directed by District, testing and inspection agency, when Work is ready for specified tests and inspections. Deliver this written notification at least 72 hours before the requested inspection date.

- D. Pay for all additional charges by testing and inspection agencies and governing authorities having jurisdiction due to the following:
  - 1. Contractor’s failure to properly schedule or notify testing and inspection agency or authorities having jurisdiction.
  - 2. Changes in sources, lots, or suppliers of products after original tests or inspections.
  - 3. Changes in means, methods, techniques, sequences, and procedures of construction that necessitate additional testing, inspection, and related services.
  - 4. Changes in mix designs for concrete and mortar after review and acceptance of submitted mix design.
  - 5. Contractor submitted requests to change materials or products, which are accepted, but require testing and/or reinspection beyond original design.
- E. Tests and special inspections to be paid by District may, where required, include the following:

<u>SECTION</u>	<u>MATERIAL TESTS</u>
03 30 00	Concrete slump and strength
05 12 00	Structural steel bolting and welding

<u>SECTION</u>	<u>SPECIAL INSPECTION</u>
03 20 00	Placement of reinforcing steel for concrete and concrete masonry
03 30 00	Placement of cast-in-place concrete
03 30 00	Installation of adhesive (epoxy) connections
05 12 00	Structural steel fabrication, erection, bolting and welding

- F. Test and Inspection Reports: After each inspection and test, one copy of report shall be promptly submitted to Division of State Architect, District’s Representative, or any other consultant District designates, Architect/Engineer, Contractor and any agency having jurisdiction (if required by Code).
  - 1. Reports shall clearly identify the following:
    - a. Date issued.
    - b. Project name and number.
    - c. Identification of product and Specifications Section in which Work is specified.
    - d. Name of inspector.
    - e. Date and time of sampling or inspection.
    - f. Location in Project where sampling or inspection was conducted.
    - g. Type of inspection or test.
    - h. Date of test.
    - i. Results of tests.
    - j. Comments concerning conformance with Contract Documents and other requirements.
  - 2. Test reports shall indicate specified or required values and shall include statement whether test results indicate satisfactory performance of products.
  - 3. Samples taken but not tested shall be reported.
  - 4. Test reports shall confirm that methods used for sampling and testing conform to specified test procedures.
  - 5. When requested, testing and inspection agency shall provide interpretations of test results.
- G. Contractor Responsibilities in Inspections and Tests:
  - 1. Unless specified otherwise, notify Inspector, District’s Representative, or any other consultant District designates, Architect/Engineer and independent testing and inspection agencies 72 hours in advance of expected time of each test and inspection, and for all other operations requiring inspection and testing services, by submitting Contractor’s inspection request in writing (or, if District provides a specific form, on that form).
    - a. When tests or inspections cannot be performed after such notice, reimburse District for testing and inspection agency personnel and travel expenses incurred due to Contractor’s negligence.
  - 2. Deliver to laboratory or designated location, adequate samples of materials proposed to be used that require advance testing, together with proposed mix designs.
  - 3. Cooperate with Inspector, District’s Representative, or any other consultant District designates, and District’s consultants. Provide access to Work areas and off-site fabrication and assembly locations, including during weekends and after normal Work hours.
  - 4. Provide incidental labor and facilities to provide safe access to Work to be tested and inspected, to obtain and handle samples at the Site or at source of products to be tested, and to store and cure test samples.

5. Provide, at least fifteen (15) Days in advance of first test or inspection of each type, a schedule of tests or inspections indicating types of tests or inspections and their scheduled dates.

**1.8 ADDITIONAL TESTING AND INSPECTION**

- A. If initial tests or inspections made by the Inspector or District's Representative, or any other consultant District designates reveal that materials do not comply with Title 24, California Code of Regulations or with the Contract Documents, or if District has reasonable doubt that materials do not comply with Title 24, California Code of Regulations or with Contract Documents, additional tests and inspections shall be made as directed.
  1. If additional tests and inspections establish that materials comply with Contract Documents, District shall pay all costs for such tests and inspections.
  2. If additional tests and inspections establish that materials do not comply with Contract Documents, all costs of such tests and inspections shall be deducted from Contract Sum.
  3. If Work requiring inspection is covered by follow-on or follow-up Work before it is inspected, uncover Work so proper inspections can be performed. All costs of such tests and inspections shall be deducted from Contract Sum.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION – NOT USED**

END OF SECTION

SECTION 01 58 00

**PROJECT IDENTIFICATION AND SIGNS**

**PART 1 GENERAL**

1.1 SUMMARY

- A. Section Includes:
  - 1. Project identification signs
  - 2. Not Applicable
  - 3. Maintenance
  - 4. Removal
  
- B. Related Sections
  - 1. Section 01 10 00: Summary of Work
  - 2. Section 01 32 19: Submittal Procedures

1.2 QUALITY ASSURANCE

- A. Design project identification signage and structure(s) to withstand 50 miles/hr wind.
- B. Sign Manufacturer/Maker: Experienced as a professional signage company for a minimum of five years.
- C. Project identification signs shall be constructed of new materials.
- D. Finishes: Adequate to withstand weathering, fading, and chipping for duration of construction.

1.3 SUBMITTALS

- A. Submit shop drawings under provisions of Section 01 32 19 - Submittal Procedures.
- B. Show content, layout, lettering style, lettering size, and colors. Make sign and lettering to scale, clearly indicating condensed lettering, if used.
- C. Show proposed location(s) for signage.

**PART 2 PRODUCTS**

2.1 Not Applicable

2.2 OWNER-PROVIDED LAMINATED PROJECT IDENTIFICATION SIGNAGE: Owner will provide three poster-sized, laminated signs, approximately 12 sq. feet, for Contractor to install.

- A. Content and composition of signage to be determined by Owner. The intent of the signage is to inform the college community of the project. Content may include the following:
  - 1. "BUILDING TODAY FOR EDUCATION TOMORROW" across the top of each sign.
  - 2. "Facilities Excellence" across the bottom of each sign.
  - 3. A District Department name and number for more information or emergency response.
  - 4. Name of Project.
  - 5. Name of District and name of College, including logos.

- 6. Names and roles of Architect and any consultants specified by District.
- 7. Name of Prime Contractor.
- 8. New construction projects shall include Architect’s artistic rendering of the building(s).
- 9. The information telephone number of the Construction Planning Department is centered near the bottom of the area with the blue background.
- 10. Graphic Design, Colors, Style of Lettering: to be determined.

B. Sign Materials

- 1. Poster paper, laminated. Metal grommets at each corner, for mounting.
- 2. Mounting Hardware:
  - a) Use plastic tie wraps to secure the signage to the construction site perimeter chain link fence, at location(s) to be identified by Owner’s construction manager.
  - b) Use clear tape to secure the signage to surfaces where tie wraps will not work.

2.3 Not Applicable

**PART 3 EXECUTION**

3.1 INSTALLATION

A. Not Applicable

B. Laminated Project Identification Signage

- a. Install project identification signage within twenty-one (21) days after date of Notice to Proceed.
- b. Place signs at locations as directed by the District representative. The District representative will provide sign placement instructions at the preconstruction meeting.
  - i. Position the sign in such a manner as to be fully visible and readable to the general public.
  - ii. Erect sign level and plumb.

C. Not Applicable

3.2 MAINTENANCE AND REMOVAL OF PROJECT IDENTIFICATION SIGNAGE

- A. Project identification signs shall be maintained to present a clean and neat look throughout the project duration. Maintain signs and supports, keep clean, repair deterioration and damage.
- B. Remove signs, framing, supports and foundations at completion of Project and restore the area to a condition equal to or better than before construction.

END OF SECTION

SECTION 01 91 13  
GENERAL COMMISSIONING REQUIREMENTS

PART 1 GENERAL

1.01 DESCRIPTION

- A. **Commissioning:** Commissioning is a quality-oriented process for achieving, verifying, and documenting that the performance of facilities, systems and assemblies meet defined objectives and criteria. The Commissioning process begins at project inception (during the pre-design phase) and continues through the life of the facility. The commissioning process includes specific tasks to be conducted during each phase in order to verify that design, construction, and training meets the owner's project requirements.
- B. **Commissioning Team:** The members of the commissioning team consist of the contracted commissioning agent (CxA), the owner's representative/construction manager (CM), the general contractor (GC), the architect and design engineers, the mechanical contractor (MC), the electrical contractor (EC), the testing and balancing (TAB) contractor, the control contractor (CC), the facility operating staff, and any other installing subcontractors or suppliers of equipment. The contracted commissioning agent is hired by the owner directly. The CxA directs and coordinates the project commissioning activities and the reports to the owner. All team members work together to fulfill their contracted responsibilities and meet the objectives of the contract documents.

Commissioning shall:

- 1) Verify that applicable equipment and systems are installed according to the contract documents, manufacturer's recommendations, and industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.
  - 2) Verify and document proper performance of equipment and systems.
  - 3) Verify that O&M documentation left on site is complete.
  - 4) Verify that the owner's operating personnel are adequately trained.
- C. The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished and fully functioning product.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and other Division 1 specification sections, apply to this section.
- B. Owner's Project Requirements and Basis of Design documents are included by reference for information only.
- C. ASHRAE Guideline 0-2005, ASHRAE Standards 55 & 62.1-2004

1.03 SUMMARY

- A. This section includes general requirements that apply to the implementation of the commissioning process without regard to specific systems, assemblies and components.

B. Related sections include the following:

- 1) Division 23 Section 23 08 00 Commissioning of HVAC for commissioning process activities for heating, ventilating, air-conditioning, and refrigerating systems, assemblies, equipment, and components.

#### 1.04 DEFINITIONS

Acceptance - A formal action, taken by a person with appropriate provider (which may or may not be contractually defined) to declare that some aspect of the project meets defined requirements, thus permitting subsequent activities to proceed.

Approval - Acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the contract documents.

Basis of Design - A document that records the concepts, calculations, decisions, and product selections used to meet the owner's project requirements 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.

Checklists - Verification checklists that are developed and used during all phases of the commissioning process to verify that the owner's project requirements are being achieved. This includes checklists for general verification, plus testing, training, and other specific requirements.

Commissioning Authority (CxA) - The entity identified by the owner who leads, plans, schedules, and coordinates the commissioning team to implement the commissioning process.

Commissioning Plan - An overall plan developed by the commissioning agent that provides the structure, schedule and coordination planning for the commissioning process.

Commissioning Process - A quality-focused process for enhancing the delivery of a project. The process focuses upon verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the owner's project requirements.

Commissioning Process Activities - Components of the commissioning process.

Commissioning Process Progress Report - A written document that details activities completed as part of the commissioning process and significant findings from those activities that is continuously updated during the course of a project. Usually it is incorporated into the commissioning plan as an ongoing appendix.

Commissioning Team - The individuals who through coordinated actions are responsible for implementing the commissioning process.

Construction Checklist - A form used by the contractor to verify that appropriate components are on-site, ready for installation, correctly installed, and functional. Also see **Checklists**.

Construction Documents - This includes a wide range of documents, which will vary from

project to project, with the owner's needs and with regulations, laws, and countries. Construction documents usually include the project manual (specifications), plans (drawings) and general terms and conditions of the contract.

Continuous Commissioning Process - A continuation of the commissioning process well into the occupancy and operations phase to verify that a project continues to meet current and evolving owner's project requirements. Continuous commissioning process activities are on-going for the life of the facility. Also see **On-Going Commissioning Process**.

Contract Documents - This includes a wide range of documents, which will vary from project to project, with the owner's needs and with regulations, laws, and countries. Contract documents frequently include price agreements, construction management process, sub-contractor agreements or requirements, requirements and procedures for submittals, changes, and other construction requirements, timeline for completion, and the construction documents.

Coordination Drawings - Drawings showing the work of all trades to illustrate that equipment can be installed in the space allocated without compromising equipment function or access for maintenance and replacement. These drawings graphically illustrate and dimension manufacturers' recommended maintenance clearances.

Control system - A component of environmental, HVAC, security, and fire systems for reporting/monitoring and issuing of commands to/from field devices.

Data logging - The monitoring and recording of flows, currents, status, pressures, etc., of equipment using stand-alone data recorders separate from the control system or the trending capabilities of control systems.

Deferred Performance Tests (DPTs) - Performance tests that are performed, at the discretion of the CxA, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design, or other site conditions that disallow the test from being performed.

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.

Factory Testing - Testing of equipment on-site or at the factory, by factory personnel, with or without an owner's representative present.

Issues Log - A formal and ongoing record of problems or concerns – and their resolution – that have been raised by members of the commissioning team during the course of the commissioning process.

Nominal Group Technique - A formal, structured brainstorming process used to obtain the maximum possible ranked input from a variety of viewpoints in a short period of time. The typical approach is a workshop session where a question is presented, the attendees each record their responses on a piece of paper, the individual responses are recorded on a flip chart without discussion in a round robin fashion, all of the responses are discussed, and the participants rank their top five responses.

Non-Compliance - See **Deficiency**.

Non-Conformance - See **Deficiency**.

On-Going Commissioning Process - A continuation of the commissioning process well into the occupancy and operations phase to verify that a project continues to meet current and evolving owner's project requirements. On-going commissioning process activities occur throughout the life of the facility. Some of these will be close to continuous in implementation, and others will be either scheduled or unscheduled (as needed). Also see **Continuous Commissioning Process**.

Owner's Project Requirements - A written document that details the functional requirements of a project and the expectations of how it will be used and operated. This includes project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information. (The term "Project Intent" is used by some owners for their commissioning process owner's project requirements or design.)

Over-ridden Value - Riding over a sensor value in the equipment's controls to observe the response of the equipment's operation. Also see **Simulated Signal**.

Phased Commissioning - Commissioning that is completed in phases as required by the phasing plan as approved for the project and other scheduling issues.

Quality Based Sampling - A process for evaluating a sub-set (sample) of the total population. The sample is based upon a known or estimated probability distribution of expected values; an assumed statistical distribution based upon data from a similar product, assembly, or system; or a random sampling that has scientific statistical basis.

Re-Commissioning - An application of the commissioning process requirements to a project that has been delivered using the commissioning process. This may be a scheduled re-commissioning developed as part of an ongoing commissioning process, or it may be triggered by use change, operations problems, or other needs.

Retro-Commissioning - The commissioning process applied to an existing facility that was not previously commissioned. This guideline does not specifically address retro-commissioning. However, the same basic process needs to be followed from pre-design through occupancy and operations to optimize the benefits of implementing the commissioning process philosophy and practice.

Seasonal Performance Tests - Performance tests that are deferred until the system(s) will experience conditions closer to their design conditions based on weather conditions.

Simulated Condition - Condition that is created for the purpose of testing the response of a system (e.g., raising/lowering the setpoint of a thermostat to see the response in a VAV box).

Simulated Signal - Disconnecting a sensor and using a signal generator to simulate a sensor value for the purpose of testing a full range of conditions.

Startup - The initial starting or activating of dynamic equipment, including completing construction checklists.

Systems Manual - A system-focused composite document that includes the operation manual, maintenance manual, and additional information of use to the owner during the occupancy and operations phase.

Test Procedure - A written protocol that defines methods, personnel, and expectations for tests conducted on components, equipment, assemblies, systems, and interfaces among systems. The test procedures are specified in the Technical Specifications sections of the contract documents. Performance testing covers the dynamic functions and operations of equipment and systems using manual or monitoring methods. Performance testing is the dynamic testing of systems under full operation. Systems are tested under various modes, such as during low cooling loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to respond as the sequences state.

Training Plan - A written document that details the expectations, schedule, budget, and deliverables of commissioning process activities related to training of project operating and maintenance personnel, users, and occupants.

Verification - The process by which specific documents, components, equipment, assemblies, systems, and interfaces among systems are confirmed to comply with the criteria described in the Owner's Project Requirements.

Trending - The monitoring, by a building management system or other electronic data gathering equipment, and analyzing of the data gathered over a period of time.

Vendor - Supplier of equipment.

Warranty Period - Refer to Document 00 65 36 Guaranty.

#### 1.05 COORDINATION

- A. Project Commissioning Team - The members of the project commissioning team will consist of the commissioning authority and any support personnel, the construction manager, the owner's facility staff (FS) or designee, the general contractor, subcontractors and/or vendors as required, and the architect/ engineer (A/E).
- B. Management - The CxA coordinates the commissioning activities through the construction manager. All members shall work together to fulfill their contracted responsibilities and meet the objectives of the contract documents. Refer to Paragraph 1.06 for additional management details.
- C. Scheduling - The CxA, through the owner or CM, will provide sufficient notice to the contractor for scheduling commissioning activities with respect to the owner's participation. The contractor will integrate all commissioning activities into the overall project schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

#### 1.06 COMMISSIONING PLAN

- A. The CxA will develop the commissioning plan which shall be included in the project schedule when approved by the owner or CM. The following narrative provides a brief overview of the typical commissioning tasks during construction and the general order in which they occur.

- 1) Commissioning during construction begins with an initial commissioning meeting conducted by the CxA where the commissioning process is reviewed with the project commissioning team members.
- 2) Additional meetings will be required throughout construction, scheduled by the CxA, through the owner or CM, with necessary parties attending to plan, scope, coordinate, schedule future activities and resolve problems.
- 3) MEP Equipment documentation is submitted to the CxA, through the owner or CM, during normal submittals, including detailed startup procedures.
- 4) The construction checklists are to be completed by the contractor (or its subcontractors), before and during the startup process.
- 5) Construction checklists, TAB and startup must be completed before performance testing.
- 6) Items of non-compliance in material, installation, or setup shall be corrected at no expense to the owner.
- 7) The contractor ensures that the subcontractors' construction checklists are executed and documented and that startup and initial checkout are performed. The CxA verifies that the TAB, construction checklists and startup were completed according to the approved plans. This includes the CxA approving TAB, checklists and startup plans. This also includes witnessing startup of selected equipment. Any testing failure is to be corrected at no additional cost to the owner, and a re-test is to be performed, observed, and documented.
- 8) The CxA develops and implements equipment and system performance test procedures. The forms and procedures are approved by the owner, CM and A/E.
- 9) The performance tests are executed by the contractor under the direction of the CxA with the assistance of the facility staff. All documentation is by the CxA.
- 10) The CxA reviews the O&M documentation for completeness and provides the commissioning record for the O&M manuals.
- 11) Commissioning should be completed before substantial completion.
- 12) The CxA develops procedures, reviews, pre-approves, coordinates, and implements the training provided by the contractor.
- 13) Deferred testing is conducted as specified or required.

#### 1.07 COMMISSIONING TEAM

- A. Members appointed by contractor(s): Individuals, each having authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions. The commissioning team shall consist of, but not be limited to, representatives of each contractor, including project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.

B. Members appointed by owner:

1. CxA - An entity identified by the owner who leads, plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
2. Representatives of the facility user and operation and maintenance personnel.
3. Architect and engineering design professionals.

1.08 RELATED REQUIREMENTS

- |                      |                                |
|----------------------|--------------------------------|
| A. Section 01 32 19  | Submittal Procedures           |
| B. Section 01 32 16  | Progress Schedules and Reports |
| C. Section 01 77 00  | Contract Closeout Procedures   |
| D. Section 01 78 39  | Project Record Documents       |
| E. Document 00 65 36 | Guaranty                       |
| F. Section 23 08 00  | Commissioning of HVAC          |

1.09 RESPONSIBILITIES

- A. The general responsibilities of various parties in the commissioning process are provided in this subsection. The specific responsibilities are in the Technical Specifications.
- B. All Parties
1. Follow the commissioning plan.
  2. Attend initial commissioning meeting and additional meetings as necessary.

C. Architect (of A/E)

*Construction Phase*

1. Attend the commissioning scoping meeting and selected commissioning team meetings.
2. Perform normal submittal review, construction observation, as-built drawing preparation, O&M manual preparation, etc., as contracted.
3. Provide any design narrative documentation requested by the CxA.
4. Coordinate resolution of system deficiencies identified during commissioning, according to the contract documents.
5. Prepare and submit final as-built design intent documentation for inclusion in the O&M manuals. Review and approve the O&M manuals.

D. Mechanical and Electrical Designers/Engineers (of the A/E)

*Construction Phase*

1. Perform normal submittal review, construction observation, as-built drawing preparation, etc., as contracted. On site observation should be completed just prior to system startup.
2. Provide any design narrative and sequences documentation requested by the CxA. The designers shall assist (along with the contractors) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
3. Attend commissioning scoping meetings and other selected commissioning team meetings.
4. Participate in the resolution of system deficiencies identified during commissioning, according to the contract documents.
5. Prepare and submit the final as-built design intent and operating parameters documentation for inclusion in the O&M manuals. Review and approve the O&M manuals.
6. From the contractor's red-line drawings, edit and update one-line diagrams developed as part of the design narrative documentation and those provided by the vendor as shop drawings for the chilled and hot water, condenser water, domestic water, steam and condensate systems; supply, return and exhaust air systems and emergency power system.
7. Provide a presentation at one of the training sessions for the owner's personnel.
8. Review and approve the construction checklists for major pieces of equipment for sufficiency prior to their use.
9. Review and approve the performance test procedure forms for major pieces of equipment for sufficiency prior to their use.
10. Witness testing of selected pieces of equipment and systems

#### *Occupancy and Operations Phase*

1. Participate in the resolution of non-compliance, non-conformance and design deficiencies identified during commissioning during warranty-period commissioning.
2. Attend lessons learned session

#### E. Commissioning Authority (CxA)

The contractors will provide all tools or the use of tools to start, check-out and test equipment and systems.

The CxA will verify the execution of commissioning process activities using random sampling. The sampling rate may vary from 1 to 100 percent. Verification will include, but is not limited to, equipment submittals, construction checklists, training, operating and maintenance data, tests, and test reports to verify compliance with the OPR. When a random sample does not meet the requirement, CxA will report the failure in the "Issues Log."

#### *Construction Phase*

1. Coordinates and directs the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
2. Coordinate the commissioning work and, with the GC and owner/CM, help integrate commissioning activities into the master schedule.
3. Revise the Construction Phase Commissioning Plan as necessary.
4. Plan and conduct a commissioning scoping meeting and other commissioning meetings.

5. Request and review additional information required to perform commissioning tasks, including O&M materials, contractor startup and checkout procedures.
6. Before startup, gather and review the current control sequences and interlocks and work with contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.
7. Review and approve normal contractor submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the A/E reviews.
8. Write and distribute construction checklists. Prepare and maintain completed construction checklist log.
9. Develop an enhanced startup and initial systems checkout plan with subcontractors.
10. Perform site visits, as necessary, to observe component and system installations. Attend selected planning and job-site meetings to obtain information on construction progress. Review construction meeting minutes for revisions/substitutions relating to the commissioning process. Assist in resolving any discrepancies.
11. Witness all or part of the HVAC piping test and flushing procedure, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify owner/CM of any deficiencies in results or procedures.
12. Witness all or part of any ductwork testing and cleaning procedures, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify owner's project manager of any deficiencies in results or procedures.
13. Approve construction checklist completion by selected site observation and spot checking.
14. Recommend approval of systems startup by reviewing startup reports and by selected site observation.
15. Review TAB execution plan.
16. Oversee sufficient testing of the control system and approve it to be used for TAB, before TAB is executed.
17. Recommend approval of air and water systems balancing by reviewing completed reports and by selected site observation.
18. With necessary assistance and review from installing contractors, write the performance test procedures for equipment and systems, including energy management control system trending or manual performance testing. Submit to CM for review, and for approval if required.
19. Analyze any performance trend logs and monitoring data to verify performance.
20. Coordinate, witness, and recommend approval of manual performance tests performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved
21. Maintain a master Issues Log and a separate testing record. Provide the owner/ CM with written progress reports and test results with recommended actions.
22. Review equipment warranties to ensure that the owner's responsibilities are clearly defined.
23. Oversee and approve the training of the owner's operating personnel.
24. Compile and maintain a commissioning record and building systems book(s).
25. Review and approve the preparation of the O&M manuals.
26. Provide a final commissioning report (as described in this section).
27. Coordinate the development of a systems manual

28. Prepare a standard trend logging package of primary parameters that will provide the operations staff clear indications of system function in order to identify proper system operation and trouble shoot problems. The CxA shall also provide any needed information on interpreting the trends.

*Occupancy and Operations Phase*

1. Coordinate and supervise seasonal testing and deficiency corrections.
2. Return to the site at 10 months into the 12 month warranty period and review with facility staff the current building operation and the condition of outstanding issues related to the original and seasonal commissioning. Also interview facility staff and identify problems or concerns they have operating the building as originally intended. Make suggestions for improvements and for recording these changes in the O&M manuals. Identify areas that may come under warranty or under the original construction contract. Assist facility staff in developing reports, documents and requests for services to remedy outstanding problems.
3. Assist in the development of a preventative maintenance plan, a detailed operating plan or an energy and resource management plan or as-built documentation.
4. Attend owner coordinated lessons learned sessions as requested.

F. Owner or Owner's Representative (CM)

*Construction and Acceptance Phase*

1. Facilitate the coordination of the commissioning work by the CxA, and, with the CM/GC and CxA, ensure that commissioning activities are being scheduled into the master schedule.
2. Review and approve the final *Commissioning Plan—Construction Phase*.
3. Attend a commissioning scoping meeting and other commissioning team meetings.
4. Perform the normal review of MEP contractor submittals.
5. Furnish a copy of all construction documents, addenda, change orders and approved submittals and shop drawings related to commissioned equipment to the CxA.
6. Review and approve the performance test procedures submitted by the CxA, prior to testing.
7. When necessary, observe and witness startup and performance testing of selected equipment.
8. Review commissioning progress and deficiency reports.
9. Coordinate the resolution of non-compliance and design deficiencies identified in all phases of commissioning.
10. Sign-off (final approval) on individual commissioning tests as completed and passing. Recommend completion of the commissioning process to the Project Manager.
11. Assist the GC in coordinating the training of owner personnel.
12. Provide the OPR documentation to the CxA and all contractors for information and use.
13. Provide the BoD documents, prepared by Architect and approved by owner, to the CxA and all contractors for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.
14. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.

*Occupancy and Operations Phase*

1. Assist the CxA as necessary in the seasonal or deferred testing and deficiency corrections required by the specifications.
2. Attend lessons learned session

G. Owner's Project Manager (CM&Owner)

*Construction Phase*

1. Manage the contract of the A/E and of the GC.
2. Arrange for facility operating and maintenance personnel to attend various field commissioning activities and field training sessions.
3. Provide final approval for the completion of the commissioning work.

*Occupancy and Operations Phase*

1. Ensure that any seasonal or deferred testing and any deficiency issues are addressed.
2. Attend lessons learned session

H. Contractor. All contractors and their subcontractors and vendors shall assign representatives with expertise and authority to act on their behalf and schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

*Construction Phase*

1. Facilitate the coordination of the commissioning and incorporate commissioning activities (the Commissioning Plan) into the Overall Project Schedule (OPS).
2. Provide detailed startup procedures
3. Include the cost of commissioning in the total contract price.
4. Ensure that all subcontractors and vendors execute their commissioning responsibilities according to the contract documents and the OPS.
5. Provide copies of all submittals as required in Section 01 32 19 Submittal Procedures, including all changes thereto.  
Attend and participate in commissioning team meetings held monthly.
6. No later than 60 days prior to startup of the first piece of major equipment, meet with the CxA, CM, A/E, and PM and owner to finalize the detailed commissioning procedures/schedule.
7. Provide the training of owner personnel.
8. Review and accept construction checklists provided by the commissioning authority.
9. Complete paper or electronic construction checklists as work is completed and provide to the commissioning agent on a weekly basis.
10. Accomplish commissioning process test procedures.
11. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
12. Cooperate with the CxA for resolution of issues recorded in the "Issues Log".
13. Prepare O&M manuals, according to the contract documents, including clarifying and updating the original sequences of operation to as-built/as-tested conditions.

*Occupancy and Operations Phase*

1. Ensure that subcontractors provide assistance for seasonal performance testing, performed by the CxA, according to the specifications.
2. Ensure that subcontractors correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

3. Perform all guarantee work for materials furnished under the contract for the time specified in the contract, including all warranties and curing all latent defects within the time period provided in the contract.

I. Vendors/Subcontractors

1. Provide all requested submittal data, including detailed startup procedures and specific responsibilities of the owner to keep warranties in force.
2. Assist in equipment testing per agreements with subcontractors and/or contractor.
3. Include cost of all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing, operating, and maintaining equipment according to these contract documents in the base bid price to the contractor.
4. Analyze specified products and verify that the A/E has specified the newest, most current equipment reasonable for this project's scope and budget.
5. Provide requested information regarding equipment sequence of operation and testing procedures.
6. Review construction checklists and test procedures for equipment installed by factory representatives.

1.10 EQUIPMENT/SYSTEMS TO BE COMMISSIONED

A. The following equipment/systems will be commissioned for this project:

1. Chillers and Towers
2. Boilers and related equipment
3. Chilled water system and pumps
4. Hot water system and pumps
5. Steam system and components
6. Air Handling Units (with supply, return and outside air duct, variable air volume boxes and units, air distribution equipment, fan coil units, unit heaters, etc., and temperature control system)
7. Exhaust air systems (including fans, ductwork and interconnection with air handling/supply systems)
8. Supply or make-up air systems (including fans, ductwork and interconnection with air handling and/or exhaust systems)
9. Specialty air removal/ventilation systems (including fans, ductwork and interconnection with air handling/supply systems)
10. Potable water system (including backflow preventers, fixtures, piping cleaning and flushing, hot water generators, and booster pumps)
11. Sanitary drainage/sewer system
12. Storm drainage system
13. Emergency power system (including emergency generator, automatic transfer switch and fuel oil system)
14. Lighting systems (interior and exterior )
15. Switchgear, transformers, panelboards and/or motor control centers
16. Lightning protection and/or surge suppression system
17. Access Control system
18. Elevator systems
19. HVAC, Test, Adjust, and Balance

## 20. BMS System

## PART 2 PRODUCTS

## 2.01 TEST EQUIPMENT

- A. All standard testing equipment required to perform startup and initial checkout and required performance testing shall be provided by the contractor for the equipment being tested. This includes, but is not limited to, two-way radios, meters, and data recorders. Data recorders may be provided by the CxA at the option of the CxA,
- B. Special equipment, tools, and instruments required for testing equipment according to these contract documents shall be included in the contractor's base bid price and shall be turned over to the owner at Project close-out.
- C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance within the tolerances specified in the specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration to NIST traceable standards within the past year to an accuracy of 0.5 degree F and a resolution of + or - 0.1 degree F. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

## PART 3 - EXECUTION

## 3.01 MEETINGS

- A. Initial Meeting. Within 10 days of the Notice to Proceed (NTP), the CxA, through the owner/CM, will schedule, plan and conduct an initial commissioning meeting. The contractor and its responsible parties are required to attend.
- B. Miscellaneous Meetings. Other meetings will be planned and conducted by the CxA as construction progresses. These meetings will cover coordination, deficiency resolution, and planning issues. These meetings will be held at least monthly, until the final 3 months of construction, when they may be held as frequently as one per week.

## 3.02 STARTUP, CONSTRUCTION CHECKLISTS, AND INITIAL CHECKOUT

- A. The following procedures apply to all equipment/systems to be commissioned, according to Paragraph 1.10 Equipment/Systems to be commissioned.
- B. General. Construction checklists are important to verify that the equipment and systems are fully connected and operational. It ensures that performance testing (in-depth system checkout) may proceed without unnecessary delays. The construction checklists for a given system must be successfully completed and approved prior to startup and formal performance testing of equipment or subsystems of the given system.

- C. Startup and Checkout Plan. The CxA will assist the project commissioning team members responsible for startup of any equipment. The primary role of the CxA in this process is to ensure that there is written documentation that each of the manufacturer-recommended procedures has been completed. The CxA shall provide construction checklists and startup shall be identified in the commissioning scoping meeting and on the checklist forms.
1. The construction checklists are provided by the CxA. These checklists indicate required procedures to be executed as part of startup and initial checkout of the systems and the party responsible for their execution.
  2. The contractor shall determine which trade is responsible for executing and documenting each of the line item tasks and transmit the checklists to the responsible subcontractors. Each form may have more than one trade responsible for its execution.
  3. The contractor/subcontractor with assistance from the CxA responsible for the purchase of the equipment shall develop the full startup plan by combining the manufacturer's detailed startup and checkout procedures and the construction checklists.
  4. The contractor/subcontractor shall submit the full startup plan to the CxA for review and approval.
  5. The CxA will review and approve the procedures and the documentation format for reporting. The CxA will return the procedures and the documentation format to the contractor, through the CM.
  6. The contractor will transmit the full startup plan to the subcontractors for their review and use.
- D. Sensor and Actuator Calibration. All field-installed temperature, relative humidity, CO, CO<sub>2</sub>, refrigerant, O<sub>2</sub>, and/or pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated. Verify that all locations are appropriate and away from causes of erratic operation. Submit to the CxA through the CM the calibration methods and results. All test instruments shall have had a certified calibration within the last 6 months to NIST traceable standards, and comply with all local, state and/or federal requirements/certifications, as required. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated. Provide bench testing as required at the direction of the CxA.

#### Sensor Calibration Methods

All Sensors-- Verify that all sensor locations are appropriate and away from causes of erratic operation. Verify that sensors with shielded cable, are grounded only at one end. For sensor pairs that are used to determine a temperature or pressure difference, make sure they are reading within 0.2°F of each other for temperature and within a tolerance equal to 2% of the reading, of each other, for pressure. Tolerances for critical applications may be tighter.

Sensors Without Transmitters-- Standard Application. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading, via the permanent thermostat, gage or building automation system (BAS), is within the tolerances in the table below of the instrument-measured value. If not, install offset in BAS, calibrate or replace sensor.

Sensors With Transmitters-- Standard Application. Disconnect sensor. Connect a signal generator in place of sensor. Connect amp meter in series between transmitter and BAS control panel. Using manufacturer’s resistance-temperature data, simulate minimum desired temperature. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the BAS. Record all values and recalibrate controller as necessary to conform with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction. Reconnect sensor. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading, via the permanent thermostat, gage or building automation system (BAS), is within the tolerances in the table below of the instrument-measured value. If not, replace sensor and repeat. For pressure or humidity sensors, perform a similar process with a suitable signal generator.

Critical Applications-- For critical applications (process, manufacturing, etc.) more rigorous calibration techniques may be required for selected sensors. Contractor shall describe any such methods used on an attached sheet.

Tolerances, Standard Applications

<u>Sensor</u>	<u>Required Tolerance (+/-)</u>	<u>Sensor</u>	<u>Required Tolerance (+/-)</u>
Cooling coil, chilled and condenser water temps	0.4F	Flow rates, water	4% of design
AHU wet bulb or dew point	2.0F	Relative humidity	4% of design
Hot water coil and boiler water temp	1.5F	Combustion flue temps	5.0F
Outside air, space air, duct air temps	0.5F	Oxygen or CO <sub>2</sub> monitor	0.1 % pts
Wathour, voltage & amperage	1% of design	CO monitor	0.01 % pts
Pressures, air, water and gas	3% of design	Natural gas and oil flow rate	1% of design
Flow rates, air	10% of design	Steam flow rate	3% of design
		Barometric pressure	0.1 in. of Hg

Valve and Damper Stroke Setup and Check EMS Readout-- For all valve and damper actuator positions checked, verify the actual position against the BAS readout. Set pumps or fans to normal operating mode. Command valve or damper closed, visually verify that valve or damper is closed and adjust output zero signal as required. Command valve or damper open, verify position is full open and adjust output signal as required. Command valve or damper to a few intermediate positions. If actual valve or damper position doesn’t reasonably correspond, replace actuator or add pilot positioner (for pneumatics).

Closure for heating coil valves (NO)-- Set heating setpoint 20°F above room temperature. Observe valve open. Remove control air or power from the valve and verify that the valve stem and actuator position do not change. Restore to normal. Set heating setpoint to 20°F below room temperature. Observe the valve close. For pneumatics, by override in the EMS, increase pressure to valve by 3 psi (do not exceed actuator pressure rating) and verify valve stem and actuator position does not change. Restore to normal.

Closure for cooling coil valves (NC)-- Set cooling setpoint 20°F above room temperature. Observe the valve close. Remove control air or power from the valve and verify that the valve stem and actuator position do not change. Restore to normal. Set cooling setpoint to 20°F below room temperature. Observe valve open. For pneumatics, by override in the EMS, increase pressure to valve by 3 psi (do not exceed actuator pressure rating) and verify valve stem and actuator position does not change. Restore to normal.

Spring Return Actuators (NC or NO)—During normal operation, disconnect the power and visually inspect the operation of the desired action (open or closed)

E. Execution of Construction Checklists and Startup.

1. Four weeks prior to the scheduled startup, the contractor shall coordinate startup and checkout with the CM, A/E, and CxA. The execution and approval of the construction checklists, startup, and checkout shall be directed and performed by the contractor, subcontractor or vendor. Signatures are required of the applicable subcontractors for verification of completion of their work.
2. The owner/CM, and A/E as necessary, shall observe, at minimum, the procedures for each piece of primary equipment, unless there are multiple units, in which case a sampling strategy may be used. The CxA will observe all testing.
3. For lower-level components of equipment, (e.g., sensors, controllers), the CxA shall observe a sampling of the startup procedures.
4. The subcontractors and vendors shall execute startup and provide the CxA and A/E, through the owner/CM, with a signed and dated copy of the completed startup and construction checklists.
5. Only individuals of the contractor (technicians, engineers, tradesmen, vendors, etc.) who have direct knowledge and witnessed that a line item task on the construction checklist was actually performed shall check off that item. It is not acceptable for witnessing supervisors to fill out these forms.

F. Deficiencies, Non-Conformance, and Approval in Checklists and Startup(Master Issues Log).

1. The contractor shall ensure that the subcontractors clearly list any outstanding items of the initial startup and construction checklist procedures that were not completed successfully, on an attached sheet. The form and any outstanding deficiencies shall be provided, through the owner/CM, to the CxA within two days of test completion.
2. The CxA will review the report and issue either a non-compliance report or an approval form, through the CM, to the contractor. The installing subcontractors or vendors shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner, shall notify the owner/CM as soon as outstanding items have been corrected, and resubmit an updated startup report with a Statement of Correction on the original non-compliance report. When satisfactorily completed, the CxA will recommend approval of the execution of the checklists and startup of each system.
3. Items left incomplete, which later cause deficiencies or delays during performance may result in backcharges to the contractor. Refer to Paragraph 3.05, herein, for details.

### 3.03 SUBMITTALS

- A. The CxA will provide appropriate contractors with a specific request for the type of submittal documentation the CxA requires facilitating the commissioning work. These requests will be

integrated into the normal submittal process and protocol of the construction team. At minimum, the request will include the manufacturer and model number, the manufacturer's printed installation and detailed startup procedures, full sequences of operation, O&M data, performance data, any performance test procedures, control drawings and details of owner contracted tests. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the commissioning authority. All documentation requested by the CxA will be included by the subcontractors in their O&M manual contributions.

- B. The CxA will review and approve submittals related to the commissioned equipment for conformance to the contract documents as it relates to the commissioning process, to the performance of the equipment and adequacy for developing test procedures. This review is intended primarily to aid in the development of performance procedures and only secondarily to verify compliance with equipment specifications. The commissioning authority will notify the owner/CM, PM or A/E as requested, of items missing or areas that are not in conformance with contract documents and which require resubmission.
- C. The CxA may request additional design narrative from the A/E and controls contractor, depending on the completeness of the OPR documentation and sequences provided with the specifications.
- D. These submittals to the CxA do not constitute compliance for O&M manual documentation. The O&M manuals are the responsibility of the contractor, though the CxA will review and approve them.

### 3.04 PERFORMANCE TESTING

- A. Requirements. The performance testing shall demonstrate that each system is operating according to the documented design intent and contract documents. Performance testing facilitates bringing the systems from a state of individual substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.
- B. Coordination and Scheduling. The contractor shall provide sufficient notice, regarding their completion schedule for the construction checklists and startup of all equipment and systems to allow the performance testing to be scheduled. The commissioning team shall oversee, witness, and document the performance all equipment and systems. The CxA in association with the contractor/subcontractors and facility staff shall execute the tests. Performance testing shall be conducted after the construction checklists, and startup has been satisfactorily completed. The control system shall be sufficiently tested and approved by the CxA before it is used, to verify performance of other components or systems. The air balancing and water balancing shall be completed before performance testing of air or water-related equipment or systems. Testing proceeds from components to sub-systems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems shall be checked.
- C. Development of Test Procedures. Before test procedures are finalized, the contractor shall provide to the A/E and the CxA all requested documentation and a current list of changes affecting equipment or systems, including an updated points list, program code, control sequences, and testing parameters. Using the testing parameters and requirements in the technical specifications, the CxA shall

update/develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Each contractor/subcontractor or vendor, as appropriate, shall provide assistance to the CxA in developing the final procedures. Prior to finalization, the A/E shall review and concur with the test procedure.

D. Test Methods.

1. Performance testing and verification may be achieved by manual testing or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by stand-alone data loggers. The CxA may substitute specified methods or require an additional method to be executed other than what was specified, with the approval of the A/E and owner/CM. The CxA will determine which method is most appropriate for tests that do not have a specified method.
2. Simulated Conditions. Simulating conditions shall be allowed, though timing the testing to experience actual conditions is encouraged wherever practical.
3. Overridden Values. Overriding sensor values to simulate a condition, such as overriding the outside air temperature reading in a control system to be something other than it really is, is acceptable.
4. Simulated Signals. Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overridden values.
5. Altering Setpoints. Rather than overriding sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable.
6. Indirect Indicators. Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the test parameters, that the indirect readings through the control system represent actual conditions and responses.
7. Setup. Each performance test shall be performed under conditions that simulate actual conditions as closely as is practically possible. The contractor/subcontractor(s) assisting the CxA in executing the test shall provide all necessary materials, system modifications, etc., to produce the necessary flows, pressures, temperatures, etc., necessary to execute the test according to the specified conditions. At completion of the test, the contractor/subcontractor(s) shall return all affected equipment and systems to their approved operating settings.

E. Test Equipment. Refer to Part 2 for test equipment requirements.

F. Problem Solving. The burden of responsibility to solve, correct, and retest malfunctions/failures is with the contractor, with A/E approval as required.

3.05 DOCUMENTATION, NON-CONFORMANCE, AND APPROVAL OF TESTS

A. Documentation. The CxA shall witness and verify/pre-approve the documentation of the results of all performance tests. The CxA shall complete all documentation for performance testing.

B. Non-Conformance.

1. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CxA. In such cases the deficiency and resolution will be documented on the procedure

- form or on an attached sheet.
2. As tests progress and a deficiency is identified, the CxA shall discuss the issue with the commissioning team, and the contractor.
    - a. When there is no dispute on the deficiency and the contractor accepts responsibility to correct it:
      - 1) The CxA will document the deficiency and the contractor's response and intentions. After the day's work, the CxA will submit the non-compliance reports to the CM. The contractor corrects the deficiency, signs the statement of correction at the bottom of the non-compliance form certifying that the equipment is ready to be retested and sends it back to the CxA.
      - 2) The contractor shall reschedule the test; and the test repeated.
    - b. If there is a dispute about a deficiency, regarding whether or not it is a deficiency:
      - 1) The dispute shall be documented on the non-compliance form with the contractor's response.
      - 2) Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the A/E. Final acceptance authority is with the construction manager.
      - 3) The CxA documents the resolution process.
      - 4) Once the interpretation and resolution have been decided, the contractor corrects the deficiency, signs the statement of correction on the non-compliance form and provides it to the CxA, through the CM. The contractor shall reschedule the test and the test repeated until satisfactory performance is achieved.
  3. Cost of retesting a performance test hall is the contractor's.
  4. The contractor shall submit in writing to the CM at least as often as commissioning meetings are being scheduled, the status of each outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreement and proposals for their resolutions.
    - a. The CxA retains the original non-conformance forms until the end of the project.
    - b. Retesting shall not be considered a justified reason for a claim of delay or for a time extension by the contractor.
- C. Failure Due to Manufacturer Defect. If 10% (or three, whichever is greater) of identical pieces of equipment fail to perform to the contract documents (mechanically or substantively) due to a manufacturing defect, not allowing it to meet its submitted performance specification, all identical units may be considered unacceptable by the A/E or CxA. In such case, the contractor shall provide the owner with the following:
- a. Within one week of notification from the owner/CM, the contractor or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the CM within two weeks of the original notice.
  - b. Within two weeks of the original notification, the contractor or manufacturer shall provide a signed and dated, written explanation of the problem, cause of failures, etc., and all proposed solutions. The proposed solutions shall not significantly exceed the specification requirements of the original installation.
  - c. The A/E will determine whether a replacement of all identical units or a repair is acceptable.

- d. Two examples, where applicable, of the proposed solution shall be installed by the contractor and the A/E shall be allowed to test the installations for up to one week, upon which the A/E will decide whether to accept the solution.
- e. Upon acceptance, the contractor and/or manufacturer shall replace or repair all identical items, at their expense. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.

D. Approval. The CxA notes each satisfactorily demonstrated function on the test form. Final approval of the performance test by the owner is made after review by the CxA and CM, following recommendations by the A/E.

### 3.06 DEFERRED TESTING

- A. Unforeseen Deferred Tests. If any check or test cannot be completed due to the project completion level, required occupancy condition or other deficiency, execution of checklists and performance testing may be delayed upon approval of the CxA and CM. These tests will be conducted in the same manner as the seasonal tests as soon as possible. Services of necessary parties will be negotiated.
- B. Seasonal Testing. During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design) shall be completed as part of this contract. The CxA shall coordinate this activity through the owner/CM. Tests will be executed, documented by the CxA and deficiencies should be corrected by the appropriate contractor/ subcontractors with the CxA witnessing. Any final adjustments to the O&M manuals and as-builts due to the testing shall be made by the contractor.

### 3.07 TRAINING OF OWNER PERSONNEL

- A. The contractor shall provide training coordination, scheduling of subcontractors, and ensure that training is completed. All training shall be coordinated, through the CM, with the CxA.
- B. The contractor shall ensure that each subcontractor and vendor (mechanical, plumbing, fire, electrical, specialty, etc.) shall have the following responsibilities:
  - 1. Provide, to the CxA through the CM, a training plan sixty days before the planned training covering the following elements:
    - a. Equipment
    - b. Intended audience
    - c. Location of training
    - d. Objectives
    - e. Subjects covered (description, duration of discussion, special methods, etc.)
    - f. Duration of training on each subject
    - g. Instructor for each subject
    - h. Methods (classroom lecture, manufacturer's quality video, site walk-through, actual operational demonstrations, written handouts, etc.).
  - 2. Provide designated owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of equipment that makes up the system.
  - 3. Training shall normally start with classroom sessions followed by hands-on demonstration/training on each piece of equipment.
  - 4. During any demonstration, should the system fail to perform in accordance with the

- requirements of the O&M manual or sequence of operations, the system shall be repaired or adjusted as necessary and the demonstration repeated at another scheduled time, if necessary.
5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment is required. More than one party may be required to execute the training.
  6. The controls contractor shall attend sessions other than the controls training, as specified, to discuss the interaction of the controls system as it relates to the equipment being discussed.
  7. The training sessions shall follow the outline in the table of contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.
  8. Training shall include:
    - a. Use of the printed installation, operation and maintenance instruction material included in the O&M manuals.
    - b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include startup, operation in all modes possible, shutdown, seasonal changeover and any emergency procedures.
    - c. Discussion of relevant health and safety issues and concerns.
    - d. Discussion of warranties and guarantees.
    - e. Common troubleshooting problems and solutions.
    - f. Explanatory information included in the O&M manuals.
    - g. Discussion of any peculiarities of equipment installation or operation.
    - h. Classroom sessions shall include the use of overhead projections, slides, video/audio-taped material as might be appropriate.
    - i. Hands-on training shall include startup, operation in all modes possible, including manual, shut-down, alarms, power failure and any emergency procedures, and preventative maintenance for all pieces of equipment.
  9. The contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls not controlled by the central control system.
- D. At the discretion of the CxA, training may occur before performance testing is complete if required by the facility operators to assist the CxA in the performance testing.
- E. Videotaping of the training sessions will be provided by the contractor and added to the O&M manuals. In addition, factory training videos identifying key troubleshooting, repair, service and/or replacement techniques shall be provided and reviewed with the owner.
- F. The CxA at the beginning of each training session presents the overall system narrative and the design concept of each equipment section.

### 3.08 INSTALLATION, OPERATION AND MAINTENANCE MANUALS/DATA

- A. The commissioning process requires detailed installation, operation and maintenance documentation as identified in this section and technical specifications.
- B. See Section 01 32 19 Submittal Procedures.
- C. See Section 01 78 39 Project Record Documents.
- D. See Section 23 08 00 Commissioning of HVAC.

### 3.09 COMMISSIONING RECORD

- A. The CxA is responsible to compile, organize and index the following commissioning data by equipment into labeled, indexed and tabbed, three-ring binders and deliver it to District, to be delivered with the O&M manuals.
- B. Commissioning Plan
- C. System reports including design narratives and criteria including sequences. Each system shall contain the startup plan and report, approvals, corrections, construction checklists, completed performance tests, trending and analysis, training plan and recommended recommissioning schedule.
- D. Final Commissioning Report including an executive summary, list of participants and roles, brief building description, overview of commissioning and testing scope and a general description of testing and verification methods. For each piece of commissioned equipment, the report should contain the disposition of the commissioning authority regarding the adequacy of the equipment, documentation and training meeting the contract documents in the following areas:
  - 1) equipment meeting the equipment specifications
  - 2) equipment installation
  - 3) performance and efficiency
  - 4) equipment documentation and design intent
  - 5) operator training

All outstanding non-compliance items shall be specifically listed. Recommendations for improvement to equipment or operations, future actions, commissioning process changes, etc. shall also be listed. Each non-compliance issue shall be referenced to the specific performance test, inspection, trend log, etc. where the deficiency is documented. The performance and efficiency section for each piece of equipment shall include a brief description of the verification method used (manual testing, BMS trend logs, data loggers, etc.) and include observations and conclusions from the testing.

END OF SECTION

SECTION 23 08 00  
COMMISSIONING of HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. OPR, BoD, and BoD-HVAC documentation prepared by Owner and Architect contains requirements that apply to this Section.

1.2 SUMMARY

- A. This Section includes requirements for commissioning the HVAC system and its subsystems and equipment. This Section supplements the general requirements specified in Division 1 Section "General Commissioning Requirements."
- B. Related Sections include the following:
  - 1. Division 1 Section 01 91 13 General Commissioning Requirements for general requirements for commissioning processes that apply to this Section.

1.3 DEFINITIONS

- A. Architect: Includes Architect identified in the Contract for Construction between College and Contractor, plus consultant/design professionals responsible for design of HVAC, electrical, communications, controls for HVAC systems, and other related systems.
- B. BoD: Basis of Design.
- C. BoD-HVAC: HVAC systems basis of design.
- D. CxA: Commissioning Authority.
- E. OPR: Owner's (College) Project Requirements.
- F. Systems, Subsystems, and Equipment: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, and equipment.
- G. TAB: Testing, Adjusting, and Balancing.

1.4 CONTRACTOR'S RESPONSIBILITIES

- A. The following responsibilities are in addition to those specified in Division 1 Section "General Commissioning Requirements."
- B. Contractor:
  - 1. Attend procedures meeting for TAB Work.
  - 2. Certify that TAB Work is complete.

- C. Mechanical Subcontractor:
1. Attend TAB verification testing.
  2. Provide measuring instruments and logging devices to record test data, and data acquisition equipment to record data for the complete range of testing for the required test period.
- D. HVAC Instrumentation and Control Subcontractor: With the CxA, review control designs for compliance with the OPR and BoD, controllability with respect to actual equipment to be installed, and recommend adjustments to control designs and sequence of operation descriptions.
- E. TAB Subcontractor:
1. Contract Documents Review: With the CxA, review the Contract Documents before developing TAB procedures.
    - a. Verify the following:
      - 1) Accessibility of equipment and components required for TAB Work.
      - 2) Adequate number and placement of duct balancing dampers to allow proper balancing while minimizing sound levels in occupied spaces.
      - 3) Adequate number and placement of balancing valves to allow proper balancing and recording of water flow.
      - 4) Adequate number and placement of test ports and test instrumentation to allow reading and compilation of system and equipment performance data needed to conduct both TAB and commissioning testing.
      - 5) Air and water flow rates have been specified and compared to central equipment output capacities.
    - b. Identify discontinuities and omissions in the Contract Documents.
    - c. This review of the Contract Documents by the TAB Subcontractor satisfies requirements for a design review report as specified in Division 23 Section "Testing, Adjusting, and Balancing."
  2. Additional Responsibilities: Participate in tests specified in Division 23 Sections "HVAC Instrumentation and Controls" and "Sequence of Operation."
- F. Electrical Subcontractor:
1. With the Mechanical Subcontractor, coordinate installations and connections between and among electrical and HVAC systems, subsystems, and equipment.
  2. Attend TAB verification testing.

## 1.5 COMMISSIONING DOCUMENTATION

- A. The following are in addition to documentation specified in Division 1 Section "General Commissioning Requirements."

- B. BoD HVAC: Owner will provide BoD-HVAC documents, prepared by Architect and approved by College Representative, to the CxA and Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.
- C. Test Checklists: CxA with assistance of Architect shall develop test checklists for HVAC systems, subsystems, and equipment, including interfaces and interlocks with other systems. CxA shall prepare separate checklists for each mode of operation and provide space to indicate whether the mode under test responded as required. In addition to the requirements specified in Division 1 Section "General Commissioning Requirements," checklists shall include, but not be limited to, the following:
  - 1. Calibration of sensors and sensor function.
  - 2. Testing conditions under which test was conducted, including (as applicable) ambient conditions, set points, override conditions, and status and operating conditions that impact the results of test.
  - 3. Control sequences for HVAC systems.
  - 4. Responses to control signals at specified conditions.
  - 5. Sequence of response(s) to control signals at specified conditions.
  - 6. Narrative description of observed performance of systems, subsystems, and equipment. Notation to indicate whether the observed performance at each step meets the expected results.
  - 7. Interaction of auxiliary equipment.
  - 8. Issues log.

#### 1.6 SUBMITTALS

The following submittals are in addition to those specified in Division 1 Section "General Commissioning Requirements."

- A. Testing Procedures: CxA shall submit detailed testing plan, procedures, and checklists for each series of tests. Submittals shall include samples of data reporting sheets that will be part of the reports.
- B. Certificate of Readiness: CxA shall compile certificates of readiness prepared by Contractor certifying that systems, subsystems, equipment, and associated controls are ready for testing.
- C. Certificate of Completion of Installation, Prestart, and Startup: CxA shall certify that installation, prestart, and startup activities have been completed. Certification shall include completed checklists provided by TAB Subcontractor as specified in Division 23 Section "Testing, Adjusting, and Balancing." and the Pre-Functional Checklist by the Controls Contractor
- D. Certified Pipe Cleaning and Flushing Report: CxA shall certify that pipe cleaning, flushing, hydrostatic testing, and chemical treating have been completed.
- E. Test and Inspection Reports: CxA shall compile and submit test and inspection reports and certificates, and shall include them into the systems manual and commissioning report.
- F. Corrective Action Documents: CxA shall submit corrective action documents.
- G. Certified TAB Reports: CxA shall submit verified, certified TAB reports.

## PART 2 - PRODUCTS

The following products and services providers will be directly involved in the commissioning of the building system:

- A. T.A.C. Americas (Yamas Controls)  
Y-Net Building Automation System

## PART 3 - EXECUTION

### 3.1 TESTING PREPARATION

#### A. Prerequisites for Testing:

1. Certify that HVAC systems, subsystems, and equipment have been completed, calibrated, and started; are operating according to the OPR, BoD, and Contract Documents; and that Certificates of Readiness are signed and submitted.
2. Certify that HVAC instrumentation and control systems have been completed and calibrated; are operating according to the OPR, BoD, and Contract Documents; and that pretest set points have been recorded.
3. Certify that TAB procedures have been completed, and that TAB reports have been submitted, discrepancies corrected, and corrective work approved.
4. Test systems and intersystem performance after approval of test checklists for systems, subsystems, and equipment.
5. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shut down, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).
6. Verify each operating cycle after it has been running for a specified period and is operating in a steady-state condition.
7. Inspect and verify the position of each device and interlock identified on checklists. Sign off each item as acceptable, or failed. Repeat this test for each operating cycle that applies to system being tested.
8. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.
9. Annotate checklist or data sheet when a deficiency is observed.
10. Verify equipment interface with monitoring and control system and TAB criteria; include the following as applicable:
  - a. Supply and return flow rates for VAV and constant volume systems in each operational mode.
  - b. Operation of terminal units in both heating and cooling cycles.
  - c. Minimum outdoor-air intake in each operational mode and at minimum and maximum airflows.
  - d. Building pressurization.
  - e. Total exhaust airflow and total outdoor-air intake.
  - f. Operation of indoor-air-quality monitoring systems.
11. Verify proper responses of monitoring and control system controllers and sensors to include the following:
  - a. For each controller or sensor, record the indicated monitoring and control system reading and the test instrument reading. If initial test indicates that the test reading is outside of the control range of the installed device, check calibration of the

- installed device and adjust as required. Retest malfunctioning devices and record results on checklist or data sheet.
- b. Report deficiencies and prepare an issues log entry.
12. Verify that HVAC equipment field quality-control testing has been completed and approved. CxA shall direct, witness, and document field quality-control tests, inspections, and startup specified in individual Division 23 Sections.
- B. Testing Instrumentation: Install measuring instruments and logging devices to record test data for the required test period. Instrumentation shall monitor and record full range of operating conditions and shall allow for calculation of total capacity of system for each mode of operation. For individual room cooling tests, provide temporary heaters to impose a cooling load indicated in BoD. Operational modes include the following:
1. Occupied and unoccupied.
  2. Warm up and cool down.
  3. Economizer cycle.
  4. Emergency power supply.
  5. Life-safety and safety systems.
  6. Smoke control.
  7. Fire safety.
  8. Stair pressurization system.
  9. Temporary upset of system operation.
  10. Partial occupancy conditions.
  11. Special cycles.

### 3.2 TAB VERIFICATION

- A. TAB Subcontractor shall coordinate with CxA for work required in Division 15 Section "Testing, Adjusting, and Balancing." TAB Subcontractor shall copy CxA with required reports, sample forms, checklists, and certificates.
- B. Contractor, HVAC Subcontractor, and CxA shall witness TAB Work.
- C. TAB Preparation:
1. TAB Subcontractor shall provide CxA with data required for "Pre-Field TAB Engineering Reports" specified in Division 23 Section "Testing, Adjusting, and Balancing."
    - a. CxA shall use this data to certify that prestart and startup activities have been completed for systems, subsystems, and equipment installation.
- D. Ductwork Air Leakage Testing:
1. Architect will identify, for HVAC Subcontractor and CxA, portions of duct systems to have ductwork air leakage testing. Ductwork air leakage testing shall be performed according to Division 23 Section "Metal Ducts," and shall be witnessed by the CxA.
  2. On approval of preliminary ductwork air leakage testing report, the CxA shall coordinate verification testing of ductwork air leakage testing. Verification testing shall include random retests of portions of duct section tests, reported in preliminary ductwork air leakage testing report. The HVAC Subcontractor shall perform tests using the same instrumentation (by model and serial number) as for original testing; the CxA shall witness verification testing.

- E. Verification of Final TAB Report:
1. CxA shall select, at random, 10 percent of report for field verification.
  2. CxA shall notify TAB Subcontractor 10 days in advance of the date of field verification; however, notice shall not include data points to be verified. The TAB Subcontractor shall use the same instruments (by model and serial number) that were used when original data were collected.
  3. Failure of an item is defined as follows:
    - a. For all readings other than sound, a deviation of more than 10 percent.
      - 1) For sound pressure readings, a deviation of 3 dB. (Note: Variations in background noise must be considered.)
  4. Failure of more than 10 percent of selected items shall result in rejection of final TAB report.
- F. If deficiencies are identified during verification testing, CxA shall notify the HVAC Subcontractor and Architect, and shall take action to remedy the deficiency. Architect shall review final tabulated checklists and data sheets to determine if verification is complete and that system is operating according to the Contract Documents.
- G. CxA shall certify that TAB Work has been successfully completed.

### 3.3 TESTING

- A. Test systems and intersystem performance after test checklists for systems, subsystems, and equipment have been approved.
- B. Perform tests using design conditions whenever possible.
1. Simulate conditions by imposing an artificial load when it is not practical to test under design conditions and when written approval for simulated conditions is received from CxA. Before simulating conditions, calibrate testing instruments. Set and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.
  2. Alter set points when simulating conditions is not practical and when written approval is received from CxA.
  3. Alter sensor values with a signal generator when design or simulating conditions and altering set points are not practical. Do not use sensor to act as signal generator to simulate conditions or override values.
- C. Scope of HVAC Subcontractor Testing:
1. Testing scope shall include entire HVAC installation, from central equipment for heat generation and refrigeration through distribution systems to each conditioned space. It shall include measuring capacities and effectiveness of operational and control functions.
  2. Test all operating modes, interlocks, control responses, responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.
- D. Detailed Testing Procedures: CxA, with HVAC Subcontractor, TAB Subcontractor, and HVAC Instrumentation and Control Subcontractor, shall prepare detailed testing plans, procedures, and checklists for HVAC systems, subsystems, and equipment.

- E. Boiler Testing and Acceptance Procedures: Testing requirements are specified in Division 15 boiler Sections. CxA shall review and comment on submittals, test data, inspector record, and boiler certification and shall compile information for inclusion in systems manual.
- F. HVAC Instrumentation and Control System Testing:
1. Field testing plans and testing requirements are specified in Division 23 Sections "HVAC Instrumentation and Controls" and "Sequence of Operation." The CxA, HVAC Subcontractor, and the HVAC Instrumentation and Control Subcontractor shall collaborate to prepare testing plans.
  2. CxA shall convene a meeting of appropriate entities to review test report of HVAC instrumentation and control systems.
- G. Pipe cleaning, flushing, hydrostatic tests, and chemical treatment requirements are specified in Division 15 piping Sections. HVAC Subcontractor shall prepare pipe system cleaning, flushing, and hydrostatic testing. CxA shall review and comment on plan and final reports. CxA shall certify that pipe cleaning, flushing, hydrostatic tests, and chemical treatment have been completed. Plan shall include the following:
1. Sequence of testing and testing procedures for each section of pipe to be tested, identified by pipe zone or sector identification marker. Markers shall be keyed Drawings for each pipe sector showing the physical location of each designated pipe test section. Drawings keyed to pipe zones or sectors shall be formatted to allow each section of piping to be physically located and identified when referred to in pipe system cleaning, flushing, hydrostatic testing, and chemical treatment plan.
  2. Description of equipment for flushing operations.
  3. Minimum flushing water velocity.
  4. Tracking checklist for managing and ensuring that all pipe sections have been cleaned, flushed, hydrostatically tested, and chemically treated.
- H. Energy Supply System Testing: HVAC Subcontractor shall prepare a testing plan to verify performance of systems and equipment. Plan shall include the following:
1. Sequence of testing and testing procedures for each equipment item and pipe section to be tested, identified by pipe zone or sector identification marker. Markers shall be keyed to Drawings for each pipe sector showing the physical location of each designated pipe test section. Drawings keyed to pipe zones or sectors shall be formatted to allow each section of piping to be physically located and identified when referred to in system testing plan.
  2. Tracking checklist for managing and ensuring that all pipe sections have been tested.
- I. Heat-Generation System Testing: HVAC Subcontractor shall prepare a testing plan to verify performance of boilers, feedwater equipment, furnaces, and auxiliary equipment. Plan shall include the following:
1. Sequence of testing and testing procedures for each item of equipment and section of pipe to be tested, identified by identification marker. Markers shall be keyed to Drawings for each pipe sector showing the physical location of each item of equipment and pipe test section. Drawings shall be formatted to allow each item of equipment and section of piping to be physically located and identified when referred to in the system testing plan.
  2. Tracking checklist for managing and ensuring that all pipe sections have been tested.

- J. Refrigeration System Testing: HVAC Subcontractor shall prepare a testing plan to verify performance of chillers, cooling towers, refrigerant compressors and condensers, heat pumps, and other refrigeration systems. Plan shall include the following:
1. Sequence of testing and testing procedures for each item of equipment and section of pipe to be tested, identified by identification marker. Markers shall be keyed to Drawings showing the physical location of each item of equipment and pipe test section. Drawings shall be formatted to allow each item of equipment and section of piping to be physically located and identified when referred to in the system testing plan.
  2. Tracking checklist for managing and ensuring that all pipe sections have been tested.
- K. HVAC Distribution System Testing: HVAC Subcontractor shall prepare a testing plan to verify performance of air, steam, and hydronic distribution systems; special exhaust; and other distribution systems. Include HVAC terminal equipment and unitary equipment. Plan shall include the following:
1. Sequence of testing and testing procedures for each item of equipment and section of pipe to be tested, identified by identification marker. Markers shall be keyed to Drawings showing the physical location of each item of equipment and pipe test section. Drawings shall be formatted to allow each item of equipment and section of piping to be physically located and identified when referred to in the system testing plan.
  2. Tracking checklist for managing and ensuring that all pipe sections have been tested.
- L. Vibration and Sound Tests: HVAC Subcontractor shall prepare testing plans to verify performance of vibration isolation and seismic controls. CxA shall witness and certify tests and inspections.
- M. Deferred Testing:
1. If tests cannot be completed because of a deficiency outside the scope of the HVAC system, the deficiency shall be documented and reported to Owner. Deficiencies shall be resolved and corrected by appropriate parties and test rescheduled.
  2. If the testing plan indicates specific seasonal testing, appropriate initial performance tests shall be completed and documented and additional tests scheduled.
- N. Testing Reports:
1. Reports shall include measured data, data sheets, and a comprehensive summary describing the operation of systems at the time of testing.
  2. Include data sheets for each controller to verify proper operation of the control system, the system it serves, the service it provides, and its location. For each controller, provide space for recording its readout, the reading at the controller's sensor(s), plus comments. Provide space for testing personnel to sign off on each data sheet.
  3. Prepare a preliminary test report. Deficiencies will be evaluated by Architect to determine corrective action. Deficiencies shall be corrected and test repeated.
  4. If it is determined that the system is constructed according to the Contract Documents, Owner will decide whether modifications required to bring the performance of the system to the OPR and BoD documents shall be implemented or if tests will be accepted as submitted. If corrective Work is performed, Owner will decide if tests shall be repeated and a revised report submitted.

END OF SECTION