N O T I C E

NO HAND CARRIED BIDS!
NO MAILED BIDS!

Current security requirements established by the U.S. Capitol Police to screen mail being delivered to the U.S. Capitol Complex of buildings preclude the use of U.S. Postal Service by offerors to deliver their proposals submitted in response to this solicitation. In addition, because all packages must be screened for security purposes at a central location prior to their delivery, the Architect of the Capitol cannot accept packages containing offers handcarried directly to the Bid Room address within the Ford House Office Building, as specified elsewhere in this solicitation, or at any other location in the U.S. Capitol Complex of buildings.

Due to these unusual circumstances the Procurement Division for the Architect of the Capitol will only accept offers/proposals via UPS or FEDEX at the address noted below. All handcarried offers/proposals will be rejected. Any attempt to hand carry an offer/proposal to any location in the U.S. Capitol Complex of buildings will be refused. See Section L for submission of offers. Offerors are advised when sending proposals via FEDEX or UPS ***not*** to use same day delivery. FEDEX/UPS often subcontract out the delivery for same-day service. It is necessary for delivery personnel to arrive in a FEDEX/UPS truck and be in a uniform recognized as FEDEX/UPS at the delivery point. Offerors are encouraged to determine who will be making the delivery when making arrangements with FEDEX/UPS.

All UPS and FEDEX deliveries are to be made to the Ford House Office Building at the following address:

Architect of the Capitol
Procurement Division
Ford House Office Building
Attn: Chris Lindsay
Room H2-263
Second and “D” Streets, S.W.
Washington, DC 20515

SOLICITATION, OFFER AND AWARD Architect of the Capitol - April 1997	REQUISITION NO.	PROJECT NO.	PAGE 1 OF 101 PAGES

1. CONTRACT NO.	2. SOLICITATION NO. RFP No. 050065	3. TYPE OF SOLICITATION _____ SEALED BID (IFB) __X__ NEGOTIATED (RFP)	4. DATE ISSUED August 26, 2005

5. ISSUED BY	6. ADDRESS OFFER TO (If other than Item 5)
ARCHITECT OF THE CAPITOL United States Capitol Washington, D.C. 20515	Architect of the Capitol Procurement Division Ford House Office Building Attn: Chris Lindsay Room H2-263 Bid Room Second and "D" Streets, S.W. Washington, DC 20515

NOTE: In sealed bid solicitations "offer" and "offeror" mean "bid" and "bidder".

SUBJECT: Replacement/Upgrade of the Automated Book Conveyor Systems at the Library of Congress, Washington, DC

SOLICITATION

7. Sealed offers in original and ___4___ complete copies for furnishing the supplies or services in the Schedule will be received at the place specified in Item 6 until **1:00 P.M., local time**, **October 26, 2005**
CAUTION - Late Submissions, Modifications, and Withdrawals: See Section L. All offers are subject to all terms and conditions contained in this solicitation.

8. FOR INFORMATION CALL: **Chris Lindsay** TELEPHONE NO. *(Include area code)* (NO COLLECT CALLS) **(202) 226-0994**

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OFFER *(Must be fully completed by offeror)*

NOTE: ITEM 10 does not apply if the solicitation includes the provision entitled Minimum Bid Acceptance Period.

10. In compliance with the above, the undersigned agrees, if this offer is accepted within 60 calendar days *(60 calendar days unless a different period is inserted by the offeror)* from the date for receipt of offers specified above, to furnish any or all items upon which prices are offered at the price set opposite each item, delivered at the designated point(s), within the time specified in the schedule.

11. DISCOUNT FOR PROMPT PAYMENT	10 CALENDAR DAYS %	20 CALENDAR DAYS %	30 CALENDAR DAYS %	_____ CALENDAR DAYS %

12. ACKNOWLEDGMENT OF AMENDMENTS *(The offeror acknowledges receipt of amendments to the SOLICITATION for offerors and related documents numbered and dated:*	AMENDMENT NO.	DATE	AMENDMENT NO.	DATE

13A. NAME AND ADDRESS OF OFFEROR		14. NAME AND TITLE OF PERSON AUTHORIZED TO SIGN OFFER *(Type or Print)*
	DUNS NO. _____ TAXPAYER IDENTIFICATION NO. _____	

13B. TELEPHONE & FACSIMILE NOS. *(Include area codes)*	13C. CHECK IF REMITTANCE ADDRESS IS DIFFERENT FROM ABOVE -ENTER ____ SUCH ADDRESS IN SCHEDULE	15. SIGNATURE	16. OFFER DATE

AWARD (To be completed by Government)

17. ACCEPTED AS TO ITEMS NUMBERED	18. AMOUNT	19. ACCOUNTING AND APPROPRIATION

20. AUTHORITY FOR NEGOTIATION, IF APPLICABLE	21. SUBMIT INVOICE FOR PAYMENT TO: FAX 202-226-2580	**ARCHITECT OF THE CAPITOL** Ford House Office Building Accounting Division, Room H2-205 Washington, D.C. 20024

22. NAME OF CONTRACTING OFFICER *(Type or print)* **CHRISTOPHER J BLUMBERG** **CONTRACTING OFFICER**	23. UNITED STATES OF AMERICA *(Signature of Contracting Officer)*	24. AWARD DATE

SECTION B
SUPPLIES OR SERVICES AND PRICES/COSTS

The Contractor shall furnish all supplies, equipment, personnel and services necessary for the Library of Congress Automated Book Conveyor System Upgrade/Replacement, Washington, D.C. (see the SPECIFICATIONS AND THE CONTRACT DRAWINGS) as required by the Architect of the Capitol.

1. SCHEDULE OF ITEMS

ITEM	DESCRIPTION	QTY.	U/M	PRICE
0001	**(Base Bid)** Development of ABCS controls system, Including all software, hardware, and Peripherals. Trial implementation and testing of control system on one vertical conveyor in the Madison Building. See Section 14501 Para. 1.3.1 And Para 1.3.2.	1	JOB	$_____
0002	Real Property Alterations as required for the Implementation of the ABCS controls system.	1	JOB	$_____
0003	Maintenance: Services Contract. See Section 14501 Para. 1.8.12.1	1	JOB	$_____
0004	Maintenance: Computerized Service Log. See Section 14501 Para. 1.8.12.2	1	JOB	$_____

TOTAL FOR BASE BID **$_____**

OPTIONS:

0005	**(Option No. 1)** Implementation of control system and physical upgrades to remainder of load/unload stations and horizontal/vertical conveyors in the Madison building (except those directly linked with SV-B). Work shall include all repair/replacement of mechanical and electrical components for the area of the work. See Section 14501 Para. 1.3.3.	1	JOB	$_____

0006	Real Property Alterations as required for the Implementation of the ABCS controls system.	1	JOB	$_____
0007	Maintenance: Services Contract. See Section 14501 Para. 1.8.12.1	1	JOB	$_____
0008	Maintenance: Computerized Service Log. See Section 14501 Para. 1.8.12.2	1	JOB	$_____

TOTAL FOR OPTION NO. 1 **$_____**

0009	**(Option No. 2)** Integration of control system and physical upgrades to load/unload stations and horizontal/vertical conveyors in SV-B of the Madison building. Work shall include all repair/replacement of mechanical and electrical components for the area of the work. See Section 14501 Para. 1.3.4.	1	JOB	$_____
0010	Real Property Alterations as required for the Implementation of the ABCS controls system. $_____	1	JOB	
0011	Maintenance: Services Contract. See Section 14501 Para. 1.8.12.1	1	JOB	$_____
0012	Maintenance: Computerized Service Log. See Section 14501 Para. 1.8.12.2	1	JOB	$_____

TOTAL FOR OPTION NO. 2 **$_____**

ITEM	DESCRIPTION	QTY.	U/M	PRICE
0013	**(Option No. 3)** Integration of control system and physical upgrades to load/unload stations and horizontal/vertical conveyors in the Jefferson building. Work shall include all repair/replacement of mechanical and electrical components for the area of the work. See Section 14501 Para. 1.3.5.	1	JOB	$_____

0014	Real Property Alterations as required for the Implementation of the ABCS controls system. $_____	1	JOB	
0015	Maintenance: Services Contract. See Section 14501 Para. 1.8.12.1	1	JOB	$_____
0016	Maintenance: Computerized Service Log. See Section 14501 Para. 1.8.12.2	1	JOB	$_____

TOTAL FOR OPTION NO. 3 **$_____**

0017	**(Option No. 4)** Integration of control system and physical upgrades to load/unload stations and horizontal/vertical conveyors in the Adams building. Work shall include all repair/replacement of mechanical and electrical components for the area of the work. See Section 14501 Para. 1.3.6.	1	JOB	$_____
0018	Real Property Alterations as required for the Implementation of the ABCS controls system. $_____	1	JOB	
0019	Maintenance: Services Contract. See Section 14501 Para. 1.8.12.1	1	JOB	$_____
0020	Maintenance: Computerized Service Log. See Section 14501 Para. 1.8.12.2	1	JOB	$_____

TOTAL FOR OPTION NO. 4 **$_____**

TOTAL INCLUDING ALL OPTIONS **$_____**

UNIT PRICES (see Section 01270 entitled UNIT PRICES):

ITEM	DESCRIPTION	U/M	EST. QTY.	U/P	PRICE
0021	Unit Price No. 1 Modification of Guardian Bars	EA	1	$_____	$_____
0022	Unit Price No. 2 Photoelectric Eyes	EA	1	$_____	$_____
0023	Unit Price No. 3 Microswitches	EA	1	$_____	$_____
0024	Unit Price No. 4 Motor Controllers	EA	1	$_____	$_____
0025	Unit Price No. 5 Totes	EA	50	$_____	$_____

* Note: The quantities and their corresponding extended amounts presented herein for Item Nos. 0021 through 0025 are estimates only and their inclusion herein does not bind the Government to the procurement of the quantities listed above. (USE FOR EVALUATION PURPOSES ONLY)

2. EXERCISE OF OPTIONS

(a) For Line Items 0005 through 0020 the AOC will decide which to exercise within six (6) months after time of contract award subject to the availability of funds.

(b) All work, to include the exercise of any option(s) is required to be completed within the completion date specified in AOC52.211-4 TERM OF THE CONTRACT in Section F in the contract. In addition, the exercise of these options may require a change to the Contractor's Schedule.

END OF SCHEDULE

SECTION C
DESCRIPTION/SPECIFICATIONS/WORK STATEMENT

1. SCOPE OF WORK

a) See Section J-Attachments for Description of Work/Specifications/Work Statement The attachments constitute the specifications.

SECTION D
PACKAGING AND MARKING

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AOC52.211-7 IDENTIFICATION OF CONTRACT DELIVERABLES

SECTION D
PACKAGING AND MARKING

AOC52.211-7 IDENTIFICATION OF CONTRACT DELIVERABLES (NOV 2004)

Unless otherwise specified, all documents prepared and submitted by the Contractor to the Government under this contract shall include the following information on the cover page of each document:

(a) Name and business address of the contractor;

(b) Contract number;

©) Point of Contact; and

(d) Date of transmittal.

(End of clause)

SECTION E
INSPECTION AND ACCEPTANCE

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SECTION E
INSPECTION AND ACCEPTANCE

AOC52.246-5 INSPECTION AND ACCEPTANCE - ARCHITECT-ENGINEER SERVICES (NOV 2004)

The Contracting Officer or his duly authorized representative will perform inspection and acceptance of services and deliverables that are provided under this contract.

(End of clause)

FAR 52.246-20 WARRANTY OF SERVICES (MAY 2001)

(a) *Definition*. "Acceptance", as used in this clause, means the act of an authorized representative of the Government by which the Government assumes for itself, or as an agent of another, ownership of existing and identified supplies, or approves specific services, as partial or complete performance of the contract.

(b) Notwithstanding inspection and acceptance by the Government or any provision concerning the conclusiveness thereof, the Contractor warrants that all services performed under this contract will, at the time of acceptance, be free from defects in workmanship and conform to the requirements of this contract. The Contracting Officer shall give written notice of any defect or nonconformance to the Contractor one year from the date of acceptance of this service. This notice shall state either --

(1) That the Contractor shall correct or reperform any defective or nonconforming services; or

(2) That the Government does not require correction or re-performance.

©) If the Contractor is required to correct or reperform, it shall be at no cost to the Government, and any services corrected or re-performed by the Contractor shall be subject to this clause to the same extent as work initially performed. If the Contractor fails or refuses to correct or reperform, the Contracting Officer may, by contract or otherwise, correct or replace with similar services and charge to the Contractor the cost occasioned to the Government thereby, or make an equitable adjustment in the contract price.

(d) If the Government does not require correction or re-performance, the Contracting Officer shall make an equitable adjustment in the contract price.

(End of clause)

FAR 52.252-2 CLAUSES INCORPORATED BY REFERENCE (FEB 1998)

This contract incorporates one or more clauses by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available. Also, the full text of a clause may be accessed electronically at this/these addresses: www.gsa.gov or www.govcon.com

CLAUSE TITLE	DATE	FAR NUMBER
INSPECTION OF SUPPLIES--FIXED-PRICE	AUG 1996	52.246-2
RESPONSIBILITY FOR SUPPLIES	APR 1984	52.246-16
INSPECTION OF SERVICES--FIXED-PRICE	AUG 1996	52.246-4

END OF SECTION E

SECTION F
DELIVERIES OR PERFORMANCE

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AOC52.211-4	TERM OF CONTRACT
FAR 52.242-14	SUSPENSION OF WORK
FAR 52.242-15	STOP-WORK ORDER

SECTION F
DELIVERIES OR PERFORMANCE

AOC52.211-4 TERM OF CONTRACT (JUN 2004)

The term of contract shall be from date of contract award through September 30, 2007.

(End of clause)

FAR 52.242-14 SUSPENSION OF WORK (APR 1984)

(a) The Contracting Officer may order the Contractor, in writing, to suspend, delay, or interrupt all or any part of the work of this contract for the period of time that the Contracting Officer determines appropriate for the convenience of the Government.

(b) If the performance of all or any part of the work is, for an unreasonable period of time, suspended, delayed, or interrupted (1) by an act of the Contracting Officer in the administration of the contract, or (2) by the Contracting Officer's failure to act within the time specified in this contract (or within a reasonable time if not specified), an adjustment shall be made for any increase in the cost of performance of this contract (excluding profit) necessarily caused by the unreasonable suspension, delay, or interruption, and the contract modified in writing accordingly. However, no adjustment shall be made under this Article for any suspension, delay or interruption to the extent that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor, or for which an equitable adjustment is provided for or excluded under any other term or condition of this contract.

©) A claim under this article shall not be allowed (1) for any costs incurred more than 20 days before the Contractor shall have notified the Contracting Officer in writing of the act or failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension order), and (2) unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of the suspension, delay, or interruption, but not later than the date of final payment under the contract.

(End of clause)

FAR 52.242-15 STOP-WORK ORDER (AUG 1989)

(a) The Contracting Officer may, at any time, by written order to the Contractor, require the Contractor to stop all, or any part, of the work called for by this contract for a period of 90 days after the order is delivered to the Contractor, and for any further period to which the parties may agree. The order shall be specifically identified as a stop-work order issued under this clause. Upon receipt of the order, the Contractor shall immediately comply with its terms and take all reasonable steps to minimize the incurrence of costs allocable to the work covered by the order during the period of

work stoppage. Within a period of 90 days after a stop-work is delivered to the Contractor, or within any extension of that period to which the parties shall have agreed, the Contracting Officer shall either --

(1) Cancel the stop-work order; or

(2) Terminate the work covered by the order as provided in the Default, or the Termination for Convenience of the Government, clause of this contract.

(b) If a stop-work order issued under this clause is canceled or the period of the order or any extension thereof expires, the Contractor shall resume work. The Contracting Officer shall make an equitable adjustment in the delivery schedule or contract price, or both, and the contract shall be modified, in writing, accordingly, if --

(1) The stop-work order results in an increase in the time required for, or in the Contractor's cost properly allocable to, the performance of any part of this contract; and

(2) The Contractor asserts its right to the adjustment within 30 days after the end of the period of work stoppage; provided, that, if the Contracting Officer decides the facts justify the action, the Contracting Officer may receive and act upon the claim submitted at any time before final payment under this contract.

(c) If a stop-work order is not canceled and the work covered by the order is terminated for the convenience of the Government, the Contracting Officer shall allow reasonable costs resulting from the stop-work order in arriving at the termination settlement.

(d) If a stop-work order is not canceled and the work covered by the order is terminated for default, the Contracting Officer shall allow, by equitable adjustment or otherwise, reasonable costs resulting from the stop-work order.

(End of clause)

END OF SECTION F

SECTION G
CONTRACT ADMINISTRATION DATA

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AOC52.223-8	DELIVERY VEHICLE INSPECTION REQUIREMENTS

SECTION G
CONTRACT ADMINISTRATION DATA

AOC52.201-1 CONTRACTING OFFICER'S AUTHORITY (JUN 2004)

The Contracting Officer is the only person authorized to make or approve any changes in any of the requirements of this contract, notwithstanding any provision contained elsewhere in this contract. In the event that the Contractor makes any change at the direction of any person other than the Contracting Officer, the change will be considered to have been made without authority and no adjustment will be made in the contract price to cover any increase in costs incurred as a result thereof.

(End of clause)

AOC52.201-2 CONTRACTING OFFICER'S TECHNICAL REPRESENTATIVE (COTR) (JUN 2004)

The Government shall provide the name, address and telephone number of the COTR at the time of contract award and the duties thereby delegated to that person. Any subsequent change to the individual or the individual's responsibilities will be confirmed in writing by the Contracting Officer. In no instance will the COTR be delegated authority to order any change in the contractor's performance which would affect (a) cost or schedule for contracts for services or supplies or cost, or (b) cost, the completion date for intermediate phases or milestones, or overall completion date for contracts for construction.

(End of clause)

AOC52.211-1 KEY PERSONNEL (MAR 2005)

(a) The Contractor shall assign to this contract the following key personnel: (the name(s) of the key personnel shall be completed at time of award)

Name	Title	Telephone No.

(b) During the first ninety (90) days of performance, the Contractor shall make no substitutions of key personnel unless the substitution is necessitated by illness, death, or termination of employment. The Contractor shall notify the Contracting Officer within 15 calendar days after the occurrence of any of these events and provide the information required by Paragraph c) below. After the initial 90-day period, the Contractor shall submit the information required by Paragraph (c) to the Contracting Officer at least 15 calendar days prior to making

any permanent substitutions.

(c) The Contractor shall provide a detailed explanation of the circumstances necessitating the proposed substitutions, complete resumes for the proposed substitutions, and any additional information requested by the Contracting Officer. Proposed substitutes should have comparable qualifications to those of the person being replaced. The Contracting Officer will notify the Contractor within 15 calendar days after receipt of all required information of the decision on substitutions. The contract will be modified to reflect any approved changes of key personnel.

(d) The approval of substitute personnel will not be considered to be grounds for an increase in the contract price.

(e) The special security requirements in AOC52.223-5, Special Security Requirements - Services, or AOC52.223-6, Special Security Requirements - U.S. Supreme Court, shall apply to all approved Contractor personnel substitutions.

(End of clause)

AOC52.211-2 APPROVAL OF SUBSTITUTE CONTRACTOR PERSONNEL (JUN 2004)

(a) During the first ninety days of performance, the Contractor shall make no substitutions of personnel unless the substitution is necessitated by illness, death, or termination of employment. The Contractor shall notify the Contracting Officer within 15 calendar days after the occurrence of any of these events and provide the information required by paragraph (b) below. After the initial 90-day period, the Contractor shall submit the information required by paragraph (b) to the Contracting Officer at least 15 calendar days prior to making any permanent substitutions.

(b) The Contractor shall provide a detailed explanation of the circumstances necessitating the proposed substitutions, complete resumes for the proposed substitutes, and any additional information requested by the Contracting Officer. Proposed substitutes should have comparable qualifications to those of the person being replaced.

(c) This paragraph applies only to a labor hour or time-and-materials contract. The Unit Price (hourly labor rate) for the approved substituted personnel shall remain the same as the rates of the relevant labor category, in the applicable Base Year or any of the subsequent Option Years (see the “SCHEDULE OF ITEMS” in Section B).

(d) The special security requirements in AOC52.223-5, Special Security Requirements - Services, shall apply to all approved Contractor personnel substitutions.

(End of clause)

AOC52.223-5 SPECIAL SECURITY REQUIREMENTS - SERVICES (JUN 2005)

(a) All vehicles, and contents, used by the Contractor or his subcontractors, which enter or leave United States Government property during performance of the work, will be subject to clearance, inspection and identification procedures conducted by the United States Capitol Police. See the attachment entitled "U.S. CAPITOL POLICE NOTICE" for instructions prior to delivery.

(b) All persons entering the Legislative Branch Buildings shall gain access to the building by passing through x-ray screening devices. In addition, all handbags and all hand-carried items shall be screened by x-ray devices prior to their entry into the building.

c) All personnel provided by the Contractor and employed on the site of the work will be subject to a security background investigation. Each employee will be required to fill out an I.D. Request Form and U.S. Capitol Police Request for check of Criminal History Records and each employee will be photographed and fingerprinted. The Contractor shall provide any assistance required by any of its employees in completing the forms.

(d) Prior to commencement of work, the contractor and all designated on-site employees will be required, on a one-time basis, to be fingerprinted in Washington D.C. The location for the Electronic Fingerprinting Service is the U.S. Capitol Hill Police Headquarters, 119 D Street, N.E.

(e) Within seven (7) calendar days after the date of contract award, the Contractor shall submit to the Contracting Officer's Technical Representative (COTR) a list of all employees proposed to be employed on this contract. This list shall include the employee's full name, date of birth and social security number.

(f) While security background investigations are in process, the Contractor's employees must not be granted access to the Capitol Hill complex to perform work or provide services for the AOC unless they are escorted by an AOC staff member. "Escorted" is defined to mean that the AOC staff member will remain with the employee(s) **at all times** during the performance of the work. Any of the Contractor's employees who are perceived by the Contracting Officer as a security risk as a result of evidence discovered in the background security investigation, will not be issued an Identification Card, will be denied access to the site of the work, and the Contractor will be directed to remove such employee from performance of any of the contract work, whether it be on or off the work site. Any contractor employee denied access to the site of work on a contract or task/delivery order as a result of a security investigation may not apply for access to any other AOC/U.S. Supreme Court contract or task/delivery order work site.

(g) An identification card, with photograph, will be prepared for each employee of the Contractor requiring access to the site. The identification card shall be dated to indicate the period of time for which it is to remain valid - from the date the employee reports for duty until the applicable date which occurs first: the expiration of the contract, or the last date of the employee's tour of duty with the Contractor.

(h) All persons entering the Legislative Branch Buildings shall gain access to the building by passing through a magnetometer. In addition, all handbags and all hand-carried items shall be screened by x-ray devices prior to their entry into the building.

(i) The Contractor is fully responsible to return:

(1) The ID badge of any individual employee, including subcontractor personnel, who is removed for any reason including but not limited to illness, or dismissal;

(2) The ID badges of all contractor employees, including subcontractor personnel, whose performance under the contract is completed in advance of final contract job completion; and

(3) All outstanding ID badges issued for the contractor and its employees, including subcontractor personnel, within 24 hours of on site contract job completion.

(j) ID badges are to be hand delivered by the contractor within 24 hours of any of the events listed under (f) above to the Contracting Officer's Representative.

(End of clause)

AOC52.223-7 SPECIAL SECURITY CLEARANCE AND INSPECTION PROCEDURES (JUN 2004)

(a) All vehicles and contents used by the Contractor or his subcontractors which enter or leave United States Government property during performance of the work will be subject to clearance, inspection, and identification procedures conducted by the United States Capitol Police. See the attachment entitled "U.S. CAPITOL POLICE NOTICE" in Section J for instructions prior to delivery.

(b) All persons entering the Legislative Branch Buildings shall gain access to the building by passing through x-ray screening devices. In addition, all handbags and all hand-carried items shall be screened by x-ray devices prior to entry into the building.

(End of clause)

AOC52.223-8 DELIVERY VEHICLE INSPECTION REQUIREMENTS (SEP 2004)

(a) All vehicles and contents used by the Contractor or his subcontractors which enter or leave United States Government property during performance of work under this contract will be subject to clearance, inspection, and identification procedures conducted by the United States Capitol Police.

(b) *Mobile Vehicle and Cargo Inspection System (Mobile VACIS).* All delivery vehicles carrying fuel, garbage, or similar cargo that cannot be offloaded for inspection and security screening shall utilize the Mobile VACIS located at Third and Pennsylvania Avenue, NW, Washington, DC, for inspection prior to making deliveries to any building within the Capitol Complex, including, but not limited to, the U.S. Capitol Building; the U.S. Botanic Garden; the Hart, Dirksen, and Russell Senate Office Buildings; the Rayburn, Longworth, Cannon, and Ford House Office Buildings; the Thomas Jefferson, John Adams, and James Madison Memorial Library of Congress buildings; the Capitol Power Plant; the Capitol Visitors Center; and the U.S. Supreme Court and Thurgood Marshall Federal Judiciary Buildings.

(1) For deliveries requiring Mobile VACIS inspection, within seven calendar days or prior to the first delivery, the contractor shall provide the following information to the U.S. Capitol Police:

(I) List of drivers;

(ii) Date of birth for each driver;

(iii) Social Security Number of each driver;

(iv) Vehicle make;

(v) Vehicle model;

(vi) License tag number and state where vehicle is licensed;

(vii) Color of vehicle; and

(viii) Contractor name, if shown on the vehicle.

(2) Information for deliveries made through the Mobile VACIS unit must be faxed to (202) 228-4313. For verification of receipt, the contractor may call (202) 224-9728.

(3) Updates to the above information for Mobile VACIS deliveries must be sent to the U.S. Capitol Police throughout the period of performance of the contract.

c) *40 P Street SE inspection facility*. All other vehicles making deliveries to the above listed locations except for the Thomas Jefferson, John Adams, and James Madison Memorial Library of Congress buildings and the U.S. Supreme Court shall utilize the off-site inspection and screening facilities at 40 P Street, SE, in compliance with instructions as provided elsewhere in this contract.

(End of clause)

END OF SECTION G

SECTION H
SPECIAL CONTRACT REQUIREMENTS

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SECTION H
SPECIAL CONTRACT REQUIREMENTS

AOC52.228-5 PERFORMANCE AND PAYMENT BONDS - CONSTRUCTION (SEP 2004)

(a) *Definitions*. As used in this clause, "original contract price" means the award price of the contract; or, for requirements contracts, the price payable for the estimated total quantity; or, for indefinite-quantity contracts, the price payable for the specified minimum quantity. Original contract price does not include the price of any options, except those options exercised at the time of contract award.

(b) *Amount of required bonds*. Unless the resulting contract price is $25,000 or less, the successful offeror shall furnish performance and payment bonds to the Contracting Officer as follows:

(1) Performance Bonds: (Standard Form 25). The penal amount of performance bonds at the time of contract award shall be 100 percent of the original contract price.

(2) Payment Bonds: (Standard Form 25-A). The penal amount of payment bonds at the time of contract award shall be 100 percent of the original contract price.

c) *Additional bond protection*. (1) The Government may require additional performance and payment bond protection if the contract price is increased. The increase in protection generally will equal 100 percent of the increase in contract price.

(2) The Government may secure the additional protection by directing the Contractor to increase the penal amount of the existing bonds or to obtain an additional bond.

(d) Furnishing executed bonds. The Contractor shall furnish all executed bonds, including any necessary reinsurance agreements, to the Contracting Officer, within the time period specified in Item 12 of the form entitled, "Solicitation, Offer, and Award (Construction, Alteration, or Repair)" or otherwise specified by the Contracting Officer, but in any event, before starting work.

(e) Surety or other security for bonds. The bonds shall be in the form of firm commitment, supported by corporate sureties whose names appear on the list contained in Treasury Department Circular 570, or by other acceptable security such as postal money order, certified check, cashier's check, irrevocable letter of credit, or, in accordance with Treasury Department regulations, certain bonds or notes of the United States. Treasury Circular 570 is published in the Federal Register or may be obtained from the U.S. Department of Treasury, Financial Management Service, Surety Bond Branch, 401 14th Street, NW, 2nd Floor, West Wing,

Washington, DC 20227.

(f) Notice of subcontractor waiver of protection (40 U.S.C. 270 b©). Any waiver of the right to sue on the payment bond is void unless it is in writing, signed by the person whose right is waived, and executed after such person has first furnished labor or material for use in the performance of the contract.

(End of clause)

FAR 52.243-4 CHANGES (AUG 1987)

(a) The Contracting Officer may, at any time, without notice to the sureties, if any, by written order designated or indicated to be a change order, make changes in the work within the general scope of the contract, including changes-

(1) In the specifications (including drawings and designs);

(2) In the method or manner of performance of this work;

(3) In the Government-furnished facilities, equipment, materials, services, or site; or

(4) Directing acceleration in the performance of the work.

(b) Any other written or oral order (which, as used in this paragraph (b), includes direction, instruction, interpretation, or determination) from the Contracting Officer that causes a change shall be treated as a change order under this clause; Provided, that the Contractor gives the Contracting Officer written notice stating-

(1) The date, circumstances, and source of the order; and

(2) That the Contractor regards the order as a change order.

c) Except as provided in this clause, no order, statement, or conduct of the Contracting Officer shall be treated as a change under this clause or entitle the Contractor to an equitable adjustment.

(d) If any change under this clause causes an increase or decrease in the Contractor's cost of, or the time required for, the performance of any part of the work under this contract, whether or not changed by any such order, the Contracting Officer shall make an equitable adjustment and modify the contract in writing. However, except for an adjustment based on defective specifications, no adjustment for any change under paragraph (b) of this clause shall be made for any costs incurred more than 20 days before the Contractor gives written notice as required. In the case of defective specifications for which the Government is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the Contractor in attempting

to comply with the defective specifications.

(e) The Contractor must assert its right to an adjustment under this clause within 30 days after (1) receipt of a written change order under paragraph (a) of this clause or (2) the furnishing of a written notice under paragraph (b) of this clause, by submitting to the Contracting Officer a written statement describing the general nature and amount of the proposal, unless this period is extended by the Government. The statement of the proposal for adjustment may be included in the notice under paragraph (b) of this clause.

(f) No proposal by the Contractor for an equitable adjustment shall be allowed if asserted after final payment under this contract

(End of Clause)

AOC52.243-1 CHANGES - SUPPLEMENT (JUN 2004)

(a) *Definitions.* (1) A "change order" is a unilateral contract modification, signed by the Contracting Officer, which describes and identifies a particular change in the requirements as permitted by the FAR clause, 52.243-4, "Changes" and authorizes the contractor to begin performance with the changed requirements. The change order may reference pertinent oral or written directives, provide an adjustment to the contract price and/or time for performance, and direct the contractor to submit a proposal for definitization of the change order.

(2) A "supplemental agreement" is a bilateral contract modification, signed by the contractor and the Contracting Officer, which either authorizes the contractor to begin performance with the changed requirements in accordance with the equitable adjustment agreed to prior to commencement of performance of the changed requirements or definitizes a change order after agreement of an equitable adjustment to the contract.

(3) Request for Proposal. A request by the Contracting Officer or his duly authorized representative for the contractor to submit a proposal for requirements contemplated to be changed. Such proposal shall be submitted within the time limit specified in the request and in accordance with the requirements and limitations of this clause.

(b) *Authorization of changes***.** All changes to contract requirements will be authorized in writing by the Contracting Officer through one of the following methods:

(1) A Supplemental Agreement, with the concurrence of the contractor; or

(2) A unilateral Change Order.

c) *Submission of proposals and cost breakdowns by the contractor.*

(1) Proposals for changes to the contract requirements shall include a brief

description of the change; a breakdown of costs as outlined hereinafter; and a time impact analysis (fragnet).

(2) In considering proposals for changes involving added requirements, omitted requirements, or any combination thereof, the Contracting Officer or his duly authorized representative will make check-estimates in such detail as he deems necessary with the view of arriving at equitable adjustments. With each proposal, the contractor shall submit separately an itemized breakdown as per "Exhibit A" hereof, which shall include, but not be limited to, the following:

(I) Direct labor costs;

(ii) Social Security and Unemployment Insurance Taxes;

(iii) Workmen's compensation and general liability insurance;

(iv) Direct material quantities and unit prices (separated into trades);

(v) Construction equipment;

(vi) Overhead; and

(vii) Profit.

(3) If the contractor believes that the change in the contract requirements affects the contract period of performance, as required by AOC52.211-5, Commencement, Prosecution, and Completion of Work, of the Supplementary Conditions, appropriate substantiation must be submitted for evaluation/review.

(4) A complete proposal, including breakdown of cost and time impact, shall be submitted by the contractor within the time frame stipulated in calendar days by the Government for each proposed change. Generally, complete proposals shall be submitted by the contractor within 7 calendar days after the contractor receives the request for proposal, although this time frame may be adjusted for more complex or more urgent requirements. Except as provided by an individual contract modification, no payment for a change order will be made until a supplemental agreement has been signed by the contractor and the Contracting Officer. If complete proposals are not received timely, the Contracting Officer, after consultation with his authorized representative, may determine the cost of the change and the time impact and issue a change order based upon this determination with the stipulation that if a supplemental agreement is not negotiated within a reasonable amount of time, this determination will be final and conclusive, subject only to the contractor's rights of appeal as provided in AOC52.233-1, Disputes, of the General Conditions.

(d) *Allowances for overhead and profit.* (1) The following percentages will be allowed for

overhead and profit:

(I) The contractor shall receive, as a percentage of the cost of all work performed by his own organization, an amount not to exceed 10% overhead and not to exceed 10% profit; and

(ii) If subcontractor(s) are involved in the change, a fee in an amount not to exceed 10% as a percentage of the total price of the subcontractor portion of the change.

(iii) Subcontractor(s) to the prime contractor (first tier subcontractor(s)) shall receive, as a percentage of the cost of all work performed by or for it, a total amount not to exceed 10% overhead and not to exceed 10% profit.

(iv) The percentages for fees, overhead, and profit permitted by the above shall be allowed only for the contractor and its first tier subcontractors. Percentages for fees, overhead, and profit in any amount will be not be allowed for subcontractors of any other tier.

(2) Percentages for overhead allowed are deemed to include, but shall not be limited to, the following:

(I) Field Overhead Items.

(A) Trailer;

(B) Storage Facilities;

C) Contractor's and subcontractor's superintendence;

(D) Construction equipment/tools, except those that are specially required for a specific change;

(E) Utilities;

(F) Contractor's and subcontractor's field office, administrative/support staff;

(G) Cost of preparing record drawing changes, correspondence, etc., relating to the contract;

(H) Job site safety aids; and

(I) Cleaning and maintenance of nuisance debris from jobsite.

(ii) Office Overhead Items for Contractor and Subcontractors.

(A) Maintenance/operation of principal or branch offices;

(B) Personnel costs;

©) Cost for preparing correspondence, fragnets, etc., relating to the contract; and

(D) Cost of insurance and bonds, except for insurance costs relating to direct labor, as outlined in "Exhibit A" .

(iii) For changes which include custom items unique to the project and which are fabricated off-site, the fabricator, whether the contractor or a subcontractor at any tier, shall furnish a breakdown of costs associated with the work in the fabricating plant. This breakdown shall include labor, material, equipment and overhead/plant costs in sufficient detail to allow for review by the Contracting Officer or his duly authorized representative. Costs charged to overhead/plant shall be allowable costs for the fabricator, whether he is the contractor or a subcontractor at any tier, provided that the costs claimed are consistent with the provisions of Subpart 31.203 of the Federal Acquisition Regulation (Chapter 1, Title 48, Code of Federal Regulations). An amount not to exceed 10% of the cost of the fabricated item will be allowed for the fabricator's profit. If the fabricator is a subcontractor, the overhead and profit percentages for the contractor and any subcontractor at a higher tier having a contractual relationship with the fabricator shall be allowed in accordance with this clause.

(e) *Changes involving decreases in price.* For changes involving only a decrease in price, the contractor and subcontractors shall return as credit for overhead and profit those same percentages which are allowed for like changes involving increases in price. On changes involving both an increase and a decrease in price, overhead and profit will be allowed only on the net increase.

(f) *Changes involving increases or decreases on basis of contract specified unit prices.* No percentages for overhead and profit will be added to, or deleted from, any unit prices in event of an increase or decrease in the contract requirements on the basis of contractual unit prices.

EXHIBIT A
TYPICAL FORM OF BREAKDOWN FOR PRICE ADJUSTMENT

SUBCONTRACTORS' BREAKDOWN

Items Involved	Quan-tities	Unit Cost	Equi p-ment	Materia l	Labor	Extensions		Unit Cost
						Totals	Final Totals	
Excavation (Identify)								
• Volume								
• Crane Operato r								
• Laborer s								
Shoring (Identify)								
• Area								
• Welder								
Subcontracto r Total								

PRIME CONTRACTOR'S BREAKDOWN

Items Involved	Quan-tities	Unit Cost	Equi p-ment	Materia l	Labor	Extensions		Unit Cost
						Totals	Final Totals	
West Wall (Cinder Block)								
• Area								
• Block 8x8x16								

• Mortar								
• Mason								
• Laborer								
Subtotal								
Prime Contractor's Total								
Prime Contractor's Overhead and Profit on Subcontractor								
Total								

(End of clause)

FAR 52.211-12 LIQUIDATED DAMAGES (SEP 2000)

(a) If the Contractor fails to complete the work within the time specified in the contract, the Contractor shall pay liquidated damages to the Government in the amount of **$1,300.00** for each calendar day of delay until the work is completed or accepted.

(b) If the Government terminates the Contractor's right to proceed, liquidated damages will continue to accrue until the work is completed. These liquidated damages are in addition to excess costs of repurchase under the Termination clause.

(End of clause)

AOC52.228-6 NOTICE TO SURETIES (JUN 2004)

The final inspection and acceptance of the work included in this contract shall not be binding or conclusive upon the Government if it shall subsequently appear that the Contractor has willfully or fraudulently, or through collusion with the representatives of the Government in charge of the work, supplied inferior material or workmanship, or has departed from the terms of the contract, or if defects of any kind should develop during the period that the guarantees covering such material and workmanship are in force. In such event, the Government shall have the right, notwithstanding such final acceptance and payment, to have the work removed and to cause the

work to be properly performed and satisfactory material supplied to such extent as, in the opinion of the Contracting Officer, may be necessary to finish the work in accordance with the drawings, if any, and specifications, at the expense of the Contractor and the sureties on its bond, and the Government shall have the right to recover against the Contractor and its sureties the cost of such work, together with such other damages as the Government may suffer because of the default of the Contractor in the premises, the same as though such acceptance and final payment had not been made.

(End of clause)

FAR 52.236-5 MATERIALS AND WORKMANSHIP (APR 1984)

(a) All equipment, material, and articles incorporated into the work covered by this contract shall be new and of the most suitable grade for the purpose intended, unless otherwise specifically provided in this contract. References in the specifications to equipment, material, articles, or patented processes by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition. The Contractor may, at its option, use any equipment, material, article, or process that, in the judgment of the Contracting Officer, is equal to that named in the specifications, unless otherwise specifically provided in this contract.

(b) The Contractor shall obtain the Contracting Officer's approval of the machinery and mechanical and other equipment to be incorporated into the work. When requesting approval, the Contractor shall furnish to the Contracting Officer the name of the manufacturer, the model number, and other information concerning the performance, capacity, nature, and rating of the machinery and mechanical and other equipment. When required by this contract or by the Contracting Officer, the Contractor shall also obtain the Contracting Officer's approval of the material or articles which the Contractor contemplates incorporating into the work. When requesting approval, the Contractor shall provide full information concerning the material or articles. When directed to do so, the Contractor shall submit samples for approval at the Contractor's expense, with all shipping charges prepaid. Machinery, equipment, material, and articles that do not have the required approval shall be installed or used at the risk of subsequent rejection.

c) All work under this contract shall be performed in a skillful and workmanlike manner. The Contracting Officer may require, in writing, that the Contractor remove from the work any employee the Contracting Officer deems incompetent, careless, or otherwise objectionable.

(End of clause)

FAR 52.236-9 PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS (APR 1984)

(a) The Contractor shall preserve and protect all structures, equipment, and vegetation (such

as trees, shrubs, and grass) on or adjacent to the work site, which are not to be removed and which do not unreasonably interfere with the work required under this contract. The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during contract performance, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer.

(b) The Contractor shall protect from damage all existing improvements and utilities (1) at or near the work site and (2) on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. The Contractor shall repair any damage to those facilities, including those that are property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.

(End of clause)

AOC52.236-1 ACCESS TO WORK (JUN 2004)

(a) The Contracting Officer or his representative may visit and inspect the Contractor's plant, without advance notice, at any time during the course of this contract, and he shall be granted every available assistance to facilitate such inspection.

(b) The Contracting Officer and proper members of his staff shall at all times have access to the work, and the Contractor shall provide proper and safe facilities for such access and for inspection.

(End of clause)

AOC52.236-2 OTHER CONTRACTS AND WORK (JUN 2004)

(a) The Contractor shall fully inform himself as to conditions relating to construction and labor under which other work, if any, is being performed, or is to be performed, by or for the Government, by contract or otherwise, where such work may affect or be affected by, operations under this Contract.

(b) Notwithstanding the performance by other parties of work at the site during performance of this contract, the Contractor shall prosecute the work diligently and continuously, and he shall cooperate in every way with such other parties. The Contractor shall give such other parties, to the extent their work is affected by his work, all information necessary for the proper execution

of their work, without delay. The Contractor shall so arrange and conduct his work that other parties may complete their work at the site according to schedule. All other work under the instant contract shall be carefully coordinated with work under such other contracts.

(End of clause)

AOC52.236-3 ACCIDENT PREVENTION AND SAFETY AND HEALTH PROGRAMS - CONSTRUCTION (SEP 2004)

(a) The Contractor shall take proper safety and health precautions to protect the work, the workers, the public, and the property of others and comply with the safety and health standards published in 41 C.F.R. Part 50-205, including any matters incorporated by reference therein. He shall also be responsible for all materials delivered and work performed until completion and final acceptance of the entire contract work, except for any completed unit thereof which theretofore may have been finally accepted.

(b) *Williams-Steiger Occupational Safety and Health Act.* The Contractor shall also comply in all aspects of the job with the regulations issued by the Secretary of Labor pursuant to the Williams-Steiger Occupational Safety and Health Act of 1970, as set forth in Title 29 of the Code of Federal Regulations. The Contractor shall bring to the attention of the Architect any work encountered which may involve entry into a suspected confined space as defined by OSHA. A determination will be made by the Architect, and if the area is deemed a permit required confined space, additional protective measures will be needed, per OSHA requirements.

(c) *National Fire Protection Association standards.* The Contractor shall comply with all applicable standards of the National Fire Protection Association relative to fire prevention, except to the extent that more exacting requirements are specified or imposed by the Contracting Officer. The Contractor shall keep and properly maintain fire prevention devices at the job site and shall take all possible precautions deemed necessary by the Government representative in charge of the work.

(d) *Protection of property and persons*. (1) The Contractor shall protect all of his material and work at the site, whether incorporated in the work or not, against damage or loss from any cause, and he shall take all necessary precautions against damage to all other work and material on the site. He shall provide and maintain necessary safeguards for protection of his employees, Government employees and the public generally, and he shall take all other proper precautions for their protection against injury. He shall comply with all directives and regulations of the Contracting Officer and other proper authorities relative to the use of public property.

(2) The Contractor shall protect all electric, telephone, computer facilities, water, gas, sewer, steam and other underground utility lines, in sidewalks, streets or other areas in, under or around the site, to the satisfaction of the Contracting Officer, the Government of the District of Columbia, and all other authorities having jurisdiction.

(3) The performance of work at the site by other parties shall not relieve the Contractor from any liability for loss or damage or from his obligations under this contract. No agreement or arrangement between the Contractor and others as to a division or proportionate share of liability for loss or damage incurred, or of the cost of insurance, shall in any way relieve the Contractor of such liability or his obligations under this contract.

(e) The Contractor shall comply with the requirements of FAR 52.236.13, Accident Prevention. In the event that conditions on the site pose an imminent danger or threat to the Contractor's workers, the public, Government employees, other persons, or to Capitol complex structures and property of historical significance, the Contracting Officer can verbally order the Contractor to suspend work operations in the specified area until said conditions are corrected to the Contracting Officer's satisfaction. The Contracting Officer shall promptly issue a written order to suspend the work to the Contractor formalizing the specifics of the verbal suspension of work.

(f) The Contractor shall not be entitled to any equitable adjustment of the contract price or extension of the performance schedule on any stop work order issued under this clause.

(End of clause)

AOC52.236-4 CUTTING AND PATCHING (JUN 2004)

Prior to initiation of the work operations of either cutting or patching, as a necessary requirement of the work under this contract, of any structural component or of lintels, stair systems, piping, duct work, vessels, equipment and like items in the building, the Contractor shall consult with the Contracting Officer and follow explicitly his directions and stated requirements concerning methods, materials, the manner in which the work is performed, and the level of competence and skill possessed by Contractor's employees, or those of subcontractors, who are proposed to be employed in said cutting and/or patching operations.

(End of clause)

AOC52.236-5 CLEANING AND RESTORING (JUN 2004)

(a) The contractor shall remove dirt and debris resulting from the operations under this contract daily.

(b) The Contractor shall, as a condition precedent to the final acceptance of the work, remove from the site of the work all remaining plant, installations, temporary barricades, temporary facilities, equipment, tools, materials, refuse, rubbish and waste, used or accumulated in connection with, but not incorporated in, the work, unless otherwise specified or directed, and he shall leave the buildings, grounds, streets, and all public places occupied by him in a thoroughly clean, neat and satisfactory condition.

(End of clause)

AOC52.236-10 SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (JUN 2004)

(a) The Contractor shall keep on the site of the work a copy of the drawings and specifications, and of approved shop drawings, product data and samples and shall at all times give the Contracting Officer access thereto. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. In case of difference between drawings and specifications, or in case of discrepancy either within the figures, within the drawings, or within the specifications, the matter shall be promptly submitted to the Contracting Officer, who shall promptly make a determination in writing. Any adjustment by the Contractor without such a determination shall be at its own risk and expense. The Contracting Officer shall furnish from time to time such detailed drawings and other information he considers necessary, unless otherwise provided.

(b) "Shop drawings" means drawings submitted to the Government by the Contractor, subcontractor, any lower tier subcontractor pursuant to a construction contract, showing in detail (1) the proposed fabrication and assembly of structural elements and (2) the installation (i.e., form, fit, and attachment details) of materials or equipment. It includes drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials furnished by the Contractor to explain in detail specific portions of the work required by the contract.

(c) The Contractor shall submit to the Contracting Officer for approval shop drawings, product data and samples as required under the various sections of this Project Manual. The Contractor shall coordinate all such submittals, and review them for accuracy, completeness, and compliance with contract requirements and shall indicate its approval thereon as evidence of such coordination and review. Shop drawings, product data, or samples submitted to the Contracting Officer without evidence of the Contractor's approval may be returned for re-submission. The Contracting Officer will indicate an approval or disapproval of the shop drawings and if not approved as submitted shall indicate the Government's reasons therefor. Any work done before such approval shall be at the Contractor's risk. Approval by the Contracting Officer shall not relieve the Contractor from responsibility for any errors or omissions in such submittals, nor from responsibility for complying with the requirements of this contract, except with respect to variations described and approved in accordance with Paragraph (d) below.

(d) If shop drawings, product data, or samples show variations from the contract requirements, the Contractor shall describe such variations in writing, separate from the drawings, at the time of submission. If the Contracting Officer approves any such variation, the Contracting Officer shall issue an appropriate contract modification, except that, if the variation is minor or does not involve a change in price or in time of performance, a modification need not

be issued.

(e) Upon completing the work under this contract, the Contractor shall furnish a complete set of all shop drawings as finally approved. These drawings shall show all changes and revisions made up to the time the equipment is completed and accepted. The Government may duplicate, use, and disclose in any manner and for any purpose shop drawings, product data or samples delivered under this contract.

(f) The provisions of this entire paragraph shall be included in all subcontracts at any tier.

(End of clause)

AOC52.236-12 PRODUCT DATA AND SAMPLES (JUN 2004)

(a) Product data shall mean information (e.g., catalog cuts, standard illustrations, drawings, performance charts, data and brochures) pertinent to a particular product, equipment or material required as a part of the work. Product data is required to establish, for the purposes of evaluation and approval, details of the product offered in response to specifications elsewhere in the contract documents. Product data pertains to significant elements such as (1) design; (2) materials; (3) components; (4) performance characteristics; and (5) methods of manufacture, assembly, construction, or operation. The term includes, in addition to the above, the manufacturer's standard printed recommendations for application and use, compliance with recognized standards of trade associations and testing agencies, and the application of their labels and seals (if any).

(b) Samples are physical examples of materials, equipment or workmanship that will be used by the Contracting Officer to establish standards by which the work will be judged.

c) Samples not subject to destructive tests may be retained by the Contracting Officer until completion of the work; they will then be returned to the Contractor, at his own expense, if he so requests in writing.

(End of clause)

FAR 52.242-14 SUSPENSION OF WORK (APR 1984)

(a) The Contracting Officer may order the Contractor, in writing, to suspend, delay, or interrupt all or any part of the work of this contract for the period of time that the Contracting Officer determines appropriate for the convenience of the Government.

(b) If the performance of all or any part of the work is, for an unreasonable period of time, suspended, delayed, or interrupted (1) by an act of the Contracting Officer in the administration of the contract, or (2) by the Contracting Officer’s failure to act within the time specified in this contract (or within a reasonable time if not specified), an adjustment shall be made for any

increase in the cost of performance of this contract (excluding profit) necessarily caused by the unreasonable suspension, delay, or interruption, and the contract modified in writing accordingly. However, no adjustment shall be made under this Article for any suspension, delay or interruption to the extent that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor, or for which an equitable adjustment is provided for or excluded under any other term or condition of this contract.

(c) A claim under this article shall not be allowed (1) for any costs incurred more than 20 days before the Contractor shall have notified the Contracting Officer in writing of the act or failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension order), and (2) unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of the suspension, delay, or interruption, but not later than the date of final payment under the contract.

(End of clause)

AOC52.246-6 ADDITIONAL WARRANTY COVERAGE (JUN 2004)

If the Contractor receives from any manufacturer, supplier or subcontractor additional warranty coverage on the whole or any component of the work required by this contract, in the form of time including any pro rata arrangements, or the Contractor generally extends to his commercial customers a greater or extended warranty coverage, the Government shall receive corresponding warranty benefits.

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CONTRACT CLAUSES

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SECTION I
CONTRACT CLAUSES

AOC52.202-1 DEFINITIONS (JUN 2004)

(a) The term "head of the agency" as used herein means the Committee, Commission, or other authority of the Legislative Branch of the Government having final jurisdiction or supervision over the work involved. The term "other authority" as used in this paragraph includes the Contracting Officer in cases in which he has final jurisdiction or supervision over the work involved.

(b) The term "Architect" as used herein means the Architect of the Capitol.

c) The term "Contracting Officer" as used herein means the Architect of the Capitol or his duly authorized representative.

(d) The term "his duly authorized representative" as used herein means any person or persons or board authorized to act for the head of the agency within the scope of their authority.

(e) Except as otherwise provided in this contract, the term "subcontracts" includes purchase orders placed for performance under this contract.

(End of clause)

AOC52.203-1 ADVERTISING/PROMOTIONAL MATERIALS (JUN 2004)

(a) It is the policy of the Congress to discourage contractors providing services and supplies to the Legislative Branch entities, including the Architect of the Capitol, from advertising practices that feature the Capitol and Capitol Complex in a manner in which conveys, or is reasonably calculated to convey, a false impression of sponsorship, approval or endorsement of any product or service by the Congress, the Government of the United States, or any Department, Agency or instrumentality thereof.

(b) Contractors performing construction services for Legislative Branch entities, including the Architect of the Capitol, are discouraged from capitalizing on their contractual relationships with such entities and shall not engage in advertising practices which convey, or are reasonably calculated to convey, a false impression of sponsorship, approval or endorsement of any product or service by the Congress, the Government of the United States, of any Department, Agency or instrumentality thereof. This includes utilizing, in conjunction with the fact of their contractual relationship, images of the Capitol, any other buildings in the Capitol Complex, or any part of the United States Capitol Grounds in their advertising or promotional materials; and/or publishing or disseminating the aforementioned advertising or promotional materials.

c) The Contractor, by signing this contract, agrees to comply with the foregoing and to submit any proposed advertising or promotional copy connected in any manner with this contract and/or the Capitol, other Capitol Complex Buildings, or the United States Capitol Grounds to the Contracting Officer for approval prior to publication.

(End of clause)

AOC52.203-2 DISCLOSURE OF INFORMATION TO THE GENERAL PUBLIC (JUN 2004)

(a) Promptly after receiving any request from the general public for information on or data derived from this contract, the contractor shall notify the Architect of the Capitol, Procurement Division. The contractor shall cooperate with the Procurement Division in compiling or collecting information or data if the Architect of the Capitol determines the information or data

to be releasable.

(b) "General public", for purposes of this clause, are those groups or individuals who are not authorized by law or regulation to have access.

c) This clause is not intended to prevent the contractor from providing contract information or data which the contractor is required to provide in order to conduct its business, such as insurance, banking, subcontracting.

(d) The contractor is permitted to request that proprietary information or data not be released if such release would harm or impair the contractor in conducting its normal business. Such request must be documented with clear and specific grounds for that claim.

(End of clause)

AOC52.203-4 DISSEMINATION OF CONTRACT INFORMATION (NOV 2004)

Unless otherwise provided in this contract, the Contractor shall not publish, permit to be published, or distribute for public consumption, any information, oral or written, concerning the results of, conclusions made pursuant to, or performance under this contract without prior written consent of the Contracting Officer, until such time as the Government may have released such information to the public.

(End of clause)

AOC52.203-5 CONFIDENTIALITY REQUIREMENT (NOV 2004)

The Contractor agrees that any information supplied by the Architect to the Contractor shall be considered confidential and/or proprietary, and agrees to hold such information in confidence. The Contractor further agrees not to disclose such information to a third party without the prior written consent of the Architect.

(End of clause)

AOC52.204-1 PRINTED OR COPIED DOUBLE-SIDED ON RECYCLED PAPER (JUN 2004)

The Contractor is encouraged to submit paper documents, such as offers, letters, or reports, that are printed or copied doubled-sided on recycled paper and meet minimum content standards when not using electronic commerce methods to submit information or data to the Government.

(End of clause)

AOC52.215-10 EXAMINATION OF RECORDS (JUN 2004)

(a) The Contractor agrees that the Architect of the Capitol or any duly authorized representatives shall, until the expiration of 3 years after final payment under this contract, have access to and the right to examine any books, accounting procedures and practices documents, papers, records and other data regardless of whether such items are in written form, in the form of computer data or in any other form and other supporting evidence, involving transactions related to this contract or compliance with any clause or certification thereunder.

(b) The Contractor further agrees to include in all its subcontracts hereunder a provision to the effect that subcontractor agrees that the Architect of the Capitol or any authorized representatives shall, until the expiration of 3 years after final payment under the subcontract, have access to and the right to examine books, documents, papers, records other data regardless of whether such items are in written form, in the form of computer data or in any other form, and other supporting evidence, involving transactions related to the subcontract or compliance with any clause or certification thereunder.

c) The term “subcontract” as used in this clause excludes purchase orders not exceeding $10,000.

(End of clause)

AOC52.215-11 AUDITS (JUN 2005)

(a) If the price of this contract is changed through the operation of any of the provisions of this contract, the Contractor, within such reasonable time as the Contracting Officer may direct, shall submit complete and accurate cost and pricing data in support of any claim asserted under such provisions.

(b) With the submission of cost and pricing data in support of any claim, the Contractor shall supply the following certification by a duly authorized corporate officer, partner, or owner, as applicable:

> "This is to certify that, to the best of my knowledge and belief, the cost and pricing data herewith submitted to the Contracting Officer in support of a price adjustment under Supplement/Claim No. for _____ (identify by description) are accurate and complete and they are current as of _____ (date).
> Date of Execution _____
> Firm _____
> Signature_____

Title_____"

(c) The Contracting Officer in accordance with the FAR clause "Audit and Records - Negotiation", 52.215-2, has the right to examine all books, records, documents and other data of the Contractor or subcontractor in order to evaluate the accuracy, completeness, and currency of cost or pricing data thus submitted. The Contractor shall insert an appropriate provision in all subcontracts for the purpose of making the requirements of this paragraph applicable thereto.

(End of clause)

AOC52.216-6 UNDEFINITIZED CONTRACT ACTIONS (MAR 2005)

(a) In the event of an urgent situation, the services or supplies may be required on an emergency basis under an undefinitized contract action (emergency task/delivery order, contract modification, or letter contract). The undefinitized contract action may be either verbal, typed, or hand written, with the form of the undefinitized contract action dictated by the access the issuing Contracting Officer has to the AOC network or a computer. If issued verbally, the Contracting Officer shall provide a written confirming document to the location identified by the contractor within 5 calendar days after issuance of the verbal undefinitized contract action. If an undefinitized contract action is issued under an existing contract, the terms and conditions of the contract shall be in effect and automatically incorporated by reference under any undefinitized contract action issued.

(b) The scope of work as originally issued on the contract action will, of necessity, be somewhat broad and general in nature. It is to also be considered as a Notice to Proceed immediately with the work under the undefinitized contract action. An estimated amount for the work to be performed shall be obligated to ensure that reasonable funds are available for payment to the contractor, and an estimated completion date shall be identified on the undefinitized contract action. If the contractor believes the amount of funds obligated or time for completion as stated in the undefinitized contact action are unreasonable, within 30 calendar days after issuance of the written undefinitized contract action the contractor is responsible for notifying the Contracting Officer of this and providing a suggested amount of funds for obligation or time for completion. In no instance shall the contractor's suggested amount of funds for obligation or time for completion be considered as binding to the contractor or the Government in future negotiations. The Government can elect to use the contractor's suggested amount of funds or time for completion as an indication that some additional funds or time for completion may be required and obligated or adjusted, respectively, in order to ensure that reasonably adequate funds are available to pay the contractor for services performed or that the completion time is reasonable .

(c) Within a reasonable amount of time after the issuance of the undefinitized contract action but not later than an estimated 25% of the way through the completion of the work under the undefinitized contract action, an authorized representative of the contractor must meet, either in person or telephonically, with the Contracting Officer to further define the scope of work,

negotiate the price, identify a final completion date, and address other activities necessary to definitize the undefinitized contract action. This estimated 25% shall use the best information reasonably available and be based upon (1) an estimate of the amount of work completed relative to the original general scope of work or (2) the amount of payments made relative to the original amount obligated.

(d) Payments can be made from the original amount obligated, but the undefinitized contract action must be definitized before payments exceed 40% of funds originally obligated.

(e) If communications are disrupted to the degree that it is necessary to communicate with the Contracting Officer at their residence or through other devices that do not utilize AOC-owned equipment, i.e., the Contracting Officer's residential telephone line, home address, etc., the contractor shall treat the Contracting Officer's personal information as confidential and shall not divulge the information to any individual or organization, including but not limited to other AOC personnel, without the Contracting Officer's express written permission. If it becomes necessary for the Contracting Officer to communicate with the contractor through means other than the contractor's normal place of business, i.e., the contractor's residential telephone line or home address, the Contracting Officer shall not divulge the information to any individual or organization, including but not limited to other AOC or contractor personnel, without the contractor's express written permission.

(f) For the purposes of this clause, e-mail is considered express written permission.

(End of clause)

AOC52.219-1 UTILIZATION OF SMALL BUSINESS CONCERNS (AUG 2004)

(a) It is the policy of the Government as declared by the Congress that a fair proportion of the purchases and contracts for supplies and services for the Government be placed with all types of small business concerns as determined by the size standards in 13 CFR 121.

(b) The Contractor agrees to accomplish the maximum amount of subcontracting to all types of small business concerns that the Contractor finds to be consistent with the efficient performance of this contract.

(End of clause)

AOC52.222-3 CONVICT LABOR (JUN 2004)

In connection with the performance of work under this contract the Contractor agrees not to employ any person undergoing sentence of imprisonment except as provided by Public Law 89-176, approved September 10, 1965, 18 U.S.C. 4082(c)(2).

(End of clause)

AOC52.222-4 OVERTIME WORK (AUG 2004)

No extra reimbursement will be allowed for work performed outside regular working hours or on Saturdays, Sundays, or holidays and, for work performed in the District of Columbia, Presidential Inauguration Day, unless such work is authorized by the Contracting Officer; and provided such work is not otherwise required to be performed under the terms of the contract. If said authorization is verbal, with written verification thereof by signature of the Contracting Officer on the employee's weekly time record (see AOC52.232-2, Payments - Services or AOC52.232-3, Payments - Services Utilizing Time Records).

(End of clause)

AOC52.223-3 SECURITY MARKINGS (JUN 2004)

(a) Before dissemination to subcontractors or other personnel, all AOC drawings and electronic copies thereof shall be considered at a minimum to be *sensitive but unclassified* (SBU). The following statement shall be imprinted on *each* page of drawings:

> **PROPERTY OF THE UNITED STATES GOVERNMENT**
> **COPYING, DISSEMINATING, OR DISTRIBUTING THESE DRAWINGS, PLANS OR SPECIFICATIONS TO UNAUTHORIZED USERS IS PROHIBITED**
> **Do not remove this notice**
> **Properly destroy documents when no longer needed**

(b) The following paragraph shall be included on the cover page of the information (such as the cover page on a set of construction drawings and on the cover page of the specifications).

> **PROPERTY OF THE UNITED STATES GOVERNMENT**
> **COPYING, DISSEMINATING, OR DISTRIBUTING THESE DRAWINGS, PLANS OR SPECIFICATIONS TO UNAUTHORIZED USERS IS PROHIBITED**
> **Do not remove this notice**
> **Properly destroy documents when no longer needed**

(End of clause)

AOC52.223-4 TRANSMISSION OR POSTING OF DRAWINGS/SPECIFICATIONS (JUN 2004)

Due to security issues, the contractor is strictly prohibited from placing or transmitting drawings and specifications on the internet or modem without express permission from the Architect of the Capitol.

(End of clause)

AOC52.223-9 ACCIDENT PREVENTION AND SAFETY AND HEALTH PROGRAMS (SEP 2004)

(a) The Contractor shall comply with the safety and health standards published in 41 C.F.R. Part 50-205, including any matters incorporated by reference therein.

(b) The Contractor shall also comply with the regulations issued by the Secretary of Labor pursuant to the Williams-Steiger Occupational Safety and Health Act of 1970, as set forth in Title 29 of the Code of Federal Regulations.

c) The Contractor shall bring to the attention of the Architect any work encountered that may involve entry into a suspected confined space as defined by OSHA. A determination will be made by the Architect, and if the areas is deemed a permit required confined space, additional protective measures will be needed, per OSHA requirements.

(d) In the event that conditions on the site pose an imminent danger or threat to the Contractor's workers, the public, Government employees, other persons, or to Capitol complex structures and property of historical significance, the Contracting Officer can verbally order the Contractor to stop work operations in the specified area until said conditions are corrected to the Contracting Officer's satisfaction. The Contracting Officer shall promptly issue a written order to stop the work to the Contractor formalizing the specifics of the verbal stop work order.

(e) The Contractor shall not be entitled to any equitable adjustment of the contract price or extension of the performance schedule on any stop work order issued under this clause.

(End of clause)

AOC52.227-2 UNLIMITED GOVERNMENT RIGHTS (NOV 2004)

The Government shall have unlimited rights, for the benefit of the Government, in all drawings, designs, specifications, notes, and other work developed in the performance of this contract, including the right to use same on any other Government work without additional cost to the Government; and with respect thereto the contractor agrees to and does hereby grant to the Government a royalty-free license to all such data which the contractor may cover by copyright and to all designs as to which the contractor may assert any rights or establish any claim under the design patent or copyright laws. The contractor agrees to furnish and to provide access to all such materials on the request of the Contracting Officer.

RIGHTS IN DATA--GENERAL (AOC) (JUL 2001)

(A) Definitions

(1) "Computer software," as used in this article, means computer programs, computer data bases, and documentation thereof.

(2) "Data," as used in this article, means recorded information, regardless of form or the media on which it may be recorded. The term includes technical data and computer software. The term does not include information incidental to contract administration, such as financial, administrative, cost or pricing, or management information.

(3) "Form, fit, and function data," as used in this article, means data relating to items, components, or processes that are sufficient to enable physical and functional interchangeability, as well as data identifying source, size, configuration, mating, and attachment characteristics, functional characteristics, and performance requirements; except that for computer software it means data identifying source, functional characteristics, and performance requirements but specifically excludes the source code, algorithm, process, formulae, and flow charts of the software.

(4) "Limited rights," as used in this article, means the rights of the Government in limited rights data as set forth in the Limited Rights Notice if included in this article or contract.

(5) "Limited rights data," as used in this article, means data (other than computer software) that embody trade secrets or are commercial or financial and confidential or privileged, to the extent that such data pertain to items, components, or processes developed at private expense, including minor modifications thereof.

(6) "Restricted computer software," as used in this article, means computer software developed at private expense and that is a trade secret; is commercial or financial and is confidential or privileged; or is published copyrighted computer software, including minor modifications of such computer software.

(7) "Restricted rights," as used in this article, means the rights of the Government in restricted computer software, as set forth in a Restricted Rights Notice made part of this contract, including minor modifications of such computer software.

(8) "Technical data," as used in this article, means data (other than computer software) which are of a scientific or technical nature.

(9) "Unlimited rights," as used in this article, means the right of the Government to use, disclose, reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, in any manner and for any purpose, and to have or permit others to do so.

(B) Allocation of Rights

(1) Except as provided in paragraph ©) of this article regarding copyright, the Government shall have unlimited rights in--

(a) Data first produced in the performance of this contract;
(b) Form, fit, and function data delivered under this contract;
©) Data delivered under this contract (except for restricted computer software) that constitute manuals or instructional and training material for installation, operation, or routine maintenance and repair of items, components, or processes delivered or furnished for use under this contract; and
(d) All other data delivered under this contract unless provided otherwise for limited rights data or restricted computer software in accordance with paragraph (G) of this article.

(2) The Contractor shall have the right to–
(a) Use, release to others, reproduce, distribute, or publish any data first produced or specifically used by the Contractor in the performance of this contract, unless provided otherwise in paragraph (D) of this article;
(b) Protect from unauthorized disclosure and use those data which are limited rights data or restricted computer software to the extent provided in paragraph G of this article;
(c) Substantiate use of, add or correct limited rights, restricted rights, or copyright notices and to take other appropriate action, in accordance with paragraphs E and F of this article; and
(d) Establish claim to copyright subsisting in data first produced in the performance of this contract to the extent provided in subparagraph C of this article.

C) Copyright

(1) *Data first produced in the performance of this contract.* Unless provided otherwise in paragraph .4 of this article, the Contractor may establish, without prior approval of the Contracting Officer, claim to copyright subsisting in scientific and technical articles based on or containing data first produced in the performance of this contract and published in academic, technical or professional journals, symposia proceedings or similar works. The prior, express written permission of the Contracting Officer is required to establish claim to copyright subsisting in all other data first produced in the performance of this contract. When claim to copyright is made, the Contractor shall affix the applicable copyright notices of 17 U.S.C. 401 or 402 and acknowledgment of Government sponsorship (including contract number) to the data when such data are delivered to the Government, as well as when the data are published or deposited for registration as a published work in the U.S. Copyright Office. For data other than computer software the Contractor grants to the Government, and others acting on its behalf, a paid-up, nonexclusive, irrevocable worldwide license in such copyrighted data to reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, by or on behalf of the Government. For computer software, the Contractor grants to the Government and others acting in its behalf, a paid-up

nonexclusive, irrevocable worldwide license in such copyrighted computer software to reproduce, prepare derivative works, and perform publicly and display publicly by or on behalf of the Government.

(2) *Data not first produced in the performance of this contract*. The Contractor shall not, without prior written permission of the Contracting Officer, incorporate in data delivered under this contract any data not first produced in the performance of this contract and which contains the copyright notice of 17 U.S.C. 401 or 402, unless the Contractor identifies such data and grants to the Government, or acquires on its behalf, a license of the same scope as set forth in subparagraph .3.1 of this article; *provided*, however, that if such data are computer software the Government shall acquire a copyright license as set forth in subparagraph (G)(3)of this article if included in this contract or as otherwise may be provided in a collateral agreement incorporated in or made part of this contract.

(3) *Removal of copyright notices*. The Government agrees not to remove any copyright notices placed on data pursuant to this paragraph C, and to include such notices on all reproductions of the data.

(D) Release, Publication and Use of Data.

(1) The Contractor shall have the right to use, release to others, reproduce, distribute, or publish any data first produced or specifically used by the Contractor in the performance of this contract, except to the extent such data may be subject to the Federal export control or national security laws or regulations, or unless otherwise provided in this paragraph of this article or expressly set forth in this contract.

(2) The Contractor agrees that to the extent it receives or is given access to data necessary for the performance of this contract which contain restrictive markings, the Contractor shall treat the data in accordance with such markings unless otherwise specifically authorized in writing by the Contracting Officer.

(E) Unauthorized Marking of Data.

(1) Notwithstanding any other provisions of this contract concerning inspection or acceptance, if any data delivered under this contract are marked with the notices specified in subparagraph (G)(1)or (G)(3) of this article and use of such is not authorized by this article, or if such data bears any other restrictive or limiting markings not authorized by this contract, the Contracting Officer may at any time either return the data to the Contractor, or cancel or ignore the markings. However, the following procedures shall apply prior to canceling or ignoring the markings.

(a) The Contracting Officer shall make written inquiry to the Contractor affording the Contractor 30 days from receipt of the inquiry to provide written

justification to substantiate the propriety of the markings;

(b) If the Contractor fails to respond or fails to provide written justification to substantiate the propriety of the markings within the 30-day period (or a longer time not exceeding 90 days approved in writing by the Contracting Officer for good cause shown), the Government shall have the right to cancel or ignore the markings at any time after said period and the data will no longer be made subject to any disclosure prohibitions.

(c) If the Contractor provides written justification to substantiate the propriety of the markings within the period set in subdivision.(E)(1)(a) of this article, the Contracting Officer shall consider such written justification and determine whether or not the markings are to be cancelled or ignored. If the Contracting Officer determines that the markings are authorized, the Contractor shall be so notified in writing. If the Contracting Officer determines, with concurrence of the head of the contracting activity, that the markings are not authorized, the Contracting Officer shall furnish the Contractor a written determination, which determination shall become the final agency decision regarding the appropriateness of the markings unless the Contractor files suit in a court of competent jurisdiction within 90 days of receipt of the Contracting Officer's decision. The Government shall continue to abide by the markings under this subdivision (E)(1)©) until final resolution of the matter either by the Contracting Officer's determination becoming final (in which instance the Government shall thereafter have the right to cancel or ignore the markings at any time and the data will no longer be made subject to any disclosure prohibitions), or by final disposition of the matter by court decision if suit is filed.

(F) Omitted or Incorrect Markings

(1) Data delivered to the Government without either the limited rights or restricted rights notice as authorized by paragraph G of this article, or the copyright notice required by paragraph C of this article, shall be deemed to have been furnished with unlimited rights, and the Government assumes no liability for the disclosure, use, or reproduction of such data. However, to the extent the data has not been disclosed without restriction outside the Government, the Contractor may request, within 6 months (or a longer time approved by the Contracting Officer for good cause shown) after delivery of such data, permission to have notices placed on qualifying data at the Contractor's expense, and the Contracting Officer may agree to do so if the Contractor–

(a) Identifies the data to which the omitted notice is to be applied;

(b) Demonstrates that the omission of the notice was inadvertent;

(c) Establishes that the use of the proposed notice is authorized; and

(d) Acknowledges that the Government has no liability with respect to the disclosure, use, or reproduction of any such data made prior to the addition of the notice or resulting from the omission of the notice.

(2) The Contracting Officer may also (I) permit correction at the Contractor's expense of incorrect notices if the Contractor identifies the data on which correction of the notice is to be made, and demonstrates that the correct notice is authorized, or (ii) correct any incorrect notices.

(G) Protection of Limited Rights Data and Restricted Computer Software

(1) When data other than that listed in subdivisions (B)(1)(a), (B)(1)(b), (B)(1)©), of this article are specified to be delivered under this contract and qualify as either limited rights data or restricted computer software, if the Contractor desires to continue protection of such data, the Contractor shall withhold such data and not furnish them to the Government under this contract. As a condition to this withholding, the Contractor shall identify the data being withheld and furnish form, fit, and function data in lieu thereof. Limited rights data that are formatted as a computer data base for delivery to the Government are to be treated as limited rights data and not restricted computer software.

(H) Subcontracting.

(1) The Contractor has the responsibility to obtain from its subcontractors all data and rights therein necessary to fulfill the Contractor's obligations to the Government under this contract. If a subcontractor refuses to accept terms affording the Government such rights, the Contractor shall promptly bring such refusal to the attention of the Contracting Officer and not proceed with subcontract award without further authorization.

(a) *Relationship to patents*. Nothing contained in this article shall imply a license to the Government under any patent or be construed as affecting the scope of any license or other right otherwise granted to the Government.

LIMITATION OF LIABILITY

(A) Except as otherwise provided by an express or implied warranty, the contractor will not be liable to the Government for consequential damages resulting from any defect or deficiencies in accepted items.

CONTRACTOR COMMITMENTS, WARRANTIES AND REPRESENTATIONS

(A) For the purpose of this contract, commitments, warranties and representation include,

(1) The contractor warrants and implies that the items delivered hereunder are

merchantable and fit for use for the particular purpose described in this contract.

(2) Technical representations and/or warranties of products concerning performance, total system performance and/or configuration, physical, design and/or functional characteristics and capabilities of a product/equipment/service/software package...

(3) Any representations and/or warranties concerning the products made in any literature, description, drawings and/or specifications furnished by the Contractor.

COMMERCIAL COMPUTER SOFTWARE--RESTRICTED RIGHTS (AOC) (JUL 2001)

(A) As used in this article, "restricted computer software" means any computer program, computer data base, or documentation thereof, that has been developed at private expense and either is a trade secret, is commercial or financial and confidential or privileged, or is published and copyrighted.

(B) Notwithstanding any provisions to the contrary contained in any Contractor's standard commercial license or lease agreement pertaining to any restricted computer software delivered under this purchase order/contract, and irrespective of whether any such agreement has been proposed prior to or after issuance of this purchase order/contract or of the fact that such agreement may be affixed to or accompany the restricted computer software upon delivery, vendor agrees that the Government shall have the rights that are set forth in paragraph .3 of this article to use, duplicate or disclose any restricted computer software delivered under this purchase order/contract. The terms and provisions of this contract, including any commercial lease or license agreement, shall be subject to paragraph C of this article and shall comply with Federal laws.

C)

(1) The restricted computer software delivered under this contract may not be used, reproduced or disclosed by the Government except as provided in subparagraph (C)(2)of this article or as expressly stated otherwise in this contract.

(2) The restricted computer software may be--

(a) Used or copied for use in or with the computer or computers for which it was acquired, including use at any Government installation to which such computer or computers may be transferred;

(b) Used or copied for use in or with backup computer if any computer for which it was acquired is inoperative;

(c) Reproduced for safekeeping (archives) or backup purposes;

(d) Modified, adapted, or combined with other computer software, provided that the modified, combined, or adapted portions of the derivative software incorporating any of the delivered, restricted computer software shall be subject to same restrictions set forth in this purchase order/contract;

(e) Disclosed to and reproduced for use by support service Contractors or

their subcontractors, subject to the same restrictions set forth in this purchase order/contract; and

(f) Used or copied for use in or transferred to a replacement computer.

(3) If the restricted computer software delivered under this purchase order/contract is published and copyrighted, it is licensed to the Government, without disclosure prohibitions, with the rights set forth in subparagraph ©)(2) of this article unless expressly stated otherwise in this purchase order/contract.

(4) To the extent feasible the Contractor shall affix a Notice substantially as follows to any restricted computer software delivered under this purchase order/contract; or, if the vendor does not, the Government has the right to do so:

"Notice--Notwithstanding any other lease or license agreement that may pertain to, or accompany the delivery of, this computer software, the rights of the Government regarding its use, reproduction and disclosure are as set forth in Government Contract (or Purchase Order) No. _____."

(5) If any restricted computer software is delivered under this contract with the copyright notice of 17 U.S.C. 401, it will be presumed to be published and copyrighted and licensed to the Government in accordance with subparagraph (c)(3) of this article, unless a statement substantially as follows accompanies such copyright notice:

"Unpublished--rights reserved under the copyright laws of the United States."

(End of clause)

AOC 52.228-2 INSURANCE - WORK ON A GOVERNMENT INSTALLATION (SEP 2004)

(a) The Contractor shall, at his own expense, provide and maintain during the entire performance of this contract at least the kinds and minimum amounts of insurance as required in this clause.

(b) Within twenty (20) calendar days after the date of contract award or before commencing work under this contract, whichever is earlier, the Contractor shall notify the Contracting Officer in writing that the required insurance has been obtained. A Certificate of Insurance evidencing the Contractor's compliance with the requirements of this clause, identifying all policies of insurance and sureties proposed for the provision of liability coverage pertinent to the work of the instant contract, including the endorsement required in this paragraph, and manually countersigned by an authorized representative of the insurance company shall be submitted in accordance with the time frame stated in this paragraph. All policies for liability protection, bodily injury, or property damage shall include the United States of America, acting by and

through the Architect of the Capitol, as an additional insured with respect to operations under this contract. Each policy of insurance shall contain the following endorsement, which may be attached as a rider:

> "It is understood and agreed that the Contractor's Insurance Company or surety shall notify the Architect of the Capitol, in writing, thirty (30) calendar days in advance of the effective date of any reduction in or cancellation of this policy."

(c) Insurance and required minimum liability limits are:

(1) Appropriate bodily injury and property damage liability insurance, with limits of not less than $500,000 for each occurrence and $2,000,000 for annual aggregate, including requirements for protection of hoisting and scaffolding operations, when applicable, and servicing areas adjacent to the building;

(2) Automobile bodily injury liability insurance with limits of not less than $200,000 for each person and $500,000 for each accident, and property liability insurance, with a limit of not less than $20,000 for each accident. A combined single limit for these coverages is acceptable; and/or

(3) Workmen's compensation insurance as required by the laws of (1) the District of Columbia for work performed on a Government site located in the District of Columbia; (2) the State of Maryland for work performed on a Government site located in Maryland; or (3) the Commonwealth of Virginia for work performed on a Government site located in Virginia.

(d) The Contractor shall insert the substance of this clause, including this paragraph, in subcontracts under this contract that require work on a Government installation, and shall require subcontractors to provide and maintain the insurance required in this clause. The Contractor shall maintain a copy of all subcontractors' proofs of required insurance, and shall make copies available to the Contracting Officer upon request.

(End of clause)

AOC52.228-3 PROFESSIONAL LIABILITY INSURANCE (NOV 2004)

The contractor shall maintain a minimum of $1,000,000.00 professional liability insurance for errors and omissions during the contract period. The Contractor shall be required to present evidence to show, as a minimum, the amount of insurance required above.

(End of clause)

AOC52.228-4 INDEMNIFICATION AND HOLD HARMLESS AGREEMENT (JUN 2004)

The Contractor agrees to indemnify and hold the Government harmless against any and all claims for damages to persons or property from any cause or causes whatsoever arising out of the performance of services covered by the contract; including, but not limited to, errors, omissions or negligent acts of the Contractor, but excluding active negligence of the Government, and against any and all costs, expenses, attorney's fees, and liability incurred by the Government in defending against such claims, whether the same proceed to judgement or not. In the prosecution of any successful claim or suit by the Government for the enforcement of this contract, the Contractor shall reimburse the Government for any reasonable attorney's fees and costs of claim or suit incurred by the Government.

(End of clause)

AOC52.227-1 PATENT INDEMNITY - COMMERCIAL ITEMS (JUN 2004)

The Contractor shall indemnify the Government and its officers, employees and agents against liability, including costs, for actual or alleged direct or contributory infringement of, or inducement to infringe, any United States or foreign patent, trademark or copyright, arising out of the performance of the contract, provided the Contractor is reasonably notified of such claims and proceedings.

(End of clause)

AOC52.232-6 PAYMENT BY ELECTRONIC FUNDS TRANSFER - OTHER THAN CENTRAL CONTRACTOR REGISTRATION (JUN 2004)

(a) *Method of payment*. (1) All payments by the Government under this contract shall be made by electronic funds transfer (EFT) except as provided in paragraph (a)(2) of this clause. As used in this clause, the term "EFT" refers to the funds transfer.

(2) In the event the Government is unable to release one or more payments by EFT, the contractor agrees to either--

(I) Accept payment by check or some other mutually agreeable method of payment; or

(ii) Request the Government to delay payment until such time as the Government makes payment by EFT (but see paragraph (d)).

(b) *Mandatory submission of Contractor's EFT information*. (1) The Contractor is required to provide the Government with the information required to make payment by EFT (see paragraph (I) of this clause). The contractor shall provide this information directly to the office designated in paragraph (k) to receive that information (hereafter: "designated office") by three working days after notification of contract award. If not otherwise specified in this contract, the

payment office is the designated office for receipt of the contractor's EFT information. If more than one designated office is named for the contract, the contractor shall provide a separate notice to each office. In the event that the EFT information changes, the contractor shall be responsible for providing the updated information to the designated office(s).

(2) If the contractor provides EFT information applicable to multiple contracts, the contractor shall specifically state the applicability of this EFT information in terms acceptable to the designated office. However, EFT information supplied to a designated office shall be applicable only to contracts that identify that designated office as the office to receive EFT information for that contract.

(c) *Mechanisms for EFT payment*. The Government may make payment by EFT through the Automated Clearing House (ACH) network, subject to the rules of the National Automated Clearing House Association. The rules governing Federal payments through the ACH are contained in 31 CFR part 210.

(d) *Suspension of payment*. (1) Notwithstanding the provisions of any other clause of this contract, the Government is not required to make any payment under this contract until after receipt, by the designated payment office, of the correct EFT payment information from the Contractor. Until receipt of the correct EFT information, any invoice or contract financing request shall be deemed not to be a valid invoice.

(2) If the EFT information changes after submission of correct EFT information, the Government shall begin using the changed EFT information no later than the 30 days after its receipt by the designated office to the extent payment is made by EFT. However, the Contractor may request that no further payments be made until the changed EFT information is implemented by the payment office.

(e) *Liability for uncompleted or erroneous transfers*. (1) If an uncompleted or erroneous transfer occurs because the Government failed to use the Contractor-provided EFT information in the correct manner, the Government remains responsible for--

(I) Making a correct payment; and

(ii) Recovering any erroneously directed funds.

(2) If an uncompleted or erroneous transfer occurs because Contractor's EFT information was incorrect at the time of Government release or was revised within 30 days of Government release of the EFT payment transaction instruction to the Federal Reserve System, and --

(I) If the funds are no longer under the control of the payment office, the Government is deemed to have made payment and the Contractor is responsible for recovery of any erroneously directed funds; or

(ii) If the funds remain under the control of the payment office, the Government shall not make payment and the provisions of paragraph (d) shall apply.

(f) *EFT and assignment of claims*. If the contractor assigns the proceeds of this contract as provided for in the assignment of claims terms of this contract, the contractor shall require as a condition of any such assignment that the assignee shall provide the EFT information required by paragraph (I) of this clause to the designated office and shall be paid by EFT in accordance with the terms of this clause. In all respects, the requirements of this clause shall apply to the assignee as if it were the contractor. EFT information that shows the ultimate recipient of the transfer to be other than the contractor, in the absence of a proper assignment of claims acceptable to the Government, is incorrect EFT information within the meaning of Paragraph (d) of this clause.

(g) *Liability for change of EFT information by financial agent.* The Government is not liable for errors resulting from changes to EFT information provided by the contractor's financial agent.

(h) *Payment information.* The payment or disbursing office shall forward to the Contractor available payment information that is suitable for transmission as of the date of release of the EFT instruction to the Federal Reserve System. The Government may request the Contractor to designate a desired format and method(s) for delivery of payment information from a list of formats and methods the payment office is capable of executing. However, the Government does not guarantee that any particular format or method of delivery is available at any particular payment office and retains the latitude to use the format and delivery method most convenient to the Government. If the Government makes payment by check in accordance with paragraph (a) of this clause, the Government shall mail the payment information to the remittance address in the contract.

(i) *EFT Information*. The contractor shall provide the following information to the designated payment office. The contractor may supply this data for this or multiple contracts (see paragraph (b) of this clause). The Contractor shall designate a single financial agent per contract capable of receiving and processing the EFT information using the EFT methods described in paragraph ©) of this clause. The information required is as follows:

(1) The contract number;

(2) The contractor's name and remittance address as stated in the contract(s);

(3) The signature (manual or electronic, as appropriate), title, and telephone number of the contractor's official authorized to provide this information;

(4) The name, address, and 9-digit Routing Transit Number of the contractor's financial agent; and

(5) The contractor's account number and the type of account (checking, saving or lockbox).

(j) The Contractor shall send all EFT information, and any changes to EFT information to the office designated in paragraph (k) of this clause. The Contractor shall not send EFT information to the payment office, or any other office than that designated in paragraph (k). The Government need not use any EFT information sent to any office other than that designated in paragraph (k).

(k) Designated office:
Name:
Architect of the Capital
Accounting Division
Mailing Address:
2nd and D Streets SW
Ford House Office Building
Washington, DC 20515
Telephone:
(202) 226-2552
Facsimile:
(202) 225-7321

(End of clause)

AOC52.232-1 PAYMENTS - SUPPLIES (JUN 2004)

(a) The Contractor shall be paid, upon the submission of proper invoices or vouchers, the prices stipulated herein for supplies delivered and accepted or services rendered and accepted, less deductions, if any, as herein provided. Unless otherwise specified, payment will be made on partial deliveries accepted by the Government when the amount due on such deliveries so warrants; or, when requested by the Contractor and not otherwise specified, payment for accepted partial deliveries shall be made whenever such payment would equal 50 percent of the total amount of this contract.

(b) If partial payments are to be made, all material and work covered by partial payments made shall thereupon become the sole property of the Government, but this provision shall not be construed as relieving the Contractor from the sole responsibility of fulfilling contractual requirements for all material and work upon which payments have been made or the restoration of any damaged work, or as waiving the right of the Government to require the fulfillment of all of the terms of the contract.

c) Upon completion and acceptance of all work, the amount due the Contractor under this contract will be paid upon the presentation of a properly executed invoice and after the Contractor shall have furnished the Government with a release, if required, of all claims against

the Government arising under and by virtue of this contract, other than claims, if any, in stated amounts as may be specifically excepted by the Contractor from the operation of the release. If the Contractor's claim to amounts payable under the contract has been assigned under the Assignment of Claims Act of 1940, as amended (31 U.S.C. 3727, 41 U.S.C. 15), a release may also be required of the assignee.

(d) Until further notice, properly certified invoices shall be FAXED, in triplicate, to the Accounting Office, Architect of the Capitol at 202-226-2580. Information concerning requirements for payment requisitions must be secured by telephoning the Accounting Officer at (202) 226-2552. To assist the AOC in making timely payments, the Contractor is requested to furnish the following additional information on the invoice:

(1) Contract number;

(2) Name, address and Taxpayer I.D. of Contractor;

(3) Invoice Date; and

(4) Amount by line item including quantity and unit pricing (see the "SCHEDULE OF ITEMS" in Section B)

(e) Payments will be made directly to the contractor's financial institution through Direct Deposit/Electronic Funds Transfer (DD/EFT). The Contractor's attention is directed to the requirements of AOC52.232-6, Payment by Electronic Funds Transfer - Other Than Central Contractor Registration.

(End of clause)

AOC52.232-2 PAYMENTS - SERVICES (JUN 2004) Line Items 003,004 Section B

(a) Invoices shall be issued at the end of each month in which services are performed by the Contractor. Until further notice, properly certified invoices shall be FAXED to the Accounting Office, Architect of the Capitol at 202-226-2580. Information concerning requirements for payment requisitions must be secured by telephoning the Accounting Officer at (202) 226-2552. Payment will be made on a monthly basis. To assist the AOC in making timely payments, the Contractor is requested to furnish the following additional information on the invoice:

(1) Contract number; including but not limited to adjustments arising out of delays or disruptions or both caused by such change. Except as the parties may otherwise expressly agree, the Contractor shall be deemed to have waived (1) any adjustments to which it otherwise might be entitled under the paragraph where such claims fail to request such adjustments, and (2) any increase in the amount of equitable adjustments additional to those requested in its claim.

(b) Further, the Contractor agrees that, if required by the Contracting Officer, he will execute

a release, in form and substance satisfactory to the Contracting Officer, as part of the supplemental agreement setting forth the aforesaid equitable adjustment, and that such release shall discharge the Government, its officers, agents and employees, from any further claims, including but not limited to further claims arising out of delays or disruptions or both, caused by the aforesaid change.

(End of clause)

AOC52.232-4 PAYMENTS - CONSTRUCTION (Jun 2004)

(a) *Payment of price*. The Government shall pay the Contractor the contract price as provided in this contract.

(b) *Progress payments*. The Government shall make progress payments monthly as the work proceeds, or at more frequent intervals as determined by the Contracting Officer, or estimates of work accomplished which meets the standards of quality established under the contract, as approved by the Contracting Officer.

(1) The Contractor's request for progress payments shall including the following substantiation:

(I) An itemization of the amounts requested, related to the various elements of work required by the contract covered by the payment requested;

(ii) A listing of the amount included for work performed by each subcontractor under the contract;

(iii) A listing of the total amount of each subcontract under the contract;

(iv) A list of the amounts previously paid to each such subcontractor under the contract; and

(v) Additional supporting data in a form and detail required by the Contracting Officer.

(2) In the preparation of estimates, the Contracting Officer may authorize material delivered on the site and preparatory work done to be taken into consideration. Material delivered to the Contractor at locations other than the site also may be taken into consideration if--

(I) Consideration is specifically authorized by this contract; and

(ii) The Contractor furnishes satisfactory evidence that it has acquired title to such material and that the material will be used to perform this contract.

(c) *Contractor certification*. Along with each request for progress payments, the Contractor shall furnish the following certification, or payment shall not be made: (However, if the Contractor elects to delete Paragraph ©)(4) from the certification, the certification is still acceptable.)

I hereby certify, to the best of my knowledge and belief, that--

(1) The amounts requested are only for performance in accordance with the specifications, terms, and conditions of the contract;

(2) Payments to subcontractors and suppliers have been made from previous payments received under the contract, and timely payments will be made from the proceeds of the payment covered by this certification.

(3) This request for progress payments does not include any amounts which the prime contractor intends to withhold or retain from a subcontractor or supplier in accordance with the terms and conditions of the subcontract; and

(4) This certification is not to be construed as final acceptance of a subcontractor's performance.

_____

(Name)

_____

(Title)

_____

(Date)

(d) *Retainage*. In making such progress payments, there shall be retained 10 percent of the estimated amount until final completion and acceptance of all work required by the contract. However, if the Contracting Officer, at any time after 50 percent of the work has been completed, finds that satisfactory progress is being made, he may authorize any of the remaining partial payments to be made in full. Also, whenever the work is substantially complete, the Contracting Officer, if he considers the amount to be retained to be in excess of the amount adequate for the protection of the Government, at his discretion, may release to the Contractor all or a portion of such excess amount. Furthermore, on completion and acceptance of each separate building, public work, or other division of the contract, on which the price is stated separately in the contract, payment may be made therefore without retention of a percentage.

(e) *Title, liability, and reservation of rights*. All material and work covered by progress payments made shall, at the time of payment, become the sole property of the Government, but this shall not be construed as--

(1) Relieving the Contractor from the sole responsibility for all material and work

upon which

FAR 52.246-20 WARRANTY OF SERVICES (MAY 2001)

(a) *Definition*. "Acceptance", as used in this clause, means the act of an authorized representative of the Government by which the Government assumes for itself, or as an agent of another, ownership of existing and identified supplies, or approves specific services, as partial or complete performance of the contract.

(b) Notwithstanding inspection and acceptance by the Government or any provision concerning the conclusiveness thereof, the Contractor warrants that all services performed under this contract will, at the time of acceptance, be free from defects in workmanship and conform to the requirements of this contract. The Contracting Officer shall give written notice of any defect or nonconformance to the Contractor within one year from the date of acceptance of this service. This notice shall state either --

(1) That the Contractor shall correct or reperform any defective or nonconforming services; or

(2) That the Government does not require correction or re-performance.

(c) If the Contractor is required to correct or reperform, it shall be at no cost to the Government, and any services corrected or re-performed by the Contractor shall be subject to this clause to the same extent as work initially performed. If the Contractor fails or refuses to correct or reperform, the Contracting Officer may, by contract or otherwise, correct or replace with similar services and charge to the Contractor the cost occasioned to the Government thereby, or make an equitable adjustment in the contract price.

(d) If the Government does not require correction or re-performance, the Contracting Officer shall make an equitable adjustment in the contract price.

(End of clause)

AOC52.246-3 WARRANTY OF COMMERCIAL ITEMS (JUN 2004)

The Contractor warrants and implies that the items delivered hereunder are merchantable and fit for use for the particular purpose described in this contract.

(End of clause)

AOC52.246-4 WARRANTY OF NON-COMMERCIAL ITEMS (JUN 2004)

(a) *Definitions*. "Acceptance", as used in this clause, means the act of an authorized representative of the Government by which the Government assumes for itself, or as an agent of another, ownership of existing supplies, or approves specific services as partial or complete performance of the contract.
"Correction", as used in this clause, means the elimination of a defect.
"Supplies", as used in this clause, means the end item furnished by the Contractor and related services required under the contract. The word does not include "data".

(b) *Contractor's Obligation.* (1) Notwithstanding inspection and acceptance by the Government of supplies furnished under this contract, or any condition of this contract concerning the conclusiveness thereof, the Contractor warrants that for one (1) year from the date of final delivery and acceptance all supplies furnished under this contract will be free from defects in material or workmanship and will conform with all requirements of this contract; and

(2) The preservation, packaging, packing, and marking, and the preparation for, and method of, shipment of such supplies will conform with the requirements of this contract.

(c) When return, correction, or replacement is required, transportation charges and responsibility for the supplies while in transit shall be borne by the Contractor. However, the Contractor's liability for the transportation charges shall not exceed an amount equal to the cost of transportation by the usual commercial method of shipment between the place of delivery specified in this contract and the Contractor's plant, and return.

(d) Any supplies or parts thereof, corrected or furnished in replacement under this clause, shall also be subject to the terms of this clause to the same extent as supplies initially delivered. The warranty, with respect to supplies or parts thereof, shall be equal in duration to that in paragraph (b)(1) of this clause and shall run from the date of delivery of the corrected or replaced supplies.

(e) All implied warranties of merchantability and "fitness for a particular purpose" are excluded from any obligation contained in this contract.

(f) The rights and remedies of the Government provided in this clause are in addition to and do not limit any rights afforded to the Government by any other clause of this contract.

(End of clause)

AOC52.232-7 DISCOUNTS (AUG 2004)

(a) Discounts for prompt payment will not be considered in the evaluation of offers. However, any offered discount will form a part of the award, and will be taken if payment is made within the discount period indicated in the offer by the offeror. As an alternative to

offering a prompt payment discount in conjunction with the offer, offerors awarded contracts may include prompt payment discounts on individual invoices.

(b) In connection with any discount offered for prompt payment, time shall be computed from the date of the invoice. If the Contractor has not placed a date on the invoice, the due date shall be calculated from the date the designated billing office receives a proper invoice, provided the agency annotates such invoice with the date of receipt at the time of receipt. For the purpose of computing the discount earned, payment shall be considered to have been made on the date that appears on the payment check or, for an electronic funds transfer, the specified payment date. When the discount date falls on a Saturday, Sunday, or legal holiday and, for work performed in the District of Columbia, Presidential Inauguration Day, when Federal Government offices are closed and Government business is not expected to be conducted, payment may be made on the following business day.

(End of clause)

AOC52.232-9 PAYMENT OF INTEREST ON CONTRACTOR CLAIMS (JUN 2004)

(a) If an appeal is filed by the Contractor from a final decision of the Contracting Officer under the Disputes paragraph of this contract, denying a claim arising under the contract, simple interest on the amount of the claim finally determined owed by the Government shall be payable to the Contractor. Such interest shall be at the rate determined by the Secretary of the Treasury pursuant to Public Law 92-41, 85 Stat. 97, from the date the Contractor furnishes to the Contracting Officer his written appeal under the Disputes paragraph of this contract, to the date of (1) a final judgement by a court of competent jurisdiction, or (2) mailing to the Contractor of a change order, or a supplemental agreement for execution either confirming completed negotiations between the parties or carrying out a decision of a contract appeals board.

(b) Notwithstanding Paragraph (a) above, (1) interest shall be applied only from the date payment was due, if such date is later than the filing of appeal, and (2) interest shall not be paid for any period of time that the Contracting Officer determines the Contractor has unduly delayed in pursuing his remedies before a board of contract appeals or a court of competent jurisdiction.

(End of clause)

AOC52.232-10 PAYMENTS - ARCHITECT-ENGINEER SERVICES - SUPPLEMENT (APR 2005)

(a) Invoices may be submitted at the end of each month in which services are performed by the Contractor and shall be submitted in accordance FAR 52.232-10 PAYMENTS UNDER FIXED-PRICE ARCHITECT-ENGINEERING CONTRACTS. Properly certified invoices shall be FAXED to: Accounting Division, Architect of the Capitol, at (202) 226-2580. Information

concerning the status of invoices and payments may be obtained by telephoning the Accounting Officer at (202) 226-2552. Payment will be made on a monthly basis. To assist the AOC in making timely payments, the Contractor is requested to furnish the following information on the invoice:

(1) Contract Number;

(2) Name and address of Contractor;

(3) Invoice Date;

(4) Period the payment covers; and

(5) Amount by line item including quantity and unit pricing (see the SCHEDULE OF ITEMS in Section B).

(b) Payments will be made directly through Direct Deposit/Electronic Funds Transfer (DD/EFT) in accordance with AOC52.232-6 Payment by Electronic Funds Transfer - Other than Central Contractor Registration.

(End of clause)

AOC52.232-12 ASSIGNMENT - SUPPLEMENT (MAR 2005)

Neither the contract nor any interest therein shall be assigned. However, moneys due or to become due under the contract may be assigned in accordance with the provisions of FAR clause 52.232-23 ASSIGNMENT OF CLAIMS.

(End of clause)

AOC52.233-1 DISPUTES (JUN 2004)

(a) Except as otherwise provided in this contract, any dispute concerning a question of fact arising under this contract which is not disposed of by agreement shall be decided by the Contracting Officer, who shall reduce his decision to writing and mail or otherwise furnish a copy thereof to the Contractor. The decision of the Contracting Officer shall be final and conclusive unless, within 30 days from the date of receipt of such copy, the Contractor mails or otherwise furnishes to the Contracting Officer a written appeal addressed to the head of the agency involved. The decision of the head of the agency or his duly authorized representative for the determination of such appeals shall be final and conclusive. This provision shall not be pleaded in any suit involving a question of fact arising under this contract as limiting judicial review of any such decision to cases where fraud by such official or his representative or board is alleged; **provided, however**, that any such decision shall be final and conclusive unless the same is fraudulent or capricious or arbitrary or so grossly erroneous as necessarily to imply bad

faith or is not supported by substantial evidence. In connection with any appeal proceeding under this paragraph, the Contractor shall be afforded an opportunity to be heard and to offer evidence in support of his appeal. Pending final decision of a dispute hereunder, the Contractor shall proceed diligently with the performance of the contract and in accordance with the Contracting Officer's decision.

(b) This paragraph does not preclude consideration of questions of law in connection with decisions provided for in Paragraph (a) above. Nothing in this contract, however, shall be construed as making final the decision of any administrative official, representative, or board on a question of law.

(End of clause)

AOC52.233-2 CLAIMS FOR EQUITABLE ADJUSTMENTS - WAIVER AND RELEASE OF CLAIMS (JUN 2004)

(a) Whenever the Contractor submits a claim for equitable adjustment under any paragraph of this contract which provides for equitable adjustment of the contract, such claim shall include all types of adjustments in the total amounts to which the paragraph entitles the Contractor, including but not limited to adjustments arising out of delays or disruptions or both caused by such change. Except as the parties may otherwise expressly agree, the Contractor shall be deemed to have waived (1) any adjustments to which it otherwise might be entitled under the paragraph where such claims fail to request such adjustments, and (2) any increase in the amount of equitable adjustments additional to those requested in its claim.

(b) Further, the Contractor agrees that, if required by the Contracting Officer, he will execute a release, in form and substance satisfactory to the Contracting Officer, as part of the supplemental agreement setting forth the aforesaid equitable adjustment, and that such release shall discharge the Government, its officers, agents and employees, from any further claims, including but not limited to further claims arising out of delays or disruptions or both, caused by the aforesaid change.

(End of clause)

AOC52.233-4 LIMITATIONS ON DAMAGES FOR DELAY (NOV 2004)

a) The Architect shall not be obligated or liable to the Contractor for, and the Contractor hereby expressly waives any claims against the Architect on account of any damages, of any nature whatsoever, which the Contractor, or its subcontractor at any tier may incur as a result of delays, interferences, disruptions, suspensions, changes in sequence or the like arising from or out of any act or omission of the Architect, it being understood and agreed that the Contractor's sole and exclusive remedies in such event shall be a reimbursement of direct costs necessarily incurred as a result of the foregoing causes, and an extension of the contract time, but only in accordance with the provisions of the Contract Documents.

(b) For the purposes of this clause, the term "Damages" shall include all indirect and/or impact costs which shall include, without limitation: unabsorbed Home Office Overhead (including calculations under the "Eichleay Formula"), Idle Labor and Equipment, Loss of Productivity, and Interest; the term "Damages" shall not include on-site direct costs, which shall include direct labor (superintendence, labor, time-keeping, and clerical work) direct materials and supplies (including material handling), direct equipment, restoration and cleanup, overhead and profit (but only as permitted under the clauses “Changes” and “Changes - Supplement”, taxes, insurance, and bonding costs, which will be calculated in accordance with the clauses “Changes” and “Changes - Supplement”. Provided, however, that the accounting practice of treating these costs as "direct" shall be in accordance with

(1) The Contractor's established and consistently followed cost accounting practices for all work; and

(2) FAR Cost Accounting Cost Principles and Procedures (FAR Part 31).

(c) To the extent that any other provision of this contract provides for the payment of damages, as defined in this clause, to the Contractor and is thus inconsistent with the provisions of this clause, such other provision will be superseded hereby with respect to the issue of damages.

(End of clause)

AOC52.236-14 NATIONAL AND LOCAL CODES (NOV 2004)

The design approach shall comply with national and local codes.

AOC52.225-1 BUY AMERICAN ACT - SUPPLEMENT (JUN 2004)

In addition to provisions of the above clause entitled, “Buy American Act”, the General Provisions of the Legislative Branch Appropriations Act provides in part, as follows:

(a) It is the sense of the Congress that, to the greatest extent practicable, all equipment and products purchased with funds made available in the Act should be American-made.

(b) In providing financial assistance to or entering into any contract with, any entity using funds made available in the Act, the head of each Federal Agency, to the greatest extent practicable, shall provide to such entity a notice describing the statement made in Paragraph (a) above, by the Congress.

(End of clause)

FAR 52.223-3 HAZARDOUS MATERIAL IDENTIFICATION AND MATERIAL SAFETY DATA (JAN 1997) ALTERNATE I (JULY 1995)

(a) "Hazardous material" as used in this clause, includes any material defined as hazardous under the latest version of Federal Standard No. 313 (including revisions adopted during the term of the contract).

(b) The offeror must list any hazardous material, as defined in Paragraph (a) of this clause, to be delivered under this contract. The hazardous material shall be properly identified and include any applicable identification number, such as National Stock Number or Special Item Number. This information shall also be included on the Material Safety Data Sheet submitted under this contract.

Material (If none, insert "None")	Identification No.
_____	_____
_____	_____
_____	_____

(c) This list must be updated during performance of the contract whenever the Contractor determines that any other material to be delivered under this contract is hazardous.

(d) The apparently successful offeror agrees to submit, for each item as required prior to award a "Material Safety Data Sheet", meeting the requirement of 29 CFR 1910.1200(g) and the latest version of Federal Standard No. 313, for all hazardous material identified in Paragraph (b) of this clause. Data shall be submitted in accordance with Federal Standard No. 313, whether or not the apparently successful offeror is the actual manufacturer of these items. Failure to submit the Material Safety Data Sheet prior to award may result in the apparently successful offeror being considered non-responsible and ineligible for award.

(e) If, after award, there is a change in the composition of the items(s) or a revision to Federal Standard No. 313, which renders incomplete or inaccurate the data submitted under Paragraph (d) of this clause, the Contractor shall promptly notify the Contracting Officer and resubmit the data.

(f) Neither the requirements of this clause nor any act or failure to act by the Government shall relieve the Contractor of any responsibility or liability for the safety of Government, Contractor, or subcontractor personnel or property.

(g) Nothing contained in this clause shall relieve the Contractor from complying with applicable Federal, State and local laws, codes, ordinances, and regulations (including the

obtaining of licenses and permits) in connection with hazardous material.

(h) The Government's rights in data furnished under this contract with respect to hazardous material are as follows:

(1) To use, duplicate and disclose any data to which this clause is applicable. The purposes of this right are to–

(I) Apprise personnel of the hazards to which they may be exposed in using, handling, packaging, transporting, or disposing of hazardous materials;

(ii) Obtain medical treatment for those affected by the material; and

(iii) Have others use, duplicate and disclose the data for the Government for these purposes.

(2) To use, duplicate and disclose data furnished under this clause, in accordance with subparagraph (h)(1) of this clause, in precedence over any other clause of this contract providing for rights in data.

(3) The Government is not precluded from using similar or identical data acquired from other sources.

(i) Except as provided in paragraph (I)(2), the Contractor shall prepare and submit a sufficient number of Material Safety Data Sheets (MSDS's), meeting the requirements of 29 CFR 1910.1200(g) and the latest version of Federal Standard No. 313, for all hazardous materials identified in paragraph (b) of this clause.

(1) For items shipped to consignees, the Contractor shall include a copy of the MSDS's with the packing list or other suitable shipping document which accompanies each shipment. Alternatively, the Contractor is permitted to transmit MSDS's to consignees in advance of receipt of shipments by consignees, if authorized in writing by the Contracting Officer.

(2) For items shipped to consignees identified by mailing address as agency depots, distribution centers or customer supply centers, the Contractor shall provide one copy of the MSDS' in or on each shipping container. If affixed to the outside of each container, the MSDS's must be placed in a weather resistant envelope.

(End of clause)

AOC52.223-1 HAZARDOUS MATERIAL IDENTIFICATION AND MATERIAL SAFETY DATA - SUPPLEMENT (JUN 2005)

(a) Except as provided in paragraph ©), the Contractor shall prepare and submit a sufficient number of Material Safety Data Sheets (MSDS's), meeting the requirements of 29 CFR 1910.1200(g) and the latest version of Federal Standard No. 313, for all hazardous materials identified in FAR 52.223-3(b).

(b) For items shipped to consignees, the Contractor shall include a copy of the MSDS's with the packing list or other suitable shipping document which accompanies each shipment. Alternatively, the Contractor is permitted to transmit MSDS's to consignees in advance of receipt of shipments by consignees, if authorized in writing by the Contracting Officer.

(c) For items shipped to consignees identified by mailing address as agency depots, distribution centers or customer supply centers, the Contractor shall provide one copy of the MSDS' in or on each shipping container. If affixed to the outside of each container, the MSDS's must be placed in a weather resistant envelope.

(d) For items provided to a construction site, the Contractor shall provide two copies of each MSDS. One copy shall be provided to the COTR in accordance with the Division 1 submittal requirements, and a second copy shall be kept in an MSDS binder on the job site.

(End of clause)

AOC52.245-2 GOVERNMENT-FURNISHED PROPERTY (NOV 2004)

(a) For the purposes of this clause, Government-furnished "property" includes cell phones and telephones, personal digital assistants, computers (including laptops), electronic devices, services such as network access, tools, furnished space, storage, utilities, furnishings, equipment, and any other item or service provided by the AOC to the contractor.

(b) No AOC equipment or property can be provided under this contract unless specifically negotiated as part of the award price. If, after contract award, it becomes necessary or advisable to issue AOC property to the contractor, the contract price shall be reduced by a reasonable amount that reflects the price the contractor would pay if providing the property.

(c) The Contracting Officer's Technical Representative (COTR) for this contract is responsible for coordinating the issuance and return of Government-furnished property.

(d) Any Government-furnished property provided to the contractor for use during performance of this contract shall be issued to the contractor's representative and recorded on AOC Form 1423, AOC PROPERTY ISSUED TO CONTRACTORS. The contractor's representative shall be responsible for the ensuring the proper care and use of the Government-furnished property, whether used by the contractor representative or another contractor employee. Government-furnished property provided by the AOC can be used only for the conduct of official business on behalf of the AOC. The contractor is specifically prohibited from

using AOC-furnished property for personal use or to conduct operations that benefit other Government agency contracts or other contractor activities that do not directly support AOC contracts.

(e) All information technology property that requires interface or connection to the AOC network must be provided by the AOC. The use of non-AOC IT property that requires interface or connection to the AOC network is strictly prohibited.

(f) All contractor employees who require access to the AOC network or who are issued a personal digital assistant must complete and sign the "Non-disclosure Agreement for Contract Employees Conditional Access to Sensitive but Unclassified Information for The Architect of The Capitol" before access will be granted. The COTR is responsible for providing the non-disclosure agreements to the AOC Office of Information Resources Management.

(g) All Government-furnished property shall be returned by the contractor to the COTR in the same condition as issued, with allowances for wear and tear that occurs with reasonable care and use. Failure to return Government-furnished property or the return of Government-furnished property that has not been properly maintained and used may result in a reduction to the contract price that reflects the market replacement value of the property or the market price to repair or restore the property to its condition when issued to the contractor.

(End of clause)

FAR 52.252-2 CLAUSES INCORPORATED BY REFERENCE (FEB 1998)

This contract incorporates one or more clauses by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available. Also, the full text of a clause may be accessed electronically at this/these addresses: www.gsa.gov or www.govcon.com

CLAUSE TITLE	DATE	FAR NUMBER
GRATUITIES	APR 1984	52.203-3
COVENANT AGAINST CONTINGENT FEES	APR 1984	52.203-5
RESTRICTIONS ON SUBCONTRACTOR SALES TO THE GOVERNMENT	JUL 1995	52.203-6
AUDITS AND RECORDS - NEGOTIATED	JUN 1999	52.215-2
OPTION TO EXTEND SERVICES	NOV 1999	52.217-8
EQUAL OPPORTUNITY	APR 2002	52.222-26
EQUAL OPPORTUNITY FOR SPECIAL DISABLED VETERANS, VETERANS OF THE VIETNAM ERA AND OTHER ELIGIBLE VETERANS	DEC 2001	52.222-35
AFFIRMATIVE ACTION FOR WORKERS WITH		

DISABILITIES	JUN 1998	52.222-36
EMPLOYMENT REPORTS ON SPECIAL DISABLED VETERANS, VETERANS OF THE VIETNAM ERA, AND OTHER ELIGIBLE VETERANS	DEC 2001	52.222-37
DRUG-FREE WORKPLACE	MAY 2001	52.223-6
FEDERAL, STATE AND LOCAL TAXES	APR 2003	52.229-3
EXTRAS	APR 1984	52.232-11
ASSIGNMENT OF CLAIMS	JAN 1986	52.232-23
DESIGN WITHIN FUNDING LIMITATIONS	APR 1984	52.236-22
RESPONSIBILITY OF THE ARCHITECT-ENGINEER CONTRACTOR	APR 1984	52.236-23
WORK OVERSIGHT IN ARCHITECT-ENGINEER CONTRACTS	APR 1984	52.236-24
REQUIREMENTS FOR REGISTRATION OF DESIGNERS	APR 1984	52.236-25
PROTECTION OF GOVERNMENT BUILDINGS, EQUIPMENT, AND VEGETATION	APR 1984	52.237-2
BANKRUPTCY	JULY 1995	52.242-13
CHANGES--FIXED-PRICE	AUG 1987	52.243-1
ALTERNATE III	APR 1984	
SUBCONTRACTORS AND OUTSIDE ASSOCIATES AND CONSULTANTS - ARCHITECT-ENGINEER SERVICES	AUG 1998	52.244-4
TERMINATION (FIXED-PRICE ARCHITECT-ENGINEER)	APR 1984	52.249-7
DEFAULT (FIXED-PRICE SUPPLY AND SERVICE)	APR 1984	52.249-8
COMPUTER GENERATED FORMS	JAN 1991	52.253-1
WALSH-HEALEY PUBLIC CONTRACTS ACT	DEC 1996	52.222-20
BANKRUPTCY	JULY 1995	52.242-13
PERMITS, AUTHORITIES, OR FRANCHISES	JAN 1997	52.247-2
DAVIS-BACON ACT	JUL 2005	52.222-6
AUDITS AND RECORDS - NEGOTIATED	JUN 1999	52.215-2
EQUAL OPPORTUNITY	APR 2002	52.222-26
BUY AMERICAN ACT - SUPPLIES	JUN 2003	52.225-1
PATENT INDEMNITY	APR 1984	52.227-3
WITHHOLDING OF FUNDS	FEB 1988	52.222-7
PAYROLLS AND BASIC RECORDS	FEB 1988	52.222-8
APPRENTICES AND TRAINEES	FEB 1988	52.222-9
COMPLIANCE WITH COPELAND ACT REQUIREMENTS	FEB 1988	52.222-10
DIFFERING SITE CONDITIONS	APR 1984	52.236-2
SITE INVESTIGATION AND CONDITIONS AFFECTING THE WORK	APR 1984	52.236-3
SUPERINTENDENCE BY THE CONTRACTOR	APR 1984	52.236-6
PERMITS AND RESPONSIBILITIES	NOV 1991	52.236-7
OTHER CONTRACTS	APR 1984	52.236-8
USE AND POSSESSION PRIOR TO COMPLETION	APR 1984	52.236-11

ACCIDENT PREVENTION	NOV 1991	52.236-13
PRE-CONSTRUCTION CONFERENCE	FEB 1995	52.236-26
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(End of clause)

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PAST PERFORMANCE QUESTIONNAIRE

BID BOND

DAVIS BACON WAGE DETERMINATION DC20030003, MODIFICATION NO. 28 DATED 8/19/2005

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SECTION K
REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS OF OFFERORS

FAR 52.203-2 CERTIFICATE OF INDEPENDENT PRICE DETERMINATION (APR 1985)

(a) The offeror certifies that -

(1) The prices in this offer have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other offeror or competitor relating to –

(I) Those prices;

(ii) The intention to submit an offer; or

(iii) The methods or factors used to calculate the prices offered;

(2) The prices in this offer have not been and will not be knowingly disclosed by the offeror, directly or indirectly, to any other offeror or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a negotiated solicitation) unless otherwise required by law; and

(3) No attempt has been made or will be made by the offeror to induce any other concern to submit or not to submit an offer for the purpose of restricting competition.

(b) Each signature on the offer is considered to be a certification by the signatory that the signatory -

(1) Is the person in the offeror's organization responsible for determining the prices being offered in this bid or proposal, and that the signatory has not participated and will not participate in any action contrary to paragraphs (a)(1) through (a)(3) of this provision; or

(2)(I) Has been authorized, in writing, to act as agent for the following principals in certifying that those principals have not participated, and will not participate in any action contrary to paragraphs (a)(1) through (a)(3) of this provision

_____

[*insert full name of person(s) in the offeror's organization responsible for determining the prices offered in this bid or proposal, and the title of his or per position in the offeror's organization*];

(ii) As an authorized agent, does certify that the principals named in

subdivision (b)(2)(I) of this provision have not participated, and will not participate, in any action contrary to paragraphs (a)(1) through (a)(3) of this provision; and

(iii) As an agent, has not personally participated, and will not participate, in any action contrary to paragraphs (a)(1) through (a)(3) of this provision.

(c) If the offeror deletes or modifies paragraph (a)(2) of this provision, the offeror must furnish with its offer a signed statement setting forth in detail the circumstances of the disclosure.

(End of provision)

FAR 52.204-3 TAXPAYER IDENTIFICATION (OCT 1998)

(a) *Definitions*.
"Common parent," as used in this provision, means that corporate entity that owns or controls an affiliated group of corporations that files its Federal income tax returns on a consolidated basis, and of which the offeror is a member.
"Taxpayer Identification Number (TIN)," as used in this provision, means the number required by the Internal Revenue Service (IRS) to be used by the offeror in reporting income tax and other returns. The TIN may be either a Social Security Number or an Employer Identification Number.

(b) All offerors must submit the information required in paragraphs (d) through (f) of this provision to comply with debt collection requirements of 31 U.S.C. 7701©) and 3325(d), reporting requirements of 26 U.S.C. 6041, 6041A, and 6050M, and implementing regulations issued by the IRS. If the resulting contract is subject to the payment reporting requirements described in Federal Acquisition Regulation (FAR) 4.904, the failure or refusal by the offeror to furnish the information may result in a 31 percent reduction of payments otherwise due under the contract.

(c) The TIN may be used by the Government to collect and report on any delinquent amounts arising out of the offeror's relationship with the Government (31 U.S.C. 7701©)(3)). If the resulting contract is subject to the payment reporting requirements described in FAR 4.904, the TIN provided hereunder may be matched with IRS records to verify the accuracy of the offeror's TIN.

(d) *Taxpayer Identification Number (TIN)*.

_____ TIN: _____.

_____ TIN has been applied for.

_____ TIN is not required because:

_____ Offeror is a nonresident alien, foreign corporation, or foreign partnership that does not have income effectively connected with the conduct of a trade or business in the United States and does not have an office or place of business or a fiscal paying agent in the United States;

_____ Offeror is an agency or instrumentality of a foreign government;

_____ Offeror is an agency or instrumentality of a Federal government;

(e) *Type of organization*.

_____ Sole proprietorship;

_____ Partnership;

_____ Corporate entity (not tax-exempt);

_____ Corporate entity (tax-exempt);

_____ Government entity (Federal, State, or local);

_____ Foreign government

_____ International organization per 26 CFR 1.6049-4;

_____ Other _____

(f) *Common Parent*.

_____ Offeror is not owned or controlled by a common parent as defined in paragraph (a) of this provision.

_____ Name and TIN of common parent:

Name _____

TIN _____

(End of provision)

AOC52.204-2 DATA UNIVERSAL NUMBERING SYSTEM (DUNS) NUMBER

(JUN 2004)

(a) The offeror shall enter, in the space provided below, the DUNS number that identifies the offeror's name and address exactly as stated in the offer. The DUNS number is a nine-digit number assigned by Dun and Bradstreet Information Services.

(b) If the offeror does not have a DUNS number, it should contract Dun and Bradstreet directly to obtain one. A DUNS number will be provided immediately by telephone at no charge to the offeror. For information on obtaining a DUNS number, the offeror, if located within the United States, should call Dun and Bradstreet at 1-800-333-0505. The offeror should be prepared to provide the following information:

(1) Company name,

(2) Company address;

(3) Company telephone number;

(4) Line of business;

(5) Chief executive officer/key manager;

(6) Date the company was started;

(7) Number of people employed by the company; and

(8) Company affiliation.

(c) Offerors located outside the United States may obtain the location and phone number of the local Dun and Bradstreet Information Services office from the Internet home page at http://www.customerservice@dnb.com. If an offeror is unable to locate a local service center, it may send an e-mail to Dun and Bradstreet at globalinfo@mail.dnb.com.

(d) Enter DUNS number:_____.

(End of provision)

AOC52.204-3 REPRESENTATIONS AND CERTIFICATIONS (NOV 2004)

The offeror shall properly execute and submit with its offer the Representations and Certifications contained herein. Insert information in spaces provided as applicable.

(End of provision)

FAR 52.209-5 CERTIFICATION REGARDING DEBARMENT, SUSPENSION, PROPOSED DEBARMENT, AND OTHER RESPONSIBILITY MATTERS (DEC 2001)

(a)(1) The Offeror certifies, to the best of its knowledge and belief, that–

(I) The offeror and/or any of its Principals –

(A) Are ( ) are not ( ) presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any Federal agency;

(B) Have ( ) 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 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

©) Are ( ) are not ( ) presently indicted for, or otherwise criminally or civilly charged by a governmental entity with, commission of any of the offenses enumerated in paragraph (a)(1)(i)(B) of this provision.

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

(2) "Principals," for the purposes of this certification, means officers; directors; owners; partners; and, persons having primary management or supervisory responsibilities within a business entity (e.g., general manager; plan manager; head of a subsidiary, division, or business segment, and similar positions).

This Certification Concerns a Matter Within the Jurisdiction of an Agency of the United States and the Making of a False, Fictitious, or Fraudulent Certification May Render the Maker Subject to Prosecution Under Section 1001, Title 18, United States Code.

(c) The Offeror shall provide immediate written notice to the Contracting Officer if, at any time prior to contract award, the Offeror learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

(d) A certification that any of the items in paragraph (a) of this provision exists will not necessarily result in withholding of an award under this solicitation. However, the certification will be considered in connection with a determination of the Offeror's responsibility. Failure of the Offeror to furnish a certification or provide such additional information as requested by the Contracting Officer may render the Offeror non-responsible.

(e) Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by paragraph (a) of this provision. The knowledge and information of an Offeror is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

(f) The certification in paragraph (a) of this provision is a material representation of fact upon which reliance was placed when making award. If it is later determined that the Offeror knowingly rendered an erroneous certification, in addition to other remedies available to the Government, the Contracting Officer may terminate the contract resulting from this solicitation for default.

(End of provision)

AOC52.209-1 ORGANIZATIONAL AND PERSONAL CONFLICTS OF INTEREST (NOV 2004)

(a) The offeror and resultant contractor certifies that, to the best of the it's knowledge and belief, there are no relevant facts or circumstances which could give rise to an organizational conflict of interest, as defined in FAR Subpart 9.5.

(b) Prior to commencement of any work, the contractor agrees to notify the Contracting Officer immediately that, to the best of its knowledge and belief, no actual or potential conflict of interest exists or to identify to the Contracting Officer any actual or potential conflict of interest the contractor may have.

(c) The offeror and resultant contractor agree to notify immediately the AOC Contracting Officer of (1) any actual or potential personal conflict of interest with regard to any of its employees working on or having access to information regarding this contract, or (2) any such conflicts concerning subcontractor employees or consultants working on or having access to information regarding this contract, when such conflicts have been reported to the Contractor. A personal conflict of interest is defined as a relationship of an employee, subcontractor employee, or consultant with an entity that may impair the objectivity of the employee, subcontractor employee, or consultant in performing the contract work.

(d) If the contractor, under the terms of this contract or through the performance of work pursuant to this contract, is required to develop specifications or statements of work and such specifications or statements of work are incorporated subsequently into an AOC solicitation, the contractor shall be ineligible to perform the work described in that solicitation as a prime contractor or subcontractor under an ensuing AOC contract.

(End of provision)

AOC52.215-8 AUTHORIZED NEGOTIATORS (JUN 2004)

The offeror represents that following persons are authorized to negotiate on its behalf with the Government in connection with this Request for Proposal:

_____ _____

Name Title

Telephone: _____ E-Mail:_____

_____ _____

Name **Title**

Telephone: _____ **E-Mail:_____**

_____ _____

Name **Title**

Telephone: _____ **E-Mail:_____**

(End of provision)

END OF SECTION K

SECTION L
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SECTION L
INSTRUCTIONS, CONDITIONS, AND NOTICES TO OFFERORS

AOC52.215-1 INSTRUCTIONS TO OFFERORS (FEB 2005)

(a) *Definitions.* As used in this provision --
"Proposal modification" is a change made to a proposal before the solicitation's closing date and time, or made in response to an amendment, or made to correct a mistake at any time before award.
"Proposal revision" is a change to a proposal made after the solicitation closing date, at the request of or as allowed by a Contracting Officer as the result of negotiations.
"Time," if stated as a number of days, is calculated using calendar days, unless otherwise specified, and will include Saturdays, Sundays, and legal holidays, including Presidential Inauguration Day. However, if the last day falls on a Saturday, Sunday, or legal holiday, including Presidential Inauguration Day, then the period shall include the next working day.

(b) Offerors are expected to examine the entire solicitation and all instructions. Failure to do so will be at the offeror's risk. Each offeror shall furnish the information required by the solicitation. The offeror will be held responsible for full knowledge of all information contained therein.

(c) *Packaging, transmission, and tracking of proposals.* (1) Proposals, modifications, and revisions shall be enclosed, in the quantities specified elsewhere in this solicitation, in sealed envelopes. Address envelopes to: Architect of the Capitol, Procurement Division, Ford House Office Building, Attn: Chris Lindsay, Contract Specialist, Room H2-263 Bid Room, Second and "D" Streets, S.W., Washington, DC 20515. Offeror shall place the OF-17, Offer Label, on the exterior of the package on the same side as the address, or write "Bid Documents Enclosed", "H2-263 Bid Room", and write the solicitation number, time and date for receipt of offers on the exterior of the package on the same side as the address. Telegraphic or facsimile proposals and modifications will not be considered.

(2) Current security requirements established by the U.S. Capitol Police to screen mail being delivered to the U.S. Capitol Complex of buildings preclude the use of U. S. Postal Service by offerors to deliver their proposals submitted in response to this solicitation. In addition, because all packages must be screened for security purposes at a central location prior to their delivery, the Architect of the Capitol cannot accept packages containing offers hand carried directly to the Bid Room address within the Ford House Office Building, or any other location in the U.S. Capitol Complex of buildings. **See "Notice for Delivery" on the front of the solicitation**.

(3) To assist in tracking of proposals, offerors are requested to fax a copy of their signed "Solicitation, Offer and Award" form as well as a copy of the FEDEX or UPS receipt to Chris Lindsay to (202) 225-3221 at the time of the issuance of their proposal.

(4) The only acceptable method by which offerors can deliver their responses to this solicitation shall be via Federal Express (FEDEX) or United Parcel Service (UPS). Offers submitted via any other method will be rejected. **OFFERORS - DO NOT MAIL YOUR OFFER BY REGULAR U.S. MAIL.** See notice attached to this solicitation for special instructions.

(d) *Submission, modification, revision, and withdrawal of proposals*. (1) Offerors are responsible for submitting proposals and any modifications or revisions so as to reach the Government office designated in the solicitation by the time specified in the solicitation. If no time is specified in the solicitation, the time for receipt is 4:30 p.m. local time, for the designated Government office on the date that the proposal or revision is due. For the purposes of determining timeliness, the designated Government office is defined as the Pitney Bowes Management Services Capitol Heights Mail Facility at 9140 East Hampton Drive, Capitol Heights, Maryland 20743.

(2) Any proposal, modification, or revision received at the Government office designated in the solicitation after the exact time specified for receipt of offers is "late" and will not be considered unless it is received before award is made, the Contracting Officer determines that accepting the late offer would no unduly delay the acquisition, and-

(i) If it was transmitted through an electronic commerce method authorized by the solicitation, it was received at the initial point of entry to the Government infrastructure not later than 5:00 p.m. one working day prior to the date specified for receipt of proposals;

(ii) There is acceptable evidence to establish that it was received at the Government installation designated for receipt of proposals and was under the Government's control prior to the time set for receipt of proposals; or

(iii) It is the only proposal received.

(3) However, a late modification of an otherwise successful proposal that makes its terms more favorable to the Government, will be considered at any time it is received and may be accepted.

(4) Acceptable evidence to establish the date of receipt at the Government installation includes the time/date stamp of that installation on the offer wrapper, other documentary evidence of receipt maintained by the installation, or oral testimony or statements of Government personnel.

(5) If an emergency or unanticipated event interrupts normal Government processes so that offers cannot be received at the Government office designated for receipt of proposals by the exact time specified in the solicitation and urgent Government requirements preclude amendment of the solicitation, the time specified for receipt of proposals will be deemed to be extended to the same time of day specified in the solicitation on the first work day on which

normal Government processes resume.

(6) Proposals may be withdrawn by written notice received at any time before award. Proposals may be withdrawn in person by an offeror or an authorized representative if the identity of the person requesting withdrawal is established and the person signs a receipt for the proposal before award.

(End of provision)

AOC52.215-2 INTERPRETATIONS AND AMENDMENTS (JUN 2004)

(a) Any prospective offeror desiring an explanation or interpretation of the solicitation, drawings, specifications, etc., must request it in writing no later than fourteen calendar days prior to the date established for receipt of offers. Oral explanations or instructions given before the award of a contract will not be binding.

(b) Prospective offerors shall request the Contracting Officer, in writing, via FAX or e-mail for an interpretation or correction of any ambiguity, inconsistency, or error in the contract documents which they may discover or which should have been discovered by a reasonably prudent offeror. Such requests or objections to materials or methods of construction shown or specified shall be directed to the attention of the Contracting Officer at least fifteen (15) calendar days prior to the date specified for receipt of proposals. Written requests shall be transmitted via e-mail to clindsay@aoc.gov or via facsimile to (202) 225-3221.

(c) Any interpretations or corrections, as well as any additional modifications the Contracting Officer may desire to include, will be in the form of amendments, in writing, which will be sent on the same date to all offerors if that information is necessary in submitting offers or if the lack of it would be prejudicial to other prospective offerors and shall become a part of any subsequent contract. The Contracting Officer reserves the right to answer only such questions as have, in his opinion, a definite bearing upon the proposals to be submitted.

(1) Offerors shall acknowledge the receipt of all amendments to the solicitation by:

(i) Signing and returning the amendment;

(ii) Identifying the amendment number and date in the space provided for this purpose on the form for submitting a offer;

(iii) Letter or telegram; or

(iv) Facsimile, if facsimile offers are authorized in the solicitation.

(2) The Government must receive the acknowledgment by the time and at the place specified for receipt of offers.

(d) Requests for oral interpretations or any other interpretations not made by amendments will not be accepted, and any information that may possibly be gained by offerors in that manner is gratuitous and not binding.

(e) If this solicitation is amended, all terms and conditions that are not amended remain unchanged.

(End of provision)

AOC52.215-3 RESTRICTION ON DISCLOSURE AND USE OF DATA (JUN 2004)

Offerors that include in their proposals data that they do not want disclosed to the public for any purpose, or used by the Government except for evaluation purposes, shall–

(a) Mark the title page with the following legend:
"This proposal includes data that shall not be disclosed outside the Government and shall not be duplicated, used, or disclosed--in whole or in part--for any purpose other than to evaluate this proposal. If, however, a contract is awarded to this offeror as a result of--or in connection with--the submission of this data, the Government shall have the right to duplicate, use, or disclose the data to the extent provided in the resulting contract. This restriction does not limit the Government's right to use information contained in this data if it is obtained from another source without restriction. The data subject to this restriction are contained in sheets (insert numbers or other identification of sheets)"; and

(b) Mark each sheet of data it wishes to restrict with the following legend:
"Use or disclosure of data contained on this sheet is subject to the restriction on the title page of this proposal."

(End of provision)

AOC52.215-6 PREPARATION OF PROPOSALS (JUN 2004)

(a) Offerors are expected to examine the drawings, if any, specifications, Schedule, and all instructions. Failure to do so will be at the Offerors risk.

(b) Each offeror shall furnish the information required by the solicitation. The offerors shall sign the offer on Page 1 (SOLICITATION, OFFER AND AWARD) in block 15 and return this solicitation package in its entirety. Erasures or other changes must be initialed by the person signing the offer. Offers signed by an agent shall be accompanied by evidence of that agent's authority, unless that evidence has been previously furnished to the issuing office.

(c) For each item offered, offers shall–

(1) Show the unit price, if required, including, unless otherwise specified, packaging, packing, and preservation; and

(2) Enter the extended price for the quantity of each item offer in the "Amount" column of the Schedule.

(d) In case of discrepancy between a unit price and an extended price, the unit price will be presumed to be correct, subject, however, to correction to the same extent and in the same manner as any other mistake.

(e) Offers for supplies or services other than those specified will not be considered unless authorized by the solicitation.

(End of provision)

AOC52.215-9 FAILURE TO SUBMIT OFFER (JUN 2004)

Recipients of this solicitation not responding with a proposal should not return this solicitation, unless it specifies otherwise. Instead, they should advise the issuing office by letter, postcard, or established electronic commerce methods, whether they want to receive future solicitations for similar requirements. If a recipient does not submit a proposal and does not notify the issuing office that future solicitations are desired, the recipient's name will be removed from the applicable mailing list.

(End of provision)

PROPOSAL COMPOSITION (AOC) (NOV 1999)

(a) Proposals shall be submitted in three major subdivisions: Technical Proposal whose content and arrangement shall be as described in the articled, "INSTRUCTIONS FOR PREPARING THE TECHNICAL PROPOSAL" of this section, Past Performance Information, whose content and arrangement shall be as described in the articled, "INSTRUCTIONS FOR PREPARING PAST PERFORMANCE INFORMATION" of this section and a Price Proposal, which shall be prepared in detail on a basis as described and set forth in the article entitled, "INSTRUCTIONS FOR PREPARING THE PRICE PROPOSAL" of this section.

(b) The Technical Proposal, Past Performance Information and the Price Proposal portions of each proposal tendered by any offeror shall each be enclosed in a separate sealed package, identified on its outer surface as to content in the manner prescribed in the article entitled "SUBMISSION OF OFFERS" of this section and submitted in the following number of copies:

1. Technical Proposal - One (1) original and four (4) copies.
2. Past Performance Information - One (1) original and four (4) copies.

3. Price Proposal - One (1) original and one (1) copy.

Each offeror may submit one or more proposals; however, each proposal shall be configured as described above, shall be considered on its own merits as to the completeness of submission and shall not share required documentation, bonding, or other requirements of submission with any other proposal submitted by the same offeror.

(End of Provision)

INSTRUCTIONS FOR PREPARING THE TECHNICAL PROPOSAL (AOC) (NOV 2002)

(a) The Technical Proposal shall be organized in accordance with the following format to facilitate evaluation by the Government. The Technical Proposal shall be subdivided into five (5) subsections:

Factor 1 - Past Performance
Factor 2 - Corporate Experience
Factor 3 - Proposed Control System Features and Capabilities
Factor 4 - Implementation Plan
Factor 5 - Project Team/Key Personnel

(1) **Factor 1 - Past Performance:** The Government will use references provided in response to Factor 2-Corporate Experience, and may use other references/information to verify past performance. Please see Section entitled "INSTRUCTIONS FOR PREPARING PAST PERFORMANCE INFORMATION" for instructions.

(2) **Factor 2 - Corporate Experience**

Address all relevant contracts held within the last five (5) years. Contracts may be either commercial or Government and should have been for the management of multi-project/multi-discipline construction efforts. Include the following:

1. Project, location
2. Contracting Agency/Owner
3. Point of contact at agency/owner and phone number
4. Date of award and completion date(s); changes to the original contract schedule (with Explanation)
5. Total Project budget including Contract award amount/final amount
6. Key personnel/subcontractors involved
7. Brief description of project incorporating multiple technology integration of similar scope (the term "similar scope" is defined here to include the design, development, installation and integration of a computer controlled management system

integrating multiple conveyor subsystems.)

8. Provide a summary product safety history for all primary equipment subcontractors.
9. Provide applicable brochures, publication reprints, testimonials, and similar documentation that may be helpful in distinguishing or evaluating particular strengths or special capabilities

(3) **Factor 3 - Proposed Control System Features and Capabilities:** Please provide the following information regarding proposed Control System features and capabilities (identify if any system components are proprietary). Equipment and systems that are in final engineering, research and development, beta test stages; or that have not been in a daily production operation for a minimum of six (6) months as of the time of the solicitation date shall be considered as experimental and therefore shall not be acceptable:

1. Computer Software features and capabilities, including target computer operating system(s).
2. Hardware-computers and Peripherals.
3. Controls System features and capabilities.
4. Safety and fire prevention compliance.
5. Offeror's proposed schedule.
6. Offeror's previous experience as a system contractor/integrator in multiple technology installations.
7. Percentage of total project supplied directly by Offeror vs. percentage subcontracted by Offeror.
8. Proposed variations, if any, from the conceptual architecture and/or technical specification.

(4) **Factor 4 - Implementation Plan:** The Offeror shall submit a detailed implementation schedule with their offer which displays the scope of work items described in Section 14501 Subsection 1.3. The schedule shall be a GANTT type schedule and shall show predecessors, successors, and durations for activities. The number of days or weeks that the LOC must manually transport library material during each phase and sub-phase shall be indicated. The selected Offeror shall make adjustments as necessary to coordinate with and be agreeable to the AOC, LOC, and their Material Handling Consultant.

(5) **Factor 5 - Project Team/Key Personnel :** The Offeror shall provide an executive summary of your organizational structure and corporate management plan. The plan should reflect key management functions and managerial authority for prime and subcontractors for the contract. At a minimum, key functions of staffing, subcontracting, and financing should be identified. Include relationships between units (Field to Home/Corporate Office) and various level managers, and related contract administration..

Provide an organizational chart which reflects your current organizational structure and how it

relates to any subcontractors, identifying individuals and their associated responsibilities for major functions to be performed for this project.

Provide a listing of personnel by discipline as follows:

(1) Total number of full-time, permanent designers/engineers on staff with multi-disciplinary systems experience and average years of experience.

(2) Total number of full-time, permanent staff who are registered professional engineers and their disciplines.

(3) Total number of full-time, permanent personnel employed in systems software engineering and development, and average years of experience.

(4) Total number of full-time, permanent personnel employed in PLC control systems engineering and development, and average years of experience.

(5) Total number of full-time, permanent personnel with materials handling system simulation experience, languages used, and average years of experience in each.

(6) Total number of full-time, permanent personnel employed in Computer-Aided Design, CAD system(s) used, and average years of experience in each.

List in your proposal work that shall be subcontracted to a third-party including:

1) Engineering/Software Development/Programming
2) Any of the primary equipment subsystems.
3) Mechanical and/or electrical installation.
4) Any single item, or group of like items, that represent more that 10% of the total, unburdened job cost. Note: Offeror shall identify one (1) potential candidate for each item identified as being subcontracted to a third party. The Contractor shall perform the work internally or have the work performed by the candidates identified in the bid for all subcontracted items. All potential subcontractors shall be required to meet the same project requirements, as defined in these Contract Documents, as the Offeror.

Provide resumes of key personnel from each of the following disciplines that may be assigned to this project:

1) Systems/Software Engineering.
2) Applications Engineering.
3) Electrical Engineering.
4) Project Management.

5) Field Services - Identify the Project Manager, Software Project Engineer, Mechanical Project Engineer and the Site Supervisor that are proposed for this project. The Offeror shall commit these specific individuals to this project for the duration of the project.

Please provide a description of your management approach with regards to efficiency, time, and cost effectiveness, in the following areas:

1) Project Management approach.
2) Field Management approach.
3) Scheduling application package utilized.

(End of provision)

INSTRUCTIONS FOR PREPARING PAST PERFORMANCE INFORMATION (AOC) (NOV 2003)

(a) Offerors are to provide information to demonstrate history of performance that demonstrates construction experience in performing work that is similar in scope, size and complexity to that category of projects listed under Factor 2 - Corporate Experience, in the section entitled "INSTRUCTIONS FOR PREPARING THE TECHNICAL PROPOSAL" of the Solicitation Conditions. This information shall address relative contracts held within the **last five (5) years**. Offerors shall explain what aspects of the contract are deemed relevant to the proposed effort and identify how each contract ranks, in terms of relevancy, with respect to the other contracts addressed in the volume. Offerors should consider the currency and relevancy of the past performance information. Current performance may have a greater impact than older performance.

(b) Offerors may include with their proposal, information on problems encountered on the identified contracts and the offeror's correction actions. Include construction awards, customer letters of commendation, etc., with points of contact and telephone numbers. Offeror may provide examples of successful cost containment and the Offeror's efforts that led to the successful cost containment, examples of timely contract completion and the Offeror's efforts that led to the timely completion, and/or examples of innovative solutions made and implemented by the Offeror that resulted in superior quality workmanship or products within the contract budget.

(c) Offerors shall forward the form listed under Attachments titled "Past Performance Questionnaire" to the references listed in Section entitled "INSTRUCTIONS FOR PREPARING THE TECHNICAL PROPOSAL" to be completed and forwarded directly to the AOC as directed on the form. Offerors are encouraged to request that references submit the Past Performance Questionnaires to the AOC prior to the closing date of this RFP. However, Past Performance Questionnaires received after the closing date of this

RFP will be accepted if received prior to the conclusion of technical evaluations and will NOT cause the offeror to be considered non-responsive.

(d) Include information on major subcontractors utilized and their relationship, if any, to the execution of projects should a contract be awarded to your firm. Specify by name any key individual(s) who participated in the contract being discussed who are proposed to support the instant acquisition. Also, indicate their contractual role for both acquisitions.

(e) Offerors are advised that the Government may use all data provided by the offeror in their proposal and data obtained from other sources, to include but not limited to government-wide databases. Past performance information on contracts not listed by the offeror, or that of proposed subcontractors, may also be evaluated. The Government may contact references provided or any other source than those identified by the offeror and information received may be used in the evaluation of the offeror's past performance. While the Government may elect to consider data obtained from other sources, the burden of providing current accurate and complete past performance information rests with the offeror.

INSTRUCTIONS FOR PREPARING THE PRICE PROPOSAL (AOC) (NOV 1999)

(a) A firm fixed-price shall be entered by each offeror on the Schedule page for each line item (line item pricing, options, and unit prices) which shall represent the cost for performing the work required by this Request for Proposal. The Architect reserves the right to request from each offeror information regarding the breakdown of all costs that are included in the in these prices, to include copies of all work sheets used in forming the proposed pricing. Erasures or other changes on any or all submissions shall be initialed by the signer of the proposal or by his duly authorized agent.

In addition, the Representations and Certifications, with applicable information included in the spaces provided shall be included as a part of the Price Proposal.

The Offeror's Bid Guarantee shall also be included in the Price Proposal.

The Price Proposal will be submitted with the required documents in the following order:

"SOLICITATION, OFFER, AND AWARD" form (original signature required in Block 20B);
"The "SCHEDULE" page;
The "REPRESENTATIONS AND CERTIFICATIONS";
The "BID GUARANTEE"; and
The "AUTOMATED CLEARING HOUSE (ACH)" form.

FAR 52.216-1 TYPE OF CONTRACT (APR 1984)

The Government contemplates award of a firm fixed price contract resulting from this solicitation.

(End of provision)

AOC52.237-1 SITE VISIT (MAY 2005)

(a) Offerors are urged and expected to inspect the site where services are to be performed and to satisfy themselves regarding all general and local conditions that may affect the cost of contract performance, to the extent that the information is reasonably obtainable. In no event shall failure to inspect the site constitute grounds for a claim after contract award.

(b) Appointments for visiting the locations specified herein can be made by contacting Chris Lindsay, Contract Specialist at (202) 226-0994. **ANY QUESTIONS, STATEMENTS OR DISCUSSIONS THAT TAKE PLACE DURING THE SITE VISIT BETWEEN POTENTIAL OFFERORS AND THE GOVERNMENT ARE NOT BINDING. QUESTIONS FOR CLARIFICATION MUST BE SUBMITTED IN WRITING, TO THE CONTRACTING OFFICER, TO BE INCLUDED IN AN SUBSEQUENT AMENDMENT TO BE BINDING.**

(End of provision)

END OF SECTION L

SECTION M
EVALUATION FACTORS FOR AWARD

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EVALUATION FACTORS FOR AWARD

PROPOSAL EVALUATION CRITERIA (AOC) (NOV 1999)

(a) General Requirements: The evaluation criteria to be used by the Contracting Officer for the selection of a contractor to perform the work specified herein are defined below. The criteria are divided into Technical and Price categories. The Technical Evaluation Criteria, when combined are significantly more important than Price. However, as the difference in technical merit between the proposals becomes less significant, the relative importance of the proposed prices will increase.

(b) Technical Evaluation Criteria. The criteria to be used in assessing the quality of each proposal are listed below. Technical Factors and considered together are more important than Price.

(1) **Factor 1 - Past Performance**

(a) The evaluation of past performance will be based in part on client references from current or recently completed projects with regard to factors including, but limited to: the offeror's record of conforming to contract requirements and to standards of good workmanship; the offeror's record of forecasting and controlling costs; the offeror's adherence to contract schedules, including the administrative aspects of performance; the offeror's history of reasonable and cooperative behavior and commitment to customer satisfaction; and generally, the offeror's business-like concern for the interest of the customer. It is the offeror's sole responsibility to ensure that correct names, addresses, and phone numbers are provided for each reference. In addition, the Government may use other references/information to verify past performance.

(b) The Government's conclusions about the overall quality of the offeror's past performance will be highly influential in determining the relative merits of the offeror's proposal and in selecting the offers considered most advantageous to the Government. Past performance findings will be used to validate proposals against established evaluation criteria and assign an overall risk to the Government for successful performance.

(c) An offeror with no past performance may receive a rating based on the evaluation of its predecessor companies, key personnel, and/or subcontractors. These ratings may/may not have the same weight as the ratings of the proposing company. If such information is not applicable (i.e., the offeror does not have a predecessor company, key personnel or subcontractors with relevant experience), the offeror shall be evaluated as "neutral". However, the proposal of an offeror with no relevant past/present performance history, while rated neutral in past/present performance, may not represent the most advantageous proposal to the Government and thus, may be an unsuccessful

proposal when compared to the proposal of the other offerors.

(2) **Factor 2 - Corporate Experience -** The experience of the offeror and any proposed key subcontractors will be evaluated to determine the extent of successful completion of projects, performed within the past five years of similar scope, size and complexity to the requirements of this project. Proposed subcontractors will be evaluated to determine if their qualifications are sufficient to carry out their portion of the work as described in the specifications. Higher ratings will be given to Offerors who demonstrate more experience in successfully completing, on time and within budget, projects of similar scope, size and complexity as this project.

(3) **Factor 3 - Proposed Control System Features and Capabilities**: The Offeror's proposed control system features and capabilities will be evaluated to determine the their compliance with systems requirements, and whether the proposed systems meet the standards of being "Proven Technology". See attachment Section 14501, Paragraph 1.2.2.5.

(4) **Factor 4 - Implementation Plan**: The Offeror's Implementation plan will be evaluated to determine if the implementation plan for scheduling and carrying out the work is efficient and effective, complies with solicitation requirements and whether the proposed labor, materials, and equipment are appropriate to ensure the successful completion of the work in the time specified.

(5) **Factor 5 - Project Team/Key Personnel:** Based upon resumes and references provided, the government will evaluate the qualifications, training and experience of the individuals the offeror designates; including subcontractors/subconsultants responsible for management of this work; to determine whether the Offeror has furnished convincing evidence that these individuals and subcontractors/subconsultants are well qualified to successfully complete their assigned responsibilities.

(c) **Price Evaluation Criteria.** The Government will evaluate the price proposals of all firms found technically qualified. Price criterion measure not only actual dollars but also analyze the realism and reasonableness of the Offeror's proposed price. Realism is evaluated by assessing the compatibility of proposed costs with proposal scope and effort. Reasonableness of an offeror's proposal is evaluated through cost or price analysis techniques. For cost/price to be reasonable, it must represent a cost/price that provides best value to the Government when consideration is given to prices in the market, technical and functional capabilities of the offeror. The evaluated price will be the sum of the proposed prices for Items 001 to 005. Those proposals evaluated as not satisfying all of the price/cost criteria may be eliminated from the competitive range unless the Contracting Officer determines.

AOC52.215-5 CONTRACT AWARD - SOURCE SELECTION

PROCEDURES (JUN 2004)

(a) The Government will award a contract resulting from this solicitation to the responsible offeror whose offer conforming to the solicitation will be most advantageous to the Government, cost or price and other factors, specified elsewhere in this solicitation, considered.

(b) The Government may–

(1) Reject any or all offers if such action is in the public interest;

(2) Accept other than the lowest offer; and

(3) Waive informalities and minor irregularities in offers received.

(c) The Government intends to evaluate proposals and award a contract without discussions with offerors (except clarifications as described in FAR 15.306(a)). Therefore, the offeror's initial proposal should contain the offeror's best terms from a price and technical standpoint. The Government reserves the right to conduct discussions if the Contracting Officer later determines them to be necessary. If the Contracting Officer determines that the number of proposals that would otherwise be in the competitive range exceeds the number at which an efficient competition can be conducted, the Contracting Officer may limit the number of proposals in the competitive range to the greatest number that will permit an efficient competition among the most highly rated proposals.

(d) The Government may accept any item or combination of items, unless doing so is precluded by a restrictive limitation in the solicitation or the offer.

(e) A written award or acceptance of offer mailed or otherwise furnished to the successful offeror within the time for acceptance specified in the offer shall result in a binding contract without further action by either party. Before the offer's specified expiration time, the Government may accept an offer (or part of an offer as provided in Paragraph (d) of this provision), whether or not there are negotiations after its receipt, unless a written notice of withdrawal is received before award. Negotiations conducted after receipt of an offer do not constitute a rejection or counteroffer by the Government.

(f) Neither financial data submitted with an offer, nor representations concerning facilities or financing, will form a part of the resulting contract. However, if the resulting contract contains a clause providing for price reduction for defective cost or pricing data, the contract price will be subject to reduction if cost or pricing data furnished is incomplete, inaccurate, or not current.

(g) The Government may determine that an offer is unacceptable if the prices proposed are materially unbalanced between line items or sub line items. Unbalanced pricing exists when, despite an acceptable total evaluated price, the price of one or more contract line items is significantly overstated or understated as indicated by the application of cost or price analysis

techniques. A proposal may be rejected if the Contracting Officer determines that the lack of balance poses an unacceptable risk to the Government.

(End of provision)

END OF SECTION M

SECTION 01000 - GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS:

A. **General Requirements**: The provisions or requirements of Division-1 apply to entire work of Contract and, where so indicated, to other elements which are included in project, and include, but are not limited to the following:

1. Summary of the Work.
2. Project Coordination.
3. Definitions and Standards.
4. Schedules and Reports.
5. Submittals.
6. Temporary Facilities and Controls.
7. Products.
8. Project Closeout.

1.2 SUMMARY OF THE WORK:

A. **Project/Work Identification**:

1. **General**: Project name is "Library of Congress Automated Book Conveyor Controls System Upgrade/Replacement," Washington, D.C., as shown on Contract Documents prepared by the Architect of the Capitol (AOC). Drawings and specifications are dated 01 November 2004.
2. **Summary by Reference**: Work of the Contract can be summarized by references to the SCHEDULE, GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, AOC52.243-1, Changes-Supplement (June 2004), Specification Sections, Drawings, Amendments and Modifications to the contract documents issued subsequent to the initial printing of this Project Manual and including, but not necessarily limited to, printed material referenced by any of these.
3. **Abbreviated Written Summary**: Briefly and without force and effect upon the contract documents, the work of the Contract can be summarized as follows:

   a. The work includes the development of control system for the Library of Congress "Blue Box" Automatic Book Conveyor System (ABCS), including all software, hardware, and peripherals.
   b. The work includes trial implementation of the new system on a non-critical conveyor (SV-A).
   c. The work includes options to implement the physical upgrades required to activate the system in the Madison, Jefferson, and Adams buildings.

4. **Informational Drawings:** Drawings indicated as "For Information Only" are included for convenience with the Contract Documents and are NOT Contract Documents. These drawings contain information requested by the AOC for the use of the Architect and other consultants to the AOC. The Contractor is expected to independently verify all information shown and provide his own surveys, testing, and verification of conditions shown therein.
5. **Use of the Contract Documents:** The Contract Documents are comprised of the Specifications (including Appendices), the Amendments, the Contract, approved Changes

and other directives. These documents are not to be used separately for bid or construction as they represent the entirety of the project. The Contractor is responsible for insuring that the documents are used together.

6. **Sequencing Plan**: Refer to and comply with the Sequencing Plan and Contractor Requirements included in Section 14501, Article 1.3 (PROJECT IMPLEMENTATION & SEQUENCING).

B. **Options:** This work shall include the following Options as defined in the SCHEDULE:

1. **Option No. 1:** Madison Loop Integration (except SV-B)
2. **Option No. 2:** Madison SV-B Integration
3. **Option No. 3:** Jefferson Building Integration
4. **Option No. 4:** Adams Building Integration and Project Completion

C. **Contractor Use of Premises**:

1. **General**: During the entire construction period the Contractor shall have the exclusive use of the premises for construction operations, including full use of the site.
2. **Contractor Use of the Existing Buildings**: During the construction period the site and the buildings will be occupied by Members of Congress, other Government employees and the general public. Maintain the existing buildings in a safe and weather-tight condition throughout the construction period. Repair damage caused by construction operations. Take all precautions necessary to protect the buildings and their occupants during the construction period. Cooperate fully with the Architect or his representative during construction operations to minimize conflicts and to facilitate Government usage.

   a. **Clear Passage**: Keep public areas such as hallways, stairs, elevator lobbies and toilet rooms free from accumulation of waste material, rubbish or construction debris.
   b. **Smoking or open fires** will not be permitted within the building enclosure or on the premises.
   c. **Temporary Elevator Use**: Any public elevator may be used by Contractor's personnel, provided they are nMay 26, 2005ot moving supplies or tools. Supplies and freight may not be delivered in passenger elevators - only the Architect's designated freight elevator may be used when receiving or moving materials.
   d. **Work Hours:** The following work hours shall be observed by the Contractor:

      1. **Public Areas:** 7:00 am to 7:00 pm, Monday through Friday
      2. **Private Areas (Offices):** Work shall be scheduled in advance or performed outside of normal working hours. Coordinate with the Architect a minimum of three (3) working days prior to work.

3. **Limitations on Use of the Site**: The book conveyor extends through several buildings, in both public and private areas. The project site is generally limited to the areas containing the book conveyor mechanical, electrical, and control equipment and physical components. Portions of the site beyond areas on which work is indicated are not to be disturbed; access to these areas shall be made only with close coordination with the Architect and/or the LOC Superintendent. Additionally, administer allocation of available space among entities needing both access and space so as to produce the best overall

efficiency in performance of the total work of the project. Schedule deliveries so as to minimize space and time requirements for storage of materials and equipment on site.

a. **Unless designated** for sole Contractor use, keep existing driveways and entrances serving the premises clear and available to the Government and its employees at all times. Do not permit trucks of any kind to use existing sidewalks without prior authorization of the Architect.
b. **Maintain driveways** between and around combustible material storage piles at least 15' wide and free of accumulation of rubbish, equipment and materials. Maintain access for fire fighting equipment.
c. **Do not unreasonably** encumber the site with materials or equipment. Confine stockpiling of materials and location of storage sheds to the areas indicated. If additional storage is necessary, obtain and pay for such storage off-site.
d. **Provide 24hr/7day** access to the building by emergency vehicles and firefighting equipment.

4. **Construction Parking Control**: Parking space for personal vehicles is not available on the site. Obtain approval of Architect for parking of construction motor vehicles or other equipment on the site.

D. **Government Occupancy**: The Government reserves the right to place and install equipment as necessary in completed areas of the building and to occupy such areas prior to final acceptance, provided that such occupancy does not substantially interfere with completion of the work. Such placing of equipment and partial occupancy shall not constitute acceptance of the work or any part of the work.

E. **Protection of Government Property**: The Contractor is expected to take all reasonable precautions to protect U.S. Government Property. In the event of damage to or theft of Government Property, the Contractor will be held fully responsible for his own personnel, his subcontractor’s personnel and their actions.

F. **Protection of Historic Buildings**: The Jefferson and Adams Buildings are designated as historic buildings on the National Register of Historic Buildings. Damage or defacement of these buildings in any way is not tolerated. No drilling, cutting, attachment to or defacing of marble or stone work or yellow tile within the building is acceptable without Architect’s approval.

G. **Blasting**: The use of any kind or type of explosive in the performance of the work is prohibited, except the use of construction tools actuated by or employing powder-actuated charges which shall be permitted, provided that the tool is of the kind and design ordinarily used for such construction and that the Architect has authorized its use after determining that its use will not endanger human life or safety.

H. **Mechanical/Electrical Requirements of General Work**: Except as otherwise indicated, comply with applicable provisions of The National Electrical Code (NEC) and standards by National Electrical Manufacturer's Association (NEMA) for electrical components of general work. Where applicable, provide products listed and labeled by nationally recognized independent testing and labeling organizations.

1.3 **PROJECT COORDINATION**:

A. **Coordination and Meetings**: Prepare a written memorandum on required coordination activities. Include such items as required notices, reports and attendance at meetings. Distribute this memorandum to each entity performing work at the project site. Prepare similar memorandum for separate contractors where interfacing of their work is required.

1. **Continuously coordinate** the work of subcontractors to ensure proper processing and progress of the work. Require each subcontractor to examine work of other trades and all sections of specifications to assure satisfactory installation of, and connection between, his work and work of other trades.

   a. **Provide other parties**, to the extent their work is affected by this work, all information necessary for the proper execution of their work. Arrange and conduct work so that other parties may complete their work at the site according to schedule. All work under this contract shall be carefully coordinated with work under other such contracts.

2. **The Contractor** shall maintain a complete set of Contract Documents on the site during the execution of this contract. All Drawings and Specifications shall be posted with the latest information and Changes.

B. **Surveys and Records/Reports**: Working from lines and levels established by the property survey, establish and maintain bench marks and other dependable markers. Establish bench marks and markers to set lines and levels for work at each story of construction and elsewhere as needed to properly locate each element of the project. Calculate and measure required dimensions as shown within recognized tolerances. Drawings shall not be scaled to determine dimensions. Advise entities performing work of marked lines and levels provided for their use. Advise Architect promptly upon detection of deviations that exceed indicated tolerances.

C. **General Installation Provisions**:

1. **Pre-Installation Meetings**: Hold a pre-installation meeting at the project site well before installation of each unit of work which requires coordination with other work. Installer and representatives of the manufacturers and fabricators who are involved in or affected by that unit of work, and with its coordination or integration with other work that has preceded or will follow, shall attend this meeting. Advise Architect of scheduled meeting dates.
2. **Installer's Inspection of Conditions**: Require the Installer of each major unit of work to inspect the substrate to receive work and conditions under which the work is to be performed. The Installer shall report all unsatisfactory conditions in writing to the Contractor. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.
3. **Manufacturer's Instructions**: Where installations include manufactured products, comply with the manufacturer's applicable instructions and recommendations for installation, to the extent that these instructions and recommendations are more explicit or more stringent than requirements indicated in the Contract Documents.
4. **Mounting Heights**: Where mounting heights are not indicated, mount individual units of work at industry recognized standard mounting heights for the particular application indicated. Refer questionable mounting height choices to the Architect for final decision.

a. **Mount units of work** required to be accessible to handicapped people at heights prescribed by the Uniform Federal Accessibility Standards as referenced by the Americans with Disabilities Act (ADA) (Fed. Reg./Vol. 56, No. 144/Part 36).

D. **Cleaning and Protection**: During handling and installation of work at the project site, clean and protect work in progress and adjoining work on the basis of continuous maintenance. Apply protective covering on installed work where it is required to ensure freedom from damage or deterioration at time of completion.

1. **Clean and perform maintenance** on installed work as frequently as necessary through remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
2. **No Touching of Library Materials:** The Contractor shall inform employees on a regular basis that there shall be no touching of books or any other stored materials in the Library. If any such materials are obstructing the Contractor from performing work, the Contractor shall inform the Architect for remediation.
3. **Limiting Exposures of Work**: To the extent possible through reasonable control and protection methods, supervise performance of the work in such a manner and by such means which will ensure that none of the work, whether completed or in progress, will be subjected to harmful, dangerous, damaging or otherwise deleterious exposure during the construction period.

   a. **Protect against possible damage** all sills, jambs and soffits of permanent openings used as passageways or through which materials are handled. Protect exposed corners, spandrels, projecting features and similar permanent work subject to damage. Cover and protect all prefinished work from damage by mortar, plaster, gypsum drywall compounds, paint, and other construction materials and operations. Use wheelbarrows equipped with rubber tires over permanently exposed floors and paving. Provide special protection for works of art, as prescribed herein.

4. **Load all trucks** leaving the site with loose debris in a manner that will prevent dropping of materials on streets. Fasten suitable tarpaulins over the load before they enter surrounding paved streets.

E. **Cutting and Patching**: Where the Contractor must cut, patch, alter, add to, repair or refinish existing construction and finishes which are not to be removed, he shall leave such construction and finishes complete and in satisfactory condition. Cutting, patching, and the like shall be neatly and carefully performed, and new materials and methods shall match existing corresponding work unless otherwise indicated. Exposed patches and repairs shall be as inconspicuous as possible.

1. **Construction, finishes,** equipment and other items which are damaged or defaced by reason of work performed under this contract shall be restored to the satisfaction of the Architect.

F. **Conservation and Salvage**: It is a requirement for supervision and administration of the work that construction operations be carried out with the maximum possible consideration given to the conservation of energy, water and materials. In addition, maximum consideration shall be given to salvaging materials and equipment involved in performance of the work but not incorporated therein. Refer to other sections for required disposition of salvage materials which are the Government's property.

1. **Architect Notification**: To allow time for the Architect to observe the construction, provide a minimum of 48 hours notice of steel work, pouring of concrete, commencements of next phase of work, and other tasks to be identified by the Architect.

1.4 **DEFINITIONS AND STANDARDS**:

A. **General**: Comply with governing regulations and the codes and standards imposed upon the work. These requirements include the obtaining of permits, licenses, inspections, releases and similar documentation, as well as payments, statements and similar requirements associated with regulations, codes and standards.

B. **Definitions**: A substantial amount of specification language consists of definitions for terms found in other contract documents, including the drawings. (Drawings must be recognized as diagrammatic in nature and not completely descriptive of the requirements indicated thereon.) Certain terms used in contract documents are defined in this article. Definitions and explanations contained in this section are not necessarily either complete or exclusive, but are general for the work to the extent that they are not stated more explicitly in another element of the contract documents.

1. **Installer**: The term "installer" is defined as the entity (person or firm) engaged by the Contractor, its subcontractor or sub-subcontractor for performance of a particular unit of work at the project site, including installation, erection, application and similar required operations. It is a general requirement that such entities (installers) be expert in the operations they are engaged to perform.
2. **Testing Laboratory**: The term "testing laboratory" is defined as an independent entity engaged to perform specific inspections or tests of the work, either at the project site or elsewhere, and to report, and (if required) interpret results of those inspections or tests.
3. **Indicated**: The term "indicated" is a cross-reference to graphic representations, notes or schedules on drawings, to other paragraphs or schedules in the specifications, and to similar means of recording requirements in contract documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used in lieu of "indicated," it is for the purpose of helping the reader locate cross-reference, and no limitation is intended except as specifically noted.
4. **Furnish**: Except as otherwise defined in greater detail, the term "furnish" is used to mean supply and deliver to the project site, ready for unloading, unpacking, assembly, installation, etc., as applicable in each instance.
5. **Install**: Except as otherwise defined in greater detail, the term "install" is used to describe operations at the project site including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations, as applicable in each instance.
6. **Provide**: Except as otherwise defined in greater detail, the term "provide" means furnish and install, complete and ready for intended use, as applicable in each instance.
7. **Exposed**: The term "exposed" is defined as an item or surface, exterior or interior, which can be seen by a person outside the building or a person inside a usable space within the building during normal activity.

    a. **Mechanical and electrical** rooms, air handling rooms, storage rooms and penthouses shall be considered to have exposed surfaces, as shall the mechanical and electrical construction within them.

b. **The interiors of closets** and alcoves shall be considered exposed surfaces, and shall be finished to match the finish of the adjoining room or space, unless another finish is otherwise indicated.

c. **The interiors of cabinets** shall be considered exposed, but a finish different from that of the exterior may be permitted or required by other sections.

8. **Concealed**: The term "concealed" is defined as an item or space not normally seen, occupied or used by building occupants or staff, such as shafts, hoistways, tunnels, ceiling plenums, attics, and crawls spaces.

9. **Finished Space**: The term "finished space" is defined as space normally used by the public, building occupants or staff for primary functions of the building, but does not include mechanical, electrical and elevator equipment rooms, hoistways, tunnels or mechanical penthouses, unless otherwise indicated.

10. **Specialist**: The term "specialist" is defined as an individual or firm of established reputation (or, if newly organized, whose personnel have previously established a reputation in the same field), which is regularly engaged in, and which maintains a regular force of workers skilled in either (as applicable) manufacturing or fabricating items required by the contract, installing items required by the contract, or otherwise performing work required by the contract. Where the contract specification requires installation by a specialist, that term shall also be deemed to mean either the manufacturer of the item, an individual or firm licensed by the manufacturer, or an individual or firm who will perform the work under the manufacturer's direct supervision.

C. **Format and Specification Content Explanations**: Bolding and underscoring are used strictly to assist reader of specification text in scanning text for key words (for quick recall). No emphasis on or relative importance is intended where bolding and underscoring are used. Imperative language is used generally in specifications. Except as otherwise indicated, requirements expressed imperatively are to be performed by the Contractor. For clarity of reading at certain locations, contrasting subjective language is used to describe responsibilities which must be fulfilled indirectly by Contractor, or when so noted, by others.

1. **Abbreviations**: The language of specifications and other contract documents is of the abbreviated type in certain instances, and implies words and meanings which will be appropriately interpreted. Actual word abbreviations of a self-explanatory nature have been included in texts. Specific abbreviations have been established, principally for lengthy technical terminology and primarily in conjunction with coordination of specification requirements with titles of general standards which are frequently abbreviated. Singular words will be interpreted as plural and plural words will be interpreted as singular where applicable and where full context of the contract documents so indicates.

2. **Minimum Quality/Quantity**: In every instance, the quality level or quantity shown or specified is intended as minimum for the work to be performed or provided. Except as otherwise specifically indicated, actual work may either comply exactly with that minimum (within specified tolerances), or may surpass the quality of that minimum within reasonable limits. In complying with requirements, indicated numeric values are either minimum or maximums as noted or as appropriate for context of requirements. Refer instances of uncertainty to the Architect for decision before proceeding.

D. **Overlapping and Conflicting Requirements**: Where there appears to be overlapping or conflicting requirements in the drawings and specifications, refer all such questions in writing to the Architect for interpretation. Do not proceed with that portion of the work that is under question until the Architect has replied in writing. Delays necessitated by requests for interpretation shall not form the basis for a Change to the contract. The Architect's interpretation and decision shall be final. Procedures for resolving disagreements with the decision of the Architect are outlined in the General Conditions of the Contract. The order of precedence is established as follows:

1. **Order of Precedence:** Any inconsistency in this solicitation or Contract shall be resolved by giving precedence in the following order:

   a. The Schedule (excluding the specifications).
   b. Representations and other instructions.
   c. Contract clauses.
   d. The Specifications. (**If conflicting with the Drawings, the latter shall take precedence only when more stringent. Refer to Section 14501, Subsection 1.2.2.2.)
   e. The Drawings. Large scale drawings take precedence over small scale drawings. Do not scale drawings.

2. **Industry Standards**: Where compliance with two (2) or more industry standards or sets of requirements is specified, and overlapping of those different standards or requirements establishes different or conflicting minimums or levels of quality, the most stringent requirement is intended and will be enforced, unless specifically detailed language written into contract documents clearly indicates that a less stringent requirement is to be fulfilled. Refer apparently-equal-but-different requirements, and uncertainties as to which level of quality is more stringent, to the Architect for a decision before proceeding.
3. **Contractor's Options**: Except for overlapping or conflicting requirements, where more than one set of requirements are specified for a particular unit of work, Options are intended to be the Contractor's regardless of whether or not it is specifically indicated.

E. **Drawing Symbols**: Except as otherwise indicated, graphic symbols used on drawings are those symbols recognized in the construction industry for purposes indicated. Where not otherwise noted, symbols are defined by "Architectural Graphic Standards", published by John Wiley & Sons, Inc., Tenth edition.

1. **Mechanical/Electrical Drawings**: Graphic symbols used on mechanical and electrical drawings are generally aligned with symbols recommended by ASHRAE. Where appropriate, these symbols are supplemented by more specific symbols as recommended by other recognized technical associations including ASME, ASPE, IEEE and similar organizations. Refer instances of uncertainty to the Architect for clarification before proceeding.

F. **Industry Standards**: Except to the extent that more explicit or more stringent requirements are written directly into contract documents, applicable standards of the construction industry have the same force and effect (and are made a part of the contract documents by reference) as if copied directly into the contract documents, or as if published copies were bound herein, subject to the order of precedence previously stated.

1. **Publication Dates**: Except as otherwise indicated, where compliance with an industry standard is required, conform to the standard in effect on the date of the Invitation for Bids, or, if referred to in any Amendments, at the date of such Amendments.
2. **Abbreviations and Names**: The following acronyms or abbreviations as referenced in contract documents are defined to mean the associated names. Both names and addresses are subject to change, and are believed to be, but are not assured to be, accurate and up-to-date as of the date of contract documents:

AIA	American Institute of Architects (The) www.aia.org	(800) 242-3837 (202) 626-7300
AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	(610) 832-9585
AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353
CDA	Copper Development Association Inc. www.copper.org	(800) 232-3282 (212) 251-7200
IEEE	Institute of Electrical and Electronics Engineers www.ieee.org	(212) 419-7900
NAAMM	National Association of Architectural Metal Mfrs www.naamm.org	(312) 332-0405
NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110
NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200
NFPA	National Fire Protection Association www.nfpa.org	(800) 344-3555 (617) 770-3000
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacna.org	(703) 803-2980
SSPC	SSPC: The Society for Protective Coatings www.sspc.org	(877) 281-7772 (412) 281-2331
UL	Underwriters Laboratories Inc. www.ul.com	(800) 704-4050 (847) 272-8800

G. **Federal Government Agencies**: Names and titles of federal government Standard- or Specification-producing agencies are often abbreviated. The following acronyms or abbreviations referenced in the Contract Documents indicate names of Standard- or Specification-producing agencies of the federal government. Names and addresses are subject to change but are believed to be, but are not assured to be, accurate and up to date as of the date of the Contract Documents.

CFR	Code of Federal Regulations Available from Government Printing Office www.access.gpo.gov/nara/cfr	 (888) 293-6498 (202) 512-1530
EPA	Environmental Protection Agency www.epa.gov	(800) 438-2474
FS	Federal Specification Available from Defense Automated Printing Service www.astimage.daps.dla.mil/online	 (215) 697-6257
	Available from General Services Administration www.fss.gsa.gov/pub/fed-specs.cfm	(202) 619-8925
	Available from National Institute of Building Sciences www.nibs.org	(202) 289-7800
OSHA	Occupational Safety and Health Administration www.osha.gov	(800) 321-OSHA (6742)

H. **District of Columbia Government Agencies**: Names and titles of local government Standard- or Specification-producing agencies are often abbreviated. The following acronyms or abbreviations referenced in the Contract Documents indicate names of Standard- or Specification-producing agencies of the DC government. Names and addresses are subject to change but are believed to be, but are not assured to be, accurate and up to date as of the date of the Contract Documents.

DC-EHA	Environmental Health Administration Department of Health Government of the District of Columbia 51 N Street. N.E, Room 5030-B Washington, DC 20002 dchealth.dc.gov	(202) 535-2500

1.5 **SCHEDULES & REPORTS**:

A. **Coordination**: Coordinate both the listing and timing of reports and other activities required by provisions of this and other sections, so as to provide consistency and logical coordination between the reports. Maintain coordination and correlation between separate reports by updating at monthly or shorter time intervals. Make appropriate distribution of each report and updated report to all parties involved in the work including the Architect.

B. **Material Schedule**: Prior to commencing work, submit for approval the names of manufacturers and the trade names or numbers of all materials proposed for use on the project. Do not use any

material until approved by the Architect. Upon request, furnish samples of materials, without cost to the Government, for examination and testing.

1. **Submit 3 copies** of the product-listing schedule prior to commencement of the Work. Provide a written explanation for omissions of data, and for known variations from contract requirements.

C. **Schedule of Values:** Within thirty (30) calendar days of the date of contract award, a Schedule of Values shall be submitted. This schedule is defined as a work item by work item breakdown of cost of each definitive work activity including Contractor's markup. The Schedule of Values shall directly correlate with the Phases of Work indicated on the approved Progress Schedule specified below.

1. The Grand Total of all of the Schedules shall equal Contractor's original bid.
2. The proper updating of both the Schedule of Values and the Record Drawings shall be considered precedent to approval of Partial Payments.

D. **Shop Drawing Submittal Schedule:** Within thirty (30) calendar days of the date of contract award, a Shop Drawing Submittal Schedule shall be submitted. The schedule shall indicate at a minimum, all shop drawing submittals to be made, their contents, each specification section (and article/paragraph number) the submittal is drawn from, the date on which it will be submitted, the expected return dates, and the subcontractor responsible for creating the submittal. The submittal will be reviewed by the Architect as the first shop drawing submittal and comments made must be acknowledged and employed in the resubmission prior to the submittal of any other shop drawing. Do not “Load” the schedule.

E. **Fully-Developed Progress Schedule**: Refer to Section 14501, Subsection 1.8.1.3 for detailed schedule submission requirement. Arrange the schedule to show how final acceptance is scheduled to allow for the Architect's procedure for certification of final acceptance. Prepare the schedule on sheets of stable transparency, or other reproducible material, to permit reproduction for the required distribution.

1. **Cost Correlation**: Immediately below the date line at the heading of the bar-chart, provide a two item cost correlation line, indicating both "precalculated" and "actual" costs. This cost correlation line shall show dollar-volume of work performed as of the same dates used for preparation of partial payment requests. Refer to GENERAL CONDITIONS for cost reporting and payment procedures. In so far as it is practical to do so, use the same units of work in the progress schedule as indicated in the "schedule of values" required by the GENERAL CONDITIONS and further specified above.
2. **Schedule Updating**: Following its initial approval, the project schedule shall be updated monthly for the purpose of recording and monitoring progress of the Work and establishing the values of progress payments. If the Work falls behind schedule, revise schedule and describe action to be taken to insure that work will be completed within the Contract time. Any adjustment to the Contract Time shall be made in accordance with the GENERAL CONDITIONS. For each schedule update, prepare a narrative report which shall include a description of all activities completed during the preceding month, description of progress made and planned activities listed as started but not completed on the updated Progress Schedule, and a written description and justification of any proposed revision to the logic sequence.

a. **Contractor Revisions**: The Contractor may also request revisions to the logic sequence and schedule of the Progress Schedule in the event that his planning for the project is revised. If revisions to the approved Progress Schedule are desired, the Architect shall be notified in writing for his approval, stating reasons for proposed revision. If the Architect considers such proposed revisions to be of a major nature, he may require the Contractor to revise and resubmit for approval, without additional cost to the Government, all or the affected portion of the schedule to indicate the effect on the entire project. Provide two weeks notice to the Architect, in writing, prior to submitting any Contractor proposed revisions not discussed in a previous Progress Meeting.

b. **Architect Revisions**: Architect-directed revisions to the Progress Schedule will be forwarded to the Contractor with a ten (10) calender day Contractor response period. The Contractor shall either assent to the proposed change or state reasons for not implementing the proposed revision.

c. **Progress Updates**: Revisions to the Progress Schedule made to reflect actual work progress to date are not revisions to logic sequence and schedule. In disagreements concerning actual progress recorded to date, the Architect's determination shall govern.

3. **Distribution**: Following the initial submittal to and response by the Architect, print and distribute progress schedules to the Architect (3 copies), separate contractors, the principal subcontractors and suppliers or fabricators, and others with a need-to-know schedule-compliance requirement. When revisions are made, distribute updated issues to the appropriate entities.

F. **Progress Meetings and Documentation**: In addition to specific coordination and pre-installation meetings for each element of work, and other regular project meetings held for other purposes, hold a general progress meeting each month with time coordinated with preparation of the partial payment request. Require each entity then involved in planning, coordination or performance of work to be properly represented at each meeting. Discuss status of each element of current work in relation to Progress Schedule. Determine how behind-schedule work will be expedited, and secure commitments from entities involved in doing so to ensure that work will be completed within Contract Time.

1. **Initial Progress Meeting**: Schedule initial progress meeting, recognized as "Pre-Construction Meeting", for a date not more than 15 days after date of commencement of the Work. Use it as an organizational meeting, and review responsibilities and personnel assignments.
2. **Daily Reports**: Prepare a daily report, recording information concerning events at the site; and submit duplicate copies to Architect on at least weekly intervals.

G. **Permits, Licenses, and Certificates**: For the Government's records, submit copies of utility permits, licenses, certifications, utility inspection reports, releases, notices, receipts for fee payments, judgments, and similar documents, correspondence and records established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

1.6 **SUBMITTALS**:

A. **General**: Shop drawings, product data, samples and other work-related submittals are required to amplify, expand and coordinate the information contained in the Contract Documents. The

Contractor is responsible for all dimensions, for the design of adequate or proper components, connections and other items, for the inclusion in the work of all elements and incidental details, and for the satisfactory fabrication, construction, operation and coordination of the work.

1. **Approval** of any submission shall not be construed as a complete or precise check of the item submitted but will only indicate that the general methods of design, detailing, construction or other elements under consideration appear to be satisfactory, without specific determinations or particulars.
2. **Changes to the Contract** will not be made by notations on submittals. In the event submittals returned by the Architect with notations, which in the opinion of the Contractor, constitute additional work for which he is entitled to an adjustment in the contract sum or the contract time, the Contractor shall comply with the procedure set forth in Article, "Changes," of the GENERAL CONDITIONS.
3. **Do not permit** submittal copies without an appropriate final "Action" marking by the Architect to be used in connection with the work.
4. **Submissions of "Approved Equals":** In addition to standard submittal requirements, for each item submitted as an "approved equal" submit the following:

    a. **Comparison of** proposed approved equal's characteristics with the salient characteristics of the specified product demonstrating that the proposed approved equal fully meets or exceeds the specifications,
    b. **Drawings and** samples as required for specified products,
    c. **Any changes** required in other elements (if any) because of the submission of the proposed approved equal, and
    d. **A listing of** sources of supply, maintenance service (if applicable), and replacement parts.

B. **Submittal Procedures**: Make all submittals to the Architect or to an individual designated by the Architect.

1. **Only the Architect** or an individual designated by the Architect can approve or disapprove submittals. Deviations and variations from the contract requirements contained in the submittal can be approved only by the Architect or by an individual delegated such authority by the Architect.
2. **Costs** associated with transmittal of submittals shall be borne by the Contractor.
3. **Review Time**: Except as specified elsewhere, allow for a review period of thirty (30) calendar days after receipt of the submittals by the Architect. Advise the Architect on each submittal, as to whether processing time is critical to the progress of the work, and if work would be expedited if processing time could be shortened. No extension of time will be authorized because of the Contractor's failure to transmit submittals or re-submittals to the Architect sufficiently in advance of the work. For submittals of items requiring coordination between different trades or subcontractors, review time period starts from the time that all required submittals have been received by the Architect and ends when submittal leaves the Architect. The Contractor is required to coordinate all work involving associated sub-trades and produce coordinated drawings for submittal where required by individual specification sections or as required below.
4. **Preparation of Submittals**: Provide permanent marking on each submittal to identify project, date, Contractor, subcontractor, supplier, manufacturer, submittal name and similar information to distinguish it from other submittals. Label as to number and title of specification section, drawing number and detail references, as appropriate. Show Contractor's executed review and approval marking and provide space of not less than 20

sq. in. for the Architect's "Action" marking. Package each submittal appropriately for transmittal and handling. Submittals which are received from sources other than through the Contractor's office will be returned without action.

5. **Number of Copies**: Submit a minimum of four (4) copies of each submittal requested.

C. **Specific Submittal Requirements**: Specific submittal requirements for individual units of work are specified in the applicable specification section. Except as otherwise indicated in the individual specification sections, comply with the requirements specified herein for each type of transmittal.

1. **Product Data**: Collect required product data into a single submittal for each unit of work or system. Mark each copy to show which choices and options are applicable to the project. Where product data has been printed to include information on several similar products, some of which are not required for use on the project, or are not included in this submittal, mark the copies to show clearly that such information is not applicable.

a. **Submittals**: Submittal is for information and record, unless otherwise indicated. Initial submittal is final submittal unless returned by the Architect, marked with an action which indicates an observed non-compliance.

1) **Except as** otherwise indicated, submit four (4) copies of each required product data submittal, plus two (2) additional copies where required for maintenance manuals. The Architect will retain two (2) copies and return the other marked with "Action" and corrections or modifications.

2. **Shop Drawings**: Provide special notation of dimensions that have been established by field measurement. Highlight, encircle or otherwise indicate deviations from the Contract Documents on the shop drawings.

a. **Preparation**: Submit newly prepared information, drawn to accurate scale on sheets not less than 8-1/2" x 11"; except for actual pattern or template type drawings, the maximum sheet size shall not exceed 36" x 48". Indicate the name of the firm that prepared each shop drawing and provide appropriate project identification in the title block.

1) **Do not reproduce** contract documents or copy standard printed information as the basis of shop drawings.
2) **Use standard** architectural scales for all drawings..

b. **Coordination Drawings**: Prior to installation of sleeves and inserts for equipment, and/or the performance of work in spaces in which two or more trades are involved and in which the probability of interference exists as determined by either the Contractor or the Architect, submit composite coordination drawings for the Work. Show sequencing and relationship of separate units of work which must interface in a restricted manner to fit in the space provided, or function as indicated. In case interference develops, the Architect will decide which work shall be relocated, regardless of which was installed first. Coordination drawings are considered shop drawings and must be definitive in nature.

c. **Equipment and Systems**: Shop Drawings for equipment and systems shall show ratings (where applicable), and how components are assembled, function together, and how they will be installed. Shop drawings, product data, certificate of

conformance or compliance, certified test or inspection reports, and other submittals for equipment, systems, and their component parts shall be coordinated and submitted as a unit. Multiple or piecemeal submissions are not acceptable except where prior approval is obtained from the Architect, in which case a list of data to be submitted later shall be included with the first submission.

d. **Initial Submittal**: One correctable 1-1/2 mil translucent polyester reproducible print and one blue-line or black-line; reproducible will be returned.

e. **Final Submittal**: 3 prints, plus 2 additional prints where required for maintenance manuals; 2 will be retained and remainder will be returned, one of which is to be marked-up and maintained by Contractor as "Record Document."

3. **Samples**: Documentation required specifically for sample submittals includes a generic description of the sample, the sample source or the product name or manufacturer, compliance with governing regulations and recognized standards. In addition, indicate limitations in availability, sizes, delivery time, and similar limiting characteristics.

a. **Preparation**: Where possible provide samples that are physically identical with the proposed material or product to be incorporated in the work; provide full scale, fully fabricated samples cured and finished in the manner specified. Where variations in color, pattern, or texture are inherent in the material or product represented by the sample, submit not less than 3 units of the sample, which show the full range of variations. Where samples are specified for the Architect's selection of color, texture or pattern, submit a full set of available choices for the material or product. Mount, display, or package samples in the manner specified to facilitate the review of indicated qualities. Prepare samples to match the Architect's sample where so indicated.

b. **Submittal**: Submit 3 sets of samples in the final submittal, one set will be returned. If the submittal is for the Architect's selection of color, pattern, texture or similar characteristics from a manufacturer's standard range of choices, only a single set of samples is required for a preliminary submittal. The final submittal may then be limited only to those choices selected by the Architect for final incorporation into the Work.

c. **Mock-Ups** and similar samples specified in individual work sections are special types of samples. Comply with sample submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.

4. **Miscellaneous Submittals**:

a. **Inspection and Test Reports**: Classify each inspection and test report as being either "shop drawings" or "product data" depending on whether the report is specially prepared for the project, or a standard publication of workmanship control testing at the point of production. Process inspection and test reports accordingly.

b. **Warranties**: Refer to Article "Products" for specific general requirements on warranties, product bonds, workmanship bonds and maintenance agreements. In addition to copies desired for the Contractor's use, furnish 2 executed copies of such warranties, bonds or agreements. Provide 2 additional copies where required for maintenance manuals.

c. **Safety Plan:** Provide a Safety Plan meeting OSHA, AOC, and LOC safety Guidelines for work in hazardous environments (areas where high voltage and large moving equipment are found) as well as confined spaces. Plan shall define number of individuals on the job site(s), their training, typical safety equipment to be used, and procedures for addressing typical hazardous conditions. Plan shall include temporary work stoppage and notifying Architect if hazardous materials are encountered. Refer to Division 1 section “Safety and Health” for additional detailed requirements.

d. **Confined Space Training Certification:** Several areas of this project will require work in confined spaces. Each person allowed to serve as Entrant must be certified, per OSHA requirements. Those serving as an Attendant or as an Entry Supervisor require additional training. Submit role and training certifications for each worker.

5. **Closeout Submittals**: Refer to Article "Project Closeout" and to individual sections of these specifications for specific submittal requirements of project closeout information, materials, tools, and similar items.

D. **Architect's Action**: Except for submittals for the record and similar purposes, where action and return on submittals is required or requested, the Architect will review each submittal and mark with appropriate "Action." Where the submittal must be held for coordination, the Architect will so advise the Contractor without delay.

1. **If no changes** to the drawing are required, three (3) prints and the reproducible drawing will be returned to the Contractor, bearing the stamp of the Architect, stating - "APPROVED."
2. **If changes** to the drawing are required, but are of such minor nature that fabrication and/or construction can proceed in accordance with the correction noted by the Architect without resubmission of the drawing three (3) prints and the reproducible drawing will be returned to the Contractor bearing the Stamp of the Architect stating "Approved as Noted." The Contractor shall proceed with fabrication and/or construction in accordance with the Architect's corrections, and resubmit corrected copy for the Architect's records.
3. **If changes** to the drawing are required, but are of such nature that fabrication or construction cannot proceed, three (3) prints and the reproducible drawing will be returned to the Contractor, bearing the stamp of the Architect stating - "Revise and Resubmit." In such a case, the Contractor shall resubmit the drawings, properly corrected. Upon resubmission of shop drawings, if any corrections or changes are made other than those marked by the Architect, the Contractor shall clearly indicate any such corrections or changes made on his own initiative.
4. **If the product does not meet** the specification requirements, the number of copies outlined above will be returned to the Contractor, bearing the stamp of the Architect stating - “REJECTED.” In such a case, the Contractor shall submit a new product which complies with the technical specifications.
5. **Other Action**: Where the submittal is returned, marked with the Architect's explanation, for special processing or other Contractor activity, or is primarily for information or record purposes, the submittal will be marked as follows:

a. **Not Subject to Review**: This review category will apply to submittals which are not required by the Contract Documents and are inadvertently submitted and stamped; or
b. **Received/No Action Required**: This category will be used when returning "Informational Submittals" for which the Architect is not required to take action.

1.7 **TEMPORARY FACILITIES AND CONTROLS**:

A. **Description of Requirements**: This article specifies administrative and procedural requirements for temporary services and facilities, including such items as temporary utility services, temporary construction and support facilities, and project security and protection.

1. **Use Charges**: No cost or usage charges for temporary services or facilities are chargeable to the Government. Cost or use charges for temporary services or facilities will not be accepted as a basis of claims for a change-order extra. All materials and equipment provided by the Contractor for temporary facilities shall remain the property of the Contractor.
2. **Materials and Execution**: Provide new materials and equipment for temporary services and facilities; used materials and equipment that are undamaged and in serviceable condition may be used, if acceptable to the Architect. Provide only materials and equipment that are recognized as being suitable for the intended use, by compliance with appropriate standards. Do not use materials of temporary service in permanent installation.

B. **Quality Assurance**: Comply with the requirements of the District of Columbia Building Code and regulations governing construction and local industry standards, in the installation and maintenance of temporary services and facilities.

1. **Standards**: Comply with the requirements of NFPA Code 241, "Building Construction and Demolition Operations", the ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition", and the NECA National Joint Guideline NJC-6 "Temporary Job Utilities and Services".

a. **Refer** to "Guidelines for Bid Conditions for Temporary Job Utilities and Services", as prepared jointly by Associated General Contractors of America (AGC) and American Specialty Contractors, Inc. (ASC) for industry recommendations.
b. **Trade Jurisdictions**: The assigned responsibilities for the installation and operation of temporary utilities are not intended to interfere with the normal application of trade regulations and union jurisdictions applicable to the work.

2. **Inspections**: Inspect and test each service before placing temporary utilities in use. Arrange for required inspections and tests by governing authorities, and obtain required certifications and permits for use.

C. **Job Conditions**: Provide each temporary service and facility ready for use at each location when the service or facility is first needed to avoid delay in performance of the Work. Maintain, expand as required and modify temporary services and facilities as needed throughout the progress of the Work. Do not remove until services or facilities are no longer needed, or are replaced by the authorized use of completed permanent facilities.

D. **Temporary Utilities**: The Architect will designate a connection point for installation of temporary service to the project to existing service. Arrange with the Architect for an acceptable

time when service can be interrupted, where necessary to make connections for temporary services.

1. **Temporary Electric Power Service**: Electrical energy will be supplied by the Government, but the Contractor shall install and maintain all necessary conduit, wiring, and devices needed to execute the work. Install all wiring in flexible conduit or armored cable with minimum No. 12 gage wire. Portable cords for small power tools shall be properly grounded and installed as approved by the Architect. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button and pilot light, for plug-in connection of power tools and equipment. The Government will not be held responsible for power outages beyond its control.

    a. **Comply with applicable NEMA**, NECA and UL standards and governing regulations for materials and layout of temporary electric service, including those requirements included in Division-16 sections.
    b. **Install service and grounding** in compliance with the National Electric Code (NFPA 70), District of Columbia Building Code, and Power Company requirements. Include necessary service connection, service switch, meters, transformers, overload protected disconnect, main distribution switch gear, panelboards, wiring, cables, devices, and accessories.

2. **Temporary Lighting**: Provide local switching of temporary lighting, spaced to allow lighting to be turned off in patterns to conserve energy and retain light suitable for work-in-progress, access traffic, security check and project lock-up.

    a. **Provide general service incandescent lamps** of wattage indicated or required for adequate illumination. Protect lamps with guard cages or tempered glass enclosures, where fixtures are exposed to breakage by construction operations. Provide exterior fixtures where fixtures are exposed to weather or moisture. Keep sockets equipped with active lamps. Where feasible, utilize fluorescent type fixtures.

3. **Temporary Heating, Cooling and Ventilating**: Provide temporary heating, cooling, and ventilating where indicated or needed for performance of the Work, curing or drying of recently installed work or for protection of work in place from adverse effects of low temperatures or high humidity. Select facilities known to be safe and without deleterious effect upon the work in place or being installed. Coordinate with ventilation requirements to produce the indicated ambient condition required, to minimize the consumption of fuel or energy, and to comply with code requirements.

    a. **Maintain** a minimum temperature of 50 deg. F (7 deg. C) in permanently enclosed portions of the building and areas where finished work has been installed. Provide temporary heating units that have been tested and labeled by UL, FM or another recognized trade association related to the fuel being consumed. Do not use open burning or salamander type heating units where prohibited by governing codes or regulations, or when combustible materials are located in or near the space being heated, or when the work installed or being installed includes work which will be exposed to view in the completed project.

        1) **Do not store** fuel in building.

b. **Provide for ventilation** where possible through use of natural ventilation, utilizing temporary heat and enclosures and openings to effect needed movement of air. Where necessary, install temporary fans or blowers to provide ventilation of construction spaces. Where necessary, operate units with filters and baffles to avoid distribution of dust and fumes and to minimize deleterious effects upon work. Equip portable ventilating fans with suitable safety guards.

4. **Temporary Telephones**: Provide cellular service to the contractor's site superintendent.

5. **Water Service**: Water will be provided for project use by the Government at existing sources. Provide temporary piping, connections, maintenance and other work required to deliver water required for the project.

6. **Temporary Sanitary Facilities**: Use of public toilet facilities and drinking water fixtures throughout the buildings will be permitted, provided these facilities are properly maintained in a condition acceptable to the Government. Do not clean tools or equipment in building toilet rooms.

7. **Temporary Fire Protection**: Until fire protection needs may be fulfilled by permanent facilities, install and maintain temporary fire protection facilities of the types needed to adequately protect against reasonably predictable and controllable fire losses. Comply with applicable recommendations of NFPA Standard 10 "Standard for Portable Fire Extinguishers". Locate fire extinguishers where they are most convenient and effective for their intended purpose, but provide not less than one extinguisher on each floor at or near each usable stairwell. Store combustible materials in clearly-labeled containers in recognized fire-safe locations.

   a. **Develop and supervise** an overall fire prevention and first aid fire protection program for personnel at the project site.
   b. **Provide type "A" fire extinguishers** for temporary offices and similar spaces where there is minimal danger of electrical or grease-oil-flammable liquid fires.
   c. **Maintain an adequate safeguard** on the site for a period of thirty (30) minutes following the cessation of welding or burning operations, including but not limited to after completion of work at end of shift, lunch breaks and temporary work.
   d. **Where temporary water outlets** are available, provide hoses of sufficient length to reach construction areas. Hang hoses with a warning sign, to the effect that hoses are for fire protection purposes and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.
   e. **At the earliest feasible date** in each area of the project, complete installation of the permanent fire protection facility, including connected services, and place into operation and use. Instruct key personnel at the site on how to use facilities which may not be self-explanatory.

E. **Temporary Construction and Support Facilities**:

1. **Storage and Fabrication Sheds**: Provide a reasonably neat and uniform appearance in temporary construction and support facilities acceptable to the Architect. For temporary fabrication shops, storage sheds and similar construction, provide either standard prefabricated or mobile units or the equivalent job-built construction. Provide support facilities that can be maintained properly throughout their use at the project site.

   a. **Provide fire-resistant construction** for sheds at approved located within the construction work area, or within 50 feet of building lines.
   b. **Locate** storage and fabrication sheds and other support facilities for easy access to the Work within the allocated staging area so that facilities will not block required exits or firemen's access to the building.
   c. **Except as otherwise indicated**, make the change-over from use of temporary services and facilities to use of permanent services and facilities at the earliest feasible date at each portion of the building, to minimize hazards and interferences with performance of the Work.
   d. **Maintain** storage and fabrication sheds, waste collection and disposal systems, and project identification and temporary signs until near final acceptance. Immediately prior to final acceptance, with the Architect's approval, remove these facilities.

2. **Field Offices**: The AOC can offer no area for a construction office at this time and a project trailer is not permitted within the Capitol complex. The Contractor is required to accommodate administrative functions off-site.
3. **Storage and Fabrication Sheds**: Coordinate with the LOC Superintendent the size and installation of storage and fabrication sheds, furnished and equipped, as required to accommodate the Work. Comply with applicable provisions specified elsewhere for distribution and use of temporary utilities.
4. **Temporary Enclosures**: At the earliest practical time, provide temporary enclosure of materials, equipment, work in progress and completed portions of the Work to provide protection to the Work and employees from effects of exposure, foul weather, other construction operations, and similar activities on the site.

   a. **Provide temporary** enclosures where temporary heat is needed and the permanent building enclosure is not yet completed, and there is no other adequate provision for containment of temporary heat. Coordinate enclosures with ventilation and material drying or curing requirements to avoid dangerous conditions and effects.

5. **Temporary Partitions:** Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.

   a. **Construct dustproof**, floor-to-ceiling partitions of not less than nominal 4-inch (100-mm) studs, 2 layers of 6-mil (0.14-mm) polyethylene sheets, inside and outside temporary enclosure. Cover floor with 2 layers of 6-mil (0.14-mm) polyethylene sheets, extending sheets 18 inches (460 mm) up the side walls. Overlap and tape full length of joints. Cover floor with 3/4-inch (19-mm) fire-retardant plywood.

      1) **Construct a** vestibule and airlock at each entrance to temporary enclosure with not less than 48 inches (1219 mm) between doors. Maintain water-dampened foot mats in vestibule.

b. **Insulate partitions** to provide noise protection to occupied areas.
c. **Seal joints** and perimeter. Equip partitions with dustproof doors and security locks.
d. **Protect air-handling** equipment.
e. **Weatherstrip** openings.

6. **Construction Aids**: Design, construct, and maintain construction aids and miscellaneous general services and facilities as needed to accommodate performance of the work. Construction aids and miscellaneous general services and facilities include, but are not limited to the following:

a. **Provide temporary stairs** where ladders are not adequate for performance of work, and until permanent stairs are available. Cover finished permanent stairs which will be exposed to occupants' use, with a durable protective covering of plywood or similar material so that finishes will be undamaged at the time of acceptance.
b. **Provide scaffolds** as required for proper execution of the Work. Remove or relocate scaffolds promptly to avoid interference with other trades. Provide stairs for vertical circulation.
c. **Provide adequate guardrails and barriers** at perimeters of each level of construction as work progresses in accordance with District of Columbia requirements and in conformance with requirements of the Special Conditions.
d. **Provide adequate facilities** for hoisting materials and employees. Do not permit employees to ride hoists which comply only with requirements for hoisting materials. The Contractor is responsible for selection of type, size and number of facilities. Truck cranes and similar devices used for hoisting are considered as being "tools and equipment" and not temporary facilities.
e. **Chutes**: Do not permit free dropping of materials, rubbish or debris, but remove by use of material hoist and/or rubbish chute. Locations of all hoists and chutes are subject to approval by the Architect.

1. **Protect building** from use of hoists and chutes to prevent damage, marring or staining of permanent work. Brace and guy securely and provide safety devices as required by code.

7. **Project Signage**: No signs, other than safety signs, may be erected on the site unless specifically indicated otherwise.

F. **Security and Protection Facilities**: Provide and maintain all necessary barricades, lights, and other safeguards for the protection of Members of Congress, Government employees, Contractor's employees and the general public from injury. Protect materials and work on the site, whether incorporated in the work or not, against damage or loss from any cause.

1. **Protect all** electric, telephone, water, gas, sewer, steam, and other underground utility lines in sidewalks, streets or other areas, in, under or around the site, to the satisfaction of the Architect, the District of Columbia, and other authorities having jurisdiction. Prior to commencing work which may affect or disturb underground utilities, consult with the Architect.
2. **Provide a reasonably neat** and uniform appearance in security and protection facilities acceptable to the Architect.

3. **Except for utilization** of permanent fire protection facilities, as soon as available in each area, do not change over from use of temporary security and protection facilities to use of permanent facilities until near final acceptance, or for longer periods of time as requested by the Architect.
4. **Barricades and Fences**: Comply with recognized standards and code requirements for the erection of substantial, structurally adequate barricades where needed to prevent accidents and losses. Paint with appropriate colors, graphics and warning signs to inform personnel at the site and the public, of the hazard being protected against. Provide lighting where appropriate and needed, including flashing red lights where appropriate.

    a. **Should fencing be necessary** to enclose a work area or to protect from public entry, provide open-mesh, chain-link fencing with posts set in a compacted mixture of gravel and earth. Provide No.11-gage galvanized chain link fabric fencing 8 feet high with galvanized barbed wire top strand and galvanized steel pipe posts, 1-1/2" I.D. for line posts, and 2-1/2" I.D. for corner posts. Provide keys to all locked gates to the USC/LOC Police.

G. **Temporary Controls**:

1. **Traffic Control**: Plan vehicular access methods, locations and timing of deliveries in a manner to minimize interference with street and pedestrian traffic and to conform to District of Columbia regulations. Do not block or obstruct public streets, driveways and walkways adjacent to the site at any time during performance of the work without proper authorization. Do not permit trucks of any kind to use existing sidewalks without prior authorization of the Architect.
2. **Collection and Disposal of Wastes**: Establish a system for daily collection and disposal of waste materials from construction areas and elsewhere on the site. Enforce requirements strictly. Do not hold collected materials at the site longer than 7 days during normal weather or 3 days when the daily temperature is expected to rise above 80 deg. F (27 deg. C). Handle waste materials that are hazardous, dangerous, or unsanitary separately from other inert waste by containerizing appropriately. Dispose of waste material in a lawful manner.

    a. **Burying or** burning of waste materials on the site will not be permitted.
    b. **Washing waste** materials down sewers or into waterways will not be permitted.
    c. **Provide rodent** proof containers located on each floor level of construction work, to encourage depositing of garbage and similar wastes by construction personnel.

3. **Janitorial Services**: Provide daily janitorial services for temporary offices, first aid stations, wash facilities, lunchrooms and similar areas. Require users of other temporary facilities to help maintain a clean and orderly premises.
4. **Dust Control**: During periods of construction activity creating dust conditions sprinkle periodically the site areas disturbed by Contractor's operation or treat with dust suppressors to control dust. Dry power brooming will not be permitted. Use vacuuming, wet mopping, wet sweeping or wet power brooming. Air blowing will be permitted only for cleaning non-particulate debris. Use only wet cutting procedures for unit masonry and concrete.
5. **Noise Control**: Avoid the use of tools and equipment that produce harmful noise. Restrict the use of noise making tools and equipment to hours of use that will minimize noise complaints from persons or firms near the project site.

6. **Environmental Protection**: Provide general protection facilities, operate temporary facilities, conduct construction activities, and enforce strict discipline for personnel on the site in ways and methods that comply with environmental regulations, and that minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result from the performance of work at the site.

H. **Installation, Operation, Termination and Removal**: Use qualified tradesmen for installation of temporary services and facilities. Locate temporary services and facilities where they will serve the entire project adequately and result in minimum interference with the performance of the Work.

1. **Supervision**: Limit availability of temporary services and facilities to essential and intended uses to minimize waste and abuse. Do not permit temporary installations to be abused or endangered. Do not allow hazardous, dangerous or unsanitary conditions to develop or persist on the project site.
2. **Maintenance**: Operate and maintain temporary services and facilities in good operating condition throughout the time of use and until removal is authorized. Protect from damage by freezing temperatures and similar elements.
3. **Termination and Removal**: Unless the Architect requests that it be maintained for a longer period of time, remove each temporary service and facility promptly when the need for it or a substantial portion of it has ended, or when it has been replaced by the authorized use of a permanent facility, or no later than substantial completion. Repair damaged work, clean exposed surfaces and replace work which cannot be satisfactorily repaired. Contract time includes the time required for final cleanup of premises.

a. **Immediately prior to final acceptance**, clean and renovate permanent services and facilities that have been used to provide temporary services and facilities during the construction period.
b. **Restoration of Site and Adjacent Areas** : Restore the site and the adjacent areas used for staging, traffic, protection and storage of materials to their conditions prior to start of work. This includes, but is not limited to all site improvements, signage, lighting, street furniture, paving, sprinkler systems, utilities, plant, trees and turf materials. Procedures which may be required include de-compaction of compacted soils, addition of soil amendments, aeration, re-grading and removal of contaminated materials or other procedures as may be necessary.

1.8 **PRODUCTS**:

A. **General**: Refer to clause, "Materials and Workmanship," of the GENERAL CONDITIONS. After execution of the Contract, the Contractor's requests for changes in the products, materials, equipment and methods of construction required by the Contract Documents are considered requests for "contract modifications," and are subject to the requirements specified in Architect of the Capitol, "AOC52.243-1, Changes-Supplement (June 2004)." Revisions to the contract documents, where requested by the Architect are considered as "changes" not substitutions.

B. **Quality Assurance**: Compatibility of products is a basic requirement of product selection. When the Contractor is given the option of selecting between two or more products for use on the project, the product selected must be compatible with other products previously selected, even if the products previously selected were also Contractor options. The complete compatibility between various choices available to the Contractor is not assured by the various requirements of the Contract Documents, but must be provided by the Contractor. Provide a

single product for each required product selection, regardless of whether that product selection is provided by more than one sub-contractor. Do not alter product brands or series for a given product selection during the life of the contract without written approval of the Architect.

1. **Source Limitations**: To the fullest extent possible and subject to the restrictions of the "Buy American Act," provide products of the same generic kind, from a single source, for each unit of work.

C. **Product Delivery, Storage, and Handling**: Deliver, store, and handle products in accordance with manufacturer's recommendations, using means and methods that will prevent damage, deterioration and loss, including theft. Control delivery schedules to minimize long-term storage at the site and to prevent overcrowding of construction spaces, and to ensure minimum holding or storage times for items known or recognized to be flammable, hazardous, easily damaged, or sensitive to deterioration or loss.

1. **Deliver products** to the site in the manufacturer's sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, ventilating, and installing.
2. **Store products** at the site in a manner that will facilitate inspection and measurement of quantity or counting of units, and in conformance with manufacturer’s instructions.
3. **Store heavy materials** away from the project structure in a manner that will not endanger the supporting construction.

D. **General Product Compliance**: Requirements for individual products are indicated in the Contract Documents; compliance with these requirements is in itself a contract requirement. These requirements may be specified in any one of several different specifying methods, or in any combination of these methods.

1. **Procedures for Selecting Products**: The Contractor's options in selecting products are limited by requirements of the Contract Documents and governing regulations. They are not controlled by industry traditions or procedures experienced by the Contractor on previous construction projects.

   a. **Performance Specification Requirements**: Where the specifications require compliance with indicated performance requirements, provide products that comply with the specific performance requirements indicated, and that are recommended by the manufacturer for the application indicated. The manufacturer's recommendations may be contained in published product literature, or by the manufacturer's individual certification of performance. General overall performance of a product is implied where the product is specified for specific performances.
   b. **Compliance with Standards, Codes and Regulations**: Where the specifications require only compliance with an imposed standard, code or regulation, the Contractor has the option of selecting a product that complies with specification requirements, including the standards, codes and regulations.

E. **General Product Requirements**: Provide products that comply with the requirements of the contract documents and that are undamaged and, unless otherwise indicated, unused at the time of installation. Provide products that are complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.

1. **Provide products** that are essentially the standard catalogued products of manufacturers regularly engaged in production of such products and that are the manufacturer's latest standard design that complies with the specification requirements. Equipment shall essentially duplicate items that have been in satisfactory commercial and industrial use at least two years, or more if otherwise specified, prior to bid opening; or in lieu thereof shall have been used and operated in a test installation which, in the opinion of the Architect, duplicate its field performance for the same period of time. The Architect reserves the right to require the Contractor to submit evidence to this effect for his approval. When two units of the same class of equipment are required, these units shall be the product of a single manufacturer; however, the component parts of the system need not be the products of the same manufacturer.
2. **Provide standard**, domestically produced products for which the manufacturer has published assurances that the products and its parts are likely to be available to the Government at a later date.
3. **Nameplates**: Except as otherwise indicated for required labels and operating data, do not permanently attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view either in occupied spaces or on the exterior of the completed project.

F. **Installation of Products**: Except as otherwise indicated in individual sections of these specifications, comply with the manufacturer's instructions and recommendations for installation of the products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other work. Clean exposed surfaces and protect surfaces as necessary to ensure freedom from damage and deterioration at time of acceptance.

1.9 **PROJECT CLOSEOUT**:

A. **Definitions**: “Project Closeout” is the term used to describe certain collective project requirements, indicating completion of the work that are to be fulfilled near the end of the Contract Time in preparation for final acceptance and occupancy of the Work by the Government, as well as final payment to the Contractor and the normal termination of the Contract.

1. **Time of closeout** is directly related to "Final Acceptance." Therefore, the time of closeout may be either a single time period for the entire Work or a series of time periods for individual elements of the Work that have been certified as substantially complete at different dates. This time variation, if any, shall be applicable to the other provisions of this Division.

B. **Final Cleaning**: Special cleaning requirements for specific units of Work are included in the appropriate sections of Division 2 through 16. General Cleaning during the regular progress of the Work is required by the GENERAL CONDITIONS and is included under Article "Temporary Facilities and Controls".

1. **Cleaning**: Provide final cleaning of the Work at the time indicated. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of work to the condition expected from a normal, commercial building cleaning and maintenance program. Comply with the manufacturer's instructions for operations.

    a. **Complete the following** cleaning operations before requesting the Architect's inspection for Final Acceptance.
    b. **Remove labels** which are not required as permanent labels.
    c. **Clean transparent materials**, including mirrors and glass in doors and windows, to a polished condition. Remove putty and other substances which are noticeable as vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
    d. **Clean exposed** exterior and interior hard-surfaced finishes to a dust-free condition, free of dust, stains, films and similar noticeable distracting substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.
    e. **Wipe surfaces** of mechanical and electrical equipment clean. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
    f. **Clean the project site**, of rubbish, litter and other foreign substances. Sweep paved areas to a broom clean condition; remove stains, spills and other foreign deposits.

2. **Compliance**: Comply with safety standards and governing regulations for cleaning operations. Remove waste materials from the site and dispose of in a lawful manner.

    a. **Where extra materials** of value remaining after completion of associated work have become the Government's property, salvage or dispose of these materials to the Government's best advantage as directed.

C. **Record Document Submittals**: Specific requirements for record documents are indicated in the individual sections of these specifications. Other requirements are indicated in the GENERAL CONDITIONS. General submittal requirements are indicated in the various "Submittals" articles of individual sections of the Project Manual.

1. **Do not use** record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Architect's reference during normal working hours.
2. **Record Documents**: Maintain a record set of blue or black line white-prints of contract drawings and shop drawings in a clean, undamaged condition. Mark-up the set of record documents to show the actual installation where the installed work varies substantially from the work as originally shown. Mark whichever drawing is most capable of showing the actual "field" condition (“as-built” condition) fully and accurately; however, where shop drawings are used for mark-up, record a cross-reference at the corresponding location on the working drawings. Give particular attention to concealed work that would be difficult to measure and record at a later date.

    a. **Mark record sets** with red erasable pencil and, where feasible, use other colors to distinguish between variations in separate categories of work.
    b. **Note related** change-order numbers where applicable.

c. **Organize record drawing sheets** into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.

d. **Materials and Tools**: Refer to individual sections of the Project Manual for required quantities of spare parts, extra and overrun stock, maintenance tools and devices, keys, and similar physical units to be submitted.

D. **Maintenance Manuals**: Refer to Section 14501, Subsection 1.8.8.11 for requirements. Organize operating and maintenance data into suitable sets of manageable size.

E. **Warranties and Bonds:** At Final Completion compile two copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. **Bind warranties** and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2" by 11" paper.

a. **Provide heavy** paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer.

b. **Identify each** binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS," the Project title or name, project number, and the name of the Contractor.

2. **When operating** and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

F. **General Operating and Maintenance Instructions**: Arrange for each installer of operating equipment and other work that requires regular or continuing maintenance, to meet at the site with the Government's personnel to provide necessary basic instruction in the proper operation and maintenance of the entire Work. Where installers are not experienced in the required procedures, include instruction by the manufacturer's representatives.

G. **Closeout Submittals:** Prior to requesting Final Inspection, submit the following:

1. Project Record Documents, properly annotated and in the format required.
2. Copies of Warranties and Bonds.
3. Operation and Maintenance data.
4. All required operating or special tools required in individual sections.
5. All required keys and keying schedules.

H. **Prerequisites to Final Acceptance**: Complete the following before requesting the Architect's final inspection for certification of final acceptance, and final payment as required by the GENERAL CONDITIONS. List known exceptions, if any, in the request.

1. **Submit the final payment** request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
2. **Submit an updated final statement**, accounting for final additional changes to the Contract Sum.
3. **Submit a certified copy** of the Architect's final punch-list of itemized work identified to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance and has been endorsed and dated by the Architect.
4. **Submit final meter readings for utilities**, a measured record of stored fuel, and similar data either as of the date of substantial completion, or else when the Government took possession of and responsibility for corresponding elements of the Work.
5. **Submit** consent of surety.

I. **Reinspection Procedures**: The Architect will reinspect the Work upon receipt of the Contractor's notice that the work, including punchlist items resulting from earlier inspections, has been completed, except for these items whose completion has been delayed because of circumstances that are acceptable to the Architect.

J. **Removal of Protection**: Except as otherwise indicated or requested by the Architect, remove temporary protection devices and facilities which were installed during the course of the work to protect previously completed work during the remainder of the construction period.

END OF SECTION 01000

SECTION 01270 - UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for unit prices.

1.3 DEFINITIONS

A. Unit price is an amount proposed by bidders/offerors, stated on the Bid Schedule, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: Methods of measurement and payment for unit prices are specified in the GENERAL CONDITIONS AND/OR SUPPLEMENTARY CONDITIONS.

C. The Architect reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at the Architect's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A list of unit prices is included in Part 3.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF UNIT PRICES

A. Unit Price No. 1: Modification of Guardian Bars

1. Description: The operation of the existing guardian bars will be modified so that, when an over height tote is detected, system workstations will inform the system operators unambiguously of such an event. A number of new guardian bars will be installed in key places, as identified in section14503, Control Requirements.
2. Unit of Measurement: Guardian Bar, 1 unit assembly

B. Unit Price No. 2: Photoelectric Eyes

1. Description: Modify/replace/add photoelectric eyes as required to be compatible with the new ABCS controls system. Identify if units are part of wholesale replacement as permanent change of system or as needed to supplement existing system.
2. Unit of Measurement: Photoelectric Eye, 1 unit assembly

C. Unit Price No. 3: Microswitches

1. Description: Modify/replace/add microswitches to be compatible with new ABCS controls system.
2. Unit of Measurement: Microswitch, 1 unit assembly

D. Unit Price No. 4: Motor Controllers

1. Description: Modify or replace motor controllers to be compatible with new ABCS controls system.

2. Unit of Measurement: Motor Controller, 1 unit assembly

E. Unit Price No. 5: Totes

1. Description: Provide additional totes, including lids, ID labels, and related items.
2. Unit of Measurement: 50 totes

END OF SECTION 01270

SECTION 01546 - SAFETY AND HEALTH

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. **General:** This section, general in nature, is applicable to all work performed under this contract and identifies some of the precautions necessary to protect the safety and health of employees, visitors, occupants and contract employees, and to prevent the loss of or damage to property and the environment.

1. Note the Construction Contractor submittal requirements outlined in Part 1 paragraph "Submittals" of this Section.

1.2 REFERENCES:

A. **General:** The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. Exclusion of any specific regulations/standards required by Federal and/or local codes does not relieve the Contractor of their legal and contractual obligations to adhere to such requirements.

B. **National Standards / Code of Federal Regulations (CFRs):**

1. 29 CFR 1910 - OSHA Occupational Safety and Health Standards.
2. 29 CFR 1926 - OSHA Safety and Health Regulations for Construction.
3. 40 CFR Parts 700-799, Subchapter R - Toxic Substance Control Act (TSCA).
4. 40 CFR Parts 50-99, Air Programs.
5. 40 CFR Parts 260-299, Hazardous Waste Management System (radionuclides).
6. 40 CFR Part 761 - Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions.
7. 40 CFR Parts 104-140 and 401-471, Water Programs.
8. DOT Manual of Uniform Traffic Control Devices.
8. Americans with Disabilities Act (ADA), current with updates.

C. **Related Building and System Codes:**

1. International Building Code (IBC), 2003.
2. International Existing Building Code (IEBC), 2003.
3. National Fire Code - NFPA 101, 2003.
4. International Electrical Code, 2003; and related NEMA, NECA, and UL Standards.
5. International Mechanical Code, 2003.
6. International Plumbing Code, 2003.

D. **Federal Standard 313A - Material Safety Data Sheets, Preparation and Submission.**

E. **Related** District of Columbia, state, and local regulations shall apply.

1.3 DEFINITION OF HAZARDOUS MATERIALS:

A. **General:** Refer to hazardous and toxic materials/substances, Subparts H and Z of 29 CFR 1910 and related parts of 29 CFR 1926; 40 CFR 261; and to others as defined in Federal Standard 313.

B. **Those hazardous materials** most commonly encountered can include pesticides, cleaning agents, paints, adhesives, strippers, solvents, asbestos, polychlorinated biphenyls (PCB's), mercury vapor lamps, but may include others. Any unlabeled substance should be handled as hazardous material until properly identified.

C. **All suspect asbestos containing materials** (e.g., boiler insulation, duct insulation, pipe insulation), surfacing materials (i.e., plaster and sprayed-on fireproofing) and miscellaneous materials (i.e., asphalt flooring, ceiling tiles, adhesives and mastics, drywall, roofing, gaskets and cement board), must be considered asbestos containing unless proven otherwise in accordance with 29 CFR 1926.1101.

D. **Pre-1978 Surfaces:** All finished/painted surfaces of buildings constructed prior to 1978 shall be considered finished with lead based paint unless proven otherwise.

E. **Products likely to contain PCB's** include electrical transformers, capacitors, voltage regulators, oil switches, and some fluorescent light ballasts. Transformer vaults with PCB contaminated floors are identified by signage at the entry door (refer to Part 3 of this Section, article “Cautionary Procedures at Existing Vaults”).

F. **Products likely to include mercury** include fluorescent light tubes, switches, gauges, thermostats, and older thermometers.

1.4 QUALITY ASSURANCE:

A. **Pre-Construction Safety Meeting:** Representatives of the Contractor must meet with the Contracting Officer and his/her representative(s) prior to the start of work under this contract. The purpose of the pre-construction meeting is to review the Contractor's Safety and Health Program and Policies, and to discuss the implementation of all safety and health provisions pertinent to the work to be performed under the contract. The Contractor shall be prepared to discuss, in detail, the measures he/she intends to take in controlling any unsafe or unhealthy conditions associated with the work to be performed under the contract. If directed by the Contracting Officer, this meeting may be held in conjunction with other pre-construction meetings such as the General Pre-Construction meeting. The level of detail of the safety meeting is dependent upon the nature of the work and the potential inherent hazards. The Contractor's principal on-site representative(s), the general superintendent and his/her safety representative(s) shall be in attendance.

B. **Compliance With Regulations:** All work, including contact with and handling of hazardous materials, the disturbance or dismantling of structures containing hazardous materials, and/or the transport and disposal of hazardous materials shall comply with the applicable requirements of 29 CFR 1910/1926, and all applicable federal, state, and local regulations.

1. **Asbestos or Lead Containing Materials:** The contractor shall work in the area where asbestos or lead is encountered and notify the Architect immediately.
2. **Site Lighting:** Lighting intensity levels for construction areas shall meet the minimum requirements established by 29 CFR 1926.56: Illumination, including *Table D-3 - Minimum Illumination Intensities in Foot-Candles*.

C. **Compliance/Conflicts:** All work shall comply with applicable Federal, state and local safety and health requirements. Where there is a conflict between applicable regulations, the most stringent shall take precedence.

D. **Contractor Responsibility:** All Contractors shall assume full responsibility and liability for compliance with applicable regulations pertaining to the health and safety of personnel during the execution of work, and shall hold the Government harmless for any action on his/her part, or that of his/her employees or subcontractors, which results in illness, injury or death. The Contractor shall designate a single point-of-contact who is authorized to act on behalf of the contracting firm, authorized to take immediate corrective actions, and assigned the task of daily inspections and reporting outlined herein. Construction Contractors shall comply with the following additional requirements in accordance with 29 CFR 1926.16 (Prime/Subs):

1. Compliance with the accepted Accident Prevention Plan written by the prime Contractor for the specific work, submitted to the government, and reviewed by the COTR. The Contractor's plan will be job specific and will include work to be performed by the subcontractors, and measures to be taken by the Contractor to control hazards associated with materials, services, or equipment provided by suppliers.
2. Regularly scheduled safety meetings shall be held at least once a week for all supervisors on the project to review past activities, to plan ahead for new or changed operations, and to establish safe working procedures for the anticipated hazards. An outline of each meeting shall be submitted through the COTR to the Contracting Officer.
3. At least one "toolbox" safety meeting shall be conducted weekly by field supervisors or foreman for all workers. An outline report of the meeting, including date, time, duration, attendance, subjects discussed and the name of the director shall be maintained and copies furnished to the designated authority on request.

1.5 SUBMITTALS:

A. **Submittal "Punch-List:"** A submittal punch list for projects involving "other" hazardous materials as identified in the Construction Contractor's Safety and Health Program and Policies (paragraph B, below) and/or other recognized flammable or toxic products identified in the referenced codes/standards.

B. **Contractor's Safety and Health Program and Policies:** Submit a Plan of Action for handling hazardous materials (except for asbestos, lead based paint, PCBs and mercury lamps as they are covered by specific sections) and/or flammable or toxic products. Work shall not commence until the Contractor's safety program has been reviewed by the Architect. The Construction Contractor's Plan of Action shall contain the following:

1. Activity Hazard Analysis and Accident Prevention Plan: Identification of anticipated hazards, problems, and proposed mitigation measures/mechanisms.
2. Description of how applicable safety and health regulations and standards are to be met.

3. Protection of the public or others not related to the operation. Maintain code-compliant means of egress for project duration.
4. Means of protection for adjacent non-construction areas, permanent and temporary access ways, and occupants and for controlling noise/dust/fumes/debris generated by the work.
5. Contractor Safety Officer: Identify a lead Safety Officer and alternates, including 24-hour contact information for each.
6. Specialized training and experience of employees to be used for the work.
7. Type of protective equipment and work procedures to be used.
8. Material Safety Data Sheets (MSDSs) for, and proposed procedures for using, disposing of, or storing toxic/hazardous materials (also see 29 CFR1910.1200). All management and disposal of wastes shall be in accordance with Federal, states and local regulations.
9. Phasing requirements to minimize impact to non-construction work activities.
10. Emergency procedures for handling accidental spills, releases or potential exposures.
11. Interfacing of trades and control of subcontractors, if applicable.
12. Identification of any required analyses, test demonstrations, and validation requirements.
13. Methods of certification for compliance.
14. Hazard Communications Plan.
15. Trenching and Shoring Plan.
16. Confined Spaces employee certifications and related work procedures.
17. Multi-Employer Worksite Plan.
18. Demolition plans outlining protective measures and responsibilities required under 29 CFR 1926, Subpart T.

C. **Accident Reporting:** Serious accidents such as those resulting in: treatment of an injury at a medical facility; response by emergency medical personnel; or damage to property other than that of the Contractor will be reported to the contracting officer's representative by telephone within twenty-four hours of the occurrence. A copy of each accident report, which the Contractor or subcontractors submit to their insurance carriers, shall be forwarded through the Contracting Officer's Technical Representative (COTR) to the Contracting Officer (CO) as soon as possible (in no event later than seven (7) calendar days after the occurrence). All accidents/losses shall be reported using AOC “Incident Investigation Report” (from AOC Safety Policy 9-4, available from the COTR) or other form that meets OSHA Standards, as required. Any incident involving fatality or permanent total disability, or property damage to the Government or other property amounting to $100,000 or more requires immediate notification of the AOC Safety and Occupational Health Branch (SOHB).

D. **MSDSs:** The Contractor shall provide copies of each MSDS, in accordance with 29 CFR 1910.1200 - *App E* and with AOC 52.223-1. One copy shall be provided to the COTR per Division 1 submittal requirements, and a second copy shall be kept in an MSDS binder on the job site.

E. **Waste Disposal:** The Contractor shall dispose of all wastes and provide all paperwork, including but not limited to, manifests and disposal certifications, in accordance with all federal, state, and local regulations. The AOC shall sign manifests, certifications, and shipping records for hazardous materials generated from this contract.

F. **Hot Work Permits:** When coordinating with the AOC’s jurisdiction Superintendent for hot work, submit AOC designated “Hot Work Permit” (from AOC Safety Policy 10-14, available

from the COTR) or other form that meets OSHA Standards, as required.

G. **Worker Certifications:** The Contractor shall provide copies of all worker certifications for handling Hazardous Materials, Working in Confined Spaces, and other certifications required by OSHA, EPA, and local regulatory agencies (not required by other technical sections in the Project Manual).

H. **Scaffolding:** All scaffolding that is erected on this job will be erected in accordance with the requirements of 29 CFR 1926, Subpart L -- *Scaffolds*. Per OSHA Standards, a scaffold erection plan will be developed by the Contractor, certified by an engineer (licensed in the District of Columba, Virginia, or Maryland) and provided to the CO prior to set up. Once in place, the Contractor's assigned safety officer shall inspect and document the conditions of the scaffold and scaffold anchor points prior to use, and once per shift thereafter. Any observed failures in the scaffold shall render it unusable until the condition is rectified and re-inspected. Weekly scaffold inspection reports shall be provided to the designated COTR for inclusion in the contract records.

1. **Other Means of Access:** Should the Contractor employ other means of access to the work area, they shall be utilized in accordance with the requirements of 29 CFR 1926, Subpart N -- *Cranes, Derricks, Hoists, Elevators, and Conveyors*. The Contractor shall submit a plan for use of such equipment, fully coordinated with any other plans for site facilities (i.e., scaffolding, staging, etc.).
2. **Scaffolding constructed** by the Contractor for use by AOC employees shall also comply with 29 CFR 1910.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT:

A. **Special facilities**, devices, equipment, clothing, and similar items used by the Contractor in the execution of work shall comply with all applicable regulations. Such materials and equipment shall be identified in the Plan of Action called for herein.

2.2 MATERIAL SAFETY DATA SHEETS (MSDSs):

A. **MSDSs** shall be available on-site for all products used under this contract. The prime contractor is responsible for meeting the hazard communication requirements, in accordance with 29 CFR 1910.1200. To the extent feasible, non-flammable and non-toxic products shall be used.

PART 3 - EXECUTION

3.1 CAUTIONARY PROCEDURES AT EXISTING VAULTS:

A. **General:** Transformer vaults may have floors which are PCB contaminated. These vaults are generally marked by blue signs, which identify the vault as PCB-contaminated; assure all vaults are marked with blue signs prior to proceeding with Work. On rare occasions, vault doors in existing buildings may be equipped with protective alarms and devices. Consult the AOC COTR to ascertain whether vault doors in areas under this contract are so equipped and have proper approved signage systems.

3.2 HAZARDOUS MATERIALS:

A. **General:** The Contractor shall bring to the COTR's attention, any material suspected of being hazardous which he/she encounters during execution of the work. The COTR shall then determine whether the Contractor shall perform tests to determine the nature or toxicity of the material. If the COTR directs the Contractor to perform tests, and/or if the material is found to be hazardous and additional protective measures are needed, a change to the contract may be required (subject to the "AOC AOC52.243-1, Changes-Supplement (June 2004). Persons conducting sampling testing and laboratories processing samples shall be certified.

3.3 CONFINED SPACES:

A. **Confined Spaces:** It is the responsibility of the AOC to identify and demarcate all known confined spaces within our facilities. It is the Contractor's responsibility to notify and coordinate with the Superintendent's Office when confined space work is to be done, obtain permission from this office to enter the space, conduct all required testing of space prior to entry, and complete an entry permit as required by OSHA regulations and the Confined Space Program previously submitted to the AOC COTR for the project.

3.4 PROTECTION:

A. **Contractor Responsibility:** The Contractor shall take all necessary precautions to prevent injury to the public, building occupants and visitors, and damage to or contamination of property or the environment. For the purposes of this contract, the public or building occupants shall include all persons not employed by the Contractor or subcontractor thereof.

B. **Welding, Cutting, and Brazing:** The AOC specifically requires a permit for welding, cutting, and brazing. This AOC "Hot Work Permit" shall be approved each day by the AOC Superintendent's Safety Specialist, or his/her designee, and coordinated through the Superintendent's Office whenever welding, cutting or any open flame work is performed. Work areas shall be kept clear of combustibles within a 35-foot radius of any hot work. Combustibles which cannot be removed shall be covered with flame-resistant blankets. Compressed gas cylinders shall be secured in a vertical position and stored in accordance with Compressed Gas Association (GSA) Guidelines at all times. Valve protection caps shall be in place whenever cylinders are not in use, moved or stored. Appropriate fire extinguishers shall be maintained at welding and cutting operations. A designated fire watch shall sign and return the permit. The fire watch shall be on duty during operations and for a minimum of 30 minutes after completion of welding or cutting operations to ensure no possibility of fire exists.

1. Provide adequate ventilation to protect employees from fume or gas exposure.
2. During arc welding activities erect screens to shield activities.

C. **Storage:** It is prohibited to store, position, or use equipment, tools, materials, scraps, and trash in a manner likely to present a hazard to the public or building occupants by its accidental shifting, ignition, or other hazardous qualities. Storing of combustible or flammable liquids shall be in accordance with the current edition of the National Fire Code for Flammable and Combustible Materials (NFPA 30). Compressed gases shall be stored in accordance with Compressed Gas Association (CGA) guidelines.

D. **Obstructions:** No corridor, aisle, stairway, door, or exit shall be obstructed or used in such a manner as to encroach upon routes of ingress or egress utilized by the public or building occupants, or to present an unsafe or unhealthy condition to the public or building occupants.

E. **Housekeeping:** Housekeeping practices shall be in conformance with OSHA 29 CFR 1910.22, 29 CFR 1910.141, 29 CFR 1910.1001, 29 CFR 1910.1025, 29 CFR 1926.25, 29 CFR 1926.62, and 29 CFR 1926.1101, for non-construction and construction contracts respectively.

F. **Protection of the Public and Federal Employees:** Work shall not be performed in any area occupied by the public or Federal employees unless the Contractor takes adequate steps for the protection of the public and Federal employees, and work is specifically permitted by the contract/COTR/jurisdiction Superintendent. Comply with requirements of ANSI A10.34.2001.

G. **Electrical Systems:** In addition to complying with the referenced standards in this Section, refer to Division 1 requirements for "Temporary Facilities and Controls." Provide compliant electrical supply, overload/ground fault protection, lighting, and signage/notification systems. Ensure that arrangements and installations accommodate the Architect's lockout/tagout procedures.

H. **Mechanical Systems:** Mechanical systems and equipment, and the components thereof, will be arranged and installed to provide ready accessibility and ease of lock/tag application during lockout/tagout procedures for AOC employees, post construction.

I. **Fences & Barricades:** The work area shall be fenced, barricaded, or otherwise segregated from the public or building occupants to prevent unauthorized entry into the work area. Fence elements shall be installed in such a manner as to overcome the negative or hazardous effects of wind and weather typical to the region. The use of barbed wire is prohibited unless requested in writing by the Architect.

J. **Pedestrian Access Ways:** All interior and exterior paths of travel established for pedestrian circulation within and around a construction site shall meet the requirements of 28 CFR Part 36 (*ADAAG*), Appendix A (Standards for Accessible Design), Articles 4.3 through 4.5; when a path is changed to accommodate work, the Contractor shall also provide directional signage in accordance with the Manual on Uniform Traffic Control Devices (MUTCD), 2003. All paths shall be maintained clear and level, without obstruction. Any proposed exceptions to these requirement must be approved in writing by the Architect prior to construction.

1. **Lighting:** All interior/exterior access ways, both permanent and temporary, shall be provided with a uniform minimum lighting level of 3 footcandles (fc) at the walking surface, in accordance with 29 CFR 1926.56(a), Table D-3 - *Minimum Illumination Intensities in Foot-Candles*.

K. **Alternate Precautions:** When the nature of the work prevents isolation of the work area and the public or building occupants may be in or pass through, under or over the work area, alternate precautions such as the posting of signs, warning lights, the use of signal persons, the erection of barricades or similar controls around particularly hazardous operations shall be approved and used.

L. **Work Over Thoroughfares:** When work is to be performed over a public thoroughfare such as a sidewalk, lobby, or corridor, the thoroughfare shall be closed, if possible, or other precautions taken such as the installation of screens or barricades. When exposure to falling objects exists, as during the erection of building walls or during demolition, special protection of the type detailed in 29 CFR 1910/1926 shall be provided.

M. **Temporary Construction Barriers:** Temporary construction barriers, partitions which cover a hole in a rated fire wall, protect occupants from noise or vibration, or separate the construction from public access and exit corridors shall be erected floor-to-ceiling, wall-to-wall, and shall remain in place for the duration of the contract. The minimum construction standards for these temporary barriers shall be metal studs, anchored top and bottom at a maximum spacing of 16 inches (406 mm) on-center, and covered with a minimum of one layer of ½-inch gypsum wallboard.

N. **Dust and Fume Control Measures:** Work performed adjacent to occupied areas shall be done within dust control barriers (generally constructed of polyethylene sheeting or other barriers as approved by the Architect). To the extent feasible, maintain the work environment at a negative pressure differential with the adjoining occupied areas. The use of fume and odor producing products and materials shall be done in such a manner, or at such a time as to minimize impact on building occupants. Provide measures to minimize migration of dust, fumes, gases, and similar affects into the adjacent areas. Ensure that adequate ventilation is provided to work areas in conformance with OSHA regulations.

O. **Roof Work:** During the performance of roofing work, employees will be protected as required by the OSHA standards contained in 29 CFR 1926 - subpart M “Fall Protection.” However, a safety monitoring system, as defined in 29 CFR 1926.502(h) is not an allowable option when working within six feet of the roofs edge or any opening. When working within six feet of the roof edge or an opening, the Contractor shall use a motion-stopping safety system(s), as defined in 29 CFR 1926.502(b through f); the selected system must be reviewed and approved by the Architect.

P. **Removal of Fences and Barricades:** Fences and barricades shall be removed upon completion of the project, in accordance with local ordinance and to the satisfaction of the Contracting Officer or his/her representative(s).

Q. **Completion of Work:** Do not create or leave hazards unabated (e.g., open or absent electrical panels, unmarked circuit breakers/fuses, faceplates missing from receptacles, open maholes, un-barricaded trenches/excavations, etc.).

END OF SECTION 01546

1 SUMMARY OF WORK / PROJECT REQUIREMENTS

1.1 GENERAL INFORMATION

1.1.1 Summary of Work

The goal of this project is to replace the current Automatic Book Conveyor System (ABCS) Controls for the "Blue Box" System. Such work is expected to encompass software development/customization as well as physical upgrades and/or changes to several system components to meet quality, performance, and code requirements. The following work items are to be included (refer to sequencing plan and drawings for additional information):

BASE BID: Development of ABCS controls system, including all software, hardware, and peripherals. Trial implementation and testing of control system on one vertical conveyor in the Madison building.

OPTION #1: Implementation of control system and physical upgrades to remainder of load/unload stations and horizontal/vertical conveyors in the Madison building (except those directly linked with SV-B). Work shall include all repair/replacement of mechanical and electrical components for the area of the work.

OPTION #2: Integration of control system and physical upgrades to load/unload stations and horizontal/vertical conveyors in SV-B of the Madison building. Work shall include all repair/replacement of mechanical and electrical components for the area of the work.

OPTION #3: Integration of control system and physical upgrades to load/unload stations and horizontal/vertical conveyors in the Jefferson building. Work shall include all repair/replacement of mechanical and electrical components for the area of the work.

OPTION #4: Integration of control system and physical upgrades to load/unload stations and horizontal/vertical conveyors in the Adams building. Work shall include all repair/replacement of mechanical and electrical components for the area of the work.

UNIT PRICES: Refer to Division 1 Section "UNIT PRICES" for a list of components which may require replacement in unknown quantities. Such components may include, but are not limited to, motor starters, totes, electronic eyes, etc.

Refer to Article 1.7, System Requirements, for a more detailed description of work.

1.2 QUALITY ASSURANCE

1.2.1 Federal Codes.

It is the Contractor's responsibility to be aware of, and in conformance with, all applicable Federal Codes. The engineering, manufacture, and installation of all work for this project shall conform to the listed or most current editions of the following:

A. American Institute for Conservation of Historic and Artistic Works
B. American Institute for Steel Construction
C. American Iron and Steel Institute
D. American Welding Society
E. National Electrical Contractors Association
F. The International Building Code, 2003 Edition
G. The National Electric Code, NFPA 70, 2003 Edition
H. National Fire Protection Association (NFPA)
I. The Occupational Safety and Health Act (OSHA)

1.2.2 Standards

1.2.2.1. Applicability of Standards

Except to the extent that more explicit or more stringent requirements are written directly into contract documents, applicable standards of the construction industry have the same force and effect (and are made a part of the contract documents by reference) as if copied directly into the contract documents, or as if published copies were bound herein, subject to the order of precedence previously stated.

A. **Publication Dates:** Comply with the standard listed in the AOC Design Standards. Where the date of issue of a referenced standard is not specified in the AOC Design Standards, then apply the code in effect as of the date of Contract Documents.
B. **Updated Standards**: At the request of the Architect, Contractor or authority having jurisdiction, submit a Change Order proposal where an applicable code or standard has been revised and reissued after the date of the Contract Documents and before performance of Work affected. The Architect will decide whether to issue a Change Order to proceed with the updated standard.

1.2.2.2 Conflicting Requirements

Where compliance with two or more standards is specified, and they establish different or conflicting requirements for minimum quantities or quality levels, the most stringent requirement will be enforced unless the Contract Documents indicate otherwise. Refer requirements that are different, but apparently equal, and uncertainties as to which quality level is more stringent to the Architect for a decision before proceeding.

A. **Minimum Quantities or Quality Levels**: In every instance the quantity or quality level shown or specified shall be the minimum to be provided or performed. The actual installation may comply exactly, within specified tolerances, with the minimum quantity or quality specified, or it may exceed that minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum values, as noted, or appropriate for the context of the requirements. Refer instances of uncertainty to the Architect for decision before proceeding.

1.2.2.3 Copies of Standards

Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entities' construction activity. Copies of applicable standards are not bound with the Contract Documents.

A. Where copies of standards are needed for performance of a required construction activity, the Contractor shall obtain copies directly from the publication source.
B. Although copies of standards needed for enforcement of requirements may be part of required submittals, the Architect reserves the right to require the Contractor to submit additional copies as necessary for enforcement of requirements.

1.2.2.4 Abbreviations and Names

Trade association names and titles of general standards are frequently abbreviated. Where acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards generating organization, authority having jurisdiction or other entity applicable to the context of the text provision. Refer to the "Encyclopedia of Associations," published by Gale Research Co., available in most libraries.

1.2.2.5 Proven Technology

It is the intention of the AOC to purchase modern, state-of-the-art equipment and systems, using proven technology. Equipment and systems that are in final engineering, research and development, beta test stages; or, that have not been in a daily production operation for a minimum of six (6) months as of the time of this project’s solicitation shall be considered as experimental and therefore shall not be acceptable.

1.2.3 AOC Standards and Procedures

The Contractor shall comply with the standards of the AOC in addition to the codes and standards previously stated. Refer to CD-ROMs (included with solicitation) of the *AOC A/E Design Manual* and the *AOC A/E Design Standards.*

1.3 PROJECT IMPLEMENTATION & SEQUENCING

Due to the size and complexity of the ABCS Controls System Replacement project, and the desire to maintain collection conveyance service to ongoing library operations while minimizing exposure to potential implementation problems, the AOC requires that the project be implemented in the sequences described as follows.

The plan outlined in this specification may be modified by the Contractor if changes will minimize impacts on Library operations or have other positive results; proposed modifications must be submitted in writing to the Architect for review and approval prior to sequencing plan implementation.

In the following description, only major events are discussed in order to describe the sequencing plan desired by the AOC; therefore all of the work is not described.

1.3.1 Sequence 1: Control System and Hardware Design (BASE BID)

During this phase, the ABCS Contractor will develop the ABCS controls system software and provide all associated computer hardware and peripherals. The Contractor shall design the new computer and control systems to support the entire ABCS. The system control workstation and operator station computer interface screens and ABCS configuration flexibility and internals shall be developed in their entirety.

The new hardware and software will be acceptance tested at Contractor facilities prior to implementation on-site at the LOC. Once the Contractor demonstrates that the ABCS prototype system is in compliance with the specifications and properly controls the prototype conveyor system, the AOC may authorize the start of Sequence 2.

Work to be performed in Sequence 1 includes the following:

A. Design and programming of ABCS Software (including Operating and Maintenance Software, and User Screens).
B. Design and manufacture of ABCS controls hardware (Central Control Computer, Servers, System Control Workstation computers, Operator Station computers, and PLC components).
C. Factory testing to demonstrate the following:

    1) Proper ABCS Central Control Computer operation, including security features.
    2) Proper operation of Building Servers.
    3) Proper operation of System Control Workstations.
    4) Proper ABCS Operator Station operation.
    5) Proper station-to-station routing.
    6) Proper conveyor control device operation.
    7) Proper reporting to the ABCS servers.
    8) Proper selective vertical conveyor operation.
    9) Proper operation of E-stops.

1.3.2 Sequence 2: Implementation of the ABCS on non-critical conveyor, SV-A (BASE BID)

In this phase, the implementation of the ABCS will begin in the Madison building of the LOC. The contractor will install the Central Control Computer, Madison Building Server, and the Shop and Office System Control Workstations without interfering with current system operations.

The initial field installation activities will be restricted to SV-A (Madison Building) while the Contractor proves the proper operation of the ABCS on this small initial implementation. This vertical conveyor has been identified as less critical to the ongoing daily operation of the book conveyor system and has been identified as available for the initial trial.

Normal operation shall continue on most of the current ABCS conveyor operating on the PDP-11 to provide service between 200 (Jefferson Control Room), SV-B/C/D in the Madison, and SV-E in Adams. The Madison loop and SV-B shall operate as normal with movements between B-25 and B-75 continuing as normal.

After the proper operation is proven on the initial vertical conveyor, the AOC may authorize the work of Sequence 3.

Work to be performed in Sequence 2 includes the following:

A. Install and test the Central Control Computer, Madison Building Server, EED Controls Shop System Control Workstation, and EED Controls Office System Control Workstation.
B. Implement the new ABCS controls on SV-A as an individual, stand-alone operating selective vertical conveyor.
C. Installation of conveyor workstation safety guards.
D. Installation of E-Stops serving vertical conveyor.
E. Procure and initiate use of new totes (500 quantity).
F. Demonstrate the following:

    1) Proper ABCS System Control Workstation (in the Madison Building) operation, including security features.
    2) Proper operation of Central Control Computer.
    3) Proper operation of Madison building server.
    4) Proper ABCS Operator Station operation.
    5) Proper station-to-station routing.
    6) Proper conveyor control device operation (with limited devices).
    7) Proper reporting to the ABCS servers.
    8) Proper selective vertical conveyor operation.
    9) Proper horizontal conveyor operation.
    10) Proper operation of E-stops.

1.3.3 Sequence 3: Madison Loop Integration (except SV-B) (OPTION No. 1)

In this phase the project implementation is expanded to include the remainder of the Selective Verticals in the Madison building (except SV-B), the Madison mail room, and the Madison loop conveyor working in integrated fashion on the new controls system.

Conveyor operation will continue for SV-B operating on the PDP- 11 as normal but will not exchange totes with the Madison loop conveyor. Movements on SV-B will be limited to those between B25 (BL-2) and B75 (BL-l and spiral P78A). Conveyors between 200 (Jefferson Control Room), and SV-E in the Adams will continue to operate as normal on the PDP-11. There will be no transfer of totes on the book conveyor system between the Jefferson and Madison building or between the Adams building and the Madison building due to the incompatible control systems.

Work to be performed in Sequence 3 includes the following:

A. Upgrade controls on the Madison Loop conveyors and the mail room conveyors (Operator Station 100).
B. Implementation of SV-A, SV-C, SV-D, BL-4 Station D-65, and Operator Station 100 (Mail Room) integrated to the Madison Loop.
C. Upgrade the conveyor between the Madison Loop and the Machine shop to the new controls system.
D. Installation of E-stops.
E. Expand use of new totes to integrated conveyors.
F. Demonstrate the following:

1) Proper ABCS System Control Workstation (in the Madison Building) operation, including security features.
2) Proper operation of the Central Control Computer.
3) Proper operation of the Madison building server.
4) Proper ABCS Operator Station operation.
5) Proper station-to-station routing.
6) Proper conveyor control device operation (with many devices).
7) Proper reporting to the ABCS servers.
8) Proper selective vertical conveyor operation.
9) Proper horizontal conveyor operation.
10) Proper operation of E-stops.

1.3.4 Sequence 4: Madison SV-B Integration (OPTION No. 2)

In this phase of work, SV-B and it’s associated conveyor which runs to B-25 and B-75 will be upgraded to the new controls configuration and integrated to the operating portion of the upgraded system.

The transport of collection material between the Law Library stacks (B-75) and the Law Library Reading Room is a critical function in the operation of the Library. The transport of material between these two areas shall remain operational for as long as possible, shall be interrupted for as short a period as possible, and shall be re-started after the upgrade as soon as possible to continue the transport of Law Library collection material. The upgraded system is now in productive operation and should not be arbitrarily interrupted

at this point.

Work to be performed in Sequence 4 includes the following:

A. Upgrade SV-B, the B25 conveyor, the B75 conveyor to the new controls system and associated horizontal system components.
B. Relocate electrical disconnects that are difficult to access on the B75 conveyor.
C. Install E-stops serving SV-B and the respective conveyor.
D. Install workstation safety guards.
E. Expand use of new totes to integrated conveyors.
F. Demonstrate the following:

1) Proper ABCS System Control Workstation (in the Madison Building) operation, including security features.
2) Proper operation of Central Control Computer.
3) Proper operation of Madison building server.
4) Proper ABCS Operator Station operation.
5) Proper station-to-station routing.
6) Proper conveyor control device operation (with many devices).
7) Proper reporting to the ABCS servers.
8) Proper selective vertical conveyor operation.
9) Proper horizontal conveyor operation.
10) Proper operation of E-stops.

1.3.5 Sequences 5: Jefferson Building Integration (OPTION No. 3)

In this sequence, the project implementation is expanded to include all controls as well as all mechanical and electrical components in the Jefferson building. Work is equal to that performed in the Madison building under work of Base Bid and Option Nos. 1 and 2.

At the completion of this sequence, identify all items to be removed under work of Sequence 6.

1.3.6 Sequence 6: Adams Building Integration and Project Completion (OPTION No. 4)

In this phase of work, the Adams building systems and any remaining areas of the ABCS Blue Box system will be upgraded and brought into operation under the new controls system. All components of the system will be fully commissioned and any items of the existing system which are no longer used shall be removed.

As an effort to minimize the extra expense for manual handling of library materials, the Conveyor path from the Jefferson building to the Adams building shall be left operational as long as possible. The Contractor shall perform as much preparation work as possible prior to shutting down operations on the Jefferson to Adams portion of the system conveyor for final tie-ins and other work.

Work to be performed in Sequence 6 includes the following:

A. Relocate inaccessible motor starters and disconnects in the Adams building; coordinate final locations with the Architect.

B. Upgrade the following to operate within the new controls system configuration:

1) Conveyor from Control Room to Machine Shop.
2) Machine Shop Loop Conveyor.
3) Conveyor from Machine Shop to SV-E in Adams.
4) SV-E in Adams.

C. Interconnection with operating portion of the system from Sequences 1 through 5.

D. Install galvanized, expanded metal machine screen guarding in the following locations:

1) Adams cellar stack elevator lobby.
2) Jefferson BL-6, ground floor.

E. Install E-stops serving Adams building system components.

F. Install workstation safety guards.

G. Finalize implementation of new totes for entire system; remove all old totes from the system and turn over to the Architect.

H. Demonstrate the following:

1) Proper ABCS Central Control Computer operation, including security features.
2) Proper operation of all Building Servers and System Control Workstations.
3) Proper ABCS Operator Station operation.
4) Proper operation of all building servers operation.
5) Proper station to station routing.
6) Proper conveyor control device operation (with all devices).
7) Proper reporting to ABCS servers.
8) Proper selective vertical conveyor operation.
9) Proper horizontal conveyor operation.
10) Proper operation of E-stops.

1.4 DOCUMENTATION CONFLICTS

Any conflicts between documents shall be immediately brought to the attention of the AOC.

1.5 *(Deleted)*

1.6 ACRONYMS

Acronym	Definition
ABCS	The current Automated Book Conveyor System in the Madison, Jefferson, and Adams buildings, referred to as the "Blue Box" system, and first supplied by ACCO as part of the original construction of the Madison Building. The appellation, Blue Box, arose out of the color of the totes used in the system. The name distinguishes the ABCS from older LOC conveyor (Gray Box) systems that use totes of the same shape but are gray in color; the Gray Box system is not included in this project.
ALDT	Administrative and Logistics Delay Time
AOC	Architect of the Capitol (aka 'Architect'). The OWNER of the Library of Congress book conveyor system.
APLO	Automation Planning and Liaison Office a division of the Library of Congress
BCD	Binary Coded Decimal
BCR	Bar Code Reader
BL	Branch Lift
CD	Cartridge Drive
CIU	Computer Interface Unit
CMD	Collection Management Division. A division of the Library of Congress
COA	Change Order Authorization
CPM	Critical Path Method
CPU	Central Processing Unit
CVL	Continuous Vertical Lift. A type of vertical conveyor
DEC	Digital Equipment Corporation
E-Stop	Emergency Stop
EED	Electronics Engineering Division. A division within the Department of Engineering of the Architect of the Capitol
FAT	Factory Acceptance Test
GUI	Graphical User Interface
I/O	Input/Output
ILS	Integrated Library System.
ITS	Information Technology Services. A governmental service group that provides data services to the Library of Congress
JAB	John Adams Building
JMB/JMMB	James Madison Memorial Building
LAN	Local Area Network
LOC	Library of Congress. The USER of the book conveyor system.

LOCIS	Library Of Congress Information System. The current system used at the Library of Congress for cataloging of library material.. To be replaced by the ILS.
MHC	Material Handling Consultant
MIS	Management Information Systems
MTBF	Mean Time Before Failure
NIST	National Institute of Standards and Technology
OT	Operating Time
P/D	Pick-up/Delivery Station
PC	Personal Computer
PCN	Part Control Number
PLC	Programmable Logic Controller
RAID	Redundant Array of Independent Disks
RF	Radio Frequency
RPM	Revolutions per minute
SIT	Site Integration Test
SQL	Structured Query Language
SR	Scheduled Route
SSR	Special Scheduled Route
ST	Standby Time
STDS	Synchronized Time Distribution System
SV	Selective Vertical shorthand for selective vertical conveyor. Often followed by the letter or number description of a specific unit, ie: SV-A
SVC	Selective Vertical Conveyor a type of vertical conveyor
TCM	Total Corrective Maintenance time
TCP/IP	Transmission Control Protocol/Internet Protocol
TEFC	Totally Enclosed Fan Cooled
TJB/TJMB	Thomas Jefferson Memorial Building
TPM	Total Preventive Maintenance time
UPS	Uninterruptible Power Supply
UTC	Coordinated Universal Time
VAX	DEC hardware platform
VDU	Visual Display Unit
VMS	DEC operating system
VRC	Vertical Reciprocating Conveyor. A type of vertical conveyor
WORM	Write Once Read Many
WWV	National Institute of Standards and Technology high frequency radio station

1.7 SYSTEM REQUIREMENTS

The project design may include the upgrade and/or replacement of all of the following obsolete controls components in the ABCS:

A. The computer system, peripherals, terminals, printers and terminal/printer communications system.
B. All computer software.
C. The Cutler Hammer Directrol multiplexer.
D. Tote identification system.
E. Operator station display, keyboard and control electronics.

F. Selective Vertical chain/carrier/operator station pantograph synchronization controls.
G. Over-height tote detection system.
H. Horizontal conveyor to selective vertical conveyor controls.
I. Selective vertical conveyor to horizontal conveyor controls.

1.7.1 Computer System Hardware

The existing computer system consists of two redundant Digital Equipment Corporation (now Compaq) PDP-11/44 computers each with console video display terminal and printer, two (2) eighty megabyte (80 Mbyte) removable media disk drives, and reel-to-reel nine-track tape drive. All this hardware is obsolete and difficult or impossible to support. There is one line printer in the computer room which can connect to either PDP-11/44. There are several system operator centers distributed throughout the Library of Congress. Each consists of a video display terminal and printer connected to the computer serial multiplexer via short haul modems.

The desired target system shall be a distributed system of servers, workstations, and printers (refer to Section 14503, Subsection 3.2, for system philosophy). Additionally, the selected ABCS solution shall adhere to the AOC Enterprise Architecture Technical Reference Model (TRM), which identifies the comprehensive set of information technology (IT) standards, services, and protocols for specifying generic components of an information system. However, the AOC will consider creative state-of-the-art practice solutions that expand upon the TRM. **The AOC Enterprise Architecture TRM is included as Appendix 7.

1.7.2 Software

The software for the new system will consist of operating systems, applications software and networking software for all the servers, workstations, and PLC systems.

1.7.2.1 Operating Systems

The current operating system (RSX-11M V3.x) is proprietary to Digital Equipment Corporation (now Compaq) and only runs on DEC PDP-11 and some VAX computers. It is obsolete and unsupported.

The AOC requires that the target operating system(s) scale properly to the job, be capable of supporting these specifications, and be of the latest version and update.

Some acceptable operating systems are:

A. LINUX
B. Proprietary UNIX operating system such as AIX (IBM) or Solaris (Sun)
C. Microsoft Windows 2000 Pro, Windows XP Pro, Windows 2003 Server
D. Other, as approved by the Architect

Some unacceptable operating system are:

A. Digital Equipment Corporation (Compaq) RSX-11.
B. Digital Equipment Corporation(Compaq) VMS.
C. Any other Digital Equipment Corporation operating system.
D. Any operating system native to an Apple computer.
E. Windows 9x.

The contractor shall provide all licenses in sufficient number (one per computer), as well as all operating system setup sources (on CD-ROM), drivers not included as part of the operating system, and any configuration data and files necessary to set up new computers void of any software (empty hard disks) thus allowing the AOC to replace and/or upgrade servers and workstations without having to rely on the contractor.

1.7.2.2 Applications

The current applications all run on the redundant PDP-11/44 computers. There is no other intelligence in the current system. The applications are:

A. Fortran 77.
B. The Book Conveyor System application - The entire Book Conveyor System operation is controlled by software written by a subcontractor who originally provided the system. It is written mostly in assembly language (Macro-11). Some of it is written in Fortran. The driver that controls the field controls hardware is a user written driver that supports a DR11-B and a KW11-P.

The target system application(s) selected by the contractor as part of the design shall include the following:

A. Report generators.
B. Any assembler, compiler, or scripting application used to generate any contractor written software.
C. Database used to support PLC system operations, user tables, security tables, tote activity tables, historical data systems, status/error messages, configuration tables, etc.
D. PLC system applications and corresponding server/workstation applications which control and monitor the tote transport system hardware through database table(s) obtained from and written to the server/workstation network. The database table(s) will contain constant and variable data. The variable data will be periodically scanned/written by both the server/workstation network and the PLC system to allow servers to record and issue event messages, to allow users on the workstations to control and monitor ABCS system activity through applications written for the purpose, and to allow systems maintenance personnel to execute diagnostics.

The replacement of the controls system Directrol multiplexer system with a PLC system may require replacement of other devices (photoelectric eyes, motor controllers, etc.) as dictated by the nature of the PLC system. Such replacement hardware shall be provided by the Contractor as required by the system design.

The AOC requires replacement of the tote identification system. The current numbering system is insufficient. It allows for only $7^3 = 343$ tote ID numbers (refer to Appendix 11 for Tote Specifications).

The AOC intends to interconnect the tote send/receive computers to a dry contact relay provided by the Library of Congress Physical Security System. This work is beyond the scope of this project except for the following:

A. The contractor will furnish a momentary contact, push button switch located in the center of an otherwise empty 4 inch by 4 inch area. This area will later be occupied by a 4 inch by 4 inch by 1 inch Hughes proximity reader head in place of the switch. This area will be uncluttered and within easy reach of the operator.

B. The dry contact switch, when depressed, will start a timer of programmable length during which the operator may complete a tote send transaction. Should the timer expire before the transaction is completed, the send operation will be aborted. The station will then be ready to accept another transaction beginning with a fresh activation of the switch.

1.7.2.3 Networks

The overall Book Conveyor System network (for servers/workstations) will be a 100-Base-TX/100-Base-FX Ethernet TCP/IP based Local Area Network. The Architect of the Capitol will assign an IP network address range within its Class B, 161.197.0.0 (subnet mask 255.255.252.0) assignment. The Architect of the Capitol will assign the six (6) most significant bits of the third octet, the subnet bits. Of the ten (10) host bits, the two (2) low order bits of the third octet will remain zero. The contractor is free to use all eight (8) bits of the fourth octet. On the Library side of the network, the Library of Congress will assign all TCP/IP addresses and netmask.

The PLC network will interface to the AOC LAN described above either directly via Ethernet Hub/Switch or gateway. If this is not possible, it will interface indirectly via programmed interface through the servers. The nature of the PLC system will determine the method. If the PLC system functionality is acceptable, the network interface will be acceptable.

1.7.3 Tote Conveyance Hardware Control Functionality

Beyond repairing known problem areas (1.7.3.1 below), The Architect of the Capitol does not intend to replace any of the conveyors and conveyor hardware that is not a part of the controls system. As a result, the software that controls tote routing must do it through the existing hardware. To that end, this section contains a functional description of the hardware that is to remain in place.

1.7.3.1 Known problem areas to refurbish/repair.

A. Conveyor P109 in the Jefferson building machine shop which is slaved from P110.

B. Conveyor P136B in the Adams building cellar which is slaved from P136A.

C. Conveyors P30, P31, and P58 in the Madison building which are too long and cannot be maintained in proper tracking.

D. Conveyor P177-P178 transition (upgrade transition roller and skate wheel conveyor to powered conveyor).

1.7.3.2 Horizontal Conveyor Subsystem

The existing horizontal conveyor structure and conveyors are to remain. The Controls System Replacement/Upgrade will control them differently and the selected Controls System may require replacement of certain items such as micro-switches, photoelectric eyes, and motor controllers so that the resulting system functions properly. The entire horizontal conveyor system shall be protected with pull ropes connected to E-stop switches. Exposed mechanics containing moving parts that can cause injury will be caged. See section 14502 and 14503 for related requirements.

Powered horizontal conveyors are driven by a three phase 208V or 480V motor. The conveyor motors are controlled by a motor controller with motor contacts, coil contacts that are controlled locally and by computer, auxiliary contacts that inform the computer that the motor controller has been energized, and an over current breaker set to trip at approximately 10% over the measured operating current of the controlled motor. The breaker also has contacts to inform the computer of the occurrence of an overload condition. Note that all powered conveyors of any type in the system shall be equipped with an E-stop device. Only selective vertical conveyors are currently so equipped.

Powered horizontal conveyors are equipped with a “jam” photoelectric eye that, when the beam is interrupted, the eye relay informs the system to start the upstream conveyor in anticipation of the tote that broke the beam. The jam eye has another component that times out if a tote remains in the beam of the eye too long. The system interprets that condition as a jam and deactivates the conveyor.

A. Powered Belt Conveyors: Powered horizontal belt conveyors consist of a motor driven conveyor belt that runs over rollers in a frame or a slider bed. Tension is maintained by a mechanism in the lower part of the belt loop. The totes ride directly on the conveyor belt in the direction of the tote’s long axis. Retaining rails are on each side of the tote. The belt/tote interface is high friction and will not allow totes to be stopped or redirected via escapement stops, guardian bars or diverters.

B. Powered Roller Conveyors: These conveyors consist of a motor driven conveyor belt that runs over rollers in a frame. Tension is maintained by a mechanism in the lower part of the belt loop. Rollers are placed in the frame above the conveyor belt. The totes ride directly on the upper rollers in the direction of the tote’s long axis. Retaining rails are on each side of the tote where they will not interfere with the action of diverters, merges, and escapement stops. The belt/roller interface is not high friction and will allow totes to be stopped or redirected via escapement stops, guardian bars or diverters.

C. Powered Slatted Turn Conveyors: These conveyors consist of a number of slats locked into and driven by a chain through a guide. In the case of slatted turns that are not slaved, the chain is motor driven. If a slave (see below), it is driven by the adjacent conveyor. Such conveyors are used for short radius right angle turns. No mechanisms are used that stop the tote relative to the slats.

D. Slaved Conveyors: A belt, roller or slatted turn conveyor that is powered by an adjacent motor driven conveyor is called a slave conveyor.

E. Unpowered Conveyors: At certain locations, a series of "skate wheels" in a frame convey the tote. The entire conveyor is tilted at an angle sufficient to allow the impetus of the entering tote to convey it to the far end of the unpowered conveyor. These conveyors are used for runoff conveyors for the spiral accumulators at B75 and 200. Runoff conveyors are placed at the output of all receive stations except B75 and 200. There is a short section of unpowered conveyor (P178) that feeds the spiral accumulator at B75. This is a problem area, with totes occasionally stalling at the input to P178 (dependant on tote loading).

F. Escapement Stops: Escapement stops, placed between readers and diverters, are to stop a tote while the system adjusts the downstream conditions proper for routing the tote. The diverter must be in the proper position and the "divert zone"(the path between the stop and the output of the diverter) must be clear. Escapement stops are placed over roller conveyors to allow the rollers to turn while the escapement stop delays a tote. This is necessary so that any tote downstream of the stopped tote can continue on its way thus clearing the divert zone. The grouping of a diverter, reader and escapement stop is known as a "Decision Point." The system must decide which way to send the tote.

G. Diverters: Diverters consist of an arm that directs a tote in one of two possible directions. They can direct the tote so that it remains within the loop (Machine shop, Madison or Adams loop) or toward a spur path. A spur path either connects two loops, goes to a particular send/receive station (200 or 100) or goes to a horizontal to vertical transfer point for a selective vertical (SV-E in the Adams building cellar or SV-A, B, C or D in the Madison building ground floor). The diverter arm is motor driven and swings over a roller conveyor. The diverter arm will not swing while a tote is in the divert zone. Low friction roller conveyors are necessary because the path of the tote is not always perpendicular to the rollers underneath. High friction would cause the tote to press against the side rails with too much force, possibly upsetting the tote.

H. Stationary Readers: Readers placed at the input to Decision Points read a tote as it goes by into the escapement stop. The reader sends the tote ID to the controlling computer which, using source and destination data for that tote, determines which of two paths to send the tote and then positions the diverter arm. The computer commands the escapement stop to release the tote once the downstream divert zone is clear and the diverter arm is in position.

Stationary readers are also placed at the input to and output from selective vertical conveyors, inputs to horizontal to selective vertical conveyor transfers that service totes coming from branch lifts, outputs from branch lifts, and inputs to spiral collectors.

Note the absence of stationary readers at the output of selective vertical to horizontal conveyor transfers and at the input to branch lift unloaders (BL-2, Bl-3, and BL-4). Tote ID as they transfer from zone to zone (see IBCS-003) at these areas is dependent on sequencing rather than an explicit Tote ID read. This is prone to errors and requires correction as part of the new design.

I. Composite Devices:

1. Merges: Merges accept a tote from one of two paths and place the tote on the single output path. Merges are placed over roller conveyors. Other than the conveyor underneath, there are no moving parts to a merge. Tote control in a merge is exercised by the feed conveyors or an escapement stop on one or both of the feed conveyors. By the use of merge area traffic zone photoelectric eyes to detect traffic in the merge, the computer can allow no more than one tote to be in a merge area at one time. This prevents jams caused by collisions.

2. Decision Points: Decision points consist of a stationary reader, an escapement stop and a diverter, in order, with at least the escapement stop and diverter arm placed over a roller conveyor. Traffic is metered in such a way that there are no collisions by the use of Divert Zone photoelectric eyes. So long as there is traffic in the decision point at the diverter arm, the diverter arm is held in its current position. If any totes are in the divert zone the escapement stop holds any approaching totes.

3. Branch Lift 6 (BL-6): BL-6 is not an actual branch lift in the same sense that BL-1 through BL-5 are, but is treated as simply a bidirectional vertical conveyor connecting the feed conveyors on one level to the output conveyors on another level. It consists of structural members, motors, chains, carriers, micro-switches, and photoelectric eyes similar to the other branch lifts, but BL-6 requires no human or operator station control. It is considered to be a member of the horizontal conveyor system.

1.7.3.3 Selective Vertical Subsystem

The selective vertical subsystem consists of the following:

A. The selective vertical chain
B. Tote carriers on the chain
C. Chain motor
D. Chain motor controls
E. Car position, state and number detectors
F. Operator stations
G. Horizontal to Selective Vertical Conveyor (H to V) devices (automatic station load devices)
H. Selective Vertical to Horizontal Conveyor (V to H) devices (automatic station unload devices)
I. Car/pantograph synchronization devices

The selective vertical chain rotates around two sprocket wheels, one located on the topmost floor of the building (the Madison building 7th floor for SV-A, SV-B, SV-C and SV-D and the Adams building reading room “dog house” for SV-E) and the other located

on the lowest available floor (The Madison building sub-basement for SV-A and SB-B, the Madison building basement for SV-C and SV-D, and the Adams building cellar for SV-E). The lower sprocket “floats” and has a chain “take up limit” switch to indicate chain stretch or the tendency for the chain to pull the lower sprocket up should the chain jam. The chain motor and gearbox drives the top sprocket. A belt on the top sprocket drives a shaft encoder. There is an automatic oiler that lubricates the chain at the top of the shaft. It dispenses lubricating oil during a time interval after the chain motor starts up. This will remain the same with the new controls system.

The chain motor controller has a three position switch at the top of the shaft which allows maintenance personnel to select one of three modes for the motor. The “OFF” position unconditionally turns the motor off, the “AUTO” position gives the controls system control of the motor, and the “MANUAL” position allows another switch to control the motor to jog it forward or in reverse. There is an array of protective devices (over current, under voltage, etc.) as well as an E-stop connected to ropes that traverse all the floors on both sides of the selective vertical. All these devices report to the central computer. This design will remain essentially the same.

At the top of each selective vertical (or near the top in the case of SV-E) , there is an array of photoelectric eyes used to detect carrier one, each carrier as it passes, and whether or nor the carrier contains a tote. This information is fed to the controls system computer through the “window generator” module.

The shaft encoder connects to the “window generator” module where it is divided and used to feed the computer with a pulse count. The pulse also acts as a clock for a series of cascaded shift register chips which shifts approximately once every six inches of chain travel. Each station has two connections along the series of shift register chips. The system is calibrated so that when one of the connections for a particular station goes high, it is safe to load the passing carrier (if it isn’t already loaded). The other connection is for the unload side. If a pantograph is detected off its home position at any other time, an error condition exists and the entire vertical ceases motion.

Operator stations and H-to-V and V-to-H transfer areas (automatic stations) work in conjunction with the central computer and the signals from the window programming module to load and unload totes.

1.7.3.4 Target System Requirements

The Controls System Replacement/Upgrade will use the existing mechanics but will operate somewhat differently. The selective vertical chain control, operator station control and H-to-V / V-to-H station control will be microcomputer controlled. The window generator functions shall be accomplished by a microprocessor using the same shaft encoder (or replacement one if the existing one is either obsolete or not of the proper type) as a clock source.

Currently, it requires 2 or more revolutions of the chain to fully synchronize the selective vertical. Synchronization informs the controls system where carrier one (and therefore, all the carriers) is located. The process also informs the system which carriers are occupied with totes. The replacement controls system will, at the passing of each carrier at the top of the vertical, immediately be aware of its sequence number and whether that carrier is occupied by a tote. It will immediately be marked available to the system for loading (if empty) and unloading (if full). And will be processed as required as it passes stations. Each subsequent carrier will be similarly processed as it passes the top. Such a system allows the system to start using parts of the selective vertical immediately and requires only one full rotation to make the selective vertical fully available.

Note that the current system uses solid state switches to control pantograph motors. When these fail they usually short out. If the station fails or is disconnected from the control lead of the solid state switch, the switch will turn on. In either case, the pantograph affected will oscillate in and out until the power to the pantograph motor(s) is turned off. This is an extremely unsafe condition and will not be acceptable in the target system.

Operator stations and H-to-V/V-to-H transfer areas need to be controlled with new electronics; a properly configured and programmed microcomputer will replace the existing operator and automatic stations. Such microcomputers will function as described in sections 14502 and 14503.

1.7.3.5 Branch Lifts BL-1 through BL-6

Six branch lifts (BL) numbered 1 through 6 are contained in the ABCS. Two branch lifts, BL-1 and BL-5, do not have unload sides, but they do feed a gravity spiral collector. Branch Lift 6 is only used as a vertical elevation change between two floors in the Jefferson Building. The purpose of a branch lift is to enable the operator to transfer a tote from a lower level station or conveyor to a higher level horizontal conveyor and vice versa. Each branch lift unit (loader/unloader) has a single car attached to the chain and can only accommodate one tote at a time. The chain is driven by a motor that cycles the car between the HOME and OUT position, where HOME for the loader is at the station level and HOME for the unloader is at the horizontal conveyor level. Opposite to the HOME position is the OUT position which is at the other end of the chain loop. The station and computer monitors the sensors that indicate car status and tote presence. For Branch Lift Stations, the totes travel to or from the car on gravity skate wheel conveyors.

As with an Operator Station on a Selective Vertical, Branch Lifts contain the same electronics. Branch Lift operator stations interface with the operator in the same way as Selective Vertical operator stations do but the operator stations are configured to control a different set of hardware. Branch Lift operator stations are to be replaced much the same way as the Selective Vertical operator stations are.

1.7.4 Key System Components to be Addressed

1.7.4.1 Installation of New Fixed Mount Tote Bar Code Label Readers

The Contractor shall be responsible for ultimate selection of tote identifier (i.e., bar code) and subsequent design and installation of fixed bar code readers mounted at all identification and decision points throughout the system. Refer to Section 14503 - Control Requirements.

1.7.4.2 Replacement of Conveyor Control Plug-In Photoelectric Eyes

The AOC Electrical Engineering Division has an ongoing program to replace original or replacement conveyor system photoelectric eyes with Telemecanique XUE series photo eyes due to superior design, construction, and maintenance features. The Contractor shall replace any malfunctioning or non-Telemecanique sensors with the same Telemecanique or an approved equal product with the same or similar physical and performance characteristics as the existing Telemecanique modules. An equivalent photoelectric eye must be modular in at least two parts. The lower part must have a bracket mount (not screw-in) containing a socket for the other part(s) and wiring connections only. The remainder of the photoelectric eye modules must plug into the base (lower Part) and be replaceable without having to disturb the base of the eye or any other part of the ABCS aside from the module(s) being replaced. Refer to Section 14505 - Electrical Requirements. The AOC is aware that the design of the controls system will impact the nature of the photoelectric eyes (or other sensors) used.

1.7.4.3 Installation of Over-Height Tote Detection Equipment

Several locations throughout the ABCS are extremely congested and vertical clearance over horizontal conveyors is limited to that which will just clear a tote. If one or more items protrude above the top of a tote in these areas, a jam may occur that is very difficult and time consuming to clear. Tote contents may shift due to accelerations experienced on pantographs or due to tilting while on inclined conveyors. The shifting may cause the tote contents to protrude above the top of the tote. The new tote design with an integral lid is expected to alleviate much of this problem. However, it is anticipated that the lids may occasionally open slightly and create an over-height situation which may cause a jam.

The AOC has installed an over-height detection and jam prevention system known as Guardian Bars. The existing controls system is difficult to modify; therefore, they were placed so as to entrap over-height totes while breaking the beam on a convenient jam photoelectric eye. In this case, the conveyor continues to run until the jam timer in the jam eye expires. The fact that the conveyor continues to run for a period requires the guardian bar to stop a tote on a roller conveyor. Over time, these points have become well known to the maintenance technicians so when a jam occurs at one of the guardian bars, it is assumed it is due to a tote with its contents protruding over the top. Such totes are manually removed from the system.

The Contractor shall design and install a Guardian Bar system that performs as follows:

A. Traps over-height, overloaded totes in locations that are reasonably accessible where totes may be manually removed with relative ease.

B. Shall, through the controls system, properly annunciate the problem as an over-height tote entrapment rather than just a generic jam.
C. The over-height detection system should immediately stop the conveyor over which it is installed. Relative conveyor/tote motion shall not be required or allowed for proper operation of the new guardian bar system thus allowing them to be installed over belt conveyors.
D. When completed, all guardian bars, both retrofitted and new, will be identical in design.

Guardian bar locations are specified in Section 14503, paragraph 3.5.9.6.

1.7.4.4 Replacement of Motors and Motor Starters

This project may include the replacement of any motors; with approval of the Architect, adjustments to project cost for replacement of motors/motor starters shall be in accordance with Division 1 Section, UNIT PRICES, and shall not result in any change to project time. If one, some or all motors or motor starters need to be replaced due to the changes in the controls system's general design, or if additional motor controllers are necessary, the motor starters used shall comply with the following:

A. They must be modular in design.
B. They must have 3-phase motor contacts rated at the voltages and currents appropriate for the motor to which it is to be attached.
C. The control coil must be appropriate for the controls system.
D. The Auxiliary contacts, which activate when the motor is energized, must be on a separate, replaceable module.
E. The overload circuit, which activates and shuts off the motor when the motor draws too much current, shall have contacts to report such a condition to the controls system. The overload circuit will be in a separate replaceable module. The overload current will be adjustable and set to 10% above the measured operating current of the motor.

1.7.4.5 Installation of Emergency Stop Devices (E-stops)

Emergency stop pull-cords shall be installed adjacent to all horizontal conveyor runs. Emergency stop pull-cords shall also be installed adjacent to vertical conveyors (these are already installed on SV-A, SV-B, SV-C, SV-D and SV-E). E-stops in each area shall be installed as required by each sequence of work, either base bid or option work.

Emergency stop push-buttons shall be installed at each control panel, each conveyor operator workstation, and at other strategic locations (i.e., Jefferson building octagon cellar). Emergency stop light curtains shall be installed at each operator workstation input and output conveyor shaft penetrations. Emergency stop pull-cables (E-stops) shall be provided for all powered conveyors in the system within easy reach of a maintenance technician who may be working on any of them. Refer to Section 14505, Electrical Requirements, for additional information.

Refer to Appendix 4 for a list of powered conveyors, lifts, diverters and escapement stops. Each of them will need e-stops (except SV-A, SV-B, SV-C, SV-D, and SV-E, which are already equipped with e-stops).

Light curtains or an equivalent device at each entry/exit port will be necessary to protect against personal injury those persons reaching through windows through which totes are entered into and unloaded from the system. There are 52 tote entrance ports and 52 exit ports, one pair per station. The stations are as follows:

	STATION #	LOCATION
1.	A10	Madison bldg 1st floor northwest off A core selective vertical
2.	A20	Madison bldg 2nd floor northwest off A core selective vertical
3.	A30	Madison bldg 3rd floor northwest off A core selective vertical
4.	A40	Madison bldg 4th floor northwest off A core selective vertical
5.	A50	Madison bldg 5th floor northwest off A core selective vertical
6.	A60	Madison bldg 6th floor northwest off A core selective vertical
7.	A70	Madison bldg sub-basement northwest off A core selective vertical
8.	A80	Madison bldg basement northwest off A core selective vertical
9.	A90	Madison bldg ground floor northwest off A core selective vertical
10.	B10	Madison bldg 1st floor northeast off B core selective vertical
11.	B20	Madison bldg 2nd floor northeast off B core selective vertical
12.	B30	Madison bldg 3rd floor northeast off B core selective vertical
13.	B40	Madison bldg 4th floor northeast off B core selective vertical
14.	B50	Madison bldg 5th floor northeast off B core selective vertical
15.	B60	Madison bldg 6th floor northeast off B core selective vertical
16.	B70	Madison bldg sub-basement northeast off B core selective vertical
17.	B80	Madison bldg basement northeast off B core selective vertical
18.	B90	Madison bldg ground floor northeast off B core selective vertical
19.	C10	Madison bldg 1st floor southeast off C core selective vertical
20.	C20	Madison bldg 2nd floor southeast off C core selective vertical
21.	C30	Madison bldg 3rd floor southeast off C core selective vertical
22.	C40	Madison bldg 4th floor southeast off C core selective vertical
23.	C50	Madison bldg 5th floor southeast off C core selective vertical
24.	C60	Madison bldg 6th floor southeast off C core selective vertical
25.	C80	Madison bldg basement southeast off C core selective vertical
26.	C90	Madison bldg ground floor southeast off C core selective vertical
27.	D10	Madison bldg 1st floor southwest off D core selective vertical
28.	D20	Madison bldg 2nd floor southwest off D core selective vertical
29.	D30	Madison bldg 3rd floor southwest off D core selective vertical
30.	D40	Madison bldg 4th floor southwest off D core selective vertical
31.	D50	Madison bldg 5th floor southwest off D core selective vertical
32.	D60	Madison bldg 6th floor southwest off D core selective vertical
33.	D80	Madison bldg basement southwest off D core selective vertical
	STATION #	**LOCATION**
34.	D90	Madison bldg ground floor southwest off D core selective vertical
35.	E01	Adams bldg north stack 1st deck off E core selective vertical

36.	E02	Adams bldg north stack 2nd deck off E core selective vertical
37.	E03	Adams bldg north stack 3rd deck off E core selective vertical
38.	E04	Adams bldg north stack 4th deck off E core selective vertical
39.	E05	Adams bldg north stack 5th deck off E core selective vertical
40.	E06	Adams bldg north stack 6th deck off E core selective vertical
41.	E07	Adams bldg north stack 7th deck off E core selective vertical
42.	E08	Adams bldg north stack 8th deck off E core selective vertical
43.	E09	Adams bldg north stack 9th deck off E core selective vertical
44.	E10	Adams bldg north stack 10th deck off E core selective vertical
45.	E11	Adams bldg north stack 11th deck off E core selective vertical
46.	E12	Adams bldg north stack 12th deck off E core selective vertical
47.	E13	Adams bldg reading room, north side off E core selective vertical
48.	B75	Madison bldg Law Library stacks (sub-basement) off BL1
49.	B25	Madison bldg Law Library reading room (2nd floor) off BL2
50.	100	Madison bldg mail room by loading dock (ground floor) off BL3
51.	D65	Madison bldg 6th floor southwest off BL4
52.	200	Jefferson building collections (ground floor octagon) off BL5

1.7.5 Machine Guarding Installation

1.7.5.1 Installation of Machine Guarding on Moving Mechanical Parts

A. **Conveyor Return Rollers:** Return rollers are currently exposed which create a pinch hazard which might entrap hair, other body parts, clothing, and other items and draw them into the conveyor, possibly causing injury to a person or damage to clothing or other material. The Contractor shall install expanded metal guards at return rollers to prevent such accidents from occurring.

B. **Conveyor Take-Ups, and Tracking Units:** Appropriate guarding shall be installed around the areas of exposed belting to protect personnel in the area from injury.

C. **Pushers, Diverters, Transfers:** Appropriate guarding shall be installed around exposed moving mechanisms which are not directly over the conveyor to protect personnel in the area from injury.

D. **Conveyor Drive Units and End Rollers:** Appropriate guarding shall be installed to protect personnel in the area from injury.

1.7.5.2 Installation of Machine Guarding in the Adams Cellar

A. **Expanded metal under overhead conveyor:** Expanded metal guarding is required under the overhead conveyor Located in the Adams building cellar stack elevator lobby. The Contractor shall supply and install the necessary structural support steel and guarding. Guarding shall be easily removable for maintenance. A conveyor support post shall be relocated to widen the traffic aisle.

B. **Fencing around low conveyor:** A portion of the conveyor in the Adams building stack elevator lobby is installed as low as 5 feet above the floor. The Contractor shall install shop fencing around this conveyor and will tie in to existing walls.

1.7.6 Installation of Operator Station Safety Guarding, Adams and Madison Buildings

Operator workstations served by selective vertical conveyors SV-A, SV-B, SV-C, SV-D and SV-E and branch lifts BL-1 (B-75 area), BL-2 (B-25 area), BL-3 (mailroom), and BL-4 (Central Services area) do not contain any safety guarding to prevent conveyor operators from reaching their arms, and/or other body parts into enclosure openings and causing themselves risk of physical harm from moving machine components. The Contractor shall install light curtains on all operator workstation input and output conveyors served by the listed selective vertical conveyors to stop machine motion if operators reach or otherwise introduce a part of their body or foreign materials into moving machine components. Spiral output conveyors do not require light curtains as they contain no automatic motion components. Tables of operator workstation locations follow.

BUILDING	SV	STATION ID	DESCRIPTION
Adams	SV-E	E13	Reading Room
Adams	SV-E	E12	Deck 12
Adams	SV-E	E11	Deck 11
Adams	SV-E	E10	Deck 10
Adams	SV-E	E9	Deck 9
Adams	SV-E	E8	Deck 8
Adams	SV-E	E7	Deck 7
Adams	SV-E	E6	Deck 6
Adams	SV-E	E5	Deck 5
Adams	SV-E	E4	Deck 4
Adams	SV-E	E3	Deck 3
Adams	SV-E	E2	Deck 2
Adams	SV-E	E1	Deck 1

BUILDING	SV	STATION ID	DESCRIPTION
Madison	SV-A	A60	Floor 6
Madison	SV-A	A50	Floor 5
Madison	SV-A	A40	Floor 4
Madison	SV-A	A30	Floor 3
Madison	SV-A	A20	Floor 2
Madison	SV-A	A10	Floor 1
Madison	SV-A	A90	Ground Floor
Madison	SV-A	A80	Basement
Madison	SV-A	A70	Sub-Basement
Madison	SV-B	B60	Floor 6
Madison	SV-B	B50	Floor 5
Madison	SV-B	B40	Floor 4
Madison	SV-B	B30	Floor 3
Madison	SV-B	B20	Floor 2
Madison	SV-B	B10	Floor 1
Madison	SV-B	B90	Ground Floor
Madison	SV-B	B80	Basement
Madison	SV-B	B70	Sub-Basement
Madison	SV-C	C60	Floor 6
Madison	SV-C	C50	Floor 5
Madison	SV-C	C40	Floor 4
Madison	SV-C	C30	Floor 3
Madison	SV-C	C20	Floor 2
Madison	SV-C	C10	Floor 1
Madison	SV-C	C90	Ground Floor
Madison	SV-C	C80	Basement
Madison	SV-D	D60	Floor 6
Madison	SV-D	D50	Floor 5
Madison	SV-D	D40	Floor 4
Madison	SV-D	D30	Floor 3
Madison	SV-D	D20	Floor 2
Madison	SV-D	D10	Floor 1
Madison	SV-D	D90	Ground Floor
Madison	SV-D	D80	Basement

1.7.7 Conveyor General Mechanical Upgrades

1.7.7.1 Installation of Guardian Bars

Refer to section 14501, paragraph 1.7.4.3 and section 14503, paragraph 3.5.9.6 for guardian bar system requirements.

1.7.7.2 Replacement of Conveyor Belting

Appendix 5, Conveyor Belting List, contains an identification of existing belting materials and a table indicating the usage of the existing belting materials on the various conveyor sections. If any existing conveyor section is modified or, for any reason, the belting on a conveyor is replaced, the belting shall be replaced with the canvas rubber belting as follows:

Flat conveyor belting shall have smooth, non-abraded, slit edges. High friction-surface belting shall be utilized on incline, decline, and flow control belt conveyors to prevent totes from sliding. Belting for each conveyor unit shall consist of a single, straight piece of belt. Multiple splice belts are not acceptable, except that a maximum of one (1) take-up patch, up to two feet in length, may be used. Clipper lacing shall be utilized for joining ends unless Contractor obtains written approval from AOC.

Belting material selection shall include superior qualities for abrasion-resistance, cut-resistance, and shall have superior tracking qualities. Cleated belts shall be provided for incline operation, if required, to maintain material flow.

Belting for horizontal conveyor runs shall be, at a minimum, a black rubber conveying surface with canvas drive surface, 3-ply cotton reinforced, 28 ounce, with l/16” x FS covers, rated 92 pounds per inch of width, and shall be recommended for use around 4” drive and end pulleys.

Belting for inclined conveyor runs shall be as required to properly convey the totes without slippage of the tote on the inclined belt or damage to the totes caused by the belt.

1.7.7.3 Installation Of Corrugated Enclosure Guarding, 2nd Street Tunnel

A small portion of conveyor under-guarding is missing at a turn in the conveyor. The Contractor shall fabricate and install the missing portion of under-guarding with similar guarding.

1.7.7.4 Installation of Powered Conveyor

The Contractor shall remove and modify and/or replace the following portions of conveyor where totes do not flow properly. These areas include locations where conveyors are slaved, or are too long to maintain tracking.

A. Conveyor P109 in the Jefferson building machine shop, which is slaved from P110.
B. Conveyor P136B in the Adams building cellar, which is slaved from P136A.
C. Conveyors P30, P31, and P58 in the Madison building, which are too long and

cannot be maintained in proper tracking.

D. Conveyor P177-P178 transition (upgrade transition roller and skate wheel conveyor to powered conveyor).

1.8 PROJECT ADMINISTRATION

1.8.1 Project Management and Administrative Requirements

1.8.1.1 Contractor Activity Milestones

The Contractor should reference the project implementation & sequencing requirements of this section when preparing Installation and Milestone Schedules .

1.8.1.2 Acceptance Testing

Acceptance testing shall be completed and any documented deficiencies shall be corrected to the AOC's satisfaction on or before the completion of each sequence of implementation. Refer to Testing Requirements, Section 14507.

1.8.1.3 Detailed Schedule Submittal

Contractor shall provide the AOC with a detailed project schedule within fourteen (14) calendar days of receipt of contract award. Wherever the Contractor's schedule is dependent upon work by others outside of the Contractor's direct control, such dependencies shall be clearly specified.

The AOC requires that the work be done according to a schedule and sequencing plan that imposes a minimum impact on Library of Congress operations. The schedule shall identify any periods which will render the system un-usable; the design shall be such that implementation can be made with a minimum of system down time.

The project schedule format shall include as a minimum:

A. A time-scaled, CPM logic diagram.
B. A tabular report showing predecessor and successor relationships.

1.8.1.4 Scheduling Software

The Contractor's project scheduling package for this project shall be the latest version of Project Planner by Primavera Systems, Inc., or compatible equal. Conversion to and continuing use of this package by the Contractor shall occur within forty-five (45) days of Contractor receipt of contract award.

1.8.2 Application Engineering

This section of the specification addresses the requirements for system support expected of the selected Contractor on this contract. This article is not all-inclusive, but, is intended to describe the minimum level of support and coordination required of the chosen Contractor by the AOC. The purpose of this section is to specifically define certain interface points. Using the information presented in this section as an example, the chosen Contractor shall develop a philosophy of support and cooperation to be practiced in every facet of this project. It is important to note that this facility is to be engineered for continuous operation.

1.8.2.1 Functional Responsibility

The Contractor shall note that the ABCS depicted on the schematic drawings and described in this performance level specification are conceptual in design and shall be considered as such. The Contractor shall be responsible for designing and providing a fully functional system according to the performance requirements and in accordance with all applicable codes.

1.8.2.2 Tasks and Functions

The Contractor shall perform the application engineering tasks and functions, as necessary, to develop a successful design as part of the Base Bid. Application engineering, in this context, encompasses the detail engineering and integration needed to develop systems that are economical, functional, and maintainable. A partial list of the tasks and functions which shall be expected of the Contractor are as follows:

A. Equipment/system engineering to support 24-hour/day operation.
B. Equipment/system redundancy to eliminate single points of failure.
C. Providing fall-back modes of operation for equipment/system failures.
D. Standardizing of common components, signage, procedures, etc. among supply and distribution systems.
E. Structural engineering for modification and attachment to existing building structural steel.
F. Engineering and furnishing totes that meet user requirements and are suitable for use.
G. Engineering equipment/systems in concert with an implementation plan so as to enhance the Contractor's ability to coordinate fabrication, delivery, installation, and check-out of the systems.
H. Active participation in the engineering and development of operator stations that interface with the Contractor's equipment/systems.

1.8.2.3 Standardization of Components

The application engineering process will be used by the AOC to identify components within the Contractor’s responsibilities that are used elsewhere in the facility. The Contractor shall utilize standard components, as identified by the AOC, wherever possible. Modifications to the component standards design proposed/accepted for the Base Bid work will be negotiated through the AOC “AOC52.243-1, Changes-Supplement (June 2004)Procedures for Making Changes to Contracts.” The Contractor shall not

purchase any components without approval by AOC. Components are defined to mean any material purchased by the Contractor for this project.

1.8.2.4 Communication and Control

The Contractor shall formalize the application engineering process to include regularly scheduled engineering review meetings with the AOC and the AOC's technical representatives. These meetings shall commence with the award of contract and continue through system installation and start-up. The Contractor shall submit a schedule of application milestone reviews as part of the project meeting schedule. This schedule shall address all provisions of this project. Reviews shall be conducted at AOC facilities in Washington, DC.

1.8.3 Installation Drawings and Specifications

The Contractor shall be responsible to access and review all portions of the AOC building design and construction documents before proceeding with the engineering of equipment. Errors and omissions resulting from the Contractor's failure to review these documents shall be the sole responsibility of the Contractor.

The Contractor shall produce a complete set of AOC approved detailed documents prior to system fabrication and installation and complete explanations of operation during system installation. All project construction documents shall adhere to AOC A/E Design Manual, Requirements (refer to Appendix 2).

The Contractor shall have available, on site, an approved set of all project documents. These specifications and drawings shall be maintained in a current "as-built" state and reflect all "as-installed" conditions. These same documents shall be available to the AOC for inspection and use at any time.

1.8.4 Approval for Fabrication

Shop and fabrication drawings shall be submitted to the AOC per the approved schedule prepared by the Contractor (refer to Article 1.8.1.3 of this Section). All drawings shall be submitted by the Contractor and approved by the AOC prior to purchase and/or fabrication. The Contractor shall allow in the schedule for an AOC review period of two (2) calendar weeks. The Contractor shall have an additional two (2) calendar weeks after receipt of AOC review comments to incorporate such changes into the Contractor's engineering documents and resubmit for AOC review. All revisions to Contractor drawings shall be readily identifiable through the use of area clouding and specific revision numbers. The Contractor shall remove all clouding and reset the revision to zero for approved drawings.

1.8.5 Right of Rejection

The AOC reserves the right to reject equipment, hardware, and/or software which, in the opinion of the AOC, does not meet specifications. The Contractor shall assume full responsibility (including labor, materials, and re-testing) to repair or replace rejected equipment or components, as required, to assure compliance with these specifications.

1.8.6 Milestone Audits

The Contractor shall make available to the AOC any information judged to be required by the AOC to verify the Contractor's schedule status. The AOC may require such information as purchase orders for equipment and/or services, payment records for employees, shop fabrication schedules, shipping bills of lading, etc. This information is intended to be used by the AOC when there is some question as to the Contractor's actual status.

1.8.7 Final Project Record Documents

The Contractor shall deliver all Final Project Record Documents to the AOC, in accordance with Division 1 Section GENERAL REQUIREMENTS. All final project record documents shall reflect the “as-built” and “as-installed” conditions of all work provided by the Contractor as part of the ABCS defined in this performance specification. The Contractor shall deliver all final project record documents per the documentation requirements defined in this Section.

1.8.8 Documentation

Note that Specifications apply only to the ABCS. All related architectural and structural information can be found on the drawings owned by the AOC. During the contract period, the Contractor shall provide detailed system documentation. Five (5) copies of the documents described in this section are to be provided on or before the milestone dates noted in the project schedule.

1.8.8.1 Project Documents

All project documentation shall be produced by the Contractor in the English language using standard English (Imperial) units of measure; metric units may be applied if they are the industry recognized standard for an individual component. All project documents and drawings shall be submitted by the Contractor and approved by the AOC prior to purchase and/or fabrication. The Contractor shall allow in the schedule for an AOC review period of two (2) calendar weeks for all document submittals. The Contractor shall have an additional two (2) calendar weeks after receipt of AOC review comments to incorporate such changes into the Contractor's design and resubmit for AOC review. All revisions to Contractor documents shall be readily identifiable through the use of highlighting, redlining or area clouding and specific revision numbers. The Contractor shall remove all highlighting and reset the revision to zero for final approved documents. All documentation requirements of the Contractor are also required of all of Contractor's subcontractors.

1.8.8.2 Drawings

All drawings shall be drawn to a suitable scale on either 24” x 36” or 30” x 42” Mylar sheets with standard title blocks and borders per the AOC, *A/E Design Manual*, Computer Aided Design Requirements (refer to Appendix 2). The Contractor shall choose either size, but must use only the size selected for all drawings. At completion of the project, the Contractor shall provide drawings to the AOC on electronic media. All files delivered to the AOC must be MicroStation Version SE or later. The Contractor

shall have sole responsibility for any translation of drawings and/or manual drawing file editing to enable the drawings to be directly loadable and usable on the AOC CAD system.

1.8.8.3 Written Documents

Word Processing, spreadsheet and other office documents will be composed using the latest version of NATIVE WordPerfect (version 9 or later), and submitted on a separate CD-ROM which must be clearly labeled according to AOC guidelines. The files shall contain the text, illustrations, tables, schedules and exhibits contained in the document. Documents prepared in or converted from MS Word do not comply with AOC requirements and will not be accepted.

1.8.8.4 Project Meeting Schedule

The Contractor shall be available at the AOC offices in Washington DC for regular project meetings and schedule updates. These meetings shall take place on a time frame not to exceed a bi-weekly basis from the date of Notice To Proceed until the Contractor arrives at site to begin installation. When the Contractor installation period begins the Contractor shall be available for site project review meetings on a weekly basis. Meetings may be required on a more frequent basis, as deemed necessary by the AOC. Note that all project related meetings shall be held at a location of AOC choice.

1.8.8.5 Detailed Functional Specifications

The Detailed Functional Specification shall provide a detailed extension of the functions described in the specifications, and must be approved before the software engineering and the Final Engineering is completed. The Detailed Functional Specification shall include the following detailed information:

A. System Overview
B. System Operating Modes
C. Overall Control Strategy
D. Material Flow & Detailed Operation Narrative
E. Overall System Data Flow Diagrams
F. Operator Functions, Station Controls & Layout
G. Data Dictionary of All System Information
H. Communication Traffic and Analysis
I. Error Conditions
J. Backup and Recovery Provisions
K. Screen Layout
L. Report Formats
M. Proposed Software Off-line Test procedure

1.8.8.6 Final Engineering

A Final Engineering Document shall be prepared containing the finalized engineering data for the ABCS Controls System Replacement/Upgrade. Included with the document shall also be shop drawings of the complete System. All drawing submittals shall be certified and dated by the Contractor and include two reproducibles in addition to the base level requirement for five blue lines. Submittals shall be submitted on electronic media (CD-ROM) as well. **TRANSMISSION OF DOCUMENTS VIA THE INTERNET OR E-MAIL IS PROHIBITED; ALL DOCUMENTS ARE TO BE MAILED OR HAND-DELIVERED ONLY.**

1.8.8.7 Software Engineering Document

A Software Engineering Document shall define the system software structure and provide a detailed software engineering program as to how the various system functions shall be implemented. Special attention shall be given to failure conditions and failure recovery procedures. The Software Engineering Document shall, at a minimum, include the following:

A. Overall system engineering and data flow
B. Individual software module identification, purpose and description
C. Module interaction and interface definition
D. Database definition, common and file layout
E. Failure identification and recovery
F. External system interfaces and support definition
G. External system data interchange requirements
H. Required transaction rates

1.8.8.8 Software Acceptance Test Plans

Software acceptance test plans for module testing, integration testing, factory acceptance testing, and installed system acceptance testing should include, as a minimum, function(s) being tested, testing criteria and a schedule of tests.

1.8.8.9 Annotated Ladder Logic

The commented ladder logic shall be provided for review at various stages of the project. The Contractor shall provide a review and test schedule. I/O description and cross reference listing shall be provided. Comments shall be on rung by rung basis. AOC approved software package shall be utilized for commenting on the ladder logic listing. All documentation shall be provided on CD-ROM in addition to the specified number of hard copies. The final copy of the annotated ladder logic shall reflect the control logic state when the system is accepted by the AOC.

1.8.8.10 Hardware/Software Manuals

The Contractor shall supply hardware device manuals for the ABCS and all other system microprocessor controlled equipment (i.e. bar code scanners, printers, etc.) and system peripherals (i.e. VDTs, keyboards, etc.). Software manuals for the aforementioned equipment shall include complete information for each subsystem, including its operating system, utility and software packages. The Contractor shall be responsible for supplying manuals and maintaining/updating the warranty accordingly until final acceptance by the AOC.

1.8.8.11 Maintenance/Reference Manuals

The Contractor shall provide manuals describing the maintenance and operation of manufactured hardware. Also included shall be troubleshooting and maintenance sections describing the various error conditions, alarm messages, diagnostic routines, and procedures for isolating and correcting failure conditions.

A. The maintenance aids shall include a suggested preventive maintenance schedule and a recommended maintenance procedure to follow based upon the Contractor's experience with similar systems.

B. Each volume shall be bound in a commercial quality white vinyl 3-ring binder with clear slip covers and with pocket folders for folded sheet information. Each volume shall be organized with index tabs and clearly identified on the cover and spine by project and applicable equipment. All pages in each volume shall be protected by clear plastic in the form of lamination or slip-in pocket. A summary of equipment warranty and service coverages shall be included at the beginning of each manual. Complete spare parts information for the applicable equipment shall be referenced to the spare parts manual and the applicable system drawings in each volume. All related manufacturer's data, equipment drawings and control schematics shall be bound with the applicable text. Manuals shall be developed based on typewritten instructions on an 8 ½" x 11", duplex page format.

C. The content of the maintenance/reference manuals shall be formatted as follows:

1) Table of contents, including a listing for each equipment item of the specific system being described.

2) Product data, drawings and schematics specific to each listing. This information shall include only applicable information.

3) A full description of the unit and its various components, including exploded view drawings, for each listing. This information shall include all part identification, the function, normal operating characteristics, limiting conditions and performance information.

4) The standard operating procedures for the unit including start-up; break-in and normal procedures; shutdown and emergency procedures; and summer, winter and special condition procedures.

5) The maintenance procedures for the unit including routine operations; a guide to troubleshooting; instructions for disassembly, repair and reassemble; alignment and adjustment information; preventive maintenance and lubrication schedule; and all as-built drawings (mechanical and electrical) referencing this unit. Drawings and schematics shall be full-size and included in drawing pockets (half-size drawings may be included with prior approval of the Architect.

6) Manufacturer's product literature and copies of each warranty.

1.8.8.12 Site Record Documents

In accordance with Division 1 Section GENERAL REQUIREMENTS, one set of project documents shall be maintained at the site as a record copy. Project documents include all drawings, specifications, amendments, contract modifications, shop drawings, product data and samples, field test records, installation instructions, operating and maintenance data, warranties and bonds and construction photographs. All Project Documents shall be maintained by the Contractor in clean, dry and legible condition. The Contractor shall store Project Documents separately from construction documents.

1.8.9 Training

ABCS Contractor shall be responsible for systems operations and maintenance training. The Contractor shall submit a maintenance training plan for approval by the AOC per the documentation schedule in preceding volumes of the Contract Documents.

1.8.9.1 Range of Training Program

Effective training should result in AOC personnel becoming self-sufficient in all phases of operation, trouble shooting, maintenance, repair, and supervision of the installed system.

1.8.9.2 Multiple Training Sessions

The AOC will require multiple training sessions; the work of this contract shall include the following training:

A. A single session, 6 hours in duration, to extensively train six persons on maintenance and operation of the system.

B. Two sessions, 2 hours in duration, to train 30 persons standard user operations of the system.

The Contractor shall provide these training sessions to accommodate the ongoing operational activity and shall be available to provide a complete repetition of each training class at an AOC approved site 180 days after Final Acceptance of the complete ABCS; cost for additional training, if elected by the Architect, will be negotiated according to the AOC's "AOC52.243-1, Changes-Supplement (June 2004).

1.8.9.3 Personnel Training Groups

Training sessions shall be provided for the following groups of Personnel:

A. Operators
B. Supervisors
C. Plant and System Engineers/Managers
D. Maintenance Staff
   1) Mechanical
   2) Electrical
   3) Software
   4) Electronics

1.8.9.4 Training Session Format

Training sessions shall include the following format for all disciplines:

A. Formal classroom instruction.

B. Hands on equipment and controls instruction, including all phases of trouble shooting, error recovery, degraded operation and operator safety.

1.8.9.5 Training Videos

The AOC reserves the right to record (audio and video) any and/or all training sessions, duplicate any of the media recorded and distribute copies of the media to the appropriate personnel, either AOC employees or maintenance contractors.

1.8.9.6 Training Manuals

The Contractor shall prepare training manuals which are specific to each personnel group (refer to paragraph 1.8.9.3 above), or are included as a separate, but specific, section of an overall operations manual.

1.8.10 Replacement Parts Recommendations

1.8.10.1 Recommended Coverage

The Contractor shall recommend replacement parts required to maintain each subsystem at the specified up-time requirements (to be purchased under a separate contract). These recommended replacement parts are in addition to the specific items denoted in this specification as spare components and required to be provided as part of the Base Bid and options work. Recommended spares shall include, as a minimum, any critical components required for system operation as well as any custom components susceptible to wear and/or breakage. “Critical component” in this context, is defined as any component which through its failure can cause the loss of operation of the specific subsystem for a period of two hours or more. “Custom component” in this context, is defined as any component specifically produced by or for the Contractor, or any of the Contractor’s subcontractors, and is not immediately available on the open market.

1.8.10.2 Recommended Inventory

The quantity and types of initial spare parts recommended by the Contractor shall be reviewed and approved by the AOC prior to the completion of system engineering. The Contractor shall consider the requirements for reliability and the up-time requirements in making recommendations to the AOC.

1.8.10.3 Replacement Parts Identification

The Contractor shall provide detailed spare parts manual(s) for the ABCS. The manual(s) shall include, as a minimum, the following information on each part used in the system:

A. The part manufacturer.
B. The manufacturer's part number.
C. The quantity of the specific part used in the system.
D. The recommended quantity for spares inventory.
E. The number of each part initially provided.
F. The Washington, DC area stocking distributor for the part.
G. The price of the part.
H. The typical lead time for the part.
I. Exploded view and/or assembly drawings and references to the project drawings where applicable.

1.8.10.4 Custom Parts

All custom parts shall be supplied with detailed drawings to manufacture these parts if necessary.

1.8.10.5 Spare Parts Inventory

As part of the warranty required as part of the work of this project (see article 1.8.11), the Contractor shall furnish and maintain a complete inventory of replacement spare parts consistent with the recommendation for components and quantity as would be necessary to maintain the ABCS at the 98% up-time levels for one (1) calendar year.

1.8.10.6 Spare Parts Coverage

The Contractor shall base the recommendation for replacement parts inventory upon the number of components utilized, the life expectancy of the component based on a standard work week, the availability of the part, and thorough and complete understanding of the AOC requirements for a reliable system.

All spare parts and components shall consist of the same parts and components employed on the original system. Changes in the part or component brand, type, or quality which may vary from the original shall require prior approval by the AOC.

1.8.11 System Warranties

1.8.11.1 Warranty

The Contractor shall provide a written warranty covering all parts and performance of the ABCS upgrade for a minimum period of three (3) calendar years from the date of Final Acceptance. This warranty shall include all parts and labor required to meet this condition. "Satisfactory operation," in this context, is defined to be 98% total ABCS up-time. Each of the individual systems within the ABCS must maintain a minimum of 99% up-time in addition to the total system requirement of 98%. Each of these systems is determined to be down or out of service when a failure condition results in the delay of delivering any tote to its assigned destination. System down time is determined from the time the error condition is reported to the ABCS information system until the error condition is reported as being cleared. No provisions shall be made for mechanic response time in the calculations for system reliability.

1.8.11.2 Warranty Response Format

The Contractor warranties shall be submitted in a narrative response to this specification. This response shall include a description of the warranties that the AOC shall receive with respect to the total system, each subsystem and specific components or assemblies. The system warranty shall include warranties of all respective manufacturers, suppliers and subcontractors. Five (5) copies of this submittal shall be required with the following information, as a minimum:

A. Table of contents listing each product or work item.
B. Each specific product or work item.
C. Firm responsible for specific product or work item including name of primary and back-up contacts, addresses and telephone numbers which are active 24 hours per day.
D. Guaranteed response time to each call for service (emergency and routine).
E. The scope of work of each firm.
F. The date of beginning of warranty (System Final Completion date).
G. The duration of the warranty (minimum of three years).
H. Define Government or service personnel procedures in case of failure.
I. Define instances which may affect validity of warranty.
J. Contractor responsible contact, including name, address and telephone number.

1.8.11.3 Software Warranty

The Contractor shall warrant the operation of all Contractor supplied software for a period of one year from the date of system final acceptance. The Contractor shall inform the Architect of all applicable software upgrades or revisions as they become available during the warranty period. The Architect shall determine the derived benefit, if any, and notify the Contractor of a decision to proceed or not to proceed with incorporation of the software upgrade or revision.

1.8.11.4 Computerized Warranty Log

The Contractor shall maintain a computerized warranty item log at the AOC site. This log shall be used to document warranty service requirements of the ABCS during the warranty period. This log should include reason for warranty service, equipment replaced or repaired and time required to perform the warranty service. This log shall be used to determine system up-time and reliability. Maintenance personnel shall be required to input reason for service and service action information to the computerized log for each system error.

1.8.11.5 Warranty Procedures

The Contractor shall define warranty procedures to the Architect and the service contract provider. The Contractor shall provide the Government with a single point of contact for all warranty and service notifications. Warranty procedures shall define what equipment is to be maintained at site and what equipment is to be returned to the manufacturer for service. For manufacturer serviced equipment, the Contractor shall define specific procedures to be used and any special manufacturer contacts to expedite equipment service.

1.8.12 **Service Contract**

As part of the ABCS system warranty, the Contractor shall provide a one year service contract, beginning on the date of System Final Completion and renewable in one year increments for a period of five years, for the ABCS. This service contract shall be directly negotiable between the AOC and the service contract provider for years two through five of this period. This contract shall include all parts, labor and services to provide preventive, routine, emergency and warranty maintenance on all equipment provided. This service contract shall also include a Contractor-provided software support representative for the first sixty (60) days of the service contract period. After this initial on-site software support period the Contractor shall be available for the remainder of the service contract period for software support via a 24-hour hotline service.

1.8.12.1 Service Contract Provider

The service contract provider shall provide qualified personnel to support this level of maintenance. The specific qualifications of the service personnel shall be documented to the AOC prior to active employment of these personnel in the facility. These personnel shall be trained by the Contractor in all facets of system equipment maintenance. The service contract provider may elect to subcontract specific portions of the responsibilities to other local contractors who specialize in certain equipment (i.e. conveyor, selective vertical conveyor, computer, etc.). It should be noted that the service contract provider shall be the central contact for all AOC service needs.

The service contract provider selected by the Contractor shall be available on-site twenty-four hours per day, three hundred and sixty-five days per year. The service contract shall include all tools and equipment necessary to provide this level of equipment maintenance.

1.8.12.2 Computerized Service Log

The service contract provider shall maintain a computerized service item log on the AOC site. This log should be used to document service requirements of the ABCS during the service contract period. This log should include reason for service, equipment replaced or repaired and time required to perform the service. The ABCS information system shall be used as the source and platform for this information. Maintenance personnel shall be required to input service reason and action information into the computerized log for each system error.

1.9 FIRE PROTECTION

The Contractor is responsible for determining any fire protection requirements, beyond the existing building fire protection, necessitated by the ABCS. All AOC Design Standards, as well as applicable Federal, State, local, and Factory Mutual codes shall be adhered to. All fire protection systems, if any, including, but not limited to, smoke detectors, interface with building alarm, wiring, etc., shall be provided by the Contractor as part of this contract.

At a minimum, the control program shall have the ability to stop the ABCS (contact closure) upon the activation of a building system alarm.

1.10 AOC CONFINED SPACE EVALUATIONS

The AOC's Safety Office has toured and evaluated the book conveyor system for confined space conditions. A copy of the evaluation documentation and findings is contained in Appendix 9, AOC Confined Space Evaluations. The ABCS Contractor is required to be aware of the confined space classifications of the various areas in which work may take place and to operate within the Contractor's Confined Space Work Procedures and within the AOC's Confined Space Work Procedures (available from the Architect upon request).

1.10.1 ABCS Contractor Confined Space Work Procedures

The ABCS Contractor shall provide a copy of his Confined Space Work Procedures for the ABCS project to the AOC. The Contractor's Confined Space Work Procedures must be approved by the Architect before work is begun in any confined space.

1.11 AVAILABILITY OF EXISTING DRAWINGS

A large number of drawings exists for the ABCS conveyor systems. A list of all drawings that are available is located in Appendix 1 - Library of Congress, Existing Book Conveyor Drawing List. A subset of drawings (marked on the list with a "check mark") which are considered helpful in formulation of proposals, are included with these specifications (on CD-ROM). If additional drawings wish to be viewed (those that are "unchecked), the Contractor shall provide a written request, indicating the drawing numbers, a minimum of 2 business days in advance.

END OF SECTION 14501

2 PERFORMANCE REQUIREMENTS

2.1 EXISTING AUTOMATED BOOK CONVEYOR SYSTEM

2.1.1 General Description

The Library of Congress (LOC) is housed in three primary buildings: the Jefferson Building, the Madison Building, and the Adams Building. These buildings are connected by underground pedestrian tunnels, through which the current Automated Book Conveyor System (ABCS) runs. The Second Street tunnel connects the Jefferson and Adams buildings while the Independence Avenue tunnel connects the Jefferson and Madison buildings.

2.1.2 Automated Book Conveyor System Architecture

A diagram of the ABCS system controls hardware is shown below in Figure 14502-1. Note that this is a manually switched redundant system. The connections represented by the dashed arrows are switched by hand when the active computer system is also manually switched.

2.1.3 Subsystems / Controls Hardware

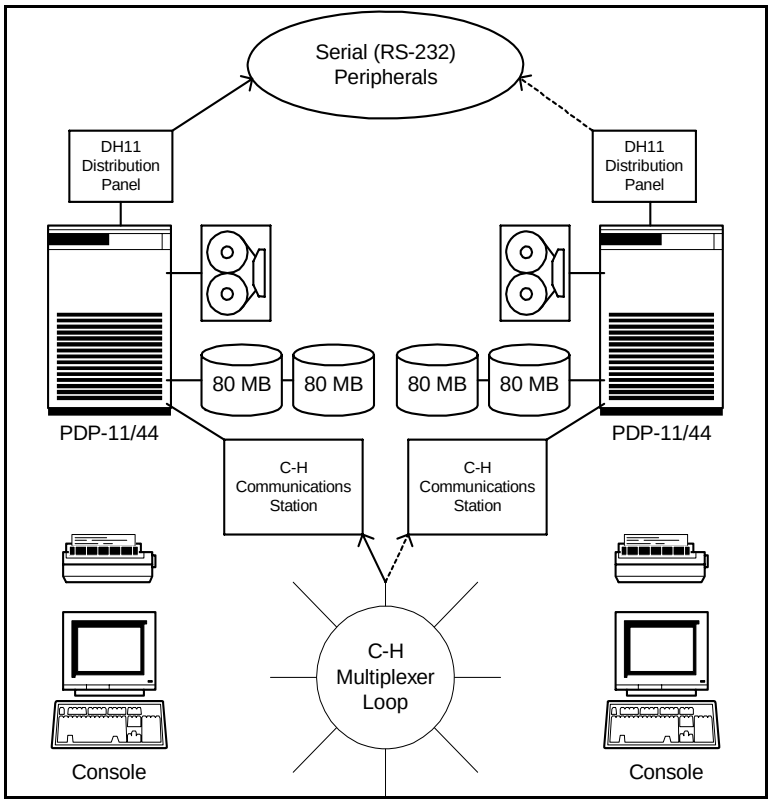

Figure 14502-1

2.1.3.1 Selective Vertical Conveyors

The ABCS contains five selective vertical (SV) conveyors, driven by a chain, which are located in fire rated shafts in the Adams and Madison buildings. The conveyors serve various floors of their respective buildings:

Vertical Conveyor	Building/Area	Floors Served
SV-A	Madison, NW core	SB, B, G, 1, 2, 3, 4, 5, 6
SV-B	Madison, NE core	SB, B, G, 1, 2, 3, 4, 5, 6
SV-C	Madison, SE core	B, G, 1, 2, 3, 4, 5, 6
SV-D	Madison, SW core	B, G, 1, 2, 3, 4, 5, 6
SV-E	Adams, N stack area	Decks 1 - 12, Reading Room

2.1.3.2 Selective Vertical Conveyor Cars

Selective Vertical cars carry totes which are spaced along the vertical chain at roughly 64 inch intervals. A sensor detects the passage of each car, another sensor detects car number one, and a third sensor determines tote presence on each car as it passes the detector.

2.1.3.3 Selective Vertical Conveyor Drives

Drive motors, located at the top of each vertical shaft, drive a reduction gear box which turns the chain sprocket to produce a chain speed of approximately 1 ft/sec. The chain drive motor couples to a shaft encoder through a timing belt. The shaft encoder, through timing circuitry, generates the clock that controls and coordinates all pantograph load and unload timing to prevent damage due to collision. All motors, except the drive for P186A, are powered by computer controlled contactors which are managed by an array of control interlocks including the following: safety; overcurrent; under and over voltage; phase reversal; and local control.

Stacking Switch: Car stacking occurs when the car-chain connection pin succumbs to metal fatigue. When the car detaches from the chain it falls onto the top of the car immediately below it. Such occurrences are detected as the stacked cars pass the Stacking Switch which is mounted near the top of the SV chain. Once detected, local controls shut the vertical chain drive off to protect each against further damage. The computer detects the event and notifies the system operator(s). Since the cause of shut-down can be easily derived a machinist will be dispatched with a replacement pin that can be quickly put into place and the vertical conveyor can be returned to service by re-establishing local power.

2.1.3.4 Branch Lifts

Six branch lifts (BL) numbered 1 through 6 are contained in the ABCS. The purpose of a branch lift is to enable the operator to transfer a tote from a lower level station or conveyor to a higher level horizontal conveyor and vice versa. Each branch lift unit (loader/unloader) has a single car attached to the chain and can only accommodate one

tote at a time. The chain is driven by a motor that cycles the car between the HOME and OUT position, where HOME for the loader is at the station level and HOME for the unloader is at the horizontal conveyor level. Opposite to the HOME position is the OUT position which is at the other end of the chain loop. The station and computer monitors the sensors that indicate car status and tote presence. For Branch Lift Stations, the totes travel to or from the car on gravity skate wheel conveyors.

The six branch lifts function as follows:

BL-1, BL-5:	Load Only; Feed to gravity spiral collector.
BL-2, BL-3, BL-4:	Full Service (Load/Unload).
BL-6:	Inaccessible; Vertical link between two floors in the Jefferson Building.

2.1.3.5 Horizontal Conveyors

The horizontal conveyor system consists of an array of powered and unpowered conveyors, some working in conjunction with stops, diverts, and merges. Operation of all of the devices, except the unpowered conveyors, is governed by the system controller of the Blue Box system. Powered horizontal conveyors are kept dormant until the system detects an approaching tote, at which time, the system starts the appropriate downstream horizontal conveyor. The horizontal conveyor runs until another tote appears or until a configuration determined time out value is reached. Turns are performed by slatted right/left turns, which are plastic slats attached to a motor driven chain.

2.1.3.6 Belt Conveyors

Belt conveyors are used to transport totes over linear distances where tote accumulation is not required. Belt conveyors consist of a conveyor belt, slightly wider than a tote, looped around two idler rollers, with a motor/tension assembly mounted on the bottom of the conveyor assembly. To keep totes on the belt, guide rails are mounted on each side of the conveyor at a height just below a tote's code plate.

2.1.3.7 Roller Conveyors

Roller conveyors are low friction (tote to conveyor) devices comprised of frame mounted cylindrical rollers driven by a belt located on the bottom of the conveyor assembly, much like a belt conveyor. Roller conveyors are noisy and should only be used in places where totes need to move relative to the conveyor belt.

2.1.3.8 Operator Stations

Operator stations at 52 locations throughout the Jefferson, Adams and Madison buildings provide attendants with the ability to send and receive totes to/from any of the operator stations. Operator stations consist of the following:

- **Pantograph or branch lift (Load side):** Pantograph loaders are used to accept totes from an attendant and transfer them onto a car on a selective vertical chain. Branch lift loaders are used to transfer totes up onto the horizontal conveyor system. In the case of branch lift loaders, the attendant places a tote onto a gravity conveyor. The tote then rolls down onto the branch lift load car.
- **Pantograph, branch lift or spiral collector (Unload side):** Pantograph unloaders are used to transfers totes from a car on a selective vertical chain to the operator station's short gravity conveyor known as a *runoff*. Branch lift unloaders (B25 in the Law Library, D65, and 100 in the mail room) are used to transfer totes from the horizontal conveyor system down to the operator station's runoff. Spiral collectors (B75 in the Law Library stacks and 200 in Collections) are used to receive (and store up to 215) totes directly from the horizontal conveyor system.
- **Keyboard:** Attendants use the keyboard to program the destination of a tote, and then send the tote. Attendants can return empty totes to the system either at will or in response to a system request. Certain keys are back lighted to convey system requests or information to the attendant. (The current system does not accept keyboard entry for tote code plate number. An inserted tote is associated with a SV carrier number as it is loaded. A tote number as on the code plate is associated with the tote as that carrier is unloaded onto the horizontal system and passes a code plate reader.)
- **Control electronics:** The control electronics listen to the central control computer, keyboard and the selective vertical synchronization pulses (load and unload windows). When conditions are right, the control electronics cause the mechanics to load and unload totes to/from selected cars on the selective vertical. When conditions are detected that might cause damage, the electronics cause the operator station devices and the selective vertical to stop all motion.

A total of 52 operator stations are located at each floor served by the vertical conveyors as well as 5 additional locations in the Madison and Jefferson Buildings, as follows:

Operator Stations	Selective Vertical or Branch Lift	Building/Area
9	SV-A	Madison, NW core (SB - 6)
9	SV-B	Madison, NE core (SB - 6)
8	SV-C	Madison, SE core (B - 6)
8	SV-D	Madison, SW core (B - 6)
13	SV-E	Adams (N stacks 1-12, Reading Rm)
1	100, Branch Lift	Madison, Mail Room (1st Floor S.)
1	D65, Branch Lift	Madison, SW core (6th Floor)
1[a]	B75, Branch Lift w/ a 215 Tote Spiral Collector Unloader	Madison, NW core Law Library Stacks (Sub-Bsmt)
1	B25, Branch Lift	Madison,, NW core Law Library (2nd Floor)
1[b]	200, Branch Lift w/ a 215 Tote Spiral Collector Unloader	Jefferson, Collections Area, (Ground Floor Octagon)

Notes: a - Secondary destination for all purged totes
b - Primary destination for all purged totes

2.1.3.9 Guardian Bars

In an effort to prevent jamming of overloaded totes, Guardian Bars were added by the AOC after the ABCS was in operation for several years. If a tote is trapped, it will block a "Jam" photoelectric eye thus forcing the computer to report a jam condition. Maintenance personnel are then dispatched to repair the jam which in this case is an overloaded tote. (Refer to Section 14501, paragraph 1.7.4.3 and Section 14503, paragraph 3.5.9.6 for additional guardian bar conditions.)

2.1.3.10 Diverters / Decision Points

Diverters are members of all decision points; decision points consist of an escapement stop, a tote code ID reader, and a diverter, all atop a roller conveyor. As a tote approaches a decision point, the code reader transmits the tote's ID to the controls system. The tote then enters and stops in an escapement stop while a "stop region" (SR) photoelectric eye signals the controls system of the existence of the tote in the stop. The controls system determines the path necessary for the tote from the tote ID and the database in the controls system and positions the diverter arm to send the tote to either the main path or the spur path. (The main path is defined as the loop containing the decision point; the spur path is in the direction of another loop, a selective vertical, or a horizontal conveyor fed operator station such as 100 or 200.) Once the arm is positioned and the divert zone is clear of previous totes, the stop releases the tote.

If the read is in error or the computer decides that the tote is out of sequence, the computer does one of two things. If the spur path is toward 100 or 200, the computer sets the diverter arm so as to keep the unidentified tote within the loop. If the spur path is toward a selective vertical, the computer sets the diverter toward the selective vertical. This error recovery logic works well only for totes that are not totally illegible. If they are, the only way currently to rid the system of them is to manually remove them - the new system should have a default location to purge illegible totes.

2.1.3.11 Merges

Merges are used to insert totes coming from a spur path into a loop; they require logic controls (including photoelectric eyes) which will prevent totes from entering from both inputs at once whereupon they may collide and cause a jam. A merge has two feed conveyors and one output conveyor. One of the input conveyors and the output conveyor are always a member of one loop. The other feed conveyor is from the spur path which leads from another loop, a selective vertical or a horizontal conveyor supported branch lift station (100 or 200). The computer controls the merge area to prevent tote collisions by controlling the run/stop status of the feed conveyors or by the use of an escapement stop (see paragraph 2.1.3.12 below).

2.1.3.12 Escapement Stops

Escapement stops, usually merely called 'stops', hold a tote motionless over a moving roller conveyor. Stops are placed before decision points and before one or both of the feeder conveyors for some merges.

In a decision point, the stop is placed between the reader and the diverter so that the system can delay the tote while it moves the diverter arm toward the proper path for the tote just identified by the reader.

Totes entering a merge area must be controlled so as to prevent them from colliding and causing a jam. If a merge feed conveyor is a simple non-roller conveyor, the tote can be controlled by running or not running the feed conveyor. If a feed conveyor is a roller conveyor, a stop can be placed before the merge over the roller conveyor. At times, one of a merge's feed conveyors is itself a roller conveyor for a decision point. For this condition, the decision point stop is used for merge feed conveyor control.

2.1.3.13 Code plate readers

Code plate readers, simply called 'readers,' consist of four photoelectric eyes placed in a vertical column. The output of the photoelectric eyes is wired to a logic board which composes the read and sends the result to the central computer. Code plates consist of a five wide by four high matrix of rectangles. A rectangle may be a piece of reflector tape (read as a binary 1) or simply a blank nonreflective area (read as a binary 0). The lower row is always all ones and is interpreted as a strobe bit. When the reader's bottom eye sees a reflection, it waits a small amount of time (just enough time for the tote to advance about ½ of a rectangle) then it accepts data from the three eyes above the strobe eye. The reader reads the five three bit characters one column at a time. The first column is all ones (start character) telling the reader to expect four more characters. The next three characters compose the tote number in a base-7 format. The last character is for error detection. Note that such a system requires that there be no more than 666_7 distinct tote ID numbers. (Remember that all character bits set which would otherwise be a seven (7) is interpreted by the reader as a start character.)

Tote Identification verification is enhanced by using two code plates, one on each tote side. The reader is placed on one side of the tote path. As a result, the code plate reader only reads one of the code plates on the tote. If a tote is misread, the tote is directed to a vertical lift where the tote orientation is reversed. The tote is then reintroduced to conveyor so that the other code plate is presented to the reader system. Code plate readers are located:

- Immediately before decision points.
- At the input to all horizontal conveyor to selective vertical (SV high stations) transfer areas.
- At the output from SV-A through SV-D ground floor selective vertical (Madison building SV high stations) to horizontal conveyor transfer areas.
- At the output from SV-E (and disabled SV-F) cellar selective vertical (Adams building SV high stations) to horizontal conveyor transfer areas.
- At the output of branch lift loaders.
- At the input to spiral collectors at B75 and 200.

Note that there are no readers at the input to branch lift unloaders BL-2 through BL-4. As totes are directed to these BL unloaders, the computer identifies the totes by sequence. It knows the ID of the tote unloaded by the high station servicing the BL (for BL-2 and BL-4). Similarly, in the case of BL3, it knows the ID of the tote coming from reader 6 at Decision point 6. (It is assumed that all totes misread by reader 6 will be sent in the other direction.) The computer keeps a list of these tote ID numbers in the zones that terminate in BL unloaders and as totes are unloaded, the computer updates its tote records. There is at least one hole in this logic. If a branch lift malfunctions during an unload the tote is physically removed from the system but is not removed from the computer records. This effect causes a number of subsequent erroneous software responses, none of which are

fatal.

2.1.3.14 Fire Detection Subsystem

Smoke detectors are located throughout the ABCS and report to the ABCS central control computer. There are fire doors at every operator station and at most of the firewall penetrations. Fire doors are held open with fusible links. Fire door position is reported to the ABCS central computer by micro switches on the fire doors. If smoke is detected or one or more fire doors close, the ABCS central computer shuts down the system components in the associated zone or zones. The existing ABCS does not currently control or operate any sprinklers.

The ABCS does not report a fire alarm detected by the ABCS central computer to any other system. It reports only to ABCS system operators in collections, the machine shop and EED's controls section. The only fire protection deficiency that can be corrected by the ABCS is to attempt to clear fire door areas and fire wall areas of totes so that the fire doors may close and sprinklers operate to protect the fire boundary.

Several other known fire protection deficiencies exist:

A. Fire doors over room vents in rooms located at the top levels of the Madison building vertical shafts are not connected to the conveyor fire alarm shutdown system.
B. The exhaust fan at the top of the SV-E shaft is not controlled by the conveyor fire alarm shutdown system. This is the only exhaust fan in any selective vertical shaft.
C. A fire door is not present at the top of the SV-E shaft.
D. There is nothing to prevent a fire-door from falling onto the top of a tote anywhere in the system.
E. The selective vertical conveyor shafts do not have smoke detectors at the tops.

2.1.4 Existing ABCS Traffic (FROM-TO DATA)

The current movement of totes through the ABCS was monitored by the AOC over approximately a 10-week period during the spring of 1995. The following tables summarizes the collected data.

A majority of the Madison to Madison movement is from the law library stacks to law library reading room and return from the reading room to the law stacks. This movement is via SV-B.

Due to security reasons, many of the operator stations in the ABCS have been shut down; therefore, the traffic data collected and included in this section is of questionable value in that it cannot predict the system loading on the target system after the controls have been updated.

TOTE SOURCE/DESTINATION TABLES.
Data collection start date: 11-May-1995
Data collection end date: 21-Jul-1995

MAJOR OPERATOR STATION TRAFFIC

Source	Destination				Total Totes Moved
	Mail Room	Jefferson	Madison	Adams	
Mail Room	1	189	0	0	190
Jefferson	118	5	4,775	7,776	12,674
Madison	3	5,401	6,088	1,048	12,540
Adams	0	7,309	2,101	18,429	27,839
Unknown	0	7	0	0	7
Totals	122	12,911	12,964	27,253	53,250

MAIN (MACHINE SHOP) LOOP TRAFFIC

Away from Main Loop	via	Toward Main Loop
6,876	Independence Tunnel	6,449
8,824	2nd Street Tunnel	9,410
12,899	Jefferson Causeway	12,669
28,599	Total	28,528

2.2 PROPOSED AUTOMATED BOOK CONVEYOR SYSTEM

2.2.1 General Scope

This project involves the design and replacement of Controls system, optional repair of certain existing problem areas, and the inclusion of necessary safety and fire protection devices.

The project does not include wholesale replacement of motors and any non-electronic hardware and mechanics.

The contractor may replace field control devices and sensors if required by the nature of his/her new Controls system design. Cost for such items, unless identified as a Unit Price item on the Schedule, shall have been included in the contract price based on the proposed control system design and shall not be at additional cost to the Government.

2.2.1.1 Components To Be Replaced (Base Bid design and trial installation shall not result in permanent replacement of conveyor components, although it shall include all computer-related items associated with the control system. Options work identified in Section 14501 (article 1.1.1) shall include the physical replacement and/or upgrade of system components; each option shall include all components integral to that area of work only.)

- All software (Base Bid);
- All computers and computer peripherals (Base Bid);
- All communications hardware (Base Bid);
- The tote identification system, including ID labels and readers, as designed;
- Operator stations (Options, as elected);
- Selective vertical controls components such as the load/unload window programmer, relays and protective circuitry (Options, as elected);
- Branch lift controls (Options, as elected);
- Unmanned Horizontal-to-Vertical and Vertical-to-Horizontal transfer area controls (Options, as elected);

2.2.1.2 Components To Be Modified (Each Option shall include modification/replacement of components integral to that area of work only. Changes to project cost for such items will be based on the Schedule of Unit Prices included with the accepted Proposal/Bid.)

- Guardian Bars: The operation of the existing guardian bars will be modified so that, when an over height tote is detected, system workstations will inform the system operators unambiguously of such an event. A number of new guardian bars will be installed in key places, as identified in section14503, Control Requirements.
- Photoelectric Eyes, Microswitches, and Motor Controllers: If the newly designed system is not compatible with the existing photoelectric eyes, microswitches, or motor controllers, those items shall be replaced. Any new photoelectric eyes, and micro switches will be of a modular design consisting of two or more parts with one part permanently mounted and wired to the system. The remaining module(s) are to be replaceable without disturbing the wiring module ("plug-in" style). The remaining modules will also be replaceable without disturbing any of the surrounding ABCS components. Motor controllers will be assembled from components modules such as the multipole contactor relay, auxiliary (computer communications) contacts, and overload module. The overload module must not rely on fusing metal to operate. Contact points will be reinforced. The overload module will be set to activate on an overload of between 5% and 10% over normal motor running current.

2.2.1.3 Components Not To Be Replaced.

A majority of the non-electronic hardware such as motors, horizontal conveyors, selective vertical drives and chains, and support structures will remain in place unless noted otherwise. If wear has rendered any of the hardware inoperative or marginal, it will be repaired by the Contractor. The Contractor is to immediately identify such components and review with the Architect for possible modifications to the contract; any approved changes to the work will be made in accordance with the AOC's "AOC52.243-

1, Changes-Supplement (June 2004)."

2.2.2 Performance

Due to maintaining the current non-electronic hardware, the active system capacity of the ABCS will remain essentially unchanged. The following performance requirements shall be met:

2.2.2.1 The Total Number of Active Totes / Tote Identification System

Active totes are totes that are in transit or are circulating empty totes. The replacement controls system will be designed to increase the amount of active totes (currently limited to $666_7 + 1 = 344_{10}$ totes due to the nature of the tote identification system); the system shall be able to accommodate at least 1000_{10} active totes, and the total number of totes allowed by the tote ID system is to be much greater than 1000_{10}. Refer to Section 14503, Article "Bar Code Label Requirements."

2.2.2.2 Tote Transit Time

Tote transit time is the time required for a particular tote to travel from its source (sending station) to its destination. This time is mostly a function of horizontal conveyor belt and SV chain speed, which will not change. Required performance includes an average of 95% of transactions under 50% system load to comply at the first opportunity.

The following deficiencies shall also be corrected:

A. Correct tendency for totes to remain on load pantographs while several empty SV cars pass.

B. Correct failure to unload totes from SV cars to an operator station runoff or the horizontal conveyor system at the first opportunity. A car destined to be unloaded shall unload the first time.

2.2.2.3 Maximize System Throughput

System throughput (number of totes delivered per hour) will be a complicated function which varies directly with conveyor speed, directly with system up-time, and non-linearly with the total number of totes in the system. The conveyor speeds will remain the same as they are now. System up-time should be high when controlled by a distributed, redundant system. Any change in this variable should cause an increase of throughput.

During the testing phase, determine the maximum number of active totes the system will support before throughput degrades significantly (i.e., clogs, filling runoffs, sequential back-ups).

2.2.2.4 Reliability

The controls system computer and PLC subsystems will be sufficiently distributed so that, if a computer or PLC system component fails, the impact of that failure will be minimized by transferring the control of that component to another component in the distributed system or to a redundant component. Degraded modes of nonessential data gathering and storage will be acceptable during such failure periods. Single operator station failure affecting a single portal need not be covered by redundancy or distributed control transfer.

Reliability of the total shall be greater than 99% while any subsystem's availability shall be greater than 99.5%, in accord with Section 14503, Article "Control System Availability."

2.2.3 Operation

2.2.3.1 Transport of Materials

Who or what sends materials is uncontrolled in the current system. The work of this project shall provide for some control of who uses an operator station through the sign-on procedure and tote send process. A table driven process using "allowable destination" tables for particular users and operator stations is to be used. The default entry will be a value for "all stations." Operators shall be assigned one of two levels of access, either "Operator" or "Administrator," with the first having only limited access to transport controls.

2.2.3.2 Tote Dispatch Process

Dispatch transactions are initiated in one of two ways. Uncataloged items, such as mail, is dispatched as the sender deems necessary. Cataloged items are dispatched as a result of a request in the form of a "Fetch Document" sent through the vacuum tube system or printed on a LOC Fetch Document printer in the stacks.

The attendant must have "logged onto" the operator station for any of the subsequent events to occur. The Attendant may explicitly log out when s/he leaves the area of the operator station. If more than a table defined number of minutes (default of 15) expires with no transaction activity, the operator station shall log itself out.

Once the operator station attendant has obtained the materials to send and knows where to send them, the operator must accomplish the following tasks using an assigned Operator Station monitor, keyboard, pointing device, bar code scanner, and bar code chart (or booklet) containing "common codes" as necessary.

A. The attendant will scan and load the materials into a tote. When all items have been scanned, the attendant will scan a "complete" bar code from the operator station's "common bar codes" chart or booklet or type a "complete" function key on the keyboard. The ABCS computer will store the list of bar codes scanned in and associate them with a transaction number. If the list is empty, the totes contain no cataloged items.

B. The attendant will scan the tote ID bar code. The ABCS computer will store the

tote ID in the transaction record assigned in item 'A' above.

C. The attendant will then place the tote on the operator station's sent pantograph thereby depressing the "tote present" flap switch on the pantograph's cradle.

D. The attendant, using his chart or booklet of common bar codes, will scan the bar code ID for the tote's destination operator station or the attendant will enter it via keyboard. The computer will record the destination operator station's ID along in the transaction record assigned in A above.

E. The attendant will scan his ABCS employee ID bar code which the computer will enter into the transaction data record assigned in item 'A' above. This last operation will signal the computer that the attendant has completed his task.

F. The computer will record the tote's source operator station ID and the time and date it was sent in the transaction record assigned in item 'A' above. The transaction will be considered complete once the tote is delivered to the destination operator station and the delivery time and date is recorded in the transaction record.

At any step in the process, the attendant may abort the process via keyboard or "abort" code scan, an error may occur or the destination may be or become unavailable. A transaction will be aborted if the send process times out (requires more than a table-driven value of minutes). Should an abort happen the transaction will immediately terminate and the incomplete transaction record will be erased. The transaction number will be used for the next transaction. If the attendant has placed the tote on the pantograph, he will remove it.

The transaction number will be at least a 32-bit unsigned integer. It will start at 1 and increase by one for each assigned transaction record. No two transactions will have the same number. Note that if the ABCS transaction rate is 100 transactions per second, a 32 bit integer can accommodate over 100 years worth of transactions.

As transactions are completed (totes delivered) the transaction records will be recorded in an online history database which will contain the last 6 month's worth of transactions before it is archived to an off-line file.

**** This process is one envisioned based on the current system and its operation as well as deficiencies. The Contractor is to determine if a more efficient method can be used; if so, such a system shall be reviewed with the Architect and, if approved, ultimately incorporated into the controls system design.**

2.2.3.3 Return of Collection Items to Storage

Collection material from 200 in the Jefferson Building is returned to the stacks (storage location) through the use of the library carts and not via the ABCS. However, the conveyor system is used to return collection materials from all other locations.

2.2.3.4 Empty Tote System

The system will maintain a certain level of circulating "empty totes" defined as those totes that will be delivered to an operator station should the attendant of that operator station request an empty tote. The empty totes shall be circulated on the five selective vertical conveyors.

The Contractor will implement an algorithm to maintain circulating empty totes at a level that does not significantly impact ABCS throughput but will provide for delivery of empty totes to requesting operator stations in a timely fashion. The algorithm will distribute circulating empty totes evenly among all selective vertical conveyors while purging those in excess of the optimum number and will accomplish this without undue traffic impact. The algorithm may request that any operator station return excess empty totes and enforce the request by informing system workstation operators of an operator station's attendant's failure to comply within a reasonable amount of time.

The system shall also prevent operators from inserting empty totes into the system if it already contains the maximum number of empties. If the system already has its maximum, the station where an operator is attempting to insert them should reject the attempt.

2.2.4 Fire Detection Subsystem

The ABCS control system shall be designed to perform the following actions in the event of a fire alarm.

A. Accept a fire alarm signal(s) from the fire detection system(s) operating in the Library of Congress and the Capitol.

B. Upon receipt of a fire alarm, the ABCS control system shall operate to clear zones at each fire door and/or fire wall from all totes in order to prevent the presence of a tote from interfering with proper action of a fire door or prevent the proper protection of a fire wall penetration by the sprinkler system. As soon as the zones at fire doors and/or fire walls are clear, conveyor motion in the affected area shall cease.

C. Upon receipt of a fire alarm, the ABCS control system shall operate to stop all motion of conveyors in the affected area after all fire doors are deemed unobstructed.

D. Upon reset of the fire alarm system, and announcement from authorities that all is clear, the ABCS shall be designed to restart by ABCS system operator command and thence to continue conveyor operations and tote deliveries.

2.2.5 Administration

2.2.5.1 Operational Database Maintenance

Such things as timeout intervals, alternate destinations, operator station tour of duty, system start and shutdown times, etc. need to be programmed into the operational database and loaded or not loaded at coldstart time.

2.2.5.2 User Database

The user account databases in all the computers, servers, workstations and microcomputers must be maintained. While the system is completely up and operating in "integrated mode" the account database in actual use should be maintained in one computer and that computer used to authenticate log-ons and other password protected events much as a domain controller does in a Microsoft Windows domain.

The Contractor shall propose a list of existing and additional data field which s/he deems critical to administering and monitoring the performance of the controls system. The final list shall be developed in coordination with the Architect.

2.2.5.3 Database Referencing and Reporting

System and system component states, event records and history, tote records and history shall be accessible both online and from the archives to create reports.

2.2.5.4 System Device Control

Devices (conveyors, stops, diverters, etc.), subsystems (selective vertical subsystems, loops, etc.), major systems (entire building) and the total system shall be started and stopped, put in and out of service, and generally directed from system control workstations.

System restarts (Cold Starts) shall be used to correct system malfunctions only as a last resort such as occurs with extensive database contamination. A variation of a Warm Start, such as one used to restart the system automatically every morning, allowing the user control of whether certain operational databases or their defaults are loaded at startup time shall be provided, thus minimizing recovery time.

2.2.5.5 System Device Monitoring

The state of all devices controlled by the new system needs to be monitored as events occur (event annunciation) and on command from a system control workstation.

2.2.5.6 Tote Dispatch Security

A tote shall not be dispatched (entered into the book conveyor) from a station if the primary configured conveyance path is not clear or if the destination station is closed or, for any reason, not in service. The attempt to do this will generate and log an error message; corrective action (e.g., path cleared, destination opened/changed, or dispatch request canceled) will be required to remove the error.

If a tote on a horizontal conveyor cannot proceed due to traffic or a malfunctioning device, the conveyor carrying the tote will stop. When the traffic jam clears, the conveyor will restart and continue tote transportation. If a conveyor transporting a tote feeds another conveyor that is stopped due to a sequential back-up, the feeding conveyor will also stop until the sequential back-up condition clears. When any conveyor stops due to such delays for more than the parametric value for the conveyor, the condition will cause an event message to be logged, printed to the appropriate event printers, and displayed at appropriate operator consoles.

2.2.6 From-To Performance

The Contractor shall endeavor, as part of the ABCS design and construction, to improve the From-To performance wherever possible. At a minimum, the from-to performance of the ABCS shall meet all the From-To performance data of the existing system, as indicated in Section 14502 Subsection 2.1.4. This performance shall not be compromised by the increase in new tote traffic on the existing system.

END OF SECTION 14502

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3. CONTROL REQUIREMENTS

This section describes the conceptual control system hardware and software design, development, implementation, installation, start-up, and commissioning requirements of the new Automated Book Conveyor System Controls (ABCS) system.

3.1 GENERAL

The Control System for the ABCS provides the functions necessary for achieving the desired level of automation in conveying, dispatching and tracking the Library of Congress collection media. The control system provides for effective and efficient control by a minimum number of system and station operators and maintenance by a minimum number of Architect of the Capitol technicians. The various control systems and subsystems shall be designed to meet, at a minimum, the following:

A. Provide schedule-driven automated system startup from a dormant condition before the Library of Congress opens and system shut-down to a dormant condition after the Library of Congress closes.
B. Provide system operator/maintenance stations in various locations throughout the three Library of Congress buildings.
C. Provide an efficient and accurate system for tote identification, movement and handling.
D. Minimize distribution (From-To) time.
E. Maximize number of totes the system can contain simultaneously.
F. Provide multiple operation states such that there is at least one alternate method of handling totes in the unlikely event of partial or total failure.
G. Minimize operator intervention for normal day-to-day operation
H. Be capable of “stand-alone” or emergency operation without the loss of material movement information.
I. All devices within the new ABCS shall know the correct time to within ±½ second. Devices shall interface with the AOC timekeeping system, at the Architect’s option.

3.1.1 DEFINITIONS

Bar Code Printer - This device is to be fully able to produce the bar codes that appear on the totes or on any other ABCS system component.

Building Server - This is the file server for each building and its complement of Conveyor Workstation Computers.

Control Computer - This is the central ABCS computer located in the Controls computer room, LM-G49D.

Event Printer - Dot matrix printers that print data line at time so that each line is readable as it is printed. They are to print on 8.5"x11” or 15”x11” fan fold paper at a rate of no less than 180 CPS. Event printers will print ABCS events as they occur. They will print in black ink on white paper. Each line will be visible as it prints.

Notebook Diagnostic Computer - Notebook Computer containing ABCS diagnostic

programs that may be connected to the provided connectors to run the appropriate diagnostics.

PLC Programmer and Control Point - This is the desktop computer used to store, write, and transfer (download) programs to PLCs, diagnose PLC system problems, store PLC programs, monitor PLC field inputs and control PLC field outputs.

Portable Bar Code Reader - Device to read and display the bar codes printed by the Bar Code Printer. Such a device may be completely contained within a hand held device or be part of a notebook computer.

Portable PLC Programmer - Notebook computer used in the field to diagnose PLC system problems and transfer (download) programs to the PLCs.

RAID - The fault tolerant disk system containing an array of three or more hot swappable disk drives. This RAID implementation will be level 5 known as RAID 5. All the "hard drives" in the Control Computer and each Building Server will be configured RAID 5. The RAID 5 will be supported by the hardware (disk controller) in each computer and not by the Operating System software.

Report Printer - Laser printers that print data one page at a time on 8.5"x11" cut sheet paper at a rate of no less than 6 ppm. They will print in black ink on white paper.

System Control Workstation - The devices used by system and security operators to control, monitor and maintain the system. They consist of a system unit (CPU), monitor, keyboard, pointing device, event printer and report printer.

3.1.2 Field Hardware

The controls system upgrade must work with nearly all the field mechanical devices. To that end, a description of those devices is included here.

3.1.2.1 Horizontal Conveyors

There are several varieties of horizontal conveyors, all with the same general components. The existing hardware system design and performance shall be maintained. All of the existing conditions described below shall be maintained as part of the upgraded system.

A. Belted conveyor: Belted conveyors are point-to-point conveyances that carry a tote directly atop a powered conveyor belt. This is a high friction conveyor where the tote should not be allowed to move relative to the belt.

B. Either right or left 90º slatted turns: Point-to-point conveyances where the tote is carried directly atop the slats.

C. Roller conveyors: Multiple-input or multiple-output conveyors used under merges, diverters and escapement stops where relative tote to conveyance motion is expected.

The controls system turns on the motor under several conditions. When the feed conveyor's "jam" photoelectric eye detects a passing tote the conveyor will either continue moving or will start up if it is not running. In either case, the run timer is reset to allow a full run time timeout. The conveyor will run until the timer times out or it detects a failure. When the entire ABCS first starts up, each horizontal conveyor is started in sequence and allowed to run until it either times out or the "jam" photoelectric eye on the feeding horizontal conveyor detects a passing tote. The controls system will command a conveyor to run if that conveyor has been placed in service by a controls system operator.

Certain conditions, caused either by the controls system or caused locally, will prevent a conveyor from running. The controls system works within the context of the tote handling system and will not allow a conveyor to run if there is an upstream sequential backup or if there is a danger of totes colliding and causing a jam. Local controls can unconditionally cause a conveyor not to run by breaking the motor controller control circuit.

The motor starter has a local switch that can be in one of three positions. OFF (the motor will not run under any conditions), AUTO (the motor is under the control of the controls system and other local controls, and ON (the motor unconditionally runs).

3.1.2.2 Composite Horizontal Conveyance Devices.

There are two types of composite horizontal conveyance devices: Decision Points and Merges. The new control system shall maintain or improve all functions of these devices. The control system shall determine the path necessary for the tote. Refer to Section 14502, paragraphs 2.1.3.10 and 2.1.3.11 for description of these components and their operation.

3.2 SYSTEM PHILOSOPHY

The control system shall be designed to seamlessly integrate via networked client/server architecture the concept as illustrated in Figure 14503 - 1. Each of the building control systems, depicted as LB1, LB2, and LB3, shall be automated and capable of coordinating material movement, and to be dispatched working in tandem with the ABCS. Each system shall have the capability for "stand-alone" operation and be capable of detecting errors, exception conditions, and provide recovery procedures which minimize impact failure on ABCS operation.

The contractor shall coordinate design, development, integration, testing and installation of the various subsystems to achieve a seamlessly integrated system. The Contractor's initial design submission(s) shall include any proposed modifications to the conceptual architecture (also identified in the Contractor's accepted offer/proposal) for review/approval by the Architect.

[Refer to next page for Figure 14503 - 1]

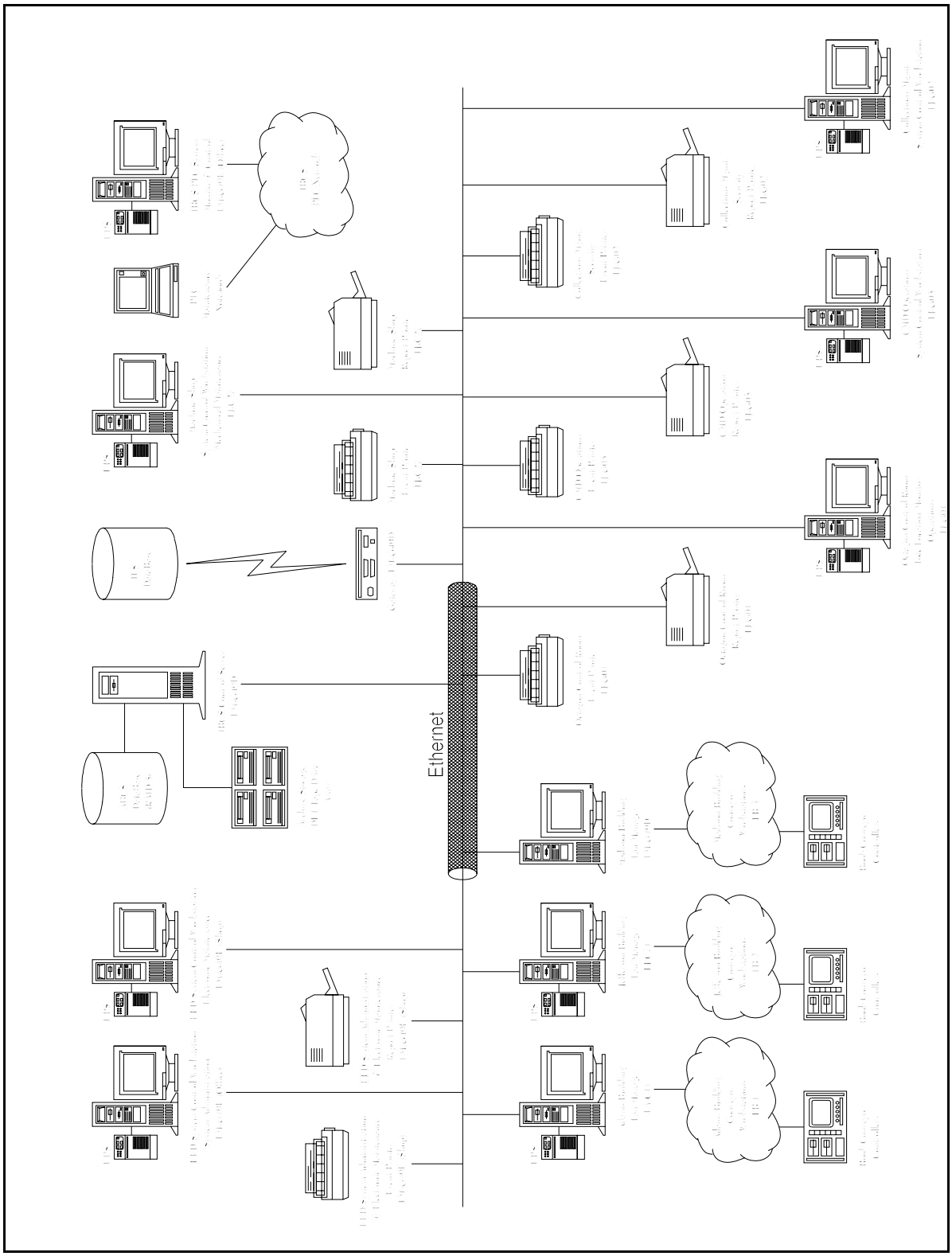

Figure 14503-1 Conceptual ABCS System Architecture

3.3 DESIGN OBJECTIVES

3.3.1 General

The ABCS control system shall be designed to meet, at a minimum, the following requirements:

A. Provide a controls system that functions with the existing system mechanics so as to provide an efficient and accurate system for the tracking and delivery of totes.
B. Provide new microcomputer system to control operator stations.
C. Provide new microcomputer system to control selective vertical operations.
D. Provide new tote ID system capable of accommodating 1000 totes in the system simultaneously while providing a numbering system that will allow the identification of many more. Note that the numbering of simultaneously active totes shall not be required to be contiguous. Any tote within the allowed ID numbering system, as long as it is unique, may be used actively so long as the total quantity of totes is 1000 or less. (The term “bar code” is used throughout the specifications, but the Contractor may propose any type of identification product which meets the system requirements and is determined advantageous.)
E. Provide several operation modes such that partial system failure does not bring the remainder of the system into trauma.
F. Provide tote transaction and event reporting.
G. Minimize operator intervention in day-to-day operation.
H. Log system events to an on-line file.
I. Provide system configuration and device features, such that all variable elements of the system can be modified by an operator with the proper security privilege.
J. Provide security so that system users can be categorized.
K. Automatic System Start/Stop Scheduling.
J. Operator Station Automatic Sign-On/Sign-Off Scheduling.
K. Shutdown of entire building by command or fire signal.
L. Data Communications - messaging system for purposes of printing/displaying event items.
M. Archive - Backup/Restore procedures for all computers in the system, historical event data, tote history.
N. Cascade power application management.
O. Empty tote management.

3.3.2 Design Basis

The overall ABCS is based on a group of logical subsystems that embrace the strategy of distributed function. The system shall be automated, capable of coordinating lift and conveyor movement, reporting events, and collecting tracking information for each conveyed tote in an efficient and timely manner. The system shall be capable of detecting and reporting errors, anomalies, exception conditions; and providing recovery functions that minimize the impact on overall system operation.

All off-normal conditions experienced by the system will be conditionally (configured) reported to all system control workstations, event printers and unconditionally recorded in the event history database.

Messages will be grouped into types: “Administrator” level personnel will have the option of preventing message type or types from appearing on any or all the system control workstations. Other types will, at a minimum, include ABCS “Operators” (i.e, ABCS security operators, ABCS maintenance operators). The capability shall exist for the AOC and/or LOC Administrators to create additional groups (minimum of five).

3.3.3 Redundancy

The contractor shall provide component redundancy to minimize down time and meet described availability requirements. Subsystem downtime due to a single point of failure shall be a maximum of two (2) hours. Functional redundancy where functions are transferred to other components during a failure is allowed if such events do not significantly impact system function. A single failure point shall not render the total system inoperable for more than 10 minutes.

3.3.3.1 System Data

The ABCS control architecture, as shown in Figure 14503 - 1, is a group of networked computers each containing a RAID (Redundant Array of Independent Disks) array. The RAID array should be configured as a RAID 5 device, which is fault-tolerant. The RAID will be accomplished by the disk controller, not by the Operating System. Each level 5 RAID container appears to its host as a single “hard disk” but consists of three (3) or more “hard disks”of identical size and specifications; one of the drives is for parity and the others store data. The total array byte capacity is equal to the capacity of one drive multiplied by one less than the total number of disks in the array. The RAID 5 array will continue to operate should any one of its component drives fail. To restore the array to full function, an operator need only replace the failed drive while the system is operating. The system will automatically restore data to the replaced drive. Should the array need to be enlarged, the operator need only insert another identical drive (with a unique SCSI ID) and instruct the system to reconfigure to include the new drive.

RAID 5 is good for applications with high read request rates. A transparent transition of inter-building traffic management from the ABCS control server to the building servers is the only acceptable failure transition.

The contractor’s system shall include all software and hardware required to fully utilize RAID technology and enable the control computers to maintain data integrity during the transition from the control server to building servers and the reverse.

3.3.3.2 Programmable Logic Controllers

Redundancy for programmable logic controllers (PLCs) and other control devices shall be provided as required to furnish a system which meets the overall availability requirements.

3.3.4 Design Aspects

The system shall provide for various states of integrated, stand-alone, local subsystem and manual operation to achieve this result without data impact.

System design shall minimize time critical requirements for higher level system response. Each subsystem shall provide positive confirmation of status for continuous run-time monitoring. The tote identity shall be positively reconfirmed at all decision points, including sorts, diverts, and transfers.

3.3.4.1 Strategy and Control Devices

Control strategies and the associated devices shall provide for efficient handling and movement of all products in a safe manner to operators and equipment. The system, operated properly, must not cause damage to tote contents, any equipment or any persons. All control components shall be designed and installed to fail in a "*safe*" manner. Special care and protection shall be employed in the system design to minimize system vulnerability to operator error /action.

3.3.4.2 Motor Control and Safety Devices

The contractor shall provide all control devices and local safety disconnects for the motors. All motor controls and safety devices shall be in accordance with Section 14505, Electrical Requirements.

3.3.4.3 Horizontal Conveyor Restart

When a series of horizontal conveyors restart after a sequential back-up has cleared, the conveyor motors must start sequentially to prevent an overload of building power. This cascade motor start-up is similar to the initial system start. When a sequential back-up occurs on a spur horizontal conveyor (those horizontal conveyors that are not part of a loop), and when the back-up reaches the loop that feeds the spur, totes that would normally be directed into the spur will instead be directed around the loop until the back-up in the spur is cleared. Such condition will cause an event message to be generated. Provisions shall be made to purge redirected totes on command from an operator console.

Authorized personnel may, on command through a system control workstation, redirect any tote in transit to another station if it is possible for the tote to reach the specified station from its current system location. Any attempt to redirect a tote will be accompanied with a system message to all system control workstations and will be recorded in the event history file.

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Authorization levels required shall vary with the type of tote being diverted. A "secure" or "sealed" tote will require a higher level (i.e. Administrator).

3.3.4.4 Software Safety and Alarms

Alarms shall be generated when equipment malfunctions or the normal operation is interrupted. Alarms shall be visually displayed at the affected system controls workstation as well as printed on the event printers with sufficient details and explanations to facilitate the determination of the failure condition. Alarm messages with error codes only, and without description, will not be acceptable.

Lockout devices, emergency stops, and interlocks shall be provided where necessary in accordance with the Electrical Requirements, Section 14505.

All alarms shall be logged in a file for historical recording and reporting purposes.

3.3.4.6 User Interface

The ABCS shall employ graphical user interfaces; the Contractor is to determine what devices will best serve the system with regard to operation, cost, and durability. Operator stations shall minimize the use of a keyboard by extensive use of bar code scanners or other proposed devices. The system shall be user friendly, operationally simple and maintainable.

User friendly implies that all operator interfaces shall be designed using display windows, icons, pull down or touch menus, etc. The various windows shall be designed to be consistent with related functions that are grouped into like-application windows.

A. Graphic displays shall be utilized to display status and other information best communicated graphically.
B. Buttons shall be consistent between forms and graphics applications.
C. Screen layouts, whether forms or graphics, shall be common and consistent across the entire operator interface.

On-line context sensitive help shall be provided. Help shall be provided for all system applications and alarms and provide assistance with recovery and operation exceptions.

3.3.4.7 Forms

Forms shall be utilized for text information and data entry. Forms shall contain logically grouped buttons for operator activities. Buttons shall be available to commit the form information to the system and to cancel the activity without updating the system database.

3.3.4.8 Backups

System backups shall be accomplished without disabling or diminishing the applications performance.

Software backup of all data on all the servers will be accomplished on the Control Computer. Data on the Central Control Computer will be backed up locally. Data on the other servers will be backed up to the Central Control Computer over the network. The backup device will be an array of tape or WORM drives whose total capacity is at least 50% more than the RAID storage space on all the computers. Full backups (weekly) and

differential backups (daily) will be performed periodically and automatically using commercially available software such as Veritas Backup Exec which supports backups over the network. The software selected shall be compatible with the current AOC backup system, which is Veritas NetBackup v5 software to LTO-2 tapes which sits on a ADIC Scalar 1000 robotic library. Full backups and differential backups will be performed so that they use different drives. It will be necessary only for the operator(s) to change media when required.

3.3.4.9 Configuration Table Modification

The system shall be designed to allow configuration table modifications during operation, without requiring a restart to make the modified parameters operationally active. Committing any configuration information shall automatically update all related database tables and maintain data integrity. Configuration tables shall have access limited to Administrators only by password privilege or permission.

Entries that apply to system integrity and security are to be available for inspection and/or modification through applications which apply the appropriate protections.

3.3.4.10 Database

The system shall be designed with a separate instance of the database for development and testing. Capability shall be provided to execute all applications in the test instance while the production application is executing.

3.3.4.11 Security

The system shall be designed to incorporate the security levels as defined by the Architect of the Capitol and Library of Congress. The security levels must be configurable and allow a user with the proper security level to add, modify and/or delete levels. The security system shall notify the user when a change will de-stabilize the system.

All computer operating systems used in the ABCS shall be C2 compliant (Refer to Appendix 8, Computer Operating Computer System Security Requirements). It is not required they be C2 certified.

3.4 CONTROL SYSTEM AVAILABILITY

3.4.1 Availability

Availability is the vehicle that translates the measures of reliability and maintainability into a combined index of effectiveness for a system. It is based on the question, “Is the equipment available in a working condition when it is needed?” Availability analysis can be used for trading between and establishing requirements for reliability and maintainability.

The time elements that comprise total time are as follows:

A. Storage, free, and off time.
B. Operating time.
C. Standby time - system is available for operation, just doesn’t have any to perform.

D. Downtime - consists of corrective, preventive maintenance, and time due to administrative and logistics delay.

3.4.1.1 Required Availability

Total system availability shall be greater than 99.0%. Any subsystem's availability shall be greater than 99.5%.

3.4.2 Calculations

3.4.2.1 Achieved Availability

Measures for operation readiness are based on all time elements. However, the availability measures do not consider the off time, including storage and free time. Achieved availability (A_a) is used for development and initial production testing where the system is not operating in its intended operation environment. Excluded are operator before-and-after operating checks and supply, administration, and waiting times. Standby time is excluded both by the definition and the environment. Therefore, Achieved Availability is calculated as follows:

$$A_a = \frac{OT}{OT + TPM + TCM}$$

where: OT = operating time
TPM = total preventive maintenance time
TCM = total corrective maintenance time

3.4.2.2 Operation Availability

Operation Availability (A_o) covers all segments of the time that the system should be operational. Therefore, standby time (ST) as well as administrative and logistics delay time (ALDT) shall be considered. Operation Availability is calculated as follows:

$$A_o = \frac{OT + ST}{OT + ST + TPM + TCM + ALDT}$$

3.4.2.3 Inherent Availability

For the sake of this specification there is a need to define system availability with respect to operating time and corrective maintenance when the system is operating in an ideal support environment. This form of availability is called Inherent Availability (A_i), and it is useful in the determination of certain aspects of merit for the system, such as frequency and type of failure occurrence, repairability (active repair time), and analysis of maintenance actions. Therefore, inherent availability is calculated by the following formula:

$$A_i = \frac{MTBF}{MTBF + MTTR}$$

Standby time, delay times associated with scheduled or preventive maintenance, and administrative/logistics downtime are excluded.

3.4.2.4 Mean Time Between Failures

Since the system is composed of subsystems the reliability and maintainability for each subsystem must be calculated to establish the Inherent Availability (A_i) of the entire system:

Mean Time Between Failures (MTBF) can be calculated as follows:

$$MTBF = \frac{1}{\lambda}$$

where: λ = failure rate

3.4.2.5 Mean Time to Repair

Mean Time To Repair (MTTR), which is the mean of the distribution of system repair time, is calculated as follows:

$$MTTR = \frac{\sum_{i=1}^{n} \lambda_i t_i}{\sum_{i=1}^{n} \lambda_i}$$

where: n = number of units for the subsystem
λ_i = failure rate for the *i*th repairable part
t_i = time required to repair the system when the *i*th part fails

Mean active corrective maintenance time and mean active preventive maintenance time are used to measure maintainability.

3.5 ARCHITECTURE AND FUNCTIONAL REQUIREMENTS

The overall conceptual architecture is illustrated by Figure 14503-l Conceptual ABCS Systems Architecture. The Contractor shall adhere to the proposed system architecture and configuration identified in his accepted proposal (which may have proposed modifications to the system in Figure 14503-1).

This section describes a conceptual ABCS architecture to meet the operations and control requirements of the Library of Congress and Architect of the Capitol. The overall ABCS architecture shall be a hierarchically organized network of computer systems employing a distributed control concept. The ABCS manages the delivery of totes of collection materials and other items such as mail to the various operator stations throughout the three buildings of the Library of Congress. The following sections describe the functional requirements of each major subsystem of the ABCS which shall be maintained, as well as various computer system architecture considerations as deemed appropriate.

3.5.1 General

At the Enterprise level, for any Collection material item requested by researchers at various reading rooms, a book request is generated either electronically or manually, and sent to the appropriate stack (storage location) for retrieval and delivery (by means of the Book Conveyor) to a reading room.

3.5.2 ABCS Computer System

The ABCS is the computer system control system for managing administrative functions such as scheduling; enabling operator station open and close times; controlling stack operator permission to route totes of Library of Congress materials; and managing the subsystem controllers that direct all material handling, movement, and tracking within the physical domain of the book conveyor system. This decentralized computer system shall be located in multiple locations throughout the Library of Congress campus and will orchestrate the activities of the material handling systems.

3.5.2.1 ABCS Functions

The ABCS control server shall, at a minimum, perform:

A. Real time communication with the Tote Conveyor Control subsystem.
B. Real time communication with the Selective Vertical Control subsystem.
C. Maintain a valid list of delivery station open schedules.
D. Provide operator interface functions for conveyor workstation operator, maintenance, and security personnel.
E. Event logging and printing.
F. Monitor and report system status, utilization, and activity.
G. Abnormal condition detection and recovery.

3.5.2.2 ABCS Subsystems

The control system shall operate the six (6) conceived subsystems of the ABCS:

A. Horizontal Conveyor Control subsystem.
B. Lift Control subsystem.
C. Tote routing and record keeping subsystem.
D. Communication subsystem.
E. Administrative subsystem.

    1. Security management.
    2. Archive management.
    3. Event management.
    4. Tote tracking.
    5. Reporting.

F. Maintenance Subsystem.

3.5.2.3 Computer Sizing

It shall be the contractor's responsibility to furnish appropriately sized computers to meet the functional requirements specified. The ABCS computers shall be sized such that they are not the limiting factor in determining the Book Conveyor throughput, i.e. the ABCS computers shall be sized to support real time control, graphical displays, relational data management, query-by-example reporting and communication functions without degrading throughput during peak operation.

3.5.2.4 Server Requirement

The control and building servers are envisioned to be fault tolerant (RAID 5 implemented in hardware) rack mountable computers. Refer to Section 14501 for system requirements, such as platforms, memory, and other items.

There shall be a maximum of four (4) networked building servers required for any future LOC book conveyor system which is to integrate other stand-alone systems. For the purposes of the ABCS controls system replacement upgrade, the minimum number of building servers required will be two (2), one for the Madison building and the other for everything else. These servers, in concert with the central control computer, shall provide automatic functional redundancy for each other by automatically shifting processing responsibility among the remaining operational computers should one computer fail. Each computer will contain at least 512 MB main memory (expandable), a RAID 5 "hard disk" system implemented in the controller hardware with at least three (3) identical drives, and an approved backup device sized to contain all the RAID array data. Furnish the central control computer in LM-G49D with a backup/archiving device with a total on-line capacity 50% greater than the sum of storage capacities of all of the RAID systems (one per server); the device is to be capable of archiving or backing up data from all of the building servers and all the System Control workstations.

3.5.2.5 Software Requirements

It shall be the Contractor's responsibility to deliver a fully operational and functional software system. Refer to Section 14501, Summary of Work / Project Requirements for system software requirements.

3.5.2.6 ABCS Application Software Requirements

This section describes the major system functional requirements and is not intended to delineate all aspects of detailed software design. The contractor shall provide application software that at a minimum meets the functional requirements of the overall system and all subsystems of the automatic ABCS operation state; all necessary communication software for the various system interfaces shall also be included. The following requirements apply to all subsystems within the ABCS:

A. All source code and supporting software necessary to create and support a working system shall be turned over to Architect of the Capitol at close of project and shall become the property of the Architect of the Capitol.
B. All database schemes, data dictionaries, and tables shall be provided and documented as required for source code.
C. All source files shall contain a comment header which, at a minimum, shall contain the

following:

1. Contractor's company name, address, phone number and software contact person.
2. Name of program author.
3. Date completed.
4. An indicator which shall be unique and consecutive for each version of the software released to the Architect of the Capitol.
5. An English language description of what the purpose of the program is, and the basic operations it performs to accomplish that purpose. Any parameters which are external to the program shall be described, as well as the output of the program.
6. The source language in which the program is written.
7. A list of all included files e.g. parameter file, common area file.

D. The capability to regenerate the application software system on all machines from the appropriate sources. The command files and all necessary manuals and instructions covering the process shall be provided.

E. All components of the software shall be written and identified in a related fashion. All programs shall be related by a naming convention to the section of the detail design document, which the contractor shall develop, describing the function of the program. Sub-functions shall be related by names which are, as in the case of main program, logical and predictable by the naming convention. Source code, object code, and executable modules shall have names which are logically predictable based on the naming convention.

F. Procedure files shall be provided.

3.5.3 System Components

3.5.3.1 Conveyor Operator Stations

There is a Conveyor Operator Station located at each of the 52 points in the ABCS where totes are inserted and/or delivered; locations are listed in Section 14502, subsection 2.1.3.8. Each operator station will be microcomputer controlled and will be of the proper size to fit in its environment.

Before a tote is sent, the operator will input sufficient information to identify the tote destination, tote ID (bar code) number, sending operator (via bar code), and contents (for catalogued LOC items). If the item has no LOC bar code, an "uncatalogued" bar code will be scanned for contents. The system will record the send time and send station. Operator stations shall have a "return empty tote" function and, under depleted tote conditions, shall request the operator to return empty totes.

Each operator station will have a schedule of operation scheduled for up to 8 intervals for each day of the week and for each of the 10 legal holidays. When an operator is not scheduled to operate it, it will not send totes and will not allow other operator stations to use the "inoperative" as a destination. Totes already in the system will be delivered normally assuming the runoff is not full.

Each operator station will have an optional alternate operator station which the system will redirect totes should the system be unable to deliver totes to the primary.

Each Operator station will be associated with one of the two purge stations. Totes inserted at this operator station, when purged, will be sent to the associated purge station if available. If not, the purged totes will be sent to the alternate purge station.

During operator station scheduled on-line times, an operator must be logged on before any totes may be sent. The operator may log out when done or the system may log out an operator after a programmed amount of inactivity time. The programmed time will adjustable for each operator station and be maintained in the system database.

Selective vertical operator will control the load/unload operations by controlling the motion of the station's pantographs. The operator station's microcomputer must be able to detect when it is safe and effective to move the pantographs. It must confine its activities to a safe "window" and only attempt to load unoccupied selective vertical cars. Either the operator station's or selective vertical's microcomputer will inform the appropriate computer (control computer and/or building server) of the appropriate data (load/unload car ID, load/unload time, load/unload station, tote date and operator data).

All new conveyor workstation computers will contain, at a minimum, the following items:

A. A momentary contact switch mounted in a 4" x 4" x 1" area reserved for a security reader head to be supplied later by others. The switch will simulate the dry contact response of a physical security system to a valid badge. The physical security system components will be provided later by others.
B. A hand-held bar code scanner for entry of employee number, tote numbers, tote contents and delivery destinations.
C. A display panel.
D. A keyboard.
E. A pointing device.
F. A CPU (microcomputer) for local operation processing and timing within the context of the selective vertical or branch lift of which it is a part. The CPU will also communicate with building servers for tote routing and event reporting purposes.

3.5.3.2 <u>System Interface Requirements</u>

System Control Workstations: Initially, the systems shall be configured with six (6) system control workstations. The ABCS, however, must provide the flexibility for the later addition of at least two (2) additional system control workstations. Each system control workstation will be accompanied by two printers, one report printer and one event printer. Each workstation will consist of the following:

A. System unit containing power supply(s), processor, appropriate I/O and memory busses, memory, I/O adapters (video w/ at least 32 MB video memory, disk controller, sound interface, 100 Base TX/10 Base T Ethernet interface, I/O ports), IDE or SCSI disk drives (30 GB or more), floppy disk drive and CD-ROM drive.

B. Flat Panel Monitor (at least 17" with a maximum resolution of at least 1280 x 1024, true color). Video refresh rate will be at least 70 Hz, non-interlaced.

C. Keyboard with alpha-numeric keypad (at least 102 keys).

D. Pointing Device.

E. Bar code scanner. (Used to proof printed bar codes and to detect defective ABCS system bar codes.)

F. Uninterruptible Power Supply (UPS).

G. One event printer. Event printers shall be dot matrix printers. Each character will be visible as it prints. If impact printers are used, they must be enclosed in noise-reducing housings.

H. One report printer. Report printers shall be network compatible laser printers. They will print at a rate of at least 6 pages per minute and at a resolution of at least 600 dpi.

One (1) System Control Workstations will be located at each the following locations:

A.	LM-G49E	Office (EED Controls section supervisor).
B.	LM-G49E	Shop (EED Controls Section maintenance personnel).
C.	LJ-C27	Machine Shop.
D.	LJ-G01	TJB Octagon, Collections control room.
E.	LJ-G02	Collections security.
F.	LJ-G05	CMD Operations.

Applications software shall allow operator and maintenance personnel to monitor and control the activities of the ABCS; allow operator and maintenance personnel to locate malfunctions (and, if possible, remedy them remotely); allow Administrators to program ABCS parameters through the ABCS hardware control database; allow operator and maintenance personnel to create reports on tote activity, tote history, historical data and database configuration; allow security operators to inspect and modify the security database; and allow administrators and backup operators to back up the System Control Workstation hard disk(s) using the backup software and hardware on a server or central computer. Each System Control Workstation will display on the monitor and print ABCS events on the event printer as they occur unless that event type is masked at that particular workstation. Events due to malfunctions, delayed tote events, and full runoff events shall cause the System Control Workstation to emit an audible alarm periodically as long as the condition persists if this particular System Control Workstation is not masked from displaying/printing that class of event. Each System Control Workstation shall provide its user with at least the same functionality provided by the current system as specified in Appendix 3, Existing Software Tools.

3.5.3.3 Device Monitoring and Control System

This system will replace the duties of the current system's Cutler Hammer Directrol Multiplexer. It is expected that it will be a Programmable Logic Controller (PLC) type system, the design of which will be the responsibility of the contractor.

Conditions:

A. No additional space will be allocated for the PLC system. As a result, designs requiring large racks of PLC components are discouraged.

B. All device points monitored by the PLC system will be available for monitoring by maintenance personnel through any System Control Workstation, the Maintenance Notebook Computer, the PLC Maintenance Notebook Computer, and the PLC Programming Desktop.

C. All device points controlled by the PLC system will be directly controllable by maintenance personnel through any System Control Workstation, the Maintenance Notebook Computer, the PLC Maintenance Notebook Computer, and the PLC Programming Desktop. Note that such control will not override local controls. It is recognized that such activities could cause serious malfunctions in the ABCS. This facility will not be used except by qualified maintenance personnel and then infrequently and only when absolutely required.

3.5.3.4 PLC Programming Desktop Computer

The Operating system shall be one supported by the PLC software offered by the PLC vendor(s) for interfacing with all types of PLCs used in the system. Applications software will be that software provided by PLC vendor(s) for interfacing with all types of PLCs used in the ABCS. It will be installed and configured in the Notebook so as to interface with any PLC in the ABCS so as to support programming, monitoring and control.

The contractor will supply all the PLC programs written for the ABCS. They will be resident on the Notebook and on CD-ROM. The programs will contain sufficient comments and/or documentation to allow AOC software maintenance personnel to modify (when necessary) and download the programs to the PLC system components.

3.5.3.5 Notebook Computers

The contractor will supply the AOC with two (2) notebook computers: one for system maintenance and diagnostics, and the other for PLC system maintenance. Both notebook computers will be of the same hardware configuration.

Notebook Hardware Configuration: A notebook computer (w/battery and charger) consisting of, at a minimum, 20 GB hard disk, CD-ROM drive, 1.44 MB Floppy disk drive, Color Graphics display (at least 14", 1024 x 768 True Color), pointing device, and the following I/O ports:

- Port replicator.
- At least one (1) RS-232 serial port.
- At least one (1) parallel printer port.
- At least two (2) USB ports.
- One set of audio (speaker/headset output and microphone input) ports.
- One (1) 100 Base TX / 10 Base T Ethernet port.
- One (1) external mouse/keyboard port.
- One (1) external video monitor port.
- Charging (power) port.

Each notebook system will contain a battery charger which plugs into the notebook and charges the notebook battery whether or not the notebook is powered up and functioning. Each notebook system will include a bar code scanner (or other designed device) programmed to read tote ID, User ID, Station ID and LOC cataloged material bar codes so as to identify and display the bar code in human readable form and verify the bar code integrity. The only components external to the Notebook case will be the battery charger, port replicator, and bar code scanner. All notebook components will be online and function simultaneously without the necessity of interchanging all needed components.

The System Maintenance and Diagnostic Notebook Computer will connect to the Ethernet and function as any other System Control Workstation. If there are devices in the field that do not contain a diagnostic mode and self test function, the notebook will, when necessary, connect to such devices and contain diagnostic routines used for troubleshooting and repair.

The PLC Maintenance Notebook Computer will contain the same Operating System and Applications software as the PLC Programming Desktop Computer.

3.5.3.6 Control Computer

The ABCS Central Control Computer shall reside in the AOC computer room (LM-G49D) in the Madison building. An Uninterruptible Power Supply (UPS) will be provided for this computer by the AOC. This computer will be of Server quality and be rack mounted. At a minimum, it will contain the following:

a. System board, with at least one Intel Pentium II Xeon (or equivalent) processor running at least 900 MHz. At a minimum, the system board shall contain the following slots/ports:

- Sufficient slots for at least 1 GB RAM.
- One (1) RS-232 serial port.
- One (1) Parallel (printer) port.
- One (1) keyboard port (either PS/2 or USB).
- One (1) mouse port (either PS/2 or USB).
- Two (2) USB ports in addition to those required by the keyboard and mouse.

The system will contain the following:

- 512 MB RAM (expandable)
- Video adapter that will provide resolutions up to 1024 x 768 True Color with a refresh rate of at least 70 Hz.
- 100 MHz Ethernet interface.
- One 17" flat panel monitor that will resolve at least 1024 x 768 @ at least a 70 Hz refresh rate.
- One (1) CD-ROM drive
- One (1) DVD+RW drive
- A fault tolerant, hot pluggable, hard disk system containing at least 100 GByte of useable storage. The system will be immune to single disk drive failure and automatically recover when the failed drive is replaced with a new, empty drive.
- One backup device and (if necessary) controller whose total online capacity is at least 150 GByte.
- One enhanced (at least 101 keys) keyboard
- One Pointing Device

3.5.3.7 Building Servers (2)

The ABCS Building Server Computers shall control all ABCS activity in the buildings they serve. The Madison server will reside in AOC computer room (LM-G49D) in the Madison building. An Uninterruptible Power Supply (UPS) will be provided for this server by the AOC. The other servers may be installed in LM-G49D, the Machine Shop, or in other AOC controlled space deemed appropriate. These computers will be of Server quality and be rack mounted. (Free-standing servers may be installed where mounted racks are not feasible due to space constraints; coordinate with the Architect for approval.) They will conform to the specification in section 3.5.3.6 with a single exception. Building servers will not be supplied with a tape array or WORM device.

3.5.3.8 Other Computers and Microprocessors

These computers will function as hardware controllers and interface between the ABCS network and the PLC devices in the system. They will be used for functions such operator station control, selective vertical control, branch lift control and horizontal subsystem control. They need to interface with the platform of the central control computer, servers and system control workstations over the Ethernet network using TCP/IP.

3.5.3.9 Bar Code Readers

Bar codes will be used for a number of purposes in the upgraded ABCS. Bar codes will be used for tote identification in place of the tote code plates. ABCS operators will be identified by a bar code carried on the operator's ID. Each operator station will be provided with a "book" of bar codes which, at a minimum, will contain codes for each operator station (these will be used to scan in destinations), and a code for not-catalogued LOC items (to be used when items such as mail and books yet to be coded are sent through the system).

A. Permanently mounted bar code readers shall replace the existing code plate readers currently in the ABCS. The current system lacks readers at the output of vertical to horizontal transfers that service branch lifts and spirals and at the branch lift unloaders. The system relies on tote sequence within a zone to keep track of the totes in these areas. Under certain conditions this logic fails. The new system will address this problem. The system shall reject a tote for a "no read" condition when the reader fails to read the bar code. The system shall log and report all "no read" conditions immediately.

B. Hand held bar code readers will be provided at all operator stations. Operators shall be required to use it to identify themselves to the system when they log in (keyboard login will be allowed) or send a tote. The reader will also be used to enter tote ID and destinations.

3.5.3.10 Bar Code Printer

Various ABCS items from personnel to totes will be identified to the ABCS with bar codes. As new employees are hired, new totes are brought into service, and old bar codes are damaged or wear out, new bar codes will have to be generated and applied to the appropriate surfaces. Two (2) bar code printers and a supply of the appropriate print medium for Employee ID, Totes, Operator station destination/contents tables, etc. that are appropriate for the purpose will be supplied as part of the system. One will be located in the Machine Shop and the other will be in the EED Controls Shop.

3.5.4 Control System Performance Requirements

This system shall meet the following criteria after all programs and databases have been loaded and the system is fully operational:

A. Data disks accessible from all network members, dependent only on operator security level.
B. No data loss due to a single disk failure (RAID 5).
C. Average CPU Utilization less than 50%.
D. Average I/O utilization for any disk less then 20%.
E. Average disk space utilization less than 60%.

3.5.5 Real Time Sizing Information

The contractor shall be responsible for developing a real-time model and a static model for the sizing of the proposed system. These rates shall be used for the sizing of the ABCS and associated ABCS subsystem computers, networks, and databases.

3.5.6 System Failure Analysis

The contractor is to develop a total failure analysis and a recovery plan as part of the ABCS control system design. The following response examples are presented only as a possible guide for the contractor.

3.5.6.1 ABCS to Tote Subsystem Communication Failure

When this occurs, an event message is logged and the ABCS changes mode to Non-Integrated. The subsystem continues to deliver totes to destinations known before the communication failure.

When the failure is resolved, the ABCS server transmits all queued destination messages to the Tote Conveyor subsystem controllers.

The ABCS returns to integrated mode.

3.5.6.2 ABCS Central Control Computer Failure

When this occurs, the building servers for each building will continue to handle intra-building traffic and the ABCS mode is changed to Non-Integrated. Inter-building traffic will be handled by resolving inter-building traffic issues among the building servers without having to communicate with the Central computer. Note that the ABCS Controls database will have to be distributed among all Control Computer and all the building servers for this to be practical. Typically such things as system event files are to be maintained only by the Central Control Computer. If the Central Control Computer fails, data for such files will be cached locally and uploaded to the Central Control Computer when it comes back online.

When the failure is resolved, the ABCS control server is brought back on-line to become an active member of the ABCS network. Inter-building traffic control is returned to the ABCS control server in an orderly manner that does not over-burden the network, subsystem controllers, and/or the various processors. The ABCS then returns to integrated mode. Data normally resident on the Central Control Computer, but has been cached on the server(s), is uploaded to the Central Control Computer as necessary in a way that will not impact normal functions.

3.5.6.3 Subsystem (PLC) Control Failure

When this occurs, the ABCS prints a priority event message and changes the ABCS mode to Back-up. The subsystem continues to deliver totes to destinations without missing a beat, however, since the subsystem is operating on the back-up PLC systems the failure of the primary PLC is an immediate concern. The primary PLC system must be-fixed and brought back on-line.

3.5.7 Automated Book Conveyor System Databases

The computer databases shall be developed using a commercially available, relational database software package, that has an identifiable installed base. Submit the proposed database management structure/process/system and include the method used for interfacing with relational database systems. That part of the database that is essential to tote handling will have to be distributed in such a fashion where it will be available in its entirety if any one of the ABCS computers (Central or Building server) fail. Any purely informational database(s) data such as event data are normally maintained by the Central Control Computer. Data for these databases will be temporarily stored more locally while the Central Control Computer is offline. When a failed computer has been restored, data temporarily cached on other computer(s) will be transferred to the restored computer and properly filed in the normally online database. All the fall-back and restoration activities described in this paragraph shall occur automatically.

3.5.7.1 Development System for Databases

A development system which includes development capability for forms and for reports shall be provided with the database software package. The Architect of the Capitol intends to use this development system to develop custom forms and reports using the database provided by the contractor.

3.5.7.2 Test Database

The database package shall allow access to multiple instances of the database to be in operation concurrently. The Contractor shall provide a test instance of the production database which may be utilized for development and for testing modifications to all contractor provided programs. The Architect of the Capitol may desire to perform custom development, upgrades, modifications and tests prior to placing them into production.

3.5.7.3 Database Security

Database and software security shall be provided with a multi-level password control scheme. The security scheme shall be implemented such that it does not interfere with operations once access has been granted. Note that, as long as the database is so protected, the multi-level password protection facility may be provided by the operating system and not be a distinct part of the database system.

A convention for the consistent use of function keys, buttons and screens within functions shall be developed. All function keys and buttons shall be described as to their meaning.

All application programs shall be written in a structured, modular form. Tables, variables, device addresses, numeric values and parameters shall not be “hard coded” in any execution sections, an application program can only address an external, to the program, configuration table for variable modification.

All application programs shall allow multiple program access to data files.

No program shall require any “customizing” of any commercially available computer operating or application systems.

All programs shall incorporate orderly start-up, initialization and shutdown.

Source code shall be provided for all application program components.

System logic diagrams and ladder listings with comments shall be provided for all PLC programs.

3.5.8 Communication System

The contractor shall install the necessary intercabling and provide ethernet switches, hubs, repeaters, network interface cards (NICs) and ports for all subsystems.

3.5.8.1 Internal Communications

The communication links between the ABCS computers are conceived to be via the TCP/IP protocol over Ethernet using l00-Base-TX modules and Category 5 unshielded twisted pair cabling. For runs over 100 meters in length, l00-Base-FX fiber optics shall be used. All ABCS devices communication over fibers and Cat. 5 twisted pair will communicate through Ethernet switches. Connections between Ethernet switches will be at least 100 MHz whereas GHz Ethernet is preferred.

TCP/IP is the required networking protocol for the ABCS.

Exceptions to Ethernet and TCP/IP requirements will be granted for a network solely for PLCs where that network is routed to the Ethernet through a PLC network control node. This will depend on the PLC communications topology and the PLC manufacturer. “Open System” solutions are always preferred over those that are proprietary.

3.5.8.2 External Communications

There are no external communications for the ABCS at this time.

3.5.9 Subsystem Functions

3.5.9.1 Tote Handling Subsystem

The tote handling subsystem for the ABCS shall be responsible for providing the real time communications interface with the tote controller(s) for the routing of totes, tracking events, and collecting system status information.

This system is the tote handling and distribution system within the physical domain of the Library of Congress facility. As totes are dispatched from an operator station, the tote conveyor system will control, manage, and track totes as they are conveyed throughout the Library of Congress facility.

A. Functional Requirements

The logical ABCS tote system will, at a minimum, perform the following:

1. Real time communication with the tote conveyor controller(s).
2. Receive tote routing transaction from logical ABCS subsystems.
3. Maintain a list of all open tote routing work.
4. Maintain the real time status of the physical tote conveyor system, e.g. conveyor drop points, lifts, and transfer devices.
5. Alarm annunciation and logging.
6. Monitor and report real time system status, system utilization reports, and activity status.
7. Failure and abnormal condition detection, annunciation and recovery.
8. Machine readable identifications will be encoded in a human readable form and tote history records will be generated for each tote trip.

3.5.9.2 Energy Management System

The tote conveyor control system shall employ an energy management system to sequentially start conveyor sections as totes approach and to stop conveyor sections when no totes are approaching, or are being transported on the subject conveyor section. An adjustable timeout for each conveyor shall be provided to control the shut down delay.

In addition, at daily system startup, and whenever the system is re-started, the energy management system shall start conveyor sections in sequence, as needed, in order to avoid placing a sudden large power load on the building power system.

3.5.9.3 Tote Handling Operations

The tote conveyor control system and the tote handling system shall work in conjunction as required to properly communicate the required information to each other and to associated subsystems.

There are several tote handling operations that deserve special discussion.

A. Tote Dispatch Operations

All tote dispatch operations at operator stations will require security system authorization, destination station identification, employee identification, and tote identification. The system shall be responsible for associating the tote identification with tote destination, and transmitting this information to the appropriate ABCS tote delivery subsystems.

A listing of conveyor workstation operator tasks required for all tote dispatch operations follows:

A. If the operator station is logged off, log onto the operator station (either by using the keyboard or a bar code assigned to the operator).
B. Load tote with items for transport via book conveyor system while scanning each item bar code if the items have bar codes. If not, scan the “un-catalogued item” bar code.
C. Close and secure the tote lid if the tote has a lid.
D. Scan tote bar code.
E. Scan destination bar code (from wall chart or book).
F. Place tote onto input (load) station.
G. If the ABCS controls system determines that the destination station is available, the system will respond with “Scan your User ID.”
H. Complete the operation by scanning your user ID bar code. The system will then accept and complete the load operation by sending the box into the system.
I. The operator may log out at any time during which he is logged in.
J. If the operator station remains unused until the inactivity timer expires, the user will be logged out.

The operator station computer and the tote conveyor control system shall not allow the dispatch of a directed tote without entry of all of the above information.

B. Empty Tote Dispatch Operations

An empty tote dispatch operation is a special case of the tote dispatch operation. The empty tote dispatch operation is used when workstation operators wish to return empty

totes to the conveyor system for storage or when empty totes are requested by the tote conveyor sub-system (for servicing empty tote requests elsewhere in the book conveyor system).

During the tote dispatch operation, when a conveyor operator wishes to send an empty tote to the system, the operator scans the “empty tote” destination instead of a physical building destination. The remainder of the tote dispatch operation remains the same.

C. Definition of Empty Tote

The contractor shall pay particular attention to the term “empty.” Empty totes are totes that circulate in selective vertical conveyors or are in transit between selective verticals so as to equalize the Empty Tote distribution. Although the tote is assumed to be without contents, whatever is actually contained within the tote is irrelevant.

D. Unidentified Tote Handling

Unidentified totes are totes whose bar code labels cannot be read by machine (bar code reader).

The operator workstation computer and building server shall not allow the induction of unidentified totes and shall recognize tote substitutions by operators and return substitutions to the sender.

If a tote is unidentifiable, it is to be immediately directed to the purge station / collections management area (station 200) for resolution. If a subsequent reader is able to identify the tote, the tote is to be redirected to its normal destination if it differs from the spiral at 200. After a number of misreads have been attributed to a particular tote, that tote is to be a candidate for repair. All misreads shall be logged in the event history database.

The goal is to purge totes with damaged bar codes. There are potential flaws with this approach, however. For example, if a reader in a critical area such as the one before the diverter in the machine shop that diverts totes to 200 goes bad, according to the above algorithm all the totes that go by this point will be purged. The Architect of the Capitol is willing to consider alternatives to the stated algorithm.

E. Empty Tote Routing

When empty totes are inducted into the conveyor system, the tote conveyor control system shall then route the empty tote to a conveyor workstation (to fulfill an active conveyor workstation empty tote request), to a selective vertical conveyor (to replenish the selective vertical empty tote queue), or to the Collections Management area (for removal of excess totes from the book conveyor system). [If the system already has the maximum number of empties, it should reject any attempts by operators to return more to the system.]

Circulating Empty Totes (those in the system that have not been specifically requested by an operator) if misplaced or properly placed in large numbers can clog the system. The system shall attempt maintain a programmable number of empty totes circulating in the selective verticals. When the number falls below a critical amount (also programmable) it will request operators to insert Empty Totes until the selective vertical is satisfied. Failing that, the system will attempt to transfer Circulating Empty Totes in from another selective vertical assuming that the request will not deplete the other selective vertical below its critical number. The number of these transfers should be kept to the smallest amount possible while still remaining effective. The system will immediately rid itself of Excess Empty Totes on a selective vertical (a programmable maximum number). They will be sent to other selective verticals if they are needed there or, if no selective verticals can use them, they will be purged to 200.

F. Tote Tracking Verification

Since it is possible to scan one tote at the entry point and actually send another, the system shall associate the tote sent with the car upon which it was loaded. When the car is unloaded onto the horizontal system, a bar code reader at that point will verify that the bar code is the same as the code scanned at the entry point. If they differ, the tote will be treated as an unidentifiable tote and purged to the spiral at 200.

There shall be alternatives which can be put into effect, including routing back to the sender (if known) or to a purge station if the ID label of the tote cannot be read.

3.5.9.4 Bar Code Label Requirements

Bar code labels, or an alternate identification label identified by the Contractor, shall be used on the totes to identify to the ABCS tote conveyor control system the identity of each tote. Each bar coded person or item, including totes, within the ABCS will have a unique code. **Other specific features, any changes in requirements, and final appearance shall be decided during the detail design phase of the work. The following requirements are part of the conceptual design outlined in Sections 14501 and 14502.

A. The bar code label shall be a Code 39 type label with the bar code readable by machine and above or underneath the bar code, a human readable (alphanumeric) representation of the bar code.

B. The alphanumeric markings shall be a minimum of l/4 inch high characters and shall be an Arial or Universe (sans serif) type of font that is easily readable.

C. The label shall contain alpha and numeric digits as follows, ANNNR, where:

"A" represents an alphabetical character readable by person
"N" represents a decimal numeric character readable by person
"R" represents an alphabetical character that is machine readable only.

The first alpha character, "A", shall be a capitalized character and shall be an identifier for each sequence of 1000 totes numbered 000 through 999. The last alpha character, R, shall represent the revision level for each individual bar code label of number ANNN. The numeric character, "NNN", shall represent the numeric identification 000 through 999 within each sequence of 1000 potential totes within each alphabetical sequence "A".

The "R" character shall not be printed on the bar code label and it shall not be displayed

on the conveyor operator workstation computer screens. This character shall only display on the System Control workstations. This character shall be a capitalized alphabetic character.

D. The system control workstation located in the Jefferson Building Machine Shop (LJ-C27) and in the EED Controls office (LM-G49E) shall have the capability to read bar code labels and to generate new bar code labels as replacements (i.e., have a bar code printer).

E. In addition to the alphanumeric tote ID label information which appears on the label stock, the label shall also contain the text "Library of Congress" at the top of the label as identification that the tote is the property of the Library of Congress. The bar code shall be of sufficient quality to be readable by a non-contact laser scanner from a distance of 10 feet and shall be capable of being read by a human from a distance of 10 feet at any time during the test until after the 20,000th test cycle.

F. Bar code label stock shall be a minimum size of 2 inches tall by 3½ inches wide and shall be a self-adhesive label of semi-permanent adhesion. The label shall not be capable of being easily removed without use of a solvent.

G. The label shall be resistant to water, coffee, colas and other common liquids which may be spilled onto the labels. The labels shall also be resistant to grease and oils which may inadvertently come into contact with the labels. Contact by any of the identified materials shall not result in any permanent damage to the label once the material is cleaned as recommended by the label supplier.

H. The labels, by nature of their design, the design of their application, and the design of their application surface and surroundings, shall be resistant to damage from abrasion from nesting of totes or from rubbing any areas of the conveyor system or operator workstations which may occur. The test for abrasion resistance shall be 10,000 cycles of nesting and de-nesting with an empty tote and 10,000 cycles of rubbing of a tote loaded with 40 pounds of test load against any conveyor component (or simulated components thereof) over the length and/or height of the bar code label stock, times the length and/or height of the bar code label stock. The contact force for the rubbing test shall be a minimum of 5 pounds or a large load as required to simulate an actual situation in the actual tote operating environment.

3.5.9.5 Lift Management Subsystem

The ABCS lift management subsystem provides the supervisory, management, and reporting functions necessary to support the real time exchange of tote tracking and conveyance information. This system shall, at a minimum, perform the following:

A. Real time communication with the Lift System Controller(s).
B. Maintain real time status of components such as totes, decision points, lifts, and queues.
C. Monitor and report real time system status and activity status.
D. Failure and abnormal condition detection, annunciation and recovery.
E. Real-time communication with the lift system(s) for the exchange of tote data.

3.5.9.6 Guardian Bars (Options Work, implemented sequentially per Section 14501, 1.3)

The existing guardian bars are situated in key places so that a tote whose contents extend above the top of the tote will be trapped before it enters an area where space is limited. When an over height tote strikes a guardian bar, the bar stops the tote over a low friction roller conveyor (which continues to run until it times out). The existing guardian bars are also situated so that if a tote is trapped, it is stopped so that it interrupts a “jam eye” beam which, after it times out, causes the computer to issue a “jam” message.

Retrofit existing guardian bars, in locations identified below, so that when one of these “jam eyes” times out a message will occur whose text offers the information that either a jam or an overheight tote has been detected at the location in question. Note that the ABCS contains a large number of jam photoelectric eyes; only a few of them double as overheight tote detectors.

Install additional guardian bars, in locations identified below, which will either be placed so that they make use of existing jam photoelectric eyes and cause a dual purpose message as stated in the preceding paragraph or be supplied with their own single purpose timed photoelectric eye which causes a message indicating that an overheight tote has been detected and detained.

Any additional guardian bars will either trap overheight totes over low friction roller conveyors (as they now do) or, if the guardian bar is installed over a high friction conveyor, it shall immediately stop the conveyor when a tote hits the guardian bar.

The guardian bars shall be constructed and installed as follows:

A. Guardian bars shall be constructed of 1½” x 1½” x 1/4" angle, cut and welded in the shape of an upside down ‘U’.
B. Each guardian bar shall be installed on a flat portion of conveyor.
C. The flat surfaces of the angles making each side shall face each other (i.e., toward the conveyor - not away).
D. The flat surface of the angle making the top, shall face the belt or conveying surface.
E. The sides of the guardian bar shall be installed perpendicular to the conveying surface and shall be installed to the outside of the guard rail in order that the guardian bar does not present a jam point to totes of the proper height.
F. The top of the guardian bar shall be parallel (horizontal) to the conveying surface, perpendicular to the direction of travel of the conveying surface, and span the width of the conveyor.
G. All guardian bars shall be bolted to the conveyor frame such that the dimension from the top of the conveying surface to the under-side of the horizontal member shall not be less than 10.50” nor more than 10.75”. Guardian bars shall be adjustable within the range given.
H. If the conveyor in “B” is not a low friction conveyor then a detector activated by a tote encountering the guardian bar will cause the conveyor to immediately stop and the system will issue the appropriate messages.
I. If the guardian bar is situated so that it detains the tote in an area over a low friction conveyor and where it breaks the beam of a jam photoelectric eye, the jam photoelectric eye (after it times out) will issue a jam or overheight tote detected and detained message.

J. If the guardian bar is situated so that it detains the tote in an area over a low friction conveyor and where it does not break the beam of a jam photoelectric eye, a timed photoelectric eye will be installed so that, when an over height tote is detained, the beam is broken and the eye (after it times out) will issue an over height tote detected and detained message.

The existing guardian bars as listed below shall be updated so that the detector that reports the entrapment of an over-height tote to the Controls system is used for over-height detection alone and not double as a jam photoelectric eye.

A. Madison building between P27 and P28.
B. Madison building between P31 and P32.
C. Jefferson building between P153 and P157.
D. Jefferson building between P83 and P85.
E. Jefferson building between P110 and P111.
F. Adams building between P136A and P137.

The Contractor shall install additional guardian bars in places identified below.

A. Jefferson building leaving Collections Management, after BL-6.
B. Madison building leaving B75 going toward SV-B.
C. Madison building leaving SV-B going toward B75.
D. Madison building leaving SV-B going toward B25.
E. Madison building leaving B25 going toward SV-B.
F. Madison building leaving SV-D going toward D65.
G. Madison building leaving D65 going toward SV-D.
H. Madison building leaving M5 going toward SV-D.
I. Madison building leaving M1 going toward SV-A.

Upon detection of an over-height condition, the conveyor controlled by the over-height detector will shut down and an over-height location alarm signal will be sent to the system operator and appropriately logged to the event file. These over-height detection areas shall be located in accessible areas where maintenance personnel can easily reach and manually remove over-height totes before an over-height tote causes a jam deep inside a congested area.

3.6 OPERATION MODES

The control system shall, at a minimum, support the following primary operation modes:

A. Integrated
B. Non-Integrated
C. Back-up
D. Manual
E. Security
F. Maintenance

The ABCS shall be designed using functional distribution to operate continuously without system shutdown. In an effort to eliminate the failure of the entire system, each subsystem shall be designed to operate in stand-alone mode, and support a combination of operation modes. The contractor shall provide for all such combinations of valid system states as part of the control system design.

3.6.1 Integrated

The Integrated mode shall be the normal mode of operation when the ABCS is fully operational; all building components are operational and able to communicate with the primary ABCS control server via the network. ABCS subsystems shall manage tote conveyor traffic within their respective domains communicating over the network to the ABCS database.

3.6.2 Non-Integrated

The Non-Integrated mode shall be the mode of operation when the ABCS Central Control Computer is not operational or has failed, and the building servers have taken over inter-building traffic control. ABCS shall manage tote conveyor traffic within their respective domains and pick-up the inter-building traffic control through negotiated communication with the other building servers. Databases essential for material handling must be distributed and available in the case of single computer failure among the Central Control Computer and building servers. Non-essential data gathered and stored in files such as the event file on the Central Control Computer will still be gathered and cached on the building servers. Once the Central Control Computer is restored to service, the cached data will be transferred to the Central Control Computer to update the data.

3.6.3 Back-up

This mode is entered when any subsystem primary PLC controller has “failed-over” to its designated secondary/back-up controller. The subsystem may continue performing automatic commands, but another subsystem failure at this location will put the complete system into dire circumstances.

3.6.5 Manual

This mode is entered when any subsystem is not capable of executing automatic commands and the system or a subsystem controller has been placed in local control. Because of the importance for Book Conveyor systems to service the Library of Congress, all systems shall be designed to have a manual back-up method of operation where feasible. It is not expected that this mode will be used as a “normal” operation mode because of the added manpower requirements. It is envisioned that this mode will be utilized for checkout and maintenance. Provision for manual control of conveyors, vertical lifts, and branch lifts shall be provided.

3.6.6 Security

This mode is entered when any subsystem is “Shut Down” because the system schedule has been modified by an administrator due to a security event.

3.6.7 Maintenance

AOC personnel shall be able to place an ABCS component into manual control for maintenance reasons. It shall be possible to manually operate any device including conveyor motors, vertical lifts, transfers, etc. without bringing the complete system to a halt. A three-position “MANUAL-OFF-AUTO” switch shall be provided for each device in the system with the following functions:

A.	MANUAL	Device shall be energized.
B.	OFF	Device shall be de-energized.

C. AUTO Device shall be under PLC control.

These switches shall be located on the appropriate control panel doors so as to have a line of sight from the switch to the controlled device. Hardwired safety and interlocks shall be provided to support the manual operation of all devices.

3.6.8 Starts and Shut Downs

3.6.8.1 Shutdown Procedures

Procedures shall allow an orderly shutdown of the complete system or of any building system without a loss of event data. The shutdown of any component must ensure that event data and uncompleted activities are not destroyed or sent awry.

3.6.8.2 System Warm Start

A system warm start can be executed, either automatically or via command, when the ABCS is in a shut down state at any time after the ABCS has been shut down in an orderly fashion. The orderly shutdown may have been done automatically after the end of a business day or done manually via command. A warm start will automatically start ABCS in the morning at programmed times before the LOC opens for business.

3.6.8.3 System Cold Start

A cold start is the process of turning on the controls system using default configuration and state data such as the day it was first activated. A cold start is only used when the system state becomes so contaminated that the only way to correct it is to start with default data.

During system operation, the system will maintain a record of the current state of all totes in the system. While performing a cold start, the operator will have the option of restoring these records, thereby preventing a purge of all totes which were in the system.

3.7 SOFTWARE REQUIREMENTS

The latest operating system software release and application products shall be provided in all cases.

3.7.1 Operator Station Functions

3.7.1.1 Operator Login

The operator shall be provided with a bar code label of the type used to identify tote destination while the operator is sending a tote. This bar code will be the operator's ABCS ID. The operator will present this bar code to the station's bar code reader when he first goes on duty. (If desired, valid operators may log in manually via keyboard.) The operator Employee Identification is verified against entries in a ABCS 'Authorized Employee File' and upon verification the Employee Identification shall be stored in the ABCS and associated with each activity completed by this operator. The bar code the operator uses at login time is the same bar code used to signal the completion of a Tote Send transaction. If the bar codes differ, the workstation will force a log out allowing the new operator to log in with the new bar code.

The workstation will maintain a record of log in/out activities and will distinguish between forced and normal log outs.

Operator stations will force a log out after a programmed time interval has expired without any operator station send or keyboard activity. There will be a value in the ABCS database for each operator station in the system. That value will determine the inactivity duration. Each operator station will have its own value (the default values will all be the same), modifiable by Administrator personnel. The table of modified values will be stored on a non-volatile on-line medium and be restored to the database at warm start time. The Operator will have the option to restore the latest copy of these modified values at cold start time.

Note that all operator stations will have a "tour of duty" assigned to them on a day of the week basis (holidays will be programmed separately). The tour of duty may contain as many as five time of day intervals which may be different for each day. The default for all operator station tours of duty will be on duty for all 24 hours. The data may be modified by Administrators and then stored on a non-volatile on-line medium, the latest copy of which will be restored to the database at warm start time and optionally restored at cold start time. When an operator station is outside of its tour of duty interval(s), it is considered off duty. When off duty, operators may not log into the operator station to send totes. Maintenance personnel may log into the operator station when it is off duty but may only perform activities that do not send directed totes or empty totes.

3.7.1.2 Operator Interface Displays

The display shall be designed and implemented consistently. These displays will contain background (static) information and also dynamic information linked to a relational database. Each operator interface display used during the normal operations shall, at a minimum, contain the following dynamic information:

A. Date and time.
B. Display Identification.
C. System Mode.
D. Current Status.
E. Alarm Status.

3.7.1.3 Activity Log

The control system shall maintain log file(s) containing events, tote dispatch, material movement, and material tracking information related to Book Conveyor activity. The logs shall include exception condition information for activity requests which could not be completed successfully. The system shall respond to queries regarding system activity status, including the status of a particular activity and collection of statistics for analyzing system throughput.

The log file(s) are to be maintained on the ABCS's Central Control Computer located in LM-G49D. Should the control server go off-line, the building servers will cache these file(s) and update the Central Control Computer file(s) when the control server comes back on-line.

No single log file will become larger than 700 Mb. This constraint is necessary so that the file(s) will fit on a standard CD-R (recordable) medium.

Capability shall be provided for archiving all historical data on a CD-RW device. It shall also be possible to access data from CD-RW medium for reporting purposes without reloading or reformatting. CD-RW capability shall only be installed on system control workstations.

Activity Log Summary data shall be archived from the real time activity log files. As old data is archived, the system shall maintain activity log summary data. This data shall be maintained for a minimum of twenty years.

All servers and system control workstations shall contain a CD-RW device that shall be used to save/restore software and create archived data media. All archived data, including data maintained on devices other than the system control server, shall be periodically copied to the system control server, at which time the local files shall be initialized. Whenever the system control server data are archived, these files shall be initialized.

Note that the archiving procedures noted in this section do not include full or differential system backups which are accomplished separately on a tape or WORM array.

3.7.1.4 Alarm Logging

The control system shall log all system alarms. It shall be possible to attach a classification, subsystem and priority to each alarm. Alarm text definition, classification and priority shall be user configurable without making program modifications. Alarms shall be written to any configured event printer and displayed on the monitor of any configured System Control Workstation. Alarm types considered significant (programmable) shall cause an audible alarm to sound on the System Control Workstation.

3.7.1.5 Transaction Tracking Number

A transaction is any system event initiated by an operator. The contractor shall develop with the Library of Congress a scheme for uniquely identifying transaction tasks by developing a transaction tracking number for each task assignment. The ABCS shall maintain open transaction tracking numbers.

The type of processing will also be developed during the design phase of the project; this function will provide the capability to upgrade the priority of a transaction.

3.7.1.6 Equipment Management and Utilization System

The contractor shall develop an Equipment Management and Utilization System, which shall provide the necessary screens and reports to provide maintenance operators and the Architect of the Capitol Electronics Engineering Division with the data about equipment performance.

3.7.1.7 Additional Operator Station Functions

All stations must be fully-selective, i.e., able to send totes to any station in the system, including themselves.

Plug-in network access points must be available at each station and major decision points.

Operate/test any transition point or subsystem independently of the total system.

Off-line diagnostics shall allow the cycling of pantograph and branch lift motors and, when the cycling is complete, leave the pantograph or branch lift in the "home" position. Work on selective vertical stations will be performed only when the selective vertical chain is not running. Maintenance personnel must inspect the chain/car/branch lift area to ascertain that no tote or other obstruction is in the way.

3.8 SYSTEM DIAGNOSTICS

Specifically, failure conditions shall be identified, located and alarmed. Software shall be provided to display system status on the operator, security, and maintenance terminals. At a minimum, this software shall indicate abnormal conditions with time, date, description, and location of the abnormal condition. This software shall complement diagnostics on specific equipment by assisting maintenance personnel in failure location detection and repair. At a minimum, diagnostic software shall visually enunciate abnormal conditions in the conveyor system component failures, bar code reader failure, and computerized equipment failures. Diagnostics should also exercise photo eyes and other sensor inputs. Note that configured alarms will also cause an audible alarm on System Control Workstations.

3.9 DISPLAYS AND REPORTS

3.9.1 General

A display and reporting system shall be designed and developed by the contractor to provide the information and data necessary to support the day-to-day operations of the entire ABCS. The display and reporting system shall consist of the tote delivery management, empty tote management, tote tracking, alarm management, data collection and reporting modules.

It shall be possible to specify selection and sort criteria for these reports/displays from the items on the display/report. All reports/displays shall list the selected and sort criteria as part of the display/report. It shall be possible to direct any report to the local terminal, a disk file, and/or a printer. The displays and reports specified here are not inclusive; other displays and reports may be necessary for operation and troubleshooting of the system. All such displays and reports shall be provided by the contractor. The layouts and formats of all displays and reports shall be generated by the contractor during the software design phase and submitted to the Architect of the Capitol for approval. The contractor shall define, design, and implement a database to support the creation of the displays and reports specified herein.

Reports shall only be printed on report printers. Once the report is initiated, it will be possible to abort the report at any time using simple, well documented commands. Once the report is aborted, processing on the report will immediately be terminated, and if the report is in the process of printing the report shall terminate at the end of the page being printed and leave the printer and associated system resources, in a usable state.

An adequate "Report Writer" application must be an integral component of the system.

3.9.2 Display

Minimum display requirements are as follows:

A. Operator and Maintenance Log-On screens.
B. Real-time equipment status showing the status of proximity terminals, conveyor systems, Selective Verticals, Branch Lifts, communication links, and workstations (showing operator logged-on). This screen data shall be refreshed automatically, at least once every 10 seconds.
C. Maintenance/Supervisory Screens and Functions:

1. Password Maintenance.
2. Terminal assignment.
3. Alarm Text.
4. Authorized Employee File Display and Maintenance.
5. Message Maintenance.

D. System Throughput.

1. Activity counts of completed tasks.

E. Workstation Ad Hoc Displays.

1. In addition to the displays and reports specified above, the ABCS shall have the capability of providing ad hoc displays of data extracted from all databases. These displays shall be for problem analysis, troubleshooting assistance and historical reporting. The data selection and sort criteria shall be at the desecration of the user.

F. Security.

1. Security screen(s) should only be options for administrator level users (with capability of being modified to include additional user groups which may be defined later). Multiple privilege levels are required.

3.9.3 Reports

3.9.3.1 <u>Minimum Report Requirements</u>

A. Activity Log Report for any user selectable time period.
B. Summary report of activity for any user selectable time period.
C. Alarm Log Report for any user selectable time period.
D. Employee Performance Report - only at security or supervision request.
E. Tote Location Report.
F. System Sign-on Security Report: Provide the ability to produce listings from the log-on identification file.
G. Scanner Reliability Report: This report summarizes all errors that have occurred on each scanner within the specified time.
H. Decision Point Activity: This report lists the number of events that have been performed

at a decision point/zone, and the total time that the decision point/zone has been active.

I. Purged Tote List: The purged tote list will be available upon command at any operator console and/or event printer.
J. Operator Log-on.
K. Subsystem Equipment Utilization.
L. Activity Log for any user selectable period by date/time interval.
M. Summary, by activity code for any user specified time period.
N. Alarm Log for any user-specified time period.
O. Report current equipment status showing the status of equipment component and all communication links.
P. Maintenance/Supervisory Functions

1. Security setup, authorized employees, alarm test, and logging selection, work order entry for degraded state operation, user defined parameters.

3.9.4 Software Test and Troubleshooting Tools

The contractor shall develop all necessary test tools, including system emulation, for testing the system software and system operation at various stages of development. These same tools must be available, and able to be used, for troubleshooting after system installation. These tools shall be documented by the contractor and shall be considered as deliverable items of the total system.

3.9.4.1 Requirements for Troubleshooting Tools

These tools are intended to be used by knowledgeable systems personnel for troubleshooting and not for the day-to-day system operation. These software tools shall, at a minimum, include the following:

A. Stubs for the various external systems.
B. An emulator shall be provided to demonstrate that the ABCS Central Control Computer responds appropriately to input received from field sensors and subsystems. The emulator shall demonstrate the correct coordination of field devices and shall allow all functions of the ABCS control computer to be tested at contractor's facility with simulated subsystem and super-system transactions. Check points shall be provided to allow test personnel to verify full communication with field devices. Emulator design shall be approved prior to the initiation of development efforts.
C. Ability to search any data item from the database.
D. Ability to simulate an event completely.

3.9.5 Subsystem Control

3.9.5.1 General

The conveyor control subsystem, controlled by PLCs, shall control and manage the movement of totes on the I/O conveyors to and from the tote loading and unloading stations at the interface with the Selective Vertical Lifts and the Branch Lifts. Facilities shall be provided to monitor any field output and/or control any field input from a central point located in the Electronic Engineering Division control room, LM-G49E. The Conveyor System shall include the conveyor controller(s), all panels and field I/O termination cabinets for field wiring from control devices and shall be conveniently located near the conveyor system. The I/O termination cabinets shall be located in spaces authorized by the Architect of the Capitol. A subsystem shall perform, at a

minimum least, the following functions within the control domain:

A. Real time communication with the ABCS Central Control Computer.
B. Load tracking control.
C. Interface with the fixed bar code readers in real time.
D. Control accumulation of empty totes.
E. Real time control of components within the domain.
F. Transmitting equipment status.
G. Event monitoring.
H. Alarm annunciation.
I. Failure condition detection and recovery management.
J. Tote movement and handling.

3.9.5.2 PLC Backup

Backup concept is dependent on contractor proposal. However, if the I/O conveyor system controller(s) are based on a redundant PLC configured as “warm backup” to provide automatic fail-over in case of primary PLC failure, without loss of data, the fail- over time shall be less than 2 minutes. From the ABCS control computer perspective, the redundant PLC should appear as a single logical system and the fail-over shall be . transparent. Any fail-over shall be written to the event log.

3.9.5.3 Bar Code Reader Stations

The contractor shall provide fixed and portable Bar Code Readers as specified in Electrical Requirements, Section 14505 Subsection 5.12.4, interfacing to the subsystem controllers and reading at least Code 39.

3.9.5.4 ABCS Communications

The contractor shall provide all hardware, software, and communication cabling for each building server location.

3.9.5.5 Abnormal Condition Handling

Abnormal condition handling is dependent on the contractor’s control strategy and is not included in the operation description. However, mechanisms shall be provided for detecting, initiating appropriate actions, and notifying Architect of the Capitol personnel of abnormal process conditions and system status. Abnormal condition handling shall, therefore, at a minimum, include the following:

A. Emergency Shutdown.
B. Tote identification.
C. Station output conveyor (runoff) full.
D. System component malfunctioning or not operational.
E. Transfer device failure.
F. Jam or backup of totes.
G. Guardian Bar violation.
H. System communications failure.
I. System network failure.
J. PLC system failure.

K. Power failure or surge.
L. Bar code reader failure.
M. Fire door closed.
N. Return to sender.
O. Delay.
P. Empty tote hoarding.

3.10 INSTALLATION

3.10.1 Components to be Installed

The contractor shall install and electrically wire all control system devices specified or required to supply a functioning system. The system hardware-shall be installed by qualified technicians in accordance with the equipment manufacturer recommendations.

3.10.1.1 Communications Cabling

The contractor shall furnish and install all communication cables. The contractor shall install and connect the ABCS and all its peripheral devices.

3.10.1.2 Uninterruptible Power Supply

All contractor supplied computers and peripherals located in the Electronic Engineering Division computer Room (LM-G49D) shall be connected to an Architect of the Capitol supplied UPS. The contractor will be responsible to provide the Architect of the Capitol, during detail design, the estimated power consumption calculations for contractor supplied equipment, and power distribution requirements. The UPS calculations shall be supplied with a minimum back-up capabilities of fifteen (15) minutes fully loaded.

All other UPS units shall be supplied, installed, and connected by the contractor as stated in the Electrical Requirements, Section 14505, Subsection 5.12.5, Uninterruptible Power Supplies.

3.10.1.3 Power Distribution

The contractor shall obtain all power distribution for the supplied systems from the main power drops, as described in the Electrical Requirements, Section 14505, as provided by the Architect of the Capitol.

3.10.1.4 Control Device Calibration and Adjustment

All control devices requiring calibration and adjustments shall be mounted in such a manner as to provide additional adjustments as may become necessary during the normal use.

END OF SECTION 14503

5 ELECTRICAL REQUIREMENTS

5.1 GENERAL

This section provides requirements for the design, construction, and application of electrical systems and controls for industrial equipment which operate from a supply voltage of 600 volts AC or less, commencing at the power supply terminals on the disconnecting means.

A. All electrical components and enclosures shall incorporate quality materials assembled and installed in a manner representative of a high grade industrial system. All components shall or bear the label of UL, ETL, CSA or any other nationally recognized independent testing agency as approved by the AOC. Plug-in modular components, where available, shall be used unless otherwise noted.

B. All electrical designs and equipment shall conform to the latest edition of the NFPA-70 (National Electrical Code), NFPA-79, applicable OSHA regulations, AOC Design Standards and this specification.

C. Nominal voltages are defined as 120/208 volts for the Jefferson and Adams buildings, and 277/480 volts for the Madison building.

D. Electrical motor power for horizontal conveyor, diverter, and escapement stops shall be/is as follows:

Madison Building:	480 volts, 60 hertz, 3 phase for those motors powered from Madison building sources.
Jefferson/Adams Buildings:	208 volts, 60 hertz, 3 phase for those motors powered from Jefferson and Adams building sources.

E. Pantograph motors and controls circuitry shall be/is powered from 110 volt, 60 hertz, single phase sources regardless of the building.

F. The AOC will provide electrical power for the Automated Book Conveyor System, from power distribution panels with disconnects sized for connected loads.

G. Per NEC requirements, the Contractor shall provide wiring, conduit and disconnect safety switches from the AOC supplied source to the respective electrical enclosures. Specialized power or conditioned power shall be the responsibility of the Contractor.

H. The power sources for all buildings, especially the Adams and Jefferson buildings, are subject to short term transients. All circuitry shall either filter out these transients or be immune to them.

I. All power disconnects installed under this contract shall provide for lock and tag-out.

J. On any point for which specific provisions are not made in this standard, the

most stringent provisions of the national codes shall be observed.

K. For hazardous locations, refer to the applicable articles in the National Electrical Code (NFPA-70).

L. Any old unused wire/cable shall be removed to the nearest junction box.

5.2 DIAGNOSTICS

This section defines the mandatory use of diagnostics as a production tool with the ultimate objective of improving product quality and productivity.

5.2.1 General

A. Diagnostics is a function that permits identification and evaluation of hardware, peripheral device conditions, monitoring system operations, and troubleshooting system malfunctions.
B. All field devices shall be equipped with integral status lights.
C. A test mode shall be provided to indicate the functionality of the diagnostic display used.
D. Four types of diagnostic displays may be used:

1. Pilot lights
2. Numeric displays
3. Alpha-numeric displays
4. Graphic displays

5.2.2 Pilot Light Displays

When pilot light displays are required, the following items shall be indicated, in addition to the requirements as specified in Control Equipment (Article 5.9).

A. Advance and return positions of all mechanical devices.
B. Status of sensors
C. Tote present
D. Over cycle time
E. Individual sequential steps

5.2.3 Numeric Displays

When numeric displays are required, the following shall be indicated at the main control station, in addition to the requirements as specified in Control Equipment (Paragraph 5.9).

A. A unique code corresponding to each fault or status condition.
B. The fault condition shall be recognized and displayed whenever an input device has failed to attain its proper state in a given sequence.

C. The primary fault responsible for the system stoppage shall be displayed automatically. A manual means shall also be provided to “scroll” the display for identifying secondary faults if any are present. When scrolling is complete, the primary fault shall be re-displayed.

D. The numeric display shall be blanked automatically when the system resumes operation and shall remain blank until a new fault occurs.

E. A “reference” or “look up” table permanently mounted in close proximity to the numeric display shall be provided to correlate the fault code with the specific fault message. Refer to the documentation section for applicable design details for this table.

F. The numeric display shall indicate the step of sequence in a multi-step cycle operation of the equipment.

5.2.4 Alpha-Numeric Displays

When alpha-numeric displays are required, they shall operate under the same guidelines and requirements of the numeric display, with the exception of not using a “reference” or “look up” table. This shall be in addition to the requirements as specified in the Control Equipment article in this section.

A. Fault messages shall be specific so as to isolate the input device at fault. Example: “Slide not advancing -- 11004 LS not actuated.”

B. When CRTs are used as alpha-numeric displays, advance-return position of a mechanical device, as specified in the “Pilot Light Displays” in this section, may be graphically displayed on a CRT. Pilot light indicators shall not be required for these functions at the main electrical enclosure if position is displayed on a CRT, but field device integral status lights shall be required. The position indicator shall be continuously displayed while the fault message is being displayed.

5.2.5 Graphic Displays

When graphic displays are required, they shall include the following functions in addition to the requirements as specified in the Control Equipment paragraph in this section.

A. Real-time data gathering/processing
B. Data analysis/display
C. Configurable/programmable
D. Multi-tasking
E. Data communications
F. Printer interface
G. Block diagram of overall system
H. Individual station “zoom in” feature for real-time fault diagnostics
I. Production report, e.g., cycle times and parts count
J. Operator prompting and assistance
K. Tool schedule
L. Real-time monitoring of PLC ladder logic
M. Statistical quality reports
N. Preventive maintenance tasks
O. Fault summary reports

5.2.6 Controls Equipment Self-Diagnostics Requirements

A. All control systems shall perform a self-test on power-up before allowing any movement.

B. Automatic detection and isolation of all system hardware and software, data and sequencing malfunctions down to the board, cable or module level shall be provided.

5.2.7 Control Equipment Maintenance Diagnostic Requirements

A. Test points shall be provided for checking essential waveforms and voltages where terminals are not otherwise provided. Test points shall be readily accessible and identified with unique designations.

B. A remote port for programmable device support equipment shall be provided at the operator console when:

1. The operator console is 25 feet or more away from the main electrical enclosure.
2. The main electrical enclosure is located on a different level than the operators console.

C. Instrumentation devices including voltmeters, ammeters, temperature indicators, pressure indicators shall be provided for process set-up or parameter monitoring.

D. A control or controls will be provided for pantographs, branch lifts, diverters, and escapement stops at a location within sight of the controlled device to command them to move as described below. For such motion to take place, the device must be in diagnostic mode, a state where the device is not in service and may safely be commanded to cycle without danger to personnel or surrounding equipment or components.

1. Extend or place the device in the “out” position and leave it there.
2. Retract or place the device in the “home” position and leave it there.
3. Command the device to cycle between “out” and “home” until the command to stop cycling. The device will stop in the “home” position after commanded to stop.

5.3 NAMEPLATES AND IDENTIFICATION

5.3.1 General

Nameplates and device identification tags shall be laminated phenolic tags with white with black characters. These tags shall be a minimum of 0.062” thick. The following exceptions can apply:

A. Warning tags described elsewhere in this section that are yellow with black letters.

B. Where environmental conditions require the use of other materials for tags, a request shall be submitted to the AOC for approval of substitution.

5.3.2 Mounting

5.3.2.1 General

A. All tags and nameplates shall be held in place with metallic drive screws, except plugs and standard ring type nameplates used for pushbuttons and pilot lights.

B. Plaques shall be secured to panel door surfaces with a minimum of two rivets or screws combined with an appropriate adhesive. Large plaques, greater than 15 square inches, shall require a minimum of four rivets or screws, one for each corner.

C. Identification tags for electrical enclosure devices shall be mounted on the panel subplate. When individual identification of components is impractical, such as on electronic assemblies, group identification may be used. Individual components shall be documented on the electrical drawings.

5.3.2.2 Field Devices

All identification tags shall be clearly visible. If the device is hidden by a cover or guard, an additional tag shall be located where visible with an arrow pointing to the device location, or a tag placed on the cover to indicate “Device XXX located inside here.”

5.3.2.3 Programmable Controller I/O Racks

Each PLC I/O point shall be permanently and plainly identified by only one I/O address that is used consistently and specifically throughout the ABCS.

5.3.3 Main Nameplates

Main nameplates, with characters no smaller than 0.25”, shall be attached to the outside of the electrical enclosure door. This nameplate shall include the following:

A. Supply voltage, phase and frequency
B. Full-load current at nominal supply voltage
C. NEMA momentary withstand and interrupting capacity of the main disconnecting means
D. Contractor’s name
E. Contractor’s electrical drawing number
F. Equipment model number and serial number
G. Contractor’s order number
H. Date of manufacture
I. Supply voltage source and location

The full load current shown on the nameplate shall be not less than the sum of the full-load currents required for all motors and other equipment which may be in operation at the same time under normal conditions of use. Where unusual conditions including loads, duty cycles, etc. require oversized conductors, the required capacity shall be included in the “full-load current” ratings marked.

5.3.4 Device Identification

5.3.4.1 General

Control and power devices shall be plainly and permanently identified, using the same identification as shown on the documentation. Identification tags shall be mounted adjacent to, not on, the device in such a manner as to allow replacement/removal of the device without disturbing or destroying the tag. (This requirement applies to devices mounted inside enclosures and devices mounted on the equipment. Characters shall not be smaller than 0.125 inch.)

5.3.4.2 Motor Control Panel Identification

Each Motor Control Panel (MCP) shall be identified with an identification plaque mounted on the outside face of the panel door to the immediate left of the MCP main disconnect. The plaque shall identify the following:

A. Motor Control Panel designation
B. Related sub-system
C. Related Conveyor System or devices controlled by the MCP

MCP plaques shall be fabricated to the same requirements as Main Nameplates.

5.3.4.3 Motor Control Panel Component Identification

Electrical enclosure component identification shall be provided. All control elements including relays, timers, starters, overloads, fuses, etc., shall be identified in such a manner as to be easily read when the electrical enclosure door is open.

5.3.5 Nameplates For Plugs And Receptacles

Plugs and receptacles shall be identified by matching tags as reflected in the documentation. The tag shall include a functional description of the plug/receptacle. Characters shall not be smaller than 0.125 inch. Tags shall be attached to plugs using clear heat shrink sleeves, nylon wire ties (on both ends of tag) or equivalent means in such a manner to prevent tag from “hanging” loosely at either end.

5.3.6 Station Identification

All multi-station machine stations shall be individually identified by number to correspond with the electrical documentation. Numbers shall have a minimum height of 0.25 inch.

5.3.7 Manufacturer's Nameplates

Where electrical equipment is removed from the original manufacturer's enclosure, or when equipment is located where the manufacturer's nameplate is not readily visible, an additional manufacturer's nameplate shall be permanently attached to the inside of the electrical enclosure. A tag with the device identification number shall be located adjacent to the extra manufacturer's nameplate. Nameplates shall not be removed from any electrical equipment or painted over.

5.3.8 Tags For Disconnects

The main disconnect for a system or any equipment shall be clearly identified as the "MAIN DISCONNECT". Letters shall be a minimum of 0.25 inch. All other disconnects shall be identified as "AUXILIARY DISCONNECT" with a description of the disconnect's purpose. This applies to disconnects on auxiliary electrical enclosures or separately mounted disconnect switches.

5.3.9 Equipment Hazard Identification

A. All unavoidable hazards associated with the specific equipment shall be identified by warning signs. The equipment manufacturer shall install additional caution signs wherever their use enhances the safety of the equipment.

B. Equipment and wiring operating at 600 volts and above shall be identified by warning signs stating the operating voltage. Warning signs shall be located on the outside and inside of each electrical enclosure, compartment, or electrical enclosure where the higher voltage is present.

C. When specific equipment or procedures must be used to effectively discharge stored or static voltages, this information shall be contained on the required warning sign.

5.3.10 Identification Of Interlock Circuitry

A. All electrical enclosures which contain interlock circuitry shall have a yellow warning tag on the outside of the electrical enclosure door adjacent to the main disconnect that states "YELLOW WIRING IS NOT DE-ENERGIZED BY MAIN DISCONNECT." In addition, terminal blocks containing interlock wiring shall have an adjacent warning tag which reads "SEPARATELY ENERGIZED INTERLOCK WIRING."

B. Electrical enclosures containing interlock wiring shall have a yellow tag on the cover which reads "SEPARATELY ENERGIZED INTERLOCK WIRING INSIDE."

C. Devices connected to the line side of the main disconnect as permitted by this section, shall be identified by yellow warning tags stating "CAUTION -- 480 VOLT - SEPARATE SUPPLY - NOT DE-ENERGIZED BY THE MAIN DISCONNECT."

5.3.11 Temporary Identification For Re-Assembly

A. All items, including wiring, conduit, duct, electrical enclosures which are disconnected for shipment of the equipment shall be identified by matching number-letter system for ease of reassemble. All sections of the equipment and material shall be identified with the equipment number.

5.3.12 Motor Nameplates

5.3.12.1 Special Characteristics

The special characteristics of any motor shall be shown on a separate nameplate mounted adjacent to the motor. The manufacturer's nameplate is not considered sufficient to identify characteristics including the following:

A. Special insulation
B. Special shaft
C. Special torque
D. Special balance
E. Special lubrication
F. Special slip
G. Hazardous classification

5.3.12.2 Rotation Direction

A directional arrow tag shall be plainly visible and mounted adjacent but not attached to the motor, at each motor to indicate rotation direction. If the motor is reversing then the tag must indicate "forward."

5.3.13 Operator Controls

A. Legend plates, at each control station, shall be located so that they can be easily read from the normal operator position must indicate the manual sequence. Individual ring type legend plates are preferred.

B. Where meters or gauges are provided to indicate variable operating conditions, the normal operating limits shall be identified by an adjacent tag.

5.4 ENCLOSURES

5.4.1 General

A. This section applies to all electrical enclosures and compartments enclosing electrical devices, including operator stations and junction boxes.

B. Electrical enclosures and compartments shall be constructed in conformance with the applicable sections of this specification, NEMA Type 12 non-ventilated (refer to ANSI/NEMA Standard ICS-1, Industrial Control), and ANSI/UL 508, Industrial Control Equipment, as a minimum requirement.

C. All electrical equipment shall be housed in non-ventilated NEMA 12 enclosures and shall be designed to operate continuously and reliably within an enclosure ambient of 60ºC, based on an ambient of 40ºC.

D. Where the requirements cannot be met due to electrical enclosure size restrictions or where operating ambient may exceed 40ºC, the temperature inside the enclosure shall be reduced to comply with these specifications, by the following (in order of preference and AOC approval):

1. Install an easily changed filter on all cooling forced air inputs.
2. Relocate heat generating equipment to another enclosure or utilize enclosed devices mounted external to the enclosure.
3. Air-to-air heat exchanger - convection type .
4. Forced circulation air inside the enclosure.
5. Air-to-air heat exchanger - forced air.
6. Air conditioning (industrial grade).

E. The thickness of the sheet metal used for walls and doors of enclosures or compartments shall be 12 gauge (Manufacturer's Standard Gauge) or greater. The following exceptions apply:

1. If a supporting frame or equivalent reinforcement is used, the minimum enclosure wall thickness, if made of sheet metal, shall be 0.075 inch for areas over 1,200 square inches.
2. The thickness of the walls and the doors of compartments made of cast material shall be a minimum of 0.125 inch.

F. The depth of the electrical enclosure or compartment shall be a minimum consistent with the maximum depth of the control devices plus the required electrical clearances as well as complying with the following:

1. In no case shall the depth of the electrical enclosure be less than 10 inches.
2. When the subplate area of the enclosure exceeds 3,600 square inches, the minimum depth shall be 12 inches.

G. The height and width of the door opening shall be at least one inch greater than the corresponding height and width of the subplate.

H. A permanent metal data pocket(s) shall be welded to the inside of the electrical enclosure or compartment to accommodate the electrical documentation.

I. The interior of the enclosure or compartment, including the door and subplate, shall be finished in gloss white.

J. Drawer-type construction shall have a retaining mechanism to prevent accidental complete withdrawal. The drawer shall be self-supporting when fully extended.

K. Swing-out subplates located between the enclosure door or the compartment door and the electrical enclosure or compartment shall not be used. Exception: electronic subplates may be of the swing-out or sliding type for servicing.

L. Moveable parts of the enclosure including doors, drawer-type units, hinged subplates shall be designed to be effectively grounded to the main electrical enclosure to meet NEC requirements. Where effective grounding cannot be assured, a braided flexible copper bonding jumper shall be provided.

M. All enclosures with subplate size in excess of 2,400 square inches shall be equipped with interior lighting and convenience receptacles, wired as specified in Articles 5.6.5 through 5.6.11, as applicable.

N. Lighting shall be one 24” fluorescent fixture, 120 VAC or 277 VAC per enclosure door section. Receptacles shall be one 20A, 120 VAC, duplex type per enclosure door section.

O. There shall not be knockout holes in any electrical enclosure.

P. Mounting feet or other suitable means external to the enclosure shall be provided for mounting.

Q. Electrical enclosures shall not be directly attached to the industrial equipment. Where vibration may be transmitted through electrical ducts or the floor, adequate isolation or vibration dampening means shall be provided by the Contractor.

R. The enclosure shall be mounted and positioned so as to guard it against oil, dirt, coolant and dust, and to minimize the possibility of damage from mobile floor equipment.

S. Where wireway and conduit are disconnected for shipment, such openings shall be sealed prior to shipment.

T. For the purposes of shipping, any enclosure over 13 feet in length shall be divided into individual sections of not more than 13 feet with provisions for interconnecting and maintaining the NEMA 12 rating.

U. Hoisting and forklift handling capabilities shall be provided for all separately mounted enclosures. The enclosure shall be structurally reinforced to prevent warping and/or damage during handling.

5.4.2 Control Component Mounting

A. Control components shall be mounted to provide mechanical clearances sufficient for mounting, wiring, adjustment, testing and replacement. Each component shall be mounted to provide heat dissipation consistent with the temperature rating of the component, adjacent components and conductors. Each component shall be arranged and oriented so that its identification may be determined without moving the component or the wiring.

B. Equipment shall be mounted so that any component or component part can be

replaced without removing the subplate. No fasteners shall be used that require access to the rear of the panel for removal of the component from the panel. No components shall be mounted behind door pillars unless adequate space is provided for replacement and servicing. In no case shall any component be mounted directly above or behind the disconnecting means.

C. Control components shall be front mounted on a rigid metal subplate so that the complete subplate can be removed through the enclosure opening. Subplate metal shall be a minimum of 0.106 inch (MSG No. 12) for mounting components with one-quarter inch diameter screws or smaller. Where larger screws are required, additional reinforcement or heavier gage subplates shall be provided. All mounting screws shall have a unified form of thread.

D. The bottom of the lowest subplate mounted device including terminal blocks shall not be less than 18 inches above the operating floor line. The top of subplate mounted components shall be no more than 84 inches above the operating floor line.

E. A minimum of 4 inches shall be provided between the subplate components and the sides of the enclosure for terminal wiring and maintenance access.

F. Subplate mounted control components shall be grouped together in one enclosure or compartment wherever possible.

G. Any component(s) mounted on the subplate carrying line voltage or a combination of line voltage and control voltage shall be grouped above or to the side and segregated from devices which carry only the control voltage. This does not apply where the line voltage is 120 volts.

H. To minimize electromagnetic interference, solid state control and its associated wiring shall be segregated from the electromagnetic control wiring.

I. Any component mounted on the subplate carrying more than 600 volts shall be mounted in a separate enclosure or be physically isolated from the other control components and labeled as detailed in the “Nameplates and Identification” paragraph in this section.

J. Pipe lines, tubing, or devices for handling of air, gases or liquids shall not be located in electrical enclosures or compartments.

K. Subplate mounted control components, such as relays, starters and contactors shall be mounted in numerical order from left to right and top to bottom.

L. Terminal blocks located in compartments shall not be recessed more than 4 inches from the subplate surface. Terminal blocks shall be mounted to provide an unobstructed access to the terminals and their conductors. The blocks shall not be mounted above each other in a plane perpendicular to the subplate. Terminal strips shall not be mounted in wireways.

M. Separately mounted terminal strips shall be used for power circuits and control circuits in all enclosures.

N. Ten percent spare terminals shall be provided on each subplate of every electrical enclosure and compartment. A minimum of eight spare control terminals and three spare power terminals shall be provided.

O. A minimum of 25 percent clear usable subplate mounting space shall be provided in all enclosures and shall be appropriately distributed.

5.4.3 Exterior Mounting Of Control Components

A. Devices such as pushbuttons, selector switches, meters, operator adjustable controls and pilot lights may be door-mounted; however, they shall be wired from terminal strips on the subplate and shall not exceed 120 volts. Components shall not be mounted on the exterior of the electrical enclosure. Such devices shall be mounted so that no portion of the equipment immediately above the door opening and less than 84 inches from the floor projects more than 6 inches beyond the door frame. The only exceptions are the following:

1. Power factor correction capacitors.
2. Control transformers larger than 2 kVA.
3. Logic power transformers of 500 VA or larger.
4. Other major heat generating devices suitable for such mounting.

B. The control components previously listed as exceptions shall not be mounted on the door or side of the enclosure.

5.4.4 Mounting Methods For Components

A. Sheet metal drive screws, rivets, welds, solders or bonding materials shall not be used to mount components.

5.4.5 Electronic Subassemblies And Components

A. Plug-in subassemblies shall be mechanically secured in place with captive fasteners and keyed for proper insertion.

B. Printed circuit boards shall be mounted in the vertical plane.

C. Components shall be mounted for ease of replacement and maintenance after assembly. Controls and adjustments for maintenance personnel shall be separately located from those required by operation personnel.

D. Transducers and associated parts shall be constructed and installed in such a manner as to provide accessibility and adequate protection against mechanical damage, degradation of performance, and contamination from the environment.

5.4.6 Electrical Compartments

A. Compartments for built-in controls shall be completely enclosed, rated a minimum NEMA 12 and isolated from coolant and oil reservoirs.

B. Compartments shall be readily accessible and contain only electrical components.

5.4.7 Doors

A. All electrical enclosures, compartments, control stations, terminal and junction boxes over 30 square inches shall have hinged doors. The door shall be hinged on the vertical edge with continuous (piano-type) hinges. All doors shall include a device to maintain the door in the open position. This device shall automatically engage at the 90º position as the door is opened. This device must be manually released to allow the door to close. Covers that are not hinged shall be captive to the box.

B. Rear doors shall be provided for access to all electrical connections and service points in enclosures containing subplates with back connected devices.

C. Compartment doors, enclosures, and enclosure doors shall be designed to have sufficient rigidity to assure continuing proper alignment between mating parts, such as door fasteners, locking devices, and mechanical interlock mechanisms.

D. Enclosure doors that cover sections housing electronic devices with built-in diagnostic indicators shall include a window of enclosure manufacturer's standard size to allow maintenance personnel to observe diagnostic indicators without opening the door. Electronic devices shall include PLCs and variable frequency motor controllers.

E. Door aligning guides may be used to ensure alignment.

F. Doors shall not exceed 40 inches in width.

G. Door swing shall be a minimum of 165 degrees and shall not prevent ready access to the disconnect handle.

H. Doors on enclosures over 1,500 square inches or other doors exposed to stresses shall be reinforced to prevent warping. Welded construction shall be used.

I. Enclosure doors shall allow a minimum clearance of 6 inches above the floor.

5.4.8 Door And Cover Fasteners

A. Door fasteners on all enclosures and compartments shall be designed to seal the door tightly around its perimeter.

B. Vault-type hardware which latches simultaneously at the top and bottom shall be used. On enclosures over 1,500 square inches, the doors shall latch simultaneously at the top, bottom, and center.

C. Operator control stations, terminal boxes and junction boxes may use vault-type door hardware or other fastening hardware provided it is completely captive and

external to the enclosed area.

D. All sealing gaskets shall be of an oil-resistant synthetic material. On doors, they shall be at least 0.125 inch thick and shall be held firmly in place by a continuous metal retainer in addition to the adhesive. On covers, they shall be at least 0.0625 inch thick and shall be held firmly and permanently in place.

5.5 DISCONNECTS

5.5.1 Electrical Enclosure and Equipment Access Door/Panel Interlocks

A. All access doors and panels which permit access to live circuits or moving parts shall be interlocked so that access cannot be gained without disconnecting power or so that opening of the door or removal of the panel shall automatically disconnect all power to the equipment.

B. The disconnecting means shall be mounted within the main electrical enclosure. The only exception is where enclosure mounting of an 800 ampere or larger disconnecting means is impractical; the equipment builder shall instead furnish a circuit breaker in a NEMA Type 12 enclosure mounted adjacent to the enclosure.

C. The disconnecting means shall be mounted at the top of the enclosure subplate; no other equipment or wiring shall be mounted directly behind or above it. A minimum of 18 inches above the disconnect shall be provided when a 4/O or larger conductor is required per phase. In electrical enclosures with three or more doors, the disconnecting means shall be mounted at the extreme right.

D. Where the main line disconnecting means is not readily accessible for lockout, an accessible second main line disconnecting means in a NEMA Type 12 enclosure shall be connected in series with, and prior to, the disconnect in the main electrical enclosure.

5.5.2 Interlocking

A. The disconnecting means shall be interlocked mechanically with the electrical enclosure door(s). A suitable device operated by a screwdriver or other common hand tool shall be provided so that the interlocks may be bypassed and the panel doors opened without disconnecting the power. Interlocking shall be reactivated automatically when panel doors are closed.

B. All doors on multiple door enclosures shall be interlocked simultaneously with the door which is interlocked with the main line disconnecting means. Except when the disconnecting means is separately mounted, it shall be mechanically or electrically interlocked with the electrical enclosure door(s).

C. Mechanical interlocking shall be provided between the disconnecting means and its associated door to accomplish the following:

1. Prevent closing of the disconnecting means while the enclosure door is open, unless an interlock is operated.
2. Prevent closing of the disconnecting means until the door is in the fully

closed position and the door hardware fully engaged.

5.5.3 Operating Handle

A. The operating handle of the disconnecting means shall be of the flange mounted type and be accessible. The center of the grip, when in its highest position, shall not be more than 78 inches above the floor and shall not be lower than 36 inches above the floor.

B. The operating handle of the disconnecting means shall be such that it can only be padlocked in the “OFF” position. Provision shall be made for a minimum of three locks having shackles 5/16 inch in diameter or smaller.

5.5.4 Position Indication

The operating handle shall plainly indicate at all times whether the disconnecting means is in the open or closed position. The operating arm shall be in the down position for “OFF”. The operating handle shall not be moved more than 5” from its full open or full closed position without changing the state of the disconnect switch. The mechanical linkage between the disconnecting means and its operating handle shall be such that the operating handle is in control of the disconnect at all times. Door mounted disconnect handles shall not be acceptable.

5.5.5 Multiple Disconnects

Multiple supply circuits and disconnects require the approval of Electronics Engineering Division.

5.6 WIRING

5.6.1 General

The Contractor shall furnish all electrical material including conduit or trough raceway and field wiring from the ABCS power source to the points of use. All wiring and electrical equipment controls shall be furnished and installed in accordance with the requirements of this specification. The Contractor shall provide wire numbers on all wiring at all points of termination. The Contractor shall provide device numbers for all devices. For purposes of this specification, “device” is defined as any and all components wired into this system, including, but not limited to, motor starters, photo sensors, limit switches, fuse blocks, manual operators, panels, and motors.

5.6.2 Conductor Identification

A. Conductors shall be identified at each termination with a marking that corresponds with the documentation.

B. Identification tags shall be made of oil-resistant material. Heat shrink preprinted (i.e., Brady type) tags shall be used for all conductor identification. Tags shall be heated after installation per manufacturer's recommendations so that they will not slip off the conductor if the conductor is removed from its termination points. Handwritten markers shall not be used. Wire identification tags shall consist of a single tag.

5.6.3 Terminals

A. Terminals shall be plainly and permanently marked to correspond with the wire identification shown on the documentation.

B. Terminals shall be numbered in numerical ascending order, starting from top to bottom, or from left to right.

C. There shall be no exposed terminals external to any electrical enclosure or compartment.

D. Terminal blocks shall be wired and mounted so that internal and external wiring does not cross over the terminals. Not more than two conductors shall be terminated at each terminal connection.

5.6.4 Electrical Connections

A. Conductors and cables shall be run without splices from terminal to terminal.

B. Electrical connections to motors, solenoids and similar devices with integral leads, size No. 4 AWG and smaller, shall be made with ring-type copper pressure connectors. The connectors shall be bolted together and taped with oil-resistant electrical tape. Soldered or insulation piercing type connectors are not acceptable. Connections shall not be made inside conduit fittings.

C. Motor junction boxes shall not be used for wiring to solenoid valves, limit switches, or other control devices. Except when connections for motor-mounted devices, such as brakes or thermostats, may be connected in the motor junction box.

D. When devices are specified with potted connections and a length of cable, the cable shall be terminated on a terminal strip or through a connector.

E. Ring-type copper pressure connectors shall be used to connect conductors to devices with lug-type terminals which are not equipped with saddle straps or equivalent means of retaining conductor strands.

F. Solder connections are acceptable only for internal connections of subassemblies which can be removed for bench service or within the protective shell of a plug or receptacle. Solder connections may also be used to obtain proper operation of devices requiring impedance matching or noise immunity.

G. The use of solderless wrapped connections shall require the written approval of the AOC Electronics Engineering Division. When authorized, they shall be applied by a tool specifically recommended by the connector manufacturer.

H. Plugs and receptacles are the desired method to interconnect subassemblies.

I. Where connection from a wire shield or drain wire to both connector pin and the cable clamp is indicated, the shield shall be connected directly to the pin and the pin connected to the cable clamp by stranded hookup wire. Connection to the clamp shall be with a lug.

5.6.5 Electrical Enclosure Wiring

A. All wiring shall be contained in wiring duct.

B. The wiring duct material shall not support combustion. It shall be made of non-warping, insulating material. The duct shall not contain exposed metal parts, except for the mounting screws where used.

C. Electrical enclosures shall be equipped with terminal blocks for all external wiring requiring No. 4 AWG and smaller conductors. Conductors larger than No. 4 AWG may be terminated directly on the device. Except when supply line conductors of any size shall be terminated directly on the device.

D. When interlocking of one electrical enclosure with another is required, the interlocking conductors shall enter and leave each enclosure through terminal blocks and be labeled as detailed in the “Equipment Hazard Identification” article in this section.

E. Conductors or cables between assemblies or components shall have sufficient length and support, and shall be secured to minimize stress on the conductors and terminations.

F. Conductors to devices on the panel doors shall not interfere with the devices on the door, components on the subplate, or operation of the door. These conductors, where used, shall be neatly bundled together and the bundle enclosed in spiral wrapping.

G. Use of ribbon type cable shall be permitted in the electrical enclosure only. Insulation piercing type connectors may be used for ribbon cable only.

5.6.6 Equipment Wiring

A. Conductors and their connections external to electrical enclosures shall be totally enclosed in metal raceways such as conduit, wireways or enclosures.

B. Multi-conductor cable, Type SO or STO, or liquid-tight flexible conduit, shall be used for connections to stationary or infrequently moved devices, such as limit switches and solenoids, operated at control voltage.

C. Liquid-tight flexible conduit shall enclose conductors to stationary or

infrequently moved devices, such as motors, brakes, and other apparatus, operated at line voltage.

D. Multi-conductor cable shall be secured at both ends with oil tight connectors. The connector shall be sized according to the manufacturer's standards. Terminations shall be made on terminal blocks.

E. The exposed length of multi-conductor cable shall not exceed three feet. An additional three feet of cable may be enclosed in a raceway, but in no case shall cable length or its conductors exceed six feet overall.

F. The length of liquid-tight flexible conduit shall not exceed three feet.

G. Multi-conductor cables and liquid-tight flexible conduit shall be installed so that liquids drain away from the fittings. They shall enter the sides or bottom of an enclosure or box.

H. Multi-conductor cables and liquid-tight flexible conduit shall be protected from possible damage from equipment motions and normal service requirements.

I. All phase conductors, including neutral conductors of any circuit, shall be contained in the same raceway.

J. Conductors may occupy the same raceway, regardless of voltage, provided they are all insulated for the maximum voltage of any conductor in the raceway. When any electrical interference may adversely affect the normal operation of the equipment, a separate raceway or shielding shall be used. It must be noted that signal wiring shall be installed in separate conduit.

K. Where equipment is constructed so that wiring must be disconnected for shipment, plugs and receptacles or terminal blocks in an accessible enclosure shall be provided at the sectional points.

L. Wiring external to the electrical enclosure shall have a termination at the terminal blocks on the subplate. The common side of the control circuit and ground bonding wires shall be wired to a terminal in electrical enclosures.

M. Electrical enclosures shall be furnished on the equipment for terminating conductors.

N. Spare wires shall be provided. The number of spares shall be 10% of the total wires used or two, whichever is greater. The spare wires shall run directly and shall be of sufficient length to reach the extreme points of both enclosures. Spare wires shall be uniquely labeled "Sp l", "Sp 2", etc. All spares shall be stored neatly and bundled together in the bottom of the electrical enclosure. Spare conductors in any multi-conductor cable shall not be cut off.

5.6.7 Flexible Wiring

A. Connections to continuously or frequently moving parts shall be made with extra flexible conductors Class K encased in liquid-tight, flexible, conduit or with extra flexible multi-conductor cable.

B. Flexible cable and conduit shall have vertical connections. Sufficient slack shall be provided per manufacturer's recommendations to avoid sharp flexing and straining. All manufacturer's instructions and recommendations shall be followed to support flexible cable and conduit.

C. Where liquid-tight flexible conduit or multi-conductor cable is used for flexing applications, fittings shall include basket weave or equivalent strain relief.

D. Where there is relative motion between flexible conduit/cable and parts in process or equipment components, the construction and supporting means shall be such that there will be a clearance of at least one inch under all operating conditions. Barriers or guides shall be provided where the clearance cannot be maintained.

5.6.8 Plugs And Receptacles

A. A locking feature shall prevent accidental disconnections. Automatic locking upon full insertion is preferred.

B. A skirt or shroud shall contain any arc and shall protect the poles when not in use.

C. A properly sized grommet around the cord shall prevent entrance of contaminants. Except that this does not apply to subassemblies mounted within electrical enclosures.

D. A means shall be provided to effectively seal the receptacle whenever the plug is removed. Except that this does not apply to subassemblies mounted within electrical enclosures.

E. All cables shall be provided with a strain relief device to support the cable.

F. Plugs and receptacles shall be provided with a grounding pole which makes first and breaks last. Shells of plugs and receptacles that are metallic shall also be grounded.

G. The grounding pole of plugs and receptacles shall only be used for grounding purposes.

H. Grounding poles of plugs shall be designed to prevent contact with current-carrying parts of receptacles or cord connectors.

I. All plugs and receptacles shall be identified and mechanically keyed to prevent incorrect insertion.

J. Plugs and receptacles shall be designed to prevent any part from accidentally shorting.

K. Disconnected plugs or receptacles shall not have any voltage to exposed pins.

5.6.9 Conduit, Raceways and Wireways

A. Rigid metal conduit, meeting the requirements below shall be used except where liquid-tight, flexible conduit or wireways are permitted as described below. Aluminum, EMT, intermediate, and non-metallic conduit types shall not be used except as approved by the AOC Electronics Engineering Division.

B. No conduit, rigid or flexible, smaller than three-quarter inch diameter trade size shall be used.

C. All fittings shall be liquid-tight.

D. All covers shall be readily accessible.

E. Gaskets shall be of an oil-resistant synthetic material.

F. Conduit/wireway shall be installed so that liquids tend to run off the surface instead of draining towards the fittings. Conduit/wireway shall enter the side or bottom of electrical enclosures.

G. Sharp edges, burrs, or rough surfaces shall be removed from all electrical raceways. A flame-retardant, oil-resistant, insulating bushing shall be provided to protect conductor insulation.

H. Electrical raceways shall be supported independent from other services.

I. Conduit drops which interfere with accessibility to the ABCS components shall not be permitted.

5.6.10 Rigid Metal Conduit And Fittings

A. All rigid conduit and fittings shall be galvanized steel, meeting the current requirements of ANSI Standard C80.1 Zinc Coated Rigid Steel Conduit, and ANSI/NEMA Standard FBl, Fittings and Supports for Conduit and Cable Assemblies. When required, conduit and fittings shall be of a corrosion resistant material suitable for the conditions. Dissimilar metals which would cause galvanic action shall not be used. Conduit and fittings shall be protected against corrosion.

B. Fittings shall be threaded. They shall be made of malleable or ductile iron and have impact strength equal to that of the conduit. Covers on conduit fittings shall be gasketed. Pulling elbows (typically referred to as “jakes”) shall not be used.

C. Running threads shall not be used.

D. All conduit and fittings shall be securely held in place and supported.

E. Bends shall be made so that the conduit will not be damaged and the internal diameter of the conduit will not be effectively reduced.

F. A run of conduit shall not contain more than the equivalent of four quarter bends (360 degree total) between electrical enclosures.

G. Where conduit terminates in a threadless opening, a locknut shall be provided both inside and outside the enclosure, and the conduit end shall be equipped with an insulating bushing. A suitable oil-tight means such as an oil-resistant synthetic rubber O-ring and a metal cup shall be provided between the outside locknut and opening. When the conduit enters the opening through a conduit connector, the shoulder of the connector may serve as the outside locknut. The O-ring assembly or an equivalent sealing device shall also be furnished when a locknut is used as a jam nut on connectors fitted to threaded hubs.

H. When the conduit enters the opening through a conduit connector equipped with a tapered surface or similar sealing action, no locknuts or gaskets are required, providing that the resulting seal is liquid-tight.

I. Conductor fill of conduits shall not exceed 40% of the available area in the conduit.

5.6.11 Liquid-Tight Flexible Conduit And Fittings

A. Liquid-tight flexible metal conduit shall consist of an oil-resistant, liquid-tight jacket or lining in combination with flexible metal reinforcing tubing.

B. Connectors for liquid-tight flexible metal and non-metallic conduit shall be liquid- tight, made of metal, designed to electrical trade sizes and meet the requirements of Underwriters' Laboratories Standard UL 514. Fittings shall have sufficient thread length to accommodate a gasket assembly, a box wall thickness of 0.125 inch and a locknut and bushing. Connectors shall be union type.

C. Conductor fill of conduits shall not exceed 40% of the available area in the conduit.

5.6.12 Special Purpose Raceways

A. Compartments and raceways within columns or bases shall not be used to enclose conductors.

B. A lay-in wireway shall be furnished between electrical enclosures when the number of conductors required exceeds that for which a single 2-l/2 inch conduit is suitable.

C. Exterior wireways shall be rigidly supported and clear of all operating or contaminating portions of the equipment and shall conform to the following:

1. Wireways shall be oil-tight, NEMA 12 minimum.
2. Metal thickness shall be a minimum 14 gage.
3. Covers on wireways shall be hinged, shaped to overlap the sides and held closed by captive screws or other suitable fasteners exterior to the wireways. For sections mounted horizontally, the covers shall be on top. All covers shall be capable of opening at least 90 degrees.
4. Wireways with knockouts are not acceptable. Only such openings as are required for wiring the equipment shall be provided. Conductor fill shall not exceed 20% of the area available in the wireway. No wireway shall contain more than 30 power conductors. This does not apply to either signal circuits or control conductors.
5. Wireways shall be fitted with telescopic sections in the horizontal and vertical portions between the enclosure and equipment to provide for variations up to plus or minus five inches.

5.6.13 Conductors

A. Conductors other than those specified in Special Insulations (see below) shall conform to one of the following:

1. Type MTW.
2. Types THWN, THHN, RHH, having all characteristics equal to Type MTW, except insulation thickness.
3. Multiconductor, Type SO or STO.
4. Multiconductor, control cable having individual conductors of Type MTW, THWN, or THHN construction and a jacket similar to Type SO construction.

B. Conductors shall be as follows:

1. Power circuits, No. 14 AWG or larger.
2. Control circuits, No. 14 AWG or larger. Exception: No. 16 AWG may be used in multiconductor cables and within electrical enclosures.
3. Signal wiring No. 18 AWG or larger, shielded/twisted.

C. Conductors shall be annealed stranded copper, conforming to the requirements of ASTM Standard B-8, Class C for non-flexing service and B-174 Class K and B-172 Class K for flexing service. Flexing is defined as “frequent movement.”

D. The insulation on the conductor shall have a readily identifiable continuous external marking to indicate: National Electric Code type, voltage, size, temperature rating and manufacturer.

5.6.14 Color Coding

A. All electric wire and cable shall be color coded with the wire numbers as shown on the Contractor electrical drawings affixed to both ends of each wire. Color coding shall be as follows:

1. Power Wiring - Line Side: This color code applies to all power wiring from the source to the line side of the fuse in the electrical enclosure. The neutral, if applicable, shall terminate at the terminal board:

   a. Phase A120-240V, Black 277-480V Brown
   b. Phase B120-240V, Red 277-480V Orange
   c. Phase C120-240V, Blue 277-480V Yellow
   d. Neutral 120-240V, White 277-480V Gray
   e. Ground 120-240V, Green 277-480V Green

2. Power Control Wiring - Load Side: The color code for power and control wiring from the load side of the fuses in the electrical enclosure to and from all other devices shall be as follows:

   a. Power Black, to control transformer and all motors
   b. Control Red
   c. Control Blue
   d. Neutral White
   e. Ground Green
   f. Foreign Voltages Yellow (NOTE: Any Motor Control Panel with foreign voltages shall carry appropriate warning tags both on the outside face of the MCP door as well as adjacent to the foreign voltage related terminal blocks within the MCP.)

5.6.15 Special Insulations

Where required by ambient conditions, other conductor insulation material shall be used. Wiring in and external to electrical enclosures used on or adjacent to high heat generating equipment, such as furnaces, ovens, heat treating equipment, etc., shall have UL approved Type SR-ML, SFF2 or equal insulation.

5.6.16 Conductor Ampacity

A. The maximum allowable ampacity of conductors used in ambient temperatures not greater than 30ºC shall not exceed the limits specified in the latest edition of the National Electric Code. Additional de-rating factors shall be used for higher ambient temperatures or for conductors used close to heat dissipating components.

B. Branch circuit conductors shall have an ampacity not less than 125 percent of the full load current rating of the highest rated motor in the branch, plus the sum of the full load current ratings of all other connected motors and apparatus in the branch which may be in operation at the same time.

C. Refer to the article “Protection and Grounding” this section for overcurrent and

short circuit protection requirements.

5.6.17 Multi-Conductor Control and Signal Cables

A. Cables shall be oil resistant and meet the requirements below for conductor standards and size.

B. Conductors in single or multi-conductor shielded cables shall be stranded copper not smaller than No. 22 AWG. If a foil shield is used around the conductor, it shall provide a continuous conduction surface in the presence of bending and flexing. A continuous drain wire shall be provided. The shields and drain wire shall be covered with an oil and moisture-resistant jacket.

C. Multi-conductor cables external to the electrical enclosure, with more than five conductors, shall have a minimum of 25 percent spares, but not less than two conductors.

D. Multi-conductor cables shall provide unique identification for the individual conductors. Identification shall not be subject to flaking, fading, running, or heat discoloration.

5.7 CONTROL CIRCUITS

5.7.1 Supply

The source of the supply for the control circuit shall be taken from the load side of the main disconnecting means. Except for programmable devices (e.g., programmable controller), a second power source may be taken from the line side main panel disconnect provided all of the following conditions are met:

A. It is internal to the electrical enclosure.

B. It terminates in a totally enclosed load center with a lockable disconnecting means, integral transformer and meets overcurrent and withstand protection as specified in the article “Protection and Grounding” in this section.

C. It is physically mounted as close to the supply source as possible and its supply wiring shall be encased in rigid or flexible conduit.

5.7.2 Voltage

The control circuit voltage shall be 120 volts ac single phase, obtained from a single transformer within the main electrical enclosure with an isolated secondary winding, having a minimum of 25% spare capacity. One leg of the secondary winding shall be grounded. Exceptions include the following:

A. Other voltages may be used for operation of electronic, static control or similar devices. These special voltages shall be obtained from separate transformers with a 120 volt primary.

B. Exposed, grounded control circuits may be used when supplied from an isolating transformer having a primary rating of not more than 120 volts, a secondary

rating of 25 volts or less, and a capacity of not more than 50 volt-amperes.

C. Two control voltage transformers may be used, one for control voltage source, and one for conditioning such as supplying filtered and/or regulated power to a programmable device. Both transformers shall have their primary windings connected across the same phase and shall have a minimum of 25% spare capacity.

5.7.3 Connection Of Control Devices

A. One side of all pilot lights and operating coils of control devices shall be connected to the same side of the control circuit herein called the coil common, which shall be the grounded “leg”. Contacts shall be connected in the other side of the control circuit herein called the control supply. No pilot light shall be in series with any operating coil. Except where lights are connected with an operating device for use as a diagnostic tool, they shall be of the neon type with a series resistor to limit leakage current to a maximum of 2 milliamperes.

B. Contacts on any starter, contactor or relay shall not be used in excess of their rating. Contacts shall not be connected in parallel to increase ampacity. Not more than ten contacts shall be connected in series to operate a control device. This limitation includes any combination of contacts.

C. When surge suppressors are used to minimize electrical noise, they shall be of the diode, MOV or RC type and properly rated for the application. MOV type suppressors shall include indication of failure. Suppressors shall be mounted to eliminate failure of connecting leads due to vibration or exposure to physical damage.

D. Integrally mounted solenoids or magnetic brakes may be connected directly across motor leads if the following conditions are met:

1. The brake coil is rated at full line voltage.
2. The brake leads are identified as power leads.

E. Solenoids shall be individually fused in the control supply, operated by a single control device and not connected in parallel with other control devices, except indicating devices may be used in parallel with the solenoids.

5.7.3.1 <u>Ungrounded Relay Systems</u>

Separate normally open contacts shall be connected in both the control supply and the coil common of the solenoid.

5.7.3.2 <u>Grounded Relay Systems</u>

A separate normally open contact shall be connected in the control supply of the solenoid.

5.7.3.3 <u>Solenoids</u>

A. Solenoids shall be externally fused in the control supply lead of the solenoid.

B. Solenoids and controls shall be considered separate branch circuits, but may be fed from the same transformer and shall be properly protected.

5.7.4 General Circuit Design

A. Fail-safe, self-checking circuits shall be incorporated in the equipment design wherever control malfunctions or improper sequencing may create a hazard to personnel, cause personal injury or damage to equipment or parts in process. This circuitry shall give protection against the following:

1. Failure of one or more devices to function properly.
2. Improper sequencing in manual and automatic operation

B. Sensors shall be interlocked to ensure their release prior to their normal operation.

C. Diagnostics should be incorporated in the design to detect mode of failure.

D. Design of control circuits shall be such that during the power up sequence, e.g., hydraulic pumps on, master on, no motion shall occur. Control circuits shall be designed so that motion can occur only when the following conditions are met:

1. Cycle is set for AUTOMATIC and CYCLE START push-button(s) is depressed or,
2. Cycle is set for MANUAL and push-button(s) for a particular function is depressed.

E. All control circuits (except combination motor starters which may be used as the “EMERGENCY STOP” control circuit if all conditions for “EMERGENCY STOP” are met) shall be designed with a non-retentive relay that perform as follows:

1. Removes all control circuit voltage on an undervoltage condition.
2. Removes all control power upon actuation of the master stop button.
3. Requires manual reset.

5.7.5 Automatic and Manual Mode

A. The AUTOMATIC and MANUAL mode shall be initiated only from the main operator’s control station. The circuit shall perform as follows:

1. Return to NEUTRAL mode on power interruption or on undervoltage condition.
2. Return to NEUTRAL mode on suspension of either AUTOMATIC or MANUAL mode.
3. Indicate the condition of AUTOMATIC or MANUAL modes.

B. For MANUAL operation, pushbuttons shall be provided to perform individual functions. Direct operation of solenoid valves with rods or tools is not considered MANUAL means. MANUAL functions shall not operate during AUTOMATIC

mode.

C. JOG or INCH circuits shall operate only in the MANUAL mode. JOG or INCH circuits shall be designed to operate only while the JOG or INCH button is held depressed, and shall prevent RUN or AUTOMATIC operation during jogging or inching. The prevention of RUN or AUTOMATIC operation during JOG or INCH shall be accomplished by a selector switch and separate pushbuttons. MANUAL reverse shall be considered a jog operation (refer below for two-hand control operation).

D. Circuitry STOP functions shall be initiated through de-energization rather than energization of control devices. All equipment motion stopped by the EMERGENCY STOP or STOP controls shall be restartable only by deliberate sequence of actions by the operator.

E. All equipment using a MASTER CONTROL RELAY shall be provided with a MASTER STOP control device. All control power shall be removed on actuation. MASTER STOP circuitry shall be hard wired and not dependent on programmable device logic.

F. Individual functional stop(s) shall upon actuation stop the individual function only and not create additional hazards.

5.7.6 Emergency Stops

A. Emergency stop push-button stations and/or pull-cord assemblies shall be provided for all powered equipment.

B. All equipment shall incorporate one or more emergency stop controls which, upon actuation, shall stop all equipment motion and when actuated shall not create other hazards. EMERGENCY STOP shall return the AUTOMATIC or MANUAL modes to the NEUTRAL mode. When EMERGENCY STOP controls would exactly duplicate the MASTER STOP function of the equipment, an EMERGENCY STOP push-pull station and a MASTER STOP push-button shall be provided for consistency in the use of the EMERGENCY STOP function. Emergency Stop controls shall be located at each operator control station and throughout the path of the ABCS. Emergency Stop devices shall be located such that anyone in the area of the equipment with the equipment in the line of sight shall also have an emergency stop device in the line of sight as well. In addition to the above condition, Emergency Stop devices shall be spaced at intervals not to exceed 25 ft. apart. Emergency Stop condition shall be annunciated by an integrally mounted red light indicating whenever the circuit is actuated.

C. Emergency stop devices shall be located at each operator work station and throughout the system in accordance with applicable codes and standard industrial safety practices. Recommended locations for emergency stop push-button stations and pull-cords shall be included on the initial design drawing submission.

D. Emergency stops shall be readily accessible from the floor and easily visible from any point adjacent to the equipment.

E. All safety circuits shall require manual resetting of the actuated switch(es) before

the portion of the ABCS stopped by the activated switch(es) can be restarted.

5.7.6.1 Emergency Stop Push-Button Stations

A. All remote emergency stop push-button stations shall be mounted flush with the outside edge of conveyor when attached to same and mounted to prevent accidental activation by personnel or other objects passing adjacent to the control station.

B. The emergency stop push-button station shall consist of a suitable enclosure, a “push-to-stop / pull-to-operate” maintained contact stop button with a red, mushroom head, and a red pilot light to indicate actuation of the stop button. The light shall remain illuminated as long as the stop button is depressed.

C. An emergency stop push-button shall be incorporated into an operator’s electrical enclosure provided it is visually separated outside the grouping of routine control devices and indicators.

D. Upon actuation each emergency stop shall be individually annunciated to the central alarm system.

5.7.6.2 Emergency Stop Pull-Cord Assemblies

A. Emergency stop switch cables shall be fabricated of plastic-coated, wire rope. Cable runs shall be installed adjacent to (not in) aisleways along the full length of the Conveyor System transport pathways as recommended by the Contractor and approved by the AOC. Cables shall be run in a straight line from the anchor point to the switch assembly.

B. Pull cords shall be affixed to the switch cable run on 20’-0” centers. Pull cords shall extend from the cable to an elevation of five feet above the finished floor.

C. The emergency stop pull-cord switch assembly shall include a red pilot light to indicate actuation of the switch. The pilot light shall remain actuated until the switch has been manually reset.

D. Upon actuation each emergency stop pull cord switch shall be individually annunciated to the central alarm system.

5.7.6.3 Device Overtravel Protection

Where equipment function includes axial motion, the Contractor shall provide a positive, fail-safe method, independent of the control system and interface components for removal of power to the axis when travel limits are exceeded.

5.7.6.4 Cycle Interruption

A. If equipment is stopped in mid-cycle, no motion shall occur until the control is reset for the MANUAL mode and returned to the proper position for re-start.

B. Emergency Return functions shall be initiated through de-energization of the

emergency return circuitry, and shall be so indicated.

5.7.7 Interlocking

A. PRESET circuits, defined as one that starts the cycle when a set of prearranged conditions are satisfied, shall be used only with prior approval in writing from AOC Electronics Engineering Division.

B. Anti-repeat operations or continuous consecutive cycles shall not result even though the CYCLE START button(s) is held depressed continuously in the START position. Timers shall not be used in the anti-repeat circuits.

C. All START buttons, where more than one cycle start station is provided, shall be concurrently depressed to initiate the cycle and released between successive operations. Except, with AOC approval, one of the following:

1. Interlocking is provided to make only one station active at a time.

2. The cycle START is initiated by depressing buttons in a specified sequence.

5.7.7.1 Control of Valves

Electrically controlled hydraulic or pneumatic solenoid valves shall be applied in such a manner that in the event of a power failure there shall be no hazard to personnel or damage to the equipment.

5.7.7.2 Sequencing, Movement, and Positioning

Proper sequencing, movement, and positioning of equipment and parts in process shall be sensed with position and movement sensors. Time in lieu of displacement shall not be used.

5.7.7.3 Start of Cycle

For safety of personnel when the system is in manual mode, all machines over 20 feet in length or width or with more than one operator shall have an alarm system to alert personnel of machine going into cycle and of pending movement. Alarm shall occur only if initial cycle start conditions are met. No motion shall occur during the alarm period. The alarm period shall be of sufficient length to allow all personnel to clear any hazard area. Continuous actuation of start push-button(s) shall be required during the alarm period. The alarm shall provide both visible and audible indication throughout the envelope of the equipment being started.

5.7.7.4 Rotary Cam Switches for Sequence Control

Rotary cam switches shall not be used as the only means of sequence control equipment. Except rotary cam switches may be used for sequence control of equipment if each step of the cycle is interlocked with position indicators which sense the position and motion of the equipment and material in process.

5.7.7.5 Sequence Control by Pressure Sensors

Pressure sensors shall not be used as the only means to determine sequence of operation. Position or motion sensors shall be interlocked with the pressure sensor to determine sequence.

5.7.7.6 Movement Initiation by Position Sensors

Control circuits shall be designed so when the equipment is in its HOME or END OF CYCLE position, movement of any part of the equipment can be initiated by position sensors only, provided all of the following conditions are met:

A. The control is set for AUTOMATIC mode and IN CYCLE, and both conditions are indicated.
B. The control is of the holding circuit type and is energized.

5.7.7.7 Interlocking of Opposing Motion

Starters, relays, contactors and solenoids which are mechanically interlocked shall also be electrically interlocked to prevent simultaneous energization.

5.7.7.8 Plugging Circuits

Plugging circuits shall not be used. A zero speed indicator or motion detector shall be used to prevent unintentional plugging where applicable.

5.7.7.9 Arrangement of Mechanical Switch Actuating Devices

Where mechanical switch actuating devices rely on spring power for return motion, they shall be arranged so that they will be fail-safe in the event of spring failure or sticking or binding of the mechanism.

5.7.7.10 Safety Gates

Equipment requiring safety gates which are not required for equipment cycling shall be interlocked with the AUTOMATIC mode circuitry. Actuation of the safety gate interlock shall perform an appropriate STOP function and de-actuate the AUTOMATIC mode circuitry.

5.7.7.11 Safety Interlocking of Sliding or Hinged Doors

Hinged or sliding doors to compartments which expose hazardous conditions, shall be interlocked with position sensors to prevent equipment from operating when doors are not closed. Interlocks shall not be defeatable.

5.7.7.12 Interlocking Between Equipment

Where interlocking between equipment or transfers is required, the following features shall be required to perform as follows:

A. Bypass circuits shall be provided for the operation of each machine.

B. Interlocks which provide personnel safety or prevent damage to equipment (e.g., position of transfer bar, EMERGENCY STOP, etc.) shall not be bypassed.

C. All interlocks shall be re-established on return to normal operation of machines.

D. Interlocks between control circuits that are not de-energized by the same disconnecting means shall have isolated contacts.

5.7.8 Automatic Lubrication Systems

A. Automatically operated lubrication systems shall be interlocked with the control circuit. Low lubricant level or lubrication system failure shall:

1. Prevent the machine or equipment cycle from starting.
2. De-energize the control machine cycle circuit after the cycle in progress has been completed.

B. The operational status of the lubrication system shall be indicated at the operator's main control station.

5.7.9 Motor Control

There shall be only one station effective at any time for starting all motors concurrently. However, multiple STOP stations may be used and shall be active at all times. Resetting the motor overload relay shall not restart the motor. In addition to the normally closed contact on the overload relay, each overload relay shall have an isolated normally open contact for monitoring purposes. This contact will close whenever the three-phase overload contact(s) trip. When programmable devices are used to control motors, the normally open overload contact shall be wired as an input, and used in the internal logic that controls the motor. The normally closed overload contact(s) shall be wired in series with the coil of the starter. Each motor, one horsepower and larger, shall be controlled by one motor starter with individual overload relays of the same manufacturer as the motor starter. Several fractional horsepower polyphase motors may be operated from one starter if each motor has its own overload relay wired in series with the starter coil, and the branch circuit is properly protected in accordance with the specifications as stated in the "Protection and Grounding" article in this section.

Cascading restart sequence of electrical motors is required.

Any conversion equipment required for systems operation, including: AC to DC, 60 Hertz to some other frequency shall be furnished by the Contractor for any electrical apparatus.

5.7.10 Auxiliary Lighting and Electrical Accessories

A. Auxiliary light and electrical accessories are defined as work lights, enclosure lighting and convenience receptacles which are not used as control circuit voltage sources.

B. The source of supply for auxiliary lighting and electrical accessories shall be taken from the line side of the main disconnect and shall meet all of the

following conditions:

1. Terminate in a totally enclosed load center with a lockable disconnecting means, integral transformer and meet overcurrent and short circuit withstand protection as specified in as stated in the “Protection and Grounding” paragraph in this section. Load center shall be properly sized to the load, having a minimum capacity of 750VA.
2. Is physically mounted as close to supply source as possible and its supply wires encased in rigid or flexible metallic conduit.

C. The auxiliary lighting and electrical accessories supply voltage shall be 120V AC single phase and grounded.

D. All electrical enclosures with a subplate size in excess of 2,400 square inches shall be provided with an internal light(s). A limit switch(es) shall be provided to detect enclosure door(s) position and illuminate the enclosure when door(s) is(are) not fully closed.

E. When work lights are required, they shall be provided with an ON-OFF switch conveniently located on the equipment. Work lights used in a wet location shall be provided with ground-fault protection in accordance with as stated in the “Protection and Grounding” article in this section.

F. When convenience receptacles are specified on equipment, they shall conform to the specification as stated in the “Plugs and Receptacles” article in this section.

G. When receptacles are installed in a wet location, they shall be provided with ground-fault protection in accordance with the “Plugs and Receptacles” article in this section.

5.8 PROTECTION AND GROUNDING

5.8.1 General

A. All protective devices shall be selected and applied with proper consideration of the inrush and normal operating current of the load as well as the thermal capacity and the short circuit withstandability of the connected devices and any equipment being protected by the device. If the calculated value for overcurrent (short circuit) devices does not correspond to standard ratings or sizes, the next larger size or rating may be used.

B. Two or more protective devices applied in series shall be selected with proper time-current and let-through energy characteristics to provide as much selective circuit protection for fault and over-load conditions as possible, based on the manufacturer's data.

C. Thermal magnetic circuit breakers shall be the required protection method for all circuits rated at 30 amps or greater. This requirement applies specifically to all electrical enclosure main disconnecting means where the panel electrical service is rated at 30 amps or greater. For all other circuits the Contractor may apply fuses as the protection method within the following parameters.

D. Time delay fuses shall be applied for current limiting as well as protection from nuisance blowing caused by inrush currents.

E. Current-limiting fuses shall be applied where the available short circuit current approaches or exceeds the momentary withstand and the interrupting capacity of the standard protective equipment.

F. All protective devices operating at voltages of 110 VAC or greater other than those protecting power supplies for electronic circuitry will not be sensitive to transients of 16 milliseconds or less (duration of one cycle at 60 Hz). Power supplies for electronic circuitry will filter out those transients.

5.8.2 Low Voltage Fuses (600 Volts Or Less)

A. Fuses for power and control shall be time delay, dual element types having a minimum interrupting rating of 120 percent of the maximum available system short circuit current. In no case shall the interrupting rating be less than 100,000 amperes RMS symmetrical. Except this interrupting capacity requirement need not apply to circuits on the secondary of the control transformer(s).

B. All low voltage fuses shall be high interrupting capacity (energy limiting) and UL listed and labeled: Class L, Class J, Class RKl or Class RK5 as required by the application. Class H renewable and one-time fuses shall not be used.

C. Time delay (dual element), high interrupting capacity (energy limiting) fuses shall be used as follows:

1. On motor branch circuits (including combination starters).
2. On branch circuits requiring both overload and short circuit protection where some appreciable time delay prior to fuse clearing is necessary to accommodate normal momentary currents up to 500 percent of full load current for a minimum of ten seconds.
3. To coordinate with other time delay fuses in the circuit.

D. Rejection type fuse clips of Class H dimensions shall be used for 600 volt fusing.

E. All fusible equipment shall be type tested and listed by the UL for Class RKl and RK5 interrupting duty. In all cases, equipment furnished shall conform with the existing U/L requirements.

F. All fusible equipment shall be type tested and listed by the Underwriters'

Laboratories for Class RKl and RK5 interrupting duty. In all cases, equipment furnished shall conform with the existing U/L requirements.

5.8.3 Main Disconnecting Means

A. Type Of Disconnect. For all equipment rated above 120 volts, the equipment Contractor shall furnish a circuit breaker conforming with NEMA Standard AB-1, Molded Case Circuit Breakers. Short circuit ratings of molded case circuit breakers shall comply with the requirements in article 5.8.

B. The specified disconnecting means shall be mounted in a NEMA Type 12 enclosure minimum. For mounting of disconnects in enclosures, refer to article “Disconnects” in this section.

C. Where nominal 120 volt, single phase is the only power supply to the equipment, a fused disconnect switch or circuit breaker of suitable size shall be provided.

5.8.4 Main And Branch Circuit Overcurrent Protection

A. The main overcurrent protection shall consist of a single breaker.

B. Whenever there is more than one branch circuit, additional overcurrent protection is required. Overcurrent protection shall be placed in each ungrounded branch circuit conductor. Circuit breakers shall open all ungrounded conductors of the branch circuit.

C. Overcurrent devices shall be located at the point where the conductor to be protected receives its supply. Except if the conductor is protected from physical damage, is less than 25 feet long, has an ampacity greater than one-third of the supplying conductor or overcurrent protection from which it is tapped, and terminates in a single breaker or set of fuses, or if the conductor has an ampacity greater than the sum of the continuous load currents, is less than 10 feet long and does not extend beyond the electrical enclosure.

D. If the required value for the overcurrent device does not correspond to standard sizes, then the next larger size may be used.

5.8.5 Motor Overcurrent Protection

A. Motor protection shall be in accordance with National Electric Code, Article 430. Where the overcurrent protection specified in Article 430 is not sufficient for the starting current of the motor, then it may be increased to a maximum of 225 percent of the motor full load current for dual element fuses, 300 percent for inverse time breakers above 100 amperes, and 400 percent for breakers of 100 amperes or less.

B. Each motor over five horsepower shall be supplied and protected as a separate branch circuit. Except when the main disconnect overcurrent protection provides

adequate protection for a large single motor, additional branch circuit protection is not required.

C. Provided the branch circuit protection is less than 400% of the smallest motor full load current, two motors from one to five horsepower may be on the same branch circuit and multiple fractional horsepower motors may be used on the single branch circuit.

5.8.6 Motor Overload Protection

A. Each motor and its related conductors shall be protected against running overload by the use of a separate current sensitive overload device in each phase.

B. The rating of the overload sensing device shall be based on the motor nameplate full load current. If the motor rating does not match a standard overload size, then the next standard larger size shall be used. The sizing of the required overload device involves consideration of the service factor, ambient temperature of both the motor and its controller and the type of motor enclosure.

C. Embedded thermal sensing overload devices shall be sensitive to the temperature of the motor or to both temperature and current. Indication of the tripped state shall be provided.

D. Short-time rated motors or high reversing duty motors shall have a thermal overload protection device mounted in the motor.

E. In all cases, the protection device shall open the coil circuit of the motor control contactor on overload.

5.8.7 Control Circuit Overcurrent Protection

A. Control conductors shall be protected against short circuits and steady overloads. An overcurrent device shall be connected in series with each ungrounded leg of all branch control circuits.

B. The overcurrent device rating shall be as low as practical and shall not exceed the current rating for the smallest conductor in the branch circuit.

C. The control transformer shall be protected in the primary and secondary circuits against short circuits and overloads.

D. Each solenoid shall be considered as a separate branch circuit and shall have an overcurrent device rated at approximately 150% of the sealed solenoid current. The overcurrent device shall be connected between the solenoid and the control relay contact or output device. If a fuse is used, then it shall be a dual element indicating type. In the case of control by a semiconductor device, this fuse shall be supplied in addition to the normally fused output to provide coordination.

5.8.8 Undervoltage Protection

Undervoltage protection shall be provided on all equipment which may be damaged by a

continuous undervoltage condition or which may initiate motion upon return of power after an undervoltage condition.

5.8.9 Auxiliary Circuits

A. All equipment circuits used for devices such as panel lighting, work lights, 120 volt receptacles, etc., shall be grounded. Auxiliary circuits shall not include any devices used to control the equipment.

B. A separate transformer shall be used for auxiliary and/or lighting circuits. Transformers supplying these circuits shall be grounded at the transformer only. Control circuit transformers shall not be used.

5.8.10 Equipment Grounding

A. All exposed, non-current carrying metal parts of equipment, such as electrical enclosures, raceways, control stations, separately mounted apparatus, and portable and pendant accessories, shall be effectively bonded to ground.

B. The main electrical enclosure shall be bonded to ground through the secondary power distribution ground bus or as approved by the AOC.

C. Subplate mounted devices are considered grounded, provided that the mounting means ensures direct metal-to-metal contact with the sub-plate. Exceptions include the following:

1. Any device which has a separate ground terminal shall be bonded to the sub-plate using a grounding conductor.
2. The chassis of electronic controls, such as programmable controllers, shall be bonded together and to the sub-plate by means of a grounding conductor.

D. All equipment and equipment-mounted enclosures or devices shall be bonded to the main electrical enclosure

E. Moving parts of the equipment shall be bonded to the stationary portion of the equipment. Sliding parts separated by air or oil are not considered bonded together.

5.8.11 Methods Of Grounding

A. Equipment shall be considered as effectively grounded or bonded only when a separate equipment grounding conductor is provided. In all installations of rigid metal conduit, wireways, multiconductor cable, liquid tight flexible conduit, or other raceways, a separate equipment grounding conductor shall be installed and bonded at each end.

B. Equipment grounding conductors shall be terminated in each electrical enclosure on a common ground bar or terminal strip which is bonded to the subplate.

C. The shield for shielded cables may be terminated separately from the equipment

grounding conductors. Only one end of the shield shall be grounded unless specified otherwise.

5.8.12 Grounding Conductors

Equipment grounding conductors shall consist of copper and have the same class of stranding as the wiring to the equipment being grounded

Equipment grounding conductors may be insulated or bare and shall be protected from damage by means equivalent to those provided for other conductors. If insulated equipment grounding conductors are used, the insulation shall be green, or green with a yellow stripe. The size of the equipment grounding conductor shall be as defined in the National Electric Code, Article 250.

5.9 CONTROL EQUIPMENT

5.9.1 Disconnecting Means

A single electrical supply source and single disconnecting device shall be provided for each individual machine or piece of equipment. The disconnecting means shall disconnect all ungrounded conductors of the supply circuit simultaneously. Multiple power sources shall not be used.

5.9.2 Electromechanical Controls

A. Control devices and three-phase control apparatus shall conform to: ANSI/NEMA Industrial Control Equipment Standards ICS1 through ICS6 inclusive.

B. AC coils of control devices shall be rated at 120 volts, 60 hertz, and shall be suitable for use on 120 ± 10% volts, 60 hertz, continuous duty.

C. Three-phase control apparatus shall have a minimum rating of 600-volt service regardless of the voltage applied.

D. Control circuit transformers shall be 100 volt-amperes minimum, copper wound with isolated secondary and conform to ANSI/NEMA Standard ST-1, Specialty Transformers, Section 4, Machine Tool Transformers, and be Type 1, without integral overcurrent protection. The transformer primary winding shall be rated 240/480 volts at 60 hertz with the secondary winding rated 120 volts. Except that transformers for use in combination motor starters shall be 50 volt-amperes minimum and shall conform to ANSI/NEMA Standard ST-l, Section 3, Control Transformers.

E. Control devices external to the electrical enclosure shall be rated NEMA 12 minimum. Where environmental conditions are more severe, devices shall be rated to suit these conditions.

F. General Requirements:

1. All electromechanical control equipment shall be housed in a non-ventilated NEMA 12 enclosure and shall be designed to operate continuously and reliably within the enclosure ambient of 0º to 60ºC. The 60ºC requirement shall be based on an ambient of 40ºC.
2. Screw-type terminals with captive saddle straps or equivalent means of retaining stranded conductors shall be provided on control devices and terminal strips. Except that this requirement does not apply to devices mounted external to the electrical enclosure and normally equipped with leads, such as valve solenoids and clutches.
3. Control devices and coils shall be marked in accordance with requirements as specified in article “Nameplates and Identification” of this section.
4. Control contacts shall be of the quick-make/quick-break type.
5. Limit switches, pressure switches, and similar devices shall have separate, isolated normally open and normally closed contacts.
6. Control relays shall be four-pole minimum, eight-pole installed maximum. Relays shall have a complete set of contacts (e.g., a four-pole block shall have all contacts furnished). Control relays shall be insulated for 600 volts unless specified otherwise.
7. The mounting details of all control devices shall not be modified from the manufacturer’s standard mounting dimensions.
8. All photocells shall be rigidly mounted and enclosed in a housing that shall prevent an operator from accidentally misaligning the unit. These control units shall have adjustable mountings to permit easy realignment, and flexible liquid- tight electrical conduit shall allow 24 inches of total adjustment. Plug-in emitters and receivers and electronics integral to the photocell shall be provided by the Contractor. When mounted and in operation, removal and replacement of the plug-in unit will entail unsecuring the plug-in unit from the wiring base and resecuring a new unit in its place. Nothing shall obstruct the removal and replacement of the plug-in unit(s).
9. All switches utilized to detect product movement and/or equipment positioning shall be rigidly mounted. Proximity (non-contact) switches are preferred. Mechanically operated (contact) limit switches shall be equipped with adjustable arms. Industrial rated switches are required. Mounting arrangement shall permit easy realignment adjustment, and flexible liquid-tight electrical conduit shall allow 24 inches of total adjustment. Plug-in devices shall be provided by the Contractor.
10. Plug-in devices and assemblies shall be mechanically secured.
11. All control relays and solenoids shall have encapsulated coils.
12. All solenoid valves, position indicators and pressure switches shall be provided with integral illuminated indicators to monitor their status.
13. Stepping switches shall not be used.
14. Push selector switches for start-stop operation shall not be used.
15. Latch relays for control of motion shall not be used.

16. Relays with “make before break” overlapping contacts shall not be used.
17. Neutral position (DPDT) limit switches shall not be used.
18. Aluminum connection devices shall not be used.
19. Maintained position limit switches shall not be used.
20. Time delay pushbuttons, selectors, and limit switches shall not be used.
21. MANUAL motor starters shall not be used.
22. Motor starters with automatic overload reset shall not be used.
23. Manifold limit switches shall not be used.
24. All devices which have a cycle shall include a resettable and non-resettable part counter. Devices which use a programmable controller shall have the counter driven by an output of the controller.
25. The non-resettable counter shall not lose the count accumulated due to power or signal interruptions; the tally shall not be maintained in the PC control.
26. Across-the-line motor starters shall be employed for alternating current motors. Except where the equipment requires limiting the accelerating torque.
27. Alternating current motor starters shall simultaneously open all of the power conductors connected to the associated motor.
28. Each motor starter shall be individually protected by a dedicated circuit breaker or fuse block.
29. External manual or automatic reset starters are not allowed.
30. The rating of starters for jogging duty requiring repeated interruption of stalled motor current or repeated closing of high transient currents encountered in rapid motor reversal involving more than five openings per minute shall be in accordance with the National Electric Code.
31. Three-phase motor starters shall be of the electrically held magnetic type and shall not be smaller than NEMA size 1. The starter shall be capable of interrupting the stalled rotor current of the motor(s).
32. All machines, having a motor 10 HP or larger, shall incorporate a shutdown timer which is interlocked with the machine logic to shut off such motors if the machine is not cycled within a pre-determined time. Exceptions are any machine where the manufacturer feels such a timer could create unsafe conditions.
33. Motors 75 HP and larger shall have circuitry designed to limit the number of starts per hour as specified by the motor manufacturer.

5.9.3 Electronic Controls

A. The provisions of this section apply to “hardware” for all types of electronic control systems and devices, including programmable controllers, microprocessor, numerical control, and other miscellaneous solid state equipment. For “Logic” design requirements, refer to Section 5.7, Control Circuits.

B. Control devices shall conform to ANSI/NEMA Standards ICS1 through ICS6 and Electronic Industries Association (EIA) Standards where applicable for all electronic control assemblies and devices, except where specified otherwise in this standard.

C. Printed circuit assemblies shall conform to NEMA Standards ICSl-l13 except

where otherwise specified.

D. Electronic control devices and subassemblies shall meet the surge withstand requirements of ANSI/IEEE Standard C37.90a-(R1980).

E. General Requirements:

1. All electronic control equipment shall be housed in a non-ventilated NEMA 12 enclosure and shall be designed to operate continuously and reliably within an enclosure ambient of 0ºC to 60ºC. The 60ºC requirement shall be based on an in-plant ambient of 40ºC, see the article "Enclosures" in this section.
2. Printed circuit board materials shall be flame retardant, and shall have mechanical and electrical characteristics equivalent to NEMA grade G10. Rigid, glass epoxy boards of not less than a nominal 0.0625 inch with tinned circuits shall be used.
3. Where printed circuit boards require surface coatings, the coating shall be clear so as not to inhibit identification of component markings.
4. Design of special solid state equipment shall utilize standard, commercially available components.
5. Printed circuit cards shall be mechanically keyed and properly identified to prevent insertion in other than the correct orientation and location and shall be mounted in the vertical plane.
6. All circuitry connections to printed circuit boards shall be made through edge plug-in connectors. Plug-in connectors shall be rugged, highly reliable, with the capability of being frequently connected and disconnected without failure.
7. All electronic circuit boards shall be fully burned-in and final heat cycle tested to ensure their reliable operation under the conditions specified as specified previously.
8. Potted circuit boards shall not be used.
9. All subassemblies shall be readily removable for inspection and/or replacement. Subassemblies with identical functions shall be interchangeable.
10. An extender board shall be provided to accommodate all unique varieties of circuit board sizes and pin spacings that exist in the system. A dedicated slot shall be provided for the storage of each of these boards.
11. Transformers mounted to printed circuit boards shall be supported by straps and/or brackets and not by the soldered leads. Resistors and capacitors exceeding 0.5 inch in diameter or 1.5 inches in length shall also be supported by a means other than the connecting leads.
12. Each power pin of all integrated circuits shall be filtered to eliminate electrical noise interference.
13. Cards or components requiring power for the purpose of sustaining memory shall be supplied with battery backup of sufficient capacity to prevent memory loss for a period of at least fourteen (14) days.

14. Transients shall not damage or cause malfunctions of the semiconductors, memory, or other electronic components. Electronic equipment shall function properly when subject to ambient electrical noise at the installation site. Transient suppression shall be provided where a contact device is hard wired between an output and an inductive load.
15. Power supplies to electronic circuits shall be the regulated type incorporating transient suppression and isolation from electrical noise and shall be sized to permit a twenty-five (25) percent increase in VA capacity. All transformation and conditioning of incoming power shall be the responsibility of the Contractor.
16. Power supplies used for logic circuits should contain circuitry for shutdown on overcurrent and overvoltage.
17. Power supplies shall not use parallel voltage regulators for regulating a single DC voltage.
18. Standard modules and power supplies shall not be modified in any manner.

F. Microprocessor, Numerical Control, and Solid State Control

1. All electronic controls shall comply with the requirements of Paragraph B of this Article.
2. All processor inputs, outputs and memory shall be unmodified standard boards as supplied and supported by the original equipment manufacturer (OEM).
3. I/O modules interfacing the machine to the electronic control shall be of the plug-in type.
4. All solid state electrical enclosures shall have I/Os pre-wired to perimeter terminal strips, see the “Wiring” paragraph in this section.

G. AC and DC Variable Speed and Servo Drive Systems

1. All AC and DC solid state supply systems and associated controls shall be housed in a NEMA 12 enclosure(s) and shall be designed to operate continuously and reliably within an enclosure ambient of 0ºC to 60ºC, see the “Enclosures” article in this section.
2. A properly sized isolation transformer with 480 volt, three phase, 60 hertz delta primary winding shall be provided.

3. Current limiting fuses, including transient suppressors, shall be used in the AC supply line to protect the power circuit semiconductors.
4. Motor controllers shall provide undervoltage, field loss, and overspeed protection on all AC and DC drives for safe operation and to prevent equipment damage.
5. Electronic circuits shall be of modular construction for ease of maintenance and replacement, see the “Wiring” paragraph in this section.
6. Thermal detectors shall be provided within the motor winding. Thermal detector(s) shall be interlocked with the motor controller.

7. Adjustment controls shall be provided for the following:

   a. Minimum Speed
   b. maximum Speed
   c. current Limit
   d. linear Acceleration
   e. linear Deceleration

H. Controllers for DC motors rated 5 HP and above shall provide the following:

1. Timed voltage acceleration on the armature voltage to prevent high armature current during start-up or under any re-start condition
2. Time voltage deceleration
3. Electronic armature current limit protection
4. An armature voltage regulating potentiometer for speed control
5. Instrumentation to monitor armature current and voltage and field current and voltage
6. Feedback control circuitry obtained from an IR (current times resistance) voltage drop proportional to armature current. Positive or negative feedback may be used. Tachometer feedback systems shall be subject to individual approval by Electronics Engineering Division.

I. Servo drives shall be designed to provide the following:

1. Four (4) quadrant operation with regenerative capacity in both forward and reverse directions
2. Dynamic braking of motor in emergency stop situations
3. Integral current and velocity feedback for precision control. Associated feedback transducers and a properly sized armature loop contactor shall be provided.
4. Drive shall be capable of commanding rated motor speed with an input signal which is compatible with current PC systems.

J. DC servo motors shall be permanent magnet type either conventional or brushless design, brushless being preferred.

K. Push-button and selector switch operators; indicating (pilot) lights and similar devices shall be oil-tight, NEMA 12 construction minimum.

L. Push-button operators shall retain their color identification throughout their life. The color code for pushbuttons shall be defined in coordination with the Architect.

M. Emergency push-button operators shall be of the palm or mushroom type.

N. Palm or mushroom type buttons shall not be used in start circuits, unless two or more are connected for two-hand, anti-tie-down operation.

O. “START” button operators shall be of the fully guarded type.

P. “STOP” button operators shall be of the unguarded type.

Q. The color code for pilot lights shall be as referenced in the National Electric Code.

R. Pilot lights shall be of the push-to-test type, powered by individual transformers mounted integrally with the lamp base. LED type pilot lights shall be used. A remote push-to-test circuit to test all pilot lights simultaneously may be used in lieu of individual push-to-test pilot lights in certain instances, but require prior approval of Electronics Engineering Division.

S. Application of “push-to-test” lights or circuits shall be such that energization of any other part of the control circuit will not occur when the light is tested.

T. Touch-type control devices shall not be used to perform operator control functions. Except where used for the purpose of setting up logic programs and/or diagnostic displays.

U. LCD, gas discharge and neon type indicating devices may be used for purposes such as programming and as indicating lights or displays for diagnostics. They may not be used for the functions listed in the preceding Paragraph E. They shall provide integrity equivalent to NEMA 12.

5.9.4 Operator Control Station Requirements

All operator control stations shall be minimum NEMA 12 unless otherwise required by code. Enclosures shall be mounted to provide easy access for operation, and protection from damage.

5.9.5 Push-Buttons

A. All push-buttons, selector switches, indicator lights and key switches shall made by the same manufacturer and of the same series.

B. Push-button and pilot light enclosures providing for six or more devices shall be equipped with piano hinged covers.

C. Where six or more devices are required, terminal strips shall be furnished in the enclosure.

D. Spare space shall be provided for 25 percent additional pushbuttons or pilot lights of the same size, with a minimum of two spaces.

E. On main control station, pilot lights shall be provided to show the following, if they apply to the equipment:

1. Power on
2. Motor(s) running
3. Mode, e.g., auto/manual
4. Full depth
5. Machine fault/abnormal stoppage
6. Machine in cycle
7. Cycle complete

8. E-Stop conditions
9. Identification of Control Devices and Control Stations

F. All operator controls, including push-buttons, selector and toggle switches, pilot lights, meters, and other indicators shall be permanently identified.

5.9.6 Control Station Arrangement

A. "START" buttons shall be mounted immediately above or to the left of their associated "STOP" buttons. However, this does not apply to "Start" buttons for two-handed control.

B. A legend (name) plate shall be provided for each control station component to identify its function and located so that it can be read easily by the equipment operator from his normal work position.

C. Palm or mushroom type buttons in start circuits shall be equipped with ring guards or equivalent and shall be at least 24 inches apart. Palm/mushroom type buttons should be located approximately 41 inches from the floor surface to the top of the button.

5.9.7 Control Station Location

A. Control stations shall be mounted in clean and dry locations.

B. Control stations shall be located within easy reach of the equipment operator when standing and away from pinch points or moving hazards.

C. Controls shall be free from possibility of accidental operation either by normal movement of the equipment or the operator.

D. All primary operator controls and monitoring devices shall be logically grouped by function, and shall be mounted so as to afford the operator maximum visibility of the work area while in the normal established work position.

E. Pipe lines, tubing or device(s) for handling air, gases, or liquids shall not be located in control stations.

F. Ground detector pilot lights shall be mounted on the front of the main electrical enclosure, see the "Equipment Grounding" paragraph in this section.

5.9.8 Pendant Stations

A. All pendant stations shall be provided with an emergency stop.

B. Pendant push-button stations shall be mechanically supported by a means other than the flexible electrical conduit or multiconductor cable.

C. For grounding requirements. Refer to paragraphs 5.8.10 through 5.8.12.

5.9.9 Multiple Station Equipment

A. An operator's control station shall be provided at each station for manual operation.

B. Pushbuttons shall be provided at the operator's control station to provide complete manual operation in accordance with the sequence of operation.

C. MANUAL control pushbuttons shall be located where the respective actuator may be observed by the operator.

D. Where a Bypass mode switch(es) is specified, the equipment manufacturer shall comply with the requirements specified in article 5.7.

E. The following devices shall not be used:

1. Stepping switches
2. Push selector switches for START/STOP operations
3. Latch relays
4. Relays with overlapping contact
5. Neutral position limit switches

5.9.10 Location And Mounting Of Control Components

A. Control components mounted externally from the electrical enclosure shall be as follows:

1. Mounted rigidly in accessible, reasonably clean and dry locations.
2. Provided with adequate clearance for replacement.
3. Free from accidental operation by normal movement of the machine components or operator.
4. Mounted and located so that it will not interfere with machine adjustments or maintenance.
5. Controls shall be mounted on an exterior surface of the equipment between 18 and 84 inches above the operating floor line. Wherever practical, and within established safety regulations, operators shall be provided with the capability to manually adjust and lock the height, pitch, and/or rotation of control stations to suit individual preferences and comfort. A sufficient range of adjustment shall be provided to accommodate the anthropometric features of adult operators between the 5th and the 95th percentiles.
6. The bottom of terminal and junction boxes shall be mounted a minimum of 18 inches above the operating floor line.
7. Position sensors and their associated actuators shall be installed so that accidental overtravel will not damage them.
8. Manifold mounted limit switches and wiring shall not be acceptable.
9. The manufacturer's standard mounting details shall not be modified or altered in any way.

5.10 AC MOTORS AND DRIVES

5.10.1 General

Motors shall be furnished TEFC. Open motors are not acceptable. Motors shall be a

minimum of ½ HP and include a minimum service factor of 1.15. Drive size calculations shall be provided to AOC for review prior to start of equipment fabrication. This submittal shall include horsepower calculations in accordance with the motor manufacturer's standard methodology. The Contractor shall utilize a minimum number of common motor/reducer combinations within the ABCS. This statement is defined such that one motor reducer combination shall be provided for each necessary horsepower rating. Motors used for the same purpose shall be common to one another. All motors used in the Automated Book Conveyor System shall be provided with a local disconnect with lock-out capability located within 6 feet of the motor and easily accessible by maintenance personnel.

Pantograph motors are currently 120 VAC, l-phase, 60HZ.

A. Except for pantograph motors (120 VAC, l-phase, 60HZ as above) fan motors and air conditioner motors, motors powered from Madison building sources shall be 480 VAC, 3-phase, 60HZ and motors powered from Jefferson and Adams building sources shall be 208 VAC, 3-phase, 60HZ.

B. All motors shall be NEMA Class B, design "B" TEFC and ball bearing; exceptions require approval by AOC.

C. Flange mounted motors shall be standard NEMA design "C".

D. Double drive extension or other motor modifications require approval by the AOC prior to implementation.

E. High slip, torque motors, wound rotor motors with external resistors and high temperature insulation require approval.

F. Motors shall have standard F-l conduit connection enclosures where mounting permits. Refer to the previous paragraph A.

G. Induction reduced voltage starting shall be used on all motors with a locked rotor current which exceeds 500 amps at 480 Volts. The use of dual winding motors to obtain reduced voltage starting is not acceptable.

5.11 PROGRAMMABLE LOGIC CONTROLLERS (PLCs)

5.11.1 Programmable Controller Hardware Components

A. One common brand and model of programmable logic controller shall be used in all conveyor subsystems. Memory requirements shall be established by the Contractor.

B. Each sub-system controlled by a programmable logic controller shall also be supplied with an individual notebook PC based programming terminal. Each PC programming terminal shall be supplied with on-line and off-line programming, ladder logic documentation/cross-referencing and diagnostic software as produced by the PLC manufacturer. The Contractor shall submit the description of the proposed terminal as a component of the proposal. All program terminals shall be identical. Only one notebook computer is required for each different type of PLC. The minimum requirements for the programming terminal are:

1. Intel (or equivalent) Pentium III or later processor running at 1 GHz or faster.
2. 256 Mbyte main (RAM) memory.
3. 18 Gigabyte hard disk drive.
4. DVD/CD-ROM drive.
5. 15” Active Matrix LCD display.
6. 3.5” x 1.44 Mb floppy disk drive.
7. Standard printer, USB and serial RS-232 communication I/O ports.
8. Integrating Pointing Device.
9. External keyboard, mouse and monitor; where the mouse is an integral part of the keyboard and the keyboard is an integral component of the computer.
10. 10BaseT / 100BaseTX Ethernet.
11. No more than 8 pounds.
12. Batteries: One in the computer, and one spare.
13. Battery runtime shall be at least 2 hours per battery.
14. Unit is entirely self contained and does not require any external. devices/modules during normal operation; external power supply (for charging purposes) is permitted.
15. Battery Charger/eliminator (110 VAC).
16. Carrying case sized to contain the computer, operator manual, charging system, and an array of external signal cables.

C. Programmable controls shall be used for all equipment which would require more than six relays for machine logic.

D. Emergency stop circuits shall not be in the programmable controller logic. They shall be in relay logic. Emergency stop condition(s) shall be input to the Programmable Controller logic to permit orderly reset and/or restart, to reflect E-STOP status for data logging, and provide diagnostics to aid in troubleshooting.

E. Enclosures shall be minimum NEMA 12 unless otherwise required by code. Air circulation within the enclosure shall be provided in the Contractor’s design as required to maintain the specified ambient conditions within the enclosure. The programmable controllers shall be capable of withstanding ambient temperatures from 40º F to 110º F external to the enclosure. Special heating or cooling requirements shall be the responsibility of the Contractor. Components shall be engineered for a temperature rise of less than 50º F at maximum load and capable of proper operation at 95% relative humidity, non-condensing.

F. The programmable logic controller system shall be wired to operate on 120 Volt, Single-phase, 60HZ power that is derived from the primary 480 Volt, 3-Phase, 60HZ input. Voltage stabilizing isolation transformers shall be sized and installed by the system Contractor.

G. There shall be a duplex outlet in the panel fed from the same 120 Volt source as the controller for a program terminal and printer.

H. All outputs to solenoids shall be fused or connected through a circuit breaker at the terminal strip.

I. Solid state devices and controllers shall have a minimum 120 hour “burn in” to minimize the possibility of failure.

J. All inputs and outputs that control machine movement, either directly or indirectly, will have a time out feature that takes the system out of automatic mode if the conditions are not met. Refer to Section 5.2.

K. Systems equipped with read-write memory shall be provided with a means to prevent unauthorized alteration of memory.

L. Systems using batteries to support system and/or memory when control power is removed shall have a visual monitor to indicate the status of the batteries. Batteries shall be replaceable while under power and shall not disrupt the operation of any of the system.

M. The PLC shall contain 20% excess memory (50% of the excess memory to be contiguous) above the system’s initial requirements, which means there shall be a minimum of 20% spare of each item listed in the executive table (timers, counters, logic lines, etc.).

N. Processors with volatile memory shall be powered from a load center.

O. Programmable devices shall use modular design in their logic. The programs shall be sectionalized according to function or operation.

P. Programmable devices shall have their inputs/outputs designed to be sequential and sectionalized per their function.

Q. Special functions which normally use dedicated external controls, such as lubrication monitoring/control, programmable limit switches and gages shall be incorporated into the programmable device whenever possible.

R. Programmable devices which use discrete inputs and outputs shall be provided with a RUN/SETUP selector switch internal to the main electrical enclosure to disconnect control power from all outputs when in the SETUP mode and restore control power when in the RUN mode. Control power shall be maintained on the inputs and the processor(s) in both modes.

S. Only one input device shall be wired in series with each input. Indicating devices, e.g., pilot lights, may be wired in parallel with an input device and connected to the coil common.

T. Outputs shall control only one device, indicating devices may be wired in parallel with the device being controlled.

U. Input devices shall be wired in the normally open state, where fail-safe requirements must be met, e.g., stop, reset, flame safeguards, etc., contacts shall be wired in the normally closed state.

V. Systems shall be designed such that one Communication Port is always available for use with the programming terminal. The Port shall not require that any other system's interface be disconnected to use the programming terminal.

W. Spare I/O slots shall be provided for expansion of a minimum of 20% inputs and 20% outputs above the system's initial requirements.

X. Wire terminals on I/O modules shall comply with the requirements of article "Wiring" of this section.

Y. All I/O racks, processor racks, and power supplies shall be electrically bonded together and connected to the main electrical enclosure ground. Refer to article "Protection and Grounding" of this section.

Z. Configuration

1. Hardware addressing shall be done using one-slot addressing.
2. The controller shall be used in the scanner mode.
3. The controller shall be set up to communicate over a peer communication link with other. Each PLC shall be wired in a trunkline/dropline configuration up to manufacturer's standard station connectors. Communications will take place over manufacturer's standard data link for motor controls and decision points.

AA. Programmable Controller System Documentation

1. Control schematics shall be drawn in ladder diagram format on 24" x 36" reproducible polyester (Mylar).
2. Program documentation shall be performed on PLC programming and documentation software. Two copies of the documented control program shall be furnished on CD-ROM. Additionally, two hard copies shall be furnished on 8-l/2" x 11" high quality bond paper.
3. All program instructions (elements) shall include complete labeling. Additionally, rung comments shall be provided to assist in scanning and understanding the PLC program.
4. The Contractor shall update all documentation, including revisions made during startup and prior to furnishing final documentation.
5. A memory map shall be provided which lists all registers, their function, and reference number.
6. Programming software shall be designed using the sequential function

chart capability of the processor.

5.12 ELECTRICAL EQUIPMENT AND CONTROLS

5.12.1 AOC Approval

The Contractor shall obtain approval from AOC Electronics Engineering Division during the detailed design phase for final product selection.

5.12.2 Motor Starters

A. Basis of Design: Allen-Bradley Bulletin 509 Full Voltage Magnetic Motor controllers, to be provided by the Contractor in every application where a motor starter is required by this standard. The following characteristics are required:

1. The Contractor shall utilize a one piece, vertical lift, gravity drop out armature mechanism. The armature, contact carrier and contacts shall move as a single unit.
2. Power contacts shall be changeable without removing power wiring.
3. All wiring pressure connectors shall be self lifting.
4. The coil and yoke shall be physically keyed for proper assembly.
5. Auxiliary contacts shall be installable without the use of tools.
6. Eutectic Alloy overload relays shall employ programmable one piece heater elements and visible optical trip indicators.
7. Overload relays shall not be convertible from manual to automatic reset.

5.12.3 Photo-Electric Detectors

Photo-electric eyes similar to the Telemecanique plug-in XUE reflex detectors shall be provided by the Contractor in every application where a photo-electric detector is required. The photo-electric eyes must be modular in design so that the optics and electronics of the eye may be replaced without having to disturb the wiring.

5.12.4 Bar Code Readers

5.12.4.1 <u>Fixed Bar Code Readers</u>

The Fixed Bar Code Readers, BCRs, shall be based on laser technology with an X and Y direction scan that provides a suitable scanning window. The scanners shall locally display the last number read (or display “NO READ”) and LEDs shall be provided to display scanner status. Each scanner shall be equipped with “shutters” which will open only when a load is present in front of the scanner such that the laser is “ON” only when scanning a load. The readability rate shall be at least 99.9% readable to unreadable. A mechanism for detection of a load which is unreadable shall be provided as a component part of each information station and/or decision point. The contractor shall develop a system which detects when a BCR has failed due to “too many” bad reads and not communicating due to a “no response” when a load is present.

5.12.4.2 Portable Bar Code Scanners

The Portable Bar Code Readers, hereafter called guns, shall be based on laser technology with an X and Y direction scan that provides a suitable scanning window that will provide capability to perform reads at distances from 1 to 10 ft. The guns shall locally display the last number read (or display “NO READ”) and LEDs shall be provided to display scanner status. Each gun shall be equipped with a trigger which will actuate the laser beam only when depressed. The readability rate shall be at least 99.9% readable to unreadable. A mechanism for detection of a gun which is non-functional shall be provided as a component part of the workstation control software. Upon completion of a good read, the gun or the conveyor operator workstation shall produce an audible beep to acknowledge the completion of the read.

5.12.5 Uninterruptible Power Supplies

Each of the ABCS building servers, and conveyor control PLCs shall be provided with uninterruptible power supplies by the ABCS Contractor. Other electronic equipment vital to the orderly shutdown of the ABCS in the event of a primary power source failure shall also be provided with UPS power. These UPSs shall provide backup power for a minimum of 15 minutes of fully loaded operation or longer as may be required to perform automatic shutdown and backup operations prior to loss of full power to the connected servers and other vital equipment.

END OF SECTION 14505

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6 ARCHITECTURAL REQUIREMENTS

Architectural Requirements are to be defined by the Contractor as part the (base bid) design portion of the project. All architectural work is to comply with current versions of the "AOC A/E Design Manual" and the "AOC Design Standards." Both AOC documents were provided on CD-ROM as part this project manual.

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7 TESTING REQUIREMENTS

7.1 SYSTEM TESTING

7.1.1 General

It is the intent of the Architect of the Capitol (Architect) that the Automated Book Conveyor System (ABCS) is designed and upgraded as a result of this project; all mobile and stationary mechanical, electrical, and control system hardware and software shall be proven to meet all functional and performance requirements specified herein. Approval of the ABCS shall require the Architect's attendance at the successful demonstration and completion of the tests outlined in this Section.

7.1.2 Responsibility

7.1.2.1 Advanced Notification

The Contractor shall provide two weeks advance notification to the Architect of each test outlined in this section. The notification shall be in written form and shall so state that all preliminary installation inspection, checking and testing has been completed and signed off by the Architect. Test scheduling shall be contingent upon approval by the Architect.

7.1.2.2 Acceptance Testing

The Contractor shall furnish all necessary supervision, technical and operations personnel, labor, Contractor-supplied software test routines and data (at the Architect's discretion), equipment, test loads, consumables (i.e. label stock, computer paper and forms, printer ribbons, toner cartridges, etc.), and support to man the system and perform the acceptance testing in accordance with the testing plan that shall be submitted to and approved by the Architect.

The Contractor shall develop and maintain records of each test as it is being conducted. A bound inspection log book shall be maintained by the Contractor; a copy of the log book shall be provided to the Architect prior to Final Acceptance. As inspections and tests are performed, the test procedure, measurements and all pertinent data shall be recorded and dated by the Contractor. Approval, in the form of a signature in the log book by the Architect, shall be the certificate of acceptance or rejection of the results. The test log book shall be kept on site at all times and shall be available for inspection by the Architect during regular working hours. The formal results of these tests shall be delivered to the Architect within five business days of the completion of each test. The Contractor shall submit a sample test report format to the Architect of the Capitol for approval a minimum of one calendar month prior to the beginning of any testing.

Each test must be completed in its entirety prior to advancing to the next stage of testing.

The Contractor test director shall compose the test plan, obtain the Architect 's approval, and document the results. Failure of any part of the testing shall require re-testing, at the Architect's discretion, of the entire system or of that specific subsystem only, following corrective action. All costs related to corrective work and re-testing shall be at no additional cost to the Government.

7.1.3 Factory Acceptance Testing

The Architect reserves the right to visit the Contractor and his subcontractor's facilities to inspect work throughout the life of the contract. This includes engineering, manufacturing, pre-shipment testing, and installation.

Points of inspection shall include quality control procedures, workmanship, assembly methods, finish, materials acceptability and for the presence of all specified equipment. A visual inspection of the completed equipment shall be conducted by the Architect.

The Contractor shall submit a software factory acceptance test plan including provisions for module and integration testing. The Contractor's system software shall undergo module and integrated factory acceptance testing at Contractor location prior to delivery to site.

All Contractor system software shall be tested in accordance with the test plan provided by the Contractor, and approved by the Architect, prior to installation of the physical ABCS control system, to ensure all software modules are functional. The test plan shall include provisions for software module testing, integration and operational tests at the Contractor's software development site and the installation site.

A. Perform system software load and startup from all supplied media and possible executive resident devices. Verify that no errors occur. Perform this activity on each central processor unit.

B. Bring the entire system, including all peripherals on line with the normal executive software operating. Then, manually interrupt the power to all devices not minimally required to operate the system. Ensure that the system software continues to operate without interruption or error.

C. Load the application software source code and data base, compile, link, and startup the system.

D. Following the procedures stated in the Contractor supplied documents, load all tables and enter all parameters required to operate the system fully loaded with all ABCS control equipment in a pre-determined sequence. Ensure that the menus and screens are clearly identified and functional as stated. Ensure that the resultant sequence is as planned.

E. After startup, check each automated supply subsystem and examine all tables referencing position and activity to verify proper operation.

F. Verify that all system commands function properly.

G. Generate samples of every report type. Have the personnel who would normally utilize the report verify that each report has a desired appearance and includes the desired content. Ensure that the report generation procedure is properly documented. Ensure that the system generated the desired report.

H. Verify that the security and access controls function as specified.

I. Generate all system and subsystem error conditions. Verify that all responses are as specified.

J. Produce specific equipment failures to actuate “hot backup” procedures in both hardware and software. Verify accuracy of procedures.

7.1.4 Site Acceptance (In accordance with each Sequence)

7.1.4.1 Site Acceptance Testing

The Contractor shall submit a site acceptance and testing plan for the Architect’s approval. The plan shall address the following:

A. Testing/Commissioning Methodology.

B. Test Description. The test descriptions listed are mandatory for each test. The Contractor shall be prepared accordingly prior to the start of formal testing. The Contractor shall have successfully completed all prior Factory Acceptance testing prior to commencement of Site Acceptance testing.

C. Testing. The site acceptance test shall consist of a series of tests conducted by the Contractor with the Architect of the Capitol present. Each test is outlined in this section. The tentative schedule and sequence of tests is as follows:

D. Week 1: System Ready Testing

E. Week 2: System Functional and Throughput Testing

F. Weeks 3 through 5: Endurance and Reliability Testing

7.1.5 System Ready Testing (In accordance with each Sequence)

7.1.5.1 Installation Inspection and Testing

The Contractor shall submit a formal installation inspection and testing plan for the Architect’s approval. The plan shall address the following:

A. Component Testing: The verification of system components shall be accomplished in stages. Once the ABCS, bar code scanners, electrical equipment, and controls equipment are installed, each in turn shall be inspected and tested.

B. Verify that the construction materials and assembly conform to the drawings and specifications.

C. Mechanical Installation Inspection: All mechanical systems shall be inspected and tested for verification of items typically as follows:

1. Mechanical installation, per approved drawings.
2. Bolt tightness.
3. Weld quality.
4. Painted finish quality and touch-up paint appearance.
5. Proper initial lubrication of all components.
6. Proper alignment and smooth operation of all equipment.

D. Electrical Installation Inspection: All electrical systems shall be inspected and tested for verification of items as follows:

1. Electrical installation per approved drawings and specifications.
2. All motors checked for correct voltage, full load amperage, uni-brake operation and adjustment, energy efficiency tags, and direction of rotation.
3. Signal wiring for all emergency stops shall be verified prior to operation of the Automated Book Conveyor System, and all subsystems in general.
4. Proper grounding of all powered equipment.

E. Control System Hardware: The control system hardware shall be inspected and tested for verification of items as follows:

1. Ensure that an accurate bill of material, including part numbers of hardware, peripherals, and options have been received.
2. Verify that installation manuals, operator manuals, maintenance manuals, diagnostic manuals, schematic diagrams, and standard diagnostics for all hardware, assemblies, options, and peripherals for the system have been received.
3. Verify that two (2) sets of security keys have been received for each lock supplied (if any).
4. Verify that the control equipment power failure/automatic restart function shall allow resumption of normal I/O processing. Test this by manual power interruption. Note that automatic restart applies to software functions only. Mechanical equipment shall not automatically restart with the return of power to the equipment.
5. Ensure that all stand alone diagnostics run complete tests on all computer hardware, assemblies, options, and peripherals in the system without failure. If a stand alone system exerciser has been configured, ensure that it shall run a complete test without failure.

F. The system shall be inspected for completeness, workmanship and cleanliness. A detailed punch list shall result.

7.1.6 System Functional Test (In accordance with each Sequence)

The Contractor shall demonstrate each and every function of the system on a "one-for-one" basis, including every safety device.

The Contractor shall test the ABCS by routing totes of each type to and from each I/O point in the system.

The Contractor shall demonstrate system operation in each mode of operation (automatic, degraded, maintenance, local and manual), including transition and recovery.

7.1.7 System Throughput Test (In accord with Options Work)

All systems shall be tested simultaneously such as to produce the maximum throughput requirements on the system as a whole. the Automated Book Conveyor System shall be demonstrated in such a manner as to simulate the ability to handle sustained peak rates as described in Sections 14502 through 14505 of this Project Manual. Each system shall be brought to steady state condition (defined as run for 4 hours at peak rates) prior to the start of the Throughput Test. Throughput testing shall proceed as follows:

A. All Systems shall maintain the specified throughput for a minimum of four hours.

B. The Contractor shall demonstrate each function of the electrical controls and software.

C. In concurrence with the throughput test period, the Contractor shall provide for professional and industry certified testing of the system sound pressure level. Sound level readings shall be taken at all operator workstation locations in the automated supply system. All equipment within the Automated Book Conveyor System shall be within the sound pressure level parameters as follows:

1. The Contractor shall measure sound pressure levels generated by the Book Conveyor System while transporting, queuing, and/or transferring loads.
2. Noise measuring equipment shall meet Type 1 or Type 2 standards for sound level meters as specified by the American National Standards Institute (ANSI 41.4) and shall be A-weighted and set for slow response.
3. The building HVAC and nearby mechanical equipment, other than book conveyor equipment, shall be turned off.
4. Noise readings shall be taken at a height of five feet above the floor at all operator workstations and in high-traffic pedestrian areas.
5. The average noise level, measured continuously at each location for a minimum of thirty seconds (or a minimum of three machine cycles) may not exceed 75 dbA.

7.1.8 System Reliability Test

7.1.8.1 Documentation and Training

Prior to commencement of this test, all documentation and training shall be completed to the satisfaction of the Architect of the Capitol.

7.1.8.2 Reliability Testing

A three-week, eight hours per day, Architect of the Capitol-supervised reliability test shall be conducted simultaneously on all systems. The Contractor shall be responsible for conducting all testing.

Repairs During Testing: For the purpose of this test, downtime shall be defined as the time required to perform the repair and bring the specific piece of equipment or subsystem back on line starting when the computer system logged the error. Preventive maintenance is part of normal operation. However, during the test period the off-shift maintenance shall be confined to inspection duties, not repair. Every effort should be made to use Contractor maintenance personnel during this test period, with Architect's maintenance personnel in attendance.

7.1.8.3 Test Performance Requirements

For the duration, no single subsystem may have more than 5% downtime. The entire system shall achieve an average minimum uptime of 95% during test conditions (operating 8 hours per day for a three (3) week period, excluding nonproductive days).

END OF SECTION 14507

APPENDIX 1: EXISTING BOOK CONVEYOR DRAWING LIST

Reference Scheme:

Drawing Source	Original Drawing No.	Drawing No. Used in List
Acco	A-nnn-mmm	A-nnn-mmm
Acco	B-nnn-mmm	B-nnn-mmm
Acco	C-nnn-mmm	C-nnn-mmm
Acco	D-nnn-mmm	D-nnn-mmm
Acco	H-nnn-mmm	H-nnn-mmm
Architect of the Capitol	varies	AOC_varies

Notes:

AOC_variesThese drawings are from Various sources including the AOC and unknown sources

✔This symbol in the *Included* column indicates a drawing included in the bid set to potential bidders. Other drawings will be available for bidders and will be provided if requested and paid for by the bidder.

Rev 1 (jcm):30-Jun-2003 – Deleted reference to drawings not of the ACCO “Blue Box” system.

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Drawing Number	*Sheet*	*Included*	*Drawing Description*	*Sheet Comment*
A-000-000	1		Operator Station Test Box Setup	
A-412-726	1		Operator Station Signal Connection	
A-412-726	2		Operator Station Signal Connection	
A-412-726	3		Operator Station Signal Connection	
A-412-726	4		Operator Station Signal Connection	
B-412-220	1		Guard Clip (Rework)	
B-412-221	1		Photo Eye Mounting Brkt. Weldment	
B-412-223	1		Detail: Limit Switch Mtg. Angle Brkt.	
B-412-224	1		Detail: Photo Cell Mtg. Bracket	
B-412-227	1		Detail: Weldment-Photo Eye Mtg. Bracket	
B-412-228	1		Detail: Limit Switch Mtg. Brkt.	
B-412-230	1		Detail: Limit Switch Mtg. Brkt.	
B-412-720	1		Operator Station Switch Settings	
B-412-727	1		Test Fixture, Operator Station	
C-412-225	1		Detail: Assy., Reflector Mtg. Brkt.	
C-412-239	1		Detail: Assy., Reflector Mtg. Brkt. & Car Monitor Assy.	
C-412-728	1		LOC Bit Assignments	
D-412-725	1		LOC Operator Station Factory Test	
D-412-725	2		LOC Operator Station Factory Test	
D-412-725	3		LOC Operator Station Factory Test	
D-412-725	4		LOC Operator Station Factory Test	
D-412-725	5		LOC Operator Station Factory Test	
D-412-725	6		LOC Operator Station Factory Test	
D-412-725	7		LOC Operator Station Factory Test	
D-412-725	8		LOC Operator Station Factory Test	
D-412-725	9		LOC Operator Station Factory Test	
D-412-725	10		LOC Operator Station Factory Test	
D-412-725	11		LOC Operator Station Factory Test	

Drawing Number	*Sheet*	*Included*	*Drawing Description*	*Sheet Comment*
D-412-725	12		LOC Operator Station Factory Test	
D-412-725	13		LOC Operator Station Factory Test	
D-412-725	14		LOC Operator Station Factory Test	
D-412-725	15		LOC Operator Station Factory Test	
D-412-725	16		LOC Operator Station Factory Test	
D-412-725	17		LOC Operator Station Factory Test	
D-412-725	18		LOC Operator Station Factory Test	
D-412-725	19		LOC Operator Station Factory Test	
D-412-725	20		LOC Operator Station Factory Test	
D-412-725	21		LOC Operator Station Factory Test	
D-412-725	22		LOC Operator Station Factory Test	
D-412-725	23		LOC Operator Station Factory Test	
D-412-725	24		LOC Operator Station Factory Test	
D-412-725	25		LOC Operator Station Factory Test	
D-412-725	26		LOC Operator Station Factory Test	
D-412-725	27		LOC Operator Station Factory Test	
D-412-725	28		LOC Operator Station Factory Test	
D-412-725	29		LOC Operator Station Factory Test	
D-412-725	30		LOC Operator Station Factory Test	
D-412-725	31		LOC Operator Station Factory Test	
D-412-725	32		LOC Operator Station Factory Test	
D-412-725	33		LOC Operator Station Factory Test	
D-412-725	34		LOC Operator Station Factory Test	
D-412-725	35		LOC Operator Station Factory Test	
D-412-725	36		LOC Operator Station Factory Test	
D-412-725	37		LOC Operator Station Factory Test	
H-412-000	1	✔	Ground Floor, West Loop (Madison Bldg.)	
H-412-000	2	✔	Ground Floor, East Loop	

Drawing Number	***Sheet***	***Included***	***Drawing Description***	***Sheet Comment***
H-412-000	3	✔	Ground Floor, Independence Ave. Tunnel	
H-412-000	4	✔	Ground Floor, West Loop 2nd & 6th Floor	
H-412-000	5	✔	Ground Floor, West Loop Sub Basement	
H-412-001	1	✔	Annex Cellar (Adams Bldg.)	
H-412-001	2	✔	Annex Tunnel	
H-412-001	3	✔	Machine Shop Loop	
H-412-001	4	✔	Main Bldg. (Jefferson Bldg.)	
H-412-001	5	✔	Main Building Octagon Area (Jefferson Bldg.)	
H-412-002	1	✔	Conveyor Installation, JMMB	
H-412-002	2	✔	Conveyor Installation, JMMB	
H-412-002	3	✔	Conveyor Installation, JMMB	
H-412-002	4	✔	Conveyor Installation, JMMB	
H-412-002	5	✔	Conveyor Installation, JMMB	
H-412-002	6	✔	Conveyor Installation, JMMB	
H-412-002	7	✔	Conveyor Installation, JMMB	
H-412-002	8	✔	Conveyor Installation, JMMB	
H-412-002	9	✔	Conveyor Installation, JMMB	
H-412-002	10	✔	Conveyor Installation, JMMB	
H-412-002	11	✔	Conveyor Installation, JMMB	
H-412-003	1	✔	Conveyor System Install, Main & Annex Bldgs.	
H-412-003	2	✔	Conveyor System Install, Main & Annex Bldgs.	
H-412-003	3	✔	Conveyor System Install, Main & Annex Bldgs.	
H-412-003	4	✔	Conveyor System Install, Main & Annex Bldgs.	
H-412-003	5	✔	Conveyor System Install, Main & Annex Bldgs.	
H-412-003	6	✔	Conveyor System Install, Main & Annex Bldgs.	
H-412-003	7	✔	Conveyor System Install, Main & Annex Bldgs.	
H-412-006	1	✔	SV-A and SV-B	
H-412-006	2	✔	SV-A and SV-B	

Drawing Number	*Sheet*	*Included*	*Drawing Description*	*Sheet Comment*
H-412-006	3	✔	SV-A and SV-B	
H-412-006	4	✔	SV-A and SV-B	
H-412-006	5	✔	SV-A and SV-B	
H-412-006	6	✔	SV-A and SV-B	
H-412-009	1	✔	Tunnel Conveyor Support Enclosure Installation (Madison – Jefferson)	
H-412-009	2	✔	Tunnel Conveyor Support Enclosure Installation (Madison – Jefferson)	
H-412-009	3	✔	Tunnel Conveyor Support Enclosure Installation (Madison – Jefferson)	
H-412-010	1		Conveyor Support Install, JMMB 6th Flr.	
H-412-023	1		Assy & Installation, BL-5 Enclosure	
H-412-026	1		Assy & Installation, BL-6 Enclosure	
H-412-701	1		Block Diagram & Top Assy., Fire Control Sys. - Fire Zones	
H-412-701	2		Block Diagram & Top Assy., Fire Control Sys. - Fire Zones	
H-412-701	3		Block Diagram & Top Assy., Fire Control Sys. - Fire Zones	
H-412-702	1		Electrothermal Link & Limit Switches	
H-412-703	1		Annex Cellar Equipment Locations, Fire Control Sys.	
H-412-703	2		Annex Cellar Equipment Locations, Fire Control Sys.	
H-412-703	3		Annex Cellar Equipment Locations, Fire Control Sys.	
H-412-704	1		Main Bldg. Equipment Locations, Fire Control Sys. (Jefferson Bldg.)	
H-412-704	2		Main Bldg. Equipment Locations, Fire Control Sys. (Jefferson Bldg.)	
H-412-704	3		Main Bldg. Equipment Locations, Fire Control Sys. (Jefferson Bldg.)	
H-412-704	4		Main Bldg. Equipment Locations, Fire Control Sys. (Jefferson Bldg.)	
H-412-704	5		Main Bldg. Equipment Locations, Fire Control Sys. (Jefferson Bldg.)	
H-412-705	1		JMMB Equipment Locations, Fire Control Sys. (Madison Bldg.)	
H-412-705	2		JMMB Equipment Locations, Fire Control Sys. (Madison Bldg.)	
H-412-705	3		JMMB Equipment Locations, Fire Control Sys. (Madison Bldg.)	
H-412-705	4		JMMB Equipment Locations, Fire Control Sys. (Madison Bldg.)	
H-412-705	5		JMMB Equipment Locations, Fire Control Sys. (Madison Bldg.)	
H-412-705	6		JMMB Equipment Locations, Fire Control Sys. (Madison Bldg.)	

Drawing Number	*Sheet*	*Included*	*Drawing Description*	*Sheet Comment*
H-412-705	7		JMMB Equipment Locations, Fire Control Sys. (Madison Bldg.)	
H-412-705	8		JMMB Equipment Locations, Fire Control Sys. (Madison Bldg.)	
H-412-705	9		JMMB Equipment Locations, Fire Control Sys. (Madison Bldg.)	
H-412-706	1		JMMB Equipment Locations, Fire Control Sys., SV (Madison Bldg.)	
H-412-706	2		JMMB Equipment Locations, Fire Control Sys., SV (Madison Bldg.)	
H-412-706	3		JMMB Equipment Locations, Fire Control Sys., SV (Madison Bldg.)	
H-412-706	4		JMMB Equipment Locations, Fire Control Sys., SV (Madison Bldg.)	
H-412-707	1		Annex Cellar Equipment Locations, Fire Ctl Sys., SV (Adams Bldg.)	
H-412-707	2		Annex Cellar Equipment Locations, Fire Ctl Sys., SV (Adams Bldg.)	
H-412-717	1	✔	Accessory Wiring Diagram, SV-A, B & C	
H-412-718	1	✔	Accessory Wiring Diagram, SV-D, E & F	
H-412-721	1	✔	Computer Room Layout - Madison Building	Obsolete
H-412-722	1	✔	Receptacle Layout, Computer Room	Obsolete
H-412-723	1		Interconnection Diagram, Mux & Phone Systems	
H-412-724	1		Assembly, Central Mux Station	
H-412-729	1	✔	Accessory Wiring, Remote CRTs & Fire Alarms	
H-412-730	1	✔	Assy & Component Locations, BL-1	
H-412-731	1		Interconnection Diagram, BL-1	
H-412-732	1	✔	Assy & Component Locations, BL-2	
H-412-733	1		Interconnection Diagram, BL-2	
H-412-734	1	✔	Assy & Component Locations, BL-3	
H-412-735	1		Interconnection Diagram, BL-3	
H-412-736	1	✔	Assy & Component Locations, BL-4	
H-412-737	1		Interconnection Diagram, BL-4	
H-412-738	1	✔	Assy & Component Locations, BL-5	
H-412-739	1		Interconnection Diagram, BL-5	
H-412-740	1	✔	Assy & Component Locations, BL-6	
H-412-741	1		Interconnection Diagram, BL-6	

Drawing Number	*Sheet*	*Included*	*Drawing Description*	*Sheet Comment*
H-412-742	1	✔	Assy, Station Terminal Box, BL-2, 3, & 4	
H-412-743	1		Detail: Station for BL-2, 3, & 4 Terminal Box	
H-412-744	1	✔	Station Terminal Box Wiring & Schematic, BL-2, 3, & 4	
H-412-745	1	✔	Assy, Station Terminal Box , BL-1 & 5	
H-412-746	1		Detail: Station for BL-1 & 5 Terminal Box	
H-412-747	1	✔	Station Terminal Box Wiring & Schematic, BL-1 & 5	
H-412-747	2	✔	Station Terminal Box Wiring & Schematic, BL-1 & 5	
H-412-748	1		Assy, Station Terminal Box, BL-6	
H-412-749	1		Station Terminal Box Wiring Diagram & Drive System Schematic Diag. for BL-6	Use Updated Drawing
H-412-752	1		SV-F Drive System Schematic Diagram	
H-412-756	1		SV-F Station Electrical Equipment Assembly	
H-412-760	1		Assembly SV-F Station Terminal Box	
H-412-760	2		Assembly SV-F Station Terminal Box	
H-412-761	1		Detail 1 SV-F	
H-412-762	1		SV-F Station Terminal Box Wiring Diagram	
H-412-764	1	✔	SV-F Interconnection Wiring Diagram	
H-412-764	2	✔	SV-F Interconnection Wiring Diagram	
H-412-764	3	✔	SV-F Interconnection Wiring Diagram	
H-412-771	1		SV-F Drive Layout	
H-412-772	1		Assembly Ribbon Cables & Connectors	
H-412-783	1	✔	Assembly Encoder Control Box	
H-412-783	2	✔	Assembly Encoder Control Box	
H-412-786	1		Assembly & Wiring Diagram, Encoder Cable	
H-412-787	1		Detail, Encoder Control Box	
H-412-791	1		Assembly Multiplexer Station BL-6	
H-412-792	1		Assembly Multiplexer Station, Annex Corridor Annex Bldg. #2	
H-412-793	1		Assembly Multiplexer Station Annex Loop (A) SV-E #1	
H-412-794	1		Assembly Multiplexer Station, SV-E #2	

Drawing Number	*Sheet*	*Included*	*Drawing Description*	*Sheet Comment*
H-412-795	1		Assembly Multiplexer Station, Annex Loop (B) SV-F #1	
H-412-796	1		Assembly # 10 Multiplexer Station, Annex Loop (B) SV-F #2	
H-412-797	1		Accessory Wiring Diagram for Multiplexer Assembly	
H-412-797	2		Accessory Wiring Diagram for Multiplexer Assembly	
H-412-797	3		Accessory Wiring Diagram for Multiplexer Assembly	
H-412-797	4		Accessory Wiring Diagram for Multiplexer Assembly	
H-412-797	5		Accessory Wiring Diagram for Multiplexer Assembly	
H-412-797	6		Accessory Wiring Diagram for Multiplexer Assembly	
H-412-797	7		Accessory Wiring Diagram for Multiplexer Assembly	
H-412-797	8		Accessory Wiring Diagram for Multiplexer Assembly	
H-412-798	1		Directrol I/O Assignments	
H-412-798	2		Directrol I/O Assignments	
H-412-798	3		Directrol I/O Assignments	
H-412-798	4		Directrol I/O Assignments	
H-412-798	5		Directrol I/O Assignments	
H-412-798	6		Directrol I/O Assignments	
H-412-798	7		Directrol I/O Assignments	
H-412-798	8		Directrol I/O Assignments	
H-412-798	9		Directrol I/O Assignments	
H-412-798	10		Directrol I/O Assignments	
H-412-798	11		Directrol I/O Assignments	
H-412-798	12		Directrol I/O Assignments	
H-412-798	13		Directrol I/O Assignments	
H-412-798	14		Directrol I/O Assignments	
H-412-798	15		Directrol I/O Assignments	
H-412-798	16		Directrol I/O Assignments	
H-412-798	17		Directrol I/O Assignments	
H-412-798	18		Directrol I/O Assignments	

Drawing Number	*Sheet*	*Included*	*Drawing Description*	*Sheet Comment*
H-412-798	19		Directrol I/O Assignments	
H-412-798	20		Directrol I/O Assignments	
H-412-798	21		Directrol I/O Assignments	
H-412-799	1		Modification Assembly Multiplexer Station	
H-412-850	1	✔	SV Block Diagram and Top Assembly	
H-412-851	1	✔	SV Drive Panel Assembly	
H-412-852	1	✔	SV Drive System Schematic Diagram (Blue Line Obsolete, Use Mark Up White-	Use Updated Drawing
H-412-853	1	✔	Block Diagram, Encoder System Assembly	
H-412-854	1		Encoder Modification, SV Drive Panel	
H-412-854	2		Encoder Modification, SV Drive Panel	
H-412-855	1		Station Assembly and Block Diagram	
H-412-856	1		Station Electrical Equipment Assembly	
H-412-856	2		Station Electrical Equipment Assembly	
H-412-857	1		4 x 4 Wireway, Sub-Assembly	
H-412-858	1		Assembly, Terminal Box & Wireway	
H-412-859	1		Station Terminal Box and Wireway Mounting	
H-412-860	1	✔	Assembly Station, Terminal Box	
H-412-860	2	✔	Assembly Station, Terminal Box	
H-412-861	1		Station Terminal Box Detail	
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APPENDIX 2: AOC A/E DESIGN MANUAL (February 2004)
AOC DESIGN STANDARDS (June 2004)

Refer to the AOC A/E Design Manual and the AOC Design Standards, both provided on CD-ROM.

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APPENDIX 3: EXISTING SOFTWARE TOOLS
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1.02 CDP, Check Decision Point status
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1.04 DGN, code plate reader DiaGNostic
1.05 DPS, Decision Point Status
1.06 JOG, horizontal conveyor JOG
1.07 MOD, change system MODe
1.08 MSG, MeSsaGe
1.09 ODT, Online Debugging Tool
1.10 OSD, Operator Station Disable (Remove operator station from system)
1.11 RLS, ReLeaSe tote
1.12 RLSALL, ReLeaSe ALL delivered totes
1.13 STA, change device STAtus
1.14 STR (STaRt), ST0 (STOp), RSM (ReSuMe), HLD (HoLD), and automatic wakeup/retire
1.15 STSLIN (STatuS LINe), OOS (Out Of Service), RFL (Runoff FuLl) and TDZ (Totes Delayed in Zone) programs. The STC (STatus line Control) program.
1.16 SVM, Selective Vertical Monitor
1.17 TCR (read TCU-150 time into RSX-11 time) and TCS (set TCU-150 time)
1.18 Tray History Files
1.19 TRAYS, Dump TRARF and TRASF Contents to the Printer
1.20 TRFFIX, Fix TRARF Contamination. SHOTRF, Show TRARF Structure
1.21 TRL, Tote Listing Program
1.22 XIO, eXercise I/O
1.23 ZRO, Zero Cumulative Statistics

1. Existing Software Tools

The existing system has a number of Software Tools beyond those utilities, assemblers, and compilers usually associated with the operating system. The Software Tools were developed and written by:

A. The contractor who built the Automated Book Conveyor System (ABCS) known as the Blue Box System.

B. Sub-contractors to the contractor in “A” above.

C. Architect of the Capitol (AOC) personnel later during the life of the ABCS

The Software tools were developed to provide specific functions that are important to personnel responsible for operating and maintaining the ABCS. The tools are listed below with a description of their functions.

The specifics of how such maintenance and operational tools are to be provided in the upgraded controls system will depend on the topology of the new computer and controls systems, the platforms involved and the operating system(s) used. The upgraded controls system. Regardless of the method, the functionality provided by the tools described in this section (as well those specified in other sections of this specification) will be provided to operators and maintenance personnel at their workstations.

1.01 ANOMLY, ANOMaLY printer output program.

ANOMLY is a program that is run at system WAKEUP time and is aborted when the system is put to sleep at the end of the day. ANOMLY simply outputs a line or lines of text to printers it controls when a device changes state among in-service, out-of-service and down. The text contains the device ID number(s), device description, the resulting state, and a short description of the problem, if any.

1.02 CDP, Check Decision Point status

CDP is a maintenance tool, written in Fortran, which can be executed from the system console or any operator console. CDP checks the status of the selected decision point consisting of a reader, stop and diverter along with their associated controls. CDP then returns the following information.

A. The area is clear and awaiting the arrival of the next tote.

B. There is a tote in the stop at the entrance or the decision point and the system is waiting for the diverter to reorient or is waiting for a tote, currently on its way through the decision point, to clear the decision point exit.

1.03 CHV, Check Horizontal to Vertical areas

CHV, when run by an operator on a VT terminal, fills a formatted screen and updates the data once a second. CHV checks every horizontal to vertical area status and allows the user to override certain conditions that may block an area. The areas monitored are:

A. Load side of the SVA ground floor automatic station
B. Load side of the SVB ground floor automatic station
C. Load side of the SVB sub-basement automatic station
D. Load side of the SVB second floor automatic station
E. Load side of the SVC ground floor automatic station
F. Load side of the SVD ground floor automatic station
G. Load side of the SVD sixth floor automatic station
H. Load side of the SVE cellar automatic station
I. Top of BL2 (B25 unload side)
J. Top of BL3 (100 unload side)
K. Top of BL4 (D65 unload side)

Note: BLl and BL5 unload onto spirals which are not computer controlled areas. BL6 is considered a “miscellaneous” device, not really a branch lift.

For each of the areas (A through K above), CHV displays one of the eight conditions shown below:

A. DORMANT
B. AREA CLEARED TO ACCEPT TRAFFIC
C. TRAY PASSING PRIORITY RUN
D. OOS PHASE - RESTORE STATION
E. STATION NOT IN SERVICE
F. TRAY AWAITING CARRIER
G. CYCLING OR RUNOFF FULL
H. BUSY FOR INCOMING TRAY

DORMANT, which occurs just after AREA CLEARED TO ACCEPT TRAFFIC means that the horizontal to vertical (H to V) area is functional and free of totes. TRAY PASSING PRIORY RUN means that the tote is passing the reader and entering the H to V area and has activated the priority run photo eye which starts the last horizontal conveyor feeding the H to V area if it is not busy handling another tote. OOS PHASE - RESTORE STATION and STATION NOT IN SERVICE mean that there is a problem. The operator should take the station out of service and put it back in service using the STA program. If this does not clear the problem the hardware may be malfunctioning. If no problem can be found, a “cold start” may be required. TRAY AWAITING CARRIER means that the tote is ready to be loaded onto a vertical car as soon as it goes by or is ready to roll onto a branch lift car as soon as it returns home. CYCLING OR RUNOFF FULL is for branch lift H to V areas. It means that the branch lift is cycling or that the BL station runoff is full. BUSY FOR INCOMING TRAY means that the tote has passed the priority run photo eye but has not yet reached the SV loader of BL unload car. This condition may be cleared by the operator if he is certain it is a “phantom tote” condition possibly caused by unintentionally activating the priority run photo eye or a malfunctioning priority run photo eye.

1.04 DGN, code plate reader DiaGNostic

DGN when run, prompts the user for a particular reader. After the operator answers, the program runs a diagnostic on that reader. The code plate reader selected must have been removed from service via STA before the operator runs DGN on that reader. After DGN completes, the result appears as a message on the printer. The message will be either *DIAGNOSTIC TEST OK* or DIAGNOSTIC TEST FAILED due to xxxxxx occurring during phase nn. The values for xxxxxx and nn are listed and explained in the ABCS documentation.

1.05 DPS, Decision Point Status

DPS lists a snap shot of all the stops in the system and the associated diverter (if the stop for that diverter is part of a decision point). The list contains status information for each stop and diverter it lists.

A.	AUTO=0	maintenance mode
B.	AUTO=1	under computer control (normal)
C.	MS=0	motor not running
D.	MS=1	motor running
E.	OVL=0	motor contactor overload not activated (normal)
F.	OVL=l	motor contactor overload activated
G.	OUT=0	the stop or diverter “out” limit switch is not activated
H.	OUT=1	the stop or diverter “out” limit switch is activated
I.	HOME=0	the stop or diverter “home” limit switch is not activated
J.	HOME=1	the stop or diverter “home” limit switch is activated
K.	DZ or SR=0	There is no tote blocking the DZ (divert zone) or SR (stop region) photo eye
L.	DZ or SR=l	There is a tote blocking the DZ or SR photo eye.

The AUTO signal originates at the MAINTENANCE/OFF/AUTO switch near the contactor. The MS signal comes from the AUX contacts and the OVL signal comes from the overload contacts on the contactor for the device motor. When a diverter is “out” its arm is positioned toward the spur path. When “home” its arm is positioned toward the main path. When a stop is in the “out” position, it is in the process of releasing a tote while blocking any tote behind the stop from entering. When “home” the stop is either awaiting a tote to arrive or is holding a tote awaiting the computer to send a release command. The DZ and SR eyes detect if any totes are in the divert zone or stop region.

DPS is rarely used for diagnostic purposes other than to check the operation of DZ and SR photo eyes. CDP is the tool used to diagnose decision point problems.

1.06 JOG, horizontal conveyor JOG

To jog a horizontal conveyor, the operator types JOG followed by the internal device ID on his terminal keyboard. JOG then echoes the unit name, location and current status (offline, overload, stopped or running). Jog prompts the user to enter M to do nothing, R to force a run, S to force a stop or ^Z to exit JOG. M, R and S will also echo back the current status and reprompt. If a conveyor does not start as a result of an S, it means that either there is a malfunction or that the local interlocks are preventing that conveyor from running.

1.07 MOD, change system MODe

MOD may be run by the operator to change the system's mode, If the current mode is offline MOD may be is used to place it online. When the system's mode is online and the state is retired, MOD is used to place it offline. When the system contained a DT03 bus switch, there was a third mode, backup, which was used to place a computer in hot backup mode. When it was discovered that the most unreliable part of the computer system was the DT03 bus switch, the DT03 was removed and the backup mode was eliminated. Now, the system is switched between computers manually.

1.08 MSG, MeSsaGe

Message is used to send the message, the command line argument, to any or all the operator terminals. It is used in place of the RSX-11 BRO command, which was causing problems at the time MSG was implemented. MSG is used in various startup and shutdown command files to inform the operators of changing system status.

1.09 ODT, Online Debugging Tool

ODT is the name of a null task built with ODT (a RSX-11 utility) enabled and linked to the data commons, COMMON and COMON. Using the standard RSX-11 ODT commands, locations in COMMON and COMON may be inspected and modified. This method is used to modify table variables that rarely need to be changed. If we encounter a variable that needs to be changed permanently, we change it via ODT then modify the "cold start" copy of COMMON.TSK or COMON.TSK in [1, l] using the RSX-11 utility ZAP. This approach makes it unnecessary to use ODT to set the variable every time the system is "cold started."

1.10 OSD, Operator Station Disable (Remove operator station from system)

After a "cold start" this command is used to remove the stations which have been deactivated. Usually the hardware for these stations has been removed. OSD zeros out the data common COMMON STNRF record for this station. OSD is generally run from within the "cold start" command file. It must be run after the data common COMMON has been loaded.

1.11 RLS, ReLeaSe tote

RLS is used to delete a TRARF record and mark that tote delivered when the tote number is known. Generally this is done when it is known that a tote is not in the system. Such a situation occurs when overloaded totes are lifted out of the system or when a BL unloader malfunctions and throws a tote (the BL never completes the unload but goes out of service, therefore the tote is never released).

1.12 RLSALL, ReLeaSe ALL delivered totes

The system does not release TRARF records for totes delivered to the spirals at 200 and B75 as it would for totes delivered at any other operator station. Such TRARF records show the totes being in zone 27A (for B75) and 31A (for 200) or OA. The zone becomes OA for totes previously listed in either zone 27A or 31A when another tote is sent from the zone's station out of the order in which they were received. Totes are supposed to be sent from B75 and 200 in order; the first tote in (on the spiral) is supposed to be the first tote to be sent out. If this order is violated, all the other totes that arrived at the spiral will be marked as being in zone OA. This method of accounting for totes accumulated in spiral zones never worked in practice. It would have been better to just release the TRARF record as the totes reached the spiral. RLSALL is run every

morning at wakeup to clean out these TRARF records and mark the totes as delivered. RLSALL also expunges any records for “unknown” tote types (not those for totes whose ID number is unknown).

1.13 STA, change device STAtus

When the operator runs STA, STA prompts for a device or subsystem ID. After the operator enters a valid ID, STA lists the current status and prompts for a change. After the operator enters the target state, STA exits. Every field device may assume one of three states, in service, out of service and down. In service means the device is functional, out of service means the device has been removed from service using the STA command, and down means a failure has caused the system to remove the device from service. STA is used to place any device or subsystem in service from an out of service or down, or used to place any device or subsystem out of service. When horizontal conveyors are placed in service from any state (including in service) the conveyor motor will start, local interlocks permitting, and time out normally.

STA is probably the most used operator command. When devices or entire subsystems are taken out of service then placed back in service using STA, many of the undefined problems that occur are solved, at least temporarily. When used on subsystems, such activity causes conveyors to restart which jars loose any totes caught on timed out conveyors. This process seems to clean up some of the software phase vs state inconsistencies that tend to arise from time to time.

Note that STA does not show the updated status of the device whose status has been changed. The ANOMLY task, which runs at all times while the system is active, continually lists changes of state of all devices. If a device changes state due to a STA command, ANOMLY will list it on the printers controlled by ANOMLY. (All printers controlled by ANOMLY print the same text.) If for any reason a device goes in service from an out of service or down condition, ANOMLY will list the change of state. If that device cannot maintain the in service condition due to some hardware problem, it will drop out of service again and ANOMLY will list that change of state also. ANOMLY usually lists specific reasons why a device changed state thus giving the operator valuable trouble shooting information.

1.14 STR (STaRt), ST0 (STOp), RSM (ReSuMe), HLD (HoLD), and automatic wakeup/retire

The ABCS uses several programs and data structures to facilitate startup and shutdown. The system automatically executes the WAKEUP and RETIRE command files as instructed by the scheduler program which is always active when the mode is on line. There are five records in the COMMON database, startup time, startup delay, shutdown time and shutdown delay, and the current system state, which scheduler uses. The delay times are set at assembly time and may be modified via ODT. Startup and shutdown times are loaded into COMMON every day just after midnight by NEWDAY (also run by the scheduler). NEWDAY gets its data from a disk resident data structure, WORKDY.DAT. Each record in WORKDY.DAT covers one calendar year and is created and filled with default start/stop times at the operators discretion using the SST program. SST also allows modification of the start/stop times for any day of the current year.

At any time other than when the system is actually executing a WAKEUP or RETIRE, the operator may command the system to change states by using the STO or HL,D program to retire the system, if it is active, or STR or RSM if the system is stopped. STO stops the system in the same way as an automatic retire would. HLD immediately stops system activity without waiting for the shutdown delay to expire. A STR is used to start up the system when retired due to automatic retire or STO command execution. RSM is used only after the system has been stopped using a the HLD command.

1.15 STSLIN (STatuS LINe), OOS (Out Of Service), RFL (Runoff FuLl) and TDZ (Totes Delayed in Zone) programs. The STC (STatus line Control) program.

STSLIN is a program that is run at system startup time and aborted at system shutdown time. It displays a single line of inverted video (line 1) on each of the operator terminals. The STC program controls whether or not the status line actually appears on a particular operator terminal. The inverted video line contains the date/time, how many devices are out of service (OOS), how many station runoffs are full (RFL), and how many totes are delayed in zone (TDZ). If there are none, the zero is replaced by “OK”. If STSLIN indicates that OOS is not OK, the operator runs the OOS program to display exactly which devices are out of service. If RFL is not OK, the RFL program will display which runoffs are full. If TDZ is not OK, the TDZ program will show which totes, by tote number, are delayed in what zone.

1.16 SVM, Selective Vertical Monitor

SVM monitors the activity of all the selective verticals. Entering SVM<Return> at the prompt starts the program. It runs, updating the displayed data once a second, for one minute then exits. The table below shows a typical display.

Selective Vertical Monitor

	SVA	SVB	SVC	SVD	SVE
STATE,PHASE	0,6	0,6	0,6	0,6	0,6
VERTICAL CONDITION	SYNC=YES	SYNC=YES	SYNC=YES	SYNC=YES	SYNC=YES
NEXT CAR EXPECTED	22	11	39	2	31
UNDER VOLTAGE	NO	NO	NO	NO	NO
OVER CURRENT	NO	NO	NO	NO	NO
1CR LOOP	NO	NO	NO	NO	NO
TAKE UP LIMIT	OK	OK	OK	OK	OK
MAINTENANCE SWITCH	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL

For auto reset, type A,B,C,D or E. To exit type ^Z

The first column contains the items to monitor; each of the other columns correspond to one of the five selective verticals. The items monitored are:

STATE, PHASE	The routine in SVCTL actually being executed for this selective vertical
VERTICAL CONDITION	SYNC=YES is the normal condition, SYNC=NO and STOPPED are the off-normal conditions. STOPPED means the chain motor is not running; SYNC=NO means the chain motor is running and the system is attempting to synchronize the vertical.
NEXT CAR EXPECTED	Once car one has passed when the vertical is synchronizing and while the vertical is synchronized, this field contains the number of the next car expected to pass the car present photo eye at the top of the vertical.
UNDER VOLTAGE	NO is the normal condition; YES is the off-normal condition. This field shows whether or not the under voltage relay at the top of the vertical has been activated
OVER CURRENT	NO is the normal condition; YES is the off-normal condition. This field shows if the over current detection circuitry has detected that the motor is drawing too much current.
1CR LOOP OPEN	NO is the normal condition; YES is the off-normal condition. This field indicates whether or not the 1CR safety loop is open (activated).
TAKE UP LIMIT	OK is normal condition; EXCEEDED is the off-normal condition. This indicates whether or not the chain guide assembly at the bottom of the vertical has moved more than ±½ inch from center.
MAINTENANCE SWITCH	NORMAL is the normal condition; MAINT. is the off-normal condition. This field shows whether or not maintenance personnel have activated the Maintenance mushroom switch at the top of the vertical. Activating this switch prevents the computer from controlling the chain motor.

1.17 TCR (read TCU-150 time into RSX-11 time) and TCS (set TCU-150 time)

The PDP-1 l/44 does not have a battery operated time of day clock. The TCU-150 is a device made by Digital Pathways that contains a battery operated time of day clock and plugs directly into the DEC Unibus. The TCU- 150 does not come with software and DEC does not provide drivers for it. The ABCS has a user written driver, QCDRV, that allows:

A. the user to set the TCU-150 time and date through the TCS program.
B. the user to set the RSX-11M time using the TCU- 150 time through the TCR program.
C. the system to set the RSX-11M time at boot time using the TCU- 150 time. (STARTUPCMD runs TCR)

Note: The computer system(s) used for the upgraded controls system shall have a battery operated time of day clock and that clock will be automatically set at least once a day by the AOC Synchronized Time Distribution System.

1.18 Tray History Files

A. ACTLOG, Log Tote Delivery to TRHIST.DAT on Disk.
B. LSTTRA, Dump TRHIST.DAT Contents to the Printer.
C. TODSK, Dump TRHIST.DAT, in ASCII Format to a Series of 1 MB files (TRHIST.LST;*).

These programs were written to keep a record of daily tote activity. ACTLOG is the executable that records the data in TRHIST.DAT. There are two listing programs. LSTTRA simply converts each TRHIST.DAT record to ASCII and dumps them all to the line printer. TODSK writes the ASCII conversion of TRHIST.DAT to a series of 1 MB files suitable to copy to diskettes so they may be easily transferred to a PC.

Note. The upgraded controls system is to record these statistics in a database which can be listed on workstation or printer according to tote ID, date the tote was sent, time the tote was sent, date the tote was delivered (if delivered), time the tote was delivered (if delivered) source station (station that sent the tote), destination station (station which has or will receive the tote) and current zone. This database is to be archived to removable media (CD-RW disk, WORM, etc.) on command or when it approaches the maximum size of the removable medium. Once archived, the system software will permit listing of the archived data in the same way it permits listing of the resident data.

1.19 TRAYS, Dump TRARF and TRASF Contents to the Printer

TRAYS simply dumps each record of the TRARF and TRASF modules to the line printer in a readable format. It is a general purpose diagnostic tool used for locating totes and for locating software and hardware problems.

Note: A sufficiently executed system described in 1.18 will cover this item as it is used to locate totes. Otherwise, these programs here in 1.19 are system specific to the PDP-11 and its software and will provide no useful function in the upgraded controls system.

1.20 TRFFIX, Fix TRARF Contamination. SHOTRF, Show TRARF Structure

SHOTRF shows the TRARF header, number of used records and the number of free records. If TRARF becomes contaminated, the sum of the number of free and used records will not be 400. In such a case, the operator may run TRFFIX. TRFFIX reconstructs the contaminated free record thread as well as releasing TRARF records for totes delivered to the spiral zones (see RLSALL). SHOTRF and TRFFIX give the operator a tool to use in place of a “cold start”.

Note: This function in 1.20 is system specific to the PDP-11 and the way it handles tote records.

1.21 TRL, Tote Listing Program

TRL is used to list all totes currently in the system (even those without known tote numbers) on the initiating terminal or any or all the operator printers. Totes are listed in ascending tote number order. Those totes whose numbers are unknown are at the end of the list. Each tote is listed with the following information.

A. FROM ID of the sending station

B.	TO	ID of the destination station
C.	NOW	Zone or vertical carrier where the tote is currently located
D.	TYPE	Type of tote
E.	STATUS	Status of the tote (delivered, unknown, etc.)
F.	REM	The destination's remote station, if any
G.	PURGE	Whether or not the tote is being purged

Note: A listing program that works in conjunction with that described in section 1.18 and can provided a sorted list of totes according to time, date and all the items from A to G above on any selected printer or workstation will be sufficient to provide this function described above in 1.21 for the updated controls system.

1.22 XIO, eXercise I/O

XIO allows the operator to inspect any Directrol input or output module bit or byte and, if it is on a Directrol output module, change the bit or byte. If the module is used for communications with stations or code plate readers, the values are handled as bytes; otherwise they are handled as bits. This program is frequently the only tool that is effective in locating defective Directrol I/O modules.

1.23 ZRO, Zero Cumulative Statistics

The system maintains a yearly cumulative statistics file, CUMFIL.DAT in [7,100]. That records operator station statistics (such as the number of totes delivered, etc.) each day. This program zeros all the statistics in the file. It must be run on January 1st every year.

END OF APPENDIX 3

APPENDIX 4: MOTOR & CONTACTOR TABLE

LEGEND:

Device ID	The identification number used in the PDP-11 computer
Name	The identification used on the drawings
Site	The general location for the motor and starter
Brake	A check mark indicates that the motor is equipped with a brake
Con	Type of contactor (CH - Cutler Hammer, AB = Allen Bradley)
HP	Motor horsepower

The remaining columns are headed with a voltage. This is the voltage of the motor at the current in that column, if any.

NOTES:

This table started life to document the existing motors and contactors in the Adams and Jefferson buildings with thoughts toward changing the Adams and Jefferson building 3-phase voltages from 208 V to 480 V as in the Madison building. This will not be done as part of the Controls System Upgrade but the table has been left in the RFP for informational purposes. The motor table now contains entries for the Madison building motors and contactors but contains little data describing them. This table is not recent therefore it is not accurate. As motors and contactors fail, they may not be replaced with identical items. This is especially true of contactors.

Device ID	Name	Site	Brake	Con	HP	115V	208V	220V	230V	240V	440V	460V	480V
1,001L	BL3	JMB Mail Room	✔	CH									
1,001U	BL3	JMB Mail Room	✔	CH									
1,046L	BL2	JMB 2nd floor @B25	✔	CH									
1,046U	BL2	JMB 2nd floor @B25	✔	CH									
1,047L	BL1	JMB sub-basement @B75	✔	CH									
1,079L	BL4	JMB 6th floor @ D65	✔	CH									
1,079U	BL4	JMB 6th floor @ D65	✔	CH									
1,113L	BL5	TJB gnd fl octagon @ 200	✔	CH	0.75		3.80						
10,001	BL6	TJB cellar to ground floors	✔	CH	0.75		3.60						
10,002	BL6	TJB ground to cellar floors	✔	CH	0.75				3.00			1.50	
10,003	P132A	Adams Cellar	✔	CH	0.25		1.20			1.20			0.60
10,004	P133A	Adams Cellar	✔	CH	0.25		1.20			1.20			0.60
2,001	SV-A	JMB NW Steeple	✔	TM									
2,002	SV-B	JMB NE Steeple	✔	TM									
2,003	SV-C	JMB SE Steeple	✔	TM									
2,004	SV-D	JMB SW Steeple	✔	TM									
2,005	SV-E	JAB N Steeple in Reading Rm	✔	TM	5.00		16.0						
2,006	SV-F	JAB S Steeple in Reading Rm	✔		1.50		5.60		5.60			2.80	3.00
3,001	P1	JMB Mail Room		CH									
3,002	P2	JMB Mail Room		AB									
3,003	P4	JMB Mail Room		CH									
3,004	P5	JMB west loop		CH									
3,005	P5A	JMB west loop		CH									
3,006	P6	JMB west loop		CH									
3,007	P7	JMB @ SV-D		CH									
3,008	P8	JMB @ SV-D		CH									
3,009	P11	JMB @ SV-D		CH									
3,010	P12	JMB @ SV-D		CH									
3,011	P13	JMB @ SV-D		CH									
3,012	P14	JMB west loop		CH									

Device ID	Name	Site	Brake	Con	HP	115V	208V	220V	230V	240V	440V	460V	480V
3,013	P15	JMB west loop		AB									
3,014	P16	JMB west loop		CH									
3,015	P17	JMB @ SV-A		CH									
3,016	P18	JMB @ SV-A		CH									
3,017	P19	JMB @ SV-A		CH									
3,018	P22	JMB @ SV-A		CH									
3,019	P23	JMB @ SV-A		CH									
3,020	P25	JMB @ SV-A		CH									
3,021	P26	JMB west loop		CH									
3,022	P27	JMB west loop		CH									
3,023	P28	JMB west loop		CH									
3,024	P30	JMB west loop		CH									
3,025	P31	JMB east loop		CH									
3,026	P32	JMB east loop		CH									
3,027	P33	JMB east loop		CH									
3,028	P34	JMB east loop		CH									
3,029	P35	JMB east loop		AB									
3,030	P36	JMB east loop		CH									
3,031	P36A	JMB @ SV-B		CH									
3,032	P37	JMB @ SV-B		CH									
3,033	P38	JMB @ SV-B		CH									
3,034	P41	JMB @ SV-B		CH									
3,035	P42	JMB @ SV-B		CH									
3,036	P43	JMB @ SV-B		CH									
3,037	P44	JMB east loop		CH									
3,038	P45	JMB east loop		AB									
3,039	P46	JMB east loop		CH									
3,040	P47	JMB east loop		AB									
3,041	P48	JMB @ SV-C		CH									
3,042	P49	JMB @ SV-C		CH									

Device ID	Name	Site	Brake	Con	HP	115V	208V	220V	230V	240V	440V	460V	480V
3,043	P50	JMB @ SV-C		CH									
3,044	P53	JMB @ SV-C		CH									
3,045	P54	JMB @ SV-C		CH									
3,046	P55	JMB east loop		CH									
3,047	P56	JMB east loop		AB									
3,048	P58	JMB east loop		CH									
3,049	P58A	JMB west loop		CH									
3,050	P60	JMB Mail Room		CH									
3,051	P61	JMB Mail Room		CH									
3,052	P62	JMB Mail Room		CH									
3,053	P65	Ind.Tunnel		CH									
3,054	P67	Ind.Tunnel		AB									
3,055	P69	Ind.Tunnel		CH									
3,056	P69A	Ind.Tunnel		CH									
3,057	P72	Ind.Tunnel		AB									
3,058	P73	Ind.Tunnel		AB									
3,059	P75	TJB Ind. Tunnel		AB	1.00		3.60			3.60			1.70
3,060	P76	TJB Ind. Tunnel		CH	0.50		2.20			2.20			1.10
3,061	P79	Ind.Tunnel		CH									
3,062	P81	TJB Main Loop		CH	0.50		2.20			2.20			1.10
3,063	P82	TJB Main Loop		CH	0.50		2.20			2.20			1.10
3,064	P83	TJB Main Loop		CH	0.50		2.20			2.20			1.10
3,065	P85	TJB toward BL6		CH									
3,066	P86	TJB toward BL6		CH	0.50		2.20			2.20			1.10
3,067	P88	TJB toward BL6		CH	0.50		2.20			2.20			1.10
3,068	P90	TJB toward BL6		CH	0.50		2.20			2.20			1.10
3,069	P91	TJB toward BL6		AB	0.50		2.20			2.20			1.10
3,070	P92	TJB @ 200		CH	0.50		2.20			2.20			1.10
3,071	P93	TJB @ 200		CH	0.50		2.20			2.20			1.10
3,072	P94	TJB @ 200		CH	0.50		2.20			2.20			1.10

Device ID	Name	Site	Brake	Con	HP	115V	208V	220V	230V	240V	440V	460V	480V
3,073	P95	TJB @ 200		CH	1.00		2.20			2.20			1.10
3,074	P97	TJB @ 200		CH	0.50		2.20			2.20			1.10
3,075	P98	TJB @ 200		CH	0.50		2.20			2.20			1.10
3,076	P99	TJB @ 200		CH	0.50		2.20			2.20			1.10
3,077	P101	TJB @ 200		AB	0.50		2.30	2.30			1.50		
3,078	P102	TJB toward BL6		CH	0.50		2.20			2.20			1.10
3,079	P103	TJB toward BL6		CH	0.50		2.20			2.20			1.10
3,080	P104	TJB from BL6		CH	0.50		2.20			2.20			1.10
3,081	P105	TJB from BL6		AB	0.50		2.20			2.20			1.10
3,082	P106	TJB from BL6		CH	0.50		2.20			2.20			1.10
3,083	P107	TJB from BL6		CH	0.50		2.20			2.20			1.10
3,084	P109	TJB Main Loop		CH	0.50		2.20			2.20			1.10
3,085	P110	TJB Main Loop		CH	0.50		3.80						1.80
3,086	P112	TJB Freight Elev.		CH	0.50		2.20			2.20			1.10
3,087	P114	TJB 2nd St. Tunnel		CH	0.50		2.20			2.20			1.10
3,088	P115	TJB 2nd St. Tunnel		CH	0.50		2.20			2.20			1.10
3,089	P116	TJB 2nd St. Tunnel		AB	1.00		3.60			3.60			1.70
3,090	P118	Adams Cellar		CH	0.50		2.20			2.20			1.10
3,091	P120	Adams Cellar		CH	0.50		2.20			2.20			1.10
3,092	P121	Adams Cellar		CH	0.50		2.20			2.20			1.10
3,093	P122	Adams Cellar		CH	0.50		2.20			2.20			1.10
3,094	P123	Adams Cellar		CH	0.50		2.20			2.20			1.10
3,095	P124	Adams Cellar		CH	0.50		2.20			2.20			1.10
3,096	P125	Adams Cellar		CH	0.50		2.20			2.20			1.10
3,097	P126	Adams Cellar		CH	0.50		2.20			2.20			1.10
3,098	P127	Adams Cellar		CH	0.50		2.20			2.20			1.10
3,099	P127A	Adams Cellar		AB	0.50		2.30	2.30			1.15		
3,100	P128	Adams Cellar		AB	0.50		2.20			2.20			1.10
3,101	P129	Adams Cellar		CH	0.50		2.20			2.20			1.10
3,102	P130	Adams Cellar		CH	0.50		2.20			2.20			1.10

Device ID	Name	Site	Brake	Con	HP	115V	208V	220V	230V	240V	440V	460V	480V
3,103	P131	Adams Cellar		CH	0.50		2.20			2.20			1.10
3,106	P134	Adams Cellar		CH	0.50		2.20			2.20			1.10
3,107	P135	Adams Cellar		CH	0.50		2.30	2.30			1.15		
3,108	P136	Adams Cellar		CH	0.50		2.20			2.20			1.10
3,109	P136A	Adams Cellar		CH	0.50		2.20			2.20			1.10
3,110	P138	Adams Cellar		CH	0.50		2.20			2.20			1.10
3,111	P140	Adams Cellar		CH	0.50		2.20			2.20			1.10
3,112	P142	TJB 2nd St. Tunnel		CH	1.00		3.80			3.80			1.80
3,113	P143	TJB 2nd St. Tunnel		CH	1.00		4.00		3.60			1.80	
3,114	P144	TJB 2nd St. Tunnel		CH	0.50		2.20			2.20			1.10
3,115	P146	TJB Freight Elev.		CH	0.50		2.20			2.20			1.10
3,116	P147	TJB Main Loop		CH	0.50		2.20			2.20			1.10
3,117	P149	TJB Main Loop		CH	0.50		2.20			2.20			1.10
3,118	P150	TJB Main Loop		CH	0.50		2.20			2.20			1.10
3,119	P151	TJB Main Loop		AB	0.50		2.20			2.20			1.10
3,120	P152	TJB Main Loop		CH	0.50		2.20			2.20			1.10
3,121	P153	TJB Main Loop		CH	0.50		2.20			2.20			1.10
3,122	P157	TJB Ind. Tunnel		CH	0.50		2.20			2.20			1.10
3,123	P158	TJB Ind. Tunnel		AB	1.00		3.60			3.60			1.70
3,124	P160	Ind. Tunnel		CH									
3,125	P161	Ind. Tunnel		CH									
3,126	P169	Ind. Tunnel		AB									
3,127	P169A	Ind. Tunnel		CH									
3,128	P171	Ind. Tunnel		CH									
3,129	P173	Ind. Tunnel		CH									
3,130	P175	JMB sub-basement		CH									
3,131	P175A	JMB sub-basement		CH									
3,132	P176	JMB sub-basement		CH									
3,133	P177	JMB sub-basement		CH									
3,135	P179	JMB sub-basement		CH									

Device ID	Name	Site	Brake	Con	HP	115V	208V	220V	230V	240V	440V	460V	480V
3,136	P181	JMB sub-basement		CH									
3,137	P182	JMB sub-basement		CH									
3,138	P182A	JMB sub-basement		CH									
3,139	P183	JMB sub-basement		CH									
3,140	P186	JMB @ B25		CH									
3,141	P187	JMB @ B25		AB									
3,142	P188	JMB @ B25		CH									
3,143	P190	JMB @ D65		CH									
3,144	P192	JMB @ D65		CH									
3,145	P193	JMB @ D65		CH									
3,146	P196	JMB @ D65		CH									
3,147	P198	JMB @ D65		CH									
4,002	S2	JMB west loop	✔	CH									
4,005	S5	JMB west loop	✔	CH									
4,008	S8	JMB east loop	✔	CH									
4,009	S9	Ind. Tunnel	✔	CH									
4,010	S10	JMB east loop	✔	CH									
4,013	S13	JMB east loop	✔	CH									
4,016	S16	JMB west loop	✔	CH									
4,019	S19	TJB Main Loop	✔	AB	0.25	0.43							
4,020	S20	TJB Main Loop	✔	CH	0.25		1.20			1.20			0.60
4,021	S21	TJB Main Loop	✔	CH	0.25		1.20			1.20			0.60
4,022	S22	Adams Cellar	✔	AB	0.25		1.20			1.20			0.60
4,025	S25	Adams Cellar	✔	CH	0.25		1.20			1.20			0.60
4,026	S26	Adams Cellar	✔	CH	0.25		1.20			1.20			0.60
4,028	S28	Adams Cellar	✔	CH	0.25		1.20			1.20			0.60
4,029	S29	Adams Cellar	✔	CH	0.25		1.20			1.20			0.60
4,030	S30	Adams Cellar	✔	CH	0.25		1.20			1.20			0.60
4,031	S31	TJB Main Loop	✔	CH	0.25		1.20			1.20			0.60
4,032	S32	TJB Main Loop	✔	CH	0.25		1.20			1.20			0.60

Device ID	Name	Site	Brake	Con	HP	115V	208V	220V	230V	240V	440V	460V	480V
4,033	S33	TJB Main Loop	✔	CH	0.25		1.20			1.20			0.60
	D1	JMB west loop	✔	CH									
	D2	JMB west loop	✔	CH									
	D3	JMB east loop	✔	CH									
	D4	JMB east loop	✔	CH									
	D5	JMB east loop	✔	CH									
	D7	TJB Main Loop	✔	CH	0.25		1.20			1.20			0.60
	D8	TJB Main Loop	✔	CH	0.25		1.20			1.20			0.60
	D9	Adams Cellar	✔	AB	0.25		1.20			1.20			0.60
	D10	Adams Cellar	✔	CH	0.25		1.20			1.20			0.60
	D11	Adams Cellar	✔	CH	0.25		1.20			1.20			0.60
	D12	TJB Main Loop	✔	CH	0.25		1.20			1.20			0.60

END OF APPENDIX 4

APPENDIX 5: CONVEYOR BELT LISTING

A5.1 Note

The table lists the types of belting used for the Jefferson, Adams, and Madison buildings horizontal conveyors. It is not a recent table. Due to wear, some belting has been replaced since and may not be of the type listed here.

A5.2 Legend

Device ID:	The horizontal conveyor computer identification number
Name:	The horizontal conveyor drawing identification number
Site	The general location for the horizontal conveyor motor starter
JMB:	Madison building
JAB:	Adams building
TJB:	Jefferson building
Codes	Code identifying the type of belting used on the named horizontal conveyor. The codes and descriptions are listed below.

2	canvas rubber
3	rubber
4	slatted turn
5	old belt
5Y	old yellow belt
AB	ribbed belt

A5.3 Table

Device ID	Name	Site	Belt type	Code
3,001	P1	JMB mail room	Slatted turn	4
3,002	P2	JMB mail room	Old belt	5
3,003	P4	JMB mail room	Slatted turn	4
3,004	P5	JMB west loop	Canvas rubber	2
3,005	P5A	JMB west loop	Old belt	5
3,006	P6	JMB west loop	Slatted turn	4
3,007	P7	JMB @ SV-D	Old belt	5
3,008	P8	JMB @ SV-D	Slatted turn	4
3,009	P11	JMB @ SV-D	Slatted turn	4
3,010	P12	JMB @ SV-D	Old belt	5
3,011	P13	JMB @ SV-D	Slatted turn	4
3,012	P14	JMB west loop	Canvas rubber	2
3,013	P15	JMB west loop	Canvas rubber	2
3,014	P16	JMB west loop	Old belt	5
3,015	P17	JMB @ SV-A	Slatted turn	4
3,016	P18	JMB @ SV-D	Old belt	5
3,017	P19	JMB @ SV-D	Slatted turn	4

Device ID	Name	Site	Belt type	Code
3,018	P22	JMB @ SV-D	Slatted turn	4
3,019	P23	JMB @ SV-D	Old belt	5
3,020	P25	JMB @ SV-D	Canvas rubber	2
3,021	P26	JMB west loop	Old belt	5
3,022	P27	JMB west loop	Old yellow belt	5Y
3,023	P28	JMB west loop	Old yellow belt	5Y
3,024	P30	JMB west loop	Rubber	3
3,025	P31	JMB east loop	Canvas rubber	2
3,026	P32	JMB east loop	Old belt	5
3,027	P33	JMB east loop	Slatted turn	4
3,028	P34	JMB east loop	Old belt	5
3,029	P35	JMB east loop	Canvas rubber	2
3,030	P36	JMB east loop	Old belt	5
3,031	P36A	JMB @ SV-B	Slatted turn	4
3,032	P37	JMB @ SV-B	Old belt	5
3,033	P38	JMB @ SV-B	Slatted turn	4
3,034	P41	JMB @ SV-B	Canvas rubber	2
3,035	P42	JMB @ SV-B	Old belt	5
3,036	P43	JMB @ SV-B	Slatted turn	4
3,037	P44	JMB east loop	Old yellow belt	5Y
3,038	P45	JMB east loop	Canvas rubber	2
3,039	P46	JMB east loop	Rubber	3
3,040	P47	JMB east loop	Old yellow belt	5Y
3,041	P48	JMB @ SV-C	Slatted turn	4
3,042	P49	JMB @ SV-C	Old belt	5
3,043	P50	JMB @ SV-C	Slatted turn	4
3,044	P53	JMB @ SV-C	Slatted turn	4
3,045	P54	JMB @ SV-C	Old belt	5
3,046	P55	JMB east loop	Slatted turn	4
3,047	P56	JMB east loop	Rubber	3
3,048	P58	JMB east loop	Canvas rubber	2
3,049	P58A	JMB west loop	Old yellow belt	5Y
3,050	P60	JMB mail room	Old belt	5
3,051	P61	JMB mail room	Old belt	5
3,052	P62	JMB mail room	Slatted turn	4
3,053	P65	Ind. Tunnel	Canvas rubber	2
3,054	P67	Ind. Tunnel	Old yellow belt	5Y
3,055	P69	Ind. Tunnel	Ribbed belt	AB
3,056	P69A	Ind. Tunnel	Old yellow belt	5Y

Device ID	Name	Site	Belt type	Code
3,057	P72	Ind. Tunnel	Canvas rubber	2
3,058	P73	Ind. Tunnel	Canvas rubber	2
3,059	P75	TJB Ind. Tunnel	Rubber	3
3,060	P76	TJB Ind. Tunnel	Rubber	3
3,061	P79	Ind. Tunnel	Slatted turn	4
3,062	P81	TJB Main Loop	Slatted turn	4
3,063	P82	TJB Main Loop	Rubber	3
3,064	P83	TJB Main Loop	Slatted turn	4
3,065	P85	TJB, toward BL6	Slatted turn	4
3,066	P86	TJB, toward BL6	Old belt	5
3,067	P88	TJB, toward BL6	Canvas rubber	2
3,068	P90	TJB, toward BL6	Canvas rubber	2
3,069	P91	TJB, toward BL6	Old yellow belt	5Y
3,070	P92	TJB @ 200	Old yellow belt	5Y
3,071	P93	TJB @ 200	Slatted turn	4
3,072	P94	TJB @ 200	Old belt	5
3,073	P95A	TJB @ 200	Old belt	5
3,074	P97	TJB @ 200	Old belt	5
3,075	P98	TJB @ 200	Slatted turn	4
3,076	P99	TJB @ 200	Old belt	5
3,077	P101	TJB @ 200	Old yellow belt	5Y
3,078	P102	TJB, toward BL6	Old yellow belt	5Y
3,079	P103	TJB, toward BL6	Old belt	5
3,080	P104	TJB, from BL6	Canvas rubber	2
3,081	P105	TJB, from BL6	Slatted turn	4
3,082	P106	TJB, from BL6	Old belt	5
3,083	P107	TJB, from BL6	Slatted turn	4
3,084	P109	TJB Main Loop	Slatted turn	4
3,085	P110	TJB Main Loop	Rubber	3
3,086	P112	TJB Freight Elev.	Old yellow belt	5Y
3,087	P114	TJB 2nd St Tunnel	Old yellow belt	5Y
3,088	P115	TJB 2nd St Tunnel	Old yellow belt	5Y
3,089	P116	TJB 2nd St Tunnel	Old belt	5
3,090	P118	Adams Cellar	Old yellow belt	5Y
3,091	P120	Adams Cellar	Old yellow belt	5Y
3,092	P121	Adams Cellar	Slatted turn	4
3,093	P122	Adams Cellar	Canvas rubber	2
3,094	P123	Adams Cellar	Slatted turn	4
3,095	P124	Adams Cellar	Slatted turn	4

Device ID	Name	Site	Belt type	Code
3,096	P125	Adams Cellar	Old yellow belt	5Y
3,097	P126	Adams Cellar	Slatted turn	4
3,098	P127	Adams Cellar	Slatted turn	4
3,099	P127A	Adams Cellar	Old yellow belt	5Y
3,100	P128	Adams Cellar	Canvas rubber	2
3,101	P129	Adams Cellar	Slatted turn	4
3,102	P130	Adams Cellar	Old yellow belt	5Y
3,103	P131	Adams Cellar	Slatted turn	4
3,106	P134	Adams Cellar	Slatted turn	4
3,107	P135	Adams Cellar	Slatted turn	4
3,108	P136	Adams Cellar	Slatted turn	4
3,109	P136A	Adams Cellar	Canvas rubber	2
3,110	P138	Adams Cellar	Old yellow belt	5Y
3,111	P140	Adams Cellar	Old yellow belt	5Y
3,112	P142	TJB 2nd St Tunnel	Old belt	5
3,113	P143	TJB 2nd St Tunnel	Old belt	5
3,114	P144	TJB 2nd St Tunnel	Canvas rubber	2
3,115	P146	TJB Freight Elev.	Old yellow belt	5Y
3,116	P147	TJB Main Loop	Slatted turn	4
3,117	P149	TJB Main Loop	Old yellow belt	5Y
3,118	P150	TJB Main Loop	Slatted turn	4
3,119	P151	TJB Main Loop	Canvas rubber	2
3,120	P152	TJB Main Loop	Slatted turn	4
3,121	P153	TJB Main Loop	Old belt	5
3,122	P157	TJB Ind. Tunnel	Rubber	3
3,123	P158	TJB Ind. Tunnel	Rubber	3
3,124	P160	Ind. Tunnel	Rubber	3
3,125	P161	Ind. Tunnel	Rubber	3
3,126	P169	Ind. Tunnel	Old yellow belt	5Y
3,127	P169A	Ind. Tunnel	Ribbed belt	AB
3,128	P171	Ind. Tunnel	Canvas rubber	2
3,129	P173	Ind. Tunnel	Old belt	5
3,130	P175	JMB sub-basement	Canvas rubber	2
3,131	P175A	JMB sub-basement	Canvas rubber	2
3,132	P176	JMB sub-basement	Old belt	5
3,133	P177	JMB sub-basement	Slatted turn	4
3,135	P179	JMB sub-basement	Canvas rubber	2
3,136	P181	JMB sub-basement	Canvas rubber	2
3,137	P182	JMB sub-basement	Canvas rubber	2

Device ID	Name	Site	Belt type	Code
3,138	P182A	JMB sub-basement	Old belt	5
3,139	P183	JMB sub-basement	Slatted turn	4
3,140	P186	JMB @ B25	Old belt	5
3,141	P187	JMB @ B25	Old belt	5
3,142	P188	JMB @ B25	Slatted turn	4
3,143	P190	JMB @ D65	Old belt	5
3,144	P192	JMB @ D65	Old belt	5
3,145	P193	JMB @ D65	Slatted turn	4
3,146	P196	JMB @ D65	Old belt & Slatted turn	5&4
	P195		Slatted turn	4
	P196		Rubber	3
	P197		Slatted turn	4
3,147	P198	JMB @ D65	Old belt	5

END OF APPENDIX 5

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APPENDIX 6: SAMPLES OF VARIOUS PASS APPLICATIONS

Contents:

-Architect of the Capitol - Sample I.D. Request Form
-Architect of the Capitol - Sample Permit for Welding, Cutting, Burning, Painting and Drilling ("Burn" Permit)
-Library of Congress - Occasional Access Deck Pass
-Library of Congress, Police Office - Office Machine Record

BILL LIVINGOOD
SERGEANT AT ARMS

JIM VAREY
DEPUTY SERGEANT AT ARMS

Office of the Sergeant at Arms
U.S. House of Representatives
Washington, DC 20515-6634

Badge #:_____
Fmt #: AOC_

ARCHITECT OF THE CAPITOL I.D. REQUEST - 105TH CONGRESS

Please type or print clearly:

☐ Social Security Number *OR* ☐ Passport Number: _____
(Foreign citizens only)

Legal Name _____
Last Name First Name Middle Initial

This section to be completed for Architect's Staff:	*This section to be completed for contract employees:*
Office Name: _____	Sponsoring Dept.: _____
Dept./Division: _____	Contractor Name: _____
Office Phone: _____ Fax: _____	Contractor Phone: _____ Fax: _____

Starting Date: _____ (Month/Day/Year) Expiration Date: _____ (Month/Day/Year)

Employee Status: ☐ Permanent ☐ Temporary Payroll Status: ☐ Paid ☐ Unpaid

Access: ☐ Yes
Card#_____

Employee Type: ☐ Staff ☐ Contractor Hours of Access: ☐ 24 Hours ☐ Business Hours
7 days/week

The signatures below certify that this information is correct and accurate. The office listed is responsible for the proper and timely return of this I.D. card upon expiration and/or termination of employment. I.D. card must be returned to: I.D. Services, 321 Cannon HOB.

_____
Signature of authorized HRMD personnel

_____
Name/Signature of Project Manager
(required for contract employees)

_____
Name/Signature of Office Contact Person

All entries must be completed and signatures present before this application will be processed.

I understand that this Congressional I.D. card is the property of the U.S. House of Representatives and that it is an integral instrument of Congressional security. I cannot authorize another to use, wear, or possess my issued I.D. card. I further acknowledge that I am responsible for the preservation and correct use of the I.D. issued in my name. I understand that I AM REQUIRED to surrender my I.D. card immediately upon expiration and/or termination of employment. By signing this form, I acknowledge that I have read and understood this statement, and that I will comply with it.

_____
Signature of Card Holder

_____
(Signature upon receipt of badge)

This completed form must be received by I.D. Services a minimum of ONE business day prior to the individual reporting for a photo. Proper photo identification must be presented before an I.D. card will be issued.

SAA 4/97 AoCIDRq.wpg

Sample

Sample I.D. Request

ARCHITECT OF THE CAPITOL
LIBRARY OF CONGRESS BUILDINGS

PERMIT
FOR WELDING, CUTTING, BURNING, PAINTING AND DRILLING

BUILDING | WING | FLOOR | DATE OF WORK

LOCATION ON FLOOR | EXPECTED STARTING TIME A.M. _____ P.M.

NATURE OF WORK | EXPECTED FINISH TIME A.M. _____ P.M.

NAME(S) OF OPERATOR(S) OF EQUIPMENT

SUPERVISOR IN CHARGE | TITLE

PREWORK INSPECTION OF SITE MADE BY

PERMIT ISSUED BY | TITLE | DATE ISSUED

The issuance of this permit will in no way relieve any Contractor of his responsibility to exercise prudent care or his responsibility for all damage to persons or property resulting from his negligence in connection with the prosecution of the work.

THIS PERMIT VALID ONLY FOR THE AREA AND WORK GIVEN ABOVE AND ONLY ON THE DATE ISSUED

COPIES TO: A.O.C. OFFICE LM G49
L.O.C. SAFETY OFFICE LM B28
L.O.C. POLICE
JOB SIGHT

Sample

Sample "Burn" Permit

LIBRARY OF CONGRESS
OCCASIONAL ACCESS
DECK PASS

DECK WORK AREA

SERVICE UNIT: _____

NUMBER: _____ DATE ISSUED: _____

AUTHORIZATION: _____

71-71a (rev 1/93)

Sample

Sample Occasional Access Deck Pass

Library of Congress - Police Office

581 (1992/04) **OFFICE MACHINE RECORD**

This Office Machine Record will expire on _____ The machine must be re-registered at the Police Office at LM G01 or LJ G-26 before the above date

Make	Machine Type	Serial Number

Owner & Soc. Sec. Number	Address
Phone Home _____ Work _____	

Checked In By	Building Entered	Date & Time Entered

Checked Out By	Date & Time Out

Sample

Sample Office Machine Record

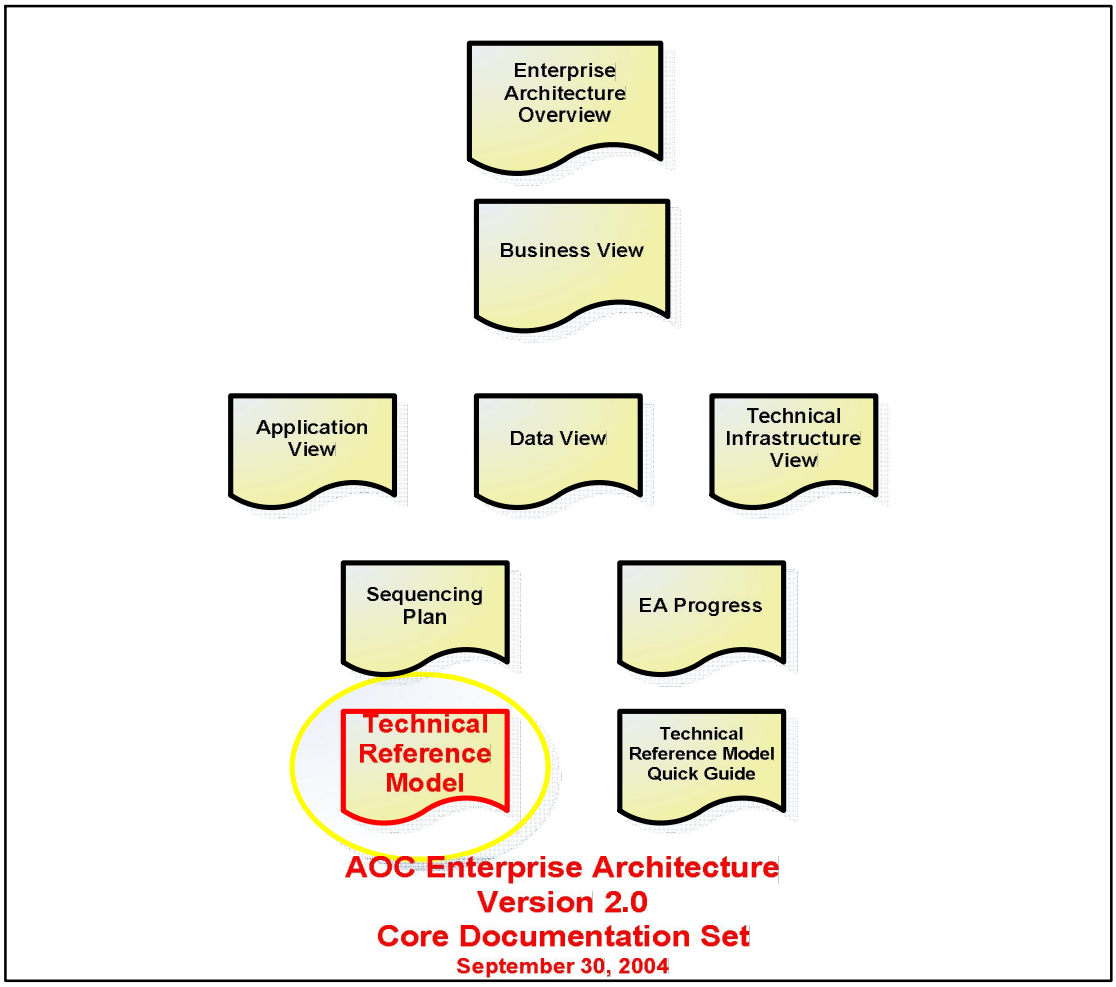
END OF APPENDIX 6

September 30, 2004

Office of Information Resources Management (OIRM)
Business Systems Modernization Office (BSMO)

Subject: AOC Enterprise Architecture **Technical Reference Model**

Brief Description: This document describes the AOC Technical Reference Model (TRM), which identifies a comprehensive set of information technology (IT) standards, services, and protocols for specifying generic components of an information system.



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TRM Executive Summary

This document describes the AOC Technical Reference Model (TRM), which identifies a comprehensive set of information technology (IT) standards, services, and protocols for specifying generic components of an information system. The TRM will allow designers, developers, and users to agree on definitions of these components, have a common understanding of the services to be provided by these components, and identify and resolve issues affecting interoperability, scalability, portability, and reliability.

The AOC is transitioning its IT base to an architecture based on open system environment concepts. The principal elements of the TRM are the services and interfaces that are used to drive hardware and software selections for individual information systems. This TRM will support this transition by allowing OIRM to:

- Respond quickly to changing business requirements by leveraging a managed IT infrastructure
- Promote vendor independence, where practical, through the use of standards-based products and interchangeable components
- Improve interoperability across AOC applications and mission areas through common infrastructure components and services
- Reduce life cycle hardware and software maintenance costs
- Reduce IT personnel training costs
- Improve information security mechanisms and comply with security requirements
- Improve user productivity and accessibility through consistent user interfaces, integrated applications, and data sharing

The premise for adopting standards is to enable innovation of technology within an environment that is well understood and defined. The enterprise standards support the technology vision and principles of the AOC Strategic Information Technology Plan and the direction in the AOC Enterprise Systems Architecture. Standards promote migration to enterprise solutions with reduced complexity and support.

Standards are necessary to promote transparent communications across the many systems operating in the AOC. Standards are important in providing the rules via which information technology products interact with each other. They are essential to ensuring that systems can communicate, which is essential in an evolving network-centric strategy. Standards such as network protocols and interfaces between applications allow systems on a variety of hardware, and even operating system platforms, to share information and even data.

The establishment and governance of enterprise standards requires a constant balancing between too much control and not enough control. Standards are both beneficial and detrimental, depending on the perspective of the user. The standards must provide the right amount of flexibility so that the AOC's business is not constrained.

While the AOC Technical Reference Model can be read in its entirety, most stakeholders can view it as a reference document, and need only consult those sections that deal with technologies and standards that specifically address their associated systems and IT development efforts.

1. Introduction

This document describes the AOC Technical Reference Model (TRM), which identifies a comprehensive set of information technology (IT) standards, services, and protocols for specifying generic components of an information system. The TRM will allow designers, developers, and users to agree on definitions of these components, have a common understanding of the services to be provided by these components, and identify and resolve issues affecting interoperability, scalability, portability, and reliability.

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1.1 Motivation

The premise for adopting standards is to enable innovation of technology within an environment that is well understood and defined. The enterprise standards support the technology vision and principles of the AOC Strategic Information Technology Plan and the direction in the AOC Enterprise Systems Architecture. Standards promote migration to enterprise solutions with reduced complexity and support. The establishment and governance of enterprise standards requires a constant balancing between too much control and not enough control. Standards are both beneficial and detrimental, depending on the perspective of the user. The standards must provide the right amount of flexibility so that the AOC's business is not constrained.

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With the AOC Standards established, the transition from the current environment to the revised environment will need to be planned and budgeted. The transition to the enterprise standards will be conducted over a period of time; the intention of establishing standards is not to enforce compliance on the day that the standards are published. The planned and budgeted transition will

take into account the current environment and the priorities and business directions for the AOC to move toward the established standards, recognizing the cost of compliance. Transition assistance and interpretation to jurisdictions, divisions and offices will be provided through the Business System Modernization Office (BMSO).

1.2 Definition

Standards are rules that define the ways in which a product performs. They provide a basis for reuse, inter-networking, cooperation, and portability. Standards are specified by a large number of formal and informal organizations. This can lead to problems with competing standards for the same technology area. This is especially true in emerging technologies. Vendor alliances are formed with the hope of setting a de facto, if not actual, standard in the hope of closing the market to competing vendors. Some standards are never formalized but become de facto standards due to market dominance of a particular product or service.

Standards allow different products from different vendors to interact. This level of interaction may vary from an interface between products to true product integration. The level of specificity of standards varies greatly from standard to standard. Some standards will have very detailed technical specifications while others will be much broader and more general. A standard can be a specification or a specific product used for comparison, either formally or informally, by which the validity of others can be determined.

The two types of standards are *de jure* (according to law) and *de facto* (as a matter of fact).

- *De jure* standards are generally known as public or industry standards, established by public bodies. These standards are endorsed and disseminated by official standards organizations.
- *De facto* standards are generally created by a single vendor with market dominance or a highly specialized niche product. They may be widely used and implemented, but controlled by a single vendor or group.

Support costs are a very significant portion of the cost of ownership in information technology. Standards can provide the needed level of flexibility while, at the same time, providing for reduced support costs and economies of scale. Standards are essential in ensuring that systems can communicate. Standards such as network protocols and interfaces between applications allow systems on a variety of hardware and even operating systems platforms to share information.

1.3 Revision

These enterprise standards will be reviewed and updated at least annually. It is critical the enterprise standards be maintained in order to accommodate existing technologies as well as emerging ones. The technology in many areas, such as desktop computing, is evolving rapidly and the standards in these areas will need to be updated frequently as the technology changes. The standards in other areas, such as network protocols, may change more slowly but need to be reviewed and evaluated regularly. There are policies and procedures being developed to support the process of review and updating the standards.

2. Scope

The Technical Reference Model applies to all Information Systems (IS), except as those designated by the AOC Centralized Oversight of Information Technology (AOC Order 8-1-1).

2.1 Background

The AOC began a modernization effort in FY2003. As part of this modernization effort, the AOC is developing Enterprise Architecture. Following the U.S. Government's Federal Enterprise Architecture Framework (FEAF), the AOC has developed a Technical Reference Model (TRM) that establishes the standards and specifications for architectural infrastructure components of the Enterprise Architecture.

2.2 Guidance

The AOC is not in the business of developing and maintaining business applications software. Other companies and organizations are, and can do it better and less expensively than custom-writing software to fit our business model.

The AOC will utilize packaged, vendor-supplied software with minimal modifications and customizations whenever possible. The AOC will evaluate its business processes based on changing technology.

The AOC will develop software using our own or contracted resources only in areas that are truly unique and cannot be met through the commercial or governmental marketplace, or where it will be prohibitively expensive to do so.

The AOC strategy will be to stay relatively current on vendor-supplied releases and updates.

2.3 Applicability

Systems Development Managers will adhere to approved standards and products unless deviation can be shown to be cost-effective over the life cycle of the application. Specifically, the TRM will be used as a guideline for:

- Acquiring IT products and services
- Developing and maintaining AOC automated information systems
- Designing the AOC IT infrastructure

3. TRM Overview

The Technical Reference Model provides a framework for designing, developing, and implementing information systems in general and the supporting infrastructures in particular. The principal elements of the TRM are the services and interfaces that are used to drive hardware and software selections for individual information systems.

A *service* represents a well-defined capability that supports activities within different application areas. Examples of services are database management, communications, and presentation at the user interface. Services are implemented by technology vendors through hardware and software components. These components can be integrated into many different information systems that support the application areas.

An *interface* exists between the services and the software that implements the applications. The interface may be realized in hardware, software, or both. Interfaces exist between an organization's internal systems and with external systems that supply or use information from the organization. Interfaces allow us to address issues of interoperability and reliability among different systems.

Figure 3-1 depicts the AOC Technical Reference Model.

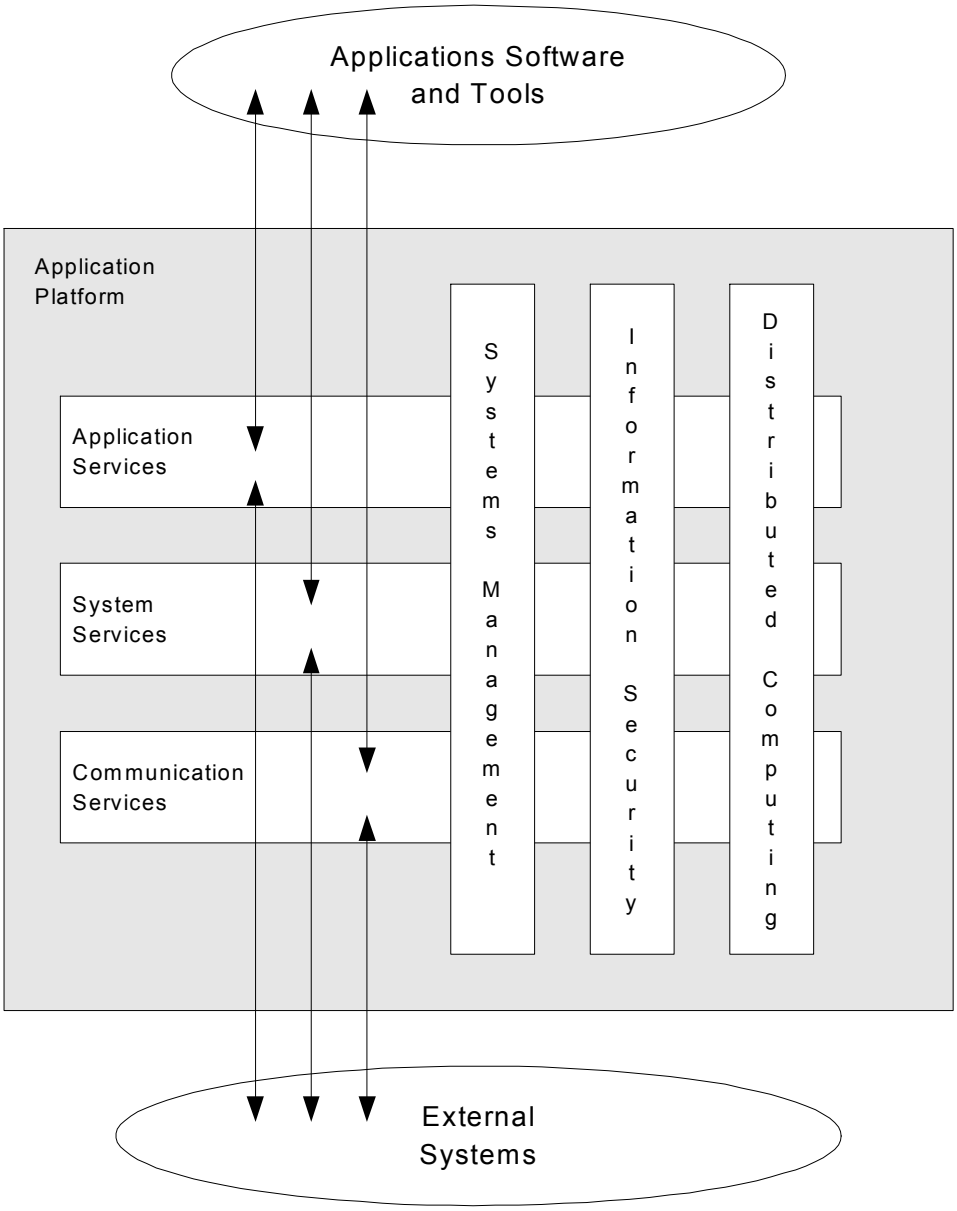

Figure 3-1. AOC Technical Reference Model.

The model is comprised of three levels of services that directly support applications: application services, system services, and communications services. Another three sets of services provide the architectural glue that allows applications to interoperate across multiple platforms and allows the AOC to administer and manage their architectural environment: systems management services, distributed computing services, and information security services.

This model can accommodate a wide variety of general and special purpose information systems. Each of the elements of this model is described in the following sections.

Using the TRM, the AOC has identified standards – de jure or de facto - for the different service areas. These standards will be used to guide the selection of infrastructure components and COTS packages to satisfy the requirements of the Enterprise Architecture. Where customized applications are developed, they must integrate with and interoperate with the infrastructure components that comply with the TRM.

3.1 Application Software and Tools

Applications are information processing tools that "do something" for the user. Applications services supply the means by which applications deliver their functionality. Application tools enable users to develop customized applications for their environment.

AOC applications will be built in part from a combination of service capabilities. To facilitate the development of these applications, an application platform's enabling services should present well-defined APIs. A given application may, in a distributed processing environment, exist in part at various points in an information system architecture. For example, some parts might reside in the information service provider's equipment, and some parts in the user's information appliances. APIs must be defined at all points in the information system architecture where portions of applications can exist.

Application development has evolved from a largely custom programming activity to an integration and customization activity of discrete modules. Previously developed reusable components—both commercial off-the-shelf (COTS) and government off-the-shelf (GOTS)—may be able to satisfy many of the functional requirements of new or evolving information systems. These reusable components are often customizable to meet a particular application's requirements. Such reusable modules will be integrated with custom-developed modules to form applications that satisfy the information support needs of the business owners.

3.2 Application Platform

An *application platform* is a collection of resources that support the services which application software requires to execute. The services are divided into several functional categories. The application platform provides services, which are invoked through the interfaces (the APIs) that, as much as possible, make the implementation-specific characteristics of the platform transparent to the application software.

To assure system integrity and consistency, application software entities using the application platform resources must access all resources via service requests using the APIs.

Applications "reach down" to specific services on the application platform through the APIs. The services execute on behalf of the applications and return results to them. Sometimes, the services interact with external entities, including users and other systems. Each of the application service categories is briefly described in the following sections.

The application platform concept does not imply or constrain any specific implementation beyond the basic requirement to supply services at the interfaces. For example, the platform might be a single processor shared by a group of applications, a multiprocessor at a single node, or it might be a large distributed system with each application dedicated to a single processor.

3.2.1 Application Services

Application services support applications by providing process, information sharing, display and output services. These automated tools are required to perform a specific process, activity or a complete function executing on distributed, shared or dedicated hardware. Applications themselves offer functionality to users. Depending on the user, applications can be spreadsheets, word processing or compilers and debuggers. Applications can be developed by programmers within an organization or purchased as COTS packages. In all cases, the applications can only be useful to users if these services are available. The services contained in this category include data management, multimedia support, and information interchange.

3.2.2 Systems Services

System services provide the facilities common to all information systems including support for distributed objects, naming services for federated data management, object management and timing services. These services provide organizational and global structures and enable physical distribution of service functions. System services include input/output processing, error checking, and coordination of application functions, synchronization and security.

3.2.3 Communications Services

Communication services provide communications support including intra- and internetworking protocol suites. These services enable the electronic linking of automated processing units to exchange information to support application and system services. The services support the computer-to-computer transfer of business transaction information using standard message formats embodies in protocol suites.

3.2.4 System Management Services

System management services refer to information technology activities that are not application execution or development. Typically, they include everything from daily operations, management, and maintenance of an information system to long-range planning for future business needs. System management comprises the processes, procedures, tools, and techniques that are implemented through personnel and automation to ensure the cost-effective operation of information systems.

3.2.5 Information Security Services

Information security services maintain the privacy and integrity of sensitive information, protect against the loss or inadvertent disclosure of information, and protect against tampering with information systems. There are legal and regulatory requirements to which the AOC must adhere, but information security is also vital to the organization's mission. Because the AOC needs to interact with other government agencies, it cannot rely on physical security alone for protection against the loss of, tampering with, or disclosure of sensitive information.

3.2.6 Distributed Computing Services

Distributed computing services support software components and databases that are physically distributed and, possibly heterogeneous, interconnection mechanisms for communication among applications. AOC applications either will be parts of larger systems that engage in distributed computing or will themselves be using distributed capabilities. Each component of a distributed system will require support from the underlying infrastructure services to communicate with other components, to exchange data, and to coordinate distributed processing tasks. The required services include, at a minimum, all core communications services. They may also include core management services and supporting services.

3.2.7 Hardware

The services described above execute on hardware platforms that provide information storage, processing, and communication support to users and applications. Among the elements included in the hardware platform are the central processing unit, central memory, persistent storage (both magnetic and optical media), user interface devices, network interface adapters, and special hardware components as needed. Hardware platforms may be configured in different ways—as mainframes, servers, or workstations.

3.3 External Systems

The External Environment (EE) component contains those entities with which the application platform exchanges information. These entities can be classified into three general categories:

- **Communication Services:** This entity provides access to services for interaction between internal application software entities and application platform external entities, such as application software entities on other application platforms, external data transport facilities, and devices. The services provided are those where protocol and format must be standardized for application interoperability.

- **Information Repository Services:** This entity defines a boundary across which external, persistent storage service is provided, where only the format and syntax is required to be specified for data portability and interoperability. This interface allows exchange of data between an application system (or an enabling or supporting service that is either an application system or provided directly to the user) and an information system (such as a database) which may be either remote or local.

- **Human-Computer Interface Services:** This entity is the boundary across which physical interaction between the user and the application platform takes place. User interface services interact with these services to receive input from the external environment and provide output to it. Examples of this type of interface include cathode-ray tube displays, keyboard, mice, and audio input/output devices. Standardization at this interface will allow users to access the services of compliant systems without costly retraining.

4. Applications Services

Application services enable applications to manipulate, exchange, access, and retrieve information for use within the application. The Application Services category provides services in five areas:

- Multimedia support services
- Information exchange services
- Data management services
- Web services
- Office Automation services

4.1 Multimedia Support Services

Multimedia support services provide the capability to manipulate and manage information consisting of text, graphics, images, video, and audio. These services can be used directly by business applications, but they can also be used by other support applications to satisfy a common requirement. In this section, the term "data" refers to all types of information used within the AOC community, and a *medium* is the means by which data is perceived, expressed, stored, or transmitted. Multimedia services include graphics, image processing, video processing, audio processing, text processing, document processing, publishing, and multimedia security.

4.1.1 Image Processing

Image processing services provide for the capture, scanning, creation, and editing of images in accordance with recognized image formatting standards. They enable the use of images to enhance documentation, presentation material, and training. These services support the creative use of graphic techniques for communication of information and enable a standard approach to the representation of concepts and functions. These services support the import and export of images for display in a variety of formats. They support the manipulation of those images by different application packages.

4.1.1.1 Image Processing Base Standards

Common industry supported standards include the Joint Photographers Expert Group (JPEG), the Graphic Interchange Format (GIF), Tag Image File Format (.tiff), and Windows Bitmap (.bmp) formats.

4.1.1.2 Image Processing Software

Acquisition software is based on the type of scanner installed with a desktop workstation.

Image editing software currently supported includes Adobe Photoshop.

4.1.2 Video Processing

Video processing services include the capability to capture, compose, and edit video information. Still graphics and title generation services are also provided. Additional capabilities include data

compression of full-motion video that can achieve varying degrees of quality and coded representations for the storage of video and audio information on digital storage media.

4.1.2.1 Video Processing Base Standards

Industry video standards include QuickTime, Audio/Video Interleave (AVI), MPEG2 and MPEG4 formats.

AVI is defined by Microsoft for the Windows operating systems. The exact definition of the file format is buried in Microsoft Foundation Classes. As the AVI format is embedded in Windows 9x/NT/2000/XP, it is a de facto standard.

MPEG2 and MPEG4: Generic coding of moving pictures and associated audio information is a standard in nine parts:

- ISO/IEC 13818-1:2000 Information Technology: Systems
- ISO/IEC 13818-2:2000 Information Technology: Video
- ISO/IEC 13818-2:2000 Information Technology: Audio
- ISO/IEC 13818-4:1998 Information Technology: Conformance Testing
- ISO/IEC TR 13818-5:1997 Information Technology: Software Simulation
- ISO/IEC 13818-6:1998/Cor 1:1999 Information Technology: Extensions for DSM-CC
- ISO/IEC 13818-7:1997 Information Technology: Advanced Audio Coding (AAC)
- ISO/IEC 13818-9:1996 Information Technology: Extension for real time interface for systems decoders
- ISO/IEC 13818-10:1999 Information Technology: Conformance extensions for Digital Storage Media Command and Control (DSM-CC)

The AOC will acquire equipment that is compliant with this standard.

QuickTime is a de facto standard developed by Apple Computer for video representation and replay. The current version for the Windows operating system is version 6.

4.1.2.2 Video Processing Software

Supported software for these formats includes Windows Media Player, version 7 or higher; Apple's QuickTime for Windows, version 5 or higher; and Real Networks Real Player, version 7.0 or higher.

4.1.3 Audio Processing

Audio processing services include the capability to capture, compose, and edit audio information. These services support the incorporation of audio components into applications, presentations and training materials. Audio components can be used to explore the use of sounds to fulfill requirements such as warning messages, alerts, or alarms associated with out-of-bounds conditions. In conjunction with video, audio services provide the full suite of capabilities for development of stand-alone informational presentations. These services support the import and export of audio components and the manipulation of those components by different applications.

4.1.3.1 Audio Processing Base Standards

Common industry supported standards include the .Audi/Video Interleave (AVI), MPEG3 and .wav formats.

The AVI standard has been described in section 4.1.3.1.

4.1.3.2 Audio Processing Software

Currently supported desktop workstation software includes Real Networks Real Player, version 7 and higher; and Windows Media Player, version 7 and higher.

4.1.4 Document Processing

The file format standard for non-editable documents must offer a freely available and easy-to-use client software for viewing documents distributed electronically. The file format must be cross-platform and work with most operating systems on the client side. The format must be capable of easy viewing and download from state government websites. The file creation software must provide for the creation of a read-only format that may be secured and rendered non-alterable by end users.

4.1.4.1 Document Processing Base Standards

Industry-wide standards for document representation are Postscript, Level 2 or higher, and Adobe Portable Document Format (PDF). Adobe® Portable Document Format (PDF) is the open de facto standard for electronic document distribution. It is a universal file format that preserves all the fonts, formatting, graphics, and color of any source document, regardless of the application and platform used to create it. (Specialized formats exist for TSD that include, Bentley's .DGN, .CGM and .SVF file formats.)

De facto standards are based on common document and word processing programs and office suites.

4.1.4.2 Document Processing Software

Currently supported document processing software for desktop workstations includes Adobe Acrobat 5.0 and higher.

4.1.5 Video Conferencing Services

Desktop video conferencing allows individuals at separate locations to see and hear each other, conduct meetings, and work together using interactive video and audio technology using a desktop computer. Images of documents can also be exchanged and users may work together on documents or projects. Desktop conferencing enables many of the functions available for enterprise systems, without the sophisticated features. Desktop systems may operate in a LAN environment at the network speed or via data lines and ISDN (128 Kbps or 384 Kbps).

4.1.5.1 Video Conferencing Base Standards

Approved Standards: H.320, G.711, G.722, G.728, H221, H261

4.1.5.2 Video Conferencing Software

The currently supported video conferencing software includes Polycom.

4.2 Information Exchange Services

Information exchange services provide specialized support for the exchange of data among applications. These services are designed to handle data exchange between applications on the same platform and applications on homogeneous and heterogeneous platforms.

4.2.1 Formatted Document Exchange

Formatted document exchange services are supported by specifications for encoding the data (e.g., text, pictures, numerics, special characters) and both the logical and visual structures of electronic documents.

4.2.1.1 Formatted Data Exchange Base Standards

The eXtensible Markup Language (XML) is an open standard for describing data from the World Wide Web Consortium (W3C) – a meta-language. XML is a simplified version of Standard Generalized Markup Language (SGML). It is used for defining data elements on a Web page and business-to-business documents. It uses a similar tag structure as HTML; however, whereas HTML defines how elements are displayed, XML defines what those elements contain. HTML uses predefined tags, but XML allows tags to be defined by the developer. There are four principle components that enable XML applications to process an XML document: the XML Document, Document Type Definitions (DTD) or Schemas, Processors and Parsers, and Style Sheets.

Approved Standard: XML version 2.0 standard from the World Wide Web Consortium (W3C)

4.2.1.2 Formatted Data Exchange Software

Formatted documents are derived from many sources. Since the advent of the personal computer, most formatted documents have been prepared by office automation packages that use proprietary encoding and representation schemes. Most office automation packages can now routinely read at least a subset of the formats used by other vendors. Commercial and shareware format converters exist for converting from one internal, proprietary format to another for the major office automation packages as well as for many older word and document processing programs. Support for formatted documents of many different types is required for the foreseeable future.

4.2.2 Graphics Data Exchange

Graphic data exchange services are supported by device-independent descriptions of picture elements for vector-based graphics and descriptions for raster-based graphics. These services enable import and export of graphics with full editing capabilities among applications. Services

include enlargement and reduction of images within text, editing of text within graphics and access to a full range of fonts for text editing within graphics.

4.2.2.1 Graphics Data Exchange Base Standards

Graphics data exchange standards are the same as the industry supported graphics processing and image processing standards described in sections 4.1.1.1 and 4.1.2.1, respectively.

4.2.2.2 Graphics Data Exchange Software

Bentley Publishing is the current approved software at the AOC. Support is also provided through standard-compliant applications such as browsers and office suites

4.2.3 Product Data Exchange

Product data exchange services are supported by specifications that describe technical drawings, documentation, and other data required for product design and manufacturing, including geometric and nongeometric data such as form features, tolerances, material properties, and surfaces.

4.2.4 Electronic Mail

Electronic mail has become the most common component of both public and private office automation efforts. To facilitate the ability to communicate electronically, it is desirable to use the same electronic mail and calendaring software throughout the Agency. This simplifies the communication process and eliminates the need for costly and often undependable e-mail gateways.

4.2.4.1 Electronic Mail Base Standards

The Approved Standard is the Messaging Application Programming Interface (MAPI).

4.2.4.2 Electronic Mail Software

The currently supported email software includes Novell GroupWise version 6.

4.3 Data Management Services

Data management services encompass the procedures, practices, methods, and software used to manage data. Components of this category include data dictionary and directory, database management systems, and distributed data support.

4.3.1 Database Management System Services

DBMS services provide controlled access to and modification of structured data. To manage the data, the DBMS provides concurrency control and facilities to combine data from different schemas. DBMS services are accessible through a programming language interface, an interactive data manipulation language interface such as Structured Query Language (SQL), or an interactive/fourth-generation language interface. For efficiency, database management systems generally provide specific services to create, populate, move, backup, restore/recover,

and archive databases, although some of these services could be provided by general file management capabilities described in operating system services.

With the move to multimedia, arbitrary collections of text, digitized sound, and binary images can all be stored on disk according to their own peculiar characteristics.

4.3.1.1 Database Management System Base Standards

Database management system (DBMS) standards are defined by logical data models (LDM): relational, flat file, object-oriented. Standards are specified de facto by the vendor's implementation of a particular LDM.

Access to databases is enabled through adherence to the Open Data Base Connectivity (ODBC) specification and in certain cases native drivers. It allows technically different solutions to share information drawn from multiple, architecturally different databases.

4.3.1.2 Database Management System Software

At the Enterprise level the supported DBMS software for enterprise servers is SQL 2000 and Oracle 8 or higher.

At the division level the supported DBMS software for division servers is Microsoft's SQL Server 6.5 or higher and Oracle 8 or higher.

On the desktop, the supported DBMS software is Microsoft Access 2002 or higher.

4.3.2 Query Processing

Query processing services provide for interactive selection, extraction, and formatting of stored information from files and databases. Query processing services are invoked via user-oriented languages and tools (often referred to as fourth generation languages, such as SQL), which simplify the definition of searching criteria and aid in creating effective presentation of the retrieved information (including use of graphics).

4.3.2.1 Query Processing Base Standards

The query processing standard for relational DBMSs is SQL-92:

ISO/IEC 9075-1:1999 Information technology -- Database languages -- SQL -- Part 1: Framework (SQL/Framework)

ISO/IEC 9075-1/Amd1: 2001 On-Line Analytical Processing (SQL/OLAP)

ISO/IEC 9075-2:1999 Information technology -- Database languages -- SQL -- Part 2: Foundation (SQL/Foundation)

ISO/IEC 9075-3:1999 Information technology -- Database languages -- SQL -- Part 3: Call-Level Interface (SQL/CLI)

ISO/IEC 9075-4:1999 Information technology -- Database languages -- SQL -- Part 4: Persistent Stored Modules (SQL/PSM)

ISO/IEC 9075-5:1999 Information technology -- Database languages -- SQL -- Part 5: Host Language Bindings (SQL/Bindings)

In addition, ISO/IEC 13249-x:2000 Information technology -- Database languages -- SQL Multimedia and Application Packages, where x runs from 1 to 5 describes SQL support for multimedia objects stored in relational databases.

4.3.2.2 Query Processing Software

Query processing software is usually integrated with the relational DBMS. Both Microsoft SQL Server 2000 or higher and Oracle 9i or higher provide full support for the SQL standards described in the previous section.

4.3.3 Database Report Writing

Reporting tools should be able to support user needs in defining, storing and scheduling reports which will be needed on an ad-hoc or recurring basis, and control their print queue(s). Tools will need to work with all standard relational databases maintained by the AOC.

4.3.3.1 Database Report Writing Base Standards

The AOC uses Brio based report writing.

4.3.3.2 Database Report Writing Software

Brio Report Writer, Version 8 or higher

4.3.4 Distributed Data Support

In today's business environment, data is typically spread across multiple DBMSs, hardware platforms, and operating systems. Access to an enterprise's data can be a complex process. Distributed data services, which support access to distributed data, consist of dialogue management, association control, resource-handling, and data language services between a single client and a single server. Association control includes making a connection to a specific database at the server site.

4.3.4.1 Distributed Data Support Standards

Currently supported DBMS distributed data support software includes Oracle 9i or higher and SQL 2000 or higher.

4.4 Web Services

The web environment consists of server-side services, client-side services and development services.

4.4.1 Client Side Web Services

The client side consists of web browsing and authoring tools for publishing.

4.4.1.1 Web Design Publishing Base Standards

Web design and publishing is the production of XML and HyperText Markup Language (HTML) documents and sites for dissemination on World Wide Web services via the Internet. The standards present style guidelines for developing web sites that are easy to understand and navigate.

4.4.1.2 Web Publishing Software

Currently supported web publishing software includes CommonSpot 3.2 or higher.

4.4.1.3 Web Browsing Base Standards

A web browser is a program which is used to display web pages. A web browser works by using the HyperText Transport Protocol (HTTP) to request a specially encoded text document from a web server. This text document contains format written in HyperText Markup Language (HTML). This format is interpreted by the browser, which then renders the document's content in an appropriate manner for the user's convenience. The two most well-known web browsers are Microsoft Internet Explorer and Netscape Navigator. Microsoft Internet Explorer is used by AOC personnel.

In addition, client side scripting languages and plug-ins can be utilized as well.

4.1.1.4 Web Browsing Software

Currently supported web browsing software includes Microsoft Internet Explorer 6 or higher.

4.4.2 Server Side Web Services

The server side services consist of site hosting, site registration / management, search and security facilities.

4.4.2.1 Web Server Base Standards

A web server reacts to requests coming from Web clients for both dynamic and static documents. It can also route requests to application and database servers for further processing.

4.4.2.2 Web Server Software

Apache Tomcat 4.1 or higher on the Unix environment
Cold Fusion MX (JRUN 4 or higher)
Microsoft IIS 5 or higher on the Windows environment

4.4.2.3 Content Manager Base Standards

Content Management is the publishing, maintaining, and delivering information on the World Wide Web. "Information delivery" and "content delivery" are related terms.

4.4.2.4 Content Manager Software

Currently supported content management software includes CommonSpot 3.2 or higher.

4.4.2.5 Server Side Scripting Base Standards

A script is a simple programming language designed to perform special or limited tasks, sometimes associated with a particular application or function. An example of a scripting language is JavaScript.

4.4.2.6 Server Side Scripting Software

Currently supported server side scripting software includes JavaScript.

4.4.3 Web Development Services

Web development services involve both client and server side Web functionality

4.4.3.1 Web Development Base Standards

The Cold Fusion development environment is the current standard web development environment at the AOC.

4.4.3.2 Web Development Software

Currently supported web development software includes Cold Fusion, MX 5 or higher.

4.5 Office Automation Services

Office Automation is generally used to describe the use of computer systems to perform office operations such as word processing, spreadsheets, presentation design, desktop publishing, desktop database support, and groupware.

4.5.1 Word Processing

Word processing services include the capability to create, edit, merge, and format documents. These services enable the composition of documents that incorporate graphics, images, and even voice annotation, along with stylized text.

4.5.1.1 Word Processing base standards

Standards for word processing include the Microsoft Word format and Corel WordPerfect.

4.5.1.2 Word Processing Software

Currently supported word processing software for the desktop workstations includes Microsoft Word 2002 (is a part of the Microsoft Office XP environment). and higher; Corel Office Suite 10 is also supported.

4.5.2 Presentation Services

Presentation Services provide automated computer support in the development and delivery of presentation materials.

4.5.2.1 Presentation Base Standards

Standards for presentation include the Microsoft PowerPoint format.

4.5.2.2 Presentation Software

Currently supported graphics processing software for the desktop workstations includes Microsoft PowerPoint 2002 (is a part of the Microsoft Office XP environment).

4.5.3 Graphics

Graphical Services provide the interfaces for programming two- and three-dimensional graphics in a device-independent manner. Within the AOC community it is envisioned that two-dimensional graphics will meet the majority of the graphical display needs for support of business presentations, map graphics, and facility plans. Three-dimensional capability will be useful for applications requiring multidimensional data visualization.

4.5.3.1 Graphics Base Standards

Standard for user-defined graphics is Visio. Facility plans incorporate Bentley's MicroStation.

4.5.3.2 Graphics Software

Currently supported graphics processing software for the desktop workstations includes Microsoft Visio 2000 or higher and Adobe PhotoShop 6 or higher.

4.5.4 Spreadsheet

They are general purpose modeling tools that allow end-users to represent a problem as a collection of data items and the formulas that express the relationships between those items.

4.5.4.1 Spreadsheet Base Standards

Standards for presentation include the Microsoft Excel format.

4.5.4.2 Spreadsheet Software

Currently supported spreadsheet processing software for the desktop workstations includes Microsoft Excel 2002 or higher (is a part of the Microsoft Office XP environment).

4.5.5 Personal Database

Personal Database programs are end-user applications that allow people to organize large quantities of data in ways that make it easy to answer questions about that data

4.5.5.1 Personal Database Base Standards

Standards for presentation include the Microsoft Access format.

4.5.5.2 Personal Database Software

Currently supported graphics processing software for the desktop workstations include Microsoft Access 2002 or higher. (is a part of the Microsoft Office XP environment).

4.6 Project Management Services

Project Management services provide automated computer support to perform basic project management activities.

4.6.1 Project Management Base Standards

Standards for presentation include the Microsoft Project format.

4.6.2 Project Management Software Tools

Currently supported project management software for the desktop workstations includes Microsoft Project 2002 or higher. For Construction Management Division, Prolog and Primavera are used. [Note – PIC, a custom developed solution that does not use a unique file format]

4.7 Computer Aided Design (CAD) Services

CAD is computer graphics software that is commonly used to make architectural and engineering drawings

4.7.1 Computer Aided Design (CAD) Base Standards

Currently supported Standards for CAD include MicroStation.

4.7.2 Computer Aided Design (CAD) Software

MicroStation, version 8 or higher.

4.8 Statistical Analysis Software

SPSS Version 12 or higher is used for statistical analysis.

5. System Services

There are many ways of categorizing system services. This TRM divides them into five categories:

- Object management services
- Directory and naming services
- User interface services
- Operating system services
- Middleware services

5.1 Object Management Services

Object management services provide mechanisms for creating, naming, and locating objects, and allowing them to communicate in a distributed environment. Objects are computational entities in which data and procedures are bundled together internally and hidden from external access and view. Communication with objects is accomplished by invoking specific object functions using a well-specified, public interface.

5.1.1 Object Management Services Base Standards

De facto object management standards have been established by Microsoft Corporation through its COM/DCOM and ActiveX technology, which is embedded in the Windows operating systems.

Another object management standard is established through a choice of programming languages. Both C++ and Java are object-oriented programming languages that have specified object management services and represent de facto standards.

The Java standard is described in the technical documentation distribute by Sun Microsystems and the provision of the standard is under the exclusive control of Sun Microsystems.

5.1.2 Object Management Services Software

The AOC will consider J2EE as a standard object management services software.

5.2 Directory and Naming Services

Directory and naming services provide the means for identifying and retrieving information about entities in the network. These services are needed to locate resources in a network. An entity is a specific resource on the network such as a computer, application, file, electronic mailbox, printer, or router. Information that can be retrieved about the entity varies with the type of entity and the naming or directory service providing the information.

Naming and directory services are related in the functions that they provide, but distinct differences exist. A naming service locates and retrieves information about an entity solely by the name of the entity. Most naming services are integrated with file systems and electronic mail services. In a directory service, entities are identified and retrieved, based on their attributes

where one of the attributes is its names. This service provides the additional capability of searching for all entities that have one or more attributes satisfying particular criteria.

Directory services allow users to identify, by name, network resources such as servers, files, disks, print queues, or mail boxes and to gain access to the resources without needing to know where they are located in a network. This versatility allows a user to continue to access a resource by one name even when attributes of that resource, such as the resource address, are changed.

5.2.1 Directory and Naming Services Base Standards

Directory standards are often implemented by the computer operating systems. Microsoft Active Directory is one such standard.

5.2.2 Directory and Naming Services Software

The currently supported directory naming services is Novell NDS and Microsoft's Active Directory.

5.3 Operating System Services

Operating system services provide access to local computing resources (e.g., processes) and platform services (e.g., peripheral hardware devices). In addition, operating systems provide access to distributed platform services such as network file systems and naming services. Access to network protocol stacks is also provided through operating system service interfaces. Operating systems mediate access to computing resources between applications and unique platform and network hardware. The operating system provides many of the services for distributed computing.

Standards-based operating systems use formally defined APIs for application program access to platform resources and are the basis for building open systems, which are the basis of distributed computing. Nonstandard operating systems provide implementation unique interfaces for applications development which requires unique coding for each platform.

5.3.1 Operating Systems Base Standards - Desktop

32-bit and 64-bit operating system with graphical user interface for Intel compatible platform for desktops, laptops, and servers.

5.1.1.1 Operating Systems Software - Desktop

The Microsoft Windows operating system is a de facto standard. Specification of this operating system is wholly controlled by Microsoft Corporation.

The currently supported desktop workstation operating systems is Microsoft Windows XP Professional.

5.3.2 Operating System Base Standards – Servers

The AOC's standard for operating system server standards is 32-bit POSIX-compliant operating systems for RISC-based servers.

5.3.2.1 Operating Systems Software – Servers

The currently supported server operating systems are Sun Solaris, Microsoft Windows 2000 Server, Microsoft Windows 2003 Server and AS/400.

IEEE Std 1003.1-2001 (POSIX.1) is the joint revision to the POSIX and Single UNIX Specification, which effectively defines the UNIX operating system.

5.3.3 Network

The currently supported network operating systems are Microsoft Windows 2003 Server and Novell Netware 6 or higher.

5.3.4 Handheld Operating System Base Standards

The currently supported network operating systems are Palm OS, and Blackberry OS.

6. Communications Services

Communications services provide a consistent, scalable and reliable approach to support multiple missions in a (possibly) secure network environment. Network services provide connectivity and basic services to foster communication across workgroups and sites. These services provide transport, internetworking, and interfaces that enable applications to communicate in a distributed environment and provide the capabilities and mechanisms to support distributed data access and interoperability in a heterogeneous environment. The services included in this category are:

- Gateway services
- Data access services
- Data transport services

The standard model for describing and implementing communication services is the ISO OSI Reference Model of Communications. There is more than one way to implement the OSI model. Layers 2 through 6 of the OSI model correspond to the data access and data transport services of the TRM, as shown in figure 4-2.

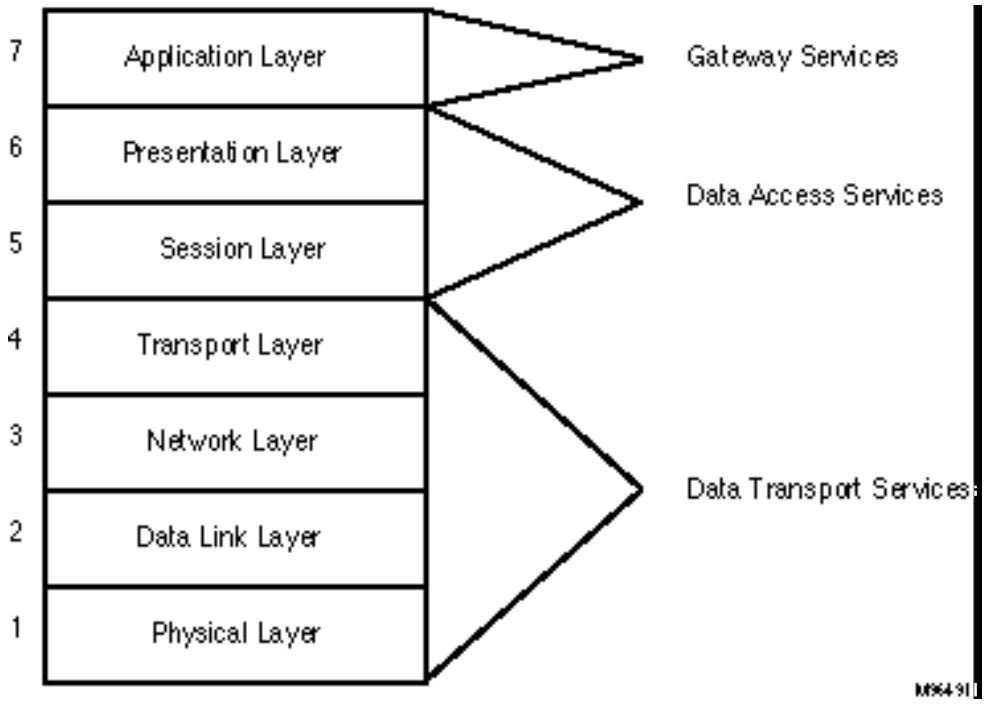

Figure 6-x. OSI Model to Communication Services Mapping

6.1 Gateway Services

Gateways provide capabilities for authentication, authorization, auditing, and control of connections between two or more networks. Specifically, gateways have been implemented as devices or software components for converting one network's message protocol to the format used by another network's protocol.

Gateway services provide for external gateway programs to interface with information servers such as Hypertext Transport Protocol (HTTP) servers. For example, a plain Hypertext Markup Language (HTML) document that the Web demon retrieves is static, which means it exists in a constant state: it doesn't change. A gateway program, on the other hand, is executed in real time, so that it can output dynamic information. Since a gateway program is executable, it allows any other server to run a program on the target system. Security precautions need to be implemented when permitting access to a computer system from another system using gateway programs.

6.2 Network Access Services

Network access services provide remote access to data in other information systems. These services must support data interchange among distributed systems that may use a variety of communications protocols. Network access services support the exchange of information among heterogeneous and homogeneous systems and the update, modification and deletion of data without compromising the integrity of the data in all systems.

6.2.1 File Transfer Services

File transfer services are a set of protocols that specify how information organized into files can be transferred from one computer to another through homogeneous and heterogeneous networks. These services provide for the transfer of file data to another location only and do not address data formats or translations which must be accomplished by the source and target systems applications.

6.2.1.1 File Transfer Base Standards

The primary standard for the File Transfer Protocol (FTP) is RFC 959: File Transfer Protocol, dated October 1985. It is amended and/or augmented by the following RFCs:

1639 Piscitello, D., "FTP Operation Over Big Address Records (FOOBAR)", RFC 1639, June 1994

1579 Bellovin, S., "Firewall-Friendly FTP", RFC 1579, February 1994.

2577 FTP Security Considerations. M. Allman, S. Ostermann. May 1999. (Informational)

6.2.1.2 File Transfer Software

FTP services are embedded in both Cisco network hardware that is used by the AOC to provide LAN and intranet services. TFTP service support is provided by the Windows operating systems from Microsoft Corp. and the Sun Solaris operating system from Sun Microsystems.

6.2.2 Remote Login Services

Remote login services identify services and protocols for remote terminal access to network computing resources. These services support data input, processing requests, receipt of output and monitoring of process functions. Although the AOC emphasis will be towards a common user interface and distributed computer access of remote processing resources, there will continue to be a requirement for remote terminal access for selected activities.

Remote login services are not supported by the AOC at this time.

6.2.3 Internet Addressing and Transmission Control

Internet addressing is a set of protocols for addressing and identifying nodes within a network. Transmission control is a set of protocols for mediating the traffic flow through a network.

6.2.3.1 Internet Addressing and Transmission Control Base Standards

Currently, the AOC uses IPv4 technology, but the AOC is currently evaluating IPv6 technology.

The original specification for internet addressing is RFC 791: Postel, J., "Internet Protocol", dated September 1981, which is usually referred to as IPv4.

The basic specification for modern internet addressing is RFC 2460 Internet Protocol, Version 6 (IPv6) Specification. S. Deering, R. Hinden. December 1998.. This is augmented by the following RFCs:

2373 Hinden, R., and S. Deering, "IP Version 6 Addressing Architecture", RFC 2373, July 1998.

2529 Transmission of IPv6 over IPv4 Domains without Explicit Tunnels. B. Carpenter, C. Jung. March 1999. (Proposed Standard)

The basic specification for transmission control across a network is RFC 793: Postel, J., "Transmission Control Protocol", September 1981.

6.2.3.2 Internet Addressing and Transmission Control Software

Internet addressing and transmission control software is provided as the basic offering of Cisco which provides the routers and switches for the AOC LAN, intranet and connection to the Legislative Branch's CAPNET.

6.3 Network Transport Services

The network transport services, comprising layers 2 through 4 of the OSI Reference Model, provide for establishing connections between two or more computer systems via some physical link and exchanging control information that allows the two computer systems to communicate.

Selecting the proper transport and network protocols is critical to ensuring a reliable, interoperable, and manageable network. Standard protocol suites have been defined and accepted by both industry and the federal government for both local area and wide area networks. Multiprotocol support is required to bridge platforms and networks using different protocols.

The network and data link layers of the OSI Reference Model are concerned with ensuring quality of services, sequencing of traffic, segmentation of messages, flow control, and error detection and correction, and control of physical signaling mechanisms. Network services are usually divided into local area network (LAN) and wide area network (WAN) services.

LAN transport services provide users with high-speed network services within a limited geographical area—usually with the confines of a building. WAN transport services provide users with high-speed network services over large distances, including nationwide.

6.3.1 Network Transport Services - NonSecure

The primary standard for LAN.MAN communication is ISO/IEC 8802-3:2000 (E)) Information Technology - LAN/MAN - Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications, which defines the Ethernet protocol.

The primary standard for wireless LAN communications is ISO/IEC 8802-11:1999) IEEE Standard for Information Technology - LAN/MAN - Specific requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications.

6.3.1.1 Network Transport Services - NonSecure Base Standards

Standards for NonSecure Transport Services include:

- 802.11b and g
- 802.1x
- FDDI
- Gigabit
- DWDM
- FibreChannel

6.3.1.2 Network Transport Services - NonSecure Software

Currently, AOC is operating on a pure IP environment.

6.3.2 Network Transport Services - Secure

Several network services are available that offer transport security. Secure Sockets Layer (SSL) is a protocol for transmitting private data via the Internet. SSL works by using a private key to encrypt data that is transported over the SSL connection. SSL establishes a secure communications channel between the server and the client web browser. Web browsers such as Internet Explorer support SSL, and many web sites use the protocol to obtain confidential user information, such as credit card numbers and other personally identifying information. A virtual private network (VPN) is a private network configured within a public network infrastructure. A VPN uses encryption and other security mechanisms to ensure that only authorized users can

access the network and that the data cannot be intercepted. On the server side, digital certificates act as electronic credentials to authenticate sites to customers and to enable secure, encrypted transactions and communications using the SSL protocol. 3DES is standard encryption level for VPN.

6.3.2.1 Secure Transport Base Standards

Standards for Secure Transport Services include:

- Secure Socket Layer (SSL) 3.0 encryption (minimum 40-bit) is required, if data needs to be secured via the Internet.
- Virtual Private Network (VPN)
- SHTTP

6.3.2.2 Secure Transport Software

Internet Explorer – supports SSL.

6.4 User Side Services - Secure

User side secure services provide the user with a level of security.

6.4.1 User Side Base Standards

A virtual private network (VPN) is a private network configured within a public network infrastructure. A VPN uses encryption and other security mechanisms to ensure that only authorized users can access the network and that the data cannot be intercepted.

6.4.2 User Side Software

Currently CheckPoint SecureClient is the standard software for the AOC.

6.5 Wireless Services

Wireless is a term used to describe telecommunications in which electromagnetic waves (rather than some form of wire) carry the signal over part or all of the communication path.

6.5.1 Personal Wireless Services

Personal Wireless services provide individual wireless capabilities to AOC employees.

6.5.1.1 Personal Wireless Base Standards

Current AOC Standards for Personal Wireless Services include: 802.11b

6.5.1.2 Personal Wireless Software/hardware

Current AOC approved software includes RIM 957 Wireless handhelds running on a Mobitex network and operating at 900 Mhz. RIM 6750 Wireless Email and phone.

7. System Management Services

System management services are integral to the operation of an open system environment. They provide the mechanisms to monitor and control the operation of individual applications, databases, systems, platforms, networks, and user interactions with these components. System management services enable users and systems to become more efficient in performing required work.

System management, or in the context of a networked heterogeneous environment, network management, encompasses the planning, installation and operation of computer networks and network components. A network component is defined as a communications or data processing resource to be managed, including protocol state machines, protocol layers, connections, and physical devices such as network interface units. Each component is further characterized by one or more attributes, such as retransmission timers or buffer sizes, which are also manageable.

There is some overlap between network management and system management functions, but system management focuses on resources and standard means to configure and use them. System management services include:

- Network services
- System administration services

7.1 Network Services

Network management is a service that employs a variety of tools, applications, and devices to assist human network managers in monitoring and maintaining networks

7.1.1 Network Management Services

Network management services deals with the hardware, software, and communications in the environment and include the protocols, services, formats, and administrative procedures for collecting management information providing a means to recognize faults, system trends and various parameters that allow timely response for reconfiguration and maintenance actions.

As interconnected networks become a critical resource for supporting the business operations of the organization, they define the way the organization operates. These interconnected networks are called intranets or enterprise networks. They are seen as a single entity and must be managed as such.

7.1.1.1 Network Management Base Standards

The original specification for network management services is RFC 2578: Structure of Management Information Version 2 (SMIv2). K. McCloghrie, D. Perkins, J. Schoenwaelder. April 1999. It is augmented by the following RFCs:

2579 Textual Conventions for SMIv2. K. McCloghrie, D. Perkins, J. Schoenwaelder. April 1999.

2580 Conformance Statements for SMIv2. K. McCloghrie, D. Perkins, J. Schoenwaelder. April 1999.

7.1.1.2 Network Management Software

Approved Product: HP Open View NNM 7.X

7.1.2 Domain Name Services

An Internet (TCP/IP network) domain name is an organization's unique name combined with a top-level domain name (TLD). Name resolution software lets users locate computers on a network or the Internet by domain name instead of the corresponding numeric IP address. DNS (Domain Name Service) is a distributed database of information about hosts (domain names) on a network. DNS names are more 'human-friendly' versions of the number-based IP addresses used by the computers themselves.

7.1.2.1 Domain Name Services Base Standards

The AOC uses class B and class C IP licenses.

7.1.2.2 Domain Name Services Software

Currently the standard software is **BIND DNS** server **version** 8.0..

7.2 System Administration Services

System administration services include the operation, administration, and maintenance of open system environment components along with their attendant services. Information systems are composed of a wide variety of resources that must be managed effectively to achieve the goals of an open system environment. While the individual resources (such as printers, software, users, processors) may differ widely, the abstraction of these resources as managed objects allows for treatment in a uniform manner.

Work on systems administration services and the attendant standards is ongoing. This work is based predominantly on the OSI network management framework, which applies mainly to networks and the individual nodes on the networks. There is, however, an overlap among certain types of network management functions and individual system administration functions. This overlapping area applies equally to networks and individual systems and forms the basis for the OSI approach to systems and network management. Other system administration functions in the typical operating system sense are also being addressed and need to be integrated into the overall systems and network management framework. Systems administration functionality may be (and has been) divided in several different ways; one way is to make a division according to the management elements that generically apply to all functional resources. This division reduces to

- Configuration management
- Performance and Fault management
- Asset management

This breakout of system administration services parallels the breakout of OSI network management thereby presenting an overall coherent framework that applies equally to networks and the individual nodes of the networks. Many of the specific services have no formal standards work in progress; however, industry consortia and others are addressing selected areas.

One important consideration of the standards supporting the services in this area is that they should not enforce specific management policies but rather enable a wide variety of different management policies to be implemented, selected according to the particular needs of the end user installations.

7.2.1 Configuration Management

Network Configuration management monitors network and system configuration information so that the effects on network operation of various versions of hardware and software elements can be tracked and managed.

7.2.1.1 Configuration Management Base Standards

Consists of hardware and software to manage the configuration of routers etc

7.2.1.1 Configuration Management Software

Currently the standard configuration management software is Novell's Zenworks for workstations.

7.2.2 Performance and Fault Management

Network performance management measures and make available various aspects of network performance so that internetwork performance can be maintained at an acceptable level. Network fault management detects, logs, notifies users of, and (to the extent possible) automatically fixes network problems to keep the network running effectively.

7.2.2.1 Performance and Fault Management Base Standards

Consists of hardware and software to manage the performance and determining faults in the network components. Currently the standard includes HPOpenview 7 Network Node Manager.

7.2.2.2 Performance and Fault Management Software

Currently the standard performance and fault management software includes HP OpenView, CiscoWorks, Compaq Insight, Zenworks for workstations and servers.

7.2.3 Asset Management

Network asset management is an automated approach for managing and tracking the AOC's Network assets.

7.2.3.1 Asset Management Base Standards

Consists of hardware and software to manage the AOC's network assets.

7.2.3.2 Asset Management Software

Currently the standard asset management software includes EasyVista for the PC, HP Openview for the Network and Compaq Insight for the Server.

8. Information Security Services

Information security services are necessary to protect sensitive information processed, transmitted or stored within an information system. The appropriate level of protection is determined based upon the value of information to the business owner and the perceived threats to the information that may occur. The mechanisms for implementing information security services must be interwoven with the other services in order to ensure an effective and comprehensive capability that attempts to reduce potential loss caused by

- Confidentiality of data
- Availability of data
- Integrity of data
- Authenticity of data

Security services are integrated with each service area and pervade these service areas in one or more forms. A security service is a service provided by the system that is used to support a system security policy or security requirement. For example, Discretionary Access Control (DAC) is one security service associated with operating system services. This specific security service satisfies the general security requirement for restricting access to objects (e.g., files) based on the identity and need-to-know of the user, process, and/or groups to which they belong. Security services implement the level(s) of protection necessary for an information system architecture to satisfy a system security policy.

Security services can be implemented by hardware, software, and firmware or through the use of administrative procedures and physical controls. Security services associated with one of the service areas may also depend on the security services offered by a different service area. For example, data management security services may depend on operating system security services.

A security service can be implemented by one or more security mechanisms. Different information systems may employ different combinations of security mechanisms to implement a specific security service. Security mechanisms may be applied to different service areas. Examples of security mechanisms include encryption, digital signature mechanisms, access control mechanisms, data integrity mechanisms, and authentication exchange mechanisms.

Security mechanisms that are not specific to any particular service area are referred to as pervasive security mechanisms. Pervasive security mechanisms include trusted functionality, security labels, event detection, security audit trail, and security recovery.

The security services described below may need to be provided through implementations in information system components.

Access Control

This service prevents the unauthorized use of information system resources. This service also prevents the use of a resource in an unauthorized way. This service may be applied to various aspects of access to a resource (e.g., access to communications to the resource, the reading, writing, or deletion of an information/data resource, the execution of a processing resource) or to all accesses to a resource.

Identity and Authorization
Access control to data is controlled by a combination of physical security and logical access control. Logical access control mechanisms permit access to platforms, data sets, or applications only after a client establishes its identity. If a security system is to remain practical in a distributed environment, it is important that users have a single sign-on procedure. Users should have to identify themselves once per work sessions. Once the identity of the user has been established, all access control to individual applications and data sets is based upon authorization. Authorization is the process of checking and approving access to some entity based on a predefined permission to do so.

Authentication
Access control is based upon the ability to establish the identities of users and other entities. However, when sending information over remote network connections or through public networks without security procedures, it is possible to impersonate users and other entities. Establishing the authenticity of messages, senders, receivers, and other entities becomes an important problem.

This service confirms the identities of requestors for use of information system resources. In addition, authentication can apply to providers of data. The authentication service may occur at the initiation of a session or during a session. There are a variety of authentication approaches that must be supported including association of roles with allowed functionality, assignment of users to groups that are allowed specific functions. The authentication may be based on what a user knows (such as a password), what a user have (such as a key), what a user "is" (such as biometrics – fingerprints).

Data Integrity
This service ensures that data are not altered or destroyed in an unauthorized manner or inadvertently by those authorized to update or modify data. This service applies to data in permanent data stores and to data in communications messages. Data integrity services include guarding against the creation of redundant data, creation and deletion of functionally dependent data and standardization of data naming and definition conventions.

Data Confidentiality
This service ensures that data are not made available or disclosed to unauthorized individuals or computer processes. This service will be applied to devices that permit human interaction with the information system or the transfer of data among information systems. In addition, this service will ensure that observation of usage patterns of communications resources will not be possible. This service is dependent on the security services and access control services defined for the system as a whole.

Nonrepudiation
This service ensures that entities engaging in an information exchange cannot deny being involved in it. This service may take one or both of two forms. First, the recipient of data is provided with proof of the origin of the data. This protects against any attempt by the sender to falsely deny sending the data or its contents. Second, the sender of data is provided with proof of delivery of data. This protects against any subsequent attempt by the recipient to falsely deny receiving the data or its contents.

Availability

This service ensures that timely and regular communications services are available. These services are intended to minimize delay or non-delivery of data passed on communications networks. These services include protecting communications networks from accidental or intentional damage and ensuring graceful degradation in communications service.

8.1 Enterprise Security Architecture

The term Enterprise Security Architecture is used to represent a collection of technologies that perform specific tasks related to data security on enterprise wide networks.

8.1.1 Enterprise Security – Desktop

The term Enterprise Security Desktop represents a collection of technologies that perform specific tasks related to data security on the user's desktop.

8.1.1.1 Enterprise Security Base Standards – Desktop

The AOC standard for Enterprise Security Desktop is antivirus application; anti-spyware software; and software-based personal firewall.

8.1.1.2 Enterprise Security anti-virus Software – Desktop

The AOC approved antivirus software for Desktop Enterprise Security is Symantec's antivirus corporate edition 9.0.1 for the desktop.

8.1.1.3 Enterprise Security anti-spyware software – Desktop

The AOC approved anti-spyware software for Desktop Enterprise Security is PestPatrol corporate edition 4.2.0.3. OIRM helpdesk has been authorized by BSMO to employ other anti-spyware utilities such as Ad-aware and Spybot Search & Destroy to eradicate rapidly mutating malware.

8.1.2 Enterprise Security – Mobile Computing (Laptops/palmtops/tablet PCs)

The term Mobile Computing Enterprise Security represents a collection of technologies that perform specific tasks related to data security on the user's laptop, palmtop, tablet PC or other such mobile computing platforms.

8.1.2.1 Enterprise Security Base Standards – Mobile Computing

The AOC standard for Mobile Computing Enterprise Security is Symantec's antivirus corporate edition for desktop and server; a suite of anti-spyware software; and software-based personal firewall, asset tracking software and physical security cable locking device.

8.1.2.2 Enterprise Security anti-virus Software – Mobile Computing

The AOC approved antivirus software for Mobile Computing Enterprise Security is Symantec's antivirus corporate edition 9.0.1 for the client.

8.1.2.3 Enterprise Security anti-spyware software – Mobile Computing

The AOC approved anti-spyware software for Mobile Computing Enterprise Security is PestPatrol corporate edition 4.2.0.3. OIRM helpdesk has been authorized by BSMO to employ other anti-spyware utilities such as Ad-aware and Spybot Search & Destroy to eradicate rapidly mutating malware.

8.1.2.4 Enterprise Security personal firewall software – Mobile Computing

The AOC approved personal firewall software for Desktop Enterprise Security is ZoneAlarm corporate edition.

8.1.2.5 Enterprise Security asset recovery software - Mobile Computing

The AOC approved software for mobile computing Enterprise Security asset recovery and tracking software is ComputracePlus Build #789 release April 20, 2004.

8.1.2.6 Enterprise Security physical security - Mobile Computing

The AOC approved hardware device for mobile computing Enterprise Security physical security is a cable lock that will secure a typical mobile computing device equipped with a chassis security slot. The cable lock shall be equipped with a four number tumbler combination lock.

8.1.3 Enterprise Security – Server

The term Enterprise Security Server represents a collection of technologies that perform specific tasks related to data security on the user's desktop.

8.1.3.1 Enterprise Security Base Standards – Server

The AOC standard for Enterprise Security Server is antivirus corporate edition for the server; firewall appliance; and proxy server.

8.1.3.2 Enterprise Security Antivirus Software – Server

The AOC approved software for Server Enterprise Security is Symantec's antivirus corporate edition 9.1 for the server.

8.1.3.3 Enterprise Security Firewall Appliance – Server

The AOC approved firewall appliance for Server Enterprise Security is Checkpoint Firewall NG with Application Intelligence Checkpoint Firewall NG with application intelligence release 54, Build #540000315. (June 2004)

8.1.3.4 Enterprise Security Proxy Server – Server

The AOC approved Proxy Server for Server Enterprise Security is BlueCoat HW/SW appliance, version 3.2.4.8 release ID 22001 (12/13/04) for the purpose of web content filtering, kiosk lockdown and site blocking.

8.1.4 Enterprise Security – email

The term Enterprise Security email represents a collection of technologies that perform specific tasks related to data security with email.

8.1.4.1 Enterprise Security Base Standards – email

The AOC standard for email Enterprise Security is Guinevere, Symantec's antivirus for email; Checkpoint Firewall; anti-spam filter, Site blocking filter, and Content Filter for email and web mail.

8.1.4.2 Enterprise Security Software at the MTA – email

The AOC approved security software at the MTA is Guinevere version 2.0.15

8.1.4.3 Enterprise Security antivirus Software at the SMTP Gateway – email

The AOC approved security software at the IronPort gateway is SOPHOS version 3.88 or above (the engine is automatically updated on a monthly basis.)

8.1.4.4 Enterprise Security Firewall Software – email

The AOC approved security firewall software is Checkpoint Firewall NG with application intelligence release 54, Build #540000315. (June 2004)

8.1.4.5 Enterprise Security Anti-spam and Content Filter Software – email

The AOC approved content filter for email and anti-spam software is the IronPort HW/SW appliance, 3.8.4-003 (11/03/04).

8.1.4.6 Enterprise Security Encryption Software – email

The AOC approved encryption software for email is PGP Enterprise version 8.0.3.

8.1.5 Enterprise Security – Miscellaneous Client Software

The term Enterprise Security Miscellaneous Client Software represents a collection of technologies that perform specific tasks related to client.

8.1.5.1 Enterprise Security Base Standards – Client

The AOC standard for miscellaneous client Enterprise Security is forensics software, file/directory/volume level encryption and Certification and Accreditation.

8.1.5.2 Enterprise Security forensics – Client

The AOC approved forensics application for Client Enterprise Security is EnCase version 4.2.0 (10/27/04) for forensics investigations.

8.1.5.3 Enterprise Security file/directory/volume level encryption – Client

The AOC approved file/directory/volume level encryption for Client Enterprise Security is PGP Enterprise 8.0.3.

8.1.5.3 TrustedAgent FISMA – Enterprise

The AOC approved Certification and Accreditation reporting tool is TrustedAgent FISMA.

9. Distributed Computing Services

Distributed computing services provide the functionality that links multiple separate nodes into one distributed system. They include network services, invocation services, location services, security services and system coordination services. They also include services that enable applications to "cooperate" to create common multiple end-user activities. Typical services include transaction processing managers; enhanced messaging services (e.g., event management, reliable message queues); and workflow managers, agents, and encapsulation facilities. Distributed processing services include:

- Distributed processing services
- Transaction processing services

9.1 Distributed Processing Services

Distributed processing requires coherent models of distributed computing. Many such models have been created in the research community over the last decade, some of which have been implemented in commercial products. Two prominent examples are distributed database management and the client-server computing model. Use of distributed computing models will provide part of the framework in which infrastructure services can be linked to enable development of applications.

Distributed processing services provide specialized support for applications that may be physically or logically dispersed among computer systems in a network yet wish to maintain a cooperative processing environment. The classical definition of a computer becomes blurred as the processes that contribute to information processing become distributed across a facility or a network. As with other cross-cutting services, the requisite components of distributed computing services typically exist within particular service areas.

9.2 Transaction Processing Services

Transaction processing services provide support for on-line processing of information in discrete units called transactions with the assurance that a consistent state if attained at the end of the transaction. A transaction is a complete unit of work, which typically will modify shared resources. Thus, in the case of error or conflict, a transaction must be capable of being rolled back (i.e., undone) at any stage. When a transaction is completed without failure, it is committed. Transactions provide the mechanism for concurrent data access, load balancing across multiple systems, failure recovery, data integrity, and resource allocation.

Transaction processing services are usually implemented via a transaction manager which provides the mechanisms for encapsulation computational activities in a transaction, recording the state prior to the transaction, tracking and validating the transaction, and rolling back to a prior consistent state in the event of transaction failure.

A distributed transaction is a transaction that spans more than one information system. For example, one transaction may have individual operations sent to several different systems. These operations may be required to communicate among themselves with respect to transfer of data,

error notification, synchronization of activities, commitment of results, and rollback in the event of failure of any operation.

9.2.1 Transaction Processing Base Standards

The AOC Standards for Transaction Processing is Tuxedo TP monitor

9.2.2 Transaction Processing Software

Tuxedo TP Monitor.

10. Hardware

The section describes the hardware Standards needed by the AOC.

10.1 Servers

A server is a computer or device on a network that manages network resources. Any user on the network can store files on the server. Servers are often dedicated, meaning that they perform no other tasks besides their server tasks. On multiprocessing operating systems, however, a single computer can execute several programs at once.

10.1.1 File Server

A file server is a computer and storage device dedicated to storing files across a network.

10.1.1.1 File Server Base Standard Operating Systems

Novell Netware 6.0, MS Windows Server 2003, Sun Solaris (Unix), AS/400.

10.1.2 Web Server

A Web server serves static content to a Web browser by loading a file from a disk and serving it across the network to a user's Web browser. This entire exchange is mediated by the browser and server talking to each other using HTTP.

10.1.2.1 Web Server Base Standards

Must be able to run the UNIX operating system, Windows 2000/2003 Server IIS operating system.

10.1.3 Application/Data Base Servers

An **Application Server** is a server on a LAN that performs data processing. In a two-tier client/server environment, typically the application server does the database processing (DBMS), and the client machine performs the business logic. In a three-tier client/server environment, typically an independent application server performs the business logic. An application server can also be used to contain applications (software) shared by network clients. In this case, it functions as a remote disk drive for storing applications.

A **Database Server** is a computer on a LAN dedicated to database storage and retrieval. The database server is usually a critical component in a client/server environment. It holds the database management system (DBMS) and the databases. Upon requests from the client machines, it searches the database for selected records and passes them back over the network. A database server and file server may be one in the same, but database servers are typically dedicated to database use only.

Application servers and database servers can vary in size from small workgroup servers to powerful enterprise servers. Enterprise servers are generally used to provide services for applications or databases shared by several agencies, or to a large number of users in a single agency.

10.1.3.1 Application/Database Server Base Standards

Must be able to run the UNIX operating system, Windows NT, or Windows 2000 Server operating system.

10.1.3.2 Application/Database Server Hardware

High-end servers are recommended for mission critical services. Fault tolerant, hot swappable, and redundant components should be utilized when application requirements call for high availability.

There are various models of Sun Solaris and Compaq servers that will meet the varying requirements of the AOC.

10.2 Personal Computer

A small, relatively inexpensive computer designed for an individual usage.

10.2.1 Desktop Workstations

A personal computer that sits on a user desk and is not portable.

10.2.1.1 Desktop Workstations Base Standards

The AOC standard is Windows Intel based platforms

10.2.1.2 Desktop Workstations Hardware

The hardware the AOC uses is Omnitech.

10.2.2 Laptops and Notebooks

A small, portable computer -- small enough to “fit on a lap”.

10.2.2.1 Laptops and Notebooks Base Standards

The standard is Windows Intel based platforms

10.2.2.1 Laptops and Notebooks Hardware

The hardware the AOC uses is Dell.

10.5 Telecommunications

This section describes the telecommunications standards for the AOC.

10.5.1 Network Hardware Components

The communications infrastructure is the most important component in the delivery of consistent, high quality services across the enterprise.

The communications equipment infrastructure consists of hubs, routers, CSU/DSU’s, remote access servers, network interface cards, and modems.

The AOC Intranet consists of Cisco and Enterasys routers and switches. However, the AOC is migrating to a pure Cisco environment.

10.5.1.1 Network Hardware Base Standards

AOC networks are Ethernet 802.3 compliant.
The approved standard is: SNMPv1, SNMPv2 compliant

Additionally, all devices should be SNMP manageable.

Note: Dialups are being eliminated

10.5.1.2 Network Hardware

Resellers providing hardware compliant with the approved standards with Cisco being the preferred vendor.
Approved AOC network routers and switches are Cisco
Net SNMP is used as well

Appendix A - Glossary

This glossary provides definitions for many of the acronyms used throughout this document.

Term	Meaning
Enterprise Server	A hardware platform supporting one or more applications used by multiple clients within the enterprise accessing it via a LAN.
GIF	Graphic Interchange Format
LAN	Local Area Network
IP	Internet Protocol
JPEG	Joint Photographic Experts Group
ODBC	Open Data Base Connectivity: A Microsoft specification for allowing access to different databases
OSI	Open System Interconnect
PDF	Portable Data Format
SSL	Secure Socket Layer
TCP	Transmission Control Protocol
TIFF	Tag Image File Format
TRM	Technical Reference Model
VPN	Virtual Private Network
WAN	Wide Area Network

Appendix B - Access Information

This appendix contains the URLs for companies providing technology that is used by the AOC or for organization that manage standards to that are adhered to by the AOC in its enterprise systems architecture.

Adobe Corp.	http://www.adobe.com
Corel	http://www.corel.com
Institute for Electrical and Electronic Engineers	http://www.ieee.org
Microsoft Corporation	http://www.microsoft.com
World Wide Web Consortium	http://www.w3.org

Appendix C - Technical Reference Manual Standards

TRM Ref	Standard Type	Standard	Version
4.1.1.1	Image Processing Base	JPEG, GIF, TIFF, BMP	
4.1.1.2	Image Processing Software	Adobe Photoshop	6 or higher
4.1.2.1	Video Processing Base	QuickTime, AVI, MPEG2, MPEG4	
4.1.2.1	MPEG2 and MPEG4 reference documents	ISO/IEC 13818-1;2000	
		ISO/IEC 13818-2;2000	
		ISO/IEC 13818-4;1998	
		ISO/IEC TR 13818-5;1997	
		ISO/IEC 13818-5;1998	
		ISO/IEC 13818-7;1997	
		ISO/IEC 13818-9;1996	
		ISO/IEC 13818-10;1999	
4.1.2.2	Video Processing Software	Windows Media Player	7 or higher
		Apple QuickTime for Windows	6 or higher
		Real Networks Real Player	7 or higher
4.1.3.1	Audio Processing Base	AVI, MPEG3, WAV	
4.1.3.2	Audio Processing Software	Real Networks Real Player	7 or higher
		Windows Media Player	7 or higher
4.1.4.1	Document Processing Base	Postscript	2 or higher
		Adobe PDF	
		Specialized formats for TSD:	
		Bentley's .DGN	
		.CGM	
		.SVF	
4.1.4.2	Document Processing Software	Adobe Acrobat	5 or higher
4.1.5.1	Video Conferencing Base	H.320, G.711, G.722, G.728, H221, H261	
4.1.5.2	Video Conferencing Software	Polycom	
4.2.1.1	Formatted Data Exchange Base	WC3's XML	2 or higher
4.2.2.2	Graphics Data Exchange Software	Bentley Publishing	
4.2.4.1	Electronic Mail Base	MAPI	
4.2.4.2	Electronic Mail Software	Novell GroupWise	6 or

			higher
4.3.1.1	Database Management System Base	DBMS Logical Data Models	
4.3.1.2	Database Management System Software	Oracle	8 or higher
		MS SQL Server	6.5 or higher
		MS Access	2002 or higher
4.3.2.1	Query Processing Base Standards	SQL-92	
4.3.2.1	Query Processing reference documents	ISO/IEC 9075-1:1999	
		ISO/IEC 9075-1/Amd1:2001	
		ISO/IEC 9075-2:1999	
		ISO/IEC 9075-3:1999	
		ISO/IEC 9075-4:1999	
		ISO/IEC 9075-5:1999	
		ISO/IEC 13249-x:2000	
4.3.2.2	Query Processing Software	MS SQL Server	2000 or higher
		Oracle	9i or higher
4.3.3.1	Database Report Writing Software	Brio Report Writer	8 or higher
4.3.4.1	Distributed Data Support	Oracle	9i or higher
		SQL 2000	
4.4.1.2	Web Publishing Software	CommonSpot	3.2 or higher
4.1.1.4	Web Browsing Software	MS Internet Explorer	6 or higher
4.4.2.2	Web Server Software	Unix – Apache Tomcat	4.1 or higher
		Cold Fusion MX (JRUN)	
		Windows – MS IIS	5 or higher
4.4.2.4	Content Manager Software	CommonSpot	3.2 or higher
4.4.2.6	Server Side Scripting Software	JavaScript	
4.4.3.1	Web Development Software	Cold Fusion	5 or higher
4.5.1.2	Word Processing Software	MS Word 2002 or higher	
		Corel Office Suite	9 or higher
4.5.2.2	Presentation Software	MS PowerPoint 2002 or higher	

4.5.3.1	Graphics Base	MS Visio 2000 or higher	
		Bentley Microstation 8 or higher	
4.5.3.2	Graphics Software	MS Visio 2000 or higher	
		Adobe Photoshop 6 or higher	
4.5.4.1	Spreadsheet Software	MS Excel 2002 or higher	
4.5.5.2	Personal Database Software	MS Access 2002 or higher	
4.6.2	Project Management Software Tools	MS Project 2002 or higher	
		Prolog (used by CMD)	
		Primavera (used by CMD)	
		PIC (Custom developed)	
4.7.2	Computer Aided Design Software	MicroStation	8 or higher
5.1.1	Object Management Services Base	C++, Java	
5.1.2	Object Management Services Software	J2EE	
5.2.2	DNS Software	**BIND DNS** server **version** 8.4	
5.3.1.1	Operating Systems Software – Desktop	Windows XP Professional	
5.3.2.1	Operating Systems Software - Servers	Sun Solaris	8 or higher
		MS Windows Adv Serv	2003 or higher
		AS/400	
		IEEE Std 1003.1-2001 (POSIX.1)	
5.3.2.1	Operating Systems Software – Servers reference documents	MS Windows Adv Serv	2003 or higher
5.3.3	Network Software	Novell Netware 6 or higher	
		Palm OS, Blackberry OS	
5.3.4	Handheld Operating System Base	RFC 959, 1639, 1579, 2577	
6.2.1.1	File Transfer (FTP) Base reference documents	Ipv4	
6.2.3.1	Internet Addressing and Transmission Control Base	IPv6	
		RFC 791, 2460, 2373, 2529, 793	
6.2.3.1	Internet Addressing and Transmission Control Base reference documents	ISO/IEC 8802-3:2000(E)	

6.3.1	Network Transport Services – NonSecure reference documentation	ISO/IEC 8802-11:1999	
		802.11b and g	
6.3.1.1	Network Transport Services – NonSecure Base	802.1x	
		FDDI	
		Gigabit	
		DWDM	
		FibreChannel	
		SSL 3.0 Encryption	
6.3.2.1	Secure Transport Base Standards	VPN	
		SHTTP	
		Checkpoint Secure Client	
6.4.2	User Side Software	802.11b	
6.5.1.1	Personal Wireless Base Standards	RIM 957 wireless handheld	
6.5.1.2	Personal Wireless Software/Hardware	RIM 6750 wireless email and phone	
		RFC 2578, 2579, 2580	
7.1.1.1	Network Management Base	HP Openview NNM 7.X	
7.1.1.2	Network Management Software	Class B and Class C IP licenses	
7.1.2.1	Domain Name Services Base	Novell NDS	
7.1.2.2	Domain Name Services Software	MS Windows XP DNS Client	
7.2.1.1	Configuration Management Software	CiscoWorks	
7.2.2.2	Performance and fault Management Software	Compaq Insight	
		Zenworks for workstations	
		Zenworks for servers	
		HPOpenview 7.X Network Node Manager	
		EasyVista - PC	
7.2.3.2	Asset Management Software	HP Openview 7.X NNM	8 or higher
		Compaq Insight - Server	
		Symantec Antivirus Corporate Edition	
8.1.1.2	Enterprise Security Software – Desktop	Symantec Antivirus Corporate Edition for desktop and server	8 or higher

8.1.2.2	Enterprise Security Software – Server	Checkpoint Firewall NG with feature pack 2, build 520146	2.013 or higher
		Genevieve	
8.1.3.2	Enterprise Security Software - email	Symantec Antivirus	7.6 or higher
		Checkpoint Firewall NG with feature pack 2, build 520146	
		Tuxedo TP Monitor	
9.2.2	Transaction Processing Software	MS Windows Advanced Server 2003 or higher	
10.1.1.1	File Server Base Standard Operating Systems	Sun Solaris (Unix)	
		AS/400	
		Must be able to run:	
10.1.2.1	Web Server Base Standards	Unix Operating System	
		Windows XP Professional	
		Windows 2000 Server or higher	
		Windows Intel Based platforms	
10.2.1.1	Desktop Workstation base standard	Omnitech, DELL	
10.2.1.2	Desktop Workstation hardware	Windows Intel Based platforms	
10.2.2.1	Laptops and Notebooks Base	Dell	
10.2.2.2	Laptops and Notebooks Hardware	Ethernet 802.3	
10.5.5.1	Network Hardware Base	SNMPv1	
		SNMPv2	
		Cisco	
10.5.1.2	Network Hardware	Net SNMP	
		SPSS	12 or higher
	Statistical Analysis Software		

APPENDIX 8: COMPUTER OPERATING SYSTEM SECURITY REQUIREMENTS

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1 COMPUTER OPERATING SYSTEM SECURITY

The level of security required for computer operating systems installed at US Government installations is described in the US Government Standard "US Department of Defense Trusted Computer System Evaluation Criteria (DoD 5200. 28-STD), also known as the Orange book. The following sections provide a description of C2 compliance and the basics of "Trusted Computer Systems" Multiple Level Security Compliance, however the complete standard should be obtained from the US printing office.

1.1 Class C2: Controlled Access Protection

Systems in this class enforce a more finely grained discretionary access control than (C1) systems, making users individually accountable for their actions through login procedures, auditing of security-relevant events, and resource isolation. The following are minimal requirements for operating systems assigned a class (C2) rating.

1.2 Discretionary Access Control

The TCB shall define and control access between named users and named objects (e.g., files and programs) in the ADP system. The enforcement mechanism (e.g., self/group/public controls, access control lists) shall allow users to specify and control sharing of those objects by named individuals, or defined groups of individuals, or by both, and shall provide controls to limit propagation of access rights. The discretionary access control mechanism shall, either by explicit user action or by default, provide that objects are protected from unauthorized access. These access controls shall be capable of including or excluding access to the granularity of a single user. Access permission to an object by users not already possessing access permission shall only be assigned by authorized users.

1.3 Object Reuse

All authorizations to the information contained within a storage object shall be revoked prior to initial assignment, allocation or reallocation to a subject from the TCB's pool of unused storage objects. No information, including encrypted representations of information, produced by a prior subject's actions is to be available to any subject that obtains access to an object that has been released back to the system.

1.4 Identification and Authentication

The TCB shall require users to identify themselves to it before beginning to perform any other actions that the TCB is expected to mediate. Furthermore, the TCB shall use a protected mechanism (e.g., passwords) to authenticate the user's identity. The TCB shall protect authentication data so that it cannot be accessed by any unauthorized user. The TCB shall be able to enforce individual accountability by providing the capability to uniquely identify each individual ADP system user. The TCB shall also provide the capability of associating this identity with all auditable actions taken by that individual.

1.5 Audit

The TCB shall be able to create, maintain, and protect from modification or unauthorized access or destruction an audit trail of accesses to the objects it protects. The audit data shall be protected by the TCB so that read access to it is limited to those who are authorized for audit data. The TCB shall be able to record the following types of events: use of identification and authentication mechanisms, introduction or objects into a user's address space (e.g., file open, program initiation), deletion of objects, and actions taken by computer operators and system administrators and/or system security officers, and other security relevant events. For each recorded event, the audit record shall identify: date and time of the event, user, type of event, and success or failure of the event. For identification/authentication events the origin of request (e.g., terminal ID) shall be included in the audit record. For events that introduce an object into a user's address space and for object deletion events the audit record shall include the name of the object. The ADP system administrator shall be able to selectively audit the actions of any one or more users based on individual identity.

1.6 System Architecture

The TCB shall maintain a domain for its own execution that protects it from external interference or tampering (e.g., by modification of its code or data structures). Resources controlled by the TCB may be a defined subset of the subjects and objects in the ADP system. The TCB shall isolate the resources to be protected so that they are subject to the access control and auditing requirements.

1.7 System Integrity

Hardware and/or software features shall be provided that can be used to periodically validate the correct operation of the on-site hardware and firmware elements of the TCB.

1.8 Security Testing

The security mechanisms of the ADP system shall be tested and found to work as claimed in the system documentation. Testing shall be done to assure that there are no obvious ways for an unauthorized user to bypass or otherwise defeat the security protection mechanisms of the TCB. Testing shall also include a search for obvious flaws that would allow violation of resource isolation, or that would permit unauthorized access to the audit or authentication data. (See the Security Testing guidelines).

1.9 Security Features User's Guide

A single summary, chapter, or manual in user documentation shall describe the protection mechanisms provided by the TCB, guidelines on their use, and how they interact with one another.

1.10 Trusted Facility Manual

A manual addressed to the ADP system administrator shah present cautions about functions and privileges that should be controlled when running a secure facility. The procedures for examining and maintaining the audit files as well as the detailed audit record structure for each type of audit event shall be given.

1.11 Test Documentation

The system developer shall provide to the evaluators a document that describes the test plan, test procedures that show how the security mechanisms were tested, and results of the security mechanisms' functional testing.

1.12 Design Documentation

Documentation shall be available that provides a description of the manufacturer's philosophy of protection and an explanation of how this philosophy is translated into the TCB. If the TCB is composed of distinct modules, the interfaces between these modules shall be described.

1.13 Multiple Level Security (MLS) Basics

The following document provides an introduction to the security required by the US Department of Defense Trusted Computer System Evaluation Criteria.

2 MULTILEVEL SECURITY IN THE DEPARTMENT OF DEFENSE: THE BASICS

This document was edited by the DoD Multilevel Security Program.
This document is releasable to the public.
1 March 1995

2.1 Preface

The Basics provides an explanation of multilevel security (MLS) technology and its operational capabilities for program managers, action officers, and others who are faced with the task of determining if and how MLS technology could be beneficial in their information systems. It contains a set of MLS

Dos and Don'ts that can guide readers in their pursuit of MLS capabilities.

This document also introduces the Department of Defense (DoD) MLS Program.

In addition to the program's mission and goals, this document describes the primary MLS capabilities that the program is developing and deploying. This document consists of four sections and an appendix. Section 1 introduces MLS. Section 2 discusses the DoD MLS Program. Section 3 discusses the concepts associated with MLS and introduces the basic MLS technologies that can provide MLS capabilities. Section 4 offers guidance for greater success in achieving MLS capabilities. The appendix presents a short list of acronyms.

2.2 Introduction

A significant challenge exists throughout the Department of Defense (DoD) in getting mission-critical and time-sensitive information into the hands of people who need it. All too often, the information resides in information systems that do not provide access to persons outside the immediate community of interest.

The DoD relies on information systems to support the missions of nearly every organization. In most cases today, information is protected at the highest classification level of the data in

the system, the system-high level. Thus, the information is not readily accessible by persons not cleared to the system-high level, even though the information being sought may be of a lower classification level and thereby releasable to the requester. Operating information systems in this manner often results in the over-classification of data, over-clearing of personnel, and system redundancies and inefficiencies. This situation commonly exists throughout the DoD. What is needed is a means by which the actual security level of the information can be maintained and information can be appropriately protected, processed, and distributed. Users also need timely access to the data and the various processing and communications resources that they require to accomplish their jobs. The security constraints imposed by the system-high mode of operation on DoD information systems often result in less than effective operations. For example, tape, disk, and paper copy output are often manually reviewed, downgraded, and transferred through time-consuming and labor-intensive procedures among systems operating at different security levels. This method of data transfer is often inefficient and ineffective. It can also result in the inefficient use of personnel and resources, a condition that challenges the current downsizing requirements facing many government organizations.

In addition, staff members need to access and fuse data and other resources currently available on several systems to perform their duties. Each system generally has its own interface (e.g., via a specific set of terminals or workstations), requiring multiple terminals that take valuable space in command centers, offices, and computer rooms. Also, significant time and effort are needed to manually fuse data from different sources. The maintenance of redundant data bases is another unfavorable condition that results from using separate systems for each security level. Often a separate data base must be created and maintained for each security level processed. The use of these multiple data bases presents several operational problems. First, it fragments information. A collection of information regarding a specific event may be split across multiple systems of different security levels. Incomplete or misleading information may result unless pertinent data can be obtained from all related systems. Second, information of a lower classification may be unnecessarily upgraded in the higher level systems, resulting in its over-classification and consequent limited access. As a result, duplication and multiple classifications of the same information occurs. Third, the maintenance of multiple data bases is staff intensive and depletes other system resources. Because the data may change continually, updating data bases often results in inconsistent views of the current information across different levels. The constantly changing nature of the data, combined with human updating, often results in outdated information at one or more of the security levels. Another difficulty when multiple systems operate at different security levels is the inability to share the computer and communication system infrastructures, such as cabling, network components, printers, workstations, and hosts. If sharing these resources were possible, equipment, operations, and maintenance costs would decrease. Multilevel security, or MLS, is a capability that allows information with different sensitivities (i.e., classification and compartments) to be simultaneously stored and processed in an information system with users having different security clearances, authorizations, and needs to know, while preventing users from accessing information for which they are not cleared, do not have authorization, or do not have the need to know. MLS capabilities often can help overcome the operational constraints imposed by system-high operations and can foster more effective operations. For example, systems once separated by an airgap or connected only by a sneaker net may be electronically interconnected by an MLS guard, allowing the data transferred to be current rather than merely historical in value. Additionally, staff members who once had to use several different terminals for day-to-day operations may now access the systems they need from an MLS workstation, allowing a single, secure interface to the systems they use.

MLS guards and MLS workstations can be used to bridge security boundaries between existing single-level systems. Ideally, information systems themselves will become MLS systems to provide more integrated multilevel capabilities for users. MLS hosts, MLS networks, and MLS data base management systems (DBMS) can provide common data processing and data transfer platforms to serve as the foundation for MLS systems. A larger community that once may have been segregated for security reasons may be electronically integrated to more effectively and efficiently execute its collective mission.

MLS technology is real and in use today. As the technology evolves with the computer and communications industry, its capabilities will provide the DoD with increasing mission effectiveness. MLS is a significant enabling technology for command, control, communications, and intelligence systems because it enhances the availability of information while maintaining security. For this reason, it is important to understand what capabilities MLS can provide and to integrate those capabilities into DoD information systems now and into the next century.

2.3 The DoD MLS Program

The DoD MLS Program provides a focal point within the DoD to promote the development and implementation of MLS solutions for information systems. The mission of the program is to expedite the fielding of MLS capabilities in the DoD. The goal of the program is to develop, acquire, and deploy solutions and technologies that will allow the DoD to meet operational requirements for MLS in its automated information systems. The program accomplishes this goal through the following activities:

- Planning, coordinating, reviewing, and assessing MLS efforts throughout the DoD to provide synergy and to reduce duplication of effort

- Developing and assessing MLS technology for widespread application through approved architectures

- Providing engineering assistance to the DoD to expedite the transfer of MLS capabilities from testbeds to operational systems

The program is managed by the Defense Information Systems Agency/Joint Interoperability and Engineering Organization/Center for Information Systems Security, with the sponsorship and oversight from the Assistant Secretary of Defense for Command, Control, Communications, and Intelligence and the Joint Staff. The National Security Agency (NSA) is the security technical coordinator for the program, and the Defense Intelligence Agency is the intelligence coordinator. This combination brings the resources and capabilities of the key DoD information systems security (INFOSEC) organizations together to meet the challenges faced when developing and deploying MLS capabilities.

The DoD MLS Program provides the following products, services, and capabilities to DoD organizations. Technology Surveys and Assessments. Technical and operational assessments of the MLS marketplace and its utility. Surveys and Assessments Available Today:

- Trusted Workstation Survey and Assessments
- Xerox Encryption Unit Assessment
- Loral Multinet Gateway MLS-100 Assessment
- Secure Network Demonstration
- SecureWare MaxSix Assessment

Surveys and Assessments Scheduled for Fiscal Year (FY) 94:

- Trusted Host and Workstation Survey
- Trusted DBMS Survey
- Trusted Network Survey
- MLS Guard Survey

MLS Solution Sets. A set of government off-the-shelf and commercial off-the-shelf near-term solutions to common requirements for MLS (discussed in greater detail in Section 2.4 - The MLS Environment):

- Standard Guards
- Operations (OPS)/Intelligence (INTEL) Interface
- MLS Workstations.

System Security Profiles. A repository of security-related assessments of MLS products and configurations to streamline the certification of MLS solutions. These profiles draw on previously tested, assessed, and evaluated configurations to assist in the system certification and accreditation process.

MLS Assistance. A wide range of MLS technical and programmatic support to DoD organizations:

- MLS requirements analysis, solution identification, security policy definition, and concept of operations development
- Certification and accreditation planning, analysis, and testing
- Project review and other consultation (e.g., MLS help desk)

MLS Deployments. Installation and integration of MLS solution sets at the Unified Commands and other high-priority commands.

MLS Demonstration and Assessment Center. A facility dedicated to investigating the application of MLS products and technology to fulfill DoD operational requirements. The MLS Demonstration and Assessment Center:

- Assesses existing emerging MLS products and technology
- Advances new approaches to MLS
- Provides a neutral demonstration environment for MLS vendors
- Maintains a DoD-wide perspective on MLS solutions.

The DoD MLS Program provides solutions to resolve interoperability problems between

existing system-high environments. The program offers expertise, technologies, and capabilities to help DoD organizations solve similar problems.

2.4 The MLS Environment

This section defines characteristics and components of the MLS environment. It explains the operational requirements for MLS technology and the problems the DoD faces with its current systems. It explores potential MLS solutions, emphasizing the need to implement an incremental approach that builds toward a full MLS capability.

Multilevel security allows information systems to provide capabilities that augment its existing single-level data processing and data communications services. Data of multiple security levels are processed and transferred by the system, which also separates the different security levels and controls access to the data. Applications are provided, much in the same way that they exist today, so that users can access, process, modify, store, and transfer data. For example, office automation (e.g., word processing, electronic filing, spreadsheets), data base management, data fusion, modeling and simulation, briefing and display, command and control, and decision support applications are needed as much in an MLS system as they are in existing single-level systems. Some applications process only one level of data at a time, such as when a user edits a document with a word processing tool. In this case, the data in the document are treated as if they were a single level, the classification of the document itself. More complex applications could be provided that treat individual data elements at their actual levels. For example, a word processor could enforce paragraph and page labels, or an MLS data base could bring together data elements of different security levels to allow an analyst a multilevel view of the information.

With the concept in mind that MLS systems can provide capabilities similar to existing, single-level applications, but for data of multiple security levels, one can understand the multilevel mode of operation and the basic building blocks that form MLS systems.

2.4.1 Multilevel Mode of Operation

In the DoD, a system's security operations are characterized according to minimum user clearances and the maximum security levels of data either processed or transferred by the systems. According to these characteristics, the DoD defines the following four modes of operation:

- Dedicated
- System high
- Partitioned (or compartmented)
- Multilevel.
- Restrictions on the user clearance levels, formal authorization requirements (i.e., for access to special access programs, compartmented information, and other close-hold data), need-to-know requirements, and the range of sensitive information permitted on the system are inherent in each of these security modes.

The following chart illustrates the characteristics of each mode of operation. As one progresses from the dedicated and system high modes to the partitioned and multilevel modes, there is a shift from providing security using physical controls, administrative procedures, and personnel security to using computer security, communications security, and trusted system techniques. Each mode of operation requires the use of security features to

provide the required level of protection. The dedicated mode (where all users possess clearance levels greater than or equal to the highest level of data to be processed, all users have formal authorization, and all users have the need to know for the data) has the fewest security requirements, followed by system high, then partitioned and multilevel, which require the most security protection because there is an increasing risk that insufficiently cleared persons may gain access to data for which they lack authorization.

When a system operates in the multilevel mode, it allows data of two or more security levels to be processed simultaneously when not all users have the clearance, formal authorization, or need to know for all data handled by the system. The system is able to separate and protect the data according to these restrictions.

To amplify the definition, an MLS system might process both Secret and Top Secret collateral data and have some users whose maximum clearance is Secret and others whose maximum clearance is Top Secret. Another MLS system might have all its users cleared at the Top Secret level, but have the ability to release information classified as Secret to a network consisting of only Secret users and systems. Still another system might process both Secret and Unclassified information and have some users with no clearance.

In each of these instances, the system must implement mechanisms to provide assurance that the system's security policy is strictly enforced. In these examples, the policy allows access to the data by only those users who are appropriately cleared and authorized (e.g., having formal access approval) and who have an official need to know for the data.

A related mode of operation is the partitioned mode, also known as compartmented mode. Although similar concepts and solutions are involved for compartmented mode operations as are for the multilevel mode, there is also a key difference. In the compartmented mode, all users have clearances for all the data processed but may not have authorizations for all the data; whereas for multilevel mode, some users may not even be cleared for the highest level. Because the compartmented mode is often envisioned for the intelligence community, all such users would have Top Secret security clearances and often authorizations for one or more, but possibly not all, compartments in the system.

DoD security regulations state that systems must receive approval to operate (in a particular mode) from their accreditation authorities. This approval is also known as an accreditation and indicates that the cognizant authorities have accepted the evidence that the system has sufficient features and assurance to allow operations while maintaining an acceptable level of risk. Only certain trusted technology provides the features and assurances required by the accreditation authorities for multilevel mode operations. The next section focuses on that technology.

2.4.2 Trusted Computer System Evaluation Criteria

The trusted computer system evaluation criteria defined in DoD 5200. 28-STD, also known as the Orange Book because of its bright orange cover, classifies systems into four broad hierarchical divisions of increasing security protection. The criteria provide the basis for evaluating the effectiveness of the security controls built into the products used in information systems.

The criteria were developed to provide users a measure with which to assess the degree of trust that can be placed in computer systems for the secure processing of classified or other

sensitive information. In general, secure systems will control, through the use of specific security features, access to data such that only properly authorized individuals, or processes operating on their behalf, will have access to read, write, delete, or execute data.

The criteria are divided into four divisions -- D, C, B, and A -- ordered in a hierarchical manner with the highest division (A) reserved for systems providing the most comprehensive security. Each division represents a major increase in the overall confidence, or trust, that one can place in the system. Successive levels of trust build upon and incorporate the criteria of the previous lower level of trust.

Within Divisions C and B there are a number of subdivisions known as classes. The classes are also ordered in a hierarchical manner with systems representative of Divisions C and B characterized by the set of computer security mechanisms that they possess. For Division C, so called discretionary protection is provided, whereby users can grant or deny access by other users and groups of users to the system resources that the users control. For Division B, mandatory protection is provided that, in conjunction with the discretionary protection, institutionalizes hierarchical access controls that can be used to separate and protect data of different security levels. Division A also provides the mandatory protection features.

Systems representative of the higher classes in Division B and Division A derive their security attributes more from their design and implementation structure than merely security features or functionality. Increased assurance that the required features are operative, correct, and tamperproof under all circumstances is gained through progressively more rigorous design, implementation, and analysis during the development process. Division A requires formal (e.g., mathematical) design and verification techniques to provide increased assurances over Division B. Four major sets of criteria apply to each class. The first three sets represent features necessary to satisfy broad control objectives of security policy, accountability, and assurance. The fourth set, documentation, defines the type of written information such as user guides, manuals, and the test and design documentation required for each class.

MLS capabilities are associated with Division B and A products. In these classes, security mechanisms are in place to ensure that only authorized users with clearances and need to know can access the data. Assurances to increase confidence that the mechanisms are functioning securely increase in the higher classes; B2, B3, and A1 class components offer progressively more assurance than do B 1 class components. The following table summarizes the key characteristics of each class. The security requirements increase as the division and class increase. The dashed line shows division where MLS capabilities are introduced into the criteria (i.e., in divisions A and B). The reader should explore DoD 5200. 28-STD for more information on the levels of trust.

The NSA has also published interpretations of the trusted systems criteria that apply to other components such as networks, data base management systems, and other computer subsystems. The levels of trust defined in DoD 5200. 28-STD, however, are not directly applicable to systems, but solely to components in systems. Products that the NSA has evaluated and that meet these criteria are recorded in the Evaluated Products List in NSA’s Information Systems Security Products and Services Catalogue, which is updated and published quarterly.

Not all MLS products are formally evaluated and placed on the Evaluated Products List. However, most MLS products are built according to the DoD 5200. 28-STD criteria or an

interpretation, and some measure of assurance may be derived for those products as well.

Division	Class	Title	Key Characteristics
D	N/A	Minimal Protection	None (a rating given to products that do not meet all of the criteria of another class)
C	C1	Discretionary Security Protection	Discretionary Access Control, User Authentication
C	C2	Controlled Access Protection	All of C1, plus Audit Trails, Individual Passwords, Object Reuse
B	B1	Labeled Security Protection	All of C2, plus Labels, Mandatory Access Control, Informal Security Policy Model
B	B2	Structured Protection	All of B1, plus Structured Trusted Computing Base (TCB), Trusted Path, Covert Channel Analysis, Penetration Resistance Configuration Management
B	B3	Security Domains	All of B2, plus Formal Security Policy Model, Minimal and Tamperproof TCB, Trusted Recovery, Substantial Documentation
A	A1	Verified Design	All of B3, plus Formal Specification, Formal Design Verification, Trusted Distribution

The NSA has also published interpretations of the trusted systems criteria that apply to other components such as networks, data base management systems, and other computer subsystems. The levels of trust defined in DoD 5200. 28-STD, however, are not directly applicable to systems, but solely to components in systems. Products that the NSA has evaluated and that meet these criteria are recorded in the Evaluated Products List in NSA's Information Systems Security Products and Services Catalogue, which is updated and published quarterly.

Not all MLS products are formally evaluated and placed on the Evaluated Products List. However, most MLS products are built according to the DoD 5200. 28-STD criteria or an interpretation, and some measure of assurance may be derived for those products as well.

2.4.3 MLS Concept of Operations

The introduction of MLS capabilities in an existing organization will result not only in changes in effectiveness and security of operations, but also in the manner business is conducted using information systems. MLS affects business processes in many ways, from providing users with multilevel views of data that they previously accessed separately, to maintaining electronic sensitivity labels (e.g., classification markings, handling restrictions) on data that are processed and transferred by the system. Although the specific effects MLS technology has on the manner in which users work will depend on numerous factors (e.g., the specific technology used, the specific application software applied, and the business processes themselves), the general impact of MLS on operations is summarized in the following paragraphs.

All data must be properly labeled as to their classification (Sensitivity Labels) and other handling restrictions if an MLS system is to properly control access to the data. In system-high operations, a user may create data (e.g., create a message on a word processor) that have security levels equal to or less than the system-high level, but all data must be protected at the system-high level until they are reliably reviewed for their actual classification and removed from the system. In many MLS systems, users make decisions at login time as to the security level at which they want to operate, knowing that files created during the session will be labeled according to their session security level. In MLS systems with multilevel windowing capabilities, the user must also make conscious decisions as to the security level of data at the time of the data's creation, rather than afterwards. This type of decision needs to be made often, for example, when composing an electronic mail message, creating a document, entering data into a data base, and creating graphs and charts.

In the partitioned or compartmented mode, information labels are companions to sensitivity labels. Where sensitivity labels indicate the overall classification of a data container, such as a file or a window on the computer screen, information labels represent the actual security level of the data within the container. Access control decisions (e.g., whether a user is allowed to access a file) are made based on sensitivity labels; information labels are referenced by users to determine the actual classification of the data viewed.

MLS systems offer users the ability to process and transfer data (Multilevel Processing) of more than one security level while maintaining control of the data according to their sensitivity. Users could, for example, edit a Secret document, then edit an Unclassified document as part of a continuous session. In other cases, users may access multilevel data bases and have access to the information contained in them according to their security level. For example, an uncleared user may have access to only the Unclassified portions of a data base, while a Secret-cleared user may have access to Secret portions in addition to the Unclassified portions. Users would be able to share more synchronous and consistent information when multilevel data bases allow currently segregated collections of data to be securely combined. In general, multilevel processing capabilities will allow access to multiple levels of data from a single work position and use of a common set of data processing tools (e.g., word processors, decision support tools, data base management systems).

Planners considering MLS capabilities must remember that MLS does not eliminate the need for physical and personnel security for computers, networks, and other components that will process or transfer classified data. The components still contain the data in their memories and disks, and the data could be compromised if adequate physical security was not maintained.

2.4.4 Potential MLS Solutions

Achieving an MLS system solution to meet operational needs involves determining how to integrate the different stand-alone legacy information systems and networks into integrated and interoperable information systems. The resulting information systems should allow authorized users to simultaneously access multiple levels of classified data and to securely gain access to classified information originally maintained by the separate stand-alone information systems. Achieving this end is not the result of an instantaneous action. Attainment of an integrated MLS capability is predicated on the completion of the following:

- Developing system capabilities that allow systems, at differing classification levels, to interact

- Developing and acquiring MLS technology such as hosts, workstations, data base management systems, and networks
- Developing expertise and techniques for securely integrating the different components into MLS systems that meet operational requirements
- All the major components--the hosts, workstations, data base management systems, and networks--work together to separate and protect data of different security levels (e.g., classifications, compartments) from users of differing clearance levels. One noteworthy aspect of an MLS architecture is that not all components need to be trusted. Therefore, a typical system needing MLS capabilities might have only a few trusted components with the remainder being single level. This combination allows a more optimal balance between security and functionality to be achieved.

Successfully reaching such an MLS solution requires a strategy. The strategy for achieving an MLS capability requires an incremental approach that reduces development risks. Shown below is a recommended implementation strategy for integrating MLS capabilities to meet operational requirements.

Each increment introduces components that provide additional MLS capabilities. Together these components will construct MLS systems that allow for the processing of data of multiple classifications while providing the assurance that users of differing clearance levels only have access to data for which they possess the clearance, authorization, and need to know. Discussions of each of the component technologies follow.

2.4.4.1 MLS Hosts

An MLS host is the primary multiuser component of an MLS system. MLS hosts are the basic building blocks of MLS systems, and as such perform a variety of data processing and data transfer services, from functioning as file servers, mail servers, and print servers to serving as the platforms for system applications such as command and control systems, data base management systems, and decision support systems. MLS hosts are compositions of trusted operating systems running on any variety of hardware platforms, such as microcomputers, minicomputers, and mainframe computers. Several products have been evaluated by the NSA that can serve as MLS hosts and are currently available.

The operational value of MLS hosts derives from some high-assurance products available to serve MLS systems. High-assurance MLS hosts could be used to allow wide ranges of classified data and cleared users to access a system (e.g., up to Top Secret data with some users uncleared). Some products that could serve as MLS hosts, however, are not necessarily high assurance (e.g., some are B1 and B2 class products).

2.4.4.2 MLS Guards

MLS guards control the flow of information across security boundaries. They are often the initial step toward MLS because they can be relatively simple to achieve and can provide some of the interconnectivity required to bridge across the security boundaries of existing systems operating at different security levels. Several types of guards exist. They might or might not involve human review of the data flow and might support data flow in one or both directions. Guards generally do not allow full-capability usage of a system on one side of the guard by users from the other side, but rather support only limited types of data transfers. As previously illustrated, MLS guards partially break through the wall of security constraints that restrict the flow of data among systems operating at different security levels.

MLS guards can be implemented as one-way filters (e.g., allowing low-to-high or high-to-low data flow only) or as bidirectional filters for data traffic between systems. Low-to-high guards are available today and can be deployed with relatively low development risk. Low-to-high guards allow data flow from a lower classified system to a higher classified system without data flow in the other direction. This capability is useful when users of high systems need data from lower systems in electronic form in a timely manner. One-way, low-to-high guards may need to prevent the transfer of malicious code (e.g., viruses), of forged identifiers, and of intentional network flooding attempts that could result in denial of service conditions on the high side. Some of these guards have been successfully operational in various DoD organizations for several years. However, the most effective use of a guard is bidirectional, because a two-way flow of data allows more robust communication protocols and provides more reliable data transfer. For example, a one-way guard provides no receipt or acknowledgment for data transfers because such a receipt would violate the security policy rule governing the one-way flow of data.

The rules for high-to-low data flow are often more complex than those for low-to-high data flow, because the guards are required to enforce complicated and sometimes dynamic security policy (e.g., classification rules). Guards can be implemented to check whether the data bound for the low system is classified at the low system's security level. This check could be executed in several ways, such as by ensuring that the data are of a specific content or format, ensuring that the data do not contain any defined classified code words or phrases (e.g., "dirty words"), or even ensuring that the data have a specific sensitivity label. If the checks pass, the guard downgrades the data and passes them to the low system.

Guards can also be implemented to actually change the data (e.g., sanitization or downgrading). The guard could accept data from the high system and apply specific processes to the data to reduce their security levels to that of the low system before it downgrades the information and passes it to the low system. A human may be called into the process at any point necessary to review specific data and make decisions when the computer is unable. For example, free-form text found in electronic mail is beyond the ability of computers to check for classification. Humans may be needed to review such data for classification before they are released to the low system.

The ideal guard would be capable of correctly reviewing or sanitizing any form and content of data without human intervention. We are, however, a long way from that ideal guard. The technology that shapes the artificial intelligence necessary to review any given format, declare it safe, and assure the user that it was executed properly, is not currently available.

The DoD MLS Program is developing and deploying guards to partially meet common requirements for MLS in the near term. The Standard WWMCCS Guard provides a means for DoD organizations to extract Secret and less classified data from the Top Secret Worldwide Military Command and Control System (WWMCCS) which operates in the system-high mode, and to make that data available to users on Secret command and control systems. The guard reviews all data transfers according to the established classification rules to verify that the data passed are not classified Top Secret. It handles a wide range of high-to-low and low-to-high data transfers, including Time Phased Force and Deployment Data, Status of Readiness and Training System data, electronic mail, and teleconference messages. The guard has been certified and accredited by the Joint Staff for use with WWMCCS.

The DoD MLS Program is also developing and deploying another standard guard to meet common operational requirements in the near term--the Standard Mail Guard. The guard

allows users of existing Secret and Unclassified communities to securely exchange Unclassified electronic mail. The guard relies on users to review messages before they send them to verify that only Unclassified data are exchanged between the Secret community and the Unclassified community.

2.4.4.3 MLS Workstations

A workstation is a user terminal with its own processing and storage capabilities. It can be linked to a local area network that can provide a number of services (e.g. electronic mail, word processing, computation, and remote file access). MLS workstations are workstations that can separate and protect data of different security levels. Compartmented mode workstations (CMW) are the predominate type of MLS workstation and specifically meet the requirements set forth by the Defense Intelligence Agency to support multilevel and compartmented mode operations of intelligence analysts. CMWs provide a multilevel, multiwindowing capability that permits users to have windows of different security levels open simultaneously on their computer screens. This trusted multiwindowing capability is a critical element in making MLS workstations operationally effective.

The initial goal of an MLS workstation is to allow a user to access systems operating at different security levels simultaneously from a single position. The concept involves the MLS workstation with two network connections, one for the high side, another for the low side. An MLS workstation provides improved capability over a guard because it supports full capability usage of both high and low existing systems from one workstation. An MLS workstation should not affect the existing systems themselves but should provide a user enhanced access to the systems. Several current development efforts with MLS workstation technology meet these operational requirements.

In MLS workstations, the trusted multiwindowing capability can be used to support interaction with multiple systems or application software. The trusted workstations allow users to access systems and application software at different classification levels simultaneously and transfer data between security levels (if the user has the appropriate authority). For example, information can be transferred from the Secret system to the Top Secret system. Information from the Top Secret system can be sanitized or downgraded, if necessary, and sent to the Secret system after review. The users can also alternate working with both systems through the multiple windows.

The DoD MLS Program is developing and deploying MLS workstations not only to bridge different security levels in a command and control infrastructure, but also to enhance the data communications between intelligence organizations and the commands that they support. Using MLS workstations and other network security techniques, the program developed the OPS/INTEL Interface to facilitate more interaction between intelligence analysts and the command staff. The OPS/INTEL Interface provides capabilities to intelligence analysts to pull data from various intelligence resources, review and, if needed, sanitize the data, and electronically pass the data to collateral systems for further access and processing. The OPS/INTEL Interface also provides a means for requests for intelligence to be sent by command staff and electronically received by the intelligence analysts.

2.4.4.4 MLS Networks

A multilevel network is the logical next step to follow the installation of multilevel workstations. An MLS network can provide secure data communication services among

components in information systems. MLS networks can interconnect single-level and multilevel components on a shared network infrastructure by providing sensitivity labels and network security services for the data transferred between systems. MLS networks do not need to have any MLS hosts or workstations on them to make them effective solutions; the MLS networks may simply allow single-level hosts and workstations of different security levels to share a common infrastructure.

MLS network components are used for both local area networks and wide area networks, which are composed of numerous elements, such as cabling, terminal servers, bridges, routers, and gateways. In an MLS network, several of these elements are trusted to enforce the security policy for the network.

2.4.4.5 MLS Data Base Management Systems

MLS DBMSs provide the management, storage, and retrieval of multiple levels of related data, allowing users of different security levels to have access to a shared set of data according to their individual authorizations. For example, a DBMS server is accessible to both the Secret and Top Secret users. Top Secret cleared users have access to read the entire data base.

Secret cleared users are restricted to reading and writing within the confines of the Secret portion of the data base. Security mechanisms are in place to enforce this policy, including sensitivity labels for various data base constructs like tables, views, and records. MLS DBMSs manage and control user queries according to the security levels of the data and the user clearances. They can eliminate duplication of information on separate systems, resulting in more timely, consistent, and accurate data. MLS DBMSs will serve as the foundation for many applications in MLS systems.

2.4.4.6 MLS Systems

The ultimate goal of MLS is not simply to interconnect existing single-level systems operating at different security levels, or even to allow users to perform office automation functions at multiple security levels (albeit maintaining separation of data of different levels). Rather, the goal is to foster a truly multilevel environment, whereby a user can process data of multiple levels in a more integral manner.

Consider, for example, a multilevel document preparation system that allows a user to label individual paragraphs and section headings with their classifications. This system would accurately label pages according to the maximum classification of the paragraphs on the pages, and allow cutting and pasting among documents while still maintaining sensitivity labels and enforcing security rules so that more classified paragraphs are not included in less classified reports.

Another example involves a multilevel data base to direct and monitor military transportation, including points and times of embarkment and destination, transit route, crew information, and cargo information. This data base could be used to direct and track missions that are both unclassified and classified. However, because some information about the classified missions needs to be visible at the unclassified level, the MLS DBMS supporting this application would allow classified users to enter and retrieve both classified and unclassified data about the missions. By providing cover stories so that some information is available at the unclassified level, uncleared persons could coordinate for the arrival of aircraft requiring

specific off-loading equipment. The unclassified users of this system could have, then, limited visibility into the various missions.

The goal MLS system combines the MLS hosts, workstations, DBMSs, networks, and other components with multilevel applications to comprise an integrated multilevel environment rather than only a lashing together of multiple single-level elements. These MLS systems could be applied to command and control, office automation, data fusion, decision support, and other uses throughout the DoD.

2.5 MLS DOs and DON'Ts

Current MLS technology is evolving. Even so, the available technology is widely applicable to DoD programs, and emerging MLS technology will have an even greater impact. There are several concepts to keep in mind and adages to apply when considering MLS technology and capabilities.

Do

- Rethink your operational concept to understand how MLS will meet and enhance your operational requirements.

Don't

- Buy a solution and then look for a requirement.

Understanding at the earliest possible time the operational requirements of the system and how the system is intended to be used will allow for the effective analysis and selection of solutions. Many areas need to be examined in defining the requirements. For example, the concept of operations addresses the following questions:

- What mission is the system to support?
- What is the function of the system?
- What are the initial and future connections?
- What is the data sensitivity range?
- Who are the intended users and what are their roles?
- What clearances and authorizations do the users have?
- How can MLS be used to automate the users' jobs?
- What is the flow of information among users and systems?

A firm understanding of the operational requirements helps to create an effective concept of operations for the system. When the operational requirements are understood, MLS capabilities can be selected to meet both the operational and security requirements. This type of approach considers, we have these requirements, therefore which security solution can satisfy them?, instead of an approach that questions, that vendor has an MLS widget, now how can we use it?

Do

- Identify and involve your accreditors early in the MLS project.

Don't

- Risk the project with your interpretation of ambiguous security regulations and policy.

The accreditor for a system, sometimes known as its Designated Approving Authority (DAA), is responsible through policy and directive for the security of that system. Therefore, the accreditor should be identified and involved in the system acquisition process from its initiation. The participation of accreditation authorities in the system definition activities will provide them insight into the rationale for the security approach chosen. This is especially important in an MLS environment where accreditors have few tools or methods with which to assess the security solutions implemented. No amount of academic rationalization regarding risk indexes and levels of trust will be of use for a program manager if the accreditor is uncomfortable with the proposed solution. The accreditor should be involved with or made aware of design, implementation, and operational proposals and decisions throughout the system life cycle. Many systems have multiple accreditation authorities because the systems have connections with other systems and networks. Any such interconnections should be identified early in the system concept and requirements stages.

Do

- Approach MLS incrementally.

Don't

- Pick unrealistic near-term goals.

- Program managers should follow workable and proven strategies for achieving MLS capabilities. For example, the implementation strategy being undertaken by the DoD MLS Program begins with the deployment of MLS guards and workstations at the interfaces between systems operating at different security levels in the near term, followed with the integration of MLS components to create MLS systems in the long term. The DoD MLS Program recommends this approach for both new system developments and existing system enhancements. The near-term time frame is considered as the current fiscal year through the next. The long term time frame is thereafter. Users with especially critical operational requirements for MLS might choose to pursue more aggressive approaches that entail higher costs and greater development risks. As time progresses, the foundation MLS technology should be able to provide increasing functionality and increasing assurances (e.g., levels of trust).

The DoD MLS Program has demonstrated the usefulness of prototyping MLS capabilities before trying to build operational capabilities. Prototyping can help validate system security requirements, demonstrate feasibility, reduce uncertainty and risk, and increase the chances of user acceptance of a new concept of operations. Prototyping provides the opportunity to develop a set of realistic functional requirements, something useful with an MLS system. The opportunity to refine and validate security requirements should not be overlooked.

Whatever the approach, be sure to choose near-term goals that can be met, and build incrementally, so that MLS capabilities can be integrated as they become available over the years.

Do

- Design and develop MLS capabilities using existing technology.

Don't

- Base the success of your project on the hype of the latest vendor marketing call.

The National Security Agency evaluates commercial products and certain government technology against the trusted computer system evaluation criteria in DoD 5200. 28- STD or one of its interpretations for networks, DBMSs, or computer subsystems. NSA's evaluation investigates not only a product's security features, but also the assurances in the product's design and implementation that the security is correct and complete. Program managers and system integrators can take advantage of NSA's efforts in the design and implementation of MLS capabilities that use these trusted products.

The benefits of using evaluated products are typically evident in the certification process, when a system undergoes its own security assessment to ensure that it satisfies its security requirements and will allow operations with an acceptable level of risk. An evaluated product has already undergone elements of that assessment itself, and its use in the system may require less effort to facilitate the system certification. For example, one can have confidence that a product having successfully completed an NSA evaluation meets a certain set of the security requirements placed on it as part of an MLS system. However, a similar unevaluated product, providing a similar set of functional and security services, would bring with it no such confidences and would require that the program manager assess those security services more comprehensively in the system certification process.

Many vendors, in an effort to advertise their products, make claims that the products are designed to meet the criteria of a certain DoD 5200. 28-STD class. Such claims should only be accepted when backed by a certificate from the NSA or a listing in the Evaluated Products List.

To allow multilevel processing in the range set of Unclassified through Secret, Secret through Top Secret, or Top Secret through Top Secret with compartments, current DoD and NSA guidance for determining an appropriate level of trust requires a level of protection equal to the B2 class.

However, most of the MLS workstation platforms are evaluated at the B1 class. This results in a workstation that can provide much of the needed functionality, but not the higher level of assurance associated with a B2 class product. This limited selection of higher assurance products sometimes leads to the decision to use lower assurance products (e.g., B1 class) to meet important operational needs. The result is multilevel functionality without the complementary assurances or trust.

There are other system requirements to consider in addition to the security requirements, and a program manager must make trade-offs when selecting technology to meet the total set of requirements on a system. When MLS is an operational requirement, program managers should consider first the set of evaluated products to satisfy the requirement. If the set of available, evaluated products does not meet the needs, products in evaluation or derived from evaluated products (e.g., such as from using a different hardware platform or a more recent version of the operating system) should be considered. Other products with claims to provide MLS capabilities but that are not evaluated or in evaluation should be investigated only after evaluated technology has been exhausted.

Do

- Consider information technology standards for MLS solutions.

Don't

- Accept proprietary solutions without good reason.

The computer and communications industry has adopted various standards that promote interoperability among networked computer systems, operating systems, and application software. For example, the following standards are significant in the development and integration of information systems:

- Portable Operating System Interface for Computer Environments (POSIX) for operating system interfaces
- Government Open Systems Interconnection Profile (GOSIP) for network protocols
- Structured Query Language (SQL) for DBMSs
- X-Windows for windowing applications.

Many MLS products use these standards for the definitions of their interfaces. By adhering to these and other industry standards in the development of MLS systems, the systems are provided a more flexible basis for enhancements and for changes in the system platforms (e.g., porting the application software to another standards-compliant operating system or DBMS) when the selection of products is as limited as it is for MLS technology. This flexibility is crucial to mitigate development risks.

Do

- Coordinate with the DoD MLS Program.

Don't

- Ignore the lessons learned and experiences from other MLS projects.

The DoD MLS Program not only manages and sponsors numerous MLS projects throughout the DoD, but it also monitors dozens of other projects in the DoD and with other government agencies. The DoD MLS Program maintains a selection of lesson learned documents, technology assessments, and other information to help program managers guide the development and operations of systems with operational requirements for MLS. In addition to the published materials, the DoD MLS Program provides other consultation with DoD and other organizations to help them meet their MLS needs.

2.6 Appendix – Acronyms

Acronym	Meaning
CMW	Compartmented Mode Workstation
COTS	Commercial Off-the-Shelf
DBMS	Data Base Management System
DAA	Designated Approving Authority
DoD	Department of Defense
FY	Fiscal Year
GOSIP	Government Open Systems Interconnect Profile
INFOSEC	Information Systems Security
MLS	Multilevel Security
NSA	National Security Agency
OPS/INTEL	Operations/Intelligence
POSIX	Portable Operating Systems Interface for Computer Environments
SQL	Structured Query Language
TCB	Trusted Computing Base
WWMCCS	Worldwide Military Command and Control System

END OF APPENDIX 8

APPENDIX 9: AOC CONFINED SPACE EVALUATIONS

Contents:

Memo from Mr. Oswald G. Addison, (OHES) to Mr. Robert Hoyler (Head, EED)

LOC Confined Spaces Table

UNITED STATES GOVERNMENT
MEMORANDUM

ARCHITECT OF THE CAPITOL
OCCUPATIONAL HEALTH, ENVIRONMENTAL, AND SAFETY OFFICE
WASHINGTON, DC 20525-8000 SECOND FLOOR, U.S. CAPITOL POWER PLANT, 225-4043

DATE: May 21, 1999

TO: Robert Hoyler, Head
Electronics Engineering Division

FROM: Oswald G. Addison

THRU: Charles E. Bowman, Safety & Occupational Health Manager
Occupational Health, Environmental, and Safety Office (OHES)

SUBJECT: Library of Congress Book Conveyor System
Confined Space Evaluations

The Safety Office was requested to evaluate the book conveyor systems to determine whether or not they and adjacent areas are confined spaces.

The modernization and replacement of the book conveyor system in each of the library buildings will be contracted differently. It is my understanding that the book conveyor system in the Madison building will be modernized. No demolition of the conveyor system will be conducted. It is also my understanding that because replacement parts are no longer available for the conveyor systems in the Adams and Jefferson buildings a considerable amount of demolition and construction may be required. This confined space evaluation takes this into account.

INTRODUCTION

The Occupational Safety and Health Administration (OSHA 29 CFR. 1910.146) defines a confined space as a space that:

1. is large enough and so configured that an employee can bodily enter and perform assigned work;

2. has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry);

3. is not designed for continuous employee occupancy.

OSHA further defines a permit-required confined space (OSHA 29 CFR. 1910.146) as a confined space that has one or more of the following characteristics:

1. contains or has the potential to contain a hazardous atmosphere; or

2. contains a material that has the potential for engulfing an entrant; or

3. has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or

4. contains any other recognized serious safety or health hazard.

Note: A non-permit confined space does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

A permit required confined space makes it clear that a space must contain or, with respect to atmospheric hazards, must have the potential to contain a hazard capable of causing death or serious physical harm, in addition to having the configuration of a confined space, to be considered a permit-required confined space.

FINDINGS

Madison Building, Library of Congress (LOC)

The Madison Building, LOC has a typical horizontal and vertical book conveyor system that was evaluated for confined space entry. The horizontal conveyor system is above the suspended ceilings in most of the corridors and in some offices. The same exists for the vertical conveyor system. The following is a list of confined spaces, and safety and health concerns that were noted during the evaluation survey:

Horizontal Book Conveyor

1. Access to the conveyor system above the suspended ceiling catwalk, crawl space creates a falling hazard to a worker needing access. A worker has to negotiate stepping from a 10 foot step ladder onto a fixed ladder above the suspended ceiling space.

2. These catwalk crawl spaces exists at several locations throughout the building. There is no standing room.

3. The conveyor system is powered by a 480 volt automatic start and stop system. There are other pieces of electrically motorized power transmission equipment associated with this conveyor system.

4. There are many sharp protrusions in this crawl space which could cause head injuries. (Safety Deficiency)

5. The unguarded fluorescent light tubes are creating a hazard for workers working in this crawl space. These fluorescent light tubes are low enough where a worker could make bodily contact with them. (Safety Deficiency)

6. In some office locations a worker would have to access the poorly illuminated horizontal conveyor system through an access panel or suspended ceiling panel with a 10 foot ladder. The worker would have to kneel or lie down on top of a plaster ceiling to work on the conveyor system, which creates a serious falling hazard. Also, hazards No. 3 and 4 exist in these spaces.

Note: *The space above the ceiling would be defined as a permit-required confined space because of the existing hazards. If the conveyor system power is shut-off by lock and tag-out procedures during the modernization contract, then the space would be defined only as a confined space.*

Vertical Book Conveyor

1. The conveyor system is powered by 480 volts, which automatically starts and stops. There are other pieces of electrically motorized power transmission equipment associated with this conveyor system.

2. The conveyor system operates in a vertical shaft way that creates a serious falling hazard.

3. There is very little space to work in these shaft way closets with the possibility of making contact with the conveyor system.

Note: *This space would be defined as a permit-required confined space because of the existing hazards. If the conveyor system power is shut-off by lock and tag-out procedures during the modernization contract, then the space would be defined only as a confined space.*

Adams Building, LOC

The Adams Building, LOC has a typical vertical book conveyor system that operates in two shaft ways approximately 10 feet from each other. This book conveyor system was evaluated for confined space entry. The following is a list of confined space, and safety and health concerns that were noted during the evaluation survey:

1. The conveyor system is powered by 208 volts, and operates continuously. There are other pieces of electrically motorized power transmission equipment associated with this conveyor system.

2. The conveyor system operates in a vertical shaft way that creates a serious falling hazard.

3. There is very little space to work in these shaft way closets with the possibility of making contact with the operating conveyor system.

4. The exposed electric light bulbs in the maintenance areas are a creating hazard for workers maintaining the conveyor system. (Safety Deficiency)

Note: *This space would be defined as a permit-required confined space because of the existing hazards. If the conveyor system power is shut-off by lock and tag-out procedures during the modernization contract, then the space would be defined only as a confined space.*

Jefferson Building, LOC

The Jefferson Building, LOC has three typical vertical book conveyor systems that operate in three shaft ways. These book conveyor systems were evaluated for confined space entry. The central book conveyor system only extends between the basement floor and the first floor, and the other two extend to the building attic. The following is a list of confined space, and safety and health concerns that were noted during the evaluation survey:

1. The conveyor system is powered by 208 volts, and operates continuously. There are other pieces of electrically motorized power transmission equipment associated with this conveyor system.

2. The conveyor system operates in two vertical shaft ways that creates a serious falling hazard.

3. There is very little space to work in these shaft way closets, and also in the attic machine room, with the possibility of making contact with the operating conveyor system.

4. The access ladder to both of the attic machine rooms are unrated and do not appear to meet the OSHA load rating requirement. (Safety Deficiency)

5. It is my understanding that ambient temperatures, in the attic machine room, can reach 130 degrees, and possibly cause workers to suffer heat stress. (Safety Deficiency)

6. The open electric junction boxes are creating an electrical hazard for workers working in both machine room attic locations. (Safety Deficiency)

7. There are several structural obstructions in the attic machine room; which creates a hazard for head injuries. (Safety Deficiency)

8. The unguarded light bulbs are creating a hazard for workers working in the attic machine rooms. These light bulbs are low enough where a worker could make bodily contact with them. (Safety Deficiency)

Note: *These spaces would be defined as permit-required confined spaces because of the existing hazards. If the conveyor system power is shut-off by lock and tag-out procedures, during the modernization contract, then the spaces would be defined only as confined spaces.*

It is my understanding that the shaft way closet walls may be dismantled during demolition. If this is the case, then there will be no confined space issues to address.

Jefferson LOC Book Conveyor Tunnel

The Jefferson LOC Book Conveyor Tunnel extends approximately 1300 feet to the U. S. Capitol Building. This tunnel contains no mechanical moving parts associated with the pneumatic book conveyor system. This book conveyor system was evaluated for confined space entry. The following is a list of confined space, and safety and health concerns that were noted during the evaluation survey:

1. The compact fluorescent light has a missing diffuser which creates an electrical hazard for workers. (Safety and Health Deficiency)

2. The electric panel has a missing cover plate exposing live electrical parts. (Safety Deficiency)

3. There is a constant water leak into the tunnel, which covers the walkway at times. (Safety and Occupational Health Deficiency)

4. Because both exits are a great distance from each other and there is no means for

communication, this tunnel is a hazardous location for workers needing to be rescued, or attempting to rescue themselves. (Safety Deficiency)

Note: *This space would be defined as a permit-required confined space because of the existing hazards.*

RECOMMENDATIONS

1. All of the safety deficiencies should be corrected before any contractor works in the book conveyor spaces.

2. If any type of welding or torch cutting is to be preformed, a Hot Work Permit must be filled out with the understanding that the welding or torch cutting process may change the atmospheric conditions. The atmosphere must be monitored while this hot work is being performed.

3. If there is any uncertainty about the atmospheric conditions, the contractor must first check the oxygen level, the combustible gas level, the carbon monoxide level, the hydrogen sulfide level, and other atmospheric conditions with the appropriate equipment.
4. If AOC personnel and contractor personnel will be working in or near the confined space at the same time; coordinate entry with each other. Debrief the parties at the conclusion of the entry operations to determine if there were any problems associated with work operation.

5. If any correctable hazards or safety deficiencies have been over-looked during the evaluation of the above confined spaces, the contractor shall notify the AOC immediately so they can be corrected.

CONCLUSION

1. A sufficient number of confined space areas typical in construction were evaluated to make the above recommendations.

cc: Turnbull, Theiss, Hanlon, Birkhead, Mulshine, Parry, Bowman, Safety Review Fill, File (u:loc-conf.spa)

Library of Congress Confined Spaces Table

Date	Inspector	Building	Floor	Room #	Space Description	Hazards	Entry type	Permit Status	Notes	Fall Protection Requirements
12/04/2000	Scott Robbins	Jefferson	Ground	Exterior (NE Corner)	Water Meter Vault	Limited Egress, Hazardous Atmosphere, Engulfment	Manhole	Permit	Entry may be conducted following c(5) procedures. See written program for instructions.	None identified
12/04/2000	Scott Robbins	Jefferson	Ground	Exterior	Water Irrigation Valve Pit (four pits around exterior)	Limited Egress	2.5' x 3' Panel in Ground	Non-permit	Pit is 5' x 3' x 3' deep	None identified
12/04/2000	Scott Robbins	Jefferson	Ground	Exterior	Crawl space under West Front Steps	Limited Egress	Two 3' x 3' Gates	Non-permit	Access to fountain pump	None identified
10/11/2000	Scott Robbins	Jefferson	Ground	Exterior	Transformer Vaults A,B,C	Limited Egress, Hazardous Atmosphere	Top Grill	Permit	Fixed ladder protected by cage in each vault. Space may be temp. reclassified as a non-permit space if initial and continuous monitoring show acceptable atmosphere	None identified
10/11/2000	Scott Robbins	Adams	Ground	Exterior	Transformer Vaults A,B,C	Limited Egress Hazardous Atmosphere	Top Grill	Permit	Fixed ladder protected by cage in each vault. Space may be temp. reclassified as a non-permit space if initial and continuous monitoring show acceptable atmosphere	None identified
12/08/2000	Scott Robbins	Madison	Sub-basement	Garage	Sewage Ejector Pit - Southeast	Limited Egress, Engulfment, Hazardous Atmosphere, Fall Hazard	22" x 15" opening	Permit	Follow permit procedures for entry. See written program for instructions	Utilize approved self-retracting lifeline protection system attached to confined space rescue tripod and rear D-ring of full body harness
12/08/2000	Scott Robbins	Madison	Sub-basement	Garage	Sewage Ejector Pit - Southwest	Limited Egress, Engulfment, Hazardous Atmosphere, Fall Hazard	22" x 15" opening	Permit	Follow permit procedures for entry. See written program for instructions	Utilize approved self-retracting lifeline protection system attached to confined space rescue tripod and rear D-ring of full body harness
12/08/2000	Scott Robbins	Madison	Sub-basement	Garage	Water storage tank under west exit ramp	Limited Egress, Engulfment	3' x 3' Panel	Permit	May be trmporarily reclassified as a non-permit space by draining tank, blocking inflow	None identified

Date	Inspector	Building	Floor	Room #	Space Description	Hazards	Entry type	Permit Status	Notes	Fall Protection Requirements
12/08/2000	Scott Robbins	Madison	Sub-basement	Garage	Crawl space above water storage tank (under west exit ramp)	Limited Egress	3' x 3' Panel	Non-permit	Space would not normally contain hazards.	None identified
12/08/2000	Scott Robbins	Madison	Sub-Basement	West side generator room	Main diesel fuel tank (4500 gallon)	Limited Egress, Engulfment, Hazardous Atmosphere	Manhole	Permit	May be temporarily reclassified to a non-permit confined space by draining, flushing, venting tank.	None identified
12/08/2000	Scott Robbins	Madison	Sub-Basement	Generator	Small Diesel Fuel Tank (yellow)	Limited Egress, Engulfment, Hazardous Atmosphere	No Entry Seen	Permit	No entry seen for tank, part of tank not visible.	None identified
12/08/2000	Scott Robbins	Madison	Sub-Basement	East House Pump Room	Acid Dilution Tank	Limited Egress, Engulfment, Hazardous Atmosphere	36" round hatch	Permit	Tank must be drained and rinsed, inflow to tank blocked prior to entry. Monitor air to verify acceptable conditions.	None identified
12/08/2000	Scott Robbins	Madison	Sub-Basement	West House Pump Room	Acid Dilution Tank	Limited Egress	36" round hatch	Permit	Tank must be drained and rinsed, inflow to tank blocked prior to entry. Monitor air to verify acceptable conditions.	None identified
12/08/2000	Scott Robbins	Madison	Sub-Basement	East House Pump Room	Storage tanks (3)	Limited Egress	16" x 12" hatch	Permit	Tanks are currently offline.	None identified
12/08/2000	Scott Robbins	Madison	Sub-Basement	West House Pump Room	Storage tanks (3)	Limited Egress	16" x 12" hatch	Permit	Tanks are currently offline.	None identified
12/08/2000	Scott Robbins	Madison	Sub-Basement	Main Steam Room	Main Condensate Tank	Limited Egress, Engulfment	16" oval	Permit	May be temporarily reclassified as non-permit space by draining tank and blocking inflow.	None identified
12/08/2000	Scott Robbins	Madison	Sub-Basement	East Transformer Vault Room	Sump pump pit, Core B Substation	Limited Egress, Engulfment, Hazardous Atmosphere	18" manhole	Permit	May be entered following c(5) procedures See written program for instructions.	None identified

Date	Inspector	Building	Floor	Room #	Space Description	Hazards	Entry type	Permit Status	Notes	Fall Protection Requirements
12/08/2000	Scott Robbins	Madison	Sub-Basement	West Transformer Vault Room	Sump pump pit, Core B Substation	Limited Egress, Engulfment, Hazardous Atmosphere	18" manhole	Permit	May be entered by following c(5) procedures See written program for instructions.	None identified
12/08/2000	Scott Robbins	Madison	Ground	Book Fumigation Chamber Room	Charcoal filter tank	Limited Egress	11" oval	Permit	Tank opening is probably too small for bodily entry.	None identified
12/08/2000	Scott Robbins	Madison	Ground	Exterior	Crawl space, East Side Water Service	Limited Egress, Engulfment	2' x 4' door	Non-permit	Space would not normally contain water. Inspection of space required prior to entry.	None identified
12/08/2000	Scott Robbins	Madison	Sub-Basement	East Side Ramp Heater Room	Ramp Heater Room	Limited Egress	3.5' x 4' Door	Non-permit	5' tall room, would not normally contain hazards	None identified
12/08/2000	Scott Robbins	Adams	Cellar	C1010	Sump pump pit	Limited Egress, Engulfment, Hazardous Atmosphere	2' x 18" opening	Permit	May be entered following c(5) procedures See written program for instructions.	None identified
12/08/2000	Scott Robbins	Adams	Cellar	C03	Sump pump pit in unfinished section	Limited Egress, Engulfment, Hazardous Atmosphere	18" manhole	Permit	May be entered following c(5) procedures See written program for instructions.	None identified
12/08/2000	Scott Robbins	Adams	Cellar	C03	Crawl space in C03 (contains sump pump pit)	Limited Egress	Access from Room C03	Non-permit	Poor lighting, must climb across lumber piles.	None identified
12/08/2000	Scott Robbins	Adams	Basement	B39	Condensate Tank	Limited Egress, Engulfment	13" hatch	Permit	May be temporarily reclassified as non-permit space by draining tank, blocking inflow	None identified
12/08/2000	Scott Robbins	Adams	Attic	N/A	Crawl spaces above 4 alcoves (A, B, C, D), 2 Reading Rooms, 2 Study Rooms	Limited Egress	2' x 2' doors	Non-permit	It was reported that plaster may not support personnel	None identified
12/08/2000	Scott Robbins	Adams	Attic	N/A	Crawl spaces above 2 Reading Rooms	Limited Egress	Opening in wall	Non-permit	It was reported that plaster may not support personnel	None identified

Date	Inspector	Building	Floor	Room #	Space Description	Hazards	Entry type	Permit Status	Notes	Fall Protection Requirements
12/19/2000	Scott Robbins	Madison	6th	Cafeteria	Grease traps (3 interceptor traps)	Limited Egress, Engulfment	2' x 4' Metal panels	Permit	Space has never been entered by LOC personnel. Size not known.	None identified
12/19/2000	Scott Robbins	Madison	6th	Outside on Terrace	Crawl space around perimeter on 6th floor	Limited Egress	Eight 3' x 4' Panels	Non-permit	Access to outside “downlights”	None identified
12/19/2000	Scott Robbins	Adams	Attic	Machine Room #13, 14	Elevator - Machine Room #13, 14	Limited Egress, Moving Parts	3.5' x 3' door	Permit	Elevator must be locked out prior to entry unless task requires operation of elevator.	None identified
12/19/2000	Scott Robbins	Adams	Attic	Elevator #15 overhead	Elevator #15 overhead rom	Limited Egress	3.5' x 3' door	Non-permit	Moving parts are guarded.	None identified
12/19/2000	Scott Robbins	Adams	Attic	Machine rooms	Elevator - Machine Rooms 1-4	Limited Egress	Standard Doors, Narrow Stairs to the door	Non-permit	Access to the space is somewhat limited by the narrow stairs leading to a standard door.	None identified
12/19/2000	Scott Robbins	Adams	All	N/A	Elevator shafts & pits #1-4, 6, 7, 9-15 (walk in pit in elevator 6 excluded)	Limited Egress, Moving Parts	Open doors, raise elevator, climb in shaft/pit	Permit	Elevator must be locked out or tagged out prior to entry unless task requires operation of elevator.	None identified
12/19/2000	Scott Robbins	Adams	All	N/A	Dumbwaiter shafts (2)	Limited Egress, Moving Parts	Open doors, raise elevator, climb in pit	Permit	Dumbwaiter must be locked out or tagged out prior to entry.	None identified
12/19/2000	Scott Robbins	Adams	All	N/A	Elevator shafts & pits 5 & 8	Limited Egress, Fall Hazard	Entry not found during initial survey	Permit	Shafts 5 & 8 do not contain elevators.	No entry spaces found. Requirements could not be evaluated
12/19/2000	Scott Robbins	Jefferson	Attic	N/A	Elevator - Overhead Space above Elevator #5	Limited Egress	Climb up ladder, over duct work	Non-permit	Access from Deck 37.	None identified
12/19/2000	Scott Robbins	Jefferson	Rooftop	N/A	Elevator - Overhead room for #6 and 7 elevators	Limited Egress, Moving Parts	Climb over duct work, up ladder.	Non-permit	Moving parts are guarded.	None identified
12/19/2000	Scott Robbins	Jefferson	All	N/A	Elevator shafts & pits #1-7, 9-11, 15. Walk in pits (elevator #3, 4, 9) excluded.	Limited Egress, Moving Parts	Open doors, raise elevator, climb in shaft/pit	Permit	Elevator must be locked out prior to entry unless task requires operation of elevator.	None identified

Date	Inspector	Building	Floor	Room #	Space Description	Hazards	Entry type	Permit Status	Notes	Fall Protection Requirements
12/19/2000	Scott Robbins	Jefferson	All	N/A	Elevator shaft #14	Limited Egress, Fall Hazard	Access to shaft 14 not known	Permit	Shaft 14 does not contain an elevator.	Access shaft 14 was not found. Fall hazard requirements could not be evaluated.
12/19/2000	Scott Robbins	Madison	All	N/A	Elevator shafts & pits (24, F1 walk in pit excluded)	Limited Egress, Moving Parts	Open doors, raise elevator, climb in pit	Permit	Elevator must be locked out prior to entry unless task requires operation of elevator.	None identified
12/19/2000	Scott Robbins	Madison	All	N/A	Dumbwaiter shafts (2)	Limited Egress, Moving Parts	2' x2' Metal Door	Permit	Dumbwaiter must be locked out prior to entry unless task requires operation of elevator.	None identified
12/08/2000	Scott Robbins	Adams	All	Between bathrooms	Pipe Chases throughout building	Limited Egress	1.5' x 4.5' door	Non-permit	Access to bathroom pipes.	None identified
12/08/2000	Scott Robbins	Adams	4th	N/A	Pipe chase/crawl space around perimeter of 4th Floor	Limited Egress	Twelve 2' x 5' doors	Non-permit	Well ventilated space.	None identified
12/08/2000	Scott Robbins	Adams	Ground	Exterior	Water meter vault, 15 feet deep.	Limited Egress, Engulfment, Hazardous Atmosphere, Fall Hazard	Manhole	Permit	Permit procedures must be followed for entry.	Utilize approved self-retracting lifeline protection system attached to confined space rescue tripod and rear D-ring of full body harness.
12/08/2000	Scott Robbins	Adams	Sub-Basement	“B23" (SB23)	Condensate pit #4	Limited Egress	Ladder (85 degree)	Non-permit	No serious hazards in pit.	None identified
12/08/2000	Scott Robbins	Adams	Sub-Basement	“B23" (SB23)	Crawl space behind AHU #4	Limited Egress	From pit #4 with portable ladder or through AHU #4	Non-permit	Crawl space would not normally contain hazards.	None identified
12/08/2000	Scott Robbins	Adams	Sub-Basement	“B23" (SB23)	Air Holding Tank	Limited Egress	15" oval hatch	Permit	May be temporarily reclassified as non-permit space by de-pressurizing, blocking inflow (LOTO compressor).	None identified
12/08/2000	Scott Robbins	Adams	Sub-Basement	“B23" (SB23)	Pit around AHU #1	Limited Egress	Vertical Ladder	Non-permit	Space would not normally contain hazards.	None identified

Date	Inspector	Building	Floor	Room #	Space Description	Hazards	Entry type	Permit Status	Notes	Fall Protection Requirements
12/08/2000	Scott Robbins	Adams	Sub-Basement	“B23" (SB23)	Ventilation Ducts (stacks 1 & 2)	Limited Egress, Fall Hazard in Stack	Vertical Ladder	Permit	Space is not accessible from the top of this space.	Approved scaffolding would need to be set up for work in ventilation duct.
12/08/2000	Scott Robbins	Adams	Sub-Basement	“B11" (SB11)	Pit around AHU #2	Limited Egress	Vertical Ladder	Non-permit	Space would not normally contain hazards.	None identified
12/08/2000	Scott Robbins	Adams	4th	AHU 9 & 10 Machine Room	Crawl Space behind AHU 9 & 10	Limited Egress	5' x 2' opening	Non-permit	Next to rooms 4028/4027	None identified
12/08/2000	Scott Robbins	Adams	4th	AHU 7 & 8 Machine Room	Crawl space behind AHU 7 & 8	Limited Egress	5' x 2' opening	Non-permit	Next to rooms 4002/4010	None identified
12/08/2000	Scott Robbins	Adams	Deck 12	N/A	Crawl space above Deck 12	Limited Egress	Two 2' x 2' hatches in ceiling of Deck 12	Non-permit	Contains telecom and electrical wires (120 V).	None identified
12/08/2000	Scott Robbins	Adams	Sub-Basement	6A	Condensate Pit around 6	Limited Egress	Vertical Ladder	Non-permit	Space would not normally contain hazards.	None identified
12/08/2000	Scott Robbins	Adams	Cellar	Northside Storage Area	Storage Area, Northside of cellar	Limited Egress	4' x 3' opening in wall	Non-permit	Space has unfinished floor - gravel, dirt.	None identified
12/08/2000	Scott Robbins	Adams	Cellar	C03	Crawl space above Substation B	Limited Egress	2' x 2' opening 12" above ground	Non-permit	Portable ladder must be used to access opening.	None identified
12/08/2000	Scott Robbins	Adams	Cellar	C03	Pit under expanded metal grill	Limited Egress	Climb over railing, dowm portable ladder	Non-permit	Space just inside door of C03, 10" deep.	A gate should be installed in the railing to allow access into space. Fixed ladder should be installed in the space.
12/08/2000	Scott Robbins	Madison	Ground	G05	Crawl space behind wall	Limited Egress	3' x 4' Door	Non-permit	Storage Area, head bump hazard	None identified
12/08/2000	Scott Robbins	Madison	Ground	JC80 (G02)	Space under raised floor in Library Computer Center	Limited Egress	2' x 2' floor panels	Non-permit	May not be considered limited egress because most floor panels can be lifted.	None identified

Date	Inspector	Building	Floor	Room #	Space Description	Hazards	Entry type	Permit Status	Notes	Fall Protection Requirements
12/08/2000	Scott Robbins	Madison	Ground	Loading Dock	Trash compactors (3)	Limited Egress, Moving Parts	Open end	Permit	May be temporarily reclassified as a non-permit space by Lock Out or Tag Out of trash compactor.	None identified
12/08/2000	Scott Robbins	Madison	Sub-Basement	Northeast Steam Room	Condensate Tank	Limited Egress, Engulfment	15" hatch	Permit	May be temporarily reclassified as a non-permit space by de-pressurizing, blocking inflow.	None identified
12/08/2000	Scott Robbins	Madison	Basement - 7th Floor	N/A	Return Air Shafts (8) - A, B, C, D, E-E, E-W, F-E, F-W	Limited Egress, Fall Hazard	Open top, guarded by railing	Permit	Fall protection required for entry into space. Mid-railings have been installed in most of the shaft entry openings.	Workers in shaft would use positioning device in shaft. The yellow I-beam above the opening (8 feet high) appears to be suitable anchor point for a positioning device.
12/08/2000	Scott Robbins	Madison	7th	7th Floor Return Air Chamber	Spaces between fresh air preheats	Limited Egress	Crawl under ducts - 3 feet clearance	Non-permit	Crawl spaces with limited egress.	None identified
12/08/2000	Scott Robbins	Madison	Basement - 7th Floor	N/A	Ventilation duct shafts	Limited Egress, Fall Hazard (7 story)	Top Entry from 7th Floor Mech Room	Permit	Fall protection required for entry.	Workers in shaft would use positioning system in shaft. The suitability of the channel beams at the top of the space as an anchor point must be evaluated.
12/08/2000	Scott Robbins	Madison	All	Mechanical Rooms	AHUs with unguarded fan belts - WZ1, SWZ1, SZ, Kitch, WZ, EZ, NZW, NZI, Assembly Rm, NZE, SZEI, EZI	Limited Egress, Moving Parts	Access Panels (various sizes)	Permit	May be temporarily reclassified as a non-permit space by Lock-Out/Tag-Out of motor.	None identified
12/18/2000	Scott Robbins	Jefferson	Cellar	C74	Crawl space above duct from AHU #10	Limited Egress	1' x 8' opening next to duct	Permit	Lock-Out/Tag-Out of conveyor required before servicing.	None identified
12/18/2000	Scott Robbins	Jefferson	Ground	G01 (200 Station/Control room	Crawl space behind conveyor	Limited Egress, Moving Parts	Opening around equipment	Permit	Lock-Out/Tag-Out of equipment required before servicing.	None identified

Date	Inspector	Building	Floor	Room #	Space Description	Hazards	Entry type	Permit Status	Notes	Fall Protection Requirements
12/18/2000	Scott Robbins	Jefferson	Ground	G01 (200 Station/Control room	Crawl space above ceiling	Limited Egress	2' x 3' gray door in wall of staircase leading to reading room	Non-permit	Access to security systems	None identified
12/18/2000	Scott Robbins	Jefferson	Ground	G01 (200 Station/Control room	Crawl space above ceiling	Limited Egress	3 entries: 2' x 2' hatch in ceiling, 18" x 18" hatch in ceiling, 2' x 2' hatch in hallway outside	Non-permit	Access to telecom & electrical wires (120 V)	None identified
12/18/2000	Scott Robbins	Jefferson	Stack 1-9	North Side Stack	Shaft for North Side Stack - Only the space between the fixed walls and the conveyor	Limited Egress, Moving Parts	Eighteen 6' x 1.5' doors	Permit	Lock-Out/Tag-Out required prior to servicing equipment.	None identified
12/18/2000	Scott Robbins	Madison	Above Stack 1	Attic above Stack 1	Crawl spaces (two) above Stack 1 (north & south side)	Limited Egress	3' x 3' panel in ceiling (one panel each side)	Non-permit	Empty crawl space, access to crawl space above north & south tower inside this space.	None identified
01/11/2000	Scott Robbins	St. Cecilia	Ground	Hallway outside Director's Office	Crawl space above ceiling	Limited Egress	Two 2' x 2' metal hatches in ceiling	Non-permit	Access to ventilation duct.	None identified
11/30/2000	Scott Robbins	All LOC Buildings	Various	Various	Air Handler Units without hazardous moving parts	Limited Egress	Various Panels	Non-permit	Blanket statement for AHUs without serious hazards (unguarded fan blades).	None identified
11/30/2000	Scott Robbins	All LOC Buildings	Various	Various	Ventilation ducts	Limited Egress	Various Panels, hatches	Non-permit	Blanket statement for ventilation ducts, ducts are not listed individually.	None identified
11/30/2000	Scott Robbins	Jefferson	Various	Various	Air Handler Units with unguarded fan blades or belts	Limited Egress, Moving Parts	Various Doors	Permit	AHU A & B and AHU #s 1, 10, 26, 31, 23, 35 A B & C.	None identified
11/30/2000	Scott Robbins	Jefferson	Attic	N/A	Crawl spaces (six) above curtain halls	Limited Egress, Fall Hazards	3' x 2' Door in wall	Non-permit	Possible fall through stained glass, some catwalks not guarded by railing.	Catwalks should be improved - improve structural integrity and install railings.

Date	Inspector	Building	Floor	Room #	Space Description	Hazards	Entry type	Permit Status	Notes	Fall Protection Requirements
11/30/2000	Scott Robbins	Jefferson	Attic	N/A	Crawl space above corner mechanical rooms [AHU 40 (SW), AHU A (NE), B (SE) & NW Corner]	Limited Egress	3' x 3' Metal Panels in ceiling	Non-permit	Crawl space contains telecom & electrical (120 V) wires.	None identified
11/30/2000	Scott Robbins	Jefferson	Attic	N/A	Attic above Deck A	Limited Egress, Fall Hazards	Standard Door, but support beams in way of egress	Non-permit	Possible fall through plasete ceiling (1' openings in metal framework). Wood catwalks (2 x 10s) in place, no railings.	Catwalks should be improved - improve structural integrity and install railings.
11/30/2000	Scott Robbins	Jefferson	Attic	N/A	Crawl space under each corner mechanical room floor	Limited Egress	Through pipe chase in corner of each corner mechanical room	Permit	Access through grill, climb down ladder (portable).	None identified
11/30/2000	Scott Robbins	Jefferson	Sub-cellar	Backstage	Pit under stage, 6 feet deep.	Limited Egress, Moving Parts	Opening to pit from backstage (no ladder)	Permit	May be temporarily reclassified as a non-permit space by lock-out or tag-out of stage.	None identified
11/30/2000	Scott Robbins	Jefferson	Cellar	C-24	Condensate Pit	Limited Egress	Vertical Ladder	Non-permit	3 Feet Deep; Space does not normally contain a hazard	None identified
11/30/2000	Scott Robbins	Jefferson	Cellar	C74	Storage Area/Crawl space behind ductwork for AHU 10	Limited Egress	Crawl under ductwork	Non-permit	Used for storage, space is 6' tall.	None identified
11/30/2000	Scott Robbins	Jefferson	Cellar	Across from C74	Crawl space behind AHU 11B	Limited Egress	Through air handler unit - 3' x 2' Door	Non-permit	White wall of space visible from entry doors	None identified
11/30/2000	Scott Robbins	Jefferson	Cellar	C72	Air Tank	Limited Egress, Pressurized Atmosphere	15" Entry Hatch	Permit	Depressurize and lock out compressor prior to entry.	None identified
11/30/2000	Scott Robbins	Jefferson	Attic	Outside (rooftop)	Pit under AHU 41	Limited Egress	Vertical Ladder	Non-permit	Well ventilated space (outside).	None identified

Date	Inspector	Building	Floor	Room #	Space Description	Hazards	Entry type	Permit Status	Notes	Fall Protection Requirements
11/30/2000	Scott Robbins	Jefferson	Attic	N/A	Space behind Main Reading Room columns (six spaces)	Limited Egress, 4 story fall hazard	Through 3' x 5' opening	Permit	Fall protection required; 2 spaces lead to each vertical shaft. Chain link fences have been installed to prevent entry into space.	Positioning device would need to be used for entry into this space. An approved anchor point would need to be installed at the topside of the space.
11/30/2000	Scott Robbins	Jefferson	3rd	N/A	Crawl spaces above page school	Limited Egress	Crawl around & over pipes	Non-permit	Access from 36 A & B, crawl spaces around perimeter of room.	None identified
11/30/2000	Scott Robbins	Jefferson	Deck 41	N/A	Crawl spaces across from AHU 11D	Limited Egress	6' x 2' Door	Non-permit	2 spaces on opposite sides of the hallway	None identified
11/30/2000	Scott Robbins	Jefferson	Deck 1, Deck 10		Crawl space above book conveyor	Limited Egress, Moving Parts	3.5' x 3.5' hatch in ceiling	Permit	Lock out conveyor prior to entry.	None identified
11/30/2000	Scott Robbins	Jefferson	Cellar	Outside C32	Steam line pit	Limited Egress, Hazardous Atmosphere	3' x 3' panels in floor	Permit	Limited potential for hazardous atmosphere.	None identified
12/18/2000	Scott Robbins	Jefferson	Stack 1-9	South Side Stack	Shaft for South Side Stack - Only the space between the fixed walls and the conveyor	Limited Egress, Moving Parts	Eighteen 6' x 1.5' doors	Permit	Lock-Out/Tag-Out required prior to servicing equipment.	None identified
12/18/2000	Scott Robbins	Jefferson	Above Stack 1	Above Stack 1 towers	Crawl space above north & south towers	Limited Egress, Moving Parts	3' x 3' opening in crawl space above Stack 1	Permit	Lock-Out/Tag-Out required prior to entry.	None identified
12/18/2000	Scott Robbins	Adams	All	Various	Access to Lampson Conveyor Unit (Gray Box) Space around & behind conveyor	Limited Egress, Moving Parts, Fall Hazard > 1st Floor	Standard door access to space, but limited access around conveyor unit	Permit	Lock-Out/Tag-Out required prior to servicing.	Positioning device would need to be used for entry into the shaft. An approved anchor point would need to be installed at the topside of the space.
12/18/2000	Scott Robbins	Adams	All	Various	Access to ACCO Conveyor Unit (Blue Box) Space around & behind conveyor	Limited Egress, Moving Parts, Fall Hazard > 1st Floor	Standard door access to space, but limited access around conveyor unit	Permit	Lock-Out/Tag-Out required prior to operations behind the conveyor equipment.	Positioning device would need to be used for entry into the shaft. An approved anchor point would need to be installed at the topside of the space.

Date	Inspector	Building	Floor	Room #	Space Description	Hazards	Entry type	Permit Status	Notes	Fall Protection Requirements
12/18/2000	Scott Robbins	Adams	Deck 12	N/A	Tube system access room	Limited Egress	1.5' x 6' door, up 3 steps across tray, down 3 steps or from hatch in Deck 11	Non-permit	Moving conveyor belt does not present a serious hazard - no pinch points accessible etc.	None identified
12/18/2000	Scott Robbins	Adams	Deck 12	N/A	Crawl space above 4th floor (Deck 11) - access to old brass tube system (not in use)	Limited Egress	Vertical Ladder to 1.5' x 2' metal hatch	Non-permit	In hallway between N & S Decks	None identified
12/18/2000	Scott Robbins	Madison	Ground	Above Hallways	Catwalk platforms above ceiling (14)	Limited Egress, Moving Parts, Fall Hazard (can be eliminated with railings)	Ceiling Panels	Permit	Lock-Out/Tag-Out of equipment required before servicing.	The installation of railings is recommended. The type of railing (fixed vs. chain) must be considered to minimize interference with maintenance activities.
12/18/2000	Scott Robbins	Madison	All	N/A	Vertical Shafts A, B, C, D (conveyor spaces)	Limited Egress, Moving Parts, Fall Hazard	Various panels	Permit	Lock-Out/Tag-Out of equipment required prior to servicing (except equipment reset), fall protection required for work inside shaft.	Suitable anchor points would need to be established for use with an approved positioning system for work inside shaft.
12/18/2000	Scott Robbins	Madison	Sub-Basement	N/A	Crawl space above hard ceiling in S27 Storage Room	Limited Egress, Moving Parts	Metal Panels or through light ballasts	Permit	Lock-Out/Tag-Out of equipment required before servicing.	None identified
12/18/2000	Scott Robbins	Madison	7th	Mechanical Room	Closet access space to top of ACCO Conveyor System	Limited Egress, Moving Parts, Fall Hazard (in shaft)	Opening at top of conveyor	Permit	Lock-Out/Tag-Out of equipment required prior to servicing. Fall protection required for work inside shaft.	When working in shaft, worker must wear a full body harness with self-retracting lifeline and shock absorbing lanyard attached to a suitable anchor point. Suitable anchor point would need to be determined.
12/18/2000	Scott Robbins	Madison	1st	Entrance Lobby (independence Ave. side)	Crawl space above door enclosure	Limited Egress	Metal plates on side of enclosure	Non-permit	Access to lighting fixtures.	None identified
12/18/2000	Scott Robbins	Madison	1st	Gift Shop	Crawl space above Gift Shop	Limited Egress	2' x 2' Door	Non-permit	Access to telecom, electrical wires	None identified

Date	Inspector	Building	Floor	Room #	Space Description	Hazards	Entry type	Permit Status	Notes	Fall Protection Requirements
12/19/2000	Scott Robbins	Jefferson	3rd	Hallway	Crawl apace under Page School	Limited Egress	2.5' x 4' metal panel in floor, vertical ladder (8 foot)	Non-permit	Access to electrical wiring.	None identified
12/19/2000	Scott Robbins	Jefferson	Above Attic	Around Dome	Crawl Space around dome	Limited Egress	4' x 2.5' metal door	Non-permit	Access to dome lights.	None identified
12/19/2000	Scott Robbins	Jefferson	3 levels above attic	Around Dome	Crawl Space around dome	Limited Egress	4' x 2' metal door	Non-permit	Access to top of dome (interior).	None identified
12/19/2000	Scott Robbins	Adams	Cellar	C25 (Substation A)	Electrical Vault	Limited Egress, Engulfment, Hazardous Atmosphere, Electrical hazard	Manhole	Permit	Sump pump inside. Follow permit procedures for entry.	None identified
12/19/2000	Scott Robbins	Adams	Cellar	C25	Crawl space under feeder room	Limited Egress, Hazardous Atmosphere, Electrical hazard	Wood & Metal Panels	Permit	May be temporarily reclassified as non-permit space by air monitoring, evaluating electrical hazard	None identified
12/19/2000	Scott Robbins	Adams	Cellar	C25 Storage Area	Crawl space around sprinkler pipes	Limited Egress	Opening in storage area	Non-permit	Crawl space would not normally contain hazards.	None identified
12/19/2000	Scott Robbins	Adams	Cellar	C03 (Substation B)	Electrical Vault	Limited Egress, Engulfment, Hazardous Atmosphere, Electrical hazard	Manhole	Permit	Sump pump inside	None identified
12/19/2000	Scott Robbins	Adams	Above Deck 12	N/A	Crawl space above Deck 12 / Below Adams Reading Room	Limited Egress	Two 2' x 2' hatches in ceiling	Non-permit	Space is empty	None identified
12/19/2000	Scott Robbins	Adams	Sub-Basement	“B18"	Crawl space above ceiling	Limited Egress	2' x 2' opening in ceiling	Non-permit	Access to sprinkler valves	None identified

Date	Inspector	Building	Floor	Room #	Space Description	Hazards	Entry type	Permit Status	Notes	Fall Protection Requirements
11/30/2000	Scott Robbins	All LOC Buildings	Various	Various	Electrical Vaults	Limited Egress, Hazardous Atmosphere	Manholes and/or floor panels	Permit	Air monitoring required prior to entry.	None identified
11/30/2000	Scott Robbins	All LOC Buildings	Various	Various	Crawl spaces above hard ceilings & behind walls	Limited Egress	Various Panels, hatches	Non-permit	Blanket statement for crawl spaces not otherwise listed	None identified
11/30/2000	Scott Robbins	All LOC Buildings	Various	Various	Storm & Sanitary Sewers	Limited Egress, Hazardous Atmosphere, Engulfment	Manholes and/or floor panels	Permit	.Entry must be conducted following permit procedures.	None identified
12/04/2000	Scott Robbins	Jefferson	Cellar	N/A	Steam tunnel to Madison building.	Limited Egress	Standard Door next to C28	Non-permit	150 foot long, tunnel on good condition. Permit-required tunnel starts at the end of this space. Separated by chainlink fence.	None identified
12/04/2000	Scott Robbins	Jefferson	Cellar	N/A	Sump pump pits (2) in Book Tunnel	Limited Egress, Hazardous Atmosphere, Engulfment	15" Oval in Manhole	Permit	May be entered following c(5) procedures. See written program for instructions.	None identified
12/04/2000	Scott Robbins	Jefferson	Cellar	C72	Book Tunnel	Limited Egress, Hazardous Atmosphere	Standard Door	Permit	Tunnel is 1300 feet long. Continuous air monitoring required during entry.	None identified
12/04/2000	Scott Robbins	Jefferson	Ground	Exterior	Moat Areas	Limited Egress	Standard Door Entries, but some spaces > 100 feet from exit	Non-permit	Exterior, well-ventilated spaces.	None identified
12/04/2000	Scott Robbins	Jefferson	Ground	Exterior	Corner Pipe Chases (4)	Limited Egress, Fall Hazard	Accessible from each floor	Permit	Pipes in top of chase closet. Space is crowded with pipes for sprinkler system.	Worker must wear a full-body harness with self retracting lifeline and shock absorbing lanyard attached to suitable anchor point and the rear D-ring of the harness. A suitable anchor point needs to be installed prior to work in space.

Date	Inspector	Building	Floor	Room #	Space Description	Hazards	Entry type	Permit Status	Notes	Fall Protection Requirements
12/04/2000	Scott Robbins	Jefferson	Cellar	C14	Sump pump pit	Limited Egress, Engulfment, Hazardous Atmosphere	15" Oval in Manhole	Permit	May be entered following c(5) procedures. See written program for instructions.	None identified
12/04/2000	Scott Robbins	Jefferson	Cellar	C14	Condensate Pump Pit behind AHU	Limited Egress, Engulfment, Hazardous Atmosphere	15" Oval in Manhole	Permit	May be entered following c(5) procedures. See written program for instructions.	None identified
12/04/2000	Scott Robbins	Jefferson	Cellar	C17	Sump pump pit	Limited Egress, Engulfment, Hazardous Atmosphere	15" Oval in Manhole	Permit	May be entered following c(5) procedures. See written program for instructions.	None identified
12/04/2000	Scott Robbins	Jefferson	Cellar	C62	Sump pump pit	Limited Egress, Engulfment, Hazardous Atmosphere	15" Oval in Manhole	Permit	May be entered following c(5) procedures. See written program for instructions.	None identified
12/04/2000	Scott Robbins	Jefferson	Sub-cellar	Under Coolidge Stage	Sump pump pit	Limited Egress, Engulfment, Hazardous Atmosphere	15" Oval in Manhole	Permit	May be entered following c(5) procedures. See written program for instructions.	None identified
12/04/2000	Scott Robbins	Jefferson	Cellar	C43	Sump pump pit	Limited Egress, Engulfment, Hazardous Atmosphere	15" Oval in Manhole	Permit	May be entered following c(5) procedures. See written program for instructions.	None identified
12/04/2000	Scott Robbins	Jefferson	Cellar	Outside C32	Condensate Pit	Limited Egress, Engulfment, Hazardous Atmosphere	15" Oval in Manhole	Permit	May be entered following c(5) procedures. See written program for instructions.	None identified
12/04/2000	Scott Robbins	Jefferson	Cellar	C40	Sump pump pit	Limited Egress, Engulfment, Hazardous Atmosphere	15" Oval in Manhole	Permit	May be entered following c(5) procedures. See written program for instructions.	None identified

Date	Inspector	Building	Floor	Room #	Space Description	Hazards	Entry type	Permit Status	Notes	Fall Protection Requirements
01/11/2001	Scott Robbins	St. Cecilia	Ground	Mechanical Room	Chimney	Limited Egress, Fall Hazard	2' x 2' Metal panel in chimney wall, rooftop access (3' x 1' opening)	Permit	Fall protection required.	An approved positioning system would need to be used for entry. Suitable anchor points were not found. Suitable anchor point for positioning system would need to be installed on top of chimney.
01/11/2001	Scott Robbins	St. Cecilia	Ground	Mechanical Room	Secondary Water Holding Tank	Limited Egress, Engulfment	14" oval hatch	Permit	May be temporarily reclassified as a non-permit space by draining tank and blocking inflow.	None identified
01/11/2001	Scott Robbins	St. Cecilia	Ground	Mechanical Room	Air Handler Unit #1 Fan Section	Limited Egress, Unguarded Moving Parts (fan belt)	Two 3' x 2' metal doors	Permit	May be temporarily reclassified as a non-permit space by Lock-Out or Tag-Out of fan blade.	None identified
01/11/2001	Scott Robbins	St. Cecilia	All	N/A	Elevator shaft & pit	Limited Egress, Moving Machinery, Fall Hazard	Open elevator doors, climb in pit	Permit	Elevator must be locked out prior to entry unless task requires operation of elevator	An approved railing system should be installed around top of car.
01/11/2001	Scott Robbins	St. Cecilia	1st	Women's Restroom	Crawl space above ceiling	Limited Egress	2' x 2' Metal hatch in ceiling.	Non-permit	Area under construction. May need follow-up to evaluate changes in the space.	None identified
01/11/2001	Scott Robbins	St. Cecilia	2nd	Women's Restroom	ceiling	Limited Egress	2' x 2' Metal hatch in ceiling.	Non-permit	Area under construction. May need follow-up to evaluate changes in the space.	None identified
01/11/2001	Scott Robbins	St. Cecilia	Ground	Exterior	East side moat	Limited Egress	Through windows of child care rooms	Non-permit	Well ventilated area.	None identified
01/11/2001	Scott Robbins	St. Cecilia	Ground	Exterior	West side moat	Limited Egress	Through windows of child care rooms	Non-permit	Well ventilated area.	None identified
01/11/2001	Scott Robbins	St. Cecilia	Ground	Gymnasium	East & West loft areas	Limited Egress	Vertical ladder	Non-permit	N/A	None identified

Date	Inspector	Building	Floor	Room #	Space Description	Hazards	Entry type	Permit Status	Notes	Fall Protection Requirements
01/11/2001	Scott Robbins	St. Cecilia	Ground	Gymnasium	Air handler units (one each) in East & West loft areas	Limited Egress	Side panels	Non-permit	These spaces may not be large enough for bodily entry. Further inspection needed during maintenance	None identified
01/11/2001	Scott Robbins	St. Cecilia	Ground	Exterior Main Entryway	Pit in ground (6 feet deep)	Limited Egress, Engulfment, Hazardous Atmosphere	2' x 2' grill on top. Vertical ladder inside.	Permit	Hazards must be evaluated at time of entry	None identified
01/10/2001	Scott Robbins	Jefferson	Cellar	C74	Crawl space above AHU 11B & behind AHU 10A	Limited Egress	10" x 8' opening next to AHU 10	Non-permit	Crawl space is continuous above hallway ceiling.	None identified
01/18/2001	Scott Robbins	Jefferson	Attic	SW Corner Mechanical Room	Pipe chase inside crawl space leading to space above curtain hall	Limited Egress, Fall Hazard	4' x 2' hole in wall	Permit	Fall protection required.	An approved positioning system would need to be used for entry. Suitable anchor points were not found. Prior to entry, approved anchor points must be installed.
01/18/2001	Scott Robbins	Adams	Cellar	C17	Crawl Space	Limited Egress	3' x 3' opening	Non-permit	Dirt floor	None identified
01/18/2001	Scott Robbins	Adams	Cellar	C08	Crawl Space	Limited Egress	Two 2' x 4' panels in floor	Non-permit	Directly inside door	None identified
01/18/2001	Scott Robbins	Jefferson	Ground	G01 (200 Station/Control Room)	Back corner of Lamson conveyor access room	Limited Egress, (behind conveyor only)	Standard door entry to room, but must squeeze between equipment	Non-permit	If work is conducted on system from back corner of room, Lock-Out/Tag-Out of equip. required.	None identified
01/11/2001	Scott Robbins	St. Cecilia	Ground	Mechanical Room	Sump pump pit	Limited Egress, Engulfment, Hazardous Atmosphere	Manhole	Permit	May be entered following c(5) procedures. See written program for instructions.	None identified

END OF APPENDIX 9

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APPENDIX 10: IBCS DRAWINGS

Note: The acronym IBCS (Integrated Book Conveyor System) appears frequently in this document. The scope of this project was reduced to comply with budgetary requirements and was renamed Automated Book Conveyor System (ABCS) Controls Upgrade. A considerable portion of the document created for the IBCS specification was used in creating the ABCS Controls Upgrade specification. The acronym IBCS will appear as an artifact of this process. Further, for the same reason, this document will contain references to the Adams and Jefferson buildings Lamson ("Gray Box") systems and the replacement conveyor system for the air tube system in the tunnel between the Jefferson building and the Capitol. Be aware that these are now beyond the scope of this project.

LIST OF DRAWINGS FOR APPENDIX 10

DRAWING	TITLE
IBCS-001	Existing Site Plan, Three Main Buildings of the Library of Congress (For Inclusion with Bid Document)
IBCS-001A	Existing Site Plan, Three Main Buildings of the Library of Congress and the U.S. Capitol (For Distribution at Pre-Bid meeting)
IBCS-002	3-D View, Three Main Buildings of the Library of Congress
IBCS-003	Existing Blue Box Conveyor System, Conveyor Identification
IBCS-004	Existing and Future IBCS Conveyor System, Jefferson Building Cellar (For Inclusion with Bid Document)
IBCS-004A	Future IBCS Conveyor System, Jefferson Building Cellar (For Distribution at Pre-Bid Meeting)
IBCS-005	Future IBCS, Existing Gray and Blue Box Conveyor Arrangement, Jefferson Building Ground Floor
IBCS-006	Future IBCS, Madison Building, Composite View
IBCS-007	Future IBCS, Madison Building, 2nd Floor, B-25 Area, Law Library Reading Room
IBCS-008	Future IBCS, Madison Building, 6th Floor, D-65 Area, Central Services
IBCS-009	Future IBCS, Madison Building, Sub-Basement, B-75 Area, Law Library Stacks
IBCS-010	Future IBCS, Adams Building Cellar
IBCS-011	Future IBCS, Adams Building, Stacks and Reading Rooms
IBCS-012	Tunnel Alignments and Schematic of Pneumatic Tube Conveyor
IBCS-013	Capitol Area Details
IBCS-014	Library Area Details
IBCS-015	New Capitol IBCS Conveyor Workstation

END OF APPENDIX 10

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APPENDIX 11: TOTE SPECIFICATIONS

Contents:

1 TOTES

1.1 General
1.2 Method of Construction
1.3 Normal Use and Abuse
1.4 Exterior Size

1.4.1 Top dimensions
1.4.2 Bottom dimensions
1.4.3 Overall Height

1.5 Interior Size
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1.7 Nesting Requirement
1.8 Stacking Requirement
1.9 Load Carrying Capacity
1.10 Bar Code Label Information
1.11 Finger Hole

1. TOTES

1.1 General

The Supplier will provide new totes for containment of books and other articles for transport by the ABCS and other transport methods used at the Library of Congress. The totes shall be identical in size to the current totes, shall have integral sealable lids, shall nest with lids open, and shall be capable of stacking with lids closed, shall contain two hand holes for lifting, and shall contain two (2) identifier (bar) code label indentations.

1.2 Method of Construction

Totes shall be fabricated through a molding process and shall have the following integral features: reinforcing around the top rim and all corners, reinforcing across the bottom, nesting lugs on the sides and/or ends, raised protective border around the identifier (bar) code application area, and thickened hand hold area.

1.3 Normal Use and Abuse

The design and construction shall be as required to provide a durable tote that will stand up to the rigors of normal use and abuse which occur in this sort of operation. In addition to lifting and lowering which are normal elements of handling of totes, the totes shall be capable of being pushed, pulled, dropped, tossed, slammed, and kicked; all of which occur in the course of operations.

1.4 Exterior Size

The exterior tote size shall be similar to the existing totes so that new totes can be conveyed on existing conveyor without modification to the conveyor or side guards and shall convey beneath existing overhead obstructions. Tote size shall be as follows:

1.4.1 Top dimensions:

A. 16 ½” long (parallel to conveying direction)
B. 12” wide (perpendicular to conveying direction)

1.4.2 Bottom dimensions:

A. 15” long (parallel to conveying direction)
B. 10 ½” wide (perpendicular to conveying direction)

1.4.3 Overall Height:

The overall exterior height of the tote including a closed lid, shall be 10 ¼” +/- ⅛”.

1.5 Interior Size

The interior dimensions shall not be less than 15 ½” x 11” at the top, shall not be less than 14 ½" x 9 ½" at the bottom, and shall not be less than 9 ¼" high from the inside of the bottom to the top of the tote.

1.6 Integral Lid

The totes shall have an integral, detachable lid consisting of two leaves, hinged along the length of the two long sides of the tote. The lid shall be capable of being sealed with plastic tie-wrap types of sealing devices.

1.7 Nesting Requirement

The totes shall be capable of nesting while the lids are open. The totes shall nest, one inside the other, with at least one-half of the overall height of the inner tote being contained within the outer tote.

1.8 Stacking Requirement

The totes shall be capable of supporting two (2) fully loaded totes on the closed and unsealed lid of a tote resting on the floor without exhibiting any sign of damage.

1.9 Load Carrying Capacity

The load carrying capacity shall be 60 pounds. The tote shall be capable of 1,000 cycles of lifting and dropping from a height of six (6) inches without exhibiting visible sign of damage.

1.10 Bar Code Label Information

The bar code label size shall be determined by the Contractor. The label shall include man and machine readable characters and comply with the operational characteristics as specified in Section 14503.

1.11 Finger Hole

The tote shall have finger hole cut-outs in the 12 inch wide ends of the tote for the purpose of providing a means of lifting. The hole shall be centered on the width of the tote and the opening shall begin approximately 1 ¼ inches from the top of the tote. The hole shall be an oval shape approximately 4 inches wide by 1 ¼ inches high. The cut-out shall have rounded corners with a radius no greater than ½ inches. The cut edges of the tote shall be smooth and comfortable to grip and shall be free from burrs, splinters and rough edges and other aberrations which might cause injury or discomfort to operators.

END OF APPENDIX 11

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**** NOTICE ****

TO: ALL VENDORS/CONTRACTORS/CONSULTANTS

FROM: THE OFFICE OF THE ARCHITECT OF THE CAPITOL

Due to requirements set forth in the DEBT COLLECTION IMPROVEMENT ACT OF 1996 (PUBLIC LAW 104-134), all payments made to vendors, contractors and consultants doing business with the Federal Government must be made by Electronic Funds Transfer (EFT) directly to your financial institution. If you are currently enrolled under EFT with the Architect of the Capitol, no further action is necessary other than to report changes.

EFT payments are cost effective, enabling prompt, convenient and reliable payments directly to a designated bank account.

The Architect of the Capitol, in making EFT payments, supplies the financial institution with identifying information (ie. invoice number), which accompanies each transaction. The financial institution in turn can supply this information to the account holder.

Therefore, to accomplish the mandate of P. L. 104-134, it is necessary that the attached sheet; PAYMENT INFORMATION FORM ACH VENDOR PAYMENT SYSTEM be completed and returned with your bid or offer as set forth in Section G of the solicitation.

PAYMENT INFORMATION FORM
ACH VENDOR PAYMENT SYSTEM

This form is used for ACH payments with an addendum record that carries payment-related information. Recipients of these payments should bring this information to the attention of their financial institution when presenting this form for completion. The information will be transmitted in the CCD+ format to the designated financial institution.

Debt Collection Improvement Act of 1996

PAPERWORK REDUCTION ACT STATEMENT

The information being collected on this form is pursuant to Public Law 104-134, which mandated Electronic Funds Transfer for recipients of all federal payments (excluding IRS tax refunds) beginning July 24, 1996. This information will be needed by the Treasury Department to transmit payments and related data.

COMPANY INFORMATION	
NAME:	
ADDRESS:	
CONTRACT NUMBER: **AOC-**_____	TAXPAYER IDENTIFICATION NUMBER (TIN):
CONTACT PERSON NAME:	TELEPHONE NUMBER: ( ) FAX NUMBER: ( )

AGENCY INFORMATION	
NAME: ARCHITECT OF THE CAPITOL - FORD HOUSE OFFICE BUILDING	
ADDRESS: ACCOUNTING DIVISION, ROOM H2-205	
WASHINGTON, D.C. 20024	FAX NUMBER: (202) 225-7321
CONTACT PERSON NAME: MR. JAMES JARBOE	TELEPHONE NUMBER: (202) 226-2552

FINANCIAL INSTITUTION INFORMATION	
BANK NAME:	
BRANCH LOCATION: (If applicable)	
CONTACT NAME:	TELEPHONE NUMBER: ( )
NINE DIGIT ROUTING TRANSIT NUMBER: ___ ___ ___ ___ ___ ___ ___ ___ ___	
DEPOSITOR ACCOUNT NUMBER:	
TYPE OF ACCOUNT: _____ CHECKING _____ SAVINGS _____LOCKBOX	
SIGNATURE AND TITLE OF REPRESENTATIVE:	TELEPHONE NUMBER:

For AOC use only:
ID required _____
No ID _____

CP–491
(4–96)

UNITED STATES CAPITOL POLICE

WASHINGTON, D.C. 20510-7218

REQUEST FOR CHECK OF CRIMINAL HISTORY RECORDS

Please report with: (1) a form of valid photo identification and (2) this form; to the Identification Section, Room 103B, U.S. Capitol Police Headquarters, 119 D Street, N.E.

1 Name *(Last, First, Middle)*	Address: _____ Street & No. _____ City & State _____ Zip _____ Tele:

2 Other names ever used *(e.g. maiden name, nickname, etc.)*

3 Date of Birth *(Month, Day, Year)*	4 Birthplace *(City and State or County)*
5 Social Security Number	6 Sex ☐ Male ☐ Female

7 Race	8 Height	9 Weight	10 Eye Color	11 Hair Color

SIGNATURE AND RELEASE OF INFORMATION:

READ THE FOLLOWING CAREFULLY BEFORE YOU SIGN:

- I understand that the information provided above will be used to check the criminal history records of the Federal Bureau of Investigation (FBI).
- I consent to the use of the information provided above in making a security determination concerning me.
- I certify that, to the best of my knowledge and belief, all the information provided above is true, correct, and complete, and made in good faith.

12 Signature _____

13 Date Signed *(Month, Day, Year)* _____

AUTHORIZED REQUESTER:

14 Name/Employing Office

15 Title

16 Telephone number	**17** Date of Request

SIGNATURE AND REQUEST:

I request that the applicant/employee indicated above be fingerprinted by the United States Capitol Police and that these fingerprints be submitted for a check of the criminal history records of the Federal Bureau of Investigation (FBI). This check will be used in making a security determination concerning this applicant/employee.

18 Signature

19 Date Signed *(Month, Day, Year)*

IDENTIFICATION SECTION:

20 Individual Receiving Request

21 Date/Time Received

22 IS #:

AOC PAST PERFORMANCE QUESTIONNAIRE
RFP 050065

Automated Book Conveyor System Upgrade/Replacement

The company listed below is preparing an offer on the above project for the Architect of the Capitol, Washington, DC. Your name has been provided as a customer reference regarding performance under a past contract with your agency/company. Your comments are considered Source Selection Sensitive, therefore, you are advised that your response will be safeguarded to the extent cited in the Federal Acquisition Regulation (FAR) 42.1503. FAR prohibits the release of past performance evaluations to other than other Government personnel and the company whose performance is being evaluated during the period the information may be used to provide source selection information.

This past performance questionnaire is being submitted by the contractor and you are requested complete it and return it to the Architect of the Capitol in care of Chris Lindsay at FAX number (202) 225-3221 or (202) 226-7056 on or before the proposal submission due date of October 26, 2005. While all elements below may not apply, please complete as much as possible.

Company/Individual Requesting Past Project Information:

Name:_____

Past Project Title On Which The Company Is Being Evaluated

Project Title :_____

Evaluator POC (for verification purposes)

Name: Agency/Company, POC _____Date:_____

Phone No.:_____ Fax No. _____

E-mail Address: _____

Address:_____

Position held or function in relation to project: _____

Ratings: Please evaluate the contractor's performance using the following ratings:

"O" Outstanding The contractor's performance clearly exceeded the contract requirements.
"S" Satisfactory The contractor's performance met the contract requirements.
"M" Marginal The contractor's performance met the minimum contract requirements but with

AOC PAST PERFORMANCE QUESTIONNAIRE
RFP 050065

difficulty.

"U" Unsatisfactory The contractor's performance was poor and/or did not satisfy contract requirements.

Please rate and provide supporting information for the following. If the rating is Outstanding or Unsatisfactory, please provide specific contract/job performance areas which were exceeded or not performed in accordance with the contract's minimum requirements. (Use additional sheets as needed)

1. Performance in meeting delivery/completion schedules: _____

_____ **Rating:** _____

2. What did the contractor do to improve or resolve schedule problems, if any?_____

_____ **Rating:** _____

3. The contractor's quality control (CQC)._____

_____ **Rating:** _____

4. The contractor's performance in delivering quality work in accordance with the contract:

_____

_____ **Rating:** _____

5. The contractor's ability to provide the required work at a reasonable total price._____

_____ **Rating:** _____

6. The contractor's compliance with labor standards, if applicable._____

_____ **Rating:** _____

7. The contractor's compliance with safety standards. _____

_____ **Rating:** _____

8. Has the contractor been given any of the following: Cure notice, show cause, letters of

reprimand, suspension of payments, termination? If yes, please explain. _____

_____ **Rating:** _____

9. Would you award another contract to this contractor? If no, please state reasons for not recommending this contractor additional work. _____

_____ **Rating:** _____

10. Was the customer satisfied with the end product? _____

_____ **Rating:** _____

11. The relationship between the contractor and owner's contract team/Contracting Officer/COR/COTR?

_____ **Rating:** _____

12. The contractor's on-site management and coordination of subcontractors.

_____

_____ **Rating:** _____

13. The contractor's overall corporate management, integrity, reasonableness and cooperative conduct.

_____

_____ **Rating:** _____

14. Has the contractor filed any modifications?_____ How many? _____

And to what extent? _____

15. Has the contractor been provided an opportunity to discuss any negative performance ratings?

If so, what were the results? _____

16. **OVERALL RATING** **Rating:** _____

AOC PAST PERFORMANCE QUESTIONNAIRE
RFP 050065

17. Please provide any additional comments:_____

_____

_____

_____

_____

_____

_____

BID BOND *(See instruction on reverse)*	DATE BOND EXECUTED *(Must not be later than bid opening date)*	OMB NO.:9000-0045

Public reporting burden for this collection of information is estimated to average 25 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the FAR Secretariat (MVR), Federal Acquisition Policy Division, GSA, Washington, DC 20405.

PRINCIPAL *(Legal name and business address)*

TYPE OF ORGANIZATION *("X" one)*

☐ INDIVIDUAL ☐ PARTNERSHIP

☐ JOINT VENTURE ☐ CORPORATION

STATE OF INCORPORATION

SURETY(IES) *(Name and business address)*

PENAL SUM OF BOND					BID IDENTIFICATION	
PERCENT OF BID PRICE	AMOUNT NOT TO EXCEED				BID DATE	INVITATION NO.
	MILLION(S)	THOUSAND(S)	HUNDRED(S)	CENTS	FOR *(Construction, Supplies, or Services)*	

OBLIGATION:

We, the Principal and Surety(ies) are firmly bound to the United States of America (hereinafter called the Government) in the above penal sum. For payment of the penal sum, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally. However, where the Sureties are corporations acting as co-sureties, we, the Sureties, bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us. For all other purposes, each Surety binds itself, jointly and severally with the Principal, for the payment of the sum shown opposite the name of the Surety. If no limit of liability is indicated, the limit of liability is the full amount of the penal sum.

CONDITIONS:

The Principal has submitted the bid identified above.

THEREFORE:

The above obligation is void if the Principal - (a) upon acceptance by the Government of the bid identified above, within the period specified therein for acceptance (sixty (60) days if no period is specified), executes the further contractual documents and gives the bond(s) required by the terms of the bid as accepted within the time specified (ten (10) days if no period is specified) after receipt of the forms by the principal; or (b) in the event of failure to execute such further contractual documents and give such bonds, pays the Government for any cost of procuring the work which exceeds the amount of the bid.

Each Surety executing this instrument agrees that its obligation is not impaired by any extension(s) of the time for acceptance of the bid that the Principal may grant to the Government. Notice to the surety(ies) of extension(s) are waived. However, waiver of the notice applies only to extensions aggregating not more than sixty (60) calendar days in addition to the period originally allowed for acceptance of the bid.

WITNESS:

The Principal and Surety(ies) executed this bid bond and affixed their seals on the above date.

PRINCIPAL

SIGNATURE(S)	1. *(Seal)*	2. *(Seal)*	3. *(Seal)*	*Corporate Seal*
NAME(S) & TITLE(S) *(Typed)*	1.	2.	3.	

INDIVIDUAL SURETY(IES)

SIGNATURE(S)	1. *(Seal)*	2. *(Seal)*
NAME(S) *(Typed)*	1.	2.

CORPORATE SURETY(IES)

SURETY A	NAME & ADDRESS		STATE OF INC.	LIABILITY LIMIT ($)	*Corporate Seal*
	SIGNATURE(S)	1.	2.		
	NAME(S) & TITLE(S) *(Typed)*	1.	2.		

AUTHORIZED FOR LOCAL REPRODUCTION
Previous edition is usable

STANDARD FORM 24 (REV. 10-98)
Prescribed by GSA - FAR (48 CFR) 53.228(a)

SURETY B	NAME & ADDRESS		STATE OF INC.	LIABILITY LIMIT ($)	Corporate Seal
	SIGNATURE(S)	1.	2.		
	NAME(S) & TITLE(S) *(Typed)*	1.	2.		
SURETY C	NAME & ADDRESS		STATE OF INC.	LIABILITY LIMIT ($)	Corporate Seal
	SIGNATURE(S)	1.	2.		
	NAME(S) & TITLE(S) *(Typed)*	1.	2.		
SURETY D	NAME & ADDRESS		STATE OF INC.	LIABILITY LIMIT ($)	Corporate Seal
	SIGNATURE(S)	1.	2.		
	NAME(S) & TITLE(S) *(Typed)*	1.	2.		
SURETY E	NAME & ADDRESS		STATE OF INC.	LIABILITY LIMIT ($)	Corporate Seal
	SIGNATURE(S)	1.	2.		
	NAME(S) & TITLE(S) *(Typed)*	1.	2.		
SURETY F	NAME & ADDRESS		STATE OF INC.	LIABILITY LIMIT ($)	Corporate Seal
	SIGNATURE(S)	1.	2.		
	NAME(S) & TITLE(S) *(Typed)*	1.	2.		
SURETY G	NAME & ADDRESS		STATE OF INC.	LIABILITY LIMIT ($)	Corporate Seal
	SIGNATURE(S)	1.	2.		
	NAME(S) & TITLE(S) *(Typed)*	1.	2.		

INSTRUCTIONS

1. This form is authorized for use when a bid guaranty is required. Any deviation from this form will require the written approval of the Administrator of General Services.

2. Insert the full legal name and business address of the Principal in the space designated "Principal" on the face of the form. An authorized person shall sign the bond. Any person signing in a representative capacity (e.g., an attorney-in-fact) must furnish evidence of authority if that representative is not a member of the firm, partnership, or joint venture, or an officer of the corporation involved.

3. The bond may express penal sum as a percentage of the bid price. In these cases, the bond may state a maximum dollar limitation (e.g., 20% of the bid price but the amount not to exceed _____ dollars).

4. (a) Corporations executing the bond as sureties must appear on the Department of the Treasury's list of approved sureties and must act within the limitation listed therein. where more than one corporate surety is involved, their names and addresses shall appear in the spaces (Surety A, Surety B, etc.) headed "CORPORATE SURETY(IES)." In the space designed "SURETY(IES)" on the face of the form, insert only the letter identification of the sureties.

(b) Where individual sureties are involved, a completed Affidavit of Individual surety (Standard Form 28), for each individual surety, shall accompany the bond. The Government may require the surety to furnish additional substantiating information concerning its financial capability.

5. Corporations executing the bond shall affix their corporate seals. Individuals shall execute the bond opposite the word "Corporate Seal"; and shall affix an adhesive seal if executed in Maine, New Hampshire, or any other jurisdiction requiring adhesive seals.

6. Type the name and title of each person signing this bond in the space provided.

7. In its application to negotiated contracts, the terms "bid" and "bidder" shall include "proposal" and "offeror."

GENERAL DECISION: **DC20030003** 08/19/2005 DC3

Date: August 19, 2005
General Decision Number: **DC20030003** 08/19/2005

Superseded General Decision Number: DC020003

State: District of Columbia

Construction Type: Building

County: District of Columbia Statewide.

BUILDING CONSTRUCTION PROJECTS (Does not include single family homes and apartments up to and including 4 stories)

Modification Number	Publication Date
0	06/13/2003
1	10/03/2003
2	10/31/2003
3	01/09/2004
4	03/19/2004
5	04/02/2004
6	05/14/2004
7	06/11/2004
8	06/18/2004
9	06/25/2004
10	07/02/2004
11	07/09/2004
12	07/16/2004
13	08/13/2004
14	08/20/2004
15	09/17/2004
16	09/24/2004
17	10/29/2004
18	11/12/2004
19	01/21/2005
20	04/01/2005
21	05/06/2005
22	06/03/2005
23	06/10/2005
24	06/24/2005
25	07/01/2005
26	07/08/2005
27	07/22/2005
28	08/19/2005

ASBE0024-001 03/01/2005

	Rates	Fringes
Asbestos Worker/Heat and Frost Insulator Includes application of all insulating materials, protective coverings, coatings and finishes to all types of mechanical systems. Also the		

```
     application of
     firestopping material for
     wall openings and
     penetrations in walls,
     floors, ceilings and
     curtain walls...............$ 25.10            11.91
-----------------------------------------------------------------
ASBE0024-002 03/01/2005

                                     Rates          Fringes

  Hazardous Material Handler
     Includes preparation,
     wetting, stripping,
     removal, scrapping,
     vacuuming, bagging and
     disposing of all
     insulation materials,
     whether they contain
     asbestos or not, from
     mechanical systems..........$ 11.93             5.85
-----------------------------------------------------------------
BRDC0001-001 05/01/2005

                                     Rates          Fringes

  Bricklayer.....................$ 25.00             6.09
-----------------------------------------------------------------
CARP0132-006 05/01/2005

                                     Rates          Fringes

  Carpenter (Including Drywall
  Hanging)......................$ 22.89             5.39
  Piledriver....................$ 21.47             5.81
-----------------------------------------------------------------
ELEC0026-003 09/02/2002

                                     Rates          Fringes

  Communication Technician.......$ 20.60             5.09

  SCOPE OF WORK: Includes low voltage construction,
  installation, maintenance and removal of teledata
  facilities (voice, data and video) including outside plant,
  telephone and data inside wire, interconnect, terminal
  equipment, central offices, PABX, fiber optic cable and
  equipment, railroad communications, micro waves, VSAT,
  bypass, CATV, WAN (Wide area networks), LAN (Local area
  networks) and ISDN (Integrated systems digital network).

  WORK EXCLUDED: The installation of computer systems in
  industrial applications such as assembly lines, robotics
  and computer controller manufacturing systems.  The
  installation of conduit and/or raceways shall be installed
  by Inside Wiremen. On sites where there is no Inside
  Wireman employed, the Teledata Technician may install
  raceway or conduit not greater than 10 feet. Fire alarm
  work is excluded on all new construction sites or wherever
  the fire alarm system is installed in conduit.  All HVAC
```

control work.

ELEC0026-016 06/06/2005

	Rates	Fringes
Electrician (Excluding Communication-Low Voltage Wiring)	$ 30.15	9.90+3%+a

a. PAID HOLIDAYS: New Year's Day, Martin Luther King Jr.'s Birthday, Inauguration Day, Memorial Day, Fourth of July, Labor Day, Veterans Day, Thanksgiving Day, the day after Thanksgiving and Christmas Day or days designated as legal holidays by the Federal Government.

---

* ENGI0077-009 05/01/2005

	Rates	Fringes
Power equipment operators:		
Boom Trucks	$ 24.87	6.02+a
Cranes (35 tons and above)	$ 25.74	6.02+a
Cranes (under 35 tons)	$ 25.28	6.02+a
Forklifts	$ 17.50	6.02+a
Piledrivers	$ 25.28	6.02+a

a. PAID HOLIDAYS:
New Years Day, Inaugural Day, Decoration Day, Independence Day, Labor Day, Martin Luther King's Birthday, Veterans Day, Thanksgiving Day, Friday after Thanksgiving and Christmas Day.

b. PREMIUM PAY:
Tower cranes and cranes 100-ton and over to receive $1.00 per hour premium over Group One.

IRON0005-001 06/01/2003

	Rates	Fringes
Ironworkers:		
Structural, Ornamental and Chain Link Fence	$ 24.00	8.975

IRON0201-003 05/01/2005

	Rates	Fringes
Ironworker, Reinforcing	$ 24.45	9.73

LABO0074-001 06/01/2005

	Rates	Fringes
Laborer: Skilled	$ 18.03	3.12

FOOTNOTE: Potmen, power tool operator, small machine operator, concrete labor including concrete preparation,

signalmen, laser beam operator, waterproofer, open caisson, test pit, underpinning, pier hole and ditches, laggers and all work associated with lagging that is not expressly stated, strippers, operator of hand derricks, vibrator operators, pipelayers, or tile layers, operators of jackhammers, paving breakers, spaders or any machine that does the same general type of work, scaffold builders, operators of towmasters, scootcretes, buggymobiles and other machines of similar character, operators of tampers and rammers, and other machines that do the same general type of work, whether powered by air, electric or gasoline builders of trestle scaffolds over one tier high and sand blasters, power and chain saw operators used in clearing, installers of well points, wagon drill operators, acetylene burners and licensed powdermen.

LABO0456-012 06/01/2005

	Rates	Fringes
Laborers:		
Mason Tenders (Brick).....	$ 13.75	3.12
Mortarmen, Scaffold Builders	$ 14.45	3.12

MARB0002-002 05/01/2005

	Rates	Fringes
Marble & Stone Mason.....	$ 28.72	10.55

INCLUDES pointing, caulking and cleaning of All types of masonry, brick, stone and cement structures; EXCEPT pointing, caulking and cleaning of exisiting masonry, brick, stone and cement (restoration work)

MARB0003-001 05/01/2005

	Rates	Fringes
Mosaic & Terrazzo Worker, Tile Layer.....	$ 23.17	8.53

MARB0003-004 05/01/2005

	Rates	Fringes
Marble, Tile & Terrazzo Finisher.....	$ 18.72	7.62

PAIN0051-004 06/01/2005

	Rates	Fringes
Glazier		
Contracts $2,000,000 and under.....	$ 21.87	7.21
Contracts over $2,000,000...	$ 23.09	7.21

PAIN0051-010 06/01/2005

```
                                    Rates          Fringes

  Painters:
     Brush, Roller, Spray and
     Drywall Finishers...........$ 21.31             7.06
-----------------------------------------------------------------
PLAS0891-003 05/01/2004

                                    Rates          Fringes

  Cement Mason..................$ 23.73            4.945
-----------------------------------------------------------------
* PLUM0005-007 08/01/2005

                                    Rates          Fringes

  Plumber
     Apartment Buildings over 4
     stories (except hotels).....$ 19.86           7.56+a
     ALL Other Work..............$ 31.05          11.26+a

  a. PAID HOLIDAYS:  Labor Day, Veterans' Day, Thanksgiving Day
  and the day after Thanksgiving, Christmas Day, New Year's
  Day, Martin Luther King's Birthday, Memorial Day and the
  Fourth of July.
-----------------------------------------------------------------
PLUM0602-006 09/01/2004

                                    Rates          Fringes

  Steamfitter, Refrigeration &
  Air Conditioning Mechanic
  (Including HVAC Pipe Work).....$ 29.17          11.22+a

a. PAID HOLIDAYS:
  New Year's Day, Martin Luther King's Birthday, Memorial Day,
  Independence Day, Labor Day, Veterans Day, Thanksgiving Day
  and the day after Thanksgiving Day and Christmas Day.

-----------------------------------------------------------------
SFDC0669-001 01/01/2005

                                    Rates          Fringes

  Sprinkler Fitter..............$ 25.05            11.00
-----------------------------------------------------------------
* SHEE0100-002 07/01/2005

                                    Rates          Fringes

  Sheet Metal Worker (Including
  HVAC Duct Work)...............$ 29.18            10.51
-----------------------------------------------------------------
 SUDC2000-001 04/12/2000

                                    Rates          Fringes

  Laborer, Unskilled............$ 11.83             2.23
  Pointer, caulker and cleaner
     INCLUDES pointing,
```

```
     caulking and cleaning of
     existing masonry, brick,
     stone and cement
     structures (restoration
     work); EXCLUDES pointing,
     caulking and cleaning of
     new or replacement
     masonry, brick, stone and
     cement.....................$ 20.00
-----------------------------------------------------------------

WELDERS - Receive rate prescribed for craft performing
operation to which welding is incidental.
=================================================================

Unlisted classifications needed for work not included within
the scope of the classifications listed may be added after
award only as provided in the labor standards contract clauses
(29CFR 5.5 (a) (1) (ii)).

-----------------------------------------------------------------

In the listing above, the "SU" designation means that rates
listed under the identifier do not reflect collectively
bargained wage and fringe benefit rates.  Other designations
indicate unions whose rates have been determined to be
prevailing.

-----------------------------------------------------------------

            WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can
be:

*  an existing published wage determination
*  a survey underlying a wage determination
*  a Wage and Hour Division letter setting forth a position on
   a wage determination matter
*  a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests
for summaries of surveys, should be with the Wage and Hour
Regional Office for the area in which the survey was conducted
because those Regional Offices have responsibility for the
Davis-Bacon survey program. If the response from this initial
contact is not satisfactory, then the process described in 2.)
and 3.) should be followed.

With regard to any other matter not yet ripe for the formal
process described here, initial contact should be with the
Branch of Construction Wage Determinations.  Write to:

        Branch of Construction Wage Determinations
        Wage and Hour Division
        U.S. Department of Labor
        200 Constitution Avenue, N.W.
        Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an
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interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION