Request for Qualifications
Architectural Services

Pima County Community College District (“College” or “District”) is seeking proposals from qualified firms for Architectural Services on an as needed basis.

The deadline for receipt of sealed proposals is: September 2, 2015 at 3:00 PM (Arizona Time). Sealed proposals must be received by this deadline at the following location:

Pima County Community College District
District Finance Office-Purchasing
4905D East Broadway, Room D-232
Tucson, Arizona 85709-1420

Any proposal received after the date and time listed above will be returned and will not be considered.

Questions pertaining to this Request for Proposal (RFQ) must be communicated in writing and be received via email by August 12, 2015 at 3:00 PM (Arizona Time). Questions must be sent to the email address below and should include the specified Buyer’s name and proposal number, and any question(s) should include a reference to the appropriate page and section number of the RFQ. Questions and answers will be posted on the Pima Community College webpage listed below by August 19, 2015 at 5:00 PM (Arizona Time):

Jan Posz, C.P.M., Sr. Buyer
DO-Staff-FO-Procur@pima.edu

Copies of the Request for Proposal, questions and answers, and any related documents are available on the Pima Community College Website:
http://www.pima.edu/administrative-services/purchasing/current-requests-for-proposals-bids-quotes.html

Mark Dworschak
Purchasing Director
Pima County Community College District
District Finance Office-Purchasing
4905 East Broadway, Room D-232
Tucson, Arizona 85709-1420
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Section 1
Introduction

1. Request for Proposal Summary
Pima County Community College District ("College" or "District") is seeking proposals from qualified firms for Architectural Services in accordance with the Scope of Work specified in this Request for Proposal (RFQ).

This Request for Proposal (RFQ) outlines the basic requirements for the services to be provided. This is a multi-term, multiple requirement contract. This type of contract is commonly referred to as an "open ended" contract. **Study this information and prepare questions for the pre-proposal conference.** Pima County Community College District Facilities Operations & Construction will be the Architect's client and will coordinate the professional services required of the Architect.

PROFESSIONAL SERVICES

1. The College contract for architectural services is included in this RFQ.

2. Professional services will include the customary services provided as part of Architectural services, including the necessary engineering Consultants.

3. Examples of the type of work to be expected include: Remodeling limited areas of existing buildings, minor additions and correcting Building Code deficiencies.

4. Services may also include the analysis of existing systems, buildings, and recommendations on solutions to system or building deficiencies and professional advice to College staff.

5. In addition, services will be based on the following:
   a) The services outlined in the Pima Community College Facilities Guidelines. The Guidelines will be referenced in the contract between the Architect and the College,

The above documents describe how the College manages the facilities development process internally. Copies of these documents are attached. The contract and the above documents describe a scope of services that includes those traditionally termed "basic services" and services traditionally termed "additional services".

2. Entity Submitting RFQ. The terms “vendor”, “proposer”, “offerer”, “firm”, “consultant”, “company” or “contractor” used in this RFQ or any subsequent documents or communications related to this RFQ are interchangeable and mean the entity submitting a proposal and seeking to enter into a contract for the goods and/or services requested in this RFQ.

3. Description of Pima County Community College District
Pima County Community College District, located in Tucson, Arizona, is one of the ten largest multi-campus, multi-site Community Colleges in the United States. The College is a two-year institution offering both occupational and traditional college courses, and awards many different degrees and certificates. The College’s comprehensive curriculum includes credit courses, workforce development programs (Center for Training and Development), adult education special programs
(GED), as well as corporate and community based non-credit instruction. Students attend classes at six major campuses including the Community Campus, which itself holds classes at over 70 locations in Southern Arizona. The College employs more than 1,400 regular employees, approximately 1,500 adjunct faculty and 500 part-time personnel. More than 70,000 students attend credit and non-credit classes annually. The population for the Tucson metro area is over 1 million people. The College is accredited by the Higher Learning Commission of the North Central Association of Colleges and Schools. The College is an equal opportunity, affirmative action employer and an educational institution committed to excellence through diversity. The College strives to create an environment of equal access to services and facilities for all individuals.
Section 2
Scope of Work
Project Submittal

General Outline:

1. Project Scope
   Pima County Community College District is seeking proposals from qualified architectural firms interested in providing services to the District on an as needed basis. This contract award is for one (1) year from date of award with four (4) additional one (1) year renewals upon mutual agreement. The District expects to award to multiple firms.

2. Proposal Copies
   The firm must submit one (1) original copy of the proposal, clearly marked “Original”. In addition, the firm must submit one (1) digital PDF copy of the proposal on media suitable for copying and distributing electronically.

3. Exceptions Requested
   Any exceptions to the requirements of this RFQ that the firm requests the College to consider must be placed in this section. Each alternate or exception should be addressed separately with specific reference to the requirement. If there are no proposed alternates or exceptions, a statement to that effect must be included in this section of the proposal. Any exceptions requested from the Contract Documents must also be included in this section. Exceptions that are not requested as part of the bid shall not be considered. Any proposed additional or alternate terms and conditions, contracts, waivers, licenses or agreements required by the firm should be included here with a brief explanatory introduction.

4. PROPRIETARY INFORMATION
   In the event any proposer shall include in the proposal any information deemed "proprietary" or "protected," such information shall be separately packaged from the balance of the proposal and clearly marked as to any proprietary claim. The College discourages the submission of such information and undertakes to provide no more than reasonable efforts to protect the proprietary nature of such information. The College, as a public entity, cannot and does not warrant that proprietary information will not be disclosed. The College shall have the right to use any and all information included in the proposals submitted unless the information is expressly restricted by the proposer.
Section 3
Criteria for Architect Selection

A. GENERAL INFORMATION

1. Selection of the Architect will be at the discretion of Pima Community College. The College reserves the right to reject any or all proposals. Following the proposal evaluation and ranking of the proposals, the College may, at its discretion, interview the top ranking firms. The College will select at least three firms and no more than five for this contract. The College reserves the right to interview finalists. If interviews are conducted the College will interview at least three firms and no more than five.

2. This solicitation does not commit Pima Community College to pay any costs incurred in the preparation, presentation or return of submittals including interview time, or to select any Architect who responds.

3. Each proposer, in submitting a proposal is deemed to have waived any claims for damage by reason of the selection of another proposal and/or the rejection of his/her proposal.

4. Each proposer, unless otherwise noted in their response, has reviewed the contract and agrees to the terms.

B. PROPOSAL FORMAT

The following criteria will form the basis for selection of an Architect for this project:

The proposal must adhere to the following order and response length. A "page" is limited to one side of an 8-1/2 by 11 inch sheet of paper:

Optional (2 pages maximum, this item is not scored):

Cover letter addressed to Jan Posz, C.P.M. Sr. Buyer; Table of Contents.

Note: the above information does not substitute for providing complete information in sections 1 through 12 below.

1. Firm Experience (four pages maximum, ten points)

Summarize experience of the firm with projects of similar type and scope for which the firm is the firm of record. Similar projects include other multi-term contract work; multiple contracts with the same owner for projects of similar scope to the potential College projects; and/or a successful history of similar scope projects.

Definitions:
Project Type: new construction, addition, renovation, etc.
Project Budget: the cost of construction of the project.
Project Manager: the person responsible to the client for the overall success of the project.
Project Architect: the person responsible for coordinating the day to day work of the project design team, construction document preparation and construction administration.
Project Designer: the person responsible for the design concepts.
Project Engineer(s): the person(s) responsible for the design, construction, document preparation and construction administration of specialized parts of the project.

Project Role: the role within the design team: Project Manager, Project Architect, Project Designer, etc. If the scope of project was small and one individual did more than one job, just list the individual once.

Use the following format for each project:

Project Name, Owner or Client
Project Type, Size (s.f.), Project Budget, Date of Completion
Project Manager, Project Architect, Project Designer
Project Engineers and other Consultants

Narrative on the project: describe how the project is similar and why your experience is relevant to this project.

2. Project Architectural Team (three pages maximum, ten points)

Provide the name of the project manager(s) project architect(s), and project designer(s) who will be assigned to this contract. Describe their responsibility on these projects. Provide the names of other key members of your project team. Provide the relevant project experience of each person.

Use the following format for each person:

Person's Name, Project Role
Education, Registration, Years employed with this firm
Years of experience as "project role" (same as role for this project)

Narrative description of the person's project responsibility. Describe his/her project role as structured within your firm and within this particular project team.

For examples of each person's relevant experience use the following format:

Project Name, Owner or Client
Project Type, Size (s.f.), Project Budget, Date of Completion
Project Role (Manager, Project Architect, etc.)

Narrative on the project: describe how the project is similar and why the person's experience is relevant to this project.

For projects that are the same as in Section 1, provide the "Project name" only and say "refer to Section 1", and provide the person's project role. For personal experience, that is experience with another firm, put a double asterisk (**) after the project name.

3. Engineer/Consultant Team (two pages maximum, ten points)

Provide the name of each project engineer and Consultant who you anticipate you will use during the term of this contract. You may include more than one engineer for each discipline if you wish.

Use the following format for each person:

Person's Name, Project Role
Education, Registration
Years of experience as "project role" (same as role for this project)
Firm Name, Years employed with firm
Narrative description of the person's project responsibility. Describe his/her project role as structured within his/her firm and within this particular project team.

4. Design Methodology/Examples (three pages design / five pages examples ten points)

Explain the firm's design methodology and approach to understanding the College's goals and needs. Focus on how you will interact with the user groups. How will the requirements of the academic Facility Specifications be developed into an architectural solution and tracked throughout the process. What are the aesthetic opportunities and challenges you perceive in these projects? Use no more than two pages for the narrative.

Provide examples via reproduction of drawings, color copies of photos or other means of your past work which you feel best expresses the firm's aesthetic capabilities as it relates to this project.

5. Assumptions and Owner Responsibilities (one page, ten points)

Provide a discussion of your assumptions that you made in your design methodology proposal. Provide a discussion of the owner's responsibilities in your design methodology proposal.

6. Project History (three pages maximum, ten points)

Establish the experience and record of the project team. For each project listed in Section 1, and for significant relevant projects listed in Sections 2 and 3, provide the following information about each project:

a. Based on the client's educational specifications and the architectural program, does the client perceive the project as meeting all the stated goals?

b. How did your estimates at the various project phases track with the client's budget and the accepted bid? Does the client perceive the project as being completed within budget?

c. What percentage of the low bid was the final total cost of non-client requested change orders? Does the client perceive that the project had few change orders?

d. How does the actual design and construction schedule compare to the client's initial project schedule? Does the client perceive the project as being completed on time?

7. Quality Control and Schedule Control Procedures (two pages maximum, ten points)

a. Describe the methods used by the firm to check the quality and completeness of the firm's construction documents, such as coordination checklists and coordination review meetings. Also describe on-going processes, such as TQM, used by the firm to improve its level of service.

b. Describe the methods used by the firm to maintain the project schedule both during design and during construction administration.

8. Firm Size and Work Load (one page maximum, five points)

List the firm's total number of staff and their responsibilities (e.g. 2 project managers, 3 project architects, and 5 drafters). Where staff regularly perform multiple tasks, include them in the most responsible position for which they spend at least 25% of their time.
9. **Schedule** (one page maximum, five points)

Describe your process for managing your office workload and integrating new projects. How long do you anticipate between your first notification of a project and when you will be able to start work?

10. **Contract Service** (one page, five points)

Does the firm have a local presence?

If not, how will the firm provide the contracted services? Discuss in detail the firm's management and operating strategy. Per the Pima Community College Facilities Guideline, Part I, Section 3.3, the cost of travel and long distance service by out of town Consultants or sub-Consultants to perform basic services of the contract shall be included in the basic service fee.

11. **References** (one page, five points)

Provide at least four Owner/User references on projects listed in Section 1 and/or significant projects listed in Section 2. **Only** provide references for projects listed in Sections 1 and/or 2. References will be checked for short-listed firms. Provide all of the following information for each reference:

<table>
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<tr>
<th>Owner</th>
<th>Project Name</th>
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<tr>
<td>Owner's Academic Rep Name, Title (President, Dean, Department Chair, etc.)</td>
<td>Contractor's Name</td>
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<tr>
<td>Rep's Current Address</td>
<td>Contractor's Project Manager</td>
</tr>
<tr>
<td>Rep's Current Phone Number</td>
<td>P.M.’s Current Address</td>
</tr>
<tr>
<td>Owner’s Facility Rep Name, Title (Director of Operations or Facilities Planning, etc.)</td>
<td>P.M.’s Current Phone Number</td>
</tr>
<tr>
<td>Rep's Current Address</td>
<td>Construction Manager (if applicable)</td>
</tr>
<tr>
<td>Rep's Current Phone Number</td>
<td>CM Project Manager (if applicable)</td>
</tr>
</tbody>
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*The points for references will be awarded on an all-or-nothing basis for correctly providing references. The evaluation of the information provided by the reference will be part of the overall evaluation performed after the interviews with the short-listed firms.*

Appendices may be attached as back up information; **primary information must be included in 1 - 11 above.** 254 & 255 forms are **not** required.
Section 4
Contract Development

GENERAL

1. Upon execution of the contract, a copy of this RFQ will be attached to the contract and all conditions of this RFQ will become conditions of the contract unless specific conditions of the RFQ are deleted by other terms of the contract. This contract will remain on file for the term of the contract.

2. The initial term of this contract will be from one year from date of award. Upon mutual agreement, the contract may be extended for up to four additional one year terms. The total maximum term is five years.

3. Individual project construction budgets will not exceed $5,000,000.

4. A separate fee will be negotiated with the Architect for each individual project. Upon acceptance of the fee by the College, the College will issue a purchase order that references the contract on file.

5. The College recognizes that over the term of the contract, members of the project team listed in the Architect's proposal may change. The architect will provide information similar to the original information in the RFQ substantiating a similar level of knowledge and ability for replacement team members.

6. Once a fee per #4 above has been negotiated and accepted, members of the project team for that project may not be removed from the project team without the written consent of the College.

FINANCIAL STABILITY: If requested, prior to contract negotiation and award, furnish appropriate documentation to substantiate the financial stability of the firm to undertake this project.
Section 5
Project Scope

A. GENERAL INFORMATION: The information in this section is presented to allow the applicant to gauge the size and complexity of the projects. It does not represent a definitive program. Nor does it represent a guarantee of the amount of work.

B. LOCATION: The College has six campuses. The locations and site plans are available at:

http://www.pima.edu/maps/index.shtml

C. BUDGET: For the past several fiscal years Facilities Operations & Construction has managed a capital budget of between $4 and $6 million with 25 to 30 projects per year.

D. DESCRIPTION: Annually the College develops between 15 and 25 projects that require consulting architectural services.

E. SCHEDULE SUMMARY: Each separate project will have its own project schedule. The College will provide the Architect with a copy of the schedule during fee negotiations.
Section 6
Proposal Form

Date ____________________________

Proposal of ________________________________________________________________,
(Name)
a corporation organized and existing under the laws of the State of ________________; a
partnership consisting of ________________________________________; an individual trading as
_______________________________________________________________.
(Name)

Request for Proposal: ______________________________________
[provide title or brief description]

To: Pima County Community College District (“College”)

1. In compliance with your Request for Proposal No. __________, the undersigned hereby
offers to furnish the services designated in the RFQ, in strict accordance with the RFQ, upon written
notice of acceptance of this Proposal at any time within thirty (30) days after the date of opening of the
Proposals, and to execute the Contract in accordance with the Proposal as accepted within five (5) days
after the Contract is presented for signature.

2. The undersigned Proposer hereby acknowledges receipt of the following Addenda, if any:

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3. The undersigned Proposer understands that the College reserves the right to reject any or
all Proposals or to waive any formality or technicality, as determined by the College in its sole discretion,
in any Proposal in the interest of the College.

4. The undersigned Proposer hereby certifies and affirms that this Proposal is genuine and
not a sham or collusive, nor made in the interest or behalf of any person not herein named, and that the
undersigned Proposer has not directly or indirectly induced or solicited any other Proposer to put in a
sham bid, or any other person, firm, or corporation to refrain from bidding, and that the Proposer has not
in any manner sought by collusion to secure for itself an advantage over any other Proposer.

5. The undersigned certifies that to the best of his/her knowledge: (check only one)
(   ) There is no officer or employee of Pima Community College who has, or would have, or whose relative has, or would have, a substantial interest in any contract resulting from this request.

(   ) The names of any and all public officers or employees of Pima Community College who have, or would have, or whose relative has, or would have, a substantial interest in any contract resulting from this request, and the nature of the substantial interest, are included below or as an attachment to this Proposal.

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

6. The Proposer certifies, to the best of its knowledge and belief, that:

(i) The Proposer and/or any of its Principals or Owners:

(A) (check one) are ( ) or are not ( ) presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any governmental agency.

(B) (check one) have ( ) or have not ( ), within a three year period preceding this offer, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain or performing a public (federal, state or local) contract or subcontract; violation of federal or state antitrust statutes, rules or regulations relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion; or receiving stolen property; and

(C) (check one) are ( ) or are not ( ) presently indicted for, or otherwise criminally or civilly charged by a governmental entity with, commission of any other of the offenses enumerated in paragraph (i)(B) of this provision.

(ii) The Proposer (check one) has ( ) or has not ( ), within a three year period preceding this offer, had one or more contracts terminated for default by any governmental agency.

“Principals,” for the purposes of this Proposal, means officers, directors, owners, partners and persons having primary or substantial management or supervisory responsibilities within a business entity.
7. The certifications in paragraphs 4, 5 and 6 of this Proposal are material representations of fact upon which reliance will be placed when making an award. If it is later determined that the Proposer knowingly rendered an erroneous certification, in addition to other remedies available to the College, the College may terminate the contract resulting from this solicitation for default.

______________________________________
(Official Name of Firm)

______________________________
(Signature)

______________________________
(Print Name)

______________________________
(Title)

_______________________________________
(Complete Business Address)

_______________________________________
(Email Address)

_______________________________________
(Federal Taxpayer ID Number)

SEAL - If Bidder is a Corporation
AGREEMENT BETWEEN PIMA COUNTY COMMUNITY COLLEGE DISTRICT

AND

(insert vendor name)

This Agreement made and entered into on the _____ day of ___________, 20___, by and between Pima County Community College District hereinafter referred to as "District" or "College" and ________________ hereafter referred to as the "Vendor."

The District and the Vendor agree as follows:

FIRST: The Vendor agrees to perform the professional, technical and/or management services hereinafter set forth when, and as assigned by the District, and

SECOND: The District agrees to pay the Vendor a fee, together with such other payments and reimbursements as are hereinafter provided.

ARTICLE 1: VENDOR ‘S SERVICES
The Vendor agrees to provide professional services and consultation to assist the District in __________________________ as outlined in the scope of work covered in Attachment A of this Agreement which is hereby referenced and incorporated as an integral part of this Agreement. All work performed under the Agreement must have prior approval of the District.

ARTICLE 2: FEE STRUCTURE
The fee structure for the work conducted under this Agreement will be in accordance with Attachment B of this Agreement which is hereby referenced and incorporated as an integral part of this Agreement.

ARTICLE 3: METHOD OF PAYMENT
Payments to the Vendor will be made monthly upon the presentation and approval of the Vendor's invoice. Each such invoice shall be documented in such detail and demonstrate such progress on each portion of the work as the District may reasonably require.

ARTICLE 4: INDEMNIFICATION
To the fullest extent permitted by law, the Vendor shall defend, indemnify and hold harmless the District, its agents, representatives, officers, directors, officials and employees, from and against all claims, damages, losses and expenses (including, but not limited to, attorneys’ fees, court costs and the cost of appellate proceedings) relating to, arising out of, or alleged to have resulted from the acts, errors, mistakes, omissions, work or services of the Vendor, its employees, agents or any tier of subcontractors in the performance of the Agreement. Vendor’s duty to defend, hold harmless and indemnify the District, its agents, representatives, officers, directors, officials and employees, shall arise in connection with any claim, damage, loss or expense that is attributable to bodily injury, sickness, disease, death or injury to, impairment or destruction of property, including loss of use resulting therefrom, caused by any acts,
errors, mistakes, omissions, work or services in the performance of the Agreement, including any employee of the Vendor or any tier of subcontractor or any other person for whose acts, errors, mistakes, omissions, work or services the Vendor be legally liable.

ARTICLE 5: EMPLOYEE RELATIONSHIP
The Vendor is an independent contractor and is not an employee, partner, legal representative, joint venturer or agent of the District. The District is not an employee, partner, legal representative, joint venturer or agent of the Vendor.

ARTICLE 6: CANCELLATION
This Agreement may be cancelled at any time, with or without cause, by the District giving seven (7) days written notice to the Vendor. In the event of such cancellation, the Vendor shall be paid for authorized services provided prior to the effective date of termination. In ascertaining the services actually rendered hereunder up to the date of the termination of this Agreement, consideration shall be given to both completed work and work in process of completion and to complete and incomplete reports and other documents whether delivered to the District or in the possession of the Vendor.

ARTICLE 7: OWNERSHIP OF DRAWINGS OR REPORTS
Services as represented on drawings, reports, memoranda, notes and drafts are the property of the District whether the work is completed or not and may be used by them in any fashion they see fit. Notwithstanding the foregoing, however, the Vendor reserves the right to use any studies, analyses or data prepared or collected during the course of this work for other purposes as seen fit, provided, however, that no such use shall allow the District to be identified without the consent of the District.

ARTICLE 8: PERSONAL SERVICES
It is agreed that the District is relying on the personal services of the Vendor and upon their technical ability and professional integrity. Such reliance is one of the chief considerations for the execution of this Agreement by the District. It is further understood and agreed that the Vendor shall not assign, sublet nor transfer his duties under this Agreement, nor shall this Agreement be assignable or transferable by operation of law or otherwise without the written consent of the District.

ARTICLE 9: CONFLICT OF INTEREST
The Vendor agrees to perform services exclusively for the District under this agreement, and expressly agrees not to undertake any conflicting duties to others, with or without compensation, which could in any way compromise that responsibility. The Vendor shall not disclose to others any confidential information gained from this relationship without the prior, written permission from the District, and the Vendor shall not seek to use their position, the information gained thereby, nor any other aspect of the project or relationship with others involved in it, for personal gain or other remuneration or benefit, beyond the compensation provided for herein.

ARTICLE 10: TERM OF AGREEMENT
The initial term of the contract shall be for one year from date of award. Four, one-year extensions of the contract may be effected by Purchase Order or an amendment to this Agreement approved by both parties.

ARTICLE 11: GOVERNING LAW
This Agreement is made in the State of Arizona and shall be subject to and governed by the laws of the State of Arizona. All questions concerning the validity, construction and administration of the Agreement shall be determined under Arizona law.
ARTICLE 12: SEVERABILITY
This Agreement shall be severable and to the extent that any part of the Agreement is unenforceable for any reason whatsoever, the remaining parts of this Agreement shall remain in full force and effect.

ARTICLE 13: NOTICES
All notices to either party shall be deemed to have been provided by depositing the same, postage pre-paid, with the United States Postal Service, addressed as follows:

District Representative:

Vendor Representative:

ARTICLE 14: ARBITRATION
If the parties are unable to resolve any disputes arising under the Agreement, those disputes shall be resolved through arbitration in accordance with A.R.S. '12-1501, et. seq.

ARTICLE 15: NON-DISCRIMINATION
The parties agree to comply with Arizona law prohibiting discrimination in employment by government contractors, to the extent applicable with this Agreement, along with other applicable non-discrimination laws and regulations.

ARTICLE 16: LACK OF SUFFICIENT FUNDING
This Agreement may be cancelled without any further obligation on the part of the College in the event that sufficient appropriated funding is unavailable to assure full performance of the Agreement terms. Vendor shall be notified in writing of any such non-appropriation at the earliest opportunity.

ARTICLE 17: INSURANCE
Vendor shall furnish insurance as required by Attachment C hereto, which is incorporated herein by this reference as though fully set forth herein.

ARTICLE 18. ADDITIONAL TERMS AND CONDITIONS
The parties shall comply with the Terms and Conditions attached hereto as Attachment D, which are incorporated herein by this reference as though fully set forth herein.

ARTICLE 19: CERTIFICATION
By signature below, the consultant certifies that it is not involved in collusion or other anti-competitive practices. The consultant has not given, offered to give, nor intends to give at any time hereafter any economic opportunity, future employment, gift, loan, gratuity, special discount, trip, favor, or service to a public servant in connection with the submitted proposal. Vendor certifies that no employee of the College, or college employee relative, has a substantial interest in any agreement subsequent to this document. Vendor also certifies it is not presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any governmental agency.
IN WITNESS WHEREOF, the Parties to this agreement have hereunto caused the same to be executed at Tucson, Arizona the day and year first above written.

Pima County Community College District: Vendor:

By: ____________________________ By: ____________________________
Print Name Above ____________________________ Above ____________________________

Title: ____________________________ Title: ____________________________
ATTACHMENT A
Non-collusion Affidavit
AFFIDAVIT BY CONTRACTOR
CERTIFYING THAT THERE WAS NO
COLLUSION IN BIDDING
FOR CONTRACT

STATE OF:  
COUNTY OF:  ss

(Name of Individual)

being first duly sworn upon oath deposes and says:

That he is (Title)
of (Name of Company, Firm, or Corporation)

that, pursuant to Subsection 112(c) of Title 23, United States Code and Title 44, Chapter 10, Article 1, and Title 34, Chapter 2, Article 4 of the Arizona Revised Statutes, he certifies that neither he nor anyone associated with the company, firm, or corporation mentioned above has, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of full competitive bidding in connection with the associated project:

Subscribed and sworn to before me _____________________________
this _______ day of _______ 201__. (Signature)

My commission expires: _______          (Seal)

If by a Corporation

Notary Public
Attachment B

Indemnification and Insurance Requirements

Indemnification
To the fullest extent permitted by law, the contractor shall defend, indemnify and hold harmless the College, its agents, representatives, officers, directors, officials and employees from and against all claims, damages, losses and expenses (including but not limited to attorney fees, court costs, and the cost of appellate proceedings), relating to, arising out of, or alleged to have resulted from the acts, errors, mistakes, omissions, work or services of the contractor, its employees, agents, or any tier of subcontractors in the performance of the contract. The contractor's duty to defend, hold harmless and indemnify the College, its agents, representatives, officers, directors, officials and employees shall arise in connection with any claim, damage, loss or expense that is attributable to bodily injury, sickness, disease, death, or injury to, impairment, or destruction of property including loss of use resulting there from, caused by any acts, errors, mistakes, omissions, work or services in the performance of this contract including any employee of the contractor or any tier of subcontractor or any other person for whose acts, errors, mistakes, omissions, work or services the contractor be legally liable. The amount and type of insurance coverage requirements set forth herein will in no way be construed as limiting the scope of the indemnity in this paragraph.

The contractor shall hold the District, its officers and employees, harmless from liability of any nature or kind on account of use of any copyrighted or non-copyrighted composition, secret process, patented or unpatented invention, article or appliance furnished or used under this request.

Insurance Requirements

The Consultant, at Consultant's own expense, shall purchase and maintain the herein stipulated minimum insurance with companies duly licensed to do business in the State of Arizona with policies and forms satisfactory to the College and possessing a current A.M. Best, Inc. Rating of B++6.

All insurance required herein shall be maintained in full force and effect until all work required to be performed under the terms of the agreement is satisfactorily completed and formally accepted; failure to do so may, at the sole direction of the College, constitute a material breach of the agreement.

The Consultant's insurance shall be primary insurance, and any insurance or self-insurance maintained by the College shall not contribute to it.

Any failure to comply with the claim reporting provisions of the policies or any breach of an insurance policy warranty shall not affect coverage afforded under the policy to protect the College.

All policies, except Workers' Compensation, shall contain a waiver of transfer rights of recovery (subrogation) against the College, its agents, representatives, directors, officers, and employees for any claims arising out of the Consultant's work or service.
The insurance policies may provide coverage which contains deductibles or self-insured retentions. Such deductible and/or self-insured retentions shall not be applicable with respect to the coverage provided to the College under such policies. The Consultant shall be solely responsible for deductible and/or self-insured retention and the College, at its option, may require the Consultant to secure the payment of such deductible or self-insured retentions by a surety bond or an irrevocable and unconditional letter of credit.

The College reserves the right to request and to receive, within 10 working days, certified copies of any or all of the herein required insurance policies and/or endorsements. The College shall not be obligated, however, to review same or to advise Consultant of any deficiencies in such policies and endorsements, and such receipt shall not relieve Consultant from, or be deemed a waiver of the College's right to insist on, strict fulfillment of Consultant's obligations under the agreement.

The insurance policies, except Workers' Compensation, required by the agreement shall name the College, its agents, representatives, officers, directors, officials, and employees as Additional Insureds.

**REQUIRED COVERAGE**

**General Liability**

Consultant shall maintain Commercial General Liability insurance with a limit of not less than $2,000,000 for each occurrence with a $2,000,000 Products and Completed Operations Aggregate and $2,000,000 General Aggregate Limit. The policies shall include coverage for bodily injury, broad form property damage, personal injury, products/completed operations and blanket contractual coverage including, but not limited to, the liability assumed under the indemnification provisions of the agreement, which coverage will be at least as broad as Insurance Service Office, Inc. Policy Form CG 000211093 or any replacement thereof. The coverage shall not exclude X, C, U.

Such policies shall contain a severability of interest provision, and shall not contain a sunset provision or commutation clause, or any provision that would serve to limit third party action over claims.

The Commercial General Liability additional insured endorsement shall be at least as broad as the Insurance Service Office, Inc's, Additional Insured, Form B CG20101185, and shall include coverage for Consultant's operations and products and completed operations.

**CERTIFICATES OF INSURANCE**

Prior to commencing Services under the agreement, Consultant shall furnish the College with Certificates of Insurance, or formal endorsements as required by the agreement, issued by Consultant’s insurer(s), as evidence that policies providing the required coverages, conditions and limits required by the agreement are in full force and effect.

In the event any insurance policy(ies) required by the agreement is(are) written on a “claims made” basis, coverage shall extend for two years past completion and acceptance of the Consultant's work or services and as evidenced by annual Certificates of Insurance.
If a policy does expire during the life of the agreement, a renewal certificate must be sent to the College thirty (30) days prior to the expiration date.

All Certificates of Insurance required by the agreement shall be identified with a bid serial number and title.

**CANCELLATION AND EXPIRATION NOTICE**

Insurance evidenced by these certificates shall not expire, be canceled, or materially changed without thirty (30) days prior written notice to the College.

**Automobile Liability**

Consultant shall maintain and cause any subcontractors to maintain Commercial/Business Automotive Liability insurance with a combined single limit for bodily injury and property damage of not less than $1,000,000 each occurrence with respect to the Consultant’s owned, hired, and non-owned vehicles assigned to or used in performance of the Consultant’s work. Coverage will be at least as broad as coverage code 1, “any auto”, (Insurance Service Office, Inc. Policy Form CA 00011293, or any replacements thereof). Such insurance shall include coverage for loading and off loading hazards. If hazardous substances, materials or wastes are to be transported, MCS 90 endorsement shall be included and $5,000,000 per accident limits for bodily injury and property damage shall apply.

**Professional Liability**

Professional liability insurance with minimum limits of $1,000,000 per occurrence and requiring notice to the College at least thirty (30) days prior to cancellation or restriction of coverage. Coverage shall be afforded on a form acceptable to the College. Consultant shall maintain such professional liability insurance until at least three (3) years after completion of all services required under this agreement.

**Workers’ Compensation**

This Consultant shall carry Workers’ Compensation insurance to cover obligations imposed by federal and state statutes having jurisdiction of Consultant’s employees engaged in the performance of the work; and, Employer’s Liability insurance of not less than $2,000,000 for each accident, $1,000,000 disease for each employee, and $1,000,000 disease policy limit.

In case any work is subcontracted, the Consultant will require the Subcontractor to provide Workers’ Compensation and Employer’s Liability to at least the same extent as required of the Consultant.
Attachment C
Terms and Conditions

1. **Legal Remedies** – All claims and controversies shall be subject to the Pima County Community College Policy regarding Formal Protests and Appeals

2. **Agreement** – The Agreement shall contain the entire agreement between the College and the Consultant relating to this requirement and shall prevail over any and all previous agreements, contracts, proposals, negotiations, purchase orders or master agreement in any form.

3. **Agreement Amendments** – The Agreement shall be modified only by a written amendment signed by persons duly authorized to enter into agreements on behalf of the College and the Consultant.

4. **Provisions Required by Law** – Each and every provision of law and any clause required by law to be in the Agreement shall be read and enforced as though it were included herein, and if through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the application of either party the Agreement shall forthwith be physically amended to make such insertion or correction.

5. **Severability** – The provisions of the Agreement are severable to the extent that any provision or application held to be invalid shall not affect any other provision or application of the Agreement which may remain in effect without the invalid provision or application.

6. **Records** – Pursuant to provisions of title 35, chapter 1, article 6 A.R.S. §35-215 the Consultant shall retain, and shall contractually require each subcontractor to retain, all books, accounts, reports, files and other records relating to the acquisition and performance of the Agreement for a period of five (5) years after the completion of the Agreement. All such documents shall be subject to inspection and audit at reasonable times. Upon request, a legible copy of any or all such documents shall be produced at the offices of the Auditor General, the Attorney General or the College Purchasing Office.

7. **Advertising** – Contractor shall not advertise or publish information concerning the Agreement, without prior written consent of the College.

8. **Preparation of Specifications by Persons Other than College Personnel** – All specifications shall seek to promote overall economy for the purposes intended and encourage competition and not be unduly restrictive in satisfying the College’s needs. No person preparing specifications shall receive any direct or indirect benefit from the utilization of specifications, other than fees paid for the preparation of specifications.

9. **Americans With Disabilities Act** – The Consultant shall comply with all applicable provisions of the Americans With Disabilities Act and applicable federal regulations under the act.

10. **Conflict of Interest** – The College may, within three years after its execution, cancel the agreement without penalty or further obligation if any person significantly involved in negotiating, drafting, securing or obtaining the agreement for or on behalf of the College becomes an employee of or a consultant in any capacity to any other party to the agreement with reference to
the subject matter of the Agreement while the Agreement or any extension thereof is in effect or as otherwise provided by A.R.S. § 38-511..

11. Drug Free Workplace – The Consultant agrees that in the performance of the Agreement, neither the Consultant nor any employee of the Consultant shall engage in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance in conducting any activity covered in the Agreement. The College reserves the right to request a copy of the Consultant Drug Free Workplace Policy. The Consultant further agrees to insert a provision similar to this statement in all subcontracts for services required.

12. Equal Opportunity – The provisions of Section 202 of Executive Order 11246.41 C.F.R. Sec. -0- 1.4.41 Sec. 60-250.4 and 41 C.F.R. Sec. 60-741.4 are incorporated herein by reference and shall be applicable to the Agreement unless the Agreement is exempted under the rules, regulations or orders of the U.S. Secretary of Labor.

13. Federal, State and Local Taxes, Licenses and Permits – Consultant is solely responsible for complying with all laws, ordinances, and regulations on taxes, registrations, licenses and permits, as they may apply to any matter under this document. The Consultant must demonstrate that they are duly licensed by whatever regulatory body may so require during the performance of the Agreement. Prior to the commencement of Agreement, the Consultant shall be prepared to provide evidence of such licensing as may be requested by the College. Consultant shall, at no expense to the College, procure and keep in force during the entire period of the Agreement all such permits and licenses.

14. Gratuities – The College may, by written notice to the Consultant, cancel the agreement if it is found by the College that gratuities, in the form of entertainment, gifts or otherwise were offered or given by the Consultant or any agent or representative of the contractor, to any officer or employee of the College with a view toward securing an agreement or securing favorable treatment with respect to the performing of such agreement.

15. Liens – Each Consultant shall keep the College free and clear from all liens asserted by any person or entity for any reason arising out of the furnishing of services or materials by or to the Consultant.

16. Sales and Use Tax – The College is not exempt from state sales and use tax.

17. Sexual Harassment – Federal law and the policies of the College prohibit sexual harassment of College employees or students. Sexual harassment includes any unwelcome sexual advance toward a College employee or student, any request to a sexual favor from a College employee or student, or any other verbal or physical conduct of a sexual nature that is so severe or pervasive as to create a hostile or offensive working or educational environment for College employees or students. Consultant, subcontractors and suppliers for this project are required to exercise control over their employees so as to prohibit acts of sexual harassment of College employees and students. The employer of any person whom the College, in its reasonable judgment, determines has committed an act of sexual harassment agrees as a term and condition of the Agreement to cause such person to be removed from the project site and from College premises and to take such other action as may be reasonably necessary to cause the sexual harassment to cease.
18. **Smoking** – To comply with the Smoke Free Arizona Act and to promote public health on College property, the College limits smoking, e-cigarette, and tobacco product use on its property to designated outside areas only, in conformity with the requirements of A.R.S. §36-601.01 and related County Code provisions and City ordinances. The Consultant is required to comply with this smoke free policy.

19. **Confidentiality** – The parties shall comply with 20 USC Section 1232(g), the Buckley Amendment to the Family Educational Right and Privacy Act of 1974. Therefore, Contractor shall not be entitled to receive Employee or Student information directly from the College, other than public information available in any College directory which is not protected by federal or state privacy or confidentiality statutes or regulations. Contractor may solicit Employee and Student information directly from Employees and Students subject to prior disclosures by Contractor of all intended uses of such information. Regardless of the Employee or Student personal information, even if such information is publicly available via directories, Contractor shall under no circumstances sell, duplicate, market, or give to any person or persons, entities or other companies a list or other personal information of any or all Employees or Students. All Employee and Student identities and personal information shall remain confidential. Disclosure by Contractor occurring without the express prior written consent of the Employee or Student shall result in the immediate termination of this agreement.

20. **Assignment-Delegation** – No right or interest in the Agreement shall be assigned or delegated by Consultant without the prior written permission of the College. Any attempted assignment or delegation by Consultant shall be wholly void and totally ineffective for all purposes unless made in conformity with this paragraph.

21. **Force Majeure** – Neither party shall be liable in damages of have the right to terminate this Agreement for any delay or default in performing under the Agreement if such delay or default is caused by conditions beyond its reasonable control including, but not limited to wars, insurrections, fires, floods, governmental restrictions and/or any other cause beyond the reasonable control of the party whose performance is affected.

22. **Intellectual Property Rights** – It is understood and agreed that ownership of intellectual property developed as a result of fulfilling the requirements of this Agreement belongs solely and exclusively to the College. Documents provided in connection with the Agreement belong to the College and are being used with permission. Intellectual property, as used herein, means all forms of legally protectable intellectual property, including copyrights, trademarks, inventions, patent applications, patents and mask works, drawings and/or blueprints. It is also understood and agreed that any intellectual property created as a result of Consultant’s performance of this Agreement is considered a work for hire under the U.S. copyright laws and as such, the College will own the copyright.

23. **Laws and Regulations** – Consultants are solely responsible for keeping themselves fully informed of and faithfully observing all laws, ordinances, and regulations affecting the rights of their employees, and shall protect and indemnify the College, its officers and agents against any claims of liability arising from or based on any violation thereof.

24. **Payment Terms** – Payments by the College shall be subject to the provision of Title 35 of Arizona Revised Statutes, relating to time and manner of submission of claims. The College’s
obligation is payable only and solely from funds appropriated for the purpose of the Agreement. Unless otherwise stated herein, the payment terms for the Agreement are Net 30 days.

25. **Price Adjustment** – Price changes will normally only be considered at the end of one Agreement period and the beginning of another. Price change requests shall be in writing, submitted at least sixty (60) days prior to the end of the current Agreement period, and shall be supported by written evidence of increased costs to the Consultant. The College will not approve unsupported price increases that will merely increase the gross profitability of Consultant at the expense of the College. Price change requests shall be a factor in the Agreement extension review process. The College shall, in its sole opinion, determine whether the requested price increase or an alternate option is in the best interest of the College.

26. **Prior Course of Dealings** – No trade usage, prior course of dealing, or course of performance under other agreements shall be a part of this Agreement resulting from this RFQ, nor shall such trade usage, prior course of dealing or course of performance be used in the interpretation or construction of such resulting agreement.

27. **Right to Offset** – The College shall be entitled to offset against any sums due the Consultant, any expenses or costs incurred by the College, or damages assessed by the College concerning the Consultant’s non-conforming performance or failure to perform the Agreement, or any other debt owing the College.

28. **Insolvency** – The College shall have the right to terminate the Agreement at any time in the event Consultant files a petition in bankruptcy; or is adjudicated bankrupt; or if a petition in bankruptcy is filed against Consultant and not discharged within thirty (30) days; or if Consultant becomes insolvent or makes an assignment for the benefit of its creditors or an arrangement pursuant to any bankruptcy law; or if a receiver is appointed for Consultant or its business.

29. **Lack of Funding** – The Agreement may be canceled without further obligation on the part of the College in the event that sufficient appropriated funding is unavailable to assure full performance of the terms. The Consultant shall be notified in writing of such non-appropriation as soon as reasonably possible. No penalty shall accrue to the College in the event this cancellation provision is exercised. This cancellation provision shall not be construed so as to permit the College to terminate the Agreement in order to acquire similar equipment, material, supplies or services from another party.

30. **Stop Work Order** – The College may at any time, by written order to the Consultant, require the Consultant to stop all or any part of the work called for by the Agreement for a period of up to ninety (90) days after the order is delivered to the Consultant, and for any further period to which the parties may agree. The order shall be specifically identified as the Stop Work Order issued under this provision. Upon receipt of the order, the Consultant shall immediately comply with its terms and take all reasonable steps to minimize the incidence of costs allocable to the work covered by the order during the period of work stoppage. If a Stop Work Order issued under this provision is canceled or the period of the order or any extension expires, the Consultant shall resume work. The College shall make an equitable adjustment in the delivery schedule or Agreement price, or both, and the Agreement shall be amended in writing accordingly.

31. **Suspension or Debarment** – The College may by written notice to the Consultant immediately terminate the Agreement if the College determines that the Consultant has been debarred,
suspended, or otherwise lawfully prohibited from participating in any public procurement activity, including but not limited to, being disapproved as a subcontractor or Contractor of any public procurement unit or other governmental body.

32. Continuation of Performance Through Termination – The Consultant shall continue to perform, in accordance with the requirements of Agreement, up to the date of termination, as directed in the termination notice.

33. Federal Immigration Laws and Regulations – Consultant warrants that it complies with all Federal Immigration laws and regulations that relate to its employees and complies with A.R.S. § 23-214(a) and that it requires the same compliance of all subcontractors under the agreement. Consultant acknowledges that pursuant to A.R.S. § 41-4401 and effective September 30, 2008, a breach of this warranty is a material breach of the agreement subject to penalties up to and including termination of the agreement. The College retains the legal right to audit the records of the Consultant and inspect the papers of any employee who works for the Consultant to ensure compliance with this warranty and the Consultant shall assist in any such audit. The Consultant shall include the requirements of this paragraph in each contract with subcontractors under the agreement.

If the Consultant or subcontractor warrants that it has complied with the employment verification provisions prescribed by sections 274(a) and 274(b) of the Federal Immigration and Nationality Act and the E-verify requirements prescribed by A.R.S. § 23-214(A), The Consultant or subcontractor shall be deemed to be in compliance with this provision. The College may request proof of such compliance at any time during the term of the Agreement by the Consultant and any subcontractor.

34. Extended Contract
The College is an active member of the Strategic Alliance for Volume Expenditures (S.A.V.E.) Cooperative agreement. Under this Cooperative Purchasing Agreement, and with the concurrence of the successful Proposer, other members of this organization may access any subsequent agreement/contract resulting from this solicitation. If the Proposer does not want to grant such access, it must be stated in their Proposal. In the absence of a statement to the contrary, the college will assume that access is granted by the Proposer to any subsequent agreement/contract.
Pima County Community College

Facilities Guidelines

Prepared By:
Facilities Planning Department,
Administrative Services and Facilities

September, 1996

Revised November 1997
Revised December 2000

Affirmative Action/Equal Opportunity College
Reasonable accommodations, including materials in alternative format will be made for individuals with
disabilities when a minimum of five working days advance notice is given. For the general public, please
contact the PCC information line at 206-4500 (TTY 206-4530); for PCC students, contact the appropriate
campus Disabled Student Resources Office

The College has a policy against sexual harassment in the work place.
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Introduction

This Facilities Guidelines (FG) document is a summary of procedures and standards for the construction, remodeling or alteration of Pima Community College facilities and infrastructure. It is intended to direct consultants, facilitate coordination and improve communication among the design team(s) and all College departments involved in the design and construction phases of facilities.

The FG document consists of guidelines and general specifications. The guidelines provide insight to the College's operation and maintenance objectives and their implication upon facilities design. The specifications provide direction regarding materials, systems and equipment preferred by the College. It should be noted that the appropriateness of all systems equipment and materials specifications is still the responsibility of the consultant.

These guidelines provide consultants with information such as general administration and design considerations, performance criteria, materials and equipment specifications, acceptable manufacturers, installation and testing procedures, etc. It must be underscored that these are not "Guide or Boilerplate Specifications" and are not intended to substitute for standard project specifications. Also, these guidelines do not address every aspect of design considerations; those are the responsibility of the consultant subject to the College's review and approval process outlined herein.

The consultant has the obligation to request variances whenever the exercise of professional judgement or regulatory implications would lead to a conclusion different from the one(s) outlined or suggested herein. All proposed variations and deviations from these guidelines must be approved in writing by the College's Facilities Planning Project Manager and/or the Job Coordinator before incorporation into the project.

The procedures and standards change from time to time as new methods and procedures are implemented. Each consultant is responsible for determining the appropriateness of any revisions to the project for which he is retained.
Section 1.1 *College Organization*
1.2 Facilities Planning Mission and Responsibilities

1.2.1 Mission

In support of the College mission, Facilities Planning provides professional expertise to other units within the College. These other units are Facilities Planning's customers. Facilities Planning will support its customers by:

- Assisting them in analyzing their facility needs,
- Planning and managing the implementation of their facility projects,
- Ensuring the long term value of the facilities, and
- Monitoring the compliance of the facilities with applicable laws and regulations.

1.2.2 Facilities Planning Responsibility/Project Manager's Role.

Facilities Planning is charged with managing the project so that the customers' (Pima Community College user groups) requirements are met, within budget and on time. The Facilities Planning Project Manager is the design and construction team leader and functions as the single-point contact with the Design Consultant's team. As team leader, the Project Manager assists the customer in stating the project requirements. The Project Manager monitors the team's progress for budget and schedule compliance.

1.2.3 Job Coordinator.

The project's Job Coordinator is the Operations and Maintenance staff person assigned to communicate project operations and maintenance requirements to the Facilities Project Manager. The Job Coordinator approves the Design Consultant team's solutions to maintenance requirements as specified in PART II of these Facilities Guidelines. The Job Coordinator has authority to make decisions relating to the operations and maintenance facility solutions.

1.3 Consulting Architects' and Engineers' Role(s)

The consultants' relationship to the College is through Facilities Planning. Facilities Planning is the consultants' contractual client. However, Facilities Planning and the Consultants have the mutual goal of meeting the customers' (users') requirements. The consultants are responsible for developing facilities solutions that meet the customers' requirements within budget and on schedule.

Section 2. Project Management

2.1 General Requirements

2.1.1 Revisions to the Facilities Guidelines

It is the intent of the College to maintain these Facilities Guidelines as a "living" document that represents current administrative procedures, design and construction practices and standards. To achieve this goal, the College has established a process by which these Guidelines can be revised and/or updated as the need arises.
Any user of this document may submit a proposal for revision. If the user is not a College employee (e.g., a consultant, supplier, etc) he may submit the revision proposal to the Project Manager assigned to the project or to the Facilities Planning Department in accordance with the requirements outlined below. Changes to PART II of this document must be made in consultation with the Operations and Maintenance Department Job Coordinator.

Any College employee may submit a proposal for revision or update of this document through his manager or supervisor for preliminary approval. The manager or supervisor will then forward the request to the Facilities Planning Department following these requirements:

The request for change or revision shall be in writing and contain the following information:

1. Reason for the proposed change or revision.
2. Proposed text of the change or revision including Division or Section number(s) as may apply.
3. Background information that may help evaluate the merit or significance of the proposed change.
4. Statement(s) of potential cost impact, whenever applicable.

Final review of the proposed change(s) or revision(s) will be done by the Director of Facilities Planning who will take one of the following actions:

- Approve as submitted
- Return to the originator for corrections and/or further study
- Rejection with an explanation

If approved, the change(s) and/or revision(s) will be incorporated in the Guidelines' subsequent edition and expedited as a revision or correction addendum. Any change(s), revision(s) or update(s) whose inclusion is essential or unique to a project may be recognized in writing as approved for that specific case.

2.1.2. Administrative Procedures

The design of Pima Community College facilities involves many individuals and groups within its community, each representing a particular interest in the project. Although these groups share similar goals, these representatives sometimes differ in their approaches for seeking solutions to specific problems. Examples include considerations of planning, financing, aesthetics, scheduling, operations, maintenance, etc.

During the evolution of a project, various departments within the College will review and approve the drawings and specifications. In order to maintain an effective flow of information to and from the Consultant's team, Pima Community College appoints a Project Manager from the Facilities Planning Department at the onset of the project. This individual is the administrative focus of all project development phases and the basic communication between the Consultant and the College shall be channeled through this person.

The Project Manager may authorize direct contact between the Consultant and other College departments on a case-by-case basis. In such cases, the Consultant shall brief the Project Manager about the full content and result of these contacts and provide written minutes of the meeting.
The Facilities Planning Project Manager is, therefore, the College's official representative and is authorized to act on behalf of the Owner (per AZ-B141-1992 4.4). Changes to instructions to the Consultant can only be made through written communication from the appointed Facilities Planning Project Manager.

The project communication procedure is summarized in the SPG Capital Projects Communication Chart. (At end of Part I.)

2.2 General Design Considerations

2.2.1 Design Approach and Objectives

It is recognized that the designer of any project is constantly faced with decisions regarding the selection of materials and methods to achieve an economical, aesthetically pleasing and well-functioning end product. While these objectives may be universally applicable on an industry-wide basis, there are several design objectives for Pima Community College projects to which the designer must devote special attention. These objectives are listed below and they must all be considered of equal importance.

A. Design Integration: Architectural design for Pima Community College facilities must respond to the environmental characteristics and unique opportunities which characterize the Southern Arizona region and the College as a whole. To this extent, all proposed designs must address and justify their aesthetic/stylistic integration into -- or departure from -- existing campus facilities.

B. Overall Economy: While Pima Community College constantly seeks ways of reducing its construction costs, the increasing sophistication of building systems often tends to obscure the fact that they require proportionately increased operation and/or maintenance costs. Because the lowest first cost does not necessarily mean lowest total cost, life-cycle cost analyses should be an important component of the design process.
C. Shearing Layers. The following diagram explains the concept of "shearing layers" of Site, Structure, Skin, Services, Space Plan and Stuff. These six "S"s provide a model for communicating the varying rates of change of different systems in a building. "Stuff" is constantly changing. The "Space Plan" is modified frequently. "Services" change less frequently than the "Space Plan". "Structure" does not change very much. Combining elements from different shearing layers reduces a building's adaptability. Consideration of appropriate separation of these shearing layers must be made during the design. [Brand, Stewart; How Buildings Learn: What Happens After they're Built, Viking/Penguin, New York/London, 1994].

D. Adaptability: "A building is not something you finish; it is something you start." (Brand, p.188). In design, this requires that the emphasis be placed on solid structure and accessible services; not on layers that change at a faster pace. Adaptability should not be confused with flexibility, which often adds undue expense. Because a "flexible" space may require "customization" such as collapsible walls, or "walker ducts" in a floor, less expensive "generic" spaces are most often appropriate unless a special requirement emerges in programming and/or the design process.

E. Learning Models. Because educational models have shifted to incorporate emerging technologies and alternative learning styles, designers need to pay careful attention to segments of the facilities specifications that outline distinctions from the old model's reliance primarily on "seat time" in lecture halls. While newer models rely on collaboration and self-paced computer learning, some instruction and learning will continue to be more traditional. The fact that many texts and journals are becoming available electronically will not eliminate the need for significant space allocated to book stacks and periodicals reading areas in Learning Resource Centers.

F. User-friendly Designs: Certain aspects of a campus or building should be more obvious to a lay person than others. Specifically, the campus "front door" should be obvious from the parking areas. The heart of the campus should be clearly developed and should foster spontaneous interaction. The overall design approach should be kept simple and avoid reliance on profuse signage to draw people into the building(s) that function as part of the campus entry.

G. Sensitivity to Cultural Diversity: The College's intent is to establish a built environment that helps stimulate and sustain appreciation of cultural diversity. The College Community recognizes that cultural, ethnic and religious minorities strengthen the College as a whole, and improve the learning process. Attention to vernacular design solutions can be one way to acknowledge cultural diversity. Such attention does not need to be literally applied. Many local structures integrate local vernacular design in different ways by providing shaded areas, semi-enclosed spaces and contained greenery.
H. Operations and Maintenance Specifications: PART II of this document provides technical guidelines for building materials, methods and performance against which projects will be evaluated. Designers are encouraged to make suggestions for alternative approaches to meet or improve upon these standards as may be justified by engineering factors, operational criteria, or cost. Among the operational factors to be considered in designing building systems are the following:

H.1. Functionality and cost considerations
H.2. Reliability and durability
H.3. Energy Conservation
H.4. Maintenance requirements minimization
H.5. Simplicity of operation and adequacy of control systems
H.6. Accessibility and serviceability of mechanical and electrical components
H.7. Availability of replacement parts.

I. Energy Conservation: Pima Community College, as a large user of energy in the operation of its facilities, is extremely conscious of the need to minimize its consumption of energy within the bounds of safe and functional requirements. In general, this requires a comprehensive, interdisciplinary approach to energy-efficient design. Examples include the use of native, drought-tolerant vegetation in landscaping, proper building orientation, adequate fenestration, appropriate design and performance of mechanical systems, etc. Refer to the State of Arizona Energy Conservation Standards for guidelines regarding the College Energy Conservation objectives.

J. Signage: Approval for all signage, whether interior or exterior, is the responsibility of Pima Community College Media Productions and Publications. All proposed signage must be reviewed and approved by the Director of Media Productions and Publications prior to their inclusion in the Contract Documents. The Design Consultant shall include exterior monument signage or signage attached to buildings in the Contract Documents.

2.2.2 Green Buildings

All new College buildings will, at a minimum, meet the LEED silver criteria. The College may establish higher level goals. All renovation projects will, at a minimum meet the LEED bronze criteria

2.2.3. Acoustical Privacy

These guidelines apply to all rooms requiring acoustic protection. The items to be considered as general design considerations are as follows:

A. All plumbing penetrations in walls must be caulked airtight using acoustical caulk.

B. Where recessed fixtures of any type are installed (e.g., medicine cabinets, fire extinguishers, electric panels, drinking fountains, bookcases, etc..) the Design Consultant must ensure that required acoustic wall construction extends behind these elements.

C. Installation of noise-generating equipment (such as telephones, drinking fountains, etc.) should be avoided on walls or rooms requiring acoustic protection.

D. Use surface-mounted rather than recessed lighting fixtures and fans at ceilings of rooms requiring acoustical protection in order to minimize sound transference to adjacent spaces.
E. Locate doors to rooms requiring acoustical protection so that neighboring rooms do not have directly adjoining doors, and in such a manner that doors on opposite sides of corridors do not face each other. In cases where acoustical isolation is imperative at each side of corridors, all doors should be staggered.

F. Avoid placing doors to rooms requiring acoustical isolation opposite to stairwells, elevator lobbies or bathroom doors.

G. Whenever possible, the gap at the bottom of all doors should not exceed 1/2".

H. Do not locate toilets (public or private) or lounges directly over rooms requiring acoustical protection, especially rooms having non-carpeted flooring.

I. Separate studs, with a structural in-wall air gap, must isolate the jambs of all heavily-used corridor doors from any adjacent rooms requiring acoustical isolation.

J. Mechanical equipment in spaces above, beside, or below rooms requiring acoustical isolation must be vibration isolated, including piping and conduits, from walls, floors and ceilings.

2.2.4. Building Configuration

Minimize the ratio of surface area of walls and roofing to gross building area in order to reduce heat loss and/or heat gain within reasonable design considerations.

2.2.5. Glazing and Infiltration

Use appropriate glazing systems to minimize heat gain and reflected glare to adjacent buildings or public areas.

The use of projections and roof overhangs is recommended over windows in sunny locations and especially in south and west orientations. The length of the projection shall be calculated to maximize solar gain in winter and shading during the summer. This function may also be achieved by using horizontal shutters, fixed awnings or other architectural devices.

Use operable windows wherever possible.

All exterior doors and operable windows shall be weatherstripped, including door thresholds.

2.2.6. Environmental Issues

There may be environmental issues which must be addressed in the early planning stages of a project and for this purposes, risk management and campus safety requirements must be considered. Of the greatest concern are environmental regulations imposed at the local, state and federal levels pertaining to air and water quality mandating that considerations be given to atmospheric emissions and discharges to storm and/or sanitary systems, as well as the handling of solid and hazardous substances, including their disposal.

2.2.7. Custodial Closets.
One custodial closet must be provided for every ten thousand (10,000) Net Assignable Square Feet (NASF) of floor area. In multistory buildings, provide one custodial closet per floor, minimum. In large floor plates, custodial closets shall not be placed any farther than three hundred feet (300') from each other. For all new construction, including remodelings and additions, verify any and all particular requirements for custodial closets requirements with the College’s Environmental Services Coordinator and the Facilities Planning Project Manager.

Ideally, custodial closets should be located near elevators, toilets, or centralized among the areas they will service. Do not locate custodial closets on stair landings. Avoid entrances to custodial closets through restrooms, mechanical rooms or similar intermediate spaces and vice versa.

The typical custodial closet floor area needs to be a minimum of sixty to seventy (60-70) square feet (approximate dimensions = 8’ x 8’) with preferably high ceilings. Minimum size is eighty (80) square feet if water heater is included. Do not locate components of any telecommunications, electrical or mechanical systems in custodial closets. Specifically, the following shall not be located inside custodial closets:

- Desks
- Telephone Panels
- Electrical Panels
- Circulation Pumps
- Mechanical Equipment
- Roof hatches/access panels.

A large capacity floor sink with hot and cold running water and a floor drain must be provided in each custodial closet. Sinks are best located near the door and should be positioned so cleaning machines and equipment can be maneuvered easily and emptied in the sink prior to being refilled.

Provide doors that open outward. A three foot (3’) wide single door is adequate except in cases where the closet is wide and relatively shallow in depth. In those cases, double doors may be required.

Provide shelving on three walls for a minimum of fifteen linear feet (15’) with a minimum of fourteen inches (14”) clearance measured vertically between shelves. Mop hangers and racks for mops, hoses or brooms must also be provided.

At least two (2) electrical duplex outlets are required in each custodial closet. Occupancy sensor lighting control is desired, but not imperative. Lighting level design standard should be figured at 50-75 fc level maintained. When occupied, adequate ventilation and exhaust are essential; provide a minimum of fifteen (15) air changes per hour. Barring fire rating restrictions, the door must have a ventilation louver and a fire extinguisher must be placed immediately outside the door.

Floors should be either quarry tile, ceramic tile, or sealed concrete. Wall finishes should be ceramic tile or other impervious material up to forty eight inches (48") from the floor. Semigloss or gloss epoxy paint is the minimum finish requirement.

2.2.8. Loading/Unloading Areas
All new facilities shall be provided with off-street adequate loading and unloading areas. The Design Consultant shall verify with the Facilities Planning Project Manager if the loading/unloading zone requires full loading dock capabilities and to which extent these facilities must be accessible to specific vehicle sizes.

It is also noteworthy that many loading and unloading operations may require an indoor or outdoor staging area for packing, unpacking and/or temporary storage of materials. The Project Program shall list the space allocation for all loading and unloading facilities, and exterior staging areas and consider them at 50% of their total for square foot costs implications. All interior staging areas shall be counted at 100% for cost analyses implications.

2.2.9. Offices

Offices are to be designed following an "office suite" concept. That is, several offices are grouped within areas off central work areas or shared areas. This is to provide a sense of openness and welcome and to avoid opening office doors into fire-rated/exit corridors. Verify space allocation guidelines with the Facilities Planning Department for recommended office area(s).

2.2.10. Building Security

A. General

A.1. Security is always needed for people, building spaces and equipment. At a minimum, the campus police require a one-half inch (1/2") conduit installed at all exterior exit doors tied back to telephone or communications rooms for future connection to a security system. Limited access to labs, offices and main computer rooms are always a concern. Access may be by means of keys or magnetic card system(s). In some cases twenty-four (24) hour surveillance may be required.

A.2. Exiting at Night: Consider the experience of leaving the building at night. Provide an area that is well lighted, without "hidden areas."

A.3. Defensible Space: Consider irate students or staff and develop defensible spaces.

B. Security Levels. In general, there are three different levels of security in most campus facilities although in special cases a fourth level may be required.

B.1. Level One (1): Public and Semi-Public Spaces. This security level applies to public spaces with intense traffic and no clear ownership definition. Among the Public spaces are: lobbies, unrestricted public corridors, vestibules, classrooms, stairs, elevators, public restrooms, food service facilities, recreation rooms, parking facilities, etc. Examples of Semi-Public spaces are reception areas, seminar rooms libraries/resource centers, theaters, lecture halls, auditoriums, study areas and conference rooms.
The following security measures are recommended for public and semi-public spaces:

- Clearly defined hours of use.
- Well-lighted entries, lobbies and corridors.
- A view into the space(s) before entering.
- Doors lockable only by maintenance staff or Campus Police.
- Visibility from adjacent occupied spaces.
- Emergency telephones and TTY phones linked to campus police.
- Easily identifiable and accessible exit routes.
- Fire/smoke alarm system.

**B.2. Level Two (2): Private and Locked Semi-Public Spaces.** Locked doors may secure parts of a facility. In those areas, traffic flow is smaller and controlled and more valuable equipment and/or risk factors are involved. Examples of private spaces at this level include: faculty and staff offices, teaching labs, exercise facilities, health and safety areas, lecture halls preparation areas, projection booths, dark rooms, private toilets and baths, special collections areas, general museums and exhibit spaces, mail rooms, police and security areas, campus operation and maintenance spaces, building mechanical and electrical rooms.

In addition to the security measures recommended for Level One spaces, these areas should include the following:

- Secured doors with inside, vandal-proof, or pinned hinges and latch guard.
- Lockable windows.
- Controlled/programmable keying system or easily changeable locks.
- Non-lift sliding windows or doors (if used).

**B.3. Level Three (3): Secure Spaces.** Among these are the following: bookstore(s), libraries, computer areas, testing areas, high-value equipment holding spaces, special collection areas, high value exhibit spaces, supply rooms, computer mainframe rooms, special secured areas, confidential file rooms and vaults.

The security requirements for these spaces must be determined on a case-by-case basis, but as a general rule of thumb the following may be considered in addition to all the security features noted before:

- Motion sensors
- Intrusion alarm(s)
- Electronic surveillance
- Time clock access restrictions
- Security guard/patrol intervals
- Duress alarm
- Special ID detection/access systems
B.4. Exterior Security: The protection of people and vehicles at building exteriors is extremely important. Security at walkways, entries, loading and unloading areas, near ground floor windows and building indentations can be significantly enhanced by applying the same principles followed in the design of other public spaces. Exterior illumination should never be below one (1) footcandle and all plantings which may serve as a hideaway must be kept below three feet (3') in height or above six feet clear trunk with a clear visibility zone between them. Exterior lighting, landscaping, traffic visibility and personal safety all need to be coordinated. Exterior lighting should be controlled by automatic devices (preferably by photocell). Refer to exterior lighting standards in **PART II, Division 16, Section 16530 B.1.**

B.5. Public Telephones: Provide public telephones or direct lines to Campus Police at strategic locations throughout campus. Include a blue light on top of each phone booth.

B.6. All elevators shall have the capability to be key-operated after regular working hours.

C. Campus Police Office: The Campus Police security, fire alarm, and radio system must be provided with an uninterrupted power source (UPS).

### 2.3 Submission Requirements

**2.3.1. General Requirements**

A. Plans Review Process. The process by which schematic design, design development, construction documents and cost estimates are reviewed and approved is the College Plans Review Process. This occurs at or near the completion of each design phase and is handled through the Facilities Planning Project Manager who distributes plans and specifications to specific departments for review and comment. These comments are transmitted to the Design Consultant for consideration, response and discussion with the Project Team prior to incorporation. The review time required at each phase is approximately three (3) weeks, but it may vary depending on the project. The number of document sets to be submitted is stipulated in the Consultant's Agreement. The two (2)-week review period for each submittal must be accounted for and included as line items in all Consultant's proposed schedule(s).

At the end of each review period, the Facilities Planning Project Manager will issue a letter to the Consultant approving each phase of the work, confirming the budget, the schedule and status of any variance.

B. The review stages are identified as follows:

B.1. 100% Program Document (Drafts as per 2.3.1 C.1, below)

B.2. 100% Schematic Design.

B.3. 100% Design Development.

B.4. 50% Construction Documents

B.5. 100% Construction Documents. (Bid Documents reviewed during bidding)

The College Plans Review Process is used to verify that the project is being designed in accordance with these Guidelines and the Facility Specifications. Any and all deviations from this document must be explicitly outlined and approved by the College's Project Manager prior to the submittal and properly authorized before incorporation into the project. The
Design Consultant shall submit a written statement with each submission affirming that the drawings and specifications are in compliance with these Guidelines.

C. Presentation Formats

C.1 Reports. All written reports shall be submitted in standard 8.5" x 11" reproducible paper typed in a clearly legible font. Major sections or parts shall be tabbed or marked in such a way that they are easily referenced. An electronic copy of the document shall be provided for the College's use in a previously approved software format. The consultant must provide one (1) report draft for approval by the Facilities Planning Project Manager prior to completing and issuing the Final Report Document.

C.2. Drawings: All drawings must have the following minimum identification: Project Name as defined by the College, College's Project Number, Date (including revisions), and the drawing identification and number. All project drawings shall be on the same size and format. The maximum overall size shall not exceed 42" x 30". The Project Manager must approve all drawing(s) reductions.

C.2.1. CAD Submissions: The drawings shall be submitted in AutoCAD format on 3.5" disks. Layering shall be as per the Facilities Planning Department CAD layering guidelines (See Appendix A).

C.2.2. Lettering shall be neat, legible and easily reproducible.

C.2.3. A North arrow and necessary key plan(s) shall be placed adjacent to the title of each plan-related drawing. The North arrow shall be oriented to the top or to the right of the drawings. The key plan(s) orientation must correspond with the North arrow. The North arrow and key plan(s) placement and direction must be maintained consistently throughout the drawings.

C.2.4. Drawing scale(s): The drawing scale shall be clearly indicated on all drawings. Floor plans, building elevations and sections shall be drawn to 1/8" or 1/4" scale in the final Construction Documents. Scales of 1/16" or 1/32" may be used during Schematic Design, but shall be avoided elsewhere unless used for overall key plans or roof plans. Details and wall sections shall be drawn to scales no smaller than 3/8" and up to full scale as deemed most appropriate to convey the intent of the drawing.

C.2.5. Drawing Organization: Organize the drawings in a logical sequence that relates to the disciplines preparing the documents and to the normal sequence of construction. All drawings designation shall follow the series codes listed below:

   G Series: Project Title sheet, Location Plan(s), Code Data, General Notes, Symbols and Conventions.

   D Series: Demolition Drawings.

   C Series: Civil Drawings, Site Surveys, Control plans, Utility Plans.

   L Series: Landscaping and Irrigation Plans and Detail Drawings, Schedules, etc.

   A Series: Architectural Drawings.
S Series: Structural Drawings.


P Series: Plumbing Drawings.

FP Series: Fire Protection Drawings (if not included in the Plumbing Drawings).


On small projects, the demolition drawings (D Series) may be combined with the architectural drawings (A Series) and the HVAC; plumbing and fire protection (M, P and FP Series) may all be combined within the M Series. These combinations need to be approved by the College's Project Manager.

C.2.6. Abbreviations and Symbols: all abbreviations and symbols must be explained in a Symbols Legend in the G Series Drawings. These abbreviations and symbols must cover all disciplines involved in the development of the drawings, including any and all special consultants.

C.2.7. Building Codes Data: The Design Consultant shall provide a Code and Occupancy Plan as part of the Construction documents G Series, showing the results of the code review of the building. For new construction, a copy of the UBC Design and Plan Review Data Sheet may be included in the G Series Drawings. Every item that applies to the project must be filled as required. Non applicable items should be indicated by the designation "N/A," never leave an item blank. All area separation walls shall be shown. Occupancy calculations by area and space shall be noted with actual numbers, not by approximations such as "less than 100." Plans must indicate exit corridors, rated walls, area separations, and other pertinent information from the code review.


C.3.1. The Specifications shall be printed on standard 8.5" x 11" reproducible paper, bound on the left with a removable binder and printed on two sides. All pages shall be numbered at the center bottom of each page with the corresponding CSI section number-page number. The cover shall include the name of the project, the Pima Community College Logo and Project Number, the Consultant's name and address, date of first advertisement for bids and seal of the Consultant. Complex and/or elaborate graphics should be avoided. The Pima Community College Logo must be included on the cover of all documents.

C.3.2. Contents: Refer to PART II, Supplementary General Conditions and Operations and Maintenance Specifications for detailed requirements.

C.4. Auxiliary Materials: All sketches, overlays, catalog cuts, special details, videos, addenda, etc., must bear the Project Name, Pima Community College's Project Number, Date (including revisions) and appropriate drawing or sketch number.

D.1. All Program Documents must contain a Project Description section including introduction to and background of the project, scope definition and appropriate credits as required. Other sections must define the goals and objectives and detail the space requirements and physical needs of the facility. Existing conditions and functional adjacencies must be clearly documented. The floor area(s), net assignable and gross square feet definitions may be found in Appendix B, Building Area Calculations which is based on the Postsecondary Education Facilities Inventory and Classification Manual.

D.2. Existing Facilities Surveys must contain the following information as required: Photographs, Field Measurements, Detailed Review(s) of Existing Data, Analysis of Structural, Mechanical and Electrical Systems and Capabilities, and Review of Existing Drawings for Inaccuracies and Reuse.

D.3. Program draft submissions shall comply with 2.3.1 C.1. Verify the numbers of drafts and Final Program reports to be submitted in each case with the Facilities Planning Project Manager.

D.4. Any and all deviations or alternatives from the Program Document statements must be approved by the Facilities Planning Project Manager in writing before being considered and/or included in the Schematic Design Phase.

D.5. The Program Document Submissions will be evaluated against the following items:

- Design Objectives, limitations and criteria.
- Adaptability and Expandability.
- Space Requirements.
- Space Relationships.
- Number and Functional Responsibilities of Personnel.
- Special Equipment and Systems.
- Site Requirements.

E. 100% Schematic Design Submissions. The following information supplements the Standard Contract Form, Document B141 12.1, 12.2 and 12.3.

E.1. Minimum Submission Data: Graphic Submittals.

E.1.1. Title Page: the information listed below shall be shown.

- Type of Construction
- Occupancy Classification.
- Applicable Building Codes

E.1.2. All graphic materials, originals or color copies, shall remain with the College. Site plans should be presented with North pointing up or to the right. Floor plans shall follow the same orientation as the site plan. Each drawing shall contain title information (Name of Project, Scale and Date). Colors and exterior materials must be identified.

E.1.3. Floor plans, typical cross sections, elevations and general site development, should be drawn at 1/8" or 1/16" scale.
E.1.4. A utility site plan at 1"=40' scale minimum is required. This plan must show all connections to existing campus lines.

E.1.5. A campus site plan, indicating all significant existing features of the site, including buildings, trees, paths, roads, etc.

E.1.6. An eye-level color rendering representing the most typical exterior view.


E.2.1. All narrative submittals must be provided in 8.5" x 11" bound format and shall include the following:

E.2.2. Project Summary Statement. This is a brief review of the entire project and can be used by the College in preparing press releases, briefing sessions, summaries for the Governors Board or the State Board of Directors and for other similar purposes. The Summary Statement shall include the following:

- Purpose of the project and key design elements incorporated to achieve the intended purpose, special siting considerations and building areas.
- Outline of materials and any special methods of construction to be employed, including exterior and interior finishes, construction techniques, mechanical and electrical systems and site work.
- Unique building systems to be employed, energy conservation methods contemplated and special operation and maintenance requirements.

E.2.3. A statement of probable Construction Cost.

E.2.4. Tabulation of building areas (Net and Gross square feet). See Appendix B for definitions and methods.

E.2.5. Provide written descriptions of subsurface investigation, structural systems, mechanical and electrical systems.

E.2.6. Outline Specifications for Sections 1 through 16.

E.2.7. Descriptive information of unusual design characteristics not documented elsewhere must accompany the submission.

E.2.8. Information and Data for the Commissioning Team

- Description of construction operations (phased construction, etc.) and special traffic routing(s), utility provisions and overall project schedule.
- Schematic diagrams and design calculations of mechanical systems. These shall include air distribution, piping and control systems. For specific requirements see PART II, Division 15, Section 15000 A.2.
- Electrical single-line distribution diagrams, lighting systems and design calculations. For specific requirements, refer to PART II, Division 16, Section 16500.
E.3. Schematic Design Submittal Evaluation

The 100% Schematic Design Submissions will be evaluated against the following:

- Adaptability and Expandability
- Internal Functions.
- Human, Vehicular and Material Flow Patterns.
- General Space Allocations.
- Analysis of Operating Functions.
- Adjacencies.
- Special Facilities and Equipment.
- Materials Handling.

The Design Consultant and all consulting design engineers shall attend a meeting with the State Board of Directors, Facilities Advisory Council in Phoenix for this submission.

F. 100% Design Development Submissions. The following information supplements the Standard Contract Form, Document B141 12.4.

F.1. Minimum Submission Requirements: Graphic Submittals.

F.1.1. Site Development drawings indicating all exterior appurtenances (bike racks, pathways, parking, patios, benches, etc.) within the project envelope.

F.1.2. Architectural and structural drawings indicating foundation and structural requirements, floor plans, elevations, cross sections and fixed equipment layouts. All drawings must be drawn to the scale of the final Construction Documents. Plans shall show the placement of new and existing furniture and fixed equipment.

F.1.3. Room Numbers. During the Design Development Phase, the Design Consultant shall coordinate with the project manager to assign room numbers. Upon approval, no changes shall be made to the Room Numbers without the specific approval of the Facilities Planning Project Manager. Room number shall be included in the Design Development submission.

F.1.4. Interior Design documentation needed to establish materials, room finishes and colors, furniture and equipment layouts, and all built-in furniture. The submittal shall include samples of all carpeting, plastic laminates, wall coverings, ceiling and flooring tiles, and any other critical elements of the project conceptual design.

When applicable, the Design Consultant shall prepare an inventory of existing furnishings and equipment. If included in his scope of work, the Design Consultant will be responsible for preparing new furnishings specifications, assisting Procurement in the preparation of furniture bid packages, and inspections of the furniture installations to insure compliance with the specifications.

F.1.5. A 1”=40’ (minimum) scale utility site plan showing all connections to campus sources shall be included with this submission.
F.1.6. Mechanical:

- Site drawings showing extent of all utility systems with preliminary sizing information.

- Plumbing and HVAC drawings (refer to individual sections for requirements). Plans shall have all fixtures and equipment shown. Include catalog cut sheets of proposed fixtures and equipment.

- Design calculations for all mechanical systems (refer to individual sections for requirements).

F.1.7. Fire Protection: preliminary drawings and specifications including plans, riser diagrams, sprinklers locations, fixtures, major equipment and control diagrams (refer to Sections 10522, 15300 and 16700).

F.1.8. Electrical:

- Preliminary drawings including furniture coordination plans and diagrams indicating power and telecommunication outlets, lighting/reflected ceiling plans including types of fixtures with catalog cut sheets and their location (see Section 16500), primary and secondary switch gear, sizes and location(s) of power and lighting distribution panels. Special systems (public address, fire alarm, smoke detection, television, etc.) can be defined in the specifications and noted on the drawings.

- Site drawing(s) indicating exterior lighting (see Section 16530) and power distribution systems, including connections to campus sources, with preliminary sizing information.

- Design calculations for all electrical systems (see Section 16 for specific requirements).

F.1.9. Any structural calculations available at the Design Development phase. Boring data or any other available information on sub-surface conditions within the project envelope.


F.2.1. All narrative submittals must be provided in 8.5” x 11” bound format and shall include the following:

F.2.2. Updated Outline Specifications indicating special systems and fixed equipment requirements.

F.2.3. Updated tabulation of Building Areas (see Appendix B). Prepare a narrative report comparing and contrasting the design solution to the Facilities Specifications and Space Requirements of the Program Document. Clearly show where areas are over or under the stipulated requirements. This report will assist the customers in understanding the project and help ensure that their needs are being met.
F.2.4. Statement of Probable Construction Costs. To assist the Design Consultant, the College may elect to provide an independent cost estimate. This cost estimate consultant shall have no current connection or interests with the Design Consultant on the project being considered.

The Design Consultant shall attend a meeting (all design engineers must also attend this meeting) with the State Board of Directors, Facilities Advisory Council, in Phoenix.

G. Construction Documents (CD) Submissions. The following information supplements the Standard Contract Form, Document B141 12.5.

G.1. General

G.1.1. The 50% Construction Documents Submittal is intended to provide an opportunity to check the progress of work during this phase. The Project Manager will work with the Design Consultant to establish the schedule and scope of this review.

Coordinate with College Departments such as Information Technology and Operations and Maintenance regarding portions of the plans that affect their operating areas. The building mechanical and electrical systems shall comply with the energy code.

All comments on the 50% CD submission shall be addressed and/or incorporated into the 100% Construction Documents Submittal (Bid Documents).

G.1.2. Phasing will require review and approval by the Facilities Planning Project Manager. Phasing of all work shall be enforceable. If certain phases or portions of the work require partial acceptance before the project is completed, separate liquidated damages should be assessed to each phase to help assure each specific completion date. When the contract lists the phases, time allocated and damages for each segment, the phasing is more easily enforceable.

G.1.3. The 100% Construction Documents Submittal is the finished bid set. This set must be delivered to the project manager one week prior to the first advertisement for bid.

G.2. 50% Construction Documents Minimum Submission Data:

G.2.1. Complete drawings and specifications for all disciplines. All drawings shall be initiated and developed to their fullest extent as possible. Refer to the Operations and Maintenance Specifications in PART II of this document for specific submittal requirements that may not be otherwise shown anywhere in the drawings. (For example, Division 7, Section 7700 requires Roof Plans to show traffic grilles or walking pads at the 50% as well as the 100% Construction Documents submittals).

G.2.2. The College's Standard Contract Documents shall be assembled and bound at the front of the Specifications manual. (See PART I, Section 3).

G.2.3. Statement of Probable Cost.

G.2.4. Tabulation of Areas (see Appendix B for definitions and methods).

G.2.5. Site development areas should be summarized on the landscaping drawings and must include the following:
- Ground cover area(s).
- Shrub area(s).
- Total number of trees.
- Total number of shrubs.
- Parking lot area(s), excluding planting islands.
- Total hard-surface/patio area(s).
- Total irrigated and non-irrigated area(s) excluding roads, buildings and hard-surfaces.

G.2.6. Fixture cut sheets shall be supplied for all mechanical and electrical fixtures and equipment.

H. Bid Period Submissions. The following information supplements the Standard Contract Form, Document B141 12.6.

H.1. General: The Design Consultant, Facilities Planning and the Procurement Department (and the Construction Manager, if applicable), shall select a list of bidders from the College’s file, plus any other potential bidders that the Design Consultant may recommend. The College’s Procurement Office will issue invitations to these bidders in addition to public media advertisement for bids.

H.2. The Design Consultant shall attend a meeting (all design engineers must also attend this meeting) with the State Board of Directors, Facilities Advisory Council, in Phoenix.

H.3. The Design Consultant and all design engineers shall attend the Pre-Bid Conference.

H.4. Alternates. The lump sum bid shall cover the scope of a complete project without the need for alternate bids (refer to AZ-B141 5.2.2). Add alternates may be requested by the College or suggested by the Design Consultant to take advantage of bids, which may be lower than estimated. Any and all Alternates must be approved by the Facilities Planning Project Manager. Alternates that significantly affect the Program requirements (such as shelling programmed parts of a building) are not allowed.

Presentation of the alternates in the bid documents shall include the following:

- Identification and description of each alternate.
- Reference to applicable drawings and specification section(s).
- Detailed description of effects upon the scope of work.
- Summary of effects upon materials and methods of construction, and reference to appropriate specification section(s).

The Alternates should be numbered in the order of priority determined by the College. If the base bid is lower than the estimate, the College may, at its discretion, accept add alternates in the numerical order presented in the bid documents.

H.5. Bid Documents Distribution. The Design Consultant shall be responsible for:

H.5.1 Document Printing. The Project Manual, as defined in A201, 1.1.7, shall include the information required by Procurement Services as defined in 3.2.
H.5.2 Document Distribution. General Contractors will each receive three (3) complete sets; no partial sets shall be issued. A refundable deposit equal to the cost of printing the sets will be required in each case. Deposit checks shall be made out to "Pima County Community College District."

H.5.3 Plan Services Distribution. Local plan services will each receive two (2) complete sets, and one set of as-built drawings with existing conditions information, if appropriate to the project.

H.5.4 Reproducible Drawings Management. One reproducible set shall be placed with a reproduction service. Only full sets will be printed, including the project manuals. Subcontractors and/or products and materials suppliers may purchase complete sets. The purchase of partial sets is not allowed.

H.5.5 Owner's Copies. The College will need a minimum of three (3) sets: one for Facilities Planning, another for Procurement and another for the Job Coordinator. Verify actual requirements with the Project Manager.

The Design Consultant may elect to have a reproduction service handle the document distribution.

H.6. Addenda. All addenda shall be prepared by the Design Consultant and approved by the Facilities Planning Department prior to issuance.

H.6.1 The cut off time for issuing Addenda is forty-eight (48) hours prior to bid opening time. No addendum shall be issued or distributed after this cut off time.

H.6.2 All addenda shall be issued and distributed by the Design Consultant. Addenda shall be placed at the front of the specifications and numbered for incorporation into the appropriate drawings or specifications sections. The addenda distribution must include all holders of plan sets, including those issued to the College.

H.6.3 Proof of addenda issuance/receipts must be provided to the Pima Community College Procurement Department no later than twenty-four (24) hours after issuance. Proof of addenda issuance and receipt are copies of fax transmissions and receipt or signed delivery forms/tickets.

H.7. Bid Opening Date. No bid opening date shall be set on Mondays, Fridays or any day of the week following a national or statewide holiday. The design Consultant shall research other bid openings which may take place concurrently and make appropriate date or time change recommendations to the College to avoid conflicts and ensure favorable bidding conditions.

H.8. Post-Bid Submissions. The Design Consultant shall submit a Bid Opening Summary and award recommendations to the Facilities Planning Department.

I. Construction Contract and Award Submissions

I.1. General: The Design Consultant shall prepare and furnish twenty-five (25) sets of the Contract Documents, fully updated including notes on drawings regarding all addenda items,
and prepared for construction. These sets shall be procured from the best sets returned by the bidders. New sets shall not be printed unless there is a lack of re-usable bid sets.

2.4 Agency Reviews

2.4.1 The State Fire Marshall review is required for all remodeling and new construction. The Consultant shall arrange for all regulatory agency reviews. It is recommended that preliminary regulatory reviews occur during the Schematic Design and Design Development phases.

2.4.2 As a political subdivision of the State of Arizona, the College is not subject to City or County ordinances and is not required to obtain a building permit. References to City or County building codes and regulations must be made carefully.

2.4.3 The College must, if required by the type of work, obtain the following types of permits to comply with State and Federal regulation:

A. Health Department approval for its food service facilities.
B. Water and sewer connection fees.
C. DEQ Demolition permits and NESHAP permits may be required.
D. DEQ Air quality activity permits.
E. Storm Water runoff prevention

2.4.4 The architect shall meet with the above agencies and 1) determine if jurisdiction applies and permits are required, and 2) submit appropriate drawings and information required for permits. Permits must be ready for the contractor to pick up on the anticipated notice to proceed date.

2.4.5 The architect shall include in the specifications a list of the permits required, the contact for each permit, and a statement that the owner will pay the cost of all permits by change order at direct cost without markup.

2.4.6 State Board of Directors, Facilities Advisory Council (FAC) review is required on all major projects (over $500,000). The FAC reviews the project at the Schematic Design, Design Development and 100% Contract Documents (Bid Period Submission) phases.

2.5 Testing Services and Special Studies.

2.5.1 General: The College's policy is for the Facilities Planning Project Manager to select soils testing agencies for both the design and construction phases of the project. Because of the extended period of time between both phases, the College may select a testing agency for each phase.
2.5.2 Design Phase. The usual services performed by the Testing Agency are:

- Test borings as required.
- Tests and analyses of boring samples.
- Consultations with structural consultants and foundation design recommendations.
- Report preparation summarizing findings and conclusions.

Upon selection of a Testing Agency, the agency will work under the advice and direction of the structural consultant. After the soils information and report become available, the Design Consultant shall, with input from the soils testing agency, prepare the specifications for soils work during construction. The specifications shall clearly define the scope of services to be performed by the soils testing agency during construction, as well as the responsibilities of the Contractor. A draft of these specifications on soils work shall be submitted to the Project Manager with the 50% Construction Documents Submittal for review and approval prior to being incorporated into the final specifications. Provisions shall be included for the Contractor to pay for any re-testing and inspection required due to failure to conform to the Contract Documents or Specifications requirements. The Contractor shall also be responsible for tests due to unnecessary delays in excavation, trenching, drilling, grading, etc., which prolong the work of the Testing Agency.

2.5.3 Per AZ A201, 5.2.2 the contractor shall not contract with any vendor who has consulted or assisted the architect to plan or design the project.

2.5.4 Construction Phase. The usual services performed by the Testing Agency are:

- Site grading and excavation.
- Footings testing.
- Backfill operations.
- Special inspections.
- Materials testing.
- Utility trenching and other miscellaneous tests.

It is the Design Consultant’s responsibility to ensure that the specific provisions necessary to execute and complete all construction testing work are included in the Contract Documents. **No reference to information included in the Project Soils Report will be acceptable** unless the Soils Report is included and/or bound in the project specifications with the corresponding disclaimer(s).

Based on the specification requirements, the Design Consultant shall determine the specific services to be performed by the Testing Agency during this phase of the project. Upon selection, the Testing Agency shall work under the direction of the structural consultant. The Contractor is responsible for re-testing and inspections of all rejected work and the Testing Agency will be required to invoice separately for such work, which will be credited by Change Order to the College.

2.6 Construction Administration. The following information supplements the Standard Contract Form, Document B141 12.7.

2.6.1 General
A. During the Construction Administration phase, the Design Consultant shall provide those services necessary for the administration of the construction contract as set forth in the General Conditions of the Contract for Construction, unless otherwise stipulated. The Design Consultant's duties and responsibilities during construction shall be as set forth in the Agreement between Owner and Architect AIA Document B141, 1987 Edition 12.7 with Arizona Modifications, which is the standard contract form used by the College.

B. Weekly jobsite meetings as defined in Division 1, paragraph 01200.02 shall not be construed to replace the required Contract Administration construction field observation services or to set a minimum or maximum on the frequency of the on-site observation requirements.

C. The Design Consultant and appropriate sub-consultants are responsible for the review of all shop drawings, products data and other submittals stipulated in the Contract Documents that pertain to their specific trades and/or specialties. These reviews shall be conducted in an expeditious manner and shall in no way delay the progress of the construction work. The Standard Contract B141 stipulates a maximum of twenty (20) days for initial reviews. The parties at the Pre-Construction meeting may modify this requirement.

D. It shall also be the responsibility of the Design Consultant to distribute these submittals to the College, sub-consultants and field representatives as required in the Contract Documents. The College requires two (2) copies of all shop drawings as initially submitted: one for the Job Coordinator and another for the Project Manager. A complete log of these submittals and all construction related communications must be maintained by the Design Consultant for the duration of the Construction phase.

2.6.2 As-Built Record Drawings

A. The agreement for professional services with the Design Consultant requires the submission of reproducible record drawings reflecting as-built conditions as per B141, 12.8.2. To ensure accurate as-built drawings, the Design Consultant or his Construction Administration representative shall review any as-built conditions and changes which may have taken place during the week with the Contractor and the Facilities Planning Project Manager during each weekly job progress meeting. The Contractor must submit current as-built updates with every request for payment.

B. The College's standard Construction Contract requires the Contractor to record all changes to drawings and specifications as they occur on the jobsite, to review these changes during the weekly jobsite meetings, and to deliver these as-built record drawings and specifications in reproducible format to the Design Consultant upon completion of the work. In addition, shop drawings, field notes, change orders, correspondence and the Design Consultant's own set(s) of field drawings must be incorporated in a final record set.

C. At the conclusion of construction, all changes shall be incorporated on the tracings by the Design Consultant and properly noted showing them as "as-built, change order #," or any other appropriate designation. The Specifications shall be annotated to show the actual products used on the project.

D. The Design Consultant shall include as part of the as-built documents a set of the final structural, mechanical and electrical calculations that differ from those prepared during the design phases. The submitted material must be clearly labeled "as-built" and dated.
The as-built drawings shall be reproducibles of a quality equal to Mylars, and/or CAD drawings (verify specific requirements with the Facilities Planning Project Manager). In some agreements, there may be an additional provision for reduced-scale prints. When these are required, they can be ozalids, photocopies, or a similar quality. The number of copies of as-built drawings to be supplied by the Design Consultant is covered in the Consultant's agreement.

2.7 Project Closeout. The following information supplements the Standard Contract Form, Document B141 12.7 and 12.8.

2.7.1 General

A. The General Conditions of the Construction Contract, contain instructions and requirements of the Contractor, the Design Consultant(s) and the College for acceptance of the project. The College also has internal procedures for turning over the project to the Operations and Maintenance Department. The Design Consultant is responsible for including in the Specifications the obligations of the Contractor for an orderly acceptance and turnover. Included in such obligations are: punch lists, "as-built" plans and specifications, operation and maintenance manuals and training of maintenance personnel.

B. In addition to the training Walk-Through (see 2.7.2B), the project specifications should stipulate a period of up to twenty-four (24) working-time hours allowance each for electrical, mechanical, plumbing and any other specialized trades as may be required for call-back training and consultations with the College maintenance personnel as part of the Construction Contract. These 24 hours are College training time, regardless of the number of participants required for the training and consultation tasks. The College will schedule these training sessions.

C. Equipment start up, testing and balancing and system(s) satisfactory operation is required to show that the work is functionally ready for occupancy as per AZ-A201 9.8.2 and must be complete before the work is considered substantially complete. The Contractor is responsible for preparing the project "punch" list (AZ-A201 9.8.2). This is a standard contract requirement. The College representatives will only participate in two inspections: the Substantial Completion inspection and one (1) re-inspection. The Contractor must submit a written request for Substantial Completion Inspection, including the punch list to the Design Consultant, who will, in turn, send the Facilities Project Manager a copy of the punch list and establish the date for the inspection (AZ A201 9.8.1). It is the responsibility of the Design Consultant to determine which items must be completed prior to this Substantial Completion Inspection.

D. The Substantial Completion Inspection must be approved by the Design Consultant and any sub-consultants as required with the concurrence of the Facilities Planning Project Manager and selected customer representative(s). One Substantial Completion re-inspection is included in AZ-A201 9.8.2. Additional inspections are considered additional services and can be back-charged to the Contractor per AZ A201 12.2.1

E. After the final inspection, the design consultant shall issue the Certificate of Substantial Completion and a final punch list. The Contractor must correct incomplete or defective work within the time stipulated for final completion.

2.7.2 Training of Maintenance Personnel.
A. Informal walk-throughs during construction shall take place as determined by the Operations and Maintenance Department and the Project Manager. In these jobsite meetings, subcontractors' foremen will review with College representatives portions of the project concerning their trades that may impact operation and maintenance once they are closed in. Suggestions for corrections and/or modifications shall be forwarded to the Project Manager. In addition, a copy of each Construction Report shall be forwarded to the Operations and Maintenance Department to keep them informed of the construction progress.

B. Training Walk-Through: After the Design Consultant's Substantial Completion inspection, an Operations and Maintenance pre-training walk-through will be scheduled with a one week advance notice to all parties by the Project Manager. Attendees shall include the College's operations and maintenance personnel, Design Consultant(s) and any specialized associates and/or representatives, mechanical, plumbing and electrical foremen, the Project Superintendent and the Project Manager. Copies of the operation and maintenance manuals will be provided at the beginning of this meeting. The College may require that the operation and maintenance manuals be separated or organized by trade. This requirement will be addressed during the Pre-Construction conference.

C. In addition to the operations and maintenance manuals, the Contractor shall also deliver all maintenance material, surplus stock, tools, keys and other such items to a place previously designated by the Project Manager. These items shall be itemized on a materials transmittal (in duplicate), giving the project name, job number, Contractor's name, reference to the specifications section, and number and complete description of the items. The description of the items shall include the manufacturer's name, supplier, order number, kind/type/model, color and color number for all items considered maintenance replacements. The Facilities Planning Project Manager will inventory these items at the time of delivery, sign, and retain one copy of the transmittal.

D. The training walk-through may be videotaped by the College. Upon completion of the walk-through, the building shall be turned over to the College for maintenance as of a specific date in writing, stipulating such exceptions as may be noted in the Certificate of Substantial Completion and/or Commissioning Report(s).

E. The project Specifications shall include a stipulation requiring twenty-four (24) working hours for each foreman of the mechanical, plumbing, electrical and other specialized trades which may need to provide additional training or trouble-shooting explanations to the College's Operation and Maintenance personnel as defined in 2.7.1 and 2.7.2 B. These twenty-four (24) hours availability shall be in addition to the Training Walk-Through time.

F. Modification of Procedures for Small Projects: On small projects (minor remodeling, in-house design and others as established by the Project Manager), the formal procedures outlined in paragraphs A through D above may be streamlined. The Project Manager will discuss the turnover steps with the Operations and Maintenance Department, arrange for whatever walk-through or inspection(s) that are warranted and send a copy of the Notice of Completion or Notice of Acceptance of Work, thus turning the project over to the Operations and Maintenance Department.
2.7.3. Design Deficiencies

When the facility users' complaints relate to deficiencies, which are neither maintenance or warranty issues, the Operations and Maintenance Department, shall contact the Project Manager and recommend a solution(s). If a problem is indeed a design deficiency, the Project Manager shall discuss the matter with the facility users, the Design Consultant and the Job Coordinator to formulate a solution. Corrective work will then be performed.

2.7.4. Warranty

Equipment Failure under Warranty: Per the College's Standard Supplementary Conditions to the Construction Contract, the warranty period is two (2) years. Special provisions or drawing notes shall not reduce this requirement. Following acceptance of the project, the Operations and Maintenance staff will perform routine maintenance in accordance with the operating manuals with the first scheduled maintenance measured from the date of turnover. All failures during the warranty period are the responsibility of the Contractor.

2.7.5. Final Application for Payment

The Contractor must include with the final Application for Payment the following (per AZ-A201 9.10.2):

- Affidavit that payroll, bills and all subcontractors due payments have been paid or otherwise satisfied.
- Insurance certificate for insurance during warranty period.
- Consent of surety to final payment.
- All applicable lien waivers.

The Design Consultant shall review the aforementioned material and any other project-specific requirements and issue a final certificate for payment.

2.7.6. Record Drawings

Pima Community College requires the following drawings for its records:

- Electronic Copies of the final drawings matching the Construction Documents set, as per 2.3.1, C.2. These drawings shall be corrected according to the contractor's as-built changes as stipulated in 2.6.2.
- A complete set of reproducible Mylar record drawings
- Two (2) blueline sets of the corrected drawings and
- Two (2) Specifications manuals showing changes and variations approved during construction as stipulated in 2.6.2.

Section 3. **Contracts and Procurement**


Pima Community College uses the AIA contracts as modified by the State of Arizona Attorney General. The College will provide copies of its standard contract forms to the consultants. These forms are the following AIA modified versions:

AZ-B141
The College tries to minimize supplemental conditions that modify the provisions of AZ-A201.

A complete copy of the standard contract form AZ-B141 can be obtained from the College for review. It is noteworthy that each contract can and will have Special Provision clauses that will modify the scope and conditions of this contract form.

All prospective Design Consultants shall, however, familiarize themselves with the basic premises set forth in this standard agreement form to facilitate and expedite the contract negotiation procedures with the College.

AZ-A201 Section 5.2.2 prevents a contract for construction with a person who consulted on the design.

See PART II, Division 1 regarding the College's standard Division 1 General Requirements.

3.2 Procurement Responsibilities

The Procurement Department is in charge of the bid process. Procurement will provide the following items to be included in the Project Specifications manual.

- Project Summary Sheet
- Bid Submittal Form listing all Alternates (Design Consultant to coordinate with Procurement).
- Statutory Bid Bond Form
- Statutory Performance Bond Form
- Statutory Payment Bond Form
- Non-Collusion Affidavit
- Affidavit of Release of Liens
- General Conditions AZ-A201
- Supplemental Conditions
- Subcontractor Listing (The Design Consultant shall review this form for completeness.
- Bidders’ Information Form
- Contractor’s Profile
- Instructions to Bidders

The Procurement Director will Chair the pre-bid conference and the bid opening and issue the Contract. The College shall issue the Construction Contract. The Procurement Department will ensure that all paperwork is submitted, including Payment and Performance Bonds and Insurance Certificates.

Bids are received at the office of the Pima Community College Director of Procurement, located at the District Central Offices (DCO), 4905-D East Broadway Street, Suite D-113, Tucson, Arizona 85709-1420.

3.3. Consultants Billing Procedures and Format

3.3.1 Procedures
The Following information shall be included on each Design Consultant invoice submitted to the College (see the sample invoice format at the end of this section):

A. Consultant's Invoice Number.
B. Invoice Date.
C. Official Project Title.
D. Current Purchase order Number. Two (2) distinct Purchase Orders (POs) may be issued to consultants: One for all combined professional services, and one for reimbursable expenses. A Purchase Order for each category will be issued at the beginning of the project, and again at the beginning of each subsequent Fiscal Year (on July 1). Payment of invoices that do not contain the correct, current PO number may be delayed.
E. Number of Invoice pages.
F. Dates covered by the Invoice.
G. Lump Sum Fee amounts.
H. Line items listed by phase for all Basic and Additional Services. Refer to the Sample Invoice Format included at the end of this section.
I. Attach documentation for all Services procured as "not to exceed," as well as unit prices. (For example: hourly rate with a maximum Not to Exceed (NTE) figure, or five (5) site visits at $75.00 per visit, etc.)
J. Do not include past due billings in the current invoice. If an amount is past due, the Project Manager should be notified directly and necessary steps will be taken to make up the payment independently from the current billing.

3.3.2 Reimbursable Expenses

Reimbursable expenses shall be billed against the District Purchase Order issued for their procurement. **Do not** include Reimbursables on the Invoice for Professional Services. Provide an itemized list and complete documentation for all reimbursables. Payment of reimbursable invoices that do not contain the correct, current reimbursable PO number may be delayed.

Acceptable Reimbursables:

The following are clarifications to Article 10.2.1 of AZ-B141, Reimbursable Expenses:

10.2.1.1 During contract negotiations, the Owner and Architect shall reach agreement on unit prices for the following:
A. A per trip charge, including meals and mileage for the Architect to visit the Facilities Advisory Council, in Phoenix.
B. A per trip charge, including meals and mileage for the Architect and mechanical and electrical engineers to visit the Facilities Advisory Council, in Phoenix.
C. For each out-of-town consultant employed by the Architect, agree on:
   C.1. The number of trips to Tucson to be included in the Basic Services (the cost of travel, meals and lodging shall be included in the Basic Services fee).
   C.2. Trips in excess of the above shall, if authorized in advance by the Owner, be billed in accordance with the Pima Community College Travel Manual. A copy of this manual can be made available to consultants upon request.
D. If the Owner requires the Architect or any consultants to travel out of Tucson, reimbursement shall be in accordance with the Pima Community College Travel Manual.
(rates vary depending on the destination). A copy of this manual can be made available to consultants upon request.

E. For the Architect and each consultant, the number of job site visits must be included in the Basic Services (mileage shall be included in the Basic Services fee). Any trips in excess of this number may be billed at an agreed-upon, per trip rate, including mileage.

10.2.1.2 During contract negotiations, the Owner and Architect shall reach agreement on unit prices for the following:

A. For in-house reproduction, a photocopy per page amount, and a Diazo per square foot amount.
B. A per page charge for faxes.
C. There shall be no reimbursement for in-house plotting of documents.
D. The cost of postage and long distance calls between the Architect and out-of-town consultants shall be included in the Basic Services fee. All other postage and long distance charges shall be reimbursable.
E. Local cellular phone charges (to or from a cellular phone) are not considered long distance charges and will not be reimbursed unless specifically authorized by the Owner.

10.2.1.3 Office expenses at the site are applicable only if the Architect is requested elsewhere in the Agreement to establish an office at the site.

3.3.3 Final Billing

In addition to the information provided above, all final Architect/Engineer invoices submitted to the College for Basic Services and Reimbursables, shall include an "Available Balance" tabulation for "not to exceed" allocations such as site investigations, construction inspections and reimbursable expenses.
### Consultant Sample Invoice Format

<table>
<thead>
<tr>
<th>Basic Services</th>
<th>% of Fee</th>
<th>Fee Amount</th>
<th>% Complete</th>
<th>Fee Earned</th>
<th>Previous Invoices</th>
<th>Current Invoice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programming</td>
<td>5%</td>
<td>$500</td>
<td>100%</td>
<td>$500</td>
<td>$333</td>
<td>$167</td>
</tr>
<tr>
<td>Schematic Design</td>
<td>15%</td>
<td>$1,500</td>
<td>50%</td>
<td>$750</td>
<td>$250</td>
<td>$500</td>
</tr>
<tr>
<td>Design Development</td>
<td>15%</td>
<td>$1,500</td>
<td>0%</td>
<td>$</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>Construct. Docs.</td>
<td>25%</td>
<td>$2,500</td>
<td>0%</td>
<td>$</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>Bid/ Negotiations</td>
<td>10%</td>
<td>$1,000</td>
<td>0%</td>
<td>$</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>Construction Admin</td>
<td>30%</td>
<td>$3,000</td>
<td>0%</td>
<td>$</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td><strong>100%</strong></td>
<td><strong>$10,000</strong></td>
<td><strong>$1,250</strong></td>
<td><strong>$583</strong></td>
<td><strong>$667</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Additional Services</th>
<th>Fee Amount</th>
<th>% Complete</th>
<th>Fee Earned</th>
<th>Previous Invoices</th>
<th>Current Invoice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Furniture Inventory</td>
<td>$1,000</td>
<td>50%</td>
<td>$500</td>
<td>$250</td>
<td>$250</td>
</tr>
<tr>
<td>Master Planning</td>
<td>$1,000</td>
<td>0%</td>
<td>$</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>Others as itemized in Contract</td>
<td>$</td>
<td>%</td>
<td>$</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td><strong>$2,000</strong></td>
<td><strong>$500</strong></td>
<td><strong>$250</strong></td>
<td><strong>$250</strong></td>
<td></td>
</tr>
</tbody>
</table>

**GRAND TOTAL**        | **$12,000**| **$1,750** | **$833**   | **$917**          |                |

End of PART I
Introduction

The requirements for facility work consist of two parts: the Facilities Specifications and the Operations and Maintenance (O & M) Guidelines. The Facilities Specifications contain the project's programmatic requirements. The success of the facility will be measured by how well the design meets these programmatic requirements. The O & M specifications provide the minimum construction standards and material preferences developed by the Administrative Services and Facilities Planning and the Plant Operations and Maintenance Departments. The maintenance success of the facility will be judged by how well the design meets the O & M criteria set forth in this document.

The guidelines included in this PART II apply to all construction (including remodeling or additions to existing facilities) on Pima Community College campuses. If any project cannot incorporate the guidelines set forth herein because of specific program limitations and/or special conditions, the items in question should be brought to the attention of the Facilities Planning Project Manager.

The Project Manager, in consultation with the Job Coordinator will provide for clarification and/or written authorization for exception to the guidelines. All other Part II guidelines shall become requirements of the contract and shall be included in the contract documents. Items that are not included will be considered document omissions.

These guidelines have been organized according to the Construction Specifications Institute (CSI) standard Divisions (1-16). Some of the sections within each division may not correspond exactly with the official CSI numbering. This has been done for clarity as well as simplification of the guidelines text and avoidance of the constant cross referencing included under the heading "related work" found in all specifications.

This document does not specify who is responsible for any facet of the construction work. It specifically concentrates on the quality and performance of the end product and sometimes details execution requirements, or specifies products and materials. In a few cases, the suggested products may not leave room for substitution. The Project Manager must approve any deviation from the material or brand name suggested. The terms "or equal" or "similar to" have been purposely avoided, since their definition and syntax are the responsibility of the Specifications prepared by the Design Consultant.
Division 1. General Conditions

1000 General Conditions of the Construction Contract

A. The College's standard Division One numbering system and language is to be included in the Project Specifications.

B. The following notes apply to said General Conditions:

- Design Consultants shall not delete any items from the College's standard boilerplate document.
- None of the items listed in the standard format are to be re-numbered.
- Any additions to the College's General Conditions shall not conflict with existing statements. Any and all additions or modifications must be previously approved by the Facilities Planning Project Manager.
- Pima Community College's Facilities Planning Department must review and approve the text and issuance of these General Conditions of the Construction Contract prior to publication.

C. Construction Controls. Limits to the work, haul routes, staging areas, access points and construction fences shall be shown on the contract documents.

1400 Commissioning Guidelines

A. General

A.1. Introduction. This section may not apply to some projects, so the Design Consultant must verify the applicability and scope of the procedures and services outlined herein.

A.2. Definition. Commissioning is a systematic process of assuring that building systems perform in accordance with the design intent and the owner's operational needs. It is a designed process of documentation, training, adjustment, testing and verification, performed specifically to ensure that the facility operates as intended, and which occurs during design, construction and through the first year of operation.

A.3. Goals and Objectives. There are six major goals to be achieved by the commissioning process. They can be summarized as follows:

- A.3.1. To provide safe and healthy facilities by minimizing building systems deficiencies relative to air quality and environmental comfort.
- A.3.2. To improve energy efficiency by improving systems performance.
- A.3.3. To reduce operating and maintenance costs by fine tuning and increasing the life of building systems.
A.3.4. To facilitate the preparation and training of the operations and maintenance staff by developing participatory and collaborative testing and operational development processes.

A.3.5. To improve the systems technical documentation relative to operation, maintenance, troubleshooting and renovation(s) of facilities.

A.3.6. To aid in meeting the facility users’ needs by developing a facility that operates as it was intended.

A.4. Single-Party Commissioning. The type of commissioning services to be retained by the College will be the single-party commissioning approach, where a commissioning team, as defined in D.2, is assigned to perform various commissioning functions as detailed in D.2. Single-party commissioning adds a new process to the traditional Owner-Design Consultant-Contractor team, but it does not require significant changes in the functions of the traditional team members.

B. Process.

B.1. Commissioning is a designed process. It differs from traditional Construction Administration services offered by most Design Consultants and/or consulting engineers. It is a preplanned series of activities designed to meet specific goals. It is not a thorough punch list or solutions to problems that arise during start-up or balancing procedures. It is an all-encompassing series of activities developed to avoid conflicts and verify intended performances in a proactive way.

B.2. Documentation is critical to this process, since it makes its results available to future operators and designers seeking to modify or renovate the facility. Obviously, effective staff training is essential to the success of the process.

B.3. Commissioned systems must be adjusted to suit the actual operating conditions. Set points and other design parameters may need to be adjusted to fit occupancy conditions which differ from those envisioned during design. In all cases, the most significant tool is the proper development and execution of testing procedures.

C. Testing.

C.1. Stages. There are four basic stages of testing which provide an objective demonstration of the proper operation of the components and systems in a facility:

   C.1.2. Component (point-to-point) Testing.
   C.1.4. Intersystem Functional Performance Testing.

Completion of the first two stages is sometimes called pre-functional performance testing. It is the phase that ensures that system and intersystem performance testing can proceed without undue interruption.

Static testing verifies the strength and integrity of installed materials and equipment. Component testing verifies that each component functions as it is intended. System functional testing verifies that each system produces the required effect in accordance with its design capacity.
and sequence of operation. Finally, intersystem testing verifies that the whole facility functions in accordance with the design intent and the users' needs.

D. Responsibilities

D.1. Responsibilities of the Design Consultant. It is the responsibility of the Design Consultant and his design engineers to develop the necessary tests and testing procedures to be followed during the Commissioning process. These tests must be designed in accordance with the stages stipulated in C.1.1 through C.1.4 above and must include the expected and/or acceptable test result(s) parameters. These parameters must contemplate year-round conditions and full building occupancy implications.

D.2. Commissioning Team Structure and Responsibilities. The Commissioning Team shall be structured as follows:

- Representative(s) of the Design Consultant's firm.
- Representative(s) of the pertinent design/consulting engineers' firm(s).
- The College's Facilities Planning Project Manager.
- The College's Job Coordinator.
- The College's Operations and Maintenance pertinent system(s) supervisor(s).
- Other specialized consultant(s) as may be required.

The design/consulting engineers and the College's Operations and Maintenance supervisors may vary from systems to system as required, but the representative from the Design Consultant, the Project Manager and the Job Coordinator shall remain constant throughout the process.

The following items constitute the basic responsibilities of the Commissioning Team throughout the design and construction processes:

D.2.1. Provide the necessary documentation and information so that work can be done effectively and expeditiously.

D.2.2. Coordinate all activities with the remainder of the design team, contractor(s), and owner's representatives.

D.2.3. Assess and document the deficiencies, problems and inefficiencies found during testing and inspection.

D.2.4. Generate facility deficiency reports.

D.2.5. Determine the party (ies) responsible for resolution of the deficiency (ies) and follow up with pertinent action to resolve the deficiency (ies).

D.2.6. Produce the Commissioning Manual complete with all appropriate testing procedures, results, adjustments, corrections, modifications and any or all pertinent project and/or systems documentation. The Commissioning Manual shall be coordinated and produced by the Design Consultant's office with input from all other commissioning team members.

E. Scope and Functions of the Commissioning Team per Project Phase.
The following constitutes a general breakdown of the commissioning scope and functions of the Commissioning Team relative to each project phase. It is noteworthy that these functions are project specific and must be verified with the Job Coordinator on a case-by-case basis.

E.1. Programming.

E.1.1. Attend Engineering Criteria meeting(s).

E.1.2. Review Project Program draft for compliance and functional issues.

E.1.3. Study and propose alternatives to programmed systems and components.

E.1.4. Review regulatory surveys reports and their applicability.

E.2. Schematic Design

E.2.1. Participate in any and all design charette sessions concerning selection and definition of building systems.

E.2.2. Review and comment on 100% Schematic Design submittal.

E.3. Design Development

E.3.1. Collaborate with the design team in outlining detailed quality control/testing procedures and desired results for performance verification.

E.3.2. Consult with the design team in the selection and specification of all commissioned building systems.

E.3.3. Review and comment on 100% Design Development submittal.

E.4. Construction Documents

E.4.1. Review proposed testing procedures and required results.

E.4.2. Participate in controls meeting(s).

E.4.3. Review and comment on 50% Construction Documents submittal.

E.4.4. Include provisions in the specifications that allow time for point to point testing.

E.4.5. Review and comment on 100% Construction Documents submittal (Bid Documents) and assist in the preparation of any addenda items that may pertain to the commissioning aspects of the project.
E.5. Construction Award

E.5.1. Verify that the aspects pertaining to the commissioning procedures are addressed and properly covered in the Construction Contract.

E.5.2. Ensure that the Construction Schedule allows for adequate testing and correction of deficiencies.

E.5.3. Ensure that the commissioning functions, testing and inspections are included in the construction schedule and process flow.

E.6. Construction Administration

E.6.1. Inspect the installation of all major systems.

E.6.2. Procure and/or conduct all testing and inspections as developed by the design team for compliance with desired results.

E.6.3. Match the systems' operating parameters to the actual usage conditions.

E.6.4. Verify and document compliance with all engineering/design criteria.

E.6.5. Check the coordination of all integrated systems and confirm their operational integrity.

E.6.6. Assist the General Contractor in the training of Operations and Maintenance staff. Maintenance staff must observe all startup and testing of equipment and systems. Following acceptance of the project, the Operations and Maintenance staff will perform routine maintenance in accordance with the operating manuals with the first scheduled maintenance measured from the date of turnover.

E.6.7. Review "as-built" drawings and request corrections and/or additions.

E.6.8. Review all Operations and Maintenance manuals prior to their distribution during the Project Closeout and ensure compliance with the College's requirements.

E.6.9. Develop a preventive maintenance program for all commissioned building systems.

E.6.10. Recommend and inspect surplus materials quantities, packaging, labeling and delivery.
F. Commissioning Systems Testing and/or Areas of Involvement.

The following constitutes a general listing of all possible areas of involvement and or testing which may be incorporated into the commissioning scope. Note that most projects will not require all areas listed below to be included within the commissioning responsibilities. The subjects which are applicable to specific jobs must be verified on a case-by-case basis.

F.1. Department-Specific Systems.

(To be defined on a project-by-project or case-by-case basis).

F.2. Site/Utilities

F.2.1. Steam.
F.2.2. High-voltage electric service.
F.2.3. Domestic/Reclaimed water.
F.2.4. Chilled water.
F.2.5. Natural gas.
F.2.6. Compressed air.
F.2.7. Telephone, Fiber Optics and Data services.


F.3.1. Building envelopes.
F.3.2. Wall systems (including fireproofing and densities tests).
F.3.3. Ceiling systems.
F.3.4. Doors, windows and glazing systems.
F.3.5. Flooring and carpeting
F.3.6. Paint and interior finishes.
F.3.7. Cabinetry and millwork.
F.3.8. Fixed equipment.
F.3.9. Furniture and furnishings systems and installation.

F.4. Structural

F.4.1. Soil(s) analyses.
F.4.2. Compaction tests.
F.4.3. Aggregates testing.
F.4.4. Concrete and masonry strength testing.
F.4.5. Welding tests.
F.4.6. Steel and high-strength bolts and connections testing.

F.5. Vertical Transportation

F.5.1. Installation and workmanship.
F.5.2. Controls and operation.

F.5.3. Finishes.

F.6. Plumbing
F.6.1. Piping.
F.6.2. Valves.
F.6.3. Pumps.
F.6.4. Fixtures.

F.7. HVAC

F.7.1. Motors and pumps
F.7.2. Water heaters and Boilers.
F.7.3. Cooling towers.
F.7.4. Cooling package and fan coil units.
F.7.5. Condensate drains.
F.7.6. Filters.
F.7.7. Convenience outlets and safety controls.
F.7.8. Evaporative cooling units.
F.7.9. Ductwork.
F.7.10. Controls and EMS.

F.8. Electrical

F.8.1. Conduits
F.8.2. Wiring and circuitry.
F.8.3. Power generation.
F.8.4. Electric service and distribution.
F.8.5. Interior, exterior and emergency lighting.
F.8.6. Fire Alarm system.
F.8.7. Security system.
F.8.8. Telecommunication and television systems.

G. Jobsite Services.

In projects where a jobsite Commissioning Team representative is required, the Design Consultant's specifications must require the following services to be made available to the Commissioning Team representative:

- Intermittent access to telephone services (for local calls only).
- Intermittent access to facsimile (FAX) machine for (local faxes only).
- Intermittent use of desk and secure desk storage space.
- Access to sanitary facilities.
- Use of on-site duplicating equipment.

In addition, the Project Specifications shall indicate that the General Contractor and any Subcontractors shall provide the Commissioning Team with names, telephone number(s) and addresses of all Sub-subcontractors, product and materials manufacturers and distributors and any other specialized trades as may be requested by the Commissioning Team.

Division 2  Sitework

2050  Demolition
Do not include any blanket salvage statements in the construction documents. The Job Coordinator shall determine if there are any specific items to be salvaged. List specific items in the contract documents.

2115 Underground Utilities.

Provide tracer wire for **ALL** underground utilities, including main irrigation lines.

2200 Excavation and Earthwork.

A. Include a statement in the specifications that the soils report is on file at the location where bid sets are picked up and will be provided to registered plan holders if requested.

A. All overburden (surplus) fill must be hauled off-site before Project Closeout procedures are initiated. Hauling fill off the site shall not be allowed as a punch list item.

B. The College may use any excess material which will not be required for filling and backfilling. Coordinate with the Job Coordinator and include this requirement in the Construction Contract.

2223 Backfilling and Compacting.

A. The College has experienced problems with inadequate fill compaction in trenches. The Consultant shall provide either: 1) recommended slurry backfill specifications, or 2) recommended compaction and requirements for testing of all backfill and compaction.

2700 Site Drainage.

Ponding of water on the site ground surfaces is not allowable unless specifically provided for in the landscaping design. All surfaces must have positive drainage. Drain all water away from the building foundations and all hardscaping surfaces.

2800 Landscaping Guidelines

2800.1 General Design Considerations

A. General Issues

A.1 The Design Consultant shall consider landscape design concepts that incorporate water and energy conservation methods, including appropriate irrigation equipment, selection of drought-resistant materials and minimal lawn areas.

A.2 Many of the College’s existing irrigation systems are connected to a non-potable water system. This system shall be identified with purple markings. This system is the preferred irrigation water supply. The Design Consultant shall ensure that no cross-connections are made between old and new systems.

B. Irrigation Systems.
B.1. All sprinkler systems shall be automatic. All systems components of the same function shall be a uniform brand.

B.2. All irrigation systems will be provided with a backflow preventer at the source connection.

B.3. Avoid slopes greater than thirty (30) degrees.

B.4. Plant materials of differing watering requirements shall not be serviced by the same valve. In no case shall turf be on the same valve as any other plant material.

C. Planting.

C.1. Planting adjacent to curb cuts and the entrance or exit of roadways, parking lots or pedestrian areas, shall be designed to provide clear visibility for persons leaving or entering the vehicular area. Verify allowable heights with the City of Tucson landscaping and traffic ordinances.

C.2. When used, only sodded turf will be allowed; turf should be kept to a minimum.

C.3. Plant selections and all landscaping shall conform with the Southern Arizona Water Resources Association (SAWRA) plants material listing. Any proposed plants not included in this listing must be approved by the Job Coordinator.

C.4. Where possible, street trees at medians or along roads should be kept at a minimum of six feet (6') from the curb to facilitate street sweeping and minimize curb damage. Provide eighteen inches (18") deep minimum, root barriers whenever trees are less than six feet (6') from curbs or hardscaped elements.

C.5. Large shrubs and trees shall be selected and located around buildings in a way compatible with accepted standards of solar exposure and energy efficient design.

C.6. Plants shall not block or cover building security lighting.

C.7. The following plant types should be avoided:

C.7.1 Plants having invasive surface root systems near underground utilities, building foundations and lawn areas.

C.7.2. Plants unduly prone to disease.

C.7.3. Plants with incompatible water requirements from existing landscaped areas.

C.7.4. Plants particularly active in fruit, pollen or leaf fall, except as otherwise approved by the Job Coordinator.

C.7.5. Plants known to have particularly brittle structures.

2800.2 Products and Materials
A. Related Work

A.1 Contractor shall provide a color-coded map of valve areas showing coverage of each valve under control, numbered and labeled to correspond with a controller setting. This map shall be created from a reduced print of the as-built drawings. Copies of this map, sealed in plastic, must be placed in each controller cabinet.

B. Irrigation System Materials and Equipment

B.1 The College preference is for drip irrigation systems for all trees and shrubs, rather than any other irrigation type. The following guidelines apply to all irrigation systems:

B.2. Pipe and pipe fittings.

B.2.1. All PVC piping for non potable water shall be purple in color.

B.2.2. All mains or pipes sustaining static pressure shall be PVC #1220, 315 psi or schedule 40 whichever pressure rating is greater.

B.2.3. All laterals shall be #1200, 200 psi or greater pressure rating.

B.2.4. All fittings and risers shall be PVC unless otherwise approved by the Job Coordinator.

B.3 Valves.

B.3.1. All remote control valves shall have a flow control handle adjustable by valve key.

B.3.2. Gate valves shall be enclosed in a box with extensions as required. Contractor is required to supply valve key to shut-off valves.

B.3.3. All valves must have the means to activate manually.

B.4 Wiring.

B.4.1. All wiring shall be #14 U.F. unless larger conductors are necessary for specific cases.

B.4.2. White wire only shall be used exclusively for the common wiring. All other wiring shall be a continuous color for each valve.

B.5 Sprinkler Heads: All Lawn Heads shall adjust vertically by mechanical means only

2800.3 Execution and Performance

A. Irrigation Systems Installation
A.1 Trenching and Backfill.

A.1.1. All main lines shall be buried at a minimum of eighteen inches (18") and shall be covered with sand to six inches (6") above main.

A.1.2. Laterals shall be buried a minimum of twelve inches (12") for spray heads and roots.

B. Piping Installation.

B.1. All piping under concrete, asphalt or other hard surface shall be cased loosely in larger-sized piping with at least six inches (6") protruding from the sleeve before any fittings are attached. The earth shall be compacted under the piping where it extends from the sleeve.

B.2. All fittings shall have at least two inch (2") clearance from other pipes or fittings.

B.3. Provide tracer wire over the main lines. The end of the wire shall terminate in a valve box or above grade.

C. Valve Installation.

C.1. All remote control valves shall be installed in large rectangular plastic boxes flush to grade unless there is a special need for sub-surface installation. In this case, valve markers shall be used with access to the flow control handle.

D. Sprinkler Heads Installation.

D.1. Sprinkler heads of different precipitation rates shall not be valved together.

D.2. Shrub heads located along pathways or traffic areas shall be the type that retract to ground level when watering is completed.

D.3. All shrub, ground cover and lawn heads shall be spaced so as to spray from head to head at a minimum. The preferred coverage is 1.25 to 1.5 times spacing.

E. Wiring and Splicing.

E.1. Wiring shall be run in the piping trenches and to one side of the main. All wiring under hardscaped areas must be sleeved.

E.2. Each wire shall have an excess of two feet (2') coiled in the valve box.

E.3. One spare wire shall be laid so that it enters and leaves every valve box. The spare shall be labeled as such.

E.4. No splices shall be directly buried. All splices shall be made within splice or valve boxes.

E.5. All splices shall be waterproofed.
2800.4 Planting

A. General

A.1. All five (5) to fifteen (15) gallon trees shall be double staked.

A.2. Tree planting in sidewalks, curbs, malls, or anywhere that roots are covered by hard surfaces, shall be in accordance with the following specifications:

A.2.1. Excavation. Do not undermine existing facilities. Tree wells located in sidewalks shall have the top of their root ball four inches (4”) minimum below the sidewalk surface.

A.2.2. Staking. Drive two (2) eight foot by two inch (8’ x 2”) diameter lodge pole pine stakes treated with copper napthanate, eighteen inches (18”) into undisturbed soil. Fasten tree to stakes with a minimum of two (2) solid rubber strips at one-third (1/3) and one-half (1/2) the height of the tree. Tree ties shall have no internal wire. There shall be no wire around any part of the tree to avoid girdling. When using guy wires, they shall be inserted into white plastic tubing or piping for better visibility and safety.

2800.5 Cleaning

A. General.

A.1. All areas included in the limits of the work indicated on the drawings shall be completely cleaned before the Substantial Completion inspection.

A.2. All debris, rocks and foreign materials shall be removed from the site and hauled away. All paved areas shall be thoroughly washed. This level of cleanliness shall be maintained throughout the maintenance period.

2800.6 Maintenance and Guarantee Period

A. Maintenance Period. The maintenance and guarantee requirements described herein apply to all planting(s) and irrigation system(s).

A.1. Maintenance, as described in A.2 below, shall start immediately upon Substantial Completion. It shall continue for one (1) year until final acceptance of the entire planting work. On small projects this maintenance period can be reduced to six (6) months if approved by the Job Coordinator.

A.2. Maintenance shall include watering of all plants. Planting shall be kept in healthy, growing condition, or replaced as necessary, until acceptance of plantings at the time of final inspection. Newly planted trees shall be pruned and all dead branches removed. Root stock shoots from grafted material shall be removed.

A.3. The final inspection shall be held at the conclusion of the maintenance period. Prior to being considered ready for final inspection, the Contractor shall have done a final weeding and raking of all planting areas; plant basins shall be repaired if necessary and
the jobsite cleared of all debris. The College shall be notified of this inspection request at least ten (10) working days before the anticipated date. It is the Contractor’s responsibility to maintain all plant material until notification of final acceptance by the College. The College shall not accept the work until all construction and plantings have been completed in accordance with the Contract Documents and the specifications and guidelines included herein.

B. Guarantee. The Contractor shall guarantee all plantings for one (1) year beyond completion of the maintenance period and respond within two (2) weeks of written requests by the College for replacement. If the Contractor fails to respond within this time frame, the College may proceed with correction and/or replacement work at the expense of the Contractor.

2830 Fences and Gates

All chain link fencing and gates shall be made of 9 gauge, 2" weave with Class 2 hot-dipped galvanized wiring minimum. All posts and rails shall be of at least Schedule 40 hot-dipped galvanized piping or high-tensile galvanized steel piping.

Division 3. Concrete

3346 Exterior Concrete Floors.

A. Any colored exterior concrete paving shall have integral coloring. Contractor shall provide integral concrete color manufacturer name, address and telephone number as well as mix specification(s) and any other formula or special designation upon completion of the work as per PART I 2.7.2 C.

B. No hardscaping or paving concrete shall be painted except for traffic/parking control striping.

C. Control joints in exposed flat work shall be tooled with a 1/4" radius tool with a narrow groove (approximately 1/8" wide) made by a deep bit groover such as manufactured by Goldblatt Tool Company Model 06215M7.

D. All exterior concrete paving shall have slip-resistant finish(es) such as light or medium broom. Verify finish with the Facilities Planning Project Manager.

E. For exterior stairways and ramps, concrete finish shall include slip-resistant aggregates (Carbolon Silicon carbide, Exolon Co.) Stair threads and exterior ramps shall be finished in smooth sweat finish. Apply distribution of 10% uniformly exposed non slip aggregate scoring at edges.

Division 4. Masonry

(This Section not used)
Division 5.  *Metals*

5500  Special Metal Fabrications

- Metal shims for columns must be spot welded to prevent shifting during construction.

Division 6.  *Wood and Plastics*

6200  Finish Carpentry

- In remodeling jobs, all finish carpentry must match adjacent surfaces unless otherwise approved by the Facilities Planning Project Manager.

6400  Custom Casework

A. The length of cabinet counter tops must be limited to twelve feet (12’) to avoid seams. No butt seams will be allowed in counter tops. If overall countertop length must exceed twelve feet (12’) a definite break in the surface must be provided.

B. Use modular sizes throughout. Consult with the Project Manager for standards.

C. Use concealed face frame hinges on all cabinetry. Approved brand: Blum.

D. Use aluminum finish wire pulls on all cabinetry doors.

Division 7.  *Thermal and Moisture Protection.*

7500  Built-up and Membrane Roofing

A. The College has developed a built-up roofing specification which will be made available for reference purposes. This standard specification outlines the College’s preferred system.

B. All roofing must have a manufacturer’s twenty (20) year warranty. The roofing manufacturer is required to inspect the system’s installation and certify in writing that the installation was done in accordance with its recommendations. The roofing contractor must provide a two (2) year workmanship/installation warranty. In addition, the roofing manufacturer must provide the following maintenance inspections:

   B.1. One (1) inspection, six (6) months after Substantial Completion.
   B.2. One (1) inspection, one (1) year after Substantial Completion.
   B.3. One (1) inspection every six (6) months thereafter for a period of four (4) years, to a total of ten (10) visits during the first five (5) years of occupancy. The results of each inspection must be documented in writing to develop a reliable roof history.
7700 Roofing Specialties

A. Particular attention shall be paid to roof edges as they meet parapets and/or vertical surfaces, because that is where most leaks develop.

B. All roofing shall have deck pads from determined roof access point(s) to all serviceable roof top mounted units. Roof plans for the 50% and 100% Construction Documents Submittals must clearly show these traffic grilles or pads location, including width and length.

C. Provide roof access to different height roofs and over demising wall parapets.

7800 Skylights

Skylights should be avoided in all Pima Community College facilities. Designer must prove weatherability and leak resistance of system. If and when used, they must include guardrails per OSHA requirements.

Division 8 Doors Windows and Glass

8100 Steel Doors and Frames

A. All frames to be fully welded; knock-down frames are not permitted. Provide floor anchors always; ramset fastening is not permitted.

B. All typical and special frame conditions shall be illustrated on the drawings.

8200 Wood Doors and Frames

A. No wood frames are permitted anywhere in Pima Community College facilities.

B. The Design Consultant shall require shop drawings of all wood doors to be submitted for approval. A cross-section sample of typical solid core doors shall also be submitted for review and approval. This cross-section sample(s) will be construed to be sample standards for all doors on the project.

C. Wood doors require a lifetime Certificate of Guarantee to be delivered to the College during the Project Closeout as per Section 2.7.2 C. The Guarantee shall cover rehanging and finishing costs as well as all services originally provided by the manufacturer if deficiencies are uncovered during the guarantee period.

D. Wood doors shall be flush, 1.75" thick solid core with stiles and top rails minimum six inches (6") wide where glass panels or vision lites are installed.

8300 Glass, Overhead and Folding Doors.

A. Avoid pivot hinges and floor closers on all glass/storefront doors.

B. See 8700 A7 and B3 for hardware restrictions
8305 Access Doors

A. All access doors shall be metal and rated as required. Provide access doors to attics, roofs, crawl spaces, tunnels and similar areas where the College's personnel must have access for maintenance or repair activities.

B. 3x3 access doors must accept Adams-Rite lock or equivalent, compatible with ASSA mortise/rim lock cylinder on the outside and thumb-turn on the inside.

C. Hatched to roofs, etc. shall provide for a hasp to accept a padlock.

8500 Windows

A. Double insulated glazing is required on all exterior windows. Whenever possible, interior glazing is preferred for ease of glass replacement.

B. No wood windows are allowed. Only steel or aluminum windows shall be specified.

C. Operable windows are desired by the College wherever possible. When and where operable windows are proposed, a careful evaluation must be made of the balancing implications of the HVAC system. The Project Manager must be informed of the results of this evaluation.

D. All pre-finished windows shall have protective coverings during construction.

E. Cut sheets for all proposed window types shall be included in the 100% Design Development Submittal for approval prior to commencing Construction Documents. Shop drawings shall require test results for water and air infiltration and certification that the windows meet the requirements of the Steel Window Institute or the Aluminum Window Institute.

8700 Hardware

A. General.

A.1 Finish Hardware shall include all hardware required for a fully functioning, secure installation for all swing, sliding, and folding doors, except special unique and non matching hardware specified in the same section as doors and frames, and for all architectural millwork. Exterior applications shall provide for weatherproof installation.

A.2 If existing hardware does not conform to the approved manufacturer(s) and model(s) outlined in this section, install hardware types specified herein.

A.3 A complete Hardware Schedule shall be provided to the Pima Community College Facilities Planning Department with the 50% Construction Documents Submittal. The Hardware Schedule shall provide the following information: Door Schedule, including door type(s); door locking hardware, including finishes, make, model number, duty level.
(medium or heavy duty), and function/use designation (classroom, storage, office, etc.) of each hardware item. Also, the Design Consultant must provide a complete set of catalog cut sheets for all specified hardware devices with the submittal.

**A.4** The Hardware specifications shall include a statement to the effect that the supplier of finish hardware is responsible to provide all items necessary for a complete and properly functioning installation, including mounting hardware, excluding cylinders. Scope of work shall include installation by contractor.

**A.5** All double-doors openings will fall under one of the three categories below and will be subject to the specific standards for each category. Double door configurations are applicable only to practical uses such as required opening width for fire egress or where very large items must pass through. They will not be used for aesthetic purposes.

**A.5.1** RHRB double-door openings shall have a removable mullion (Precision Hardware No. 811, 822 or FL 822 see section B.3). The openings shall utilize surface-mounted (rim) exit devices, which shall latch at the mullion.

**A.5.2** RHRB double-door openings without a mullion will be utilized only when there is a justified need, approved by the job coordinator, to routinely pass very large objects through them. These openings shall use surface mounted vertical rod exit devices that will latch at the base and top of the opening for each of the doors. Base latch shall be D1200 (See section B.3).

**A.5.3** When an exit device is not possible, only manually operated flush-bolts or surface mounted bolts at the top and bottom of the inactive door shall be used. The door shall use a heavy-duty lockset or a heavy-duty deadbolt if the active door needs to have a retractable latch. The lockset will latch to a strike mounted on the inactive door.

**A.6** No lock cylinders will be allowed at the base or at the head of any door. This includes aluminum and glass entrance or storefront doors. No narrow-stile type exit devices will be used.

**A.7** Keyed switches in elevators, control panels, access panels or in built in cabinets shall not have any restricted keyblank types. Keyblanks types shall be readily obtained from locksmith supply sources.

**A.8** Provide closers **only** on rated doors, exterior doors, washroom doors, or as required by user function. Consider magnetic hold opens where function will require frequent opening or need for "welcoming."
B. Products

B.1 Locksets. Contractor shall install all locksets and test doors for proper latching. If door warpage, silencers, gaskets or smoke/sound insulators mounted on the door frame prevent the unit from latching properly, the Contractor will take proper measures to correct the problem. Locksets shall be as follows:

- "Arrow" brand, cylindrical type as follows
  - **H-17** shall be used on all outside public entrances, public restrooms, classrooms, labs, testing rooms, study rooms, etc which do not have exit devices or automatic openers
  - **H-11** shall be used on all office suite entrances, student and staff service offices, administrative offices and other high use office doors.
  - **H-12** shall be used on mechanical rooms, IDF rooms, large storage rooms, custodial closets, and other rooms with high daily use.
  - **H-02** shall be used on all single occupant restrooms.
  - **M-11** shall be used on faculty offices and other offices with the lowest levels of daily use.
  - **M-12** shall be used on small storage closets and other areas with the lowest levels of daily use.

- All locksets shall have lever handles: "Sierra" (SR) design.

- Finish to be: US 26D, BHMA-626, satin chrome.

- Lockset backset to be two and three-quarter inches (2.75”). All dimensions must conform to the American National Standards Institute (ANSI) specifications.

- All locksets must be ordered without the cylinder. The locksets' cylinders will be "ASSA" Key-in-knob (65691) and shall be supplied and installed by the College's Locksmith Shop upon occupancy. The contractor shall provide his own lockset cylinders and keys for security reasons during construction.

- No interchangeable core (IC) locksets will be accepted.

- Built-in cabinetry locks to be "National" brand with wafer disc or pin tumbler, as required.

- All keys provided with these locks shall be turned over to the Job Coordinator prior to building occupancy for safekeeping and key file establishment at the Locksmith's Shop.

- Final keying is the responsibility of the College's Operations and Maintenance Department
B.2 Deadbolts. All deadbolts shall have a thumbturn on the inside.

- Deadbolts shall be installed only on doors with a latch that must remain retracted enabling the door to be opened automatically by a push button for handicapped access and where an exit device with a retractable latch cannot be installed, such as on inward opening doors (RH or LH). No other uses for dead bolts are permitted.

- Provide "Arrow" brand deadbolt D60 series as follows: shall be.
  - D64 on public restroom doors that use automatic door openers
  - D61 on office suites that open inward (RH and LH) and which use an automatic door opener.

- All deadbolts shall have a thumb-turn on the inside

- Finish to be: US 26D, BHMA-626, satin chrome.

- Deadbolt backset to be two and three-quarters inches (2.75").

B.3 Exit Devices.

- Exit devices to be "Precision" "Apex" Series hardware as follows:
  - 1108 or F-1108 shall be used on all double doors with removable mullions
  - 811 or FL-822
  - 1108 or FL-1108 shall be used on all single doors
  - D1208 or FL-1208 shall be used only with approval of the job coordinator.

- Finish to be: US 26D, BHMA-626, satin chrome.
- Provide trim Number 9L. (Lever handles.)

- 1108 and D1208 shall be standard 1/4 turn Allen type dogging standard.

B.4 Door Closers and Opening Devices. Through bolts shall always be specified for all door closers.

- All door closers to be "LCN" brand models 4040 DEL, 4041 DEL or 1461 DEL as required. All door closers shall have the delayed (DEL) function incorporated within.

- Finish to be: Aluminum.

- Automatic devices to assist in opening doors shall be wireless, push plate activated. Walkway pads or assist devices activated on each swing of the door(s) are not allowed. Do not use power-assisted door operators

8960 Sloped Glazing Systems

- Sloped glazing systems should be avoided throughout the Pima Community college campuses.
8970 Suspended Glazing Systems

- Suspended glazing systems should be avoided throughout the Pima Community college campuses.

**Division 9  Finishes**

9200 Drywall, Lath and Plaster

- Drywall texture. The College's standard drywall finish texture is light or medium rolled on "orange peel," no other finish will be allowed unless specifically approved by the Project Manager.

- Plaster finish. No sand finish plaster shall be used.

9300 Tile

- No porcelain tile to be used.

- All tile grout must be sealed to avoid discoloration.

- Provide integral colored grout in toilet rooms. Avoid white or light colored grouts.

- Verify surplus quantity(ies) with the Job Coordinator.

9511 Suspended Acoustical Ceilings

- Non rated suspended acoustical tile ceilings need to be different and easily identifiable by visual inspection from rated suspended acoustical tile ceilings.

- Surplus/extra stock. Extra stock shall be provided from the same manufactured lot as the materials installed and enclosed in protective packaging with appropriate identifying labels. Verify quantity(ies) with the Job Coordinator.

9635 Brick Flooring

- All brick flooring shall be sealed with an epoxy, oil modified urethane or water-based urethane seal.

- Verify surplus quantity(ies) with the Job Coordinator.

9680 Carpeting.

**A. General**

A.1 The College has developed a comprehensive carpeting specification which will be made available to the Design Consultant. All areas to be carpeted shall be carpet tiles installed using a repositionable adhesive. All materials must be from the same manufacturer, production run and dye lot.
A.2. Maintenance quantity(ies): Minimum of two cases or 10% which ever is greater.

B. Minimum Product Requirements

B.1. Carpet Material and Construction. The following specification is intended to establish the minimum standard of quality desired by the College. Any substitution or deviation from these standards must meet or exceed, without exception, all performance requirements.

B.2. Carpet Color:

- Color shall be selected by the Design Consultant from manufacturer's standard mid-tone colors for a simple tweed pattern. The pile yarn shall be composed of three different colors: a light shade, a medium shade and a dark shade. These three colors can be in the same color tones, such as beige, brown and cocoa, or they can be in contrasting colors, as long as they are light, medium and dark.

9700 Resilient and Vinyl Flooring

A. General

A.1 Only first quality resilient flooring, applied in strict accordance with the manufacturer's latest specifications shall be furnished and installed. Verify surplus quantity(ies) with the Job Coordinator.

A.2 The College has developed a comprehensive resilient flooring specification which will be made available to the Design Consultant.

B. Installation and Execution

B.1 Subflooring Leveling and/or Patching. Do not use gypsum-based products for filling cracks and/or subflooring depressions. Only epoxy or Portland cement products are acceptable.

9900 Painting

A. General Requirements

A.1 Complete paint specifications must be submitted during the 50% Construction Documents submittal for approval. All colors must be approved by the Facilities Planning Job Coordinator before incorporation in the Construction Documents.

A.2 Avoid all dark paint colors for interior painted surfaces. No dark paint colors will be allowed on any exterior surfaces.

A.3 No interior flat paints are to be used. Use only low-sheen, semi-gloss or gloss enamel paint.
A.4 Contractor shall prepare and submit 8.5" x 11" sample drywall boards with samples of each color to be applied to interior surfaces. These boards shall have the approved texture(s) and/or finish(es) specified in each case. The prime coat and the intermediate coat for each color shall be tinted to a slight color variation from each other and from the final coat for field application verification by the Job Coordinator.

A.5 Contractor shall provide two (2) four by four feet (4' x 4') exterior painted surface panels for approval. These panels shall each have a sample of each paint coat to be applied to the surface as per the Design Consultant's specifications. The prime coat and the intermediate coat shall be tinted to a slight color variation from each other and from the final coat for field application verification by the Job Coordinator.

A.6 For natural and stained finishes, provide sample on each type and quality of wood used on the project.

A.7 Submit the manufacturer's technical product data information, stating the material composition and analysis and the Material Safety Data Sheet (MSDS) on all paint to be used.

A.8 At the completion of the job, using paint from the maintenance stock containers, the painting contractor shall paint a 12" diameter patch on a wall matching the paint sample color used. This procedure shall be done in the presence of the Job Coordinator. If the color and sheen matches are approved, the painting contractor shall deliver two (2) gallons of each paint color to be used to the Owner as per 2.7.2 B for definitive maintenance stock supply.

B. Minimum Construction Standards

B.1 All work where a coat of material has been applied, must be inspected and approved by the Job Coordinator before application of the following coat.

B.2 All visible interior surfaces of ducts at diffusers or air vents servicing rooms must be painted flat black.

C. Protection

C.1 Do not store thinners or any flammable materials in buildings.

C.2 The painting contractor shall protect surfaces and objects inside and outside the building as well as the grounds, lawns, shrubbery and adjacent properties against damage.

C.3 Protect floors and all adjacent surfaces from paint smears, spatters and droppings. Use drop cloths to protect floors. Cover all fixtures not to be painted carefully. Mask off areas where required.

C.4 Protect surfaces, equipment and fixtures from damage resulting from the use of mixed, moveable and hanging scaffolding, planking and staging.
C.5 No lacquering shall be done inside buildings while occupied by the College's staff or students, even if on a different floor. No lacquering shall be done near fresh air intakes under any circumstances.

D. Standard Paint Specifications

D.1. Interior Acrylic Enamel, Low Sheen. The composition of the material shall conform to the following:

- Pigment: to be no less than 35% and titanium dioxide to be no less than 18% of pigment by weight.
- Vehicle: to be no less than 63% and vinyl resin to be no less than 20% of vehicle by weight. Gloss level to be no less than 5% or more than 9% using Garder Gloss Meter after air dry for seven (7) days.
- Note: total pigment and vehicle to equal 100% of direct composition method.
- Thickness: 1.5 dry mils.

D.2. Interior Acrylic Enamel, Semi-Gloss. The composition of the material shall conform to the following:

- Pigment: to be no less than 20% and titanium dioxide to be no less than 20% of pigment by weight.
- Vehicle: to be no less than 78% and vinyl resin to be no less than 24% of vehicle by weight. Gloss level to be no less than 49% or more than 61% using Garder Gloss Meter after air dry for seven (7) days.
- Note: total pigment and vehicle to equal 100% of direct composition method.
- Thickness: 1.5 dry mils.

D.3. Interior Alkyd Enamel, Semi-Gloss. The composition of the material shall conform to the following:

- Pigment: to be no less than 43% and titanium dioxide to be no less than 22% of pigment by weight.
- Vehicle: to be no less than 70% and vinyl resin to be no less than 26% of vehicle by weight.
- Gloss level to be no less than 50% or more than 60% using Garder Gloss Meter after air dry for fourteen (14) days.
- Note: total pigment and vehicle to equal 100% of direct composition method.
- Thickness: 1.5 dry mils.

D.4. Exterior Alkyd Enamel Gloss. The composition of the material shall meet or exceed the following:

- Pigment: to be no less than 27% and titanium dioxide to be no less than 25% of pigment by weight.
- Vehicle: to be no less than 73% and vinyl resin to be no less than 37% of vehicle by weight.
- Gloss level to be no less than 85-90% using Garder Gloss Meter after air dry for fourteen (14) days.
- Note: total pigment and vehicle to equal 100% of direct composition method.
D.5. 100% Acrylic Exterior Flat. The composition of the material shall conform to the following:

- Pigment: to be no less than 28% and titanium dioxide to be no less than 19% of pigment by weight.
- Vehicle: to be no less than 70% and acrylic resin to be no less than 16% of vehicle by weight.
- Note: total pigment and vehicle to equal 100% of direct composition method.
- Thickness: 1.5 dry mils.

D.6. 100% Acrylic Exterior Semi-gloss Enamel. The composition of the material shall meet or exceed the following:

- Pigment: to be no less than 23% and titanium dioxide to be no less than 24% of pigment by weight.
- Vehicle: to be no less than 75% and acrylic resin to be no less than 20% of vehicle by weight.
- Note: total pigment and vehicle to equal 100% of direct composition method.
- Thickness: 1.5 dry mils.

D.7. Traffic Paint (White). The composition of the material shall conform to the following:

- Pigment: to be no less than 38% and titanium dioxide to be no less than 14% of pigment by weight.
- Vehicle: to be no less than 60% and acrylic resin to be no less than 15% of vehicle by weight.
- Note: total pigment and vehicle to equal 100% of direct composition method.
- Thickness: 1.5 dry mils.

The College may elect to use traffic vinyl reflective pavement tape in lieu of, or in addition to, traffic paint. Verify requirements with the Job Coordinator.

9990 Adhesives

- All adhesives used in carpeting, tile, resilient flooring and base shall be approved by the flooring product manufacturer and applied as per the manufacturer's recommendations.

- Specified adhesives shall have minimal volatile organic chemical (VOC)-releasing characteristics. Verify with information available from the flooring product(s) manufacturer.

Division 10 Specialties

10160 Toilet Compartments and Urinal Screens
Plastic laminate on particle board toilet compartments and urinal screens are not permitted. The College prefers metal toilet partitions and doors.

Toilet partitions shall not be ceiling mounted. Specify floor mounted, overhead-braced, units only. Urinal screens shall be wall mounted.

Toilet partitions' and urinal screens' finishes shall be graffiti resistant.

Toilet partitions' and urinal screens' colors shall be light in color. All dark colors shall be avoided.

**10350 Flagpoles.**

Flagpoles must be considered and/or included in all new facilities. Verify specific requirement(s) and location with the Facilities Planning Project Manager.

Flagpoles to be anodized aluminum.

**10400 Signage and Graphics**

All exterior signage must be reviewed and approved by the College's Director of Media Productions. Refer to **PART I** Section 2.2.1 F. Unless otherwise stipulated, interior signage is not included in the Design Consultant's scope of work.

**10522 Fire Extinguishers.**

All fire extinguishers shall be placed in fully recessed cabinets. Refer to **PART I** Section 2.2.3 for acoustical implications.

**10800 Toilet and Bath Accessories**

**A. General**

**A.1** The College will provide and install the toilet accessories specified in subsection **B** below. Under no circumstances shall undercounter mounted soap dispensers be considered or specified.

**A.2** The Construction Documents shall show all toilet accessories and their placement in accordance with the sizes and proportions given in subsection **B** for the purposes of locating anchors and/or backing. The items listed in subsection **B**, however, shall be clearly marked as Not in Contract (N.I.C.) in the plans and specifications.

**A.3** No recessed or semi-recessed toilet paper, sanitary napkins or paper towel disposal units are acceptable. Only surface mounted units shall be considered.

**B. Products**

**B.1** The College shall provide and install the toilet accessories listed in B.1.1 through B.1.6. Each item shall be shown in the plans with the sizes shown in parentheses as follows: (Height (H):, Width (W):, and Depth (D):)
B.1.1 Soap Dispensers (H: 12", W: 6", D: 5") Avoid under all circumstances showing these dispensers mounted on mirrors.

B.1.2 Roll Towel Dispensers (H: 12", W: 12", D: 10")

B.1.3 Paper Towel Disposal: free standing plastic trash can 15" diameter, 28" high.

B.1.4 Toilet Paper Dispenser: 15" diameter, 4" deep.

B.1.5 Feminine Napkin Dispenser (H: 27", W: 10", D: 7") Wall mounted.

B.1.6 Feminine Napkin Disposal (H: 11", W: 8", D: 5") Wall mounted.

B.1.7 Disposable Toilet Seat Covers (H: 12", W: 16", D: 3") Wall mounted.

B.2 All mirrors shall have stainless steel purse shelf.

B.3 Grab bars in handicapped toilets shall be provided and installed by the Contractor.

Division 11  Equipment

11000 Instructional Spaces Equipment.

- All fixed equipment and special mounting brackets for educational components, must be installed by the contractor.

11160 Loading/Unloading Dock Equipment.

- All building projects must satisfy the need or verify the availability of off-street loading/unloading zone(s) and/or loading dock equipment as part of the Construction Contract. Specific requirements must be verified with the Job Coordinator. Refer to PART I Section 2.2.8.

11172 Dumpsters and Waste Compactors

- All building projects must provide an area specifically designated for waste, trash and recycling containers if no existing waste disposal area can be used for these purposes. This area must be carefully screened from public view, but easily accessible for collection and/or disposal operations. Specific requirements must be verified with the Job Coordinator.

11400 Food Service Equipment

A. All food service equipment must be coordinated with the College's food service vendor. Verify requirements and implications with the Facilities Project Manager prior to involving any specialized food service consultant or equipment supplier.
B. All food service equipment shall be provided with a backflow prevention device.

C. Carbonated beverage dispensers shall include a reduced pressure backflow assembly.

**Division 12  Furnishings**

**12100** Instructional Spaces Furnishings

- Unless otherwise stipulated in the Design Consultant's scope of work, all instructional furnishings will be specified by the Design Consultant and bid by the College. The bid package includes boilerplate instructions to bidders including installation. The Design Consultant is expected to review these documents to become familiar with the College's bidding procedures as well as the scope and extent of the Furnishings, Fixtures and Equipment (FF&E) bid package.

- All fixed equipment is to be installed by the Contractor.

**12400** Office Furnishings.

A. Standard Systems Furniture is Steelcase 9000; or Herman Miller. Match the prevailing system in the facility.

B. The Design Consultant shall meet with the College's Procurement Department to clarify the scope and extent of the FF&E bid package.

C. Don't "Box-in" systems furniture with walls on all sides.

D. Coordinate power and data outlets with system requirements.

**12500** Louvers, Blinds and Drapery

A. General

A.1 All window louvers and blinds shall be of commercial grade quality. Window blinds may be included in the construction contract or as part of the Furnishings, Fixtures and Equipment (FF&E) budget. Verify with the Facilities Planning Project Manager for the appropriate method of inclusion in the project.

A.2 Details shall be provided for the proper attachment with backing as required for all louvers and/or blinds. If blinds are to be placed in front of windows, proper clearance for furnishings shall be provided.

B. Products.

B.1 Vertical or horizontal blinds may be specified at the discretion of the Design Consultant. The College's preference is for vertical blinds due to dust control, but building users must be consulted in each case for their preference.

B.2 Overall building appearance shall be taken into consideration when determining the specific type of window covering specified. If a standard has been established,
such standard shall be maintained throughout the facility. In remodeling or addition projects, consistency of window coverings shall be maintained throughout unless specifically approved by the Project Manager.

B.3 If horizontal blinds are selected, use aluminum, commercial-grade mini-blinds.

Division 13  Special Construction

13121 Pre-Engineered Buildings

- The College has developed a portable building specification which should be used for all portable buildings. Such specification is available upon request from the Facilities Planning Department Office.

Division 14  Conveying Systems

14300 Escalators.

- Escalators are not acceptable in any of the Pima Community College campuses.

14400 Stair Lifts.

- Stair lifts are not permitted anywhere in any Pima Community College campus.

Division 15  Mechanical

A. General Requirements

A.1 All mechanical systems chosen for use on the College’s campuses shall consider long-term ownership, and operation and maintenance needs. Systems and construction methods shall be chosen based on a useful life of 30 to 50 years.

A.2 Floor drains with trap primers shall be provided in all restrooms, mechanical rooms, custodial closets, and rooms with water heaters.

A.3 Provide isolation valves to individual restrooms, kitchens, labs, shower rooms, emergency shower station, hose bibs, wall hydrants, and rooms where water heaters are located.

A.4 No water heaters are to be suspended in ceilings or attic spaces, or enclosed in cabinets.

A.5 Provide easy access to all valves for operation and servicing.

A.6 Submittals. Emphasis must be placed on the preliminary phases of the project design process. Deliverables for the Schematic Design submittal shall include the following:
A.6.1 Brief overview of the mechanical system recommended with justification(s) for recommendation. Also, a brief overview of the alternative methods considered must be included, stating the reason why each alternative was not selected.

A.6.2 Overview of compliance with regulatory agencies.

A.6.3 Mechanical system energy requirements.

A.6.4 Drawings indicating the proposed mechanical systems, utility connections, air distribution, piping and control systems.

A.6.5 Equipment room(s) and mechanical chase(s) sizes.

A.6.6 Statement of probable construction cost(s) for all mechanical equipments based on the data provided above.

A.7 All equipment to be fully BACNET compatible.

Submittal at the 100% Design Development phase shall include further completion and development of all items included above, plus catalog cut sheets of all plumbing fixtures. This submittal shall also include design calculations and assumptions for commissioning procedures.

Submittal at the 50% Construction Documents phase shall include further completion and development of all items previously submitted plus catalog cut sheets and full specifications of all ductwork, piping, valves and plumbing or mechanical systems specialties for final review and approval. No items shall be submitted with the 100% Construction Documents submittal (Bid Set) which have not been previously approved by the College.

A.8 Operation and Maintenance Manuals. Provide two (2) complete sets of operating and maintenance manuals for all mechanical systems and applications bound in hard cover and fully indexed. The data included must list all materials and products installed. Refer to PART I Section 2.7.2 for specific procedures.

All Operation and Maintenance Manuals shall include the following:

A.8.1 Complete operating instructions and cut sheet with parts breakdown for each item of ventilation and plumbing equipment.

A.8.2 Test data and air balancing reports as specified.

A.8.3 All HVAC equipment and systems manuals shall include the equipment name plate data, model and serial number.

A.8.4 Typewritten maintenance instructions for each item of equipment, listing in detail the lubricants to be used, frequency of lubrication, inspections required, adjustments, etc.
A.8.5 Manufacturer's bulletins with parts, numbers and instructions for each equipment item for stripping and assembling.

A.8.6 Temperature control diagrams and literature.

A.8.7 A complete list or schedule of all valves giving the number of the valve, its function, location and the rooms or area(s) controlled by it. Identify each valve with a permanently attached metal tag stamped with a number matching the valve schedule.

A.9 System(s) Testing. Refer to Division 1, Section 1400, Commissioning guidelines.

15060 Pipes and Pipe Fittings

A. Pipe and Fittings. The following applies to all pipes and pipe fittings throughout the College's campuses.

A.1 All piping and fittings shall be Domestic products or comply with Domestic standards.

A.2 Building drains shall be as follows: for two (2) stories or less: ABS pipe, Schedule 40. For three (3) stories or more: hubless cast iron.

A.3 Building sewer/rainwater piping to be ABS Schedule 40 with tracer wire for ease of underground location. See Division 2, Section 2115.

A.4 Vent piping to be as follows: for two (2) stories or less: ABS pipe, Schedule 40. For three (3) stories or more: hubless cast iron.

A.5 Domestic water piping. Interior: Type L hard drawn to 4". Underground: Type K. Exterior: 2.5" and smaller, PVC Schedule 40; 3" and larger, C-900 Plastic. All underground piping shall be provided with tracer wire as per Section 2115.

A.6 Natural Gas piping. Underground piping: black Schedule 40 with Scotch coating #202 and with tracer wire as per Section 2115. Above ground: black Schedule 40, to be painted to A.C.C. specifications. Discard all shipping couplings and replace accordingly.

A.7 Compressed Air: Type L, copper piping.

B. Joints. The following applies to all piping joints throughout the College's campuses. All jointing material shall be applied to industry standards.

B.1 For all ABS, Schedule 40: UPC approved adhesive, applied per industry standards.

B.2 For hubless cast iron: UPC approved S.S. hubless coupling, applied per industry standards.
B.3 For copper. Above ground: UPC approved 95/5 lead-free solder, applied to industry standards. Below ground: brazed silver solder, applied per industry standards with lead-free solder flux.

B.4 For PVC Schedule 40: UPC approved adhesive applied per industry standards.

B.5 For PVC C-900: by manufacturer's specifications.

B.6 Black steel, Schedule 40: for 2.5" and smaller, joints shall be threaded and installed to industry standards. For 3" and larger, joints shall be welded per industry standards.

B.7 For Natural Gas, Schedule 40: for 2.5" and smaller, joints shall be threaded with AGA approved Teflon tape. For 3" and larger, joints shall be welded per industry standards.

15100 Valves, Cleanouts and specialties

A. Valves -- All Domestic products; Provide specification for all valves with submittal.

A.1 Valves 2.5" and smaller shall be Full Port, Ball Valve type: Nibco, Apollo or Stockham. All water valves 3" and larger shall be: butterfly, flanged, Nibco, Apollo or Stockham.

A.2 Bronze Check valves shall be Nibco, Apollo or Stockham with resilient seats.

A.3 Gate valves (except for underground mains) 4" and larger shall be: Stockham or Nibco, outside stem and yolk, resilient seat.

A.4 All interior valves to be Full Port ball valves domestic.

A.5 All valves shall have adequate access for servicing, operation, repairs and/or replacement.

A.6 Contractor to supply valve key for all underground valves.

A.7 All valves shall be identified with a permanently attached metal tag stamped with a number matching the valve schedule.

B. Cleanouts and Access

B.1 Urinal cleanouts shall be located above fixtures' flood levels. Cleanout plugs to be easily removable during Commissioning inspection and testing.

B.2 Approved manufacturers: J.R. Smith, Zurn or Wade.

B.3 Floor clean out covers to be easily removed during commissioning.

C. Specialties.
C.1 Temperature and relief valves approved manufacturer: Watts.

C.2 Water shock arresters approved manufacturers: J.R. Smith and Zurn. Provide shut-off valve at each shock arrester to facilitate maintenance.

C.3 Hose bibs and wall hydrants approved manufacturers: Arrowhead and J.R. Smith, with approved vacuum breakers.

C.4 Trap Primers. All floor drains shall have working trap primers with access panel. Provide shut-off valve at each trap primer to facilitate maintenance. Provide one trap primer per floor drain. Do not combine traps in different rooms to one trap primer.

15170 Motors

- All motors shall be high-efficiency motors. Where applicable, all motors used for pumping and air handling shall be controlled by a variable-frequency drive (VFD). All motors controlled by VFD shall be rated by manufacturer as adjustable speed, inverter duty, adjustable frequency, or meet NEMA Standard MG1, part 31.

15200 Insulation

A. General

A.1 All insulation to be installed per manufacturer’s instructions.

B. Pipe Insulation

B.1 Pre-formed, open-cell, melamine foam with color-coded, PVC impregnated jacket for indoor use. Approved manufacturer: TechLite SSL379, or equal.

B.2 Pre-formed, open-cell, melamine foam with semi-rigid PVC jacket with UV inhibitors for outdoor use. Approved manufacturer: TechLite SSL879, or equal.

B.3 Fittings and valves to have pre-formed insulators with jackets from the same material as used on attached piping. Approved manufacturer: TechLite SSL series, or equal.

C. Vessel Insulation

C.1 Open-cell melamine foam sheet stock with .020" PVC jacket containing UV inhibitors. Approved manufacturer: TechLite Type 79 with Type 800 jacket, or equal.

D. Insulated Ducts

D.1 Open-cell melamine foam sheet stock, applied externally. Approved Manufacturer: TechLite Type 79, or equal.

15300 Fire Sprinklers

A. Provide flow switch at riser.
B. Provide two piece escutcheons in all lay-in ceilings which allow simple removal of ceiling tile without manipulation of sprinkler head or piping.

15440 Plumbing Fixtures

The following are the approved manufacturers for all plumbing fixtures to be specified in Pima Community College facilities. All fixtures to be white.

A. Lavatories, Water Closets, Urinals and Bathtubs: American Standard, Kohler or Crane.

B. Stainless steel sinks: Elkay or Just.

C. Lavatories and sinks faucets: Crane, Chicago and Delta. All faucets shall be provided with 2.0 gpm aerators. Faucets for handicapped lavatories shall conform to ADA standards. Where metering faucets are required, provide Delta or Chicago faucets. (See 15400 J.)

D. Flush valves: Sloan Optima auto flush, battery-operated, to conform to ADA standards on all urinals and handicapped water closets. Provide Sloan Royal flush valves on all others.

E. Service sinks: American Standard or Kohler.

F. Mop sinks: Fiat or Floorstone.

G. Mop and service sink faucets: Chicago faucets with approved vacuum breaker, pail hook and internal stops.

H. Showers, Kitchen faucets and laboratory faucets: Chicago faucets with approved vacuum breaker; internal stops where applicable.

I. Electric drinking fountains: Elkay, Halsey Taylor or Haws. Remote chillers shall not be located in ceilings.

J. Water Heaters

J.1. Fifty (50) gallons or less: State, or A.O. Smith, all with approved safety devices. Over fifty (50) gallons: Parker "WH" Series indirect-fired model(s) or equal.

J.2. All hot water piping shall originate from a commercial water heater with a circulating pump. Pumps: Bell Gossett or Taco, all bronze.

J.3. Instantaneous water heaters are not acceptable.

K. Backflow devices and vacuum breakers

K.1. Watts or Febco to meet with the approval of the City of Tucson Water Department. Testing must meet all standards set forth by certified testers. Backflow
preventers shall be installed with provision for thermal expansion where needed. Also, any backflow preventer installed above eight feet (8') shall have a platform to enable testing and repairs by a certified tester. A ladder shall be permanently attached to the building to access the platform per UPC.

**K.2.** Backflow prevention shall have shut off valve on both sides of assembly separator of those on assembly.

**K.3.** Service backflow shall include strainer on supply side

**K.4.** Any equipment connected to potable water must have backflow prevention as required by code. This includes: Beverage machines, coffee dispensing machines, soap/cleaning solution dispensers, lab equipment and dish washers.

**L.** Roof drains, floor drains, carriers and grease traps: J.R. Smith, Zurn or Wade.

**M.** Grease traps shall be located outside of buildings with clean out on discharge side within two feet of trap.

**N.** Angle stops: Eastman with loose key, 1/4 turn stops

**O.** Traps and drain connections: McGuire or T.S. Brass.

**P.** Emergency showers and eye wash units: Haws or Western. Each to have isolating S.O.V. Insulate exterior showers. No floor drains at emergency showers.

**Q.** Water filtering: Cuno Systems, or as otherwise approved by the Operations and Maintenance Department.

**R.** Water treatment: to be approved by the Operations and Maintenance Department on a case-by-case basis.

**15600 Heating, Ventilation and Air Conditioning (HVAC).**

**A.** General

**A.1** Location of all HVAC equipment and controls must be easily accessible for servicing and maintenance activities. Allow a minimum of 36" clearance for operator's access to all equipment, including (specifically) the controls side of variable air volume (VAV) boxes.

**A.2** All selected HVAC units shall be of the highest energy efficiency available.

**A.3** All mechanical equipment rooms are to be fully enclosed and roofed.

**A.4** All condensate drip pans must be piped to drains. Provide legal air gap.

**A.5** Heating Boilers: Parker "T" Series, direct-fired model(s) or approved equal providing unconditional guarantee against thermal shock.
A.6 All roof top equipment shall have a hose bib and 110 V convenience electrical outlet within 30 feet of the equipment.

15700 Cooling Towers/Cooling Package Units.

A. Cooling Towers.

A.1 All mechanical equipment on cooling towers shall be located out of the wet air stream.

A.2 All mechanical equipment must be located and/or positioned so as to be easily serviceable without the use of a crane.

A.3 Make-up water to be protected with back flow preventers that are accessible for maintenance.

B. Cooling Package and Fan Coil Units.

B.1 Approved Manufacturers: Payne, Trane, Rheem, McQuay or York. Rheem units are the first preference for compatibility of spare parts throughout the campuses and for high compatibility and availability of replacement parts.

B.2 Filters: all units shall have filters located at the unit. Roofs are the preferred location. No air filters are to be located inside of classrooms.

B.3. Provide a 115 volt, 15 amp Convenience outlet and a hose bib within 40 feet for maintenance.

B.4 Safety controls: In all cooling package units, the cooling system shall be protected by a fusible plug, high pressure stat, with manual reset, low pressure stat, compressor motor overload, and a timing device which will prohibit the compressor motor from being subjected to a starting current more than once every five (5) minutes.

15800 Evaporative Cooling Units.

- The College prefers non metallic evaporative cooling units. All evaporative cooling units specified are to include a non metallic blower wheel, a fifteen (15) year warranty and shall be of the highest energy-efficient design available.

- Drains and evaporative cooling unit bleeds shall be piped to drain(s).

15900 Ductwork

- No ductwork shall be exposed to the elements.

- All final air delivery devices shall have diffusers.

15970 Energy Management Systems (EMS), Controls and Instrumentation.

- The College has developed an EMS specification which must be considered in all new and/or upgraded facilities mechanical designs. See Appendix E for reference.
- All digital controls shall be seamlessly, interfaceable with CSI Inet 7700 controllers and run on ethernet.

- All controls to be fully BACNET compatible.

- All functions and displays shall be available for remote control at the operator's station.

- Provide full digital controls in all new and/or retrofitted facilities.

15990 Commissioning Guidelines.

- Refer to Division 1, Section 1400 of this document for Commissioning Guidelines.

15995 Operations and Maintenance Training

- Refer to PART I Section 2.7.2 of this document for requirements regarding project closeout, facilities walk-through and Operations and Maintenance training requirements.

Division 16  Electrical

16000 A. General

A.1 All work shall comply with the electrical ordinances of the City of Tucson, Pima County, OSHA, Tucson Electric Power requirements, and with all the requirements of the latest edition of the National Electrical Code. A copy of the latest edition of the National Electrical Code shall be kept at the job site at all times.

A.2 Protection for all material and equipment in storage or installed at the job site is mandatory. Electronic equipment shall be stored in a controlled humidity and temperature environment.

A.3 All damages caused by concrete core/hole cutting, drilling or sawing shall be repaired by the party who caused the damage. Repairs shall be done immediately and to the complete satisfaction of the College or its authorized representative.

A.4 All electrical work shall be inspected and approved by the Job Coordinator and/or the College's Electrical Shop before it is covered.

16100 Conduit

- Provide two (2) 2" diameter empty raceways and boxes between buildings and under all patios, hardscaped areas and outdoor gathering places. Verify requirements and location with the College's electrical supervisor.

- Provide tracer wire in all underground lines per Section 2115.

16120 Wiring and Circuitry
A. Use a separate neutral wire for all convenience outlets and circuits where computers will be connected. Elsewhere, the electrical designer must provide for the possible effects of harmonics on the neutral wire and the transformer. The electrical designer must consider the alternative use of spaces and circuitry since many building or room(s) functions are subject to change over time.

B. When splicing wires in a junction box, the wires must be twisted a minimum of three (3) turns before placing the wire nut on the splice to maintain electrical and mechanical continuity if the wire nut needs to be removed.

C. Circuit Labeling. Each circuit must be labeled at the panel as follows:

- Circuit number/designation.
- Specific use (outlet, lighting, equipment, etc.)
- Room number and location (room 203, E. wall, etc.)
- Circuit labeling shall be typed -- not handwritten.

D. Provide duplex outlets in all hallways and corridors for custodial equipment. Verify location and spacing with the Job Coordinator.

16190 Supporting Devices

- All fixtures and equipment installed or located in suspended ceilings shall be supported by seismic wiring.

16200 Power Generation

A. Except for minor remodelings, all new, remodeled or upgraded facilities shall have an emergency generator. Emergency generators shall run on natural gas unless otherwise approved by the Job Coordinator.

B. Typical fixtures to be connected to emergency generators shall be: exit signage and emergency lighting.

C. Built-in UPS system(s) must be approved by the Job Coordinator.

16400 Service and Distribution

- All main distribution equipment shall have copper buss bars; no aluminum will be allowed.

- All switchboards, motor control centers, disconnects, etc., shall be lockable in the OFF position for compliance with OSHA standard lock/tag out procedures.
16500 Interior Lighting

A. Submittals

A.1 Provide electric fixtures catalog cut sheets for approval with the 100% Design Development submittal. Catalog cut sheets must specify the following:

- Manufacturer and local representative.
- Fixture Model number, size(s)/dimensions.
- Lamp(s) type, wattage, color(s) and finish(es).
- Lenses type(s) and mounting characteristics.
- Unit cost.

B. Products and Materials

B.1 All lighting fixtures shall have energy-efficient electronic ballasts with 32W T8 fluorescent tubes. Color rendition: 3500 Kelvin or (occasionally) 4100 Kelvin.

B.2 All new multimedia and computer classrooms shall be provided with dimmable lighting systems.

16530 Exterior and Site Lighting.

A. Submittals

A.1 Provide electric fixtures catalog cut sheets for approval with the 100% Design Development submittal. Catalog cut sheets must specify the following:

- Manufacturer and local representative.
- Fixture Model number, size(s)/dimensions.
- Lamp(s) type, wattage, color(s) and finish(es).
- Lenses type(s) and mounting characteristics.
- Unit cost.

B. General Design Considerations

B.1 Site lighting should not exceed thirty (30) feet in height. Site lighting illumination criteria shall be as follows:

- Open parking facilities: 0.6 minimum footcandles (fc) on pavement.
- Covered parking facilities during daytime: 50 fc at entrance(s), 10 fc at ramps and corners and 5 fc in general parking spaces.
Covered parking facilities during nighttime: 5 fc minimum at entrance(s), ramps, corners and general parking spaces.

All illuminance uniformity ratios shall be 4:1 (Average/Minimum).

B.2 All proposed site lighting designs must be coordinated with the College Department of Public Safety (Campus Police).

B.3 All site lighting must include provisions for rewiring to additional timers for possible changes involving security/off-hours lighting distribution.

B.4 All exterior lighting shall be connected to photoelectric cells.

B.5 All exterior lighting must be coordinated with the landscaping design to avoid night shadows and fixture accessibility.

B.6 Avoid low pressure sodium fixtures.

16535 Emergency Lighting

- Power for emergency lighting shall be provided by emergency generators. Emergency ballasts/battery packs are not acceptable.
- Exit lighting signs and type: green light-emitting diodes on white background.

16700 Fire Alarm System(s)

A. General Design Considerations.

A.1 The fire alarm system must be independent from the security system.

A.2 The fire alarm system must be connected to the College Department of Public Safety central dispatch center.

A.3 All fire alarm wiring shall be in EMT conduit with junction boxes painted red.

A.4 Extension of existing system requires addressable devices and programming at the alarm panel. Power supplies may need to be increased in some cases.

16727 Security System(s)

A. Approved Manufacturer. All new security systems must be compatible with the current system.

B. General Design Considerations.

B.1 Security systems must be independent from the fire alarm system.

B.2 All security systems must be connected to the College Department of Public Safety central dispatch center.

16735 Telecommunications Facilities
A. See Appendix D

B. The General Contract shall include all tele/data infrastructure: conduit, cabling trays, back boards, cables and pulled wiring. A separate specialty contractor shall be responsible for termination and bridges.

16800 Television

(This Subsection is not used).

16850 Electric Heating

- Electric heating shall be avoided throughout all Pima Community College Campuses facilities. No electric heating shall be allowed unless specifically approved in writing by the Facilities Planning Department.

End of PART II
APPENDIX A

LAYERING GUIDELINES FOR PIMA COMMUNITY COLLEGE - Facilities Planning

Pima College Facilities Planning Department has developed these guidelines to facilitate maintaining the database of the Colleges facilities on CAD. The base plans of PCC's Campus Facilities contain the information which facilities planning requires for the management of facilities. These guidelines will help us in the development and maintenance of our “Facilities Handbook”. This handbook, contains updated floor plans of each building at PCC, the plans are at a “Design Development" level of drawing with an accurate layout of the floor. The information included assist Facilities Planning in many areas; An accurate square foot count, room name and number designations, provide facility information to the College Administration, for “as built" information to our consultants, space planning, furniture layouts, information for our Plant Operations and Maintenance Department. These guidelines will help us to continue and maintain an accurate “Facilities Handbook”.

For each new building or remodel the following guidelines will apply to CAD generated Floor Plan and Site Plan Drawings. At each floor (floor plan) or site (site plan) we will require a base set of layers, these layers can be incorporated into the floor plan drawings files or can be a separate base drawing file. The following charts outlines the layering guidelines:

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**FLOOR PLAN - LAYER GUIDELINES**

<table>
<thead>
<tr>
<th>LAYERS:</th>
<th>STATE:</th>
<th>COLOR:</th>
<th>LINETYPE:</th>
<th>COMMENTS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>On</td>
<td>White</td>
<td>Continuous</td>
<td>For structural walls and columns, exterior walls bearing walls, vertical</td>
</tr>
<tr>
<td>Structure</td>
<td></td>
<td></td>
<td></td>
<td>penetrations-stairs, chimneys</td>
</tr>
<tr>
<td>Partitions</td>
<td>On</td>
<td>White</td>
<td>Continuous</td>
<td>For non-bearing interior partitions, and other vertical penetrations</td>
</tr>
<tr>
<td>Firewall</td>
<td>On/freeze</td>
<td>Red</td>
<td>Dashed</td>
<td>firewall designation-is enhancement to partitions, short walls</td>
</tr>
<tr>
<td>Window</td>
<td>On</td>
<td>Yellow</td>
<td>Continuous</td>
<td>For glass/glazing incl. frames and mullions</td>
</tr>
<tr>
<td>Layer</td>
<td>State</td>
<td>Color</td>
<td>Linetype</td>
<td>Comments</td>
</tr>
<tr>
<td>---------------------</td>
<td>--------------</td>
<td>--------</td>
<td>---------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Doors</td>
<td>On</td>
<td>Blue</td>
<td>Continuous</td>
<td>For all doors-exterior/interior - to include swing of door 90 degrees, includes overhead/roll-up doors.</td>
</tr>
<tr>
<td>Attribute</td>
<td>On/Freeze</td>
<td>Red</td>
<td>Continuous</td>
<td>Reserved - not to be used in drawing file.</td>
</tr>
<tr>
<td>Roomno.</td>
<td>On</td>
<td>Red</td>
<td>Continuous</td>
<td>Room number designation.</td>
</tr>
<tr>
<td>Millwork</td>
<td>On</td>
<td>Cyan</td>
<td>Center Line</td>
<td>For fixed cabinet and counter work which is part of floor plan.</td>
</tr>
<tr>
<td>Fixture/Equip.</td>
<td>On</td>
<td>Cyan</td>
<td>Continuous</td>
<td>For fixed pieces of equipment and fixtures.</td>
</tr>
<tr>
<td>Furniture</td>
<td>Off</td>
<td>Yellow</td>
<td>Continuous</td>
<td>For the furniture plan developed in the Design and Development phase of the project as specified in the consultant contract.</td>
</tr>
<tr>
<td>Ceiling</td>
<td>Off/Freeze</td>
<td>Green</td>
<td>Continuous</td>
<td>Reflected ceiling plan showing light fixtures and air registers.</td>
</tr>
</tbody>
</table>

**SITE PLAN - LAYER GUIDELINES**

**LAYERS:**

<table>
<thead>
<tr>
<th>Layer</th>
<th>State</th>
<th>Color</th>
<th>Linetype</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>On</td>
<td>White</td>
<td>Continuous</td>
<td>For building footprints.</td>
</tr>
<tr>
<td>Building</td>
<td>On</td>
<td>White</td>
<td>Continuous</td>
<td>For curbing, sidewalks and all walkways.</td>
</tr>
<tr>
<td>Walks</td>
<td>On</td>
<td>Blue</td>
<td>Continuous</td>
<td>For property lines including dimension (distance at an angle) and easements.</td>
</tr>
<tr>
<td>Property line</td>
<td>On</td>
<td>Yellow</td>
<td>Continuous</td>
<td>For parking lots and striping and markings.</td>
</tr>
<tr>
<td>Parking</td>
<td>On</td>
<td>Yellow</td>
<td>Continuous</td>
<td>Building name or designation and other street names.</td>
</tr>
<tr>
<td>Name</td>
<td>On</td>
<td>Red</td>
<td>Continuous</td>
<td></td>
</tr>
<tr>
<td>Attribute</td>
<td>On/Off</td>
<td>Color</td>
<td>Line Type</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
<td>--------</td>
<td>---------</td>
<td>-------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Grade</td>
<td>On</td>
<td>Cyan</td>
<td>Center Line</td>
<td>For distinct grade features of site - drainage ways, washes, hills.</td>
</tr>
<tr>
<td>Attribute</td>
<td>Off</td>
<td>Red</td>
<td>Continuous</td>
<td>Reserved - not to be used in drawing file.</td>
</tr>
<tr>
<td>Gas&lt;</td>
<td>On</td>
<td>Yellow</td>
<td>Continuous</td>
<td>For site gas utility lines/meters.</td>
</tr>
<tr>
<td>Electrical</td>
<td>On</td>
<td>Red</td>
<td>Continuous</td>
<td>For site electrical lines, and equip. Transformer.</td>
</tr>
<tr>
<td>Water</td>
<td>On</td>
<td>Blue</td>
<td>Continuous</td>
<td>For site water lines, and valves and equipment.</td>
</tr>
<tr>
<td>Sewer</td>
<td>On</td>
<td>Green</td>
<td>Dashed</td>
<td>For site sewer lines, and clean outs, manholes.</td>
</tr>
<tr>
<td>Effluent</td>
<td>On</td>
<td>Cyan</td>
<td>Dashed</td>
<td>For effluent water lines applicable.</td>
</tr>
<tr>
<td>Fire</td>
<td>On</td>
<td>Red</td>
<td>Continuous</td>
<td>For site fire lines, including hydrants and valves.</td>
</tr>
<tr>
<td>Data</td>
<td>On</td>
<td>Cyan</td>
<td>Continuous</td>
<td>For site data, phone, and communication lines and equipment.</td>
</tr>
</tbody>
</table>
APPENDIX B

BUILDING DEFINITIONS AND DATA ELEMENTS

This chapter provides the technical definitions, measurement procedures, and coding structures for building data elements. The interrelationships between these components of building area are illustrated by the conceptual framework in Figure 1. The technical definitions and codes for the room use categories are found in Chapter 5.

Definitions of Building Areas (7)

The definitions and procedures provided in this chapter are intended to clarify and provide guidelines for the most commonly used types of data to be collected and compiled on buildings. These guidelines are based on the definitions and standards established during the 1960s for the Federal Construction Council and published by the National Academy of Sciences. The Federal Construction Council standards were intended for use by federal agencies, but they have been widely adopted and used by colleges and...
The definitions and guidelines in this chapter attempt to clarify and update some of the earlier standards by providing additional guidance on how to interpret and apply measurement procedures. The guidelines also are intended to establish a common standard for the minimum amount of data to be included in a building inventory in order to provide a database that is usable for both intra-institutional and inter-institutional purposes. Institutions are not precluded by these guidelines from collecting additional building data or from including other types of structures in their facilities inventory.

1. Gross Area

A. Definition: The sum of all areas on all floors of a building included within the outside faces of its exterior walls, including floor penetration areas, however insignificant, for circulation and shaft areas that connect one floor to another.

B. Basis for Measurement. Gross area is computed by physically measuring or scaling measurements from the outside faces of exterior walls, disregarding cornices, pilasters, buttresses, etc., which extend beyond the wall faces. Exclude areas having less than a six-foot, six-inch clear ceiling height unless the criteria of a separate structure are met. (See the sections in Chapter 2 on buildings to be included in the inventory.)

C. Description: In addition to all the internal floored spaces obviously covered above, gross area should include the following: excavated basement areas; mezzanines, penthouses, and attics; garages; enclosed porches, inner or outer balconies whether walled or not, if they are utilized for operational functions; and corridors whether walled or not, provided they are within the outside face lines of the building, to the extent of the roof drip line. The footprints of stairways, elevator shafts, and ducts (examples of building infrastructure) are to be counted as gross area on each floor through which they pass.

D. Limitations: Exclude open areas such as parking lots, playing fields, courts, and light wells, or portions of upper floors eliminated by rooms or lobbies that rise above single-floor ceiling height.

E. Exception: Include top, unroofed floor of parking structures where parking is available. (See the section on Parking Structures at the end of this chapter.)

2.Assignable Area (Net Assignable Square Feet - NASF)

A. Definition: The sum of all areas on all floors of a building assigned to, or available for assignment to, an occupant or specific use.

B. **Basis for Measurement.** Assignable area is computed by physically measuring or scaling measurements from the inside faces of surfaces that form the boundaries of the designated areas. Exclude areas having less than a six-foot, six-inch clear ceiling height unless the criteria of a separate structure are met. (See the section, Buildings To Be Included, in Chapter 2.)

Measured in terms of assignable square feet (ASF),

\[ \text{Assignable Area} = \text{Sum of Area Designated by the Ten Assignable Major Room Use Categories}. \]

C. **Description:** Included should be space subdivisions of the ten major room use categories for assignable space - classrooms, labs, offices, study facilities, special use, general use, support, health care, residential and unclassified-that are used to accomplish the institution's mission.

D. **Limitations:** Deductions should not be made for necessary building columns and projections. Areas defined as building service, circulation, mechanical, and structural should not be included.

3. Nonassignable Area

A. **Definition:** The sum of all areas on all floors of a building not available for assignment to an occupant or for specific use, but necessary for the general operation of a building.

B. **Basis for Measurement.** Nonassignable Area is computed by physically measuring or scaling measurements from the inside faces of surfaces that form the boundaries of the designated areas. Excludes areas having less than six-foot, six-inch clear ceiling height unless the criteria of a separate structure are met.

Measured in terms of area,

\[ \text{Nonassignable Area} = \text{Sum of the Area Designated by Three Nonassignable Room Use Categories}. \]

C. **Description:** Included should be space subdivisions of the three nonassignable room use categories-building service, circulation and mechanical-that are used to support the building's general operation.

D. **Limitations:** Deductions should not be made for necessary building columns and projections. Areas defined as assignable should not be included.

4. Building Service Area

A. **Definition:** The sum of all areas on all floors of a building used for custodial supplies, sink rooms, janitorial closets, and for public rest rooms. (NOTE: Building service area includes all areas previously classified as custodial area. Building service area also includes public rest rooms that were previously classified as mechanical area. Building Service Area does not include assignable areas (e.g., areas classified as 730-Central Storage and 870-Central Supplies are not part of Building Service Area).

B. **Basis for Measurement.** Building service area is computed by physically measuring or scaling measurements from the inside faces of surfaces that form boundaries of the designated areas. Exclude areas having less than a six-foot, six-inch clear ceiling height unless the criteria of a separate structure are met.

C. **Description:** Included should be janitor closets or similarly small cleanup spaces, maintenance
material storage areas, trashrooms exclusively devoted to the storage of nonhazardous waste created by
the building occupants as a whole, and public toilets.

D. **Limitations:** Deductions should not be made for necessary building columns and

minor projections. Areas defined as central physical plant shop areas, or special purpose storage or
maintenance rooms, such as linen closets and housekeeping rooms in residence halls, should not be
included. Does not include private rest rooms.

5. **Circulation Area**

A. **Definition:** The sum of all areas on all floors of a building required for physical access to some
subdivision of space, whether physically bounded by partitions or not.

B. **Basis for Measurement:** Circulation area is computed by physically measuring or scaling
measurements from the inside faces of surfaces that form the boundaries of the designated areas.
Exclude areas having less than a six-foot, six-inch clear ceiling height unless the criteria of a separate
structure are met.

C. **Description:** Included should be, but is not limited to, public corridors, fire towers, elevator lobbies,
tunnels, bridges, and each floor's footprint of elevator shafts, escalators and stairways. Receiving areas,
such as loading docks, should be treated as circulation space. Any part of a loading dock that is not
covered is to be excluded from both circulation area and the gross building area. A loading dock —which
is also used for central storage should be regarded as assignable area and coded as central storage (730).
Also included are corridors, whether walled or not, provided they are within the outside facelines of the
buildings to the extent of the roof drop line.

D. **Limitations:** Deductions should not be made for necessary building columns and minor projections.
When determining corridor areas, only spaces required for public access should be included. Restricted
access private circulation aisles used only for circulation within an organizational unit's suite of rooms,
auditoria, or other working areas should not be included.

6. **Mechanical Area**

A. **Definition:** The sum of all areas on all floors of a building designed to house mechanical equipment,
utility services, and shaft areas.

B. **Basis for Measurement.** Mechanical area is computed by physically measuring or scaling
measurements from the inside faces of surfaces that form the boundaries of the designated areas.
Exclude areas having less than six-foot, six-inch clear ceiling height unless the criteria of a separate
structure are met.

C. **Description:** Included should be mechanical areas such as central utility plants,

boiler rooms, mechanical and electrical equipment rooms, fuel rooms, meter and communications
closets, and each floor's footprint of air ducts, pipe shafts, mechanical service shafts, service chutes, and
stacks.

D. **Limitations:** Deductions should not be made for necessary building columns and projections. Areas
designated as private toilets are not included.
7. Net Usable Area

A. **Definition:** The sum of all areas on all floors of a building either assigned to, or available for assignment to, an occupant or specific use, or necessary for the general operation of a building.

B. **Basis for Measurement.** Net usable area is computed by summing the assignable area and the nonassignable area.

Measured in terms of net usable square feet (NUSF),

\[
\text{Net Usable Area} = \text{Assignble Area} + \text{Nonassignable Area}.
\]

C. **Description:** Included should be space subdivisions of the ten assignable major room use categories and the three nonassignable space categories.

D. **Limitations:** Deductions should not be made for necessary building columns and projections. Areas defined as structural should not be included.

8. Structural Area (S)

A. **Definition:** The sum of all areas on all floors of a building that cannot be occupied or put to use because of structural building features.

B. **Basis for Measurement.** Precise computation by direct measurement is not possible under these definitions. It is determined by calculating the difference between the measured gross area and the measured net usable area.

Measured in terms of area,

\[
\text{Structural Area} = \text{Gross Area} - \text{Net Usable Area}.
\]

C. **Description:** Examples of building features normally classified as structural areas include exterior walls, fire walls, permanent partitions, unusable areas in attics or basements, or comparable portions of a building with ceiling height restrictions, as well as unexcavated basement areas.

8 Referred to as "construction area" in TR-50.

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Other Building Information

1. Estimated Replacement Cost

A. **Definition:** The estimated cost to replace the building at the time of inventory.

B. **Basis for calculation:** Determined in terms of the cost to replace the building's gross floor area at
current construction costs in accordance with current building and public safety codes, and standard
construction methods. The Engineering News Record, R.S. Means(9), or Boeckh (10) are examples of
frequently used sources of information for determining construction cost indices. The selected source of
information should be locally determined. The replacement cost of fixed equipment in the building
should be included.

2. Condition

A. Definition: The physical status of the building at the time of the inventory or audit, based on the best
judgment of those persons familiar with the physical characteristics and condition of the campus.

B. Derivation: The most useful facilities management information is produced when the inventory or
audit rates each subsystem of a building. This approach documents the building's overall composite
rating and provides information about needed repairs or replacements. A facilities audit should tie
subsystem and overall composite ratings to the estimated building replacement value to provide a rough
estimate of the cost of rehabilitating or renovating the facility. (11)

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9 R.S. Means Company, Inc., Construction Consultants and Publishers, publishes an historical cost
index. In addition, the Commercial/Industrial/Institutional section of one of the Means' manuals contains
base building costs per square foot or floor area for seventy model buildings.

10 The Boeckh Division of the American Appraisal Company computes a construction cost index that
appears applicable to the mix and types of buildings found on college and university campuses. The
index is reported in the Higher Education Price Indexes by Research Associates of Washington
(Washington, D.C.).

11 For a simple approach to procedures and categories rating facility subsystems, see Kaiser, H.H.,
Association of Physical Plant Administrators of Universities and Colleges.

---

C. Description: Building condition has the following categories:

i. Satisfactory  Suitable for continued use with normal maintenance.
ii. Remodeling - A  Requires restoration to present acceptable standards without major room
    use changes, alterations, or modernizations. The approximate cost of Remodeling-A is not greater than 25% of the estimated replacement cost of
    the building.
iii. Remodeling - B  Requires major updating or modernization of the building. The
    approximate cost of Remodeling-B is greater than 25 %, but not greater
    than 50 % of the estimated replacement cost of the building.
iv. Remodeling - C  Requires major remodeling of the building. The approximate cost of
    Remodeling-C is greater than 50% of the replacement cost of the building.
v. Demolition  Should be demolished or abandoned because the building is unsafe or
    structurally unsound, irrespective of the need for the space or the
    availability of funds for a replacement. This category takes precedence over
    categories i-iv. If a building is scheduled for demolition, its condition is
3. Building Ownership Status

A. Definition: The type of ownership and relation of title holder to institution.

B. Description: The following categories illustrate types of ownership status; these may also be used as codes for ownership status in the facilities inventory database.

i. Owned in fee simple.

ii. Title vested in the institution and being paid for on an amortization schedule (regardless of whether the building is shared with another institution or organization).

iii. Title vested in a holding company or building corporation to which payments are being made by the institution; title will ultimately pass to the institution (includes lease-purchase arrangements).

iv. Not owned by the institution, but leased or rented to the institution at a typical local rate.

v. Not owned by the institution, but made available to the institution either at no cost or at a nominal rate.

vi. Not owned by the institution, but shared with an educational organization that is not a postsecondary institution.

vii. Not owned by the institution, but shared with another postsecondary educational institution.

viii. Other (e.g., not owned by the institution, but shared with a noneducational institution).

Note: For some institutional purposes and external sharing of data, it may be appropriate to collapse categories v through viii into a single category of "Other, not owned by the institution, including facilities shared with other entities."

Parking Structures

Due to the absence of guidance in previous editions of this manual, parking structures or decks are classified differently by institutions across the country. Because these structures may represent a large portion of campus facilities space, the specific method for classifying these areas can have significant impacts on campus-level statistics. For interinstitutional comparisons and surveys, it is recommended that parking structure data, if considered important to the study, be maintained and reported separately on a predefined and agreed upon basis. Three different methods of classifying parking structures currently prevail:

1. Classification with Assignable and Gross Square Footage

This method determines statistics for the structure which are commensurate with all other major
inventoried campus buildings (i.e., assignable space, gross square footage, estimated replacement cost, etc.). Standard nonassignable areas (building service, circulation, and mechanical) are appropriately classified, and parking space square footage is assigned the 740-Vehicle Storage Facility room use code. Other standard assignable areas (offices, etc.) are classified with the appropriate room use codes. Ramps and other driving areas are classified as nonassignable circulation areas; upper level unroofed parking areas are classified as assignable (see 740) space.

2. Classification with Gross Square Footage Only

Many institutions maintain only building-level data for parking structures and do not classify parking areas as assignable space. Instead, parking areas are classified as nonassignable space. Standard assignable areas within the parking structure, such as offices, may be appropriately classified. Only the gross area recorded within the building file becomes a significant square footage statistic. Institutions may also maintain parking structure data separately from the formal building and room inventory files.

3. Classification With Neither Gross Nor Assignable Square Footage

Under this system, parking decks are considered as part of the campus infrastructure and are managed with other "parking facilities." As a result, they are not classified as buildings, and neither gross nor assignable square footage data for these structures is defined within the campus building or room inventories. As with buildings, stadium seating, unroofed swimming pools, radio/TV towers, etc., parking decks are classified as a separate subcategory of "structure."
APPENDIX C

Scheduling Formats
### Pima Community College

#### Major Project Template

<table>
<thead>
<tr>
<th>ID</th>
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<tr>
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<td>Project Start</td>
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Pima Community College Major Project Template

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<td>Prepare Board Report</td>
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## Pima Community College

### Major Project Template

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<td>Pre-Bid Conference</td>
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<td>Prepare Board Report</td>
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<td>BOG Award of Bid or Execute Contract</td>
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<td>Telecom Construction</td>
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<td>Testing/Punchlist Work</td>
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SECTION 1  GENERAL

1.01  RELATED CONDITIONS

A.  CONDITIONS
The General Conditions and any Supplementary or Special Conditions or Provisions which are part of the Contract Documents are part of this Division to the same extent as if written herein in full, and Contractor shall observe all the requirements thereof insofar as they are applicable to his work.

B.  DESCRIPTION
It is the intent of this specification to describe the basic architecture and performance requirements of the Facility Management System (FMS). The FMS shall be based on a distributed system of fully intelligent, stand-alone controllers, operating in a multi-tasking, multi-user environment on a true peer-to-peer, token passing FMS contractor installed Local Area Network (LAN), called the Controller LAN. All "primary" equipment shall be served by stand alone controllers residing directly on this Controller LAN. System architectures with primary equipment controllers residing on master/slave (polling) networks or sub-networks will not be acceptable. Systems utilizing a monolithic processing architecture or those not operating in a true networking environment will not be acceptable. Power line carrier is not acceptable.

1.02  SCOPE

A.  EXTENT
The Contractor shall furnish all equipment, materials, labor, supervision and services necessary for or incidental to the installation of a complete and operating electronic system of temperature controls for heating, ventilating and air conditioning. The Facility Management System shall include all work station software and hardware, Process Control Units (PCU), Terminal Controllers (TC), Local Area Networks (LAN), sensors, control devices, actuators, installation and calibration, supervision, adjustments and fine tuning necessary for a complete and fully operational system. Provide a complete system comprising but not limited to:

♦ Sensors and actuators.
♦ Controllers.
♦ System software.
♦ Interconnecting wiring to the required termination points.
♦ Testing and commissioning.
♦ Maintenance during Warranty period.
♦ Workstation and associated equipment, as required.
♦ Purchase and install newest release of CSI operator workstation software at all county wide campuses and support offices.
♦ Loading existing workstations at all county wide campuses and support offices with the new displays, graphics and points list.

B.  MANUFACTURER
An existing Control Systems International (CSI) Energy Management and Control System (EMCS) is installed throughout the Pima Community College District. The existing EMCS controllers, associated power wiring, communications network and controller input/output devices, and wiring shall be modified.
as indicated on the drawings and required by the sequences of operation to result in a fully functioning Facility Management System. All controller hardware shall be manufactured by CSI. All points added to the system shall be available to the existing district wide CSI workstations using the latest release of INET 2000 software. Gateways or protocol converters are not acceptable.

The FMS supplier will be an authorized factory representatives or branch office of Control Systems International (CSI). **NO EXCEPTIONS.**

C. Qualifications

The FMS contractor shall

- Be in the business of regularly installing CSI equipment and controls
- Have been in business for at least 3 years
- Have installed at least 5 CSI projects of similar size and scope in the state of Arizona
- Have a local technician that is factory trained to install, program, and start up CSI hardware and software.

1.03 RELATED WORK

A. All electrical control wiring shall be furnished and installed under this section, unless shown on the electrical drawings. Low voltage wiring shall be run in EMT conduit in exposed areas and in vertical risers between floors. Low voltage plenum rated wire may be used without conduit in concealed but accessible areas. All conduit on roofs shall be EMT with rain tight fittings. Line voltage control wiring shall be run in EMT conduit.

B. All power wiring associated with the control system shall be provided by Division 16-Electrical except 24VAC for VAV boxes, fan-coils, heat pumps, RTU’s, etc. Units already having power run by Division 16 for fans, electric heat, etc. shall utilize control power via a step down transformer. VAV boxes not having accessible power shall be provided with a power trunk, by this section, to power box mounted Terminal controllers when specified.

C. Control valves and separable wells for immersion elements, and couplings for flow and pressure switches furnished under this section shall be installed by the Mechanical Contractor.

D. All automatic dampers furnished under this section shall be installed by the Mechanical Contractor. It shall be the responsibility of the Mechanical Contractor to provide and install blank off plates when the control application requires dampers smaller than duct size.

E. Concrete foundations for air compressors shall be provided by the General Contractor in accordance with dimensional drawings supplied by the Control Contractor.

F. All finished painting required for Control piping and equipment shall be done by the General Contractor.

G. All cutting and patching necessary for the installation of Control System shall be done by the General Contractor.

H. Section 15000 – Mechanical – General Provisions

I. Section 15900 – Installation

1.04 QUALITY ASSURANCE

System manufactures shall have implemented a Quality System which is ISO9001 compliant. Provide the Architect/Engineer with manufacturer’s certificate showing materials meet or exceed the minimum requirements as specified.

System manufacture shall provide evidence to prove Year 2000 Compliance of Hardware & Software.
1.05 REFERENCE STANDARDS / SUBMITTALS

A. STANDARDS
Except as modified by this Specification, conform to the applicable provisions and recommendations of the latest editions of the following standards:
1. American Society of Mechanical Engineers (ASME)
3. Factory Mutual (FM)
4. National Electrical Code (NEC)
5. National Fire Protection Association (NFPA)
6. Underwriters’ Laboratories (UL)

B. Submittals
The Contractor shall submit to the Architect/Engineer for review all of the items listed below. No work shall be initiated prior to the submission of these documents to the Architect/Engineer. After review of submitted documents the Architect/Engineer will issue instructions to proceed with the installation; however, such instructions will not relieve the Contractor from complete compliance with the drawings and Specifications. Provide a submittal for approval before programming commences, to include:
- English language description of system operation.
- Logical flow charts.
- Control graphs showing setpoints and control parameters.
- Input/output schedules and controller configurations.
- A copy of the database put into logical groups which represents how information will be displayed to the user.
- Floor plans showing location of all controllers and sensors.
- Co-ordination drawings showing interface terminal numbers and cross referenced wire numbers for all connections between the DDC and other equipment.
- Details of all the actuators, control devices and sensors.
- Full details of each control station including equipment and wiring diagrams/terminal layouts.
- Calibration certificates for temperature and humidity calibration instruments. Calibrate instruments a maximum of six months prior to commencement of commissioning.

1.06 RESPONSIBILITY
The contractor shall be responsible for providing a system of controls that will completely accomplish the implied or intended functions of the control system as shown or indicated on the drawings and/or as specified herein. The contractor shall provide a system of consistent architecture and control philosophy, with similar components of uniform manufacture. The contractor shall provide a control system that communicates seamlessly with the existing CSI system utilizing the same ethernet network as the existing system.

A. WARRANTY
Provide maintenance of the system during the warranty period with the following minimum provisions:
- Notify building owner's representative prior to performing any maintenance work.
- A designated representative to monitor and report on equipment performance and service history and liaise with building owner.
- Conditions: The warranty shall cover any defects in materials and workmanship including installation and programming which shall be found during the term. This shall include any deficiencies in installation standards vis-à-vis the Specifications.
- Response: The contractor shall respond to calls for warranty service within 2 working hours. Emergency service shall be obtainable within 4 hours of notification by the Owner. Emergency service shall be obtainable on a 24 hours basis, 7 days per week.
• Qualifications: The contractor shall utilize factory trained technicians located within 50 miles of the job site.
• Repair parts shall be available within 24 hours.

B. POWER
The Temperature Control Contractor shall be responsible for locating and obtaining any electric power required for the operation of the control equipment. Temperature control wiring, conduit and devices shall be as specified under Division 16.

1.07 TRAINING
The contractor shall supply personnel to train key customer personnel in the operation and maintenance of the installed system. The training program shall be designed to provide a comprehensive understanding and basic level of competence with the system. It shall be sufficiently detailed to allow customer personnel to operate the system independent of any outside assistance.
On line context sensitive HELP screens shall be incorporated into the system to further facilitate training and operation.
The training plan shall include detailed session outlines and related reference materials. The customer personnel shall be able to utilize these materials in the subsequent training of their co-workers.
Training shall consist of two parts, local and factory. Local training shall not be less than a total of 40 hours and shall consist of:
• (20) Twenty hours during normal day shift periods for system operators. Specific schedules shall be established at the convenience of the customer.
• (20) Twenty hours of system training shall be provided to customer supervisory personnel so that they are familiar with system operation.
• The specified training schedule shall be coordinated with the customer and will follow the training outline submitted by the contractor as part of the submittal process.

Factory training shall be at the manufacturers training center and be not less than a total of 80 hours. Training classes shall consist of any combination of the courses listed below as determined by PCC:
• CSI course #2001, I/NET 2000 System Operation (HVAC) 40 hours
• CSI course #2002, I/NET 2000 Installation & Start-up (HVAC) 40 hours
• CSI course #2003, I/NET Database Design 2000 40 hours
• CSI course #2007, I/NET 2000 Environmental Micro Controller LAN Devices 40 hours

As part of the factory training all costs, expenses, 2 round trip airline tickets and hotels shall be paid by the contractor.

1.08 SUBSTITUTIONS
1. No substitutes
The exact make and model number identified in this specification shall be provided without exception.
1.09 DEFINITIONS

DDC:  Direct digital control.
LAN:  Local area network.
UPS:  Un-interruptible power supply.
FMS:  Facility Management System.
SECTION 2 PRODUCTS

2.01.0 FACILITY MANAGEMENT SYSTEMS

GENERAL REQUIREMENTS
System administration shall be available from any Workstation on the 10 BaseT Ethernet LAN (Local Area Network) or the Pima Community College WAN (Wide Area Network) in the system. The system specifically must have the capability to support not less than fifteen (64) workstations connected on the LAN or WAN network at the same time. The Facility Management System shall allow all connected workstations to function in a true multi-user, multi-tasking environment using Microsoft Windows 95, 98 or NT with TCP/IP Protocol.

The system architecture shall be capable of supporting single sites and/or campuses as well as multiple sites located in different geographical locations.

The Operating System shall be based on a Microsoft WINDOWS 95, Windows 98 Or Windows NT platform using TCP/IP Protocol.

The system shall be capable of modular expansion without software upgrades or wiring revisions.

2.01.1 SOFTWARE

A.GENERAL
The Contractor shall provide all software required for efficient operation of all the automatic system functions required by this specification. Software shall be modular in design for flexibility in expansion or revision of the system. It is the intent of this specification to require provisions of a system which can be fully utilized by individuals with no, or limited, previous exposure to PC's and programming techniques and languages. If the system to be provided requires the use of any modified BASIC, "C", PASCAL, or DRUM Language program, or writing "line" programming statements to modify operation or strategy in the system, the vendor shall provide unlimited, no charge, software modification and support for a period of five (5) years after the completion of the project in addition to the warranty period specified elsewhere. Systems which are factory programmed are unacceptable.

The software shall include a General Purpose Operating system which will be based on Microsoft Windows 95, 98 or NT as well as Facility Management System Application Software (CSI I/NET 2000), TCP/IP and 3Com Drivers. All available vendor work station application software shall be provided with the system, and shall reside in each and every PC. "Unbundled" software packages where the vendor can charge the user extra fees, or require dedicated work stations, or require system rebooting for access, are unacceptable.

The software in the system shall consist of both "firmware" resident in the controllers and "software" resident in the operator workstations. The architecture of the system, and the application software/firmware shall be distributed with no single system component responsible for a control function for the entire Controller LAN. Each controller resident on the controller LAN shall contain the necessary firmware and I/O capability to function independently in case of a network failure. No active control sequences shall be resident in the PC work stations. All PC work stations shall be removable from the system without loss of control function - only alarm monitoring, long term history collection, and operator
monitor/command/edit functions would be lost.

The Primary operator interface to the system shall be through a graphical, “object oriented”, interactive presentation using a mouse and cursor for object selection and commands.

The system software shall support an operator definable “default” system page. The default system page shall be displayed upon system startup, operator activity time-outs, and when the system is not in use. This default system page may be any one of the standard dynamic graphic pages or a custom display developed for this purpose. The operator shall be able to display their corporate logo, emergency information, etc. as the default system page.

The system software shall support "pop-up" windows for point commands. On selecting an object with the cursor, a window shall open up to present the operator with choices corresponding to the operator's password authorizations. These point commands shall include state changes, manual override of application software, test mode activation and test value entry. This window shall include, for reference, the point's descriptor (name), the point's hardware address, and alarm status.

The system software shall support "pop-up" windows for point editing. On selecting an object with the cursor, a window shall open up to present the operator with a list of active point database editors, if permitted by the operators password level. Selecting one of these editors shall allow the operator to modify the basic parameters associated with a point, as well as access any programs assigned to the point (such as time schedules, calculations, events, etc.).

The system software shall be based on interactive prompts and choices, using "dialog boxes" as opposed to memorization of commands, "syntax", exact spellings, etc. This interactive prompt and choices approach shall be used in monitoring, issuing commands, and editing. Command choices shall be as simple as "clicking" the cursor over the correct word choice prompts (i.e., START, STOP), without typing in the letters. Editing mode choices shall prompt with ranges or options (i.e., 16 CHARACTERS for point name, or ON, OFF for action).

The system software shall support a “zoom” function: It shall be possible for an operator to locate any system point to monitor status, issue commands, or edit associated database without knowledge of the point's name, address, or associated controller, and without having to refer to a “tree” directory. The operator shall be able to zoom in on a building in a campus graphic, zoom in on a floor in a building graphic, zoom in on a door in a floor plan graphic, etc.

The system software shall be compiled for faster execution speeds and shall offer all of the following features and capabilities:

♦ Input/Output Capabilities: From any local PC work station or any remotely connected PC work station, the system operator shall have the capabilities through the keyboard/mouse to request dynamic displays of current values or status using a tabular or graphic format. A global database sort utility shall allow an expanded tabular display of only the points on the current graphic display. This expanded tabular display shall list point name, hardware address, dynamic state or value, alarm status, override status, and test mode status.
♦ Obtain a summary of all system points with status (DCU SUMMARY) and allow issuing commands to the system points to manually force the system points to one of the above states, or provide a momentary release, or return to automatic control (remove manual state).
♦ Add, delete, or change points within each Controller or application routine while on line.
♦ Change point I/O descriptors, status, and alarm descriptors and engineering unit descriptors while the system is on-line.
♦ Add new Controllers and sub-controllers to the system while the system is on-line.
♦ Develop, modify, delete or display full range of color graphic displays providing dynamic displays.
development, editing and display work shall be performed with the system fully on line and in full communications with the Controllers and sub-controllers.

♦ To enhance system response the database shall be distributed and reside in each DCU. The manufacturer shall have the ability to supply DCU’s (distributed control unit) that support a combination of up to 64 sub-lan controllers consisting of MR’s (micro-control units), ASC’s (Application Specific Controllers) or UC’s (Unitary Controllers). Each DCU shall be capable of providing full Energy Management control decision capabilities and monitoring of assigned input/output alarm points whether on or off line with host computer.

2.01.2 DATABASE CREATION AND SUPPORT

GENERAL

The intent of this specification is to provide a Facility Management System which will allow the owner to independently perform his own modifications to the system from any operator work station. All changes shall be done utilizing standard procedures and must be capable of being done while the system is on-line and operational. The DCU on the Controller LAN shall automatically check a PC work station's data base files upon connection to verify a current data base match. A utility shall inform the operator if the DCU's database files do not match the backup files stored on the PC workstation, along with the date of last DCU modification and date of last backup. The owner must have as a minimum, the on line capability to:

♦ Add and delete points.
♦ Modify any point parameter.
♦ Determine which PC work station(s) points will be directed to, on a point by point basis.
♦ Change, add, or delete English language descriptors (i.e., name). System I/O points may be identified either by name or its logical address. Up to 16 characters shall be available for the English language descriptor, which shall be used in all control sequences. Use of a second abbreviated point "name" for control sequences is unacceptable complexity.
♦ Add, modify, or delete alarm limits.
♦ Add, modify, or delete points in start/stop programs, trend logs, etc.
♦ Create custom relationship between points. A general purpose user utility shall be provided, such that the user can implement software interlocks, calculations, etc.
♦ Assign application programs to points (as opposed to assigning points to programs).
♦ Obtain an "audit trail" of which application programs are controlling an individual point, on a point by point basis.
♦ Create and/or modify override parameters.
♦ Add, modify, and delete any applications program.
2.01.3 SYSTEM PASSWORDS
To limit control by the system operators the FMS shall support system passwords at both the host level and controller level.

- The host passwords shall limit user access and privileges to provide system level security. A password shall be required to “log on” the system. The FMS host shall support up to 1,100 passwords. It shall be possible to enable or disable each and every individual function of the FMS on a password basis using a simple point and click operation. Each password shall allow a 30 character operator name, a 10 character alphanumeric password, and 4 characters for the operator initials.

- The controller passwords shall restrict user access and privileges to system controllers. The controller passwords shall support 4 levels:
  - Level 1 – Display only access
  - Level 2 – Display controller data, issue commands, acknowledge alarms.
  - Level 3 – Display data, issue commands, acknowledge alarms and edit all functions except the DCU password function.
  - Level 4 - Display data, issue commands, acknowledge alarms and edit all functions including the DCU password function.

2.01.4 SYSTEM RESPONSE TIMES
Maximum response times:

- Change of State: Time for change of state or value of a field point to register an alarm or update at the workstation: 5 seconds.
- Manual Command: Time for a manual command from the workstation to override field device: 3 seconds.
- Graphics Display: Time to display a full graphic with current parameter values: 8 seconds.
- System Logs: Time to display a system log or report: 8 seconds.
- Global Data Transfer: Time for data to travel between stand alone controllers: 3 seconds.
- Local Control Event: Time for stand alone controller to initiate an output action after change of input: 2 seconds.

2.01.5 ALARM /MESSAGES/EVENT SIGNALING

A. ALARMS

The FMS shall provide three alarm summary screens; one for critical alarms, one for priority alarms and one for routine alarms. The alarms summary screens shall display points that are, or have been in alarm and provide 3 status indicators of the alarms in the form of selectable Status Colors. The status colors shall indicate the following:

- Alarm – The point is currently in alarm, and the alarm has not yet been acknowledged.
- Alarm Acknowledged – The point is currently in alarm, and has already been acknowledged.
- Return to normal – The point went into alarm, but has since returned to normal without being acknowledged.

The summary screens will display the date/time that each alarm occurred, the point address, the name assigned to the point, the current status of the point, and the system graphic page the point can be found on. The FMS shall provide a means for storing all alarms, messages, and events for an indefinite period and allow for quick retrieval at any time. The FMS shall maintain as a minimum the latest 128 alarms for quick review or display. In the event of an alarm condition occurring the FMS shall display a message on the operator workstation, print on the printer, sound an audible alarm and optionally set off a visual annunciation (i.e. flashing lights).
Alarm management: Provide:

♦ Exception reporting.
♦ Priority allocation.
♦ Consequential alarm suppression.
♦ Graphical representation of alarms.

The FMS shall have the following alarm processing features, all of which shall be owner definable through the input keyboard:

♦ Each off normal condition shall cause an alarm and an appropriate message, including the time of the alarm, system and point descriptor, alarm condition. The operator shall have the capability to select, at any time, which state/value shall be considered alarms and which alarms shall cause automatic dial-out to occur.
♦ Each critical alarm or change-of-state message shall be displayed. All Controller LAN network alarm messages shall be stored on disk and may be reviewed on the CRT and/or printed on operator selected printers at any time. It shall be possible to sort this alarm/change-of-state data base by date, time and/or item fields.
♦ An Alarm Summary shall show all new alarms and indicate which is the "best" graphic page to select to act upon the alarm condition. Each alarm shall have its “priority” listed and all alarms shall be displayed with highest priority first, then by reverse chronological order within a priority.
♦ Provide an automatic page selection option for alarms. This feature (operator activated) automatically selects and displays designated “best” graphic page for each alarm, even when the operator is signed off. In the event of multiple alarms, the page associated with the most recent highest priority alarm is displayed.
♦ Automatic user defined time delay of alarms during equipment start-up or shutdown shall be provided to prevent nuisance and false alarms.
♦ Unique alarm delays on analog and discrete input points to prevent "flutter" alarms.
♦ The operator shall have the capability to route specific alarms to specific work stations, and/or to specific pagers.
♦ When on an ethernet network, the above messages can be accepted or passed on to an alternate work station based on occupied / unoccupied status.
♦ Messages can be set manually or automatically.
♦ Unacknowledged alarms will continue to blink even if they have "returned to normal". Only operator acknowledgment can remove the blinking alarm indication. Red will signify points in alarm while green will signify points in normal condition.
♦ Each operator work station will have the ability to notify an operator of an alarm condition in one or more points or controllers anywhere in the system. Alarm notification shall consist of:
♦ Automatic print of the alarm condition as described above.
♦ Display of an ICON indicating an alarm condition, including while in a third party program.
♦ Operator selectable audible alarm indication. The audible alarm may sound once, constant or not at all, at owners option.
♦ Relay operation at the PC workstation, used to activate notification devices where the operator will be too far from the PC to see visual indication, or the environment is too noisy to hear the PC's audible.
♦ Automatic dialing of up to 8 different numeric pagers or beepers on alarm conditions.
♦ Automatic alarm/message redirection of unattended workstations connected on a WAN.

B. EVENTS

The FMS software shall have the ability to automatically initiate commands, user-defined messages, take specific control actions or change control strategy and application programs as a result of an event condition.

♦ An event condition may be an analog high or low value crossing an operator defined limit, a change-of-state, a specified state, or alarm occurrence, a return to normal or logical combinations
of the above. Events shall not be limited to alarm occurrences only but shall also include time, dates, as specified system results. All event assignments or modifications shall be owner defined through the input keyboard.

C. MESSAGES

The system shall be capable of automatically displaying or printing a user-defined message subsequent to the occurrence of selected events. Events shall not be limited to alarm occurrences. It shall be possible for the owner to construct independent messages for each DCU, each with as many as 64 characters. The operator shall be able to:
- Compose, change, or delete any message
- Display or log any message at any time
- Assign any message to any event

2.01.6 REPORTS

Provide facility to extract data from archived files and generate custom reports.
Report generation: Automatically via user defined time schedules or on demand immediately.
Provide facility to generate reports in a user defined format.
Provide facility to export (as a whole or individually) the following data to be used in Access or some other common database software package:
- Messages
- Passwords
- Alarms (sorted by priority)
- Network Configuration
- DCU Files

A comprehensive report writer capability shall be provided in each work station to sort and extract data from the archived files and to generate finished custom reports. Reports shall be capable of manual initiation and/or printout as well as automatic printout. The system will have the capability to print reports on a daily, weekly, monthly, yearly or scheduled basis. The system will have the capability to print reports as a result of an “event”. This report writer shall provide the capability for statistical data manipulation and extraction. As a minimum the custom report writer must provide the capability to generate four types of reports: 1) Statistical detail reports, 2) Summary reports, 3) Trend graphic plots for up to four variables, 4) x-y graphic plots.
This report function shall be "on-line" for both development and printout, and shall not require export to a third party spreadsheet program for execution.
In addition to this "on-line" function, the historical database shall be capable of being converted to Data Interchange Format (DIF) for use in third party spreadsheet programs such as Microsoft Excel, for off-line manipulation. Transmission to DIF files shall be manual, event driven, or automatic based on operator selectable parameters including: time of day, frequency (daily, weekly, monthly, yearly), scheduled days (32 days minimum). File transfer shall support "appending" new data to the existing file data.

Support two printer operations. The alarm printer will print all alarm annunciation’s and return to normal, operator acknowledgments, action messages, system alarms, operator sign-on and sign-off. All operator control activities shall include the operators initials in the printed and disk record.
The data printer will be reserved for printing reports, page prints, and data base prints. Both printer functions shall be available from any PC work station.

Prepared Historical Report: Provide an on-line, historical, database report utility, with the following features:
- Prompts to select data base sort by time, by date, by point (or range of points) with system supplied default values of 24 hours, today, all Controller LAN points, respectively.
- Prompts for activating "conditional" sorts, including: changes-of-state, alarms, returns to normal,
operator sign on/off, operator acknowledgments, command errors, program control of a point, test on/off, manual on/off, program control (AIC,, Event) override, power restore, LAN reconfiguration, controller off line, time/date modifications, and archive disk memory 90% full, 95% full, and full.

- Single keystroke retrieval resulting in a report listing the most recent condition first, along with the time, date, address, name, condition type, and value.

Free Form Historical Reports: An operator shall be able to manually request reports from a console keyboard. All reports shall have time and date and shall not be limited to "canned" or "standard" format. Data shall be gathered from the field LAN's automatically and archived on owner selected work stations. The systems shall include a report writer function which supports as a minimum the following functions:

- Long term data archiving to hard disk
- Automatic directives to download to transportable media such as floppy diskettes or tapes for storage
- Data selection methods to include data base searches, sorts, and manipulation
- Data extraction shall support mathematical manipulation
- Data reports shall allow development of XY curve plotting, tabular reports (both statistical and summary),and multi-point timed based plots with not less than four (4) variables displayed.
- Generating reports either normally at operator direction, or automatically under PC directions. Both Event driven and scheduled automatic reports shall be supported.

Archiving to disk shall automatically occur as long as the PC work station is ON and physically capable of communicating with the Controller LAN(s), regardless of what programs are currently being executed at the time data is needed to be stored to disk (i.e., an operator can be developing a financial spread sheet in Excel when the FMS stores field trending information to disk--the current Excel™ program shall not be interrupted or halted) for archiving.

2.01.7 HELP SCREENS

Context Sensitive Help Screens: Provide a dedicated function key which will call up a context sensitive help screen associated with the current keyboard/mouse input.

Application Sensitive Help Screens: Provide the capability to develop help screens tailored to job specific applications. These screens shall be displayed by selecting an icon from an associated graphic display.

Dedicated Function Keys: The system shall include the following dedicated function keys as a minimum:

- Function Key Help - definition of all function keys.
- System Help - context sensitive Help
- Silence - silences new audible alarms
- Recall - re-enters deleted data during editing
- Alarm Summary - displays alarm summary screen to review or acknowledge alarms
- Messages Summary - displays events screen to review or acknowledge system messages
- Page Acknowledge - allows acknowledgment of all alarms that appear on a System Page, DCU Summary, Page Summary, or Alarm Summary
2.02.0 OPERATOR WORK STATIONS

General
Provide an on site operator workstation to provide user friendly, operator interface with the complete system.

A. Hardware specifications
Provide a DELL workstation equipment, conforming to the specified requirements. (see the project requirements schedule).

- Dell Intel Mini Tower Workstation Pentium III 500Mhz or higher processor
- 128 MB Random Access Memory
- 10GB Hard Disk or better
- 3.5 IN. 1.44 MB Diskette Drive.
- Read /WriteCD ROM 32X Or Faster
- Serial Port
- Parallel Printer Port
- 15” SVGA Color Monitor
- Color Graphics Card with at least 6 MB RAM
- 101 Keyboard
- Logitech 3 button track ball with scroll wheel
- 3COM Etherlink III with the following drivers:
  - Packet Driver: 3COM 3C59X.EXE
- Desk Jet 890C Professional Series or Equal
- Microsoft Office Professional Consisting of:
  - Access
  - Word for Windows
  - Excel

2.02.1 SOFTWARE, GENERAL

The FMS shall allow all connected work stations to function in a true multi-user, multi-tasking environment such that:

- All terminals can access the same network at the same time.
- All terminals can access and/or control the same control unit at the same time
- All terminals can access and/or modify the same control unit database at the same time
- All terminals shall be able to archive data, alarms, transactions, messages and network actions to hard disk regardless of what application programs are being currently executed (i.e., LAN operating system, spreadsheets, word processing, etc.). All archiving disk traffic shall be accomplished on line without effecting the operation of the current programs.
- A proprietary operating system to control all support functions including memory allocation, disk access and external devices.
- An application package specific to the manufacturer's FMS, operating in a Microsoft Windows environment to support versions Windows 95, 98 or NT.
- Any other required proprietary programs for functions such as graphics, reports etc.
- Latest revisions of all programs at time of practical completion.
- Licensing of software at time of practical completion.
- The software shall support fully Integrated Energy Management functions and Security / Access Control.
Operator Work Station: Any operator work station shall:

- Accept data from the Controller LAN on an as needed basis without having to scan the entire network of DCUs or MCs for updated point data.
- Interrogate the Controller LAN for updated point data when requested by the system operator.
- Allow operator command of equipment connected to DCUs and MCs.
- Allow operator to place specific MCs in or out of service.
- Allow parameter editing of DCUs, MCs, and "gateway" nodes (limited only by an individual operator's access assignments).
- Store duplicate data base on file for every DCU and MC and allow this data base to be downloaded to the remote panel while the system is on line.
- Control or modify specific programs on a per DCU, or MC basis.
- Develop, store and modify dynamic color graphics utilizing system supplied mouse and mouse supported software. It shall be possible for both mouse supported work stations and non-mouse supported work stations to coexist on the same Controller LAN.
- Provide data archiving of assigned points throughout the system and to support overlaid graphing of this data utilizing up to four (4) variables.
- To maintain system integrity, the operator shall have available an automatic DCU save utility. The database of the DCUs shall be automatically uploaded to a work station at 02:00 AM, for backup purposes. This utility will function for both direct connect and dial-up work stations.
- The operator will have the option of selecting daily, weekly or monthly as a scheduled frequency to synchronize time and date in Distributed Control Units from the PC workstation. This function will be performed for dial up as well as direct connected locations. This program shall accommodate automatic daylight savings time adjustments as well as automatic time zone adjustments world wide.
- The FMS shall support not less than 15 operator work stations, each with simultaneous access to the Local Area Network. Regardless of how the operator work stations are connected to the Controller LAN (i.e., hardwired or via modem), the network shall support all specified functions.
- The operator may print a selected Distributed Control Unit data base whenever desired. The operator shall be able to select any or all control parameters as needed. A "bindable" printout of the database of each DCU (including MCs and DPU's), with a floppy disk backup shall be submitted with "as-builts" as part of the final acceptance procedure.
- The CRT shall have a feature to indicate audibly and visually, Off-Normal conditions and messages pending, whether in FMS operating mode or third party software mode.

2.02.2 APPLICATION PACKAGE

A. General

The primary operator interface to the system shall be through the existing CSI I/NET 2000 frontend fully integrated graphical, "object oriented", interactive presentation using a mouse and cursor for object selection and commands. Features:

- Microsoft Windows 95, 98 or NT based, English language, user friendly, menu driven.
- Input commands through keyboard or mouse.
- Extensive context sensitive help facilities.
- Incorporate password access to various levels of the system.
- Time schedules including holidays.
- Maintenance of a daily log.
- Control programming using English language.
- Data base management, Data Exporter/Reporter using 3rd party packages.
- Alarm management.
- Graphics.
- Historical data file for all points.
Multi Point Trend Plot editor.
Control Unit “Point” sort function, based on Point Name or Address
User initiated logging and reports.
Support of multiple operator workstations.
Ability to integrate with Access Control and Information System.
Ability to Integrate Photo Identification Systems (Video Badging)
Remote workstation: Provide facility so that data stored on an on-site workstation may be downloaded to a remote workstation.

2.02.3 GRAPHICS
The system shall support an operator definable “default” system page. The default system page shall be displayed upon system startup, operator activity time-outs, and when the system is not in use. This default system page may be any one of the standard dynamic graphic pages, or may be a custom display developed for this purpose. The operator shall be able to display their corporate logo, emergency information, an index of all graphic pages, etc. as the default system page.

A. DYNAMIC GRAPHIC PROGRAMMING
The operator shall have the ability to construct "dynamic" graphics pages for monitoring and system control. This graphics utility shall be usable both for on-line control such as override and alarm acknowledgment, and for display of system status and alarm activity. The graphics program shall have the following features:

♦ Microsoft Windows 95, 98, or NT based integrated graphic package.
   A separate or optional graphics generation program or package is unacceptable.
♦ Minimum of 1 second updating of real time data.
♦ Page summary feature for all graphic pages.
♦ Operator modification of set points and adjustable parameters.
♦ User friendly operator development of graphics.
♦ Allow ability to copy graphic files and include function to change point references without the need to delete / re-enter.
♦ Comprehensive library of symbols.
♦ Ability to create user defined symbols.
♦ Provide an automatic page selection option for alarms. This feature (operator activated) automatically selects and displays designated “best” graphic page for each alarm, even when the operator is signed off. In the event of multiple alarms, the page associated with the most recent highest priority alarm is displayed.
♦ On-Line graphic development shall be supported on all work stations connected to the LAN either as "hard-wired" direct connect or via remote dial-in.
♦ Provide for import of .BMP file format graphics developed in third party programs such as Paintbrush. Such imported graphics shall be used as a "backdrop", so that all other dynamic and animated system features may be superimposed on this graphic. Similarly, it shall be possible to import CAD type drawings, by first converting the CAD drawing from .DXF format to .BMP format.
♦ Ability to display multiple, all dynamic graphic pages simultaneously as a multiple document interface (MDI).
♦ Add, delete, develop and/or modify custom dynamic color graphic displays utilizing either custom symbols or system supported library of symbols. Graphics shall support at least sixteen (16) colors and not less than sixty (60) outputs of real time, live dynamic data per graphic. The system shall allow this dynamic graphic data to be displayed as an animated symbol (i.e., when a door opens the door on a floor plan moves to the open position), an ASCII set (i.e., on-off), a decimal (i.e., 96.3F), or as an analog bar graph. Each operator work station shall support not less than 1,000 separate graphic pages.
This contractor shall include fifteen (15) developed graphics as approved by the owner's representative for this project. The following graphic pages shall be provided as a minimum:

- Index page of all graphics, with direct selection
- Floor plan of each floor, with mechanical room status and other values as specified.

System graphics: Provide the following graphic displays:

♦ Master graphic from which other graphics may be selected.
♦ Building elevations and plans: A number of graphics indicating position of security operations centers, plant rooms and major items of equipment and providing access to other graphics.
♦ A series of graphics (e.g. building sections) showing all equipment operational during fire mode.
♦ A series of floor plans showing all secured portals and sensor locations.
♦ System configuration: Indicating relationship of workstation, controllers, printers etc.
♦ Building single line electrical diagram: Graphic showing status and values of all monitored electrical equipment.

B. DYNAMIC GRAPHIC FLOW CHART PROGRAMMING

If desired, The operator shall have the ability to construct "dynamic" graphic flow charts of system control logic/sequences, while the system is on-line. This flow chart utility shall be usable both for on-line control logic development (i.e., programming), and for live displays of the interactive process variables occurring throughout the sequences of operations. Flow chart elements shall consist of "Icons" selected from a "toolkit". Discrete Icons shall exist for:

- Each point type (AI, DO, etc.)
- Each DDC Module or Block
  - Relay
  - Relay, Delay before break
  - Relay, Delay before make
  - Relay, Interval timer
  - PID modules
  - Two Position Modules
  - Reset modules
- Each Application program appended to a point
  - Calculations
  - Event sequences
  - Time schedules
  - Trend
  - Alarm inhibit/enable
- "Lines" (values passed between DDC modules or points)
- Pages
- Graphic pages shall have the capability to display an active ASC Icon for each ASC connected to the system

The cursor and mouse shall be used to place the Icons on the graphic, and to connect the Icons (where meaningful) with "lines". "Lines" shall display the current state or value of data passing between Icons, or Modules.

♦ Text may be inserted into the graphic to describe the control logic in sentence format. Once completed the graphics shall be able to be printed out for permanent records.

During and/or after completing construction of the dynamic graphic flow chart, the cursor may be placed on the Icon, and by "clicking" the mouse, the Icon may be expanded into the associated database editor for adding, deleting, or modifying the point, module, or application program. Similarly, the point may have its "pop-up" window called up to issue point commands, or overrides. Systems requiring graphic programming languages which are off-line, or require time delays for compiling, or which are not integrated into the primary operator work station are not acceptable.
Select a graphic screen refresh rate between 1 second refresh and 60 second refresh rate.

Graphic Display: On-line graphic development shall be supported on all work stations connected to the LAN either as "hard-wired" direct connect or via remote dial-in. The system shall support any mix of mouse supported work stations or non-mouse work stations.

The systems graphic software shall provide the following minimum features:

♦ "Page Linking" such that it is possible to "zoom" into a specific door or any other page through a sequence of graphics without using anything but the system mouse.
♦ Generate, store, and retrieve library symbols for use in generating graphic pages.
♦ Single or double height characters.
♦ Sixty (60) dynamic points of data per graphic page.
♦ Pixel level resolution. Graphics will be displayed on SVGA monitors with a 640 X 480 resolution, minimum. Color selections will be made from a color bar consisting of 16 colors, with adjacent text description.
♦ Animated objects for discrete points (i.e., doors open and close on authorized access or when a parking gate opens it goes up on the screen).
♦ Analog bar graphs for analog points. The operator shall be able to locate up to 60 bar graphs per graphic page, with options as to bar graph color, dimensions, horizontal/vertical orientation, and limit values.
♦ The real time value of each input or output from the DCU’s DDC control block modules shall be displayable on the color graphic.

An on-line "Draw" utility with a "toolkit" containing the following:

- Library Symbols
- Fill
- Page Links
- Line
- Undo
- Point Values
- Box
- Move
- Line Values
- Circle
- Delete
- Arc
2.1.0 SYSTEM CONTROLLERS

A. GENERAL

All points in the system shall be monitored and/or controlled through "intelligent" Distributed Control Units. Each distributed control unit in the system shall contain its own microprocessor and memory with a minimum 300 hours battery backup. Each Distributed Control Unit shall be a completely independent stand-alone "master" with its own hardware clock calendar and all firmware and software to maintain complete control on an independent basis. Control Units generally shall:

♦ Acquire, process, and transfer information to the PC operator work stations or other control units on the network.
♦ Accept, process, and execute commands from the other control units or other input devices, or multiple PC work stations.
♦ Allow access to both data base and control functions by multiple work stations at the same time.
♦ Record, evaluate, and report the changes of state and/or value that occur among points associated with the control unit. If any operator work station or transmission network fails, but the power to the control unit does not, the control unit shall continue to perform all control functions associated with the points connected to that control unit.
♦ Control Unit Upload/Download Capability: Each control unit shall be able to download from or upload to any PC operators existing CSI work station. All point data shall be modifiable from any authorized PC operators work station and downloaded to the control unit over the Control Unit LAN. This upload/download shall be readily performed on a regular basis without interrupting the control functions in the control unit. All upload/downloads shall be performed without the operator workstation being taken "off-line.

♦ The system controllers must provide an integral time clock and have the capability to Synchronize time with operator workstation or other FMS panels at least weekly.

♦ The system controllers must provide a dedicated port for communication link between panels.

♦ The system controllers must provide a separate RS232 communications port for connection of portable operator's terminal (laptop PC and/or a hand held controlling device).

♦ Provide sufficient input/output modules to achieve the required control functions, including the required spare points.

♦ Terminal Blocks: Removable without having to disconnect field cabling.

♦ Control Unit Point Scanning: It shall be possible to independently set the scan or execution speed for each point in the control unit to an operator selected time from 1 to 254 seconds.

2.1.1 CONTROLLER SOFTWARE/FIRMWARE

Provide the following features:

♦ Real time, day of the week and calendar.
♦ Automatic clock synchronization from operator work station.
♦ Time schedules.
♦ Holiday schedules.
♦ Temporary Schedule Overrides
♦ Automatic Daylight Savings Time Switcher
Software timers with 1 second resolution.

User defined alphanumeric software and hardware point descriptors.

Resident diagnostics which continuously monitors the operation of the unit, enunciate faults (including continuous looping of control loops, unreliable data) and provide continuous operation using the last reliable data.

Test mode to drive a selected point (not the physical service) to a selected value and observe the consequential effect.

Four levels of password protection.

Alarm processing program including the ability to redirect alarms according to alarm priority and time schedules.

Trend logging and event logging programs. Minimum 100 samples per point.

Analog totalization (integration).

Pulse accumulation providing totalization and rate values.

Spare points: Allow for all software associated with the required spare points.

Field points and software derived points: Fully addressable.

Program loading: On line, either from a personal computer directly into the Control panel or through the operator workstation.

2.1.2 CONTROLLER APPLICATION ROUTINES

**Automatic Time Scheduling (ATS):**
Each Control Unit shall provide self-contained ATS programs for automatic start/stop/scheduling of devices. Each ATS program shall support up to seven (7) normal day schedules, seven (7) "special day" schedules and two (2) temporary day schedules. The special days schedule shall support up to 30 unique date/duration combinations. Each load shall support an individual time program, as a minimum.

Each load shall be able to be assigned at least 17 control actions per day with 1 minute resolution. Operator selectable time schedule operation choices shall include the following: Start, Optimized Start, Stop, Optimized Stop, Cycle, Optimized Cycle.

A minimum of 30 holiday periods up to 99 days in length may be specified for the year.

It shall be possible to create "temporary" schedules up to a week in advance that will be in operation only on the day or days specified.

Support a temporary "special day" date and duration to be broadcast to selected or all sites to account for unusual situations such as temporary operating hours or "snow days".

Support control actions to be performed at any operator selectable time of day as well as at "sunrise" and "sunset". Sunrise and sunset parameters shall be selectable based on time zone, latitude, and longitude.

In addition to individual load scheduling, provide for group scheduling by designating equipment to be linked to a “master” time schedule, for quick schedule changes of large groups of equipment which follow a common schedule, (i.e. master / slave scheduling). The master schedule shall provide a choice of fixed start and stop times by day, or a plus and minus adjustments to the existing schedule, in minutes. Master schedules shall provide a choice of immediate activation or activation at a later date and time.

**Calculated Points:**
Each Control Unit shall provide the operator a means of defining calculations and totalization computed from monitored points (analog/digital points), constants, or other calculated points. Calculations shall be executed at the uniquely assigned point scan rates.
Numeric values generated from the calculations shall be treated like any other analog value in that alarm limits may be assigned to them. These values may be used in any Control Unit on the controller LAN for any function that a "hardwired point" might be used (i.e., control sequences, setpoints, targets, etc.).

**Event Initiated Programming (EIP):**
Each Control Unit shall provide event initiated programs. An event may be initiated by any data point. Triggering an EIP shall cause a series of control actions in a sequence, i.e., if point A reaches an alarm condition, start points 1 through 12. Up to 64 sequences can be defined. Each sequence may cause up to 18 control actions. Sequences may be chained together. As a minimum provide the following options for Event initiated programming:

- Start
- Stop with Lock
- Stop
- Stop with Lock
- Inhibit
- Enable
- Zero
- Non-Zero
- Skip
- Output
- Output with Lock

**Direct Digital Control (DDC) Modules:**
If required supply Control Units capable of providing "Block" or "Modular" programming software such that the operator can easily develop custom control strategies and sequences of operation, without learning a programming language.

If required control loops and sequences shall be defined using "modules" that are analogous to traditional pneumatic or electric control devices. Modules may be linked together to form more complex security strategies. The use of mathematical equations, "BASIC", or proprietary programming languages for defining a control loop is unacceptable.

The following types of modules shall be supported in firmware for each Distributed Control Unit in the system:

- Two-position controller
- Primary and secondary reset schedule selector
- Hi/Low signal selector
- Single pole double throw relay
- Single pole double throw time delay relay with delay before break, delay before make and interval time capabilities
- Proportional, Integral, Derivative module (PID)
- Floating module
- Calculation module

**2.1.3 POINT TYPES**
The Facility Management System must support small point controllers that have the capability to provide and support (if required) the following point types:
Universal inputs:
The FMS system must support a voltage, current, temperature, pulse or digital input from a field device.
♦ Derive from voltage free contacts on the monitored equipment.
♦ Digital inputs:
♦ For push button inputs, provide means of holding signal to suit SMS scan time.
♦ Provide indication lights.
♦ Pulsed inputs: Provide accumulation interface, capable of accepting 10 pulses/second.

Analog inputs:
♦ Provide surge protection.
♦ 4-20 ma, 0-10 volt or 0-5 volt input.
♦ Accuracy: Minimum ± 0.2%.
♦ Minimum 12 bit analog to digital conversion.

Digital outputs:
♦ Digital outputs with voltage free contacts.
♦ Voltage sourceing Digital outputs.
♦ Indication lights for outputs.
♦ Adjustable pulse length for pulsed outputs.

Analog outputs:
♦ Provide surge protection
♦ 0-10 Volt output or 4-20 ma.
♦ Accuracy: Minimum ± 0.2%.
♦ Minimum 8 bit digital to analog conversion.
♦ Pulse width modulated outputs.

Spare points: Provide the required spare inputs and outputs.

Provide digital input devices to satisfy the requirements of the installation.

2.2.0 HARDWARE SPECIFICATIONS, 7800 SERIES TAPS
The quantities and types of controllers shall be determined by the contractor based on the requirement to provide a fully operational system, as per the intent of the specification, as shown on the drawings and recommended by the manufacturer. As a Minimum the following features shall be supported in each 7800 Series Taps:
Locate Anywhere on the LAN
Protocol Conversion
Message Buffering
Desktop and Wall Mount Versions
Provides Concurrent, Multiple System Interfaces
Multi-Tier
♦ Commercial LAN (Ethernet 10BaseT)
♦ Host LAN
♦ Communications
♦ Controller LAN
♦ Modular Networks
♦ Distributed Networks
Peer-to-Peer Networks
- Token Passing Networks
- Host LAN
- Controller LAN
- Collision Detection Networks
- Ethernet
- TCP/IP

Telephone Communications
- Voice Grade Lines
- Leased Lines
- Dedicated Lines
- Hayes Modem Compatible
- AutoDial/AutoAnswer (AD/AA) Support

Globalization of All Points
- Automatic Token Spawning
- Reconfiguration on Fault Conditions
- Multiple “Messages” per Token
- High Throughput

Long Distance
- 25,000 feet (8KM)
- Fiber Optic Compatible

2.2.1 CONTROLLER OPERATION

System utilizes a multi-tier, distributed Local Area Network (LAN) topology to provide high speed communications between controllers, buildings, service centers and PC workstations. TAPs are nodes on the LANs and provide protocol conversion and buffering to interface tiers, PCs or modems. The Controller LAN supports both Controllers and TAPs. TAPs on the Controller LAN allow connection of PCs or modems any-where along the Controller LAN.

LANs
The Controller LAN utilizes a peer-to-peer, token passing protocol to communicate between nodes on the network. This LAN operates at 19,200KB. Effective throughputs and response times are very high due to the efficient design of the “message packets,” which carry many more messages per token than conventional systems. With a maximum dwell time of 0.055 seconds, (0.015 seconds typical), a fully loaded Controller LAN, consisting of 64 stations, is assured to have a response time of no worse than 3.5 seconds. Some controllers support integral TAPS. The Host LAN supports one or more PC Workstations for Service Center operations. A Host LAN also supports TAPs, which provide connection to many local or remote Controller LANs and controllers, usually via modems. Up to 8 PCs can reside on a single Host LAN. A Host LAN supports up to 16 Link TAPs for connection to remote sites. PC Workstations can also reside on a Commercial LAN such as Ethernet. Up to 63 Workstations can reside on an Ethernet LAN, and co-reside with many other user PCs on the same non-dedicated network.

2.2.2 DATA COMMUNICATIONS

PC Port:
- Protocol: Asynchronous, Polling, RS-232
- Baud Rate: 300, 1200, 2400, or 9600

Host Lan:
- Protocol: Token Passing, RS-485
- Baud Rate: 9600 or 19200

Controller LAN
- Protocol: Token Passing, RS-485
• Baud Rate: 9600 or 19200
Cables:
• LAN: 22 AWG (0.324mm) shielded, twisted pair (Belden 9184) 5,000’ (1500mm) maximum or 24
AWG (0.206mm) shielded, twisted pair (Belden 9841) 4,000’ (1200mm) maximum per segment.

2.3.0 HARDWARE SPECIFICATIONS 7716 PROCESS CONTROL UNIT
The quantities and types of distributed controllers shall be determined by the contractor based on the
requirement to provide a fully operational system, as per the intent of the specification, as shown on the
drawings and recommended by the manufacturer. As a Minimum the following features shall be supported
in each Process Control Unit:
• Direct Digital Control (DDC)
• Both Adaptive and Self-Tuning PID Algorithms
• Universal Inputs
  Pulse
  Analog
  Discrete
• Configurable Outputs
  Pulse Width Modulation (PWM) Analog Control
  Form C Relay Discrete Control
  Floating Control
• Peer-to-Peer Token Passing LAN Port — Built-in
• Automatic LAN reconfiguration upon any fault detection
• Automatic Restart Procedure Upon Power Loss/Restoration
• On-Off-Auto Switches On All Outputs
• Pre-wired for Status Feedback
• LED Indicators for Output Status
• Look-Up Tables for Each Input
  20 Segment Curve Fitting
• Analog Transducer Power Supply Built-in
• Local Port for PC
• Local Port for Auto Dial/Auto Answer Modem
• On-board Trending of All I/O Points
• Modular, Object Oriented Programming
• Extensive Math/Logic Package
• Resident Programs for:
  Environmental Control with DDC
  Energy Management
  Historical Data Collection
  Baseplate Mounting
  Downloadable Firmware
• UL Listing

2.3.1 CONTROLLER OPERATION
The 7716 Process Control Unit provides direct control and monitoring of process functions from a “Peer-
to-Peer” LAN based controller. These process functions include environmental control, trending, energy
management, and process control which may be executed locally in a standalone mode or “globalized”
across the Token Passing LAN. The 7716 is appropriate for commercial, institutional, industrial
applications and will provide the following control functions:
• **Direct Digital Control** is provided by “Object Modules” which are used to develop global logic sequences. These Object Modules emulate pneumatic/electronic components and may be “linked” to create a wide variety of custom control sequences. Object Modules are available for: PID, Floating, High/Low Selector, 2 Position, Relay (with timer), and Reset (dual input).

• **Automatic Time Scheduling** provides a full year’s schedule, including multiple start/stop times, special days and temporary inputs for each load.

• **Automatic Temperature Control**, working in conjunction with Automatic Time Scheduling, self adjusts the heating or cooling set-point providing normal temperature control, as well as setup/set back control, including user specified deadbands. Predictive Central Plant Start allows plant startup based on inputs from one or more space sensors.

• **Demand Limiting** continuously monitors the rate of electrical power consumption and predicts the demand during each demand interval. If the predicted demand exceeds a preset level, controlled loads are shed or control set points changed in a user defined priority sequence. As peak demand passes and electrical power consumption decreases, the controller restores the loads or set points to their normal routines. Multiple power meters are supported in each PCU, with multiple loads specified for each meter. Maximum Off, Minimum On-Off, and seven levels of shed priority ensure efficient Demand Limiting, while protecting environmental control objectives.

• **Calculated Points** are used to perform special calculations required by the system. Calculated points allow development of “equations” using math, logic, Boolean, time, and other operators. “IF-THEN-ELSE” control sequences, with time delay options, based on a state change or specified state of a point.

• **Additional Functions** include Runtime, Consumption and Alarm Inhibit.

• **High Resolution Look-up Tables** Non-linear points may use a look up table for linearization. The table contains as few as 2 or as many as 21 entries. Separation between entries is user definable, allowing higher accuracy around the primary area of interest. Look up tables may be used with linear or non-linear signals to clamp the end points to a specific value.

• **Downloadable Firmware** Complete executable software is downloaded through a locally connected PC, the LAN, or a modem.

• **On-Line Editing Capability**. The 7716 provides direct on-line edit capability via a local, remote, or portable PC for instant modification of all parameters. An operator with the appropriate password authorization may make changes “on-line” that are as simple as time schedule changes or as comprehensive as chiller optimization strategies. There is no need to use archaic techniques that require compiling, debugging or reload-ing the software. The operator may observe the results of the changes instantly

• **Trend Sampling**. Trend Sampling is accomplished within the controller independent of any PC workstation. Each PCU can trend all connected points and can store up to 1440 samples of critical points within the PCU. These samples can be archived to multiple local or remote PC workstations and used to generate custom reports.

### 2.3.2 DATA COMMUNICATIONS

• **COMMUNICATION PORTS**
  Controller LAN: RS-485; 19,200 or 9600 baud, SDLC, token-passing.  
  Hand Held Console Port- RJ11 Modular, 1200 baud, TTL  
  RS-232 Port: PC @ 9600 baud (7801 TAP function), or Hayes direct-dial asynchronous modem @ 1,200, 2,400 baud or 9,600 baud  
  RS-232 Expansion Board Port: Supports synchronous modem, direct or two-way dial SDLC (78061 or 78035 TAP functions) @ baud rates of 1,200 to 9,600 baud. Requires optional plug on module.

• **NETWORK WIRING REQUIREMENTS**
  Cable Supported: Twisted pair, shielded. 22 AWG (0.324 mm2) or larger, 30 pF/ft. or less between conductors, 55 pF/ft. or less conductor to shield, 85 to 150 Ohm impedance. Belden 9841 or equivalent

• **CONTROLLER LAN LENGTH**: 5000 ft. (1500 m) per segment. 25,000 ft (7600 m) with repeaters

### 2.8.0 HARDWARE SPECIFICATIONS, 7793 MICRO CONTROLLER INTERFACE
The quantities and types of controllers shall be determined by the contractor based on the requirement to provide a fully operational system, as per the intent of the specification, as shown on the drawings and recommended by the manufacturer. As a Minimum the following features shall be supported in each MCI Controller:

Integration:
- Environmental / Energy Management
- Access Control
- General Purpose

MicroControl Units Supported:
- 123 Series MicroRegulators’
- Application Specific Controllers (ASC)
- Universal Series MicroRegulators
- 7910A Series Door Processing Units (DPU)
- 7920 Series Door Processing Units DPU
- 7930 Series Digital Input Unit (DIU)
- 7940 Series Digital Input Output Unit (DIO)

Peer-to-Peer Token Passing LAN Standard
Dual MicroController Sub-LANs
- 32 DPU’s per MCI
- 64 MRs per MCI
- 64 MicroControl Units per MCI (DPU and MR combined)

Mix and Match Controllers on the Sub-LANs
Counter-Scanning Loop Option
Front End Controller for Standalone System
Supports Up to 64 Doors
Supports Up to 64 HVAC Equipment Units
Remote Operation Over Dial-Up Phone Lines
Fiber Optic Compatible
Local Ports for PC or Modem
Auto Dial/Auto Answer Modem Option Board
Modular, Object Oriented Programming
Gateway for Global Control Functions

Resident Programs for:
- Access Initiated Control
- Elevator Control
- Environmental Control
- Energy Management
- Historical Data Collection

2.8.1 CONTROLLER OPERATION
7793 MicroController Interface provides a “Gateway” between CSI’s token passing, peer to peer Controller LAN and a network of standalone MicroControllers. The MCI also functions as a network controller for a stand alone system. The 7793 MCI serves a dual role. It can be a standalone network controller for a system of MicroControl Units. Or, it can function as a gateway between a network of MicroControl Units and other controllers in a larger I/NET 7700* Distributed Control System. An RS-232 port is standard for either a local PC or a modem. An option board adds a second port so that a local PC and an Auto Dial/Auto Answer modem may operate concurrently. Both the PC and the AA/AD modem have access to any point on the Controller LAN or the sub-networks of MicroControl Units. The MCI supports up to 8 telephone numbers for use with the AD/AA modem function. The MCI provides global functions for the MicroControl Units. These global functions include: Access Initiated Control, Elevator Control, Event Initiated Control, Trending, Runtime Accumulation, Automatic Time Scheduling.
Calculations, Anti-Passback and periodic synchronization of the local clocks in the MicroControl Units.

2.8.2 DATA COMMUNICATIONS

- CONTROLLER LAN: RS-485; 19,200 or 9,600 baud, SDLC, token-passing
- DOOR CONTROLLER LAN: RS-485; 9,600 baud, asynchronous, polling.
- HAND HELD CONSOLE PORT: RJ11 Modular, 1,200 baud, TTL
- RS-232 PORT: PC @ 9,600 baud (7801 TAP function), or Hayes direct-dial asynchronous modem @ 1,200, 2,400, or 9,600 baud
- RS-232 EXPANSION BOARD PORT: Supports synchronous modem, direct or two-way dial SDLC (78061 or 78035 TAP functions) @ baud rates of 1,200 to 9,600 baud. Requires optional plug on module.
- NETWORK WIRING REQUIREMENTS:
  CONTROLLER LAN LENGTH: 5000 ft. (1500 m) per segment. 25,000 ft (7600 m) with repeaters
  MICROCONTROLLER SUB-LAN LENGTH: 5000 ft. (1500 m)
- CABLE SUPPORTED: twisted pair, shielded. 22 AWG (0.324 mm2) or larger, 30 pF/ft. or less between conductors, 55 pF/ft. or less conductor to shield, 85 to 150 ohm impedance
- AUTO DIAL SUPPORT
  TELEPHONE NUMBERS: 8, stored in NOVRAM
  NUMBER OF DIGITS: 31 per phone number
  SUPPORTED: Phone, Beeper, Pager

2.10.0 HARDWARE SPECIFICATIONS, UNIVERSAL SERIES MICROREGULATOR CONTROLLERS

The quantities and types of MicroRegulator controllers shall be determined by the contractor based on the requirement to provide a fully operational system, as per the intent of the specification, as shown on the drawings and recommended by the manufacturer. As a Minimum the following features shall be supported in each Universal MicroRegulator Control Unit:

- I/STAT Support Standard
  Local Display 3 Digit & Decimal
  Local Control – Analog or Digital
  Local Override & Setpoint Adjustment
  4 Local or Global Points
  User Defined Passwords
- Integral 7 Cay Start/Stop Schedule
  Default if Not connected to Controller
- "Standalone" Logic Sequences
  Object Module Programming
- Universal Inputs
  Thermistor
  Voltage (0-5V or 0 – 10 V)
  Current (0 – 20mA)
  Contact (Discrete or Pulse)
- Relay or Low Voltage Triac Outputs
  Control Floating Actuators
  Two Position Actuators
  On/Off Control
  PWM Proportional Control Systems International Analog Outputs
  0-10 Vdc Actuators
- Self Test Diagnostics
- Input Point Parameters
  Normal & Narrow Range
  Outdoor & Indoor Temperature Ranges
2.10.1 CONTROLLER OPERATION
Database and logic sequences may be custom developed on a PC and downloaded to the MicroRegulator. Database and critical parameters are stored in non-volatile ram for standalone operation thereafter. Database and parameters may be modified from the PC. Points may be displayed and controlled, and object module outputs may be displayed from either a PC or locally connected I/STAT. The MicroRegulator contains “Object Modules” which are used to develop the local logic sequences. Object Modules are “linked” to create a wide variety of custom control sequences. These Object Modules, which can scan at 1-255 seconds (individually selectable) include:
- PID
- Floating
- 2Position
- Reset
- Relay
- Calculation

2.10.2 DATA COMMUNICATIONS
- MICRONREGULATOR LAN: RS-485, 9600 baud, asynchronous, polling.
- NETWORK WIRING REQUIREMENTS
  - MR LAN LENGTH: 5,000 ft. (1500 m)
  - CABLE SUPPORTED: twisted pair, shielded. 22 AWG or larger, 30 pF/ft. or less between conductors, 55 pF/ft. or less conductor to shield, 85 to 150 ohm impedance. Belden 9184 or equivalent.

2.11.0 HARDWARE SPECIFICATIONS, MR-VAV-AX APPLICATION SPECIFIC CONTROLLER
The quantities and types of MicroRegulator ASC controllers shall be determined by the contractor based on the requirement to provide a fully operational system, as per the intent of the specification, as shown on the drawings and recommended by the manufacturer. As a Minimum the following features shall be supported in each MR-VAV-AX ASC Control Unit:
- Fully Integrated Actuator, Airflow Transducer and Controller in a single, low profile package.
- Standalone and Networked Applications
- Extensive VAV Control Sequences:
  - Two Stage Heating, Multiple Modes
  - Series/Parallel Fan
  - Local/Remote Central Plant Heat or Morning Warm-up Control
  - Local/Remote Shut Down Override (fire, failure, etc)
  - Indoor Air Quality Airflow Setpoint Override
  - Demand Control Setpoint Override
  - Minimum and Maximum Airflow Parameters for Heating and Cooling
- Complete “Out-Of-the Box” Installation, Configuration and Commissioning
- DIP Switch Configuration and Network Addressing with Local/Remote Override
- Completely Mount and Secure with one Box Screw and Two Damper Shaft Screws
- Travel Limit Settings
  - Autocalibration of Airflow and Temperature Sensors
  - Autoconfiguration of Heating Stages
  - “Prove It” function for Performance Verification
  - Automatic Database Distribution for Networked Configurations
- Default Parameter Values
  - Configuration and Commissioning by I/STAT, M/STAT, or PC
Auto rescaling of velocity transducer in low flow applications
Self Test Diagnostics
• I/STAT and M/STAT Support Standard
• Local Display – 3 Digit & Decimal
  Local Point Control – Analog or Digital
  Local Override & Setpoint Adjustment
  Service Mode for Commissioning and Calibration
  User Defined Passwords
  Slide /STAT Support Standard
• Slide Setpoint Override
  Integral Port for M/STAT Connection
• Five Inputs
• Integrated Airflow Transducer
  Thermistor or Discrete
• Five Low Voltage Triac Outputs for
  Series/Parallel Fan Control
  First Stage Heater Control (Two Position, Frequency Modulated, Pulse Width Modulated or Floating
  Control Modes)
  Second Stage Heater Control (Two Position Control only)
  Integrated Actuator

2.11.1 CONTROLLER OPERATION
The MR-VAV-AC has been designed to minimize the total installation setup, configuration and
commissioning time typically associated with VAV controllers. The actuator, airflow transducer and
controller have been integrated into a low profile, plenum rated package that can be completely mounted
and secured with one box screw and two damper shaft screws. The controller is also supplied with an
extensive range of pre-engineered and tested control sequences; Therefore no application programming is
required. All configuration parameters are pre-installed with the most typical default values; However, they
can be overwritten either by an I/STAT, an M/STAT or an Operator PC workstation. Also, a “Prove It”
function allows a complete verification of the control sequence from an I/STAT or M/STAT. Once
initiated the space temperature is placed in Test Mode and can be “increased” or decreased by the buttons
on the I/STAT. This allows confirmation of the thermodynamic process from end to end.

2.11.2 DATA COMMUNICATIONS
• MICROREGULATOR LAN: RS-485, 9600 baud, asynchronous, polling.
• NETWORK WIRING REQUIREMENTS
• MR LAN LENGTH: 5000 ft. (1500 m)
  CABLE SUPPORTED: Twisted pair, shielded. 24 AWG or larger, 30 pF/ft. or less between
  conductors, 55 pF/ft. or less conductor to shield, 85 to 150 Ohm impedance. Belden 9841 or
equivalent

HARDWARE SPECIFICATIONS, MR-AHU/HP APPLICATION SPECIFIC CONTROLLER
The quantities and types of MicroRegulator AHU/HP controllers shall be determined by the contractor
based on the requirement to provide a fully operational system, as per the intent of the specification, as
shown on the drawings and recommended by the manufacturer. As a Minimum the following features shall
be supported in each MR-AHU/HP ASC Control Unit:
• Standalone and Networked Applications
• Extensive AHU/HP Control Sequences:
  Single/Dual Duct
  Two Stage Cooling, Multiple Modes
  Two Stage Heating, Multiple Modes
Economizer Control (AHU)
Reversing Valve Control (HP)
Local/Remote Occupancy Override
Local/Remote Enthalpy Override of Economizer
Local/Remote Shut Down Override (fire, failure, etc)
Demand Control Setpoint Override

- Complete “Out-Of-the Box” Installation, Configuration and Commissioning
- DIP Switch Configuration and Network Addressing with Local/Remote Override
- Autocalibration of Temperature Sensors
- “Prove It” function for Performance Verification
- Automatic Database Distribution for Networked Configurations
- Default Parameter Values
- Configuration and Commissioning by I/STAT, M/STAT, or PC
- Self Test Diagnostics

- I/STAT and M/STAT Support Standard
- Local Display – 3 Digit & Decimal
- Local Point Control – Analog or Digital
- Local Override & Setpoint Adjustment
- Service Mode for Commissioning and Calibration
- User Defined Passwords

- Slide /STAT Support Standard
- Slide Setpoint Override
- Occupancy Override
- Integral Port for M/STAT Connection

- Four Inputs
  - Thermistor or Discrete
- Six Low Voltage Triac Outputs for:
  - Fan Control (Two Position only)
  - First Stage Cooling Control (Two Position, Frequency Modulated, Pulse Width Modulated or Floating Control Modes)
  - Second Stage Cooling Control (Two Position Control only)
  - First Stage Heater Control (Two Position, Frequency Modulated, Pulse Width Modulated or Floating)
  - Second Stage Heater Control (Two Position, Frequency Modulated, Pulse Width Modulated or Floating)
  - Outside Air Damper (With Economiser)
  - Reversing Relay (HP)

2.13.1 CONTROLLER OPERATION

The MR-AHU/HP ASC has been designed to minimize the total installation setup, configuration and commissioning time typically associated with Air Handling Units and Heat Pump controllers. The controller is also supplied with an extensive range of pre-engineered and tested control sequences; therefore no application programming is required. All configuration parameters are pre-installed with the most typical default values; however, they can be overwritten either by an I/STAT, an M/STAT or an Operator PC workstation. Also, a “Prove It” function allows a complete verification of the control sequence from an I/STAT or M/STAT. Once initiated the space temperature is placed in Test Mode and can be “increased” or decreased by the buttons on the I/STAT. This allows confirmation of the thermodynamic process from end to end.

2.13.2 DATA COMMUNICATIONS

- MICROREGULATOR LAN: RS-485, 9600 baud, asynchronous, polling.
- NETWORK WIRING REQUIREMENTS
• MR LAN LENGTH: 5000 ft. (1500 m)
  CABLE SUPPORTED: Twisted pair, shielded. 24 AWG or larger, 30 pF/ft. or less between
  conductors, 55 pF/ft. or less conductor to shield, 85 to 150 Ohm impedance. Belden 9841 or
  equivalent

2.15.0 FIELD HARDWARE

DIGITAL INPUT DEVICES

A. General
  Provide digital input devices to satisfy the requirements of the installation.

B. Electric duct heater protection thermostat
  Type: Duct mounted, Penn A25N or equal.
  Operation: Manual reset with adjustable external dial in the range of 140°F to 250°F (60°C to 120°C),
  switching voltage free contacts. Provide single pole double throw contacts where indication is required.

C. Current Sensing Relay
  • Type: Adjustable current threshold

D. Air flow switch
  • Type: Two-port operating a diaphragm, incorporating protection against three times working pressure.
  • Operation: Spring loaded diaphragm with adjustable set point, activated by air pressure, switching
    voltage free contacts.

E. Water flow switch
  • Type: Pipe mounted.
  • Operation: Spring loaded fully sealed paddle with adjustable set point, activated by water flow,
    switching voltage free contacts.

F. Float switch
  • Type: Suitable for the fluid, mounted in accessible position.
  • Operation: Float with adjustable differential, switching voltage free contacts.

G. KWH Transducers
  • Type: Current input from current transformer and Voltage inputs with pulsed output, and rate
    proportional to monitored current and Voltage.
  • Transformer selection: Maximum current to meter approximately 1.5 times full load of monitored
    current. Provide integral, accessible zero and span adjustment, open and short circuit protection and
    reverse polarity protection.
  • Accuracy: ± 1.5% of span, maintained with up to ± 30% supply voltage fluctuation.

ANALOG INPUT DEVICES

A. General
  Provide analog input devices to satisfy the requirements of the installation.
  Provide devices with the following characteristics:
  Long term accuracy without the need for regular calibration.
  Have a range, accuracy, and speed of response suitable for the application and suitable for the environment
  in which they are installed.
  Selected and installed to ensure that they together with the wiring system will not be adversely affected by
  induced voltages from other wiring systems in the building.
Achieve the required device accuracy’s in the software point value, i.e. after inclusion of transducer and signal transmission errors.

B. Analog input transducers
Provide analog input transducers where required for signal conversion. Provide integral, accessible zero and span adjustments, open and short circuit protection and reverse polarity protection.
Accuracy: \( \pm 1.5\% \) of span
Output: 4-20 MA or 0-10 V.D.C. directly proportional to input over the entire rated span of the transducer.

C. All temperature sensors
Type: Current loop, Integrated Circuit, Thermistor or RTD operation. Linear response, suitable for the working range of the application.
Accuracy: \( \pm 0.5^\circ \)F of calibrated temperature over the working range, including drift over a 6 month period.
Repeatability: \( \pm 0.5^\circ \)F

D. Space air temperature sensors
Wall, column and ceiling mounted type with an attractive tamperproof cover containing terminal connections and sensor insulated from the mounting surface.
Outdoor air sensors: Weatherproof, insect proof, dust resistant and not directly affected by radiation.
Installation: Firmly screw mount sensors to walls, ceilings or columns. Conceal all wiring from view inside wall, column or ceiling space. Mount sensors to avoid exposure to sunlight and other heat sources.
Wall or column sensors: Mount 60” above floor level. Seal all penetrations in the mounting surface.

E. Intelligent Sensors
Where shown on the plans, provide “intelligent” space sensors for Application Specific Controllers which have the following features:
3 digit (plus decimal) alphanumeric display
A means to locally control analog or digital points in the connected controller
Local override and setpoint adjustment (within software limits)
Occupancy status LED and On/Off push-button
A “call” push-button that can be linked to an Event Initiated Program anywhere in the system
Display of all local input and output points in the service mode for ASCs
Display of up to 4 user defined “global” or system points (e.g., outside air temperature, outside air RH, fan status)
Password protection of access to service mode.
Space sensors shall have an integral port for connection of a portable “intelligent” sensor to communicate with its ASC. This port and portable “intelligent” sensor may be used for initiating the "test mode" locally to verify all ASC control sequences, and perform test and balancing functions.

F. Duct and Coil Discharge Temperature Sensors
Installation: Locate so that representative temperature readings are obtained.
Coil discharge sensors: Use averaging capillary type. Provide adequate support for the sensing element and access to the wiring. Alternatively, provide four separate sensors, uniformly spaced, mounted on a grid and average the readings.

G. Immersion temperature sensors
Type: Suitable for pipe or tank immersion with sufficient length to ensure accurate measurement.
Installation: Install sensors in stainless steel wells such that the response time is suitable for the application. Provide thermal contact with the immersed surface of the well by means of thermal conductive paste. Make provision for sensor removal. Where wells are installed in insulated pipe, ensure that the well extends clear of the insulation.
Mounting: Such that condensation does not run into the sensor head.
H. Relative humidity sensors
Type: Capacitance or resistance type, space or duct mounted.
Space mounted: In accordance with Clause: Space air temperature sensors.
Accuracy: ± 2% R.H. or ± 4% RH as the application demands.

I. Air velocity sensors
Type: Multi-point grid sized suitable for duct size.
Installation: Locate to provide representation of duct velocity in accordance with the applicable standard.
Operation: Pitot tube principle sensing velocity pressure, using Differential Pressure sensor.
Accuracy: ± 3% of span.

J. Air differential pressure or static pressure sensors
Type: Two port input operating a diaphragm, incorporating protection against three times working pressure.
Installation: Locate sensing tubes to accurately sense pressure in each section.
Accuracy: ± 2% of span.

K. Water differential pressure sensors
Note: The sensing element is an annubar or venturri type for flow measurement. This specification shall also apply to water differential pressure sensors installed between supply and return water lines which provide input to the DDC system for pressure bypass or pump VSD control.
Transducer: Two port input operating a stainless steel diaphragm, incorporating protection against three times the working static pressure.
Accuracy: ± 2% of span.

L. Water magnetic or Turbine flow meters
Selection: Size for flow requirements, not line size, with minimum turndown of 100:1.
Type: Teflon lined tube with stainless steel electrodes, suitable for sensing flow in either direction.
Accuracy: ± 2% of span.

M. Refrigerant pressure sensors
Installation: Locate to minimize pressure fluctuations. Sense head pressure after condenser in liquid line, not in compressor discharge line.

N. Current transformers
Type: Resin encapsulated with 5A secondary windings, with open and short circuit protection.
Selection: Rated output when current is approximately 150% of the full load current.

O. Current and voltage transducers
Type: Accuracy class 0.5, solid state with isolated inputs.
Selection: 4-20 MA or 0-10 VDC output over entire span of transducer.

P. Watt transducers
Type: Accuracy class 0.5, solid state with isolated inputs.
Inputs: From current transformers and voltage of the phases measured.
Output: 4-20 MA or 0-10 VDC, proportional to measured power, taking into account power factor correction.
Balanced three phase circuits: Provide one watt transducer.

OUTPUT DEVICES
A. General
Provide output devices to satisfy the requirements of the installation.
B. Damper and Valve actuators

- **Type:** Two position or modulating, normal or spring return to meet specified requirements, with 0-10 V or 2-10 V control signal input.
- **Selection:** Torque sufficient for application, selected for a maximum of 80% of the manufacturer's rating.
- **Features:**
  - Direct shaft mounting.
  - Overload/stall protected.
  - Linear shaft output to input signal.
  - 24 Volt A.C. power operation.
  - Dampers above occupied space: Inaudible operation.
  - Open, closed and intermediate position indication on actuator case.
  - Disengagement mechanism to allow the dampers to be manually operated.

C. Control valves

- **Selection:**
  - Pressure rating: To suit working pressure and full pump shut-off head.
  - Temperature rating: To suit the application.
  - Leakage in full closed position: Less than 1% of design flow at pump shut-off head.
  - Coil control valves: Provide equal percentage characteristic. Select valve coefficient so that pressure drop through fully open valve at full flow is not less than 150% and not more than 250% of the operating pressure drop through the coil.
  - Bypass valves: Provide modified linear characteristic. Select valve coefficient so that pressure drop through fully open valve at full flow is as close as practical to, but not greater than the design system pumping pressure differential.
- **Construction:**
  - Type: Ball or Globe valves may be used to suit the application.
  - Valves 2 inch and below: Bronze or cast iron body with screwed ends and union connections.
  - Valves above 2 inch: Cast iron or cast steel with flanged ends.
- **Installation:** Install valve stems vertically.

D. Control valve actuators

Provide actuators to meet specified sequence of operation.

- **Features:**
  - Mounted direct to valve stem.
  - 24 Volt A.C. power operation.
  - Open, closed and intermediate position indication.
  - Facility to allow the valve to be manually operated.
  - Actuators for steam valves: Spring return type.

E. Electronic to pneumatic transducers

Application: Conversion of analog input voltage or PWM to proportional output air pressure in a smooth stable manner.

2.16.0 ASSOCIATED EQUIPMENT

A. Portable operator's terminal

Provide a hand-held portable terminal to connect directly to Security Management System (SMS) panel or small point controller.

**Functions:**

- Program and parameter alteration.
Overriding of all inputs and outputs.
Communication with any other panel.
Operation not affecting panel communication with other panels.

B. Modems

*If required,* provide:

- Modem connected to the communication network.
- Modem at the required remote location.

**Type:** Dial in, dial out at each site.

**Operation:** Remote communication with the system without the need to load any additional driver software or change hardware or cabling configuration. Provide hardware and software and configure the system to:

- Dial out when a selected event occurs and transmit a message to a remote device.
- Inhibit dial-out according to time schedules.
- Select the dial-out telephone number according to time schedules.
- Ten simultaneous dial connections
- Graphic Page Dial Icons
- Redial if an attempt to transmit a message is unsuccessful. The number of redial attempts and the time delay between attempts shall be operator adjustable.
- Dial an alternate number if unsuccessful with the first number.
- Auto-answer a call from a remote modem and connect the SMS system to the phone line.

**Approval:** Provide certification of approval for use by relevant communications authority.

C. Integrated Dial

*If required,* provide the facility to dial into a site from a remote workstation and operate the system as if it was a workstation on the site.

D. Auto dialer/paging system

*If required,* provide modem and software to communicate system messages to a paging system operating through the telephone network. Provide storage for a minimum of three telephone numbers and twenty messages.

E. High level interface(s)

*If required,* provide a dedicated Industrial Controller Interface, Model 7797, to directly connect the following equipment to the communication network so that such equipment becomes an extension of the FMS system.

- Security management / Access Control system.
- Photo identification system.
- CCTV system.
- Fire detection system.
- Chiller plant.
- Standby power programmable logic controllers.
- Computer room air conditioning units.
This connection shall utilize a single RS-232/RS485 communication cable to communicate any and all data provided by the vendor of the above listed systems to the workstations that are running CSI INET 2000 software and that are located throughout the city wide system.

Section 3 EXECUTION

3.01 INSTALLATION
Install all devices in locations as shown on the drawings in accordance with standard industry practice.

Install and adequately support fixed wiring throughout the installation. For cabling routes not specified in detail, submit a proposed route layout. Install bulk cable runs from switchboards to FMS panels in metal ducts.

Handling cables: Handle cables so as to avoid damage to insulation and sheathing. Report any damage and replace or repair damaged cable as directed.

Straight-through joints: Unless unavoidable due to length or difficult installation conditions, run cables for their entire route length without intermediate straight-through joints. Where straight-through joints are used contain within a junction box arranged so that they are accessible after installation.

Tagging: Identify all cables at each end and at crowded intermediate points by means of stamped, non-ferrous tags, clipped around each cable.

Cables in false ceilings: Secure from building structure, not from other services.

Cables in conduits: Feed cables into conduits in such a way as to prevent twisting and crossing. Do not use inspection fittings for drawing in cables.

Cables on trays and ladders: Fix cables neatly to trays and ladders in single layers and parallel to the tray edge to avoid unnecessary crossovers. Fix cables at intervals not exceeding 48” by means of non-corrosive fastening materials.

Segregation: Physically segregate data cabling from power and SMS input/out cabling and mains cabling from all other cabling.

PANELS
Install panels and controllers within a dedicated metal enclosure.

Documentation: Provide plastic fade-free points list in a pocket. Include terminal numbers, point addresses and short and long descriptions.

Small point controllers: Install adjacent to the controlled device, accessible for maintenance. Provide suitable enclosure.
3.02 TRANSMISSION SYSTEMS

The FMS shall utilize the above LAN architecture to allow all of the Control Units to share data as well as to globalize alarms. The Controller LAN shall be based on a peer-to-peer, token passing technique with a data speed of not less than 19.2 KB. Systems which require a "master" communications controller or network manager for the Controller LAN are not acceptable.

To ensure high throughput, data transmission shall use "packetized" communication techniques, such that dozens of "messages" are contained in each "packet". The "turnaround time" for a global point to be received by any node, including operator stations, shall be less than 3 seconds.

Fiber Optic Pathways: If required, Fiber Optic media shall be used between buildings for the Controller LANs. Wherever the optical fiber enters or leaves the building, provide a fiber to hard copper interface device. The FOI shall regenerate data prior to transmitting this data to either the fiber or hard copper channels, so as not to result in the degradation of signal and to minimize the accumulation of errors between multiple FOIs. The FOI shall include "jabber" protection, such that continuous data from a defective component will not destroy communications on the LAN. Provide visual indication of receiving and transmitting data activity on the hardwired drop. Provide visual indication of data transmission on the fiber media, jabber presence on fiber and hard copper channels, and bad signal quality on the hard copper channel.

3.03 COMMUNICATIONS

Utilize the existing CSI LAN & WAN standard to link all FMS equipment.

Technique: Token Passing network for Controller LAN, Polled for Small Point & Application Specific Controllers.

Configuration: A break in the communication path of the Controller LAN shall be announced as an alarm and shall automatically initiate a Controller LAN reconfiguration such that the resulting sections of the Controller LAN continue to function as separate LANs. No loss of control shall result from such a break in the Controller LAN.

Data corruption: Check all data and retransmit if corruption has occurred. Provide adequate buffering to ensure that important data is not lost.

Commercial LAN: Work stations on the Controller LAN may also reside on a higher tier "commercial" LAN. This "commercial" LAN shall be based on Ethernet, and comply with IEEE 802.3 standards. Where a "commercial" LAN is implemented, it shall be possible to connect multiple Controller LANs together, with global data sharing across this commercial LAN.

An operator at a work station on the "commercial" LAN may connect to any other work station on the "commercial" LAN as if the operator were sitting at the other work station.

Alarms and special event notices shall be routed to different work stations on the "commercial" LAN based on time of day, and day of the week.

Operator password assignment shall be available on both a system-wide basis and a workstation by workstation basis.
3.04 TESTING AND COMMISSIONING

A. General
The contractor shall perform all tests submitted in the “Test Procedure” section as outlined in the specification.
Provide a program for the testing and commissioning procedure. Use a qualified representative of the FMS supplier to co-ordinate testing and present at all tests and training courses and remain on site until the FMS is fully operational.

B. Factory testing
Procedure: Submit procedure for factory test at least two weeks prior to the test.
Demonstration: Demonstrate each control loop including all calculations and global functions. Simulate analog values with potentiometers if required. Allow for attendance by three (3) persons nominated by the Owner.
After test: Submit summary of results and necessary modifications.

C. Site testing and commissioning
Carry out the following:
- Testing and commissioning of all FMS panels separately before connecting to the network.
- Attendance at the testing of all equipment that interfaces to the FMS and confirmation of the operation of such equipment from the FMS interface terminals.
- Testing and calibration checks of all installed controllers, actuators and sensors by actual operation of the devices.
- Testing of all field wiring from terminals to field interface terminal strips.
- Testing and commissioning of all power supplies and batteries.
- Verification of communication to remote systems.
- Testing of the operation of each control point from the operator's workstation (if supplied) and verification of the status of all points and alarm functions on graphic displays.

Demonstrate the following:
- Operation of each control loop.
- Calibration of sensors.
- Globally transferred information such as alarms.
- Detection and action of all alarm conditions.
- Communications with PC workstations.
- Time schedules and after-hours operation.
- Mapping of system points to operator's workstation(s).
- Operator's workstation software.
- Power fail re-start.
- Essential power mode operation.
- Fire mode of operation.
- Telecommunication facilities.
B. Final acceptance Test:

After the testing report and as built drawings have been approved by the customers representative, the completed system shall be tested in the presence of the customers representative. Acceptance of the system shall require a demonstration of the stability of the system. Should major equipment failure occur, the contractor shall replace or repair component(s). This test shall not start until the customer has obtained 30 days beneficial use of the system.

3.05 NOTICE OF COMPLETION

When the final acceptance test described above has been satisfactorily completed, the contractor shall issue a letter of completion to the customer indicating the date of such completion. The notice of completion shall be recorded by the contractor upon receipt of the customer completion letter. This date of record shall be the start of the one year guarantee period.

END OF SECTION
SEQUENCE OF OPERATION
APPENDIX A

Point List Here ..
### APPENDIX B - DIVISION OF RESPONSIBILITY - REFRIGERATION/HEATING PLANT

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<td>Mech</td>
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<td>DDC panel to device</td>
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<td>MCC indication and test switches.</td>
<td>Electrical Contractor</td>
<td>Electrical Contractor</td>
<td>DDC panel to MCC terminal strip.</td>
<td>MCC terminal strip to device.</td>
<td>Electrical Contractor</td>
</tr>
<tr>
<td>Fused 24V power supply and interposing relays for DDC outputs.</td>
<td>Electrical Contractor</td>
<td>Electrical Contractor</td>
<td>DDC panel to MCC terminal strip.</td>
<td>MCC terminal strip to device.</td>
<td>Electrical Contractor</td>
</tr>
</tbody>
</table>
## APPENDIX B - DIVISION OF RESPONSIBILITY - VAV BOX SYSTEMS

<table>
<thead>
<tr>
<th>FIELD DEVICE</th>
<th>FIELD DEVICE SUPPLIED BY</th>
<th>FIELD DEVICE INSTALLED BY</th>
<th>WIRING BY Controls Vendor</th>
<th>WIRING BY Electrical Contractor</th>
<th>COMMISSIONING OF DEVICE BY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature sensor</td>
<td>Controls Vendor</td>
<td>Controls Vendor</td>
<td>DDC panel to device</td>
<td>N/A</td>
<td>Controls Vendor</td>
</tr>
<tr>
<td>Velocity sensor (for pressure independent operation).</td>
<td>Velocity sensor by VAV box manufacturer. Pressure transducer by Controls Vendor.</td>
<td>Velocity sensor installed by VAV box manufacturer. Pressure transducer installed by Controls Vendor. Controls Vendor connects tubes between sensor and transducer.</td>
<td>Pressure transducer to DDC panel.</td>
<td>N/A</td>
<td>Mech, Controls Vendor</td>
</tr>
<tr>
<td>VAV Actuator</td>
<td>Controls Vendor</td>
<td>Controls Vendor</td>
<td>DDC panel to device.</td>
<td>N/A</td>
<td>Mech, Controls Vendor</td>
</tr>
<tr>
<td>Heater protection thermostat</td>
<td>Controls Vendor</td>
<td>Mech</td>
<td>N/A</td>
<td>HPT in heater safety circuit.</td>
<td>Mech</td>
</tr>
<tr>
<td>Heater</td>
<td>Mech</td>
<td>Mech</td>
<td>DDC panel to MCC terminal strip.</td>
<td>MCC terminal strip to device</td>
<td>Mech</td>
</tr>
<tr>
<td>Solid state heating controllers</td>
<td>Controls Vendor</td>
<td>Electrical Contractor in MCC</td>
<td>DDC panel to MCC terminal strip</td>
<td>MCC terminal strip to device</td>
<td>Electrical Contractor, Controls Vendor</td>
</tr>
<tr>
<td>Fan (for fan assisted boxes)</td>
<td>Mech</td>
<td>Mech</td>
<td>DDC panel to MCC terminal strip.</td>
<td>MCC terminal strip to device</td>
<td>Mech</td>
</tr>
<tr>
<td>MCC indication and test switches</td>
<td>Mech</td>
<td>Mech</td>
<td>DDC panel to MCC terminal strip</td>
<td>MCC terminal strip to device</td>
<td>Electrical Contractor</td>
</tr>
<tr>
<td>Fused 24V power supply and interposing relays for DDC outputs.</td>
<td>Mech</td>
<td>Mech</td>
<td>DDC panel to MCC terminal strip</td>
<td>MCC terminal strip to device</td>
<td>Electrical Contractor</td>
</tr>
</tbody>
</table>