

Lee Hall Depot Building under construction





BID PRICE BREAKDOWN Stabilization of the Lee Hall Depot (Phase 3a)

Newport News, Virginia

Description	Subtotals	Total Cost
General Conditions	[
Site Work		
Utilities	Γ	
Electrical service		
Domestic water extension		
Sewer service		
Stormwater		
Gas		
Sprinkler service extension		
Landscaping	[
Exterior Building Work	[
Interior Building Work	[
Building Systems	ſ	
mechanical systems		
electrical systems		
plumbing systems		
sprinkler system		
site ligthing		
security system		
TOTAL BID PRICE:]	

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SF010CF-0309

FHWA 1273, MEMORANDUM AND CFR CHANGE

January 19, 2009

REQUIRED CONTRACT PROVISIONS, FEDERAL-AID CONSTRUCTION CONTRACTS (FHWA 1273) shall apply to this contract as well as the following:

• FHWA memorandum with the subject titled "THE DISCONTINUANCE OF THE FHWA-45, FHWA-47 & FHWA-810". In accordance with this memorandum the Contractor shall be governed by the following:

> The submission of Form C-50 (FHWA 47) which is used to fulfill the reporting requirements of Section VI, Record of Materials, Supplies, and Labor of FHWA 1273— Required Contract Provisions Federal-Aid Construction Contracts is no longer required on Federal Aid Construction Contracts. Only that part of Section VI of FHWA 1273 is thus eliminated. All the other parts remain in effect.

• <u>CFR (Code of Federal Regulations) change regarding Employee Social Security Numbers and</u> <u>Addresses on Payrolls</u>. In accordance with the US Department of Labor regulations change in 29 CFR Parts 3 and 5 the Contractor shall be governed by the following:

Section V, Paragraph 2b of FHWA 1273—Required Contract Provisions Federal-Aid Construction Contracts is replaced with the following:

The payroll records shall contain the name, and the last four digits of the social security number of each such employee, his or her correct classification; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalent thereof the types described in Section 1(b)(2)(B) of the Davis Bacon Act); daily and weekly number of hours worked; deductions made; and actual wages paid.

FHWA-1273 Electronic version --March 10, 1994

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A. Employment Preference for Appalachian Contracts (included in Appalachian contracts only)

I. GENERAL

- 1. These contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendent and to all work performed on the contract by piecework, station work, or by subcontract.
- 2. Except as otherwise provided for in each section, the contractor shall insert in each subcontract all of the stipulations contained in these Required Contract Provisions, and further require their inclusion in any lower tier subcontract or purchase order that may in turn be made. The Required Contract Provisions shall not be incorporated by reference in any case. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with these Required Contract Provisions.
- 3. A breach of any of the stipulations contained in these Required Contract Provisions shall be sufficient grounds for termination of the contract.
- 4. A breach of the following clauses of the Required Contract Provisions may also be grounds for debarment as provided in 29 CFR 5.12:

Section I, paragraph 2; Section IV, paragraphs 1, 2, 3, 4, and 7; Section V, paragraphs 1 and 2a through 2g.

- 5. Disputes arising out of the labor standards provisions of Section IV (except paragraph 5) and Section V of these Required Contract Provisions shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the U.S. Department of Labor (DOL) as set forth in 29 CFR 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the DOL, or the contractor's employees or their representatives.
- 6. Selection of Labor: During the performance of this contract, the contractor shall not:
 - a. discriminate against labor from any other State, possession, or territory of the United States (except for employment preference for Appalachian contracts, when applicable, as specified in Attachment A), or
 - b. employ convict labor for any purpose within the limits of the project unless it is labor performed by convicts who are on parole, supervised release, or probation.

II. NONDISCRIMINATION

(Applicable to all Federal-aid construction contracts and to all related subcontracts of \$10,000 or more.)

1. Equal Employment Opportunity: Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630 and 41 CFR 60) and orders of the

Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The Equal Opportunity Construction Contract Specifications set forth under 41 CFR 60-4.3 and the provisions of the American Disabilities Act of 1990 (42 U.S.C. 12101 <u>et seq</u>.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the State highway agency (SHA) and the Federal Government in carrying out EEO obligations and in their review of his/her activities under the contract.

b. The contractor will accept as his operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, preapprenticeship, and/or on-the-job training."

- 2. EEO Officer: The contractor will designate and make known to the SHA contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active contractor program of EEO and who must be assigned adequate authority and responsibility to do so.
- **3. Dissemination of Policy:** All members of the contractor's staff who are to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual will be taken as a minimum:
 - a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.
 - b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.
 - c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minority group employees.
 - d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.
 - e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.
- 4. **Recruitment:** When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minority groups in the area from which the

project work force would normally be derived.

- a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minority group applicants. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority group applicants may be referred to the contractor for employment consideration.
- b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, he is expected to observe the provisions of that agreement to the extent that the system permits the contractor's compliance with EEO contract provisions. (The DOL has held that where implementation of such agreements have the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Executive Order 11246, as amended.)
- c. The contractor will encourage his present employees to refer minority group applicants for employment. Information and procedures with regard to referring minority group applicants will be discussed with employees.
- 5. Personnel Actions: Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:
 - a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.
 - b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.
 - c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.
 - d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with his obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of his avenues of appeal.

6. Training and Promotion:

- a. The contractor will assist in locating, qualifying, and increasing the skills of minority group and women employees, and applicants for employment.
- b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training. In the event a special

provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision.

- c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.
- d. The contractor will periodically review the training and promotion potential of minority group and women employees and will encourage eligible employees to apply for such training and promotion.
- 7. Unions: If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use his/her best efforts to obtain the cooperation of such unions to increase opportunities for minority groups and women within the unions, and to effect referrals by such unions of minority and female employees. Actions by the contractor either directly or through a contractor's association acting as agent will include the procedures set forth below:
 - a. The contractor will use best efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minority group members and women for membership in the unions and increasing the skills of minority group employees and women so that they may qualify for higher paying employment.
 - b. The contractor will use best efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.
 - c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the SHA and shall set forth what efforts have been made to obtain such information.
 - d. In the event the union is unable to provide the contractor with a reasonable flow of minority and women referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minority group persons and women. (The DOL has held that it shall be no excuse that the union with which the contractor has a collective bargaining agreement providing for exclusive referral failed to refer minority employees.) In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the SHA.
- 8. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment: The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment.
 - a. The contractor shall notify all potential subcontractors and suppliers of his/her EEO obligations under this contract.
 - b. Disadvantaged business enterprises (DBE), as defined in 49 CFR 23, shall have equal opportunity to compete for and perform subcontracts which the contractor enters into pursuant to this contract. The contractor will use his best efforts to solicit bids from and to utilize DBE subcontractors or subcontractors with meaningful minority group and female

representation among their employees. Contractors shall obtain lists of DBE construction firms from SHA personnel.

- c. The contractor will use his best efforts to ensure subcontractor compliance with their EEO obligations.
- **9. Records and Reports:** The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following completion of the contract work and shall be available at reasonable times and places for inspection by authorized representatives of the SHA and the FHWA.
 - a. The records kept by the contractor shall document the following:
 - (1) The number of minority and non-minority group members and women employed in each work classification on the project;
 - (2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women;
 - (3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minority and female employees; and
 - (4) The progress and efforts being made in securing the services of DBE subcontractors or subcontractors with meaningful minority and female representation among their employees.
 - b. The contractors will submit an annual report to the SHA each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. If on-the job training is being required by special provision, the contractor will be required to collect and report training data.

III. NONSEGREGATED FACILITIES

(Applicable to all Federal-aid construction contracts and to all related subcontracts of \$10,000 or more.)

- a. By submission of this bid, the execution of this contract or subcontract, or the consummation of this material supply agreement or purchase order, as appropriate, the bidder, Federal-aid construction contractor, subcontractor, material supplier, or vendor, as appropriate, certifies that the firm does not maintain or provide for its employees any segregated facilities at any of its establishments, and that the firm does not permit its employees to perform their services at any location, under its control, where segregated facilities are maintained. The firm agrees that a breach of this certification is a violation of the EEO provisions of this contract. The firm further certifies that no employee will be denied access to adequate facilities on the basis of sex or disability.
- b. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and washrooms, restaurants and other eating areas, timeclocks, locker rooms, and other storage or dressing areas, parking lots, drinking

fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive, or are, in fact, segregated on the basis of race, color, religion, national origin, age or disability, because of habit, local custom, or otherwise. The only exception will be for the disabled when the demands for accessibility override (e.g. disabled parking).

c. The contractor agrees that it has obtained or will obtain identical certification from proposed subcontractors or material suppliers prior to award of subcontracts or consummation of material supply agreements of \$10,000 or more and that it will retain such certifications in its files.

IV. PAYMENT OF PREDETERMINED MINIMUM WAGE

(Applicable to all Federal-aid construction contracts exceeding \$2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural minor collectors, which are exempt.)

1. General:

- a. All mechanics and laborers employed or working upon the site of the work will be paid unconditionally and not less often than once a week and without subsequent deduction or rebate on any account [except such payroll deductions as are permitted by regulations (29 CFR 3) issued by the Secretary of Labor under the Copeland Act (40 U.S.C. 276c)] the full amounts of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment. The payment shall be computed at wage rates not less than those contained in the wage determination of the Secretary of Labor (hereinafter "the wage determination") which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor or its subcontractors and such laborers and mechanics. The wage determination (including any additional classifications and wage rates conformed under paragraph 2 of this Section IV and the DOL poster (WH-1321) or Form FHWA-1495) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers. For the purpose of this Section, contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act (40 U.S.C. 276a) on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of Section IV, paragraph 3b, hereof. Also, for the purpose of this Section, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in paragraphs 4 and 5 of this Section IV.
- b. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein, provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed.
- c. All rulings and interpretations of the Davis-Bacon Act and related acts contained in 29 CFR 1, 3, and 5 are herein incorporated by reference in this contract.

2. Classification:

- a. The SHA contracting officer shall require that any class of laborers or mechanics employed under the contract, which is not listed in the wage determination, shall be classified in conformance with the wage determination.
- b. The contracting officer shall approve an additional classification, wage rate and fringe benefits only when the following criteria have been met:

(1) the work to be performed by the additional classification requested is not performed by a classification in the wage determination;

(2) the additional classification is utilized in the area by the construction industry;

(3) the proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination; and

(4) with respect to helpers, when such a classification prevails in the area in which the work is performed.

- a. If the contractor or subcontractors, as appropriate, the laborers and mechanics (if known) to be employed in the additional classification or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the DOL, Administrator of the Wage and Hour Division, Employment Standards Administration, Washington, D.C. 20210. The Wage and Hour Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30day period that additional time is necessary.
- b. In the event the contractor or subcontractors, as appropriate, the laborers or mechanics to be employed in the additional classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. Said Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary
- c. e The wage rate (including fringe benefits where appropriate) determined pursuant to paragraph 2c or 2d of this Section IV shall be paid to all workers performing work in the additional classification from the first day on which work is performed in the classification.

3. Payment of Fringe Benefits:

a. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor or subcontractors, as appropriate, shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly case equivalent thereof.

b. If the contractor or subcontractor, as appropriate, does not make payments to a trustee or other third

person, he/she may consider as a part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, provided, that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

4. Apprentices and Trainees (Programs of U.S. DOL) and Helpers:

a. Apprentices:

(1) Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the DOL, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau, or if a person is employed in his/her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State apprenticeship agency (where appropriate) to be eligible for probationary employment as an apprentice.

(2) The allowable ratio of apprentices to journeyman-level employees on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any employee listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate listed in the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the work actually performed. Where a contractor or subcontractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman-level hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

(3) Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman-level hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator for the Wage and Hour Division determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

(4) In the event the Bureau of Apprenticeship and Training, or a State apprenticeship agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor or subcontractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the comparable work performed by regular employees until an acceptable program is approved.

b. Trainees:

(1) Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the

DOL, Employment and Training Administration.

(2) The ratio of trainees to journeyman-level employees on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the applicable wage rate on the wage determination for the applicable wage rate on the wage determination for the applicable wage rate on the wage determination for the applicable wage rate on the wage determination for the work actually performed.

(3) Every trainee must be paid at not less than the rate specified in the approved program for his/her level of progress, expressed as a percentage of the journeyman-level hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman-level wage rate on the wage determination which provides for less than full fringe benefits for apprentices, in which case such trainees shall receive the same fringe benefits as apprentices.

- (4) In the event the Employment and Training Administration withdraws approval of a training program, the contractor or subcontractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.
- c. Helpers: Helpers will be permitted to work on a project if the helper classification is specified and defined on the applicable wage determination or is approved pursuant to the conformance procedure set forth in Section IV.2. Any worker listed on a payroll at a helper wage rate, who is not a helper under a approved definition, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed.

5. Apprentices and Trainees (Programs of the U.S. DOT):

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

6. Withholding:

The SHA shall upon its own action or upon written request of an authorized representative of the DOL withhold, or cause to be withheld, from the contractor or subcontractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements which is held by the same prime contractor, as much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the SHA contracting officer may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

7. Overtime Requirements:

No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers, mechanics, watchmen, or guards (including apprentices, trainees, and helpers described in paragraphs 4 and 5 above) shall require or permit any laborer, mechanic, watchman, or guard in any workweek in which he/she is employed on such work, to work in excess of 40 hours in such workweek unless such laborer, mechanic, watchman, or guard receives compensation at a rate not less than one-and-one-half times his/her basic rate of pay for all hours worked in excess of 40 hours in such workweek.

8. Violation:

Liability for Unpaid Wages; Liquidated Damages: In the event of any violation of the clause set forth in paragraph 7 above, the contractor and any subcontractor responsible thereof shall be liable to the affected employee for his/her unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory) for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer, mechanic, watchman, or guard employed in violation of the clause set forth in paragraph 7, in the sum of \$10 for each calendar day on which such employee was required or permitted to work in excess of the standard work week of 40 hours without payment of the overtime wages required by the clause set forth in paragraph 7.

9. Withholding for Unpaid Wages and Liquidated Damages:

The SHA shall upon its own action or upon written request of any authorized representative of the DOL withhold, or cause to be withheld, from any monies payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph 8 above.

V. STATEMENTS AND PAYROLLS

(Applicable to all Federal-aid construction contracts exceeding \$2,000 and to all related subcontracts, except for projects located on roadways classified as local roads or rural collectors, which are exempt.)

1. Compliance with Copeland Regulations (29 CFR 3):

The contractor shall comply with the Copeland Regulations of the Secretary of Labor which are herein incorporated by reference.

2. Payrolls and Payroll Records:

- a. Payrolls and basic records relating thereto shall be maintained by the contractor and each subcontractor during the course of the work and preserved for a period of 3 years from the date of completion of the contract for all laborers, mechanics, apprentices, trainees, watchmen, helpers, and guards working at the site of the work.
- b. The payroll records shall contain the name, social security number, and address of each such employee; his or her correct classification; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalent thereof the types

described in Section 1(b)(2)(B) of the Davis Bacon Act); daily and weekly number of hours worked; deductions made; and actual wages paid. In addition, for Appalachian contracts, the payroll records shall contain a notation indicating whether the employee does, or does not, normally reside in the labor area as defined in Attachment A, paragraph 1. Whenever the Secretary of Labor, pursuant to Section IV, paragraph 3b, has found that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1(b)(2)(B) of the Davis Bacon Act, the contractor and each subcontractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, that the plan or program has been communicated in writing to the laborers or mechanics affected, and show the cost anticipated or the actual cost incurred in providing benefits. Contractors or subcontractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprentices and trainees, and ratios and wage rates prescribed in the applicable programs.

- c. Each contractor and subcontractor shall furnish, each week in which any contract work is performed, to the SHA resident engineer a payroll of wages paid each of its employees (including apprentices, trainees, and helpers, described in Section IV, paragraphs 4 and 5, and watchmen and guards engaged on work during the preceding weekly payroll period). The payroll submitted shall set out accurately and completely all of the information required to be maintained under paragraph 2b of this Section V. This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal stock number 029-005-0014-1), U.S. Government Printing Office, Washington, D.C. 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors.
- d. Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his/her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) that the payroll for the payroll period contains the information required to be maintained under paragraph 2b of this Section V and that such information is correct and complete;

(2) that such laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in the Regulations, 29 CFR 3;

(3) that each laborer or mechanic has been paid not less that the applicable wage rate and fringe benefits or cash equivalent for the classification of worked performed, as specified in the applicable wage determination incorporated into the contract.

- e. The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 2d of this Section V.
- f. The falsification of any of the above certifications may subject the contractor to civil or criminal prosecution under 18 U.S.C. 1001 and 31 U.S.C. 231.
- g. The contractor or subcontractor shall make the records required under paragraph 2b of this Section V available for inspection, copying, or transcription by authorized representatives of the SHA, the FHWA, or the DOL, and shall permit such representatives to interview employees

during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the SHA, the FHWA, the DOL, or all may, after written notice to the contractor, sponsor, applicant, or owner, take such actions as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

VI. RECORD OF MATERIALS, SUPPLIES, AND LABOR

- 1. On all Federal-aid contracts on the National Highway System, except those which provide solely for the installation of protective devices at railroad grade crossings, those which are constructed on a force account or direct labor basis, highway beautification contracts, and contracts for which the total final construction cost for roadway and bridge is less than \$1,000,000 (23 CFR 635) the contractor shall:
 - Become familiar with the list of specific materials and supplies contained in Form FHWA-47, "Statement of Materials and Labor Used by Contractor of Highway Construction Involving Federal Funds," prior to the commencement of work under this contract.
 - b. Maintain a record of the total cost of all materials and supplies purchased for and incorporated in the work, and also of the quantities of those specific materials and supplies listed on Form FHWA-47, and in the units shown on Form FHWA-47.
 - c. Furnish, upon the completion of the contract, to the SHA resident engineer on Form FHWA-47 together with the data required in paragraph 1b relative to materials and supplies, a final labor summary of all contract work indicating the total hours worked and the total amount earned.
- 2. At the prime contractor's option, either a single report covering all contract work or separate reports for the contractor and for each subcontract shall be submitted.

VII. SUBLETTING OR ASSIGNING THE CONTRACT

- 1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the State. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635).
 - a. "Its own organization" shall be construed to include only workers employed and paid directly by the prime contractor and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor, assignee, or agent of the prime contractor.
 - b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid on the contract as a whole and in general are to be limited to minor components of the overall contract.
- 3. The contract amount upon which the requirements set forth in paragraph 1 of Section VII is

computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

- 4. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the SHA contracting officer determines is necessary to assure the performance of the contract.
- 5. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the SHA contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the SHA has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

VIII.SAFETY: ACCIDENT PREVENTION

- 1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the SHA contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.
- 2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 333).
- Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 333).

IX. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, the following notice shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project: **NOTICE TO ALL PERSONNEL ENGAGED ON FEDERAL-AID HIGHWAY PROJECTS**

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used

or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined not more that \$10,000 or imprisoned not more than 5 years or both."

X. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

(Applicable to all Federal-aid construction contracts and to all related subcontracts of \$100,000 or more.)

- By submission of this bid or the execution of this contract, or subcontract, as appropriate, the bidder, Federalaid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:
 - That any facility that is or will be utilized in the performance of this contract, unless such contract is exempt under the Clean Air Act, as amended (42 U.S.C. 1857 <u>et seq</u>., as amended by Pub.L. 91604), and under the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 <u>et seq</u>., as amended by Pub.L. 92-500), Executive Order11738, and regulations in implementation thereof (40 CFR 15) is not listed, on the date of contract award, on the U.S. Environmental Protection Agency (EPA) List of Violating Facilities pursuant to 40 CFR 15.20.
 - 2. That the firm agrees to comply and remain in compliance with all the requirements of Section 114 of the Clean Air Act and Section 308 of the Federal Water Pollution Control Act and all regulations and guidelines listed thereunder.
 - 3. That the firm shall promptly notify the SHA of the receipt of any communication from the Director, Office of Federal Activities, EPA, indicating that a facility that is or will be utilized for the contract is under consideration to be listed on the EPA List of Violating Facilities.
 - 4. That the firm agrees to include or cause to be included the requirements of paragraph 1 through 4 of this Section X in every nonexempt subcontract, and further agrees to take such action as the government may direct as a means of enforcing such requirements.

XI. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

1. Instructions for Certification -Primary Covered Transactions:

(Applicable to all Federal-aid contracts -49 CFR 29)

- a. By signing and submitting this proposal, the prospective primary participant is providing the certification set out below.
- b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination

whether to enter into this transaction. However, failure of the prospective primary participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.

- c. The certification in this clause is a material representation of fact upon which reliance was placed when the department or agency determined to enter into this transaction. If it is later determined that the prospective primary participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause of default.
- d. The prospective primary participant shall provide immediate written notice to the department or agency to whom this proposal is submitted if any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
- e. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the department or agency to which this proposal is submitted for assistance in obtaining a copy of those regulations.
- f. The prospective primary participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.
- g. The prospective primary participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
- h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the nonprocurement portion of the "Lists of Parties Excluded From Federal Procurement or Nonprocurement Programs" (Nonprocurement List) which is compiled by the General Services Administration.
- i. 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 this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
- j. Except for transactions authorized under paragraph f of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Primary Covered Transactions

1. The prospective primary participant certifies to the best of its knowledge and belief, that it and its

principals:

- a. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
- b. Have not within a 3-year period preceding this proposal 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) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
- c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph 1b of this certification; and
- d. Have not within a 3-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.
- 2. Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

2. Instructions for Certification -Lower Tier Covered Transactions:

(Applicable to all subcontracts, purchase orders and other lower tier transactions of \$25,000 or more 49 CFR 29)

- a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.
- b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.
- c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.
- d. The terms "covered transaction," "debarred," "suspended," "ineligible," "primary covered transaction," "participant," "person," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations.
- e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
- f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
- g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may

decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.

- h. 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 this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
- i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Covered Transactions:

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

XII. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

(Applicable to all Federal-aid construction contracts and to all related subcontracts which exceed \$100,000 -49 CFR 20)

- 1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:
 - a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
 - b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
- 2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than

\$100,000 for each such failure.

3. The prospective participant also agrees by submitting his or her bid or proposal that he or she shall require that the language of this certification be included in all lower tier subcontracts, which exceed \$100,000 and that all such recipients shall certify and disclose accordingly.

FHWA MEMORANDUM



U.S. Department of Transportation **Federal Highway Administration**

MEMORANDUM

In Reply HIPA-10

Refer to:

- Subject: ACTION: The Discontinuance of the FHWA-45, Date: May 22, 2007 FHWA – 47 & FHWA-810
- From: /s/Original signed by Dwight Horne, Director Office of Program Adminstration
- To: Directors of Field Services Division Administrators Federal Lands Administrators

Effective immediately, Divisions and/or our State Transportation Agency (STA) partners will no longer be required to submit data to HIPA-10 that is collected as it relates to:

The FHWA-45, Bid Price Data^{*},

The FHWA-47, Statement of Materials and Labor Used by Contractors on Highway Construction Involving Federal Funds^{*}, and

The FHWA-810, Bid Tabulation Data⁺

For several years, STAs have commented that the reports generated from the data collection efforts were of little utility and that there were statistical limitations, statistical significance, and accuracy issues with the data which were felt could result in misleading information. There was also a noted reporting burden on States and contractors. The suggestions have often been to eliminate the reporting requirements all together.

In 2003, the GAO conducted a review of the States' highway construction costs. As part of its review, the GAO reviewed FHWA's cost data collection requirements. In its discussions, the GAO also identified similar issues and concerns with the data series as discussed above. In a December 2003 report GAO made recommendations to FHWA to review the usefulness and accuracy and/or under reporting of the data collected.

As a result, FHWA has determined that it is appropriate to discontinue the reporting requirements for the FHWA 45, 47 and 810 as collection of this data for needed reports such as the "Highway Statistics" publication can be collected through other means. The main reasons for this decision are the strong disinterest in the data collection activities and comments provided to us by our STA partners suggesting that we are not collecting the data extensively enough to be of utility. We will also be going through an abridged regulatory update as appropriate to reflect this action. Please contact Bob Wright, at 202-366-4630, to answer any questions and/or for additional information on this matter.

The FHWA 45, Bid Price Data, was collected on NHS projects over \$500,000. The FHWA 45 served as a means to compute the highway construction bid price index, which is published in the document "Price

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

Trends for Federal-aid Highway Construction. The data was used in our "Highway Statistics" publication and by other outside sources, including its use by congressional committees in their deliberations on pending new highway legislation.

The FHWA 47, Statement of Materials and Labor Used by Contractors on Highway Construction Involving Federal Funds, was collected on all NHS projects over \$1,000,000. The FHWA 47 served as a means to collect data related to the quantities of materials, supplies and labor used for various types of highway construction. The data reported on this form was used primarily to compute usage factors for these various materials, supplies, and labor. These factors were used to determine the economic impacts of cuts or increases in the cost of Federal-aid highway construction.

FHWA 810, Bid Tabulation Data was collected on all NHS projects. The needs for the FHWA 810 have been to compute national summaries on the largest contract awards and contract size statistics. The data was also used to produce state-by-state summaries on contracts awards, number of bids and average number of bids.

GUIDELINES -FEDERAL-AID PROJECTS GREATER THAN \$10,000

SF030AF-0708

Reissued July 2008

VIRGINIA DEPARTMENT OF TRANSPORTATION SPECIAL PROVISION FOR NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (EXECUTIVE ORDER 11246)

- 1. The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.
- The goals for female and minority participation, expressed in percentage terms of the Contractor's aggregate work force in each trade on all construction works in the covered area, are as follows:
 - a. Females-6.9% Minorities -See Attachment "A"

The goals are applicable to all the Contractor's construction work performed in the covered area, whether or not it is Federal or federally assisted. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the Contractor also is subject to the goals for both its federally involved and non-federally involved construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications, set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals established herein. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executives Order and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs <u>within 10 workings days</u> the award of any construction subcontract in excess of \$10,000 at any tier for construction works under this contract. The notification shall list the name, address and telephone number of the subcontractor, employer identification number, estimated dollar amount of the subcontract, estimated starting and completion dates of the subcontract and the geographical area in which the contract is to be performed.

STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS (EXECUTIVE ORDER 11246)

- 1. As, used in this provision:
 - a. "Covered area" means the geographical area described in the solicitation from which this contract resulted;
 - b. "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;

- c. "Employer identification number" means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return, U. S. Treasury Department Form 941;
- d. "Minority" includes:
 - i. Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);
 - ii. Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);
 - iii. Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
 - iv. American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).
- 2. Whenever the Contractor, or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation.
- 3. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U. S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other Contractor's or Subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.
- 4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7 a through p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the coverer area. Covered construction Contractors performing construction work in geographical areas where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the Federal Register in notice form, and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The Contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.
- 5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations

promulgated pursuant thereto.

- 6. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U. S. Department of Labor.
- 7. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:
 - a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, shall assign two or more women to each construction project. The Contractor shall specifically ensure that all foreman, superintendents and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites in such facilities.
 - b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.
 - c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off the street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union, or if referred, not employed by the Contractor, this shall be documented in the file with the reason therefore, along with whatever additional actions the Contractor may have taken.
 - d. Provide immediate written notification to the Director when the union or unions which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or women sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.
 - e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources complied under 7b above.
 - f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper or annual report; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

- g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination, or other employment decisions including specific review of these items with onsite supervisory personnel such as Superintendents and General Foremen prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed and disposition of the subject matter.
- h. Disseminate the Contractor's EEO policy externally by including in any news media advertisement that the Contractor is "An Equal Opportunity Employer" for minority and female, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.
- i. Directs its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures and tests to be used m the selection process.
- j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of Contractor's workforce.
- k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.
- I. Conduct, at least annually, an inventory and evaluation of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for such opportunities through appropriate training or other means.
- m. Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.
- n. Ensure that all facilities and company activities are nonsegregated, except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.
- Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.
- p. Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.
- 8. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7a through p). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member

and participant, may be asserted as fulfilling any one or more of its obligations under 7a through p of these Specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

- 9. Goals for women have been established. However, the Contractor IS required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner, that is even thought the Contractor has achieved its goals for women, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized.
- 10. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex or nation origin.
- 11. The Contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.
- 12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations by the Office of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246. as amended.
- 13. The Contractor, in fulfilling its obligations under these specifications shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from Its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director will proceed in accordance with 41 CFR 60-4.8.
- 14. The Contractor shall designate and make known to the Department a responsible official as the EEO Officer to monitor all employment related activity, to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, Contractors will not be required to maintain separate records.
- 15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

ATTACHMENT A

Economic Area Goal (Percent)

Virginia:	
021 Roanoke-Lynchburg, VA	
SMSA Counties:	
4640 Lynchburg, VA 19.	.3
VA Amherst; VA Appomattox; VA Campbell; VA Lynchburg	
6800 Roanoke, VA 10	1.2
VA Botetourt; VA Craig; VA Roanoke; VA Roanoke City; VA Salem	
Non-SMSA Counties	.0
VA Allegnany; VA Augusta; VA Bath; VA Bedford; VA Bland; VA	
Carroll;)/A. Floud:)/A. Franklin:)/A. Cilaa:)/A. Crawaan:)/A. Llanny:)/A	
VA Floyd; VA Flanklin; VA Glies; VA Glayson; VA Henry; VA	
Highlidhu, Mantaomary: MA Nolean: MA Datrick: MA Dittaylyania: MA	
VA Monigomery, VA Neison, VA Pairick, VA Pilisyivania, VA Dulacki:	
Fuldski, \/A Rockbridge: \/A Rockingham: \/A \/\vthe: \/A Bedford City: \/A Buena	
VA Nockolidge, VA Nockingham, VA Wythe, VA Dediord City, VA Duena Vieta:	
Visia. VA Clifton Forge: VA Covington: VA Danville: VA Galay: VA Harrisonburg:	
VA United Forge, VA Govington, VA Darvine, VA Galax, VA Hansenburg,	
WV Pendleton	
022 Richmond, VA	
SMSA Counties:	
6140 Petersburg - Colonial Heights - Hopewell, VA	.6
VA Dinwiddie; VA Prince George; VA Colonial Heights; VA Hopewell;	
VA Petersburg.	
6760 Richmond, VA	.9
VA Charles City; VA Chesterfield; VA Goochland, VA Hanover; VA	
Henrico; VA New Kent; VA Powhatan; VA Richmond.	
Non-SMSA Counties	<i>.</i> 9
VA Albemarle; VA Amelia; VA Brunswick; VA Buckingham, VA Caroline;	
VA Charlotte; VA Cumberland; VA Essex; VA Fluvanna; VA Greene; VA	
Greensville; VA Halifax; VA King and Queen; VA King William; VA	
Lancaster; VA Louisa; VA Lunenburg; VA Madison; VA Mecklenburg; VA	
Northumberland; VA Nottoway; VA Orange; VA Prince Edward; VA Richmond	
VA Sussex; VA Charlottesville; VA Emporia; VA South Boston	
023 Norfolk - Virginia Beach - Newport News VA:	
SMSA Counties:	
5680 Newport News- Hampton, VA	.1
VA Gloucester; VA James City; VA York; VA Hampton; VA Newport	
News; VA Williamsburg.	~
5720 NOTIOIR - VIrginia Beach - Portsmouth, VA – NC	о
NC Cumuck, VA Chesapeake, VA Nonoik, VA Ponsmouth, VA	
Sullok, VA Vigilia Deach.	7
NOT-SINGA COUTILIES	1
NC Derue, NC Canden, NC Chowan, NC Gales, NC Heriord, NC Descuotank: NC Perquimans: V/A lele of Wight: V/A Matthews:	
VA Middlesev: VA Southamston: VA Surry: VA Franklin	
Washington DC:	
020 Washington, DC.	

SMSA Count 8840	ties:) Washington, DC - MD - VA DC District of Columbia; MD Charles; MD Montgomery MD Prince Georges; VA Arlington; VA Fairfax; VA Loudoun; VA Prince William VA Alexandria; VA Fairfax City; VA Falls Church.	28.0
Non- SMSA	Counties	25.2
	MD Calvert; MD Frederick; MD St. Marys: MD Washington; VA Clarke; VA Culpeper; VA Fauquier; VA Frederick; VA King George; VA Page; VA Rappahannock; VA Shenandoah; VA Spotsylvania; VA Stafford; VA Warren: VA Westmoreland; VA Fredericksburg; VA Winchester WV Berkel WV Grant; WV Hampshire; WV Hardy; WV Jefferson; WV Morgan.	ey;
Tennessee:		
052 Johnson City - K	ingsport - Bristol, TN - VA	
SMSA Count	ties:	
3630) Johnson City - Kingsport -Bristol, TN-VA TN Carter; TN Hawkins; TN Sullivan; TN Washington; VA Scott: VA Washington; VA Bristol.	2.6
Non-SMSA (Counties	3.2
	TN Greene; TN Johnson; VA Buchanan; VA Dickenson; VA Lee; VA Russell; VA Smyth; VA Tazewell; VA Wise; VA Norton; WV McDowell; WV Mercer.	
Maryland:		
019 Baltimore MD Non-SMSA (MD (MD Nortl	Counties Caroline; MD Dorchester; MD Kent; MD Queen Annes; MD Somerset; Talbot; MD Wicomico; MD Worchester; VA Accomack; VA hampton.	23.6

GUIDELINES — THIS DOCUMENT IS TO BE USED ONLY IN VOLUME 1 (BID PROPOSAL AND CONTRACT) FOR PROJECTS USING THE VOLUME 1 AND VOLUME 2 METHOD OF PROPOSAL DEVELOPMENT. <u>SFV03AF</u> <u>Predetermin Min Wage Rates (Vol2)</u> MUST BE INCLUDED IN VOLUME 2 (SEPARATE-COVER CONTRACT DOCUMENTS) TO USE THIS. USE ON FEDERAL-AID PROJECTS. THIS SOURCE FILE HAS A BLANK AREA INCLUDED TO ACCOMMODATE THE ADDITION (*FILL-IN*) OF THE LATEST WAGE RATES THAT WILL APPLY TO THIS CONTRACT. CONTACT SCHEDULING AND CONTRACT DIVISION FOR THE LATEST WAGE RATES.

PREDETERMINED MINIMUM WAGE RATES (VOLUME 1)

Below are the predetermined minimum wage rates that are required for this contract by the U.S. DEPARTMENT OF LABOR in the letter made a portion of the special provision for **PREDETERMINED MINIMUM WAGE RATES** <u>LETTER</u> (VOLUME 2). The special provision for **PREDETERMINED MINIMUM WAGE RATES** <u>LETTER</u> (VOLUME 2) is in the accompanying contract document assembly titled "Separate-Cover Contract Documents" and is a binding part of the Contract and carries the same status in the Contract as that stated in Section 105.12 of the Specifications.

GENERAL DECISION: VA20100003 06/04/2010 VA3 Date: June 4, 2010 General Decision Number: VA20100003 06/04/2010 Superseded General Decision Number: VA20080003 State: Virginia Construction Type: Building County: Newport News* County in Virginia. *INDEPENDENT CITY OF NEWPORT NEWS (INCLUDING FORT EUSTIS) BUILDING CONSTRUCTION PROJECTS (Does not include single family homes and apartments up to and including 4 stories) Modification Number Publication Date 03/12/2010 0 1 05/07/20102 2 06/04/2010 * ELEC1340-001 12/01/2009 Rates Fringes \$ 23.80 Electricians..... 7.98 ENGI0147-007 05/01/2010 Rates Fringes Power equipment operators: Cranes, Under 90 tons..... \$ 25.99 8.69%+7.25 Oilers.....\$ 17.99 8.69%+5.75 IRON0079-002 05/01/2009 Rates Fringes Ironworkers: Structural and Rigging..... \$ 23.40 6.5%+9.72 LABO0388-001 03/01/2006 Rates Fringes Mason tender, brick..... \$ 13.20 3.30 PLUM0540-005 05/01/2010 Rates Fringes Pipefitters (Including HVAC Pipe Work)..... \$ 26.05 12.57

SUVA1999-005 06/11/1999
	Rates	Fringes
Carpenters (Including Form Work and Excluding Drywall Hanging and Acoustical		
Ceiling Work)	\$ 12.75	
Cement Finisher/Mason	\$ 12.11	
Drywall Finishers	\$ 12.50	
Drywall Hanger	\$ 12.50	
INVA MEGUNNIA (Inghallation		
and Repair ONLY)	\$ 15.00	
Laborer, Unskilled	\$ 7.34	
PLASTERER	\$ 11.40	
Plumbers	\$ 15.65	3.19
Power equipment operators.		
Backhoed	¢ 10 23	
Bulldozers	\$ 11 30	
Forklifts	\$ 8.58	
Loaders	\$ 10.30	
Sheet Metal Worker (HVAC Duct		
Work ONLY)	\$ 15.00	
Truck Driver, Dump	\$ 9.00	

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.

END OF GENERAL DECISION.

Last Saved: 12/17/2010 12:29 PM

UPDATED December 17, 2010

Today's Date: December 17, 2010

U.S. DEPARTMENT OF LABOR OFFICE OF THE SECRETARY WASHINGTON DECISION OF THE SECRETARY

This case is before the Department of Labor pursuant to a request for a wage predetermination as required by law applicable to the work described.

A study has been made of wage conditions in the locality and based on information available to the Department of Labor the wage rates and fringe payments listed are hereby determined by the Secretary of Labor as prevailing for the described classes for labor in accordance with applicable law.

This wage determination decision and any modifications thereof during the period prior to the stated expiration date shall be made a part of every contract for performance of the described work as provided by applicable law and regulations of the Secretary of Labor, and the wage rates and fringe payments contained in this decision, including modifications, shall be the minimums to be paid under any such contract and subcontractors on the work.

The contracting officer shall require that any class of laborers and mechanics which is not listed in the wage determination and which is to be employed under the contract, shall be classified or reclassified conformably to the wage determination, and a report of the action taken shall be sent by the Federal agency to the Secretary of Labor. In the event the interested parties cannot agree on the proper classification or reclassification of a particular class of laborers and mechanics to be used, the question accompanied by the recommendation of the contracting officer shall be referred to the Secretary for determination.

Before using apprentices on the job the contractor shall present to the contracting officer written evidence of registration of such employees in a program of a State apprenticeship and training agency approved and recognized by the U.S. Bureau of Apprenticeship and Training. In the absence of such a State agency, the contractor shall submit evidence of approval and registration by the U.S. Bureau of Apprenticeship and Training by the U.S. Bureau of Apprenticeship and Training.

The contractor shall submit to the contracting officer written evidence of the established apprenticejourneyman ratios and wage in the project area, which will be the basis for establishing such ratios and rates for the project under the applicable contract provisions.

Fringe payments include medical and hospital care, compensation for injuries or illness resulting from occupational activity, unemployment benefits, life insurance, disability and sickness insurance, accident insurance (all designated as health and welfare), pensions, vacation and holiday pay, apprenticeship or other similar programs and other bona fide fringe benefits.

By direction of the Secretary of Labor

E. Irving Manger, Associate Administrator Division of Wage Determinations Wage and Labor Standards Administration

GUIDELINES — ALL FEDERALLY FUNDED PROJECTS.

(c105hf1-0309) SECTION 105.06 SUBCONTRACTING of the Specifications is amended to include the following:

Any distribution of work shall be evidenced by a written binding agreement on file at the project site. Where no field office exists, such agreement shall be readily available upon request to Department inspector(s) assigned to the project.

The provisions contained in Form FHWA-1273 specifically, and other federal provisions included with the prime Contract are generally applicable to all Federalaid construction projects and must be made a part of, and physically incorporated into all contracts, as well as, appropriate subcontracts for work so as to be binding in those agreements.

12-19-08 (SPCN)

GUIDELINES — FEDERAL-AID PROJECTS CONTAINING ANY IRON OR STEEL PRODUCTS.

S102CF1-0309

VIRGINIA DEPARTMENT OF TRANSPORTATION SPECIAL PROVISION FOR USE OF DOMESTIC MATERIAL

February 26, 2009

SECTION 102.05 PREPARATION OF BID of the Specifications is amended to include the following:

In accordance with the provisions of Section 635.410(b) of Title 23 CFR, hereinafter referred to as "Buy America", except as otherwise specified, all iron and steel products (including miscellaneous steel items such as fasteners, nuts, bolts and washers) to be permanently incorporated for use on federal aid projects shall be produced in the United States of America regardless of the percentage they exist in the manufactured product or final form they take. Therefore, "Domestically produced in the United States of America, to mean, in one of the 50 States, the District of Columbia, Puerto Rico or in the territories and possessions of the United States. Manufacturing processes are defined as any process which alters or modifies the chemical content, physical size or shape or final finish of iron or steel material) such as rolling, extruding, bending, machining, fabrication, grinding, drilling, finishing, or coating whereby a raw material or a reduced iron ore material is changed, altered or transformed into a steel or iron item or product which, because of the process, is different from the original material. For the purposes of satisfying this requirement "coating" is defined as the application of epoxy, galvanizing, painting or any other such process that protects or enhances the value of the material. Materials used in the coating process need not be domestic materials.

For the purposes herein the manufacturing process is considered complete when the resultant product is ready for use as an item in the project (e.g. fencing, posts, girders, pipe, manhole covers, etc.) or is incorporated as a component of a more complex product by means of further manufacturing. Final assembly of a product may occur outside of the United States of America provided no further manufacturing process takes place.

Raw materials such as iron ore, pig iron, processed, pelletized and reduced iron ore, waste products (including scrap, that is, steel or iron no longer useful in its present form from old automobiles, machinery, pipe, railroad rail, or the like and steel trimmings from mills or product manufacturing) and other raw materials used in the production of steel and/or iron products may, however, be imported. Extracting, handling, or crushing the raw materials which are inherent to the transporting the materials for later use in the manufacturing process are exempt from Buy America. The use of foreign source steel or iron billet is not acceptable under the provisions of Buy America. For the purposes of this provision all steel or iron material not meeting the criteria as domestically produced in the United States of America will be considered as "foreign" material. All iron and steel items will be classified hereinafter as "domestic" or "foreign", identified by and subject to the provisions herein.

Domestically produced iron or steel ingots or billets shipped outside the United States of America for any manufacturing process and returned for permanent use in a project would not comply with "Buy America" requirements.

Buy America provisions do not apply to iron or steel products used temporarily in the construction of a project such as temporary sheet piling, temporary bridges, steel scaffolding, falsework or such temporary material or product or material that remains in place for the Contractor's convenience.

Section 635.410(b) of Title 23 CFR permits a minimal amount of steel or iron material to be incorporated in the permanent work on a federal-aid contract. The cost of such materials or products

must not exceed one-tenth of one percent of the contract amount or \$2500, whichever is greater. The cost of the foreign iron or steel material is defined as its monetary value delivered to the job site and supported by invoices or bill of sale to the Contractor. This delivered to site cost must include transportation, assembly, installation and testing.

In the event the total cost of all "foreign" iron and steel product or material does not exceed one-tenth of one percent of the total contract cost or \$2,500, whichever is greater, the use of such material meeting the limitations herein will not be restricted by the domestic requirements herein. However, by signing the bid, the Bidder certifies that such cost does not exceed the limits established herein.

Waivers:

With prior concurrence from Federal Highway Administration (FHWA) headquarters, the Federal Highway Division Administrator may grant a waiver to specific projects provided it can be demonstrated:

- 1. 1 that the use of domestic steel or iron materials would be inconsistent with the public interest; or
- 2. materials or products requested for use are not produced in the United States in sufficient or reasonably available quantities and are of satisfactory quality for use in the permanent work.

The waiver request shall be submitted with supportive information to include:

- 1. Project number\description, project cost, waiver item, item cost, country of origin for the product, reason for the waiver, and
- 2. Analysis of redesign of the project using alternative or approved equal domestic products

In order to grant such a waiver the request for the waiver must be published in the Federal Register for a period not less than 15 days or greater than 60 days prior to waiving such requirement. An initial 15 day comment period to the waiver will be available to the public by means of the FHWA website: http://www.fhwa.dot.gov/construction/contracts/waivers.cfm. Following that initial 15 day period of review and comment the request for waiver will be published by the FHWA in the Federal Register. The effective date of the FHWA finding, either to approve or deny the waiver request, will be 15 days following publication in the Federal Register.

Only the FHWA Administrator may grant nationwide waivers which still are subject to the public rulemaking and review process.

Alternative Bidding Procedures:

An alternative bidding procedure may be employed to justify the use of foreign iron and\or steel. To qualify under this procedure the total project is bid using two alternatives, one based on the use of domestic products and the other, the use of corresponding foreign source steel and\or iron materials.

In accordance with the provisions of Section 103.02 the Contract will be awarded to the lowest responsive and responsible bidder who submits the lowest total bid based on furnishing domestic iron or steel unless such total exceeds the lowest total bid based on furnishing foreign iron and\or steel by more than 25 percent, in which case the award will be made to the lowest responsive and responsible bidder furnishing foreign iron and\or steel based upon furnishing verifiable supportive data. The bidder shall submit a bid based on permanently incorporating only domestic iron and\or steel in the construction of the project. The bidder may also submit a bid for the same proposed contract based on being allowed to permanently incorporate corresponding foreign iron and\or steel materials meeting the other contract requirements into the work on the contract. If he chooses to submit such a

bid, that alternate bid shall clearly indicate which foreign iron and\or steel items will be permanently installed in the work as well as contain prices for all other items listed in the corresponding domestic proposal to complete a total "Foreign" bid.

In the event the contract is awarded to the bidder furnishing foreign iron and\or steel materials or items the provision for price adjustment of steel items will be permitted, however, price fluctuations shall use the U.S. index as stated in the Special Provision for Price Adjustment For Steel. The Contractor must indicate which corresponding eligible steel items he chooses price adjustment to apply. In the event the contract is awarded to a bidder furnishing foreign iron and\or steel items and during the life of that contract the Contractor discovers he can not furnish foreign iron and\or steel material as originally anticipated and agreed upon, he shall be responsible to honor the total bid price and furnish such iron and\or steel materials meeting the contract requirements from other sources as necessary to complete the work.

In the event the Contractor proposes to furnish "foreign" iron and steel and can verify a savings in excess of 25 percent of the overall project cost if bid using domestic materials, the Contractor shall submit a second complete paper bid proposal clearly marked "Foreign" including Form C-7 and supportive data supplement on all sheets. Supportive data shall list, but not be limited to, origin of material, best price offer, quantity and complete description of material, mill analysis, evidence or certification of conformance to contract requirements, etc. The "Foreign" bid shall be completed using the best price offer for each corresponding bid item supplying foreign material in the alternative bid and submit the same with the Contractor's "Domestic" bid. The Contractor shall write the word "Foreign" by the bid total shown on Form C-7 as well as last page of Schedule of Items showing the total bid amount. The bidder shall also contact the State Contract Engineer to inform him that he is also submitting an alternate "Foreign" paper bid.

The information listed on the supportive data sheet(s) will be used to provide the basis for verification of the required cost savings. In the event comparison of the prices given, or corrected as provided in Section 103.01 of the Specifications, shows that use of "foreign" iron and steel items does not represent a cost savings exceeding the aforementioned 25 percent, "domestic" iron and\or steel and prices given there for shall be used and the "100 percent Domestic Items Total" shall be the Contractor's bid.

Certification of Compliance:

Where domestic material is supplied, prior to final payment the Contractor shall furnish to the Department a certificate of compliance (such as may be furnished by steel mill test reports) that all steel and\or iron products supplied to the project except as may be permitted (one-tenth of one percent of the total contract cost or \$2,500, whichever is greater) and permanently incorporated into the work satisfies the domestic requirements herein. This certification shall contain a definitive statement about the origin of all products covered under the provisions of Buy America as stated herein.

In lieu of the Contractor providing personal certification, the Contractor may furnish a stepped certification in which each handler of the product, such as supplier, fabricator, manufacturer, processor, etc. furnishes an individual certification that their step in the process was domestically performed.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

GUIDELINES — FEDERAL PROJECTS ONLY. BEGIN USE WITH THE FEBRUARY 2011 ADVERTISEMENT.

S107HF1-0211

VIRGINIA DEPARTMENT OF TRANSPORTATION SPECIAL PROVISION FOR SECTION 107.15

December 10, 2010

Section 107.15 of the Specifications is replaced by the following:

Section 107.15—Use of Disadvantaged Business Enterprises (DBEs)

A. Disadvantaged Business Enterprise (DBE) Program Requirements

Any Contractor, subcontractor, supplier, DBE firm, and contract surety involved in the performance of work on a federal-aid contract shall comply with the terms and conditions of the United States Department of Transportation (USDOT) DBE Program as the terms appear in Part 26 of the Code of Federal Regulations (49 CFR as amended), the USDOT DBE Program regulations; and the Virginia Department of Transportation's (VDOT or the Department) Road and Bridge Specifications and DBE Program rules and regulations.

For the purposes of this provision, Contractor is defined as the Prime Contractor of the contract; and sub-contractor is defined as any DBE supplier, manufacturer, or subcontractor performing work or furnishing material, supplies or services to the contract. The Contractor shall physically include this same contract provision in every supply or work/service subcontract that it makes or executes with a subcontractor having work for which it intends to claim credit.

In accordance with 49 CFR Part 26 and VDOT's DBE Program requirements, the Contractor, for itself and for its subcontractors and suppliers, whether certified DBE firms or not, shall commit to complying fully with the auditing, record keeping, confidentiality, cooperation, and anti-intimidation or retaliation provisions contained in those federal and state DBE Program regulations. By bidding on this contract, and by accepting and executing this contract, the Contractor agrees to assume these contractual obligations and to bind the Contractor's subcontractors contractually to the same at the Contractor's expense.

The Contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 49 CFR Part 26 in the award, administration, and performance of this contract. Failure by the Contractor to carry out these requirements is a material breach of this contract, which will result in the termination of this contract or other such remedy, as VDOT deems appropriate.

All administrative remedies noted in this provision are automatic unless the Contractor exercises the right of appeal within the required timeframe(s) specified herein. Appeal requirements, processes, and procedures shall be in accordance with guidelines stated herein and current at the time of the proceedings. Where applicable, the Department will notify the Contractor of any changes to the appeal requirements, processes, and procedures after receiving notification of the Contractor's desire to appeal.

All time frames referenced in this provision are expressed in business days unless otherwise

indicated. Should the expiration of any deadline fall on a weekend or holiday, such deadline will automatically be extended to the next normal business day.

B. DBE Certification

The only DBE firms eligible to perform work on a federal-aid contract for DBE contract goal credit are firms certified as Disadvantaged Business Enterprises by the Virginia Department of Minority Business Enterprise (DMBE) or the Metropolitan Washington Airports Authority (MWAA) in accordance with federal and VDOT guidelines. DBE firms must be certified in the specific work listed for DBE contract goal credit. A directory listing of certified DBE firms can be obtained from the Virginia Department of Minority Business Enterprise and the Metropolitan Washington Airports Authority Internet websites: http://www.dmbe.virginia.gov/; <a href="http://w

C. Bank Services

The Contractor and each subcontractor are encouraged to use the services of banks owned and controlled by socially and economically disadvantaged individuals. Such banking services and the fees charged for services typically will not be eligible for DBE Program contract goal credit. Such information is available from the VDOT's Internet Civil Rights Division website: <u>http://insidevdot/C7/Civil%20Rights/default.aspx</u>

D. DBE Program-Related Certifications Made by Bidders\Contractors

By submitting a bid and by entering into any contract on the basis of that bid, the bidder/Contractor certifies to each of the following DBE Program-related conditions and assurances:

- That the management and bidding officers of its firm agree to comply with the bidding and project construction and administration obligations of the USDOT DBE Program requirements and regulations of 49 CFR Part 26 as amended, and VDOT's Road and Bridge Specifications and DBE Program requirements and regulations.
- 2. Under penalty of perjury and other applicable penal law that it has complied with the DBE Program requirements in submitting the bid, and shall comply fully with these requirements in the bidding, award, and execution of the contract.
- 3. To ensure that DBE firms have been given full and fair opportunity to participate in the performance of the contract. The bidder certifies that all reasonable steps were, and will be, taken to ensure that DBE firms had, and will have, an opportunity to compete for and perform work on the contract. The bidder further certifies that the bidder shall not discriminate on the basis of race, color, age, national origin, or sex in the performance of the contract or in the award of any subcontract. Any agreement between a bidder and a DBE whereby the DBE promises not to provide quotations for performance of work to other bidders is prohibited.
- 4. As a bidder, good faith efforts were made to obtain DBE participation in the proposed contract at or above the goal for DBE participation established by VDOT. It has submitted as a part of its bid true, accurate, complete, and detailed documentation of the good faith efforts it performed to meet the contract goal for DBE participation. The bidder, by signing and submitting its bid, certifies the DBE participation information submitted within the stated time thereafter is true, correct, and complete, and that the information provided includes the names of all DBE firms that will participate in the contract, the specific line item(s) that each listed DBE firm will perform, and the creditable dollar amounts of the participation of each listed DBE. The specific line item must reference the VDOT line number and item number contained in the proposal.

- 5. The bidder further certifies, by signing its bid, it has committed to use each DBE firm listed for the specific work item shown to meet the contract goal for DBE participation. Award of the contract will be conditioned upon meeting these and other listed requirements of 49 CFR Part 26.53 and the contract documents. By signing the bid, the bidder certifies on work that it proposes to sublet; it has made good faith efforts to seek out and consider DBEs as potential subcontractors. The bidder shall contact DBEs to solicit their interest, capability, and prices in sufficient time to allow them to respond effectively, and shall retain on file proper documentation to substantiate its good faith efforts. Award of the contract will be conditioned upon meeting these and other listed requirements of 49 CFR Part 26.53 and the contract documents.
- 6. Once awarded the contract, the Contractor shall make good faith efforts to utilize DBE firms to perform work designated to be performed by DBEs at or above the amount or percentage of the dollar value specified in the bidding documents. Further, the Contractor understands it shall not unilaterally terminate, substitute for, or replace any DBE firm that was designated in the executed contract in whole or in part with another DBE, any non-DBE firm, or with the Contractor's own forces or those of an affiliate of the Contractor without the prior written consent of VDOT as set out within the requirements of this provision.
- 7. Once awarded the contract, the Contractor shall designate and make known to the Department a liaison officer who is assigned the responsibility of administering and promoting an active and inclusive DBE program as required by 49 CFR Part 26 for DBEs. The designation and identity of this officer need be submitted only once by the Contractor during any twelve (12) month period at the preconstruction conference for the first contract the Contractor has been awarded during that reporting period. The Department will post such information for informational and administrative purposes at VDOT's Internet Civil Rights Division website.
- 8. Once awarded the contract, the Contractor shall comply fully with all regulatory and contractual requirements of the USDOT DBE Program, and that each DBE firm participating in the contract shall fully perform the designated work items with the DBE's own forces and equipment under the DBE's direct supervision, control, and management. Where a contract exists and where the Contractor, DBE firm, or any other firm retained by the Contractor has failed to comply with federal or VDOT DBE Program regulations and/or their requirements on that contract, VDOT has the authority and discretion to determine the extent to which the DBE contractor any remedies available at law or provided in the contract in the event of such a contract breach.
- 9. In the event a bond surety assumes the completion of work, if for any reason VDOT has terminated the prime Contractor, the surety shall be obligated to meet the same DBE contract terms and requirements as were required of the original prime Contractor in accordance with the requirements of this specification.

E. Disqualification of Bidder

Bidders may be disqualified from bidding for failure to comply with the requirements of this Special Provision, the contract specifications, and VDOT Road and Bridge Specifications.

F. Bidding Procedures

The following bidding procedures shall apply to the contract for DBE Program compliance purposes:

1. Contract Goal, Good Faith Efforts Specified: All bidders evidencing the attainment of DBE goal commitment equal to or greater than the required DBE goal established for the project must submit completed Form C-111, Minimum DBE Requirements, and Form C48, Subcontractor/Supplier Solicitation and Utilization, as a part of the bid documents.

Form C-111 may be submitted electronically or may be faxed to the Department, but in no case shall the bidder's Form C-111 be received later than 10:00 a.m. the next business day after the time stated in the bid proposal for the receipt of bids. Form C-48 must be received within ten (10) business days after the bid opening.

If, at the time of submitting its bid, the bidder knowingly cannot meet or exceed the required DBE contract goal, it shall submit Form C-111 exhibiting the DBE participation it commits to attain as a part of its bid documents. The bidder shall then submit Form C49, DBE Good Faith Efforts Documentation, within two (2) business days after the bid opening.

The lowest responsive and responsible bidder must submit its properly executed Form C112, Certification of Binding Agreement, within three (3) business days after the bids are received. DBEs bidding as prime contractors are not required to submit Form C-112 unless they are utilizing other DBEs as subcontractors.

If, after review of the apparent lowest bid, VDOT determines the DBE requirements have not been met, the apparent lowest successful bidder must submit Form C-49, DBE Good Faith Efforts Documentation, which must be received by the Contract Engineer within two (2) business days after official notification of such failure to meet the aforementioned DBE requirements.

Forms C-48, C-49, C-111, and C-112 can be obtained from the VDOT website at: <u>http://vdotforms.vdot.virginia.gov/</u>

Instructions for submitting Form C-111 can be obtained from the VDOT website at: <u>http://www.virginiadot.org/business/resources/const/Exp_DBE_Commitments.pdf</u>

- 2. **Bid Rejection:** The failure of a bidder to submit the required documentation within the timeframes specified in the **Contract Goal, Good Faith Efforts Specified** section of this Special Provision may be cause for rejection of that bidder's bid. If the lowest bidder is rejected for failure to submit the required documentation in the specified time frames, the Department may award the work to the next lowest bidder, or re-advertise the proposed work at a later date or proceed otherwise as determined by the Commonwealth.
- 3. Good Faith Efforts Described: In order to award a contract to a bidder that has failed to meet DBE contract goal requirements, VDOT will determine if the bidder's efforts were adequate good faith efforts, and if given all relevant circumstances, those efforts were made actively and aggressively to meet the DBE requirements. Efforts to obtain DBE participation are not good faith efforts if they could not reasonably be expected to produce a level of DBE participation sufficient to meet the DBE Program and contract goal requirements.

Good faith efforts may be determined through use of the following list of the types of actions the bidder may make to obtain DBE participation. This is not intended to be a mandatory checklist, nor is it intended to be exclusive or exhaustive. Other factors or types of efforts of similar intent may be relevant in appropriate cases:

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

- a) Soliciting through reasonable and available means, such as but not limited to, attendance at prebid meetings, advertising, and written notices to DBEs who have the capability to perform the work of the contract. Examples include: advertising in at least one daily/weekly/monthly newspaper of general circulation, as applicable; phone contact with a completely documented telephone log, including the date and time called, contact person, or voice mail status; and internet contacts with supporting documentation, including dates advertised. The bidder shall solicit this interest no less than five (5) business days before the bids are due so that the solicited DBEs have enough time to reasonably respond to the solicitation. The bidder shall determine with certainty if the DBEs are interested by taking reasonable steps to follow up initial solicitations as evidenced by documenting such efforts as requested on Form C-49, DBE Good Faith Efforts Documentation.
- b) Selecting portions of the work to be performed by DBEs in order to increase the likelihood that the DBE goals will be achieved. This includes, where appropriate, breaking out contract work items into economically feasible units to facilitate DBE participation, even when the Contractor might otherwise prefer to completely perform all portions of this work in its entirety or use its own forces;
- Providing interested DBEs with adequate information about the plans, specifications, and requirements of the contract in a timely manner, which will assist the DBEs in responding to a solicitation;
- d) Negotiating for participation in good faith with interested DBEs;

1) Evidence of such negotiation shall include the names, addresses, and telephone numbers of DBEs that were considered; dates DBEs were contacted; a description of the information provided regarding the plans, specifications, and requirements of the contract for the work selected for subcontracting; and, if insufficient DBE participation seems likely, evidence as to why additional agreements could not be reached for DBEs to perform the work;

2) A bidder using good business judgment should consider a number of factors in negotiating with subcontractors, including DBE subcontractors, and should take a firm's price, qualifications, and capabilities, as well as contract goals, into consideration. However, the fact that there may be some additional costs involved in finding and using DBEs is not sufficient reason for a bidder's failure to meet the contract goal for DBE participation, as long as such costs are reasonable and comparable to costs customarily appropriate to the type of work under consideration. Also, the ability or desire of a bidder to perform the work of a contract with its own organization does not relieve the bidder of the responsibility to make diligent good faith efforts. Bidders are not, however, required to accept higher quotes from DBEs if the price difference can be shown by the bidder to be excessive, unreasonable, or greater than would normally be expected by industry standards;

e) A bidder cannot reject a DBE as being unqualified without sound reasons based on a thorough investigation of the DBE's capabilities. The DBE's standing within its industry, membership in specific groups, organizations, associations, and political or social affiliations, and union vs. non-union employee status are not legitimate causes for the rejection or non-solicitation of bids in the bidder's efforts to meet the project goal for DBE participation;

f) Making efforts to assist interested DBEs in obtaining bonding, lines of credit, or insurance as required by VDOT or by the bidder/Contractor;

(g) Making efforts to assist interested DBEs in obtaining necessary equipment, supplies, materials, or related assistance or services subject to the restrictions contained in these provisions;

(h) Effectively using the services of appropriate personnel from VDOT and from DMBE; available minority/women community or minority organizations; contractors' groups; local, state, and Federal minority/ women business assistance offices; and other organizations as allowed on a case-by-case basis to provide assistance in the recruitment and utilization of qualified DBEs.

G. Documentation and Administrative Reconsideration of Good Faith Efforts

During Bidding: As described in the **Contract Goal, Good Faith Efforts Specified** section of this Special Provision, the bidder must provide Form C-49, DBE Good Faith Efforts Documentation, of its efforts made to meet the DBE contract goal as proposed by VDOT within the time frame specified in this provision. The means of transmittal and the risk for timely receipt of this information shall be the responsibility of the bidder. The bidder shall attach additional pages to the certification, if necessary, in order to fully detail specific good faith efforts made to obtain the DBE firms participation in the proposed contract work.

However, regardless of the DBE contract goal participation level proposed by the bidder or the extent of good faith efforts shown, all bidders shall timely and separately file their completed and executed forms C-111, C-112, C-48, and C-49, as aforementioned, or face potential bid rejection.

If a bidder does not submit its completed and executed forms C-111, or C-112, when required by this Special Provision, the bidder's bid will be considered non-responsive and may be rejected.

Where the Department upon initial review of the bid results determines the apparent low bidder has failed or appears to have failed to meet the requirements of the **Contract Goal, Good Faith Efforts Specified** section of this Special Provision and has failed to adequately document that it made a good faith effort to achieve sufficient DBE participation as specified in the bid proposal, that firm upon notification of the Department's initial determination will be offered the opportunity for administrative reconsideration before VDOT rejects that bid as non-responsive. The bidder shall address such request for reconsideration in writing to the Contract Engineer within five (5) business days of receipt of notification by the Department and shall be given the opportunity to discuss the issue and present its evidence in person to the Administrative Reconsideration Panel. The Administrative Reconsideration Panel will be made up of VDOT Division Administrators or their designees, none of who took part in the initial determination, VDOT shall notify the bidder in writing of its decision and explain the basis for finding that the bidder did or did not meet the goal or make adequate good faith efforts to do so.

If, after reconsideration, the Department determines the bidder has failed to meet the requirements of the contract goal and has failed to make adequate good faith efforts to achieve the level of DBE participation as specified in the bid proposal, the bidder's bid will be rejected.

If sufficient documented evidence is presented to demonstrate that the apparent low bidder made reasonable good faith efforts, the Department will award the contract and reduce the DBE requirement to the actual commitment identified by the lowest successful bidder at the time of its bid. The Contractor is still encouraged to seek additional DBE participation during the life of the contract.

However, such action will not relieve the Contractor of its responsibility for complying with the reduced DBE requirement during the life of the contract or any administrative sanctions as may be appropriate.

During the Contract: If a DBE, through no fault of the Contractor, is unable or unwilling to fulfill his

agreement with the Contractor, the Contractor shall immediately notify the Department and provide all relevant facts. If a Contractor relieves a DBE subcontractor of the responsibility to perform work under their subcontract, the Contractor is encouraged to take the appropriate steps to obtain a DBE to perform an equal dollar value of the remaining subcontracted work. In such instances, the Contractor is expected to seek DBE participation towards meeting the goal during the performance of the contract.

If the Contractor fails to conform to the schedule of DBE participation as shown on the progress schedule, or at any point at which it is clearly evident that the remaining dollar value of allowable credit for performing work is insufficient to obtain the scheduled participation, and the Contractor has not taken the preceding actions, the Contractor and any aforementioned affiliates may be subject to disallowance of DBE credit until such time as conformance with the schedule of DBE participation is achieved.

Project Completion: If the Contractor fails upon completion of the project to meet the required participation, the Contractor and any prime contractual affiliates, as in the case of a joint venture, may be enjoined from bidding as a prime Contractor, or participating as a subcontractor on VDOT projects for a period of 90 days.

Prior to enjoinment from bidding or denial to participate as a subcontractor for failure to comply with participation requirements, as provided hereinbefore, the Contractor may submit documentation to the State Construction Engineer to substantiate that failure was due solely to quantitative underrun(s), elimination of items subcontracted to DBEs, or to circumstances beyond their control, and that all feasible means have been used to obtain the required participation. The State Construction Engineer upon verification of such documentation shall make a determination whether or not the Contractor has met the requirements of the contract.

If it is determined that the aforementioned documentation is insufficient or the failure to meet required participation is due to other reasons, the Contractor may request an appearance before the Administrative Reconsideration Panel to establish that all feasible means were used to meet such participation requirements. The decision of the Administrative Reconsideration Panel shall be administratively final. If the decision is made to enjoin the Contractor from bidding on other VDOT work as described herein, the enjoinment period will begin upon the Contractor's failure to request a hearing within the designated time frame or upon the Administrative Reconsideration Panel's decision to enjoin, as applicable.

H. DBE Participation for Contract Goal Credit

DBE participation on the contract will count toward meeting the DBE contract goal in accordance with the following criteria:

- 1. Cost-plus subcontracts will not be considered to be in accordance with normal industry practice and will not normally be allowed for credit.
- 2. The applicable percentage of the total dollar value of the contract or subcontract awarded to the DBE will be counted toward meeting the contract goal for DBE participation in accordance with the DBE Program-Related Certifications Made by Bidders\Contractors section of this Special Provision for the value of the work, goods, or services that are actually performed or provided by the DBE firm itself or subcontracted by the DBE to other DBE firms.
- 3. When a DBE performs work as a participant in a joint venture with a non-DBE firm, the Contractor may count toward the DBE goal only that portion of the total dollar value of the contract equal to the distinctly defined portion of the contract work that the DBE has performed with the DBE's own forces or in accordance with the provisions of this Section. The Department shall be contacted in

advance regarding any joint venture involving both a DBE firm and a non-DBE firm to coordinate Department review and approval of the joint venture's organizational structure and proposed operation where the Contractor seeks to claim the DBE's credit toward the DBE contract goal.

- 4. When a DBE subcontracts part of the work of the contract to another firm, the value of that subcontracted work may be counted toward the DBE contract goal only if the DBE's subcontractor at a lower tier is a certified DBE. Work that a DBE subcontracts to either a non-DBE firm or to a non-certified DBE firm will not count toward the DBE contract goal. The cost of supplies and equipment a DBE subcontractor purchases or leases from the prime Contractor or the prime's affiliated firms will not count toward the contract goal for DBE participation.
- 5. The Contractor may count expenditures to a DBE subcontractor toward the DBE contract goal only if the DBE performs a Commercially Useful Function (CUF) on that contract.
- 6. A Contractor may not count the participation of a DBE subcontractor toward the Contractor's final compliance with the DBE contract goal obligations until the amount being counted has actually been paid to the DBE. A Contractor may count sixty (60) percent of its expenditures actually paid for materials and supplies obtained from a DBE certified as a regular dealer, and one hundred (100) percent of such expenditures actually paid for materials and supplies obtained from a certified DBE manufacturer.
 - a) For the purposes of this Special Provision, a regular dealer is defined as a firm that owns, operates, or maintains a store, warehouse, or other establishment in which the materials, supplies, articles, or equipment required and used under the contract are bought, kept in stock, and regularly sold or leased to the public in the usual course of business. To be a regular dealer, the DBE firm shall be an established business that regularly engages, as its principal business and under its own name, in the purchase and sale or lease of the products or equipment in question. Packagers, brokers, manufacturers' representatives, or other persons who arrange or expedite transactions will not be considered regular dealers.
 - b) A DBE firm may be a regular dealer in such bulk items as petroleum products, steel, cement, gravel, stone, or asphalt without owning, operating, or maintaining a place of business where it keeps such items in stock if the DBE both owns and operates distribution equipment for the products it sells and provides for the contract work. Any supplementation of a regular dealer's own distribution equipment shall be by a long-term lease agreement and not on an *ad hoc* or contract-by-contract basis to be eligible for credit to meet the DBE contract goal.
 - c) If a DBE regular dealer is used for DBE contract goal credit, no additional credit will be given for hauling or delivery to the project site goods or materials sold by that DBE regular dealer. Those delivery costs shall be deemed included in the price charged for the goods or materials by the DBE regular dealer, who shall be responsible for their distribution.
 - d) For the purposes of this Special Provision, a manufacturer will be defined as a firm that operates or maintains a factory or establishment that produces on the premises the materials, supplies, articles, or equipment required under the contract and of the general character described by the project specifications. A manufacturer shall include firms that produce finished goods or products from raw or unfinished material, or purchase and substantially alter goods and materials to make them suitable for construction use before reselling them.
 - g) A Contractor may count toward the DBE contract goal the following expenditures to DBE firms that are not regular dealers or manufacturers for DBE program purposes:
 - 1) The entire amount of fees or commissions charged by a DBE firm for providing a bona

fide service, such as professional, technical, consultant or managerial services, or for providing bonds or insurance specifically required for the performance of the federal-aid contract, if the fee is reasonable and not excessive or greater than would normally be expected by industry standards for the same or similar services.

- 2) The entire amount of that portion of the construction contract that is performed by the DBE's own forces and equipment under the DBE's supervision. This includes the cost of supplies and materials ordered and paid for by the DBE for contract work, including supplies purchased or equipment leased by the DBE, except supplies and equipment a DBE subcontractor purchases or leases from the prime Contractor or its affiliates.
- h) A Contractor may count toward the DBE contract goal one hundred (100) percent of the fees paid to a DBE trucker or hauler for the delivery of material and supplies required on the project job site, but not for the cost of those materials or supplies themselves, provided that the trucking or hauling fee is determined by VDOT to be reasonable, as compared with fees customarily charged by non-DBE firms for similar services. A Contractor shall not count costs for the removal or relocation of excess material from or on the job site when the DBE trucking company is not the manufacturer of or a regular dealer in those materials and supplies. The DBE trucking firm shall also perform a Commercially Useful Function (CUF) on the project and not operate merely as a pass through for the purposes of gaining credit toward the DBE contract goal. Prior to submitting a bid, the Contractor shall determine, or contact the VDOT Civil Rights Division or its district Offices for assistance in determining, whether a DBE trucking firm will meet the criteria for performing a CUF on the project. See section on Miscellaneous DBE Program Requirements; Factors used to Determine if a DBE Trucking Firm is Performing a CUF.
- i) The Contractor will receive DBE contract goal credit for the fees or commissions charged by and paid to a DBE broker who arranges or expedites sales, leases, or other project work or service arrangements provided that those fees are determined by VDOT to be reasonable and not excessive as compared with fees customarily charged by non-DBE firms for similar services. For the purposes of this Special Provision, a broker is defined as a person or firm that regularly engages in arranging for delivery of material, supplies, and equipment, or regularly arranges for the providing of project services as a course of routine business but does not own or operate the delivery equipment necessary to transport materials, supplies, or equipment to or from a job site.

I. Performing a Commercially Useful Function (CUF)

No credit toward the DBE contract goal will be allowed for contract payments or expenditures to a DBE firm if that DBE firm does not perform a CUF on that contract. A DBE performs a CUF when the DBE is solely responsible for execution of a distinct element of the contract work and the DBE actually performs, manages, and supervises the work involved with the firm's own forces or in accordance with the provisions of the **DBE Participation for Contract Goal Credit** section of this Special Provision. To perform a CUF the DBE alone shall be responsible and bear the risk for the material and supplies used on the contract, selecting a supplier or dealer from those available, negotiating price, determining quality and quantity, ordering the material and supplies, installing those materials with the DBE's own forces and equipment, and paying for those materials and supplies. The amount the DBE firm is to be paid under the contract shall be commensurate with the work the DBE actually performs and the DBE credit claimed for the DBE's performance.

Monitoring CUF Performance: It shall be the Contractor's responsibility to ensure that all DBE firms selected for subcontract work on the contract, for which he seeks to claim credit toward the contract goal, perform a CUF. Further, the Contractor is responsible for and shall ensure that each DBE firm fully performs the DBE's designated tasks with the DBE's own forces and equipment under the DBE's

own direct supervision and management or in accordance with the provisions of the **DBE Participation for Contract Goal Credit** section of this Special Provision. For the purposes of this provision the DBE's equipment will mean either equipment directly owned by the DBE as evidenced by title, bill of sale or other such documentation, or leased by the DBE, and over which the DBE has control as evidenced by the leasing agreement from a firm not owned in whole or part by the prime Contractor or an affiliate of the Contractor under this contract.

VDOT will monitor the Contractor's DBE involvement during the performance of the contract. However, VDOT is under no obligation to warn the Contractor that a DBE's participation will not count toward the goal.

DBEs Must Perform a Useful and Necessary Role in Contract Completion: A DBE does not perform a commercially useful function if the DBE's role is limited to that of an extra participant in a transaction, contract, or project through which funds are passed in order to obtain the appearance of DBE participation.

DBEs Must Perform The Contract Work With Their Own Workforces: If a DBE does not perform and exercise responsibility for at least thirty (30) percent of the total cost of the DBE's contract with the DBE's own work force, or the DBE subcontracts a greater portion of the work of a contract than would be expected on the basis of normal industry practice for the type of work involve, VDOT will presume that the DBE is not performing a CUF and such participation will not be counted toward the contract goal.

VDOT Makes Final Determination On Whether a CUF Is Performed: VDOT has the final authority to determine whether a DBE firm has performed a CUF on a federal-aid contract. To determine whether a DBE is performing or has performed a CUF, VDOT will evaluate the amount of work subcontracted by that DBE firm or performed by other firms and the extent of the involvement of other firms' forces and equipment. Any DBE work performed by the Contractor or by employees or equipment of the Contractor shall be subject to disallowance under the DBE Program, unless the independent validity and need for such an arrangement and work is demonstrated.

J. Verification of DBE Participation and Imposed Damages

Within fourteen days after contract execution, the Contractor shall submit to the Responsible Engineer, with a copy to the District Civil Rights Office (DCRO), a fully executed subcontract agreement for each DBE used to claim credit in accordance with the requirements stated on Form C-112. The subcontract agreement shall be executed by both parties stating the work to be performed, the details or specifics concerning such work, and the price which will be paid to the DBE subcontractor. Because of the commercial damage that the Contractor and its DBE subcontractor could suffer if their subcontract pricing, terms, and conditions were known to competitors, the Department staff will treat subcontract agreements as proprietary Contractor trade secrets with regard to Freedom of Information Act requests. In lieu of subcontract agreements, purchase orders may be submitted for haulers, suppliers, and manufacturers. These too, will be treated confidentially and protected. Such purchase orders must contain, as a minimum, the following information: authorized signatures of both parties; description of the scope of work to include contract item numbers, quantities, and prices; and required federal contract provisions.

The Contractor shall also furnish, and shall require each subcontractor to furnish, information relative to all DBE involvement on the project for each quarter during the life of the contract in which participation occurs and verification is available. The information shall be indicated on Form C-63, DBE and SWAM Payment Compliance Report. The department reserves the right to request proof of payment via copies of cancelled checks with appropriate identifying notations. Failure to provide Form C-63 to the District Civil Rights Office (DCRO) within five (5) business days after the reporting period

may result in delay of approval of the Contractor's monthly progress estimate for payment. The names and certification numbers of DBE firms provided by the Contractor on the various forms indicated in this Special Provision shall be exactly as shown on the DMBE's or MWAA's latest list of certified DBEs. Signatures on all forms indicated herein shall be those of authorized representatives of the Contractor as shown on the Prequalification Application, Form C-32 or the Prequalification/Certification Renewal Application, Form C-32A, or authorized by letter from the Contractor. If DBE firms are used which have not been previously documented with the Contractor's bid and for which the Contractor now desires to claim credit toward the project goal, the Contractor shall be responsible for submitting necessary documentation in accordance with the procedures stipulated in this Special Provision to cover such work prior to the DBE beginning work.

Form C-63 can be obtained from the VDOT website at: http://vdotforms.vdot.virginia.gov/

The Contractor shall submit to the Responsible Engineer its progress schedule with a copy to the DCRO, as required by Section 108.03 of the Specifications or other such specific contract scheduling specification that may include contractual milestones, i.e., monthly or VDOT requested updates. The Contractor shall include a narrative of applicable DBE activities relative to work activities of the Contractor's progress schedule, including the approximate start times and durations of all DBE participation to be claimed for credit that shall result in full achievement of the DBE goal required in the contract.

On contracts awarded on the basis of good faith efforts, narratives or other agreeable format of schedule information requirements and subsequent progress determination shall be based on the commitment information shown on the latest Form C-111 as compared with the appropriate Form C-63.

Prior to beginning any major component or quarter of the work, as applicable, in which DBE work is to be performed, the Contractor shall furnish a revised Form C-111 showing the name(s) and certification number(s) of any current DBEs not previously submitted who will perform the work during that major component or quarter for which the Contractor seeks to claim credit toward the contract DBE goal. The Contractor shall obtain the prior approval of the Department for any assistance it may provide to the DBE beyond its existing resources in executing its commitment to the work in accordance with the requirements listed in the **Good Faith Efforts Described** section of this Special Provision. If the Contractor is aware of any assistance beyond a DBE's existing resources that the contractor, or another subcontractor, may be contemplating or may deem necessary and that have not been previously approved, the Contractor shall submit a new or revised narrative statement for VDOT's approval prior to assistance being rendered.

If the Contractor fails to comply with correctly completing and submitting any of the required documentation requested by this provision within the specified time frames, the Department will withhold payment of the monthly progress estimate until such time as the required submissions are received VDOT. Where such failures to provide required submittals or documentation are repeated the Department will move to enjoin the Contractor and any prime contractual affiliates, as in the case of a joint venture, from bidding as a prime Contractor, or participating as a subcontractor on VDOT projects until such submissions are received.

K. Documentation Required for Semi-final Payment

On those projects nearing completion, the Contractor must submit Form C-63 marked "Semi-Final" within twenty (20) days after the submission of the last regular monthly progress estimate to the DCRO. The form must include each DBE used on the contract work and the work performed by each DBE. The form shall include the actual dollar amount paid to each DBE for the accepted creditable work on the contract. The form shall be certified under penalty of perjury, or other applicable law, to

be accurate and complete. VDOT will use this certification and other information available to determine applicable DBE credit allowed to date by VDOT and the extent to which the DBEs were fully paid for that work. The Contractor shall acknowledge by the act of filing the form that the information is supplied to obtain payment regarding a federal participation contract. A letter of certification, signed by both the prime Contractor and appropriate DBEs, will accompany the form, indicating the amount, including any retainage, if present, that remains to be paid to the DBE(s).

L. Documentation Required for Final Payment

On those projects that are complete, the Contractor shall submit a final Form C-63 marked "Final" to the DCRO, within thirty (30) days of the final estimate. The form must include each DBE used on the contract and the work performed by each DBE. The form shall include the actual dollar amount paid to each DBE for the creditable work on the contract. VDOT will use this form and other information available to determine if the Contractor and DBEs have satisfied the DBE contract goal percentage specified in the contract and the extent to which credit was allowed. The Contractor shall acknowledge by the act of signing and filing the form that the information is supplied to obtain payment regarding a federal participation contract.

M. Prompt Payment Requirements

The Contractor shall make prompt and full payment to the subcontractor(s) of any retainage held by the prime Contractor after the subcontractor's work is satisfactorily completed.

For purposes of this Special Provision, a subcontractor's work is satisfactorily completed when all the tasks called for in the subcontract have been accomplished, documented, and accepted as required by the contract documents by VDOT. When VDOT has made partial acceptance of a portion of the prime contract, the Department will consider the work of any subcontractor covered by that partial acceptance to be satisfactorily completed. Payment will be made in accordance with the requirements of Section 107.01, Section 109.08, and Section 109.09 of the Specifications.

Upon VDOT's payment of the subcontractor's portion of the work as shown on the monthly progress estimate and the receipt of payment by the Contractor for such work, the Contractor shall make compensation in full to the subcontractor for that portion of the work satisfactorily completed and accepted by the Department. For the purposes of this Special Provision, payment of the subcontractor's portion of the work shall mean the Contractor has issued payment in full, less agreed upon retainage, if any, to the subcontractor for that portion of the subcontractor's work that VDOT paid to the Contractor on the monthly progress estimate.

The Contractor shall make payment of the subcontractor's portion of the work within seven (7) days of the receipt of payment from VDOT in accordance with the requirements of Section 107.01, Section 109.08, and Section 109.09 of the Specifications.

If the Contractor fails to make payment for the subcontractor's portion of the work within the time frame specified herein, the subcontractor shall contact the Responsible Engineer and the Contractor's bonding company in writing. The bonding company and VDOT will investigate the cause for non-payment and, barring mitigating circumstances that would make the subcontractor ineligible for payment, ensure payment in accordance with the requirements of Section 107.01, Section 109.08, and Section 109.09 of the Specifications.

By bidding on this contract, and by accepting and executing this contract, the Contractor agrees to assume these contractual obligations, and to bind the Contractor's subcontractors contractually to those prompt payment requirements.

Nothing contained herein shall preclude the Contractor from withholding payment to the subcontractor in accordance with the terms of the subcontract in order to protect the Contractor from loss or cost of damage due to a breach of agreement by the subcontractor.

N. Miscellaneous DBE Program Requirements

Loss of DBE Eligibility: When a DBE firm has been removed from eligibility as a certified DBE firm, the following actions will be taken:

- 1. When a Bidder/Contractor has made a commitment to use a DBE firm that is not currently certified, thereby making the Contractor ineligible to receive DBE participation credit for work performed, and a subcontract has not been executed, the ineligible DBE firm does not count toward either the contract goal or overall goal. The Contractor shall meet the contract goal with a DBE firm that is eligible to receive DBE credit for work performed, or must demonstrate to the Contract Engineer that it has made good faith efforts to do so.
- 2. When a Bidder/Contractor has executed a subcontract with a certified DBE firm prior to official notification of the DBE firm's loss of eligibility, the Contractor may continue to use the firm on the contract and shall continue to receive DBE credit toward its DBE goal for the subcontractor's work.
- 3. When VDOT has executed a prime contract with a DBE firm that is certified at the time of contract execution but that is later ruled ineligible, the portion of the ineligible firm's performance on the contract before VDOT has issued the notice of its ineligibility shall count toward the contract goal.

Termination of DBE: If a certified DBE subcontractor is terminated, or fails, refuses, or is unable to complete the work on the contract for any reason, the Contractor must promptly request approval to substitute or replace that firm in accordance with this section of this Special Provision.

The Contractor, as aforementioned in **DBE Program-Related Certifications Made by Bidders/Contractors**, shall notify VDOT in writing before terminating and/or replacing the DBE that was committed as a condition of contract award or that is otherwise being used or represented to fulfill DBE contract obligations during the contract performance period. Written consent from the Department for terminating the performance of any DBE shall be granted only when the Contractor can demonstrate that the DBE is unable, unwilling, or ineligible to perform its obligations for which the Contractor sought credit toward the contract DBE goal. Such written consent by the Department to terminate any DBE shall concurrently constitute written consent to substitute or replace the terminated DBE with another DBE. Consent to terminate a DBE shall not be based on the Contractor's ability to negotiate a more advantageous contract with another subcontractor whether that subcontractor is, or is not, a certified DBE.

- 1. All Contractor requests to terminate, substitute, or replace a certified DBE shall be in writing, and shall include the following information:
 - a. The date the Contractor determined the DBE to be unwilling, unable, or ineligible to perform.
 - b. The projected date that the Contractor shall require a substitution or replacement DBE to commence work if consent is granted to the request.
 - c. A brief statement of facts describing and citing specific actions or inaction by the DBE giving rise to the Contractor's assertion that the DBE is unwilling, unable, or ineligible to

perform;

- d. A brief statement of the affected DBE's capacity and ability to perform the work as determined by the Contractor;
- e. A brief statement of facts regarding actions taken by the Contractor which are believed to constitute good faith efforts toward enabling the DBE to perform;
- f. The current percentage of work completed on each bid item by the DBE;
- g. The total dollar amount currently paid per bid item for work performed by the DBE;
- h. The total dollar amount per bid item remaining to be paid to the DBE for work completed, but for which the DBE has not received payment, and with which the Contractor has no dispute;
- i. The total dollar amount per bid item remaining to be paid to the DBE for work completed, but for which the DBE has not received payment, and over which the Contractor and/or the DBE have a dispute.
- 2. Contractor's Written Notice to DBE of Pending Request to Terminate and Substitute with another DBE.

The Contractor shall send a copy of the "request to terminate and substitute" letter to the affected committed DBE firm, in conjunction with submitting the request to the DCRO. The affected DBE firm may submit a response letter to the Department within two (2) business days of receiving the notice to terminate from the Contractor. The affected DBE firm shall explain its position concerning performance on the committed work. The Department will consider both the Contractor's request and the DBE's response and explanation before approving the Contractor's termination and substitution request, or determining if any action should be taken against the Contractor.

If, after making its best efforts to deliver a copy of the "request to terminate and substitute" letter, the Contractor is unsuccessful in notifying the affected DBE firm, the Department will verify that the affected, committed DBE firm is unable or unwilling to continue the contract. The Department will immediately approve the Contractor's request for a substitution.

3. Proposed Substitution of Another Certified DBE

Upon termination of a DBE, the Contractor shall use reasonable good faith efforts to replace the terminated DBE. The termination of such DBE shall not relieve the Contractor of its obligations pursuant to this section, and the unpaid portion of the terminated DBE's contract will not be counted toward the contract goal.

When a DBE substitution is necessary, the Contractor shall submit an amended Form C111 with the name of another DBE firm, the proposed work to be performed by that firm, and the dollar amount of the work to replace the unfulfilled portion of the work of the originally committed DBE firm. The Contractor shall furnish all pertinent information including the contract I.D. number, project number, bid item, item description, bid unit and bid quantity, unit price, and total price. In addition, the Contractor shall submit documentation for the requested substitute DBE as described in this section of this Special Provision.

Should the Contractor be unable to commit the remaining required dollar value to the substitute DBE, the Contractor shall provide written evidence of good faith efforts made to obtain the substitute value requirement. The Department will review the quality,

thoroughness, and intensity of those efforts. Efforts that are viewed by VDOT as merely superficial or pro-forma will not be considered good faith efforts to meet the contract goal for DBE participation. The Contractor must document the steps taken that demonstrated its good faith efforts to obtain participation as set forth in the **Good Faith Efforts Described** section of this Special Provision.

Factors Used to determine if a DBE Trucking Firm is performing a CUF:

The following factors will be used to determine whether a DBE trucking company is performing a CUF:

- To perform a CUF the DBE trucking firm shall be completely responsible for the management and supervision of the entire trucking operation for which the DBE is responsible by subcontract on a particular contract. There shall not be a contrived arrangement, including, but not limited to, any arrangement that would not customarily and legally exist under regular construction project subcontracting practices for the purpose of meeting the DBE contract goal;
- 2. The DBE must own and operate at least one fully licensed, insured, and operational truck used in the performance of the contract work. This does not include a supervisor's pickup truck or a similar vehicle that is not suitable for and customarily used in hauling the necessary materials or supplies;
- 3. The DBE receives full contract goal credit for the total reasonable amount the DBE is paid for the transportation services provided on the contract using trucks the DBE owns, insures, and operates using drivers that the DBE employs and manages;
- 4. The DBE may lease trucks from another certified DBE firm, including from an owner-operator who is certified as a DBE. The DBE firm that leases trucks from another DBE will receive credit for the total fair market value actually paid for transportation services the lessee DBE firm provides on the contract;
- 5. The DBE may also lease trucks from a non-DBE firm, including an owner-operator. The DBE who leases trucks from a non-DBE is entitled to credit for the total value of the transportation services provided by non-DBE lessees, not to exceed the value of transportation services provided by DBE-owned trucks on the contract. For additional participation by non-DBE lessees, the DBE will only receive credit for the fee or commission it receives as a result of the lease arrangement.

EXAMPLE

DBE Firm X uses two (2) of its own trucks on a contract. The firm leases two (2) trucks from DBE Firm Y and six (6) trucks from non-DBE Firm Z.

Value of Trans. Serv.

(For Illustrative Purposes Only)

Firm X Truck 1 Truck 2	Owned by DBE Owned by DBE	\$100 per day \$100 per day
<u>Firm Y</u>		
Truck 1 Truck 2	Leased from DBE Leased from DBE	\$110 per day \$110 per day
<u>Firm Z</u>		
Truck 1 Truck 2	Leased from Non DBE Leased from Non DBE	\$125 per day \$125 per day

Truck 3	Leased from Non DBE	\$125 per day
Truck 4	Leased from Non DBE	\$125 per day
Truck 5	Leased from Non DBE*	\$125 per day
Truck 6	Leased from Non DBE*	\$125 per day

DBE credit would be awarded for the total transportation services provided by DBE Firm X and DBE Firm Y, and may also be awarded for the total value of transportation services by four (4) of the six (6) trucks provided by non-DBE Firm Z (not to exceed the value of transportation services provided by DBE-owned trucks).

Credit = 8 Trucks

Total Value of Transportation Services = \$820

In all, full DBE credit would be allowed for the participation of eight (8) trucks (twice the number of DBE trucks owned and leased) and the dollar value attributable to the Value of Transportation Services provided by the 8 trucks.

* With respect to the other two trucks provided by non-DBE Firm Z, DBE credit could be awarded only for the fees or commissions pertaining to those trucks that DBE Firm X receives as a result of the lease with non-DBE Firm Z.

6. For purposes of this section, the lease must indicate that the DBE firm leasing the truck has exclusive use of and control over the truck. This will not preclude the leased truck from working for others during the term of the lease with the consent of the DBE, provided the lease gives the DBE absolute priority for and control over the use of the leased truck. Leased trucks must display the name and identification number of the DBE firm that has leased the truck at all times during the life of the lease.

Data Collection: In accordance with 49CFR Section 26.11, all firms bidding on prime contracts and bidding or quoting subcontracts on federal-aid projects shall provide the following information to the Contract Engineer annually.

- o Firm name
- o Firm address
- o Firm's status as a DBE or non-DBE
- The age of the firm and
- The annual gross receipts of the firm

The means of transmittal and the risk for timely receipt of this information shall be the responsibility of the bidder. However, the above information can be submitted by means of the Annual Gross Receipts Survey as required in the Prequalification/Certification application.

All bidders, including DBE prime Contractor bidders, shall complete and submit to the Contract Engineer the Subcontractor/Supplier Solicitation and Utilization Form C-48 for each bid submitted; to be received within ten (10) business days after the bid opening. Failure of bidders to submit this form in the time frame specified may be cause for disqualification of the bidder and rejection of their bid in accordance with the requirements of this Special Provision, the contract specifications, and VDOT Road and Bridge specifications.

O. Suspect Evidence of Criminal Behavior

Failure of a bidder, Contractor, or subcontractor to comply with the Virginia Department of Transportation Road and Bridge Specifications and these Special Provisions wherein there appears to be evidence of criminal conduct shall be referred to the Attorney General for the Commonwealth of Virginia and/or the FHWA Inspector General for criminal investigation and, if warranted, prosecution.

Suspected DBE Fraud

In appropriate cases, VDOT will bring to the attention of the U. S. Department of Transportation (USDOT) any appearance of false, fraudulent, or dishonest conduct in connection with the DBE program, so that USDOT can take the steps, e.g., referral to the Department of Justice for criminal prosecution, referral to the USDOT Inspector General, action under suspension and debarment or Program Fraud and Civil Penalties rules provided in 49CFR Part 31.

P. Summary of Remedies for Non-Compliance with DBE Program Requirements

Failure of any bidder\Contractor to comply with the requirements of this Special Provision for Section 107.15 of the Virginia Road and Bridge Specifications, which is deemed to be a condition of bidding, or where a contract exists, is deemed to constitute a breach of contract shall be remedied in accordance with the following:

1. Disadvantaged Business Enterprise (DBE) Program Requirements

The Contractor shall carry out applicable requirements of 49 CFR Part 26 in the award, administration, and performance of this contract. Failure by the Contractor to carry out these requirements is a material breach of this contract, which will result in the termination of this contract or other such remedy, as VDOT deems appropriate.

All administrative remedies noted in this provision are automatic unless the Contractor exercises the right of appeal within the required timeframe(s) specified herein.

2. DBE Program-Related Certifications Made by Bidders\Contractors

Once awarded the contract, the Contractor shall comply fully with all regulatory and contractual requirements of the USDOT DBE Program, and that each certified DBE firm participating in the contract shall fully perform the designated work items with the DBE's own forces and equipment under the DBE's direct supervision, control, and management. Where a contract exist and where the Contractor, DBE firm, or any other firm retained by the Contractor has failed to comply with federal or VDOT DBE Program regulations and/or their requirements on that contract, VDOT has the authority and discretion to determine the extent to which the DBE contract requirements have not been met, and will assess against the Contractor any remedies available at law or provided in the contract in the event of such a contract breach.

3. Disqualification of Bidder

Bidders may be disqualified from bidding for failure to comply with the requirements of this Special Provision, the contract specifications, and VDOT Road and Bridge Specifications.

4. Bidding Procedures

The failure of a bidder to submit the required documentation within the timeframes specified in the **Contract Goal, Good Faith Efforts Specified** section of this Special Provision may be cause for rejection of that bidder's bid. If the lowest bidder is rejected for failure to submit required

documentation in the specified time frames, the Department may either award the work to the next lowest bidder, or re-advertise and construct the work under contract or otherwise as determined by the Commonwealth.

In order to award a contract to a bidder that has failed to meet DBE contract goal requirements, VDOT will determine if the bidder's efforts were adequate good faith efforts, and if given all relevant circumstances, those efforts were to the extent a bidder actively and aggressively seeking to meet the requirements would make. Regardless of the DBE contract goal participation level proposed by the bidder or the extent of good faith efforts shown, all bidders shall timely and separately file their completed and executed Forms C-111, C-112, C-48, and Form C-49, as aforementioned, or face potential bid rejection. If a bidder does not submit it's completed and executed C-111, or C-112, when required by this Special Provision, the bidder's bid will be considered nonresponsive and may be rejected. If, after reconsideration, the Department determines the bidder has failed to meet the level of DBE participation as specified in the bid proposal, the bidder's bid will be rejected. If sufficient documented evidence is presented to demonstrate that the apparent low bidder made reasonable good faith efforts, the Department will award the contract and reduce the DBE requirement to the actual commitment identified by the lowest successful bidder at the time of its bid. The Contractor is encouraged to seek additional participation during the life of the contract.

If the Contractor fails to conform to the schedule of DBE participation as shown on the progress schedule, or at any point at which it is clearly evident that the remaining dollar value of allowable credit for performing work is insufficient to obtain the scheduled participation, the Contractor and any aforementioned affiliates may be enjoined from bidding for 60 days or until such time as conformance with the schedule of DBE participation is achieved. In such instances, the Contractor is expected to seek DBE participation towards meeting the goal during the prosecution of the contract.

If the Contractor fails upon completion of the project to meet the required participation, the Contractor and any prime contractual affiliates, as in the case of a joint venture, may be enjoined from bidding as a prime Contractor, or participating as a subcontractor on VDOT projects for a period of 90 days.

Prior to enjoinment from bidding or denial to participate as a subcontractor for failure to comply with participation requirements, as provided hereinbefore, the Contractor may submit documentation to the State Construction Engineer to substantiate that failure was due solely to quantitative underrun(s) or elimination of items subcontracted to DBEs, and that all feasible means have been used to obtain the required participation. The State Construction Engineer upon verification of such documentation shall make a determination whether or not the Contractor has met the requirements of the contract.

If it is determined that the aforementioned documentation is insufficient or the failure to meet required participation is due to other reasons, the Contractor may request an appearance before the Administrative Reconsideration Panel to establish that all feasible means were used to meet such participation requirements. The decision of the Administrative Reconsideration Panel shall be administratively final. The enjoinment period will begin upon the Contractor's failure to request a hearing within the designated time frame or upon the Administrative Reconsideration Panel's decision to enjoin, as applicable.

5. Verification of DBE Participation and Imposed Damages

If the Contractor fails to comply with correctly completing and submitting any of the required documentation requested by this provision within the specified time frames, the Department will withhold payment of the monthly progress estimate until such time as the required submissions are received by VDOT. Where such failures to provide required submittals or documentation are repeated the Department will move to enjoin the Contractor and any prime contractual affiliates, as in the case of a joint venture, from bidding as a prime Contractor, or participating as a subcontractor on VDOT projects until such submissions are received.

In addition to the remedies described heretofore in this provision VDOT also exercises its rights with respect to the following remedies:

Suspect Evidence of Criminal Behavior

Failure of a bidder, Contractor, or subcontractor to comply with the Virginia Department of Transportation Road and Bridge Specifications and these Special Provisions wherein there appears to be evidence of criminal conduct shall be referred to the Attorney General for the Commonwealth of Virginia and/or the FHWA Inspector General for criminal investigation and, if warranted prosecution.

In appropriate cases, VDOT will bring to the attention of the U. S. Department of Transportation (USDOT) any appearance of false, fraudulent, or dishonest conduct in connection with the DBE program, so that USDOT can take the steps, e.g., referral to the Department of Justice for criminal prosecution, referral to the USDOT Inspector General, action under suspension and debarment or Program Fraud and Civil Penalties rules provided in 49CFR Part 31.

Form C-48

COMMONWEALTH OF VIRGINIA DEPARTMENT OF TRANSPORTATION SUBCONTRACTOR/SUPPLIER SOLICITATION AND UTILIZATION FORM (ALL BIDDERS)

PROJECT NO._____ CONTRACT I.D. NO. _____

FEDERAL PROJECT NO. DATE SUBMITTED

All bidders, including DBEs bidding as Prime Contractors, shall complete and submit the following information as requested in this form within ten (10) calendar days after the opening of bids.

The bidder certifies this form accurately represents its solicitation and utilization or non-utilization, as indicated, of the firms listed below for performance of work on this contract. The bidder also certifies he/she has had direct contact with the named firms regarding participation on this project.

BIDDER ______SIGNATURE_____

TITLE_____

SUBCONTRACTOR/SUPPLIER SOLICITATION AND UTILIZATION (ALL)

VENDOR NUMBER	NAME OF SUBCONTACTOR/SUPPLIER	TELEPHONE NUMBER	DBE OR NON-DBE	UTILIZED (Y/N)

NOTE: ATTACH ADDITIONAL PAGES, IF NECESSARY. BIDDER MUST SIGN EACH ADDITIONAL

SHEET TO CERTIFY ITS CONTENT AND COMPLETION OF FORM.

Form C-49 12-16-04 Sheet 1 of 10

COMMONWEALTH OF VIRGINIA DEPARTMENT OF TRANSPORTATION

DBE GOOD FAITH EFFORTS DOCUMENTATION

--DO NOT DETACH--

THIS INFORMATION MUST BE SUBMITTED WITH YOUR BID PROPOSAL IF YOUR BID DOES NOT MEET THE PROJECT DBE REQUIREMENTS, OR WHEN REQUESTED BY VDOT

CONTRACT I.D. NUMBER
PROJECT NUMBER
FHWA NUMBER
DISTRICT
DATE BID SUBMITTED
BIDDER'S NAME
SIGNATURE
TITLE
VENDOR NUMBER
DBE GOAL FROM BID PROPOSAL

Form C-49 12-16-04 Sheet 2 of 10

COMMONWEALTH OF VIRGINIA DEPARTMENT OF TRANSPORTATION

DBE GOOD FAITH EFFORTS DOCUMENTATION

CONTRACT I.D. NO._ ___DATE SUBMITTED__

IF THE DBE GOAL ESTABLISHED FOR THIS CONTRACT HAS NOT BEEN MET OR VDOT REQUESTS THE SUBMITTAL THEREOF. THE BIDDER IS REQUIRED TO SUBMIT GOOD FAITH EFFORTS AS OUTLINED IN THIS DOCUMENT.

THE BIDDER ACKNOWLEDGES AND CERTIFIES THAT THIS FORM ACCURATELY REPRESENTS THE INFORMATION CONTAINED HEREIN.

SIGNATURE BIDDER

TITLE____

NAMES OF CERTIFIED DBES AND THE DATES ON WHICH THEY WERE SOLICITED TO BID ON THIS PROJECT

INCLUDE THE ITEMS OF WORK OFFERED AND THE DATES AND METHODS USED FOR FOLLOWING UP INITIAL SOLICITATIONS TO DETERMINE WHETHER OR NOT DBES WERE INTERESTED.

NAMES AND VENDOR NUMBERS OF DBES SOLICITED	DATE OF INITIAL SOLICITATION	ITEMS(S) OF WORK	FOLLOW-UP METHODS AND DATES

NOTE: ATTACH ADDITIONAL PAGES IF NECESSARY

ATTACH COPIES OF SOLICITATIONS, TELEPHONE RECORDS, FAX CONFIRMATIONS, ELECTRONIC INFORMATION, ETC.

Form C-49 12-16-04 Sheet 3 of 10

COMMONWEALTH OF VIRGINIA DEPARTMENT OF TRANSPORTATION DBE GOOD FAITH EFFORTS DOCUMENTATION

CONTRACT I.D. NO. _____ DATE SUBMITTED____

IF THE DBE GOAL ESTABLISHED FOR THIS CONTRACT HAS NOT BEEN MET OR VDOT REQUESTS THE SUBMITTAL THEREOF, THE BIDDER IS REQUIRED TO SUBMIT GOOD FAITH EFFORTS AS OUTLINED IN THIS DOCUMENT.

THE BIDDER ACKNOWLEDGES AND CERTIFIES THAT THIS FORM ACCURATELY REPRESENTS THE INFORMATION CONTAINED HEREIN.

SIGNATURE BIDDER____

TITLE

TELEPHONE LOG

DBE(s) CALLED				CONTACT PERSON OR VOICE MAIL STATUS
	Rombert	UNELLD	UNELED	01/100

NOTE: ATTACH ADDITIONAL PAGES IF NECESSARY

Form C-49 12-16-04 Sheet 4 of 10

COMMONWEALTH OF VIRGINIA DEPARTMENT OF TRANSPORTATION DBE GOOD FAITH EFFORTS DOCUMENTATION

CONTRACT I.D. NO. DATE SUBMITTED

THE DBE GOAL ESTABLISHED FOR THIS CONTRACT HAS NOT BEEN MET OR VDOT REQUESTS THE SUBMITTAL THEREOF. THE BIDDER IS REQUIRED TO SUBMIT GOOD FAITH EFFORTS AS OUTLINED IN THIS DOCUMENT.

THE BIDDER ACKNOWLEDGES AND CERTIFIES THAT THIS FORM ACCURATELY REPRESENTS THE INFORMATION CONTAINED HEREIN.

_____SIGNATURE _____ BIDDER TITLE

ITEM(S) OF WORK THAT THE BIDDER MADE AVAILABLE TO DBE FIRMS

IDENTIFY THOSE ITEM(S) OF WORK THAT THE BIDDER MADE AVAILABLE TO DBE FIRMS OR THOSE ITEM(S) THE BIDDER IDENTIFIED AND DETERMINED TO SUBDIVIDE INTO ECONOMICALLY FEASIBLE UNITS TO FACILITATE DBE PARTICIPATION. FOR EACH ITEM LISTED, SHOW THE DOLLAR VALUE AND PERCENTAGE OF THE TOTAL CONTRACT AMOUNT. IT IS THE BIDDER'S RESPONSIBILITY TO DEMONSTRATE THAT SUFFICIENT WORK TO MEET THE GOAL WAS MADE AVAILABLE TO DBE FIRMS.

ITEM(s) OF WORK MADE AVAILABLE	BIDDER NORMALLY PERFORMS ITEM(S) (Y/N)	ITEM(S) BROKEN DOWN TO FACILITATE PARTICIPATION (Y/N)	AMOUNT IN DOLLARS	PERCENTAGE OF CONTRACT

NOTE: INFORMATION REQUIRED FOR THIS SECTION CONTINUED ON SHEET 5 ATTACH ADDITIONAL PAGES IF NECESSARY

Form C-49 12-16-04 Sheet 5 of 10

COMMONWEALTH OF VIRGINIA DEPARTMENT OF TRANSPORTATION DBE GOOD FAITH EFFORTS DOCUMENTATION

CONTRACT I.D. NO. DATE SUBMITTED

IF THE DBE GOAL ESTABLISHED FOR THIS CONTRACT HAS NOT BEEN MET OR VDOT REQUESTS THE SUBMITTAL THEREOF, THE BIDDER IS REQUIRED TO SUBMIT GOOD FAITH EFFORTS AS OUTLINED IN THIS DOCUMENT.

THE BIDDER ACKNOWLEDGES AND CERTIFIES THAT THIS FORM ACCURATELY REPRESENTS THE INFORMATION CONTAINED HEREIN.

SIGNATURE _____ BIDDER TITLE

ADDITIONAL INFORMATION REGARDING ITEM(S) OF WORK THAT THE BIDDER **MADE AVAILABLE TO DBE FIRMS** (Continued From Sheet 4)

ITEM(S) OF WORK MADE AVAILABLE, NAMES OF SELECTED FIRMS AND DBE STATUS, DBES THAT PROVIDED QUOTES, PRICE QUOTE FOR EACH FIRM, AND THE PRICE DIFFERENCE FOR EACH DBE IF THE SELECTED FIRM IS NOT A DBE.

ITEM(S) OF WORK MADE AVAILABLE (CONT.)	NAME OF SELECTED FIRM AND VENDOR NUMBER	DBE OR NON-DBE	NAME OF REJECTED FIRM(S)	QUOTE IN DOLLARS	PRICE DIFFERENCE IN DOLLARS

NOTE: ATTACH ADDITIONAL PAGES IF NECESSARY.

IF THE FIRM SELECTED FOR THE ITEM IS NOT A DBE, PROVIDE THE REASON(S) FOR THE SELECTION ON A SEPARATE PAGE AND ATTACH.

PROVIDE NAMES, ADDRESSES, AND TELEPHONE NUMBERS FOR THE FIRMS LISTED ABOVE.

Form C-49 12-16-04 Sheet 6 of 10

COMMONWEALTH OF VIRGINIA DEPARTMENT OF TRANSPORTATION DBE GOOD FAITH EFFORTS DOCUMENTATION

CONTRACT I.D. NO. DATE SUBMITTED

IF THE DBE GOAL ESTABLISHED FOR THIS CONTRACT HAS NOT BEEN MET OR VDOT **REQUESTS THE SUBMITTAL THEREOF, THE BIDDER IS REQUIRED TO SUBMIT GOOD FAITH EFFORTS AS OUTLINED IN THIS DOCUMENT.** THE BIDDER ACKNOWLEDGES AND CERTIFIES THAT THIS FORM ACCURATELY REPRESENTS THE INFORMATION CONTAINED HEREIN.

SIGNATURE BIDDER

TITLE

ADVERTISEMENTS OR PROOFS OF PUBLICATION.

NAMES AND DATES OF EACH PUBLICATION IN WHCH A REQUEST FOR DBE PARTICIPATION FOR THE PROJECT WAS PLACED BY THE BIDDER. ATTACH COPIES OF PUBLISHED ADVERTISEMENTS OR PROOFS OF PUBLICATION.

PUBLICATIONS	DATES OF ADVERTISEMENT

NOTE: ATTACH ADDITIONAL PAGES IF NECESSARY

Form C-49 12-16-04 Sheet 7 of 10

COMMONWEALTH OF VIRGINIA DEPARTMENT OF TRANSPORTATION DBE GOOD FAITH EFFORTS DOCUMENTATION

CONTRACT I.D. NO. DATE SUBMITTED

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THE BIDDER ACKNOWLEDGES AND CERTIFIES THAT THIS FORM ACCURATELY REPRESENTS THE INFORMATION CONTAINED HEREIN.

BIDDER ______ SIGNATURE _____ TITLE____

NAMES OF AGENCIES CONTACTED TO PROVIDE ASSISTANCE

NAMES OF AGENCIES (SEE SPECIAL PROVISION FOR 110.04) AND THE DATES THESE AGENCIES WERE CONTACTED TO PROVIDE ASSISTANCE IN CONTACTING, RECRUITING, AND USING DBE FIRMS. IF THE AGENCIES WERE CONTACTED IN WRITING, ATTACH COPIES OF SUPPORTING DOCUMENTS.

NAME OF AGENCY	METHOD AND DATE OF CONTACT	RESULTS

NOTE: ATTACH ADDITIONAL PAGES IF NECESSARY.

For Form C-49 12-16-04 Sheet 8 of 10

COMMONWEALTH OF VIRGINIA DEPARTMENT OF TRANSPORTATION DBE GOOD FAITH EFFORTS DOCUMENTATION

CONTRACT I.D. NO. DATE SUBMITTED

IF THE DBE GOAL ESTABLISHED FOR THIS CONTRACT HAS NOT BEEN MET OR VDOT **REQUESTS THE SUBMITTAL THEREOF, THE BIDDER IS REQUIRED TO SUBMIT GOOD FAITH** EFFORTS AS OUTLINED IN THIS DOCUMENT.

THE BIDDER ACKNOWLEDGES AND CERTIFIES THAT THIS FORM ACCURATELY REPRESENTS THE INFORMATION CONTAINED HEREIN.

BIDDER ______ SIGNATURE ______

TITLE

TECHNICAL ASSISTANCE AND INFORMATION PROVIDED TO DBES

EFFORTS MADE TO PROVIDE INTERESTED DBES WITH ADEQUATE INFORMATION ABOUT THE PLANS, SPECIFICATIONS, AND REQUIREMENTS OF THE BID DOCUMENTS TO ASSIST THE DBEs IN RESPONDING TO A SOLICITATION.

IDENTIFY THE DBES ASSISTED, THE INFORMATION PROVIDED, AND THE DATE OF CONTACT. ATTACH COPIES OF SUPPORTING DOCUMENTS.

DBEs ASSISTED	INFORMATION PROVIDED	DATE OF CONTACT

NOTE: ATTACH ADDITIONAL PAGES IF NECESSARY.

Form C-49 12-16-04 Sheet 9 of 10

COMMONWEALTH OF VIRGINIA DEPARTMENT OF TRANSPORTATION DBE GOOD FAITH EFFORTS DOCUMENTATION

DATE SUBMITTED CONTRACT I.D. NO.

IF THE DBE GOAL ESTABLISHED FOR THIS CONTRACT HAS NOT BEEN MET OR VDOT **REQUESTS THE SUBMITTAL THEREOF, THE BIDDER IS REQUIRED TO SUBMIT GOOD FAITH** EFFORTS AS OUTLINED IN THIS DOCUMENT.

THE BIDDER ACKNOWLEDGES AND CERTIFIES THAT THIS FORM ACCURATELY **REPRESENTS THE INFORMATION CONTAINED HEREIN.**

BIDDER	SIGNATURE
TITLE	

EFFORTS MADE TO ASSIST DBES OBTAIN BONDING, LINES OF CREDIT, **INSURANCE, ETC.**

EFFORTS MADE TO PROVIDE INTERESTED DBES IN OBTAINING BONDING, LINES OF CREDIT, INSURANCE, NECESSARY EQUIPMENT, SUPPLIES, MATERIALS, OR RELATED ASSISTANCE OR SERVICES, EXCLUDING SUPPLIES AND EQUIPMENT THE SUBCONTRACTOR PURCHASES OR LEASES FROM THE PRIME CONTRACTOR OR ITS AFFILIATES.

IDENTIFY THE DBES ASSISTED, THE ASSISTANCE OFFERED, AND THE DATES OF SERVICES OFFERED AND PROVIDED. ATTACH COPIES OF SUPPORTING DOCUMENTS.

DBEs ASSISTED	ASSISTANCE OFFERED	DATES SERVICES OFFERED AND/OR PROVIDED

NOTE: ATTACH ADDITIONAL PAGES IF NECESSARY.

Form C-49 12-16-04 Sheet 9 of 10

COMMONWEALTH OF VIRGINIA DEPARTMENT OF TRANSPORTATION DBE GOOD FAITH EFFORTS DOCUMENTATION

CONTRACT I.D. NO. DATE SUBMITTED

IF THE DBE GOAL ESTABLISHED FOR THIS CONTRACT HAS NOT BEEN MET OR VDOT **REQUESTS THE SUBMITTAL THEREOF, THE BIDDER IS REQUIRED TO SUBMIT GOOD FAITH EFFORTS AS OUTLINED IN THIS DOCUMENT.**

THE BIDDER ACKNOWLEDGES AND CERTIFIES THAT THIS FORM ACCURATELY REPRESENTS THE INFORMATION CONTAINED HEREIN.

BIDDER ______ SIGNATURE _____

TITLE_____

ADDITIONAL DATA TO SUPPORT DEMONSTRATION OF GOOD FAITH EFFORTS

ADDITIONAL DATA TO SUPPORT DEMONSTRATION OF GOOD FAITH EFFORTS

NOTE: ATTACH ADDITIONAL PAGES, IF NECESSARY
Form C-104 Rev. 7-13-05

COMMONWEALTH OF VIRGINIA DEPARTMENT OF TRANSPORTATION

PROJECT:

FHWA:

This form must be completed, signed and returned with bid; and failure to do so may result in the rejection of your bid. THE CONTRACTOR SHALL AFFIRM THE FOLLOWING STATEMENT <u>EITHER</u> BY SIGNING THE AFFIDAVIT AND HA VING IT NOTARIZED <u>OR</u> BY SIGNING THE UNSWORN DECLARATION UNDER PENALTY OF PERJURY UNDER THE LAWS OF THE UNITED STATES. A SEPARATE FORM MUST BE SUBMITTED BY EACH PRINCIPAL OF A JOINT VENTURE BID.

STATEMENT. In preparation and submission of this bid, I, the firm, corporation or officers, agents or employees thereof did not, either directly or indirectly, enter into any combination or arrangement with any persons, firm or corporation or enter into any agreement, participate in any collusion, or otherwise take any action in the restraint of free, competitive bidding in violation of the Sherman Act (15 U.S.C. Section 1) or Article 1.1 or Chapter 12 of Title 18.2 (Virginia Governmental Frauds Act), Sections 59.1-9.1 through 59.1-9.17 or Sections 59.1-68.6 through 59.1-68.8 of the Code of Virginia.

The undersigned is duly authorized by the bi	dder to mak	ke the foregoing s	tatement to be filed with bids
Signed at	, this	day of	, 20
County (City), State			
	Bv:		
(Name of Firm)		(Signature)	Title (print)
STATE of	COUN	TY (CITY) of	
	To-wit	:	
I		_, a Notary Public	c in and for the State and
County(City) aforesaid, hereby certify that the	is day		
personally appeared before me and made or	ath that he i	s duly authorized	to make the above statements
and that such statements are true and correct	ct.		
Subscribed and sworn to before me this		day of	, 20
	Mv Cor	mmission expires	
Notary Public			
UNSV	VORN DEC	LARATION	
The undersigned is duly authorized by the submitted on behalf of the bidder for contract	bidder to m ts to be let t	ake the foregoing by the Commonw	g statement to be filed with bids ealth Transportation Board.
Signed at County (City), State	, this _	day of	, 20
	Ву:		
(Name of Firm)		(Signature)	Title (print)

AFFIDAVIT

Form C-105 Rev. 7-13-05

COMMONWEALTH OF VIRGINIA DEPARTMENT OF TRANSPORTATION AFFIDAVIT

PROJECT:

FHWA:

This form must be completed, signed, notarized and returned with bid; and failure to do so, may result in the rejection of your bid. A separate form must be submitted by each principal of a joint venture bid.

1. I, the firm, corporation or officers, agents or employees thereof have neither directly nor indirectly entered into any combination or arrangement with any person, firm or corporation or entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with such contract, the effect of which is to prevent competition or increase the cost of construction or maintenance of roads or bridges.

During the preceding twelve months, I (we) have been a member of the following Highway Contractor's Associations, as defined in Section 33.1-336 of the Code of Virginia (1970). (If none, so state).

NAME	Location of Principal Office

2. I (we) have _____, have not _____, participated in a previous contract or subcontract subject to the equal opportunity clause, as required by Executive Orders 10925, 11114, or 11246, and that I/We have _____, have not _____, filed with the joint Reporting Committee, the Director of the Office of Federal Contract Compliance, a Federal Government contracting or administering agency, or the former President's Committee on Equal Employment Opportunity, all reports due under the applicable filing requirements.

<u>Note:</u> The above certification is required by the Equal Employment Opportunity Regulations of the Secretary of Labor [41 CFR 60-1.7(b)(1)], and must be submitted by bidders and proposed subcontractors only in connection with contracts and subcontracts which are subject to the equal opportunity clause. Contracts and subcontracts which are exempt from the equal opportunity clause are set forth in 41 CFR 60-1.5. (Generally only contract or subcontracts of \$10,000 or under are exempt.)

Currently, Standard Form 100 (EEO-1) is the only report required by the Executive Orders or their implementing regulations.

Proposed prime contractors and subcontractors who have participated in a previous contract or subcontract subject to the Executive Orders and have not filed the required reports should note that 41 CFR 60-1.7(b) (1) prevents the award of contract and subcontract unless such contractor submits a report covering the delinquent period or such other period specified by the Federal Highway Administration or by the Director, Office of Federal Contract Compliance, U.S. Department of Labor.

(Continued)

ORDER NO.: CONTRACT ID. NO.:

Form C-105 page 2

- 3. The bidder certifies to the best of its knowledge and belief, that it and its principals:
 - a. Are not presently debarred, suspended, proposed for debarment, declared ineligible or voluntarily excluded from covered transactions by any Federal department or agency;
 - b. Have not within a three year period preceding this proposal been convicted of or had a civil judgement rendered against them for commission of fraud or a criminal offence in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
 - c. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated above; and
 - d. Where the bidders is unable to certify to any of the statements in this certification, the bidder shall show an explanation below.

Explanations will not necessarily result in denial of award, but will be considered in determining bidder responsibility. For any explanation noted, indicate below to whom it applies, initiating agency, and dates of action. Providing false information may result in federal criminal prosecution or administration sanctions. The bidder shall provide immediate written notice to the Department if at any time the bidder learns that its certification was erroneous when submitted or has become erroneous by reason of change circumstances.

The undersigned is duly authorized by the bidder to make the foregoing statements to be filed with bids submitted on behalf of the bidder for contracts to be let by the Commonwealth Transportation Board.

Signed at County (City), State	, this day of	, 20
(Name of Firm)	By:	Title (print)
(Name of Firm)	(Signature)	
STATE of	COUNTY (CITY) of	
I	To-wit: , a Notary Public	in and for the State and
County(City) aforesaid, hereby certify that personally appeared before me and made	this day	 o make the above statements
and that such statements are true and corr	ect.	
Subscribed and sworn to before me this	day of	, 20
	My Commission expires _	

Form C-111 Rev. 7-13-05

COMMONWEALTH OF VIRGINIA DEPARTMENT OF TRANSPORTATION MINIMUM DBE REQUIREMENTS

PROJECT NO:

FHWA NO:

INSTRUCTIONS

SECTION II OF THIS FORM IS TO BE USED BY THE CONTRACTOR TO SUBMIT THE NAMES OF DBE FIRMS TO BE UTILIZED ON THE PROJECT. ADDITIONAL SHEETS TO SHOW THE ALLOWABLE CREDIT PER ITEM MAY BE ATTACHED IF NECESSARY. NOTE: IF 100% OF AN ITEM IS NOT TO BE PERFORMED OR FURNISHED BY THE DBE, DESCRIBE THE PORTION AND PERCENTAGE TO BE PERFORMED OR FURNISHED BY THE DBE.

SECTION I:

DBE REQUIREMENT <u>4</u>%

SECTION II:

PERCENT ATTAINED BY BIDDER

%

NAME(S) AND CERTIFICATIOS NO. OF DBE(s) TO BE USED	TYPE OF WORK & ITEM NO(s)	PERCENT OF WORK	AMT. OF ALLOWABLE CREDIT PER ITEM

TOTAL: \$

Total Contract Value \$ X Required DBE % = \$

I/WE CERTIFY THAT THE PROPOSED DBE (S) SUBMITTED WILL BE USED ON THIS CONTRACT AS STATED HEREON AND ASSURE THAT DURING THE LIFE OF THE CONTRACT, I/WE WILL MEET OR EXCEED THE PARTICIPATION ESTABLISHED HEREON BY THE DEPARTMENT.

	By	
BIDDER	SIGNATURE	
	Ву	
TITLE	DATE	

Form C-112 Rev. 12-12-05

COMMONWEALTH OF VIRGINIA DEPARTMENT OF TRANSPORTATION CERTIFICATION OF BINDING AGREEMENT

Project No.: _____

Federal Project No.:

It is hereby certified by the below signed Contractors that there exists a written quote acceptable to both parties preliminary to a binding subcontract agreement stating the details concerning the work to be performed and the price which will be paid for the aforementioned work. A copy of the fully executed subcontract agreement shall be submitted to the Engineer within fourteen (14) working days after contract execution.

It is further certified that the aforementioned mutually acceptable quote and fully executed subcontract agreement represent the entire agreement between the two parties and that no conversations, verbal agreements, or other forms of non-written representations shall serve to add to, delete, or modify the terms as stated.

The prime Contractor further represents that the aforementioned mutually acceptable quote and fully executed subcontract agreement shall remain on file for a period of not less than one year following completion of the prime's contract with the Department or for such longer period as provisions of governing Federal or State law or regulations may require.

Contractors further jointly and severally represent that said binding agreement is for the performance of a "commercially useful function" as that term is employed in 49 C.F.R. Part 26.55 (c). (d).

DBE/WBE Contract	or			
	Ву: _			
		Signature		Title
			Date:	
Prime Contractor:				
	Ву: _			
		Signature		Title
			Date:	

Note: This document is not intended to, nor should it be construed to, contain the entire text of the agreement between the contracting parties. This document does not take the place of, nor may it be substituted for, an official subcontracting agreement in those situations that may require such an agreement.

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01000 - OVERALL PROJECT REQUIREMENTS

- 1. LOCATION OF THE WORK: The project site is located in the Lee Hall area of Newport News, Virginia, at 9 Elmhusrt Street, as indicated in the Project Location Map on the title sheet.
- GENERAL DESCRIPTION OF THE WORK The project is described in the following documents: Project Manual title "Phase 3a: Construction for the Lee Hall Train Depot – Exterior Rehabilitation, Sprinkler & Security", Newport News, Virginia, Bid Documents Issued October 20, 2010, as well as the following drawing sheets:

a.

CIVIL / LANDSCAPE DRAWINGS:

• TITLESHEET

.

- C1 LEGEND AND GENERAL NOTES
- C2 LAYOUT, MATERIALS AND UTILITY PLAN
- C3 GRADING DRAINAGE AND E&S PLAN
- C4 DETAILS
- C5 DETAILS
- C6 DETAILS
- C7 DETAILS
- C8 E&S CONTROL NOTES AND DETAILS
- SV-1 EXISTING CONDITIONS, PLAN OF LAND
- L1 LANDSCAPE PLAN

ARCHITECTURAL / ENGINEERING DRAWINGS

- T1 Title Sheet
- D1 Demolition Plans and Elevations
- ALS-1 Architectural Life Safety Plans, Wall Types
- A1 Floor plans, restroom plans
- A2.1 Reflected Ceiling Plans, Roof Plans
- A2.2 Roof Details
- A2.3 Lighting, Mechanical & Sprinkler Plans
- A3 Building Elevations
- A4.1 Building Sections
- A4.2 New Bay Section and Details
- A5 Ramp and Loading Dock Details
- A7.1 Door and Finish Schedules, Door and Window Types, Trim Profiles
- A7.2 Door and Window Details
- A8 Details
- S1.1 Structural Plans
- S3.1 Sections
- S3.2 Sections
- P1.1 Plumbing Legends, Notes and Schedules and New Work Plan
- M1.1 Mechanical Legend, Notes and Schedules and New Work Plan
- E1 Electrical Legends Notes & Schedules
- E2 Electrical Site Plan and Fixture Schedule
- E3 Electrical Floor Plan Demolition
- E4 Electrical Floor Plan New Work Lighting
- E5 Electrical Floor Plan New Work Power
- E6 Power Riser Diagram and Details
- E7 Panel Board Schedules

- a. The Project is titled 'Phase 3a: Construction for the Lee Hall Train Depot Exterior Rehabilitation, Sprinkler & Security'', and the scope of work shown in the drawings listed above prepared by PMA, Inc., dated and issued on October 20, 2010.
- b. The project will include, but is not limited to, the following elements of work:
 - i. Minor site improvements and the installation of building utilities to serve the building including water, electrical, and sanitary Demolition of existing site paving, and patch and repair with new paving for installation of utilities.
 - ii. Protection of the existing adjacent properties during construction.
 - iii. Extend the roof overhangs to match original roof and installation of new metal shingle roof, removing existing shingle roof and patch and repair of sheathing as required.
 - iv. Installation of new limited mechanical, electrical and plumbing systems.
 - v. Rehabilitation of the historic building exterior to its 1918 appearance to include extending eaves, reconstructing two-story bay, (this work to be done by City)
- 3. CONTRACTOR'S RESPONSIBILITY TO SUBCONTRACTORS AND MATERIAL SUPPLIERS: The Contractor shall be responsible for furnishing each subcontractor and material supplier with all the contract and bidding documents for each subcontractor and material supplier as required to perform his work, and shall include the Instructions to Bidders, General Conditions, Supplementary General Conditions, all specification sections of Division 1, all technical specification sections of Divisions 2 through 16, Appendices to Specifications, the Drawings, and all Addenda, including modifications to the Specifications and Drawings. Contractor shall perform this requirement prior to receiving a price from these organizations and prior to submitting a bid on this project.
- 4. TIME FOR COMPLETION: In accordance with the Agreement and Section "Project Closeout," the time for substantial completion of the Lee Hall Depot Building Foundation project shall be 150 consecutive calendar days from the date of commencement of the work as specified in the Notice to Proceed. Final Completion of the project shall be achieved no later than 180 days after commencing the project.
- 8. MATERIAL STORAGE AREA: Space for Contractor material storage is limited on-site and has been identified on the bid documents. The contractor shall coordinate final location, size and clearance requirements with the City and adjacent property owners as needed. The CSX right-of-way is not to be used as storage area for equipment or materials at any time.
- 9. ON-SITE CONFERENCES: On-site conferences required in the technical specifications that require the attendance of the Architect-Engineer shall be scheduled to occur during the Architect-Engineer's regular visits to the site.
- 10. **NATIONAL HISTORIC REGISTER ELIGIBLE BUILDING**: The Lee Hall Depot is a national historic register eligible building. All work performed on this building is to meet the Secretary of the Interior's standards for historic preservation. The General Contractor shall be familiar with these requirements and shall obtain the services of a qualified historic carpenter to perform/oversee any work to the existing building fabric to ensure the standards and guidelines for historic preservation are adhered to during construction. General contractor shall submit qualifications for the historic carpenter /supervisor assigned to the project. Qualifications shall describe experience and historic project they have work on.

SECTION 01100 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following, but is not limited to the following:
 - 1. Work covered by the Contract Documents.
 - 2. Work phases.
 - 3. Work under other contracts.
 - 4. Use of premises.
 - 5. Work restrictions.
 - 6. Specification formats and conventions.
- B. Related Sections include the following:
 - 1. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: Phase 3a: Construction for the Lee Hall Train Depot Exterior Rehabilitation, Sprinkler & Security.
 - 1. Project Location: 9 Elhurst Street, in the Lee Hall area of Newport News, VA
- B. Owner: The City of Newport News, Virginia
 - 1. Owner's Representative: Mike Griffin, Department of Engineering, 2400 Washington Avenue, Newport News, Virginia 23607. Telephone 757.926.8611.
- C. Architect: PMA, Inc., 110227 Warwick Boulevard, Newport News, Virginia 23601. Telephone 757.596.8200.
- D. The Work will include, but is not limited to, the following elements of work:
- 1. Minor site improvements and the installation of building utilities to serve the building including water, electrical, and sanitary Demolition of existing site paving, and patch and repair with new paving for installation of utilities.
- 2. Protection of the existing adjacent properties during construction.
- 3. Extend the roof overhangs to match original roof and installation of new metal shingle roof, removing existing shingle roof and patch and repair of sheathing as required.
- 4. Installation of new limited mechanical, electrical and plumbing systems.
- 5. The Work Cooperation, coordination and sequencing of work to be performed along the City Right of Way and adjacent property under this contract.

6. The City's forces will undertake the rehabilitation of the Building Exterior to include siding/trim replacement, window and door replacement, construction of 2-story bay. The City will also coordinate and provide to the General Contractor for installation the roof brackets for around the building.

1.4 USE OF PREMISES

- A. General: Contractor shall have full use of premises for construction operations, including use of Project site, during construction period. Contractor's use of premises is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
- B. Use of Site: Limit use of premises to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Use of Existing Building: Maintain existing building in a weathertight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period.

1.5 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 16-division format and CSI/CSC's "MasterFormat" numbering system.
 - 1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
 - 2. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.6 MISCELLANEOUS PROVISIONS

- A. **HISTORIC CARPENTERS:** THE GENERAL CONTRACTOR SHALL HAVE A HISTORIC CARPENTER UNDER CONTRACT KNOWLEDABLE OF THE SECRETARY OF THE INTERIOR STANDARDS AND GUIDLINES FOR HISTORIC PRESERVATION TO PERFORM ANY WORK TO THE TO THE HISTORIC FABRIC OF THE BUILDING. THIS WILL INCLUDE REMOVAL AND REPLACEMENT OF SIDING AND TRIMS, REMOVAL AND REINSTALLATION OR REPLACEMENT OF INTERIOR FINIHSES AS REQUIRED FOR INTALALTION OF THE NEW BUILDING SYSTEMS. SEE ADDITIONAL REQUIREMENTS IN DIVISION 1. CARPENTERS QUALIFICATIONS ARE TO BE SUBMITTED FOR REVIEW AND APPROVAL, AND INCLUDE THE FOLLOWING:
 - 1. NAME OF CARPENTER
 - 2. COMPANY NAME
 - 3. LIST OF EXPERIENCE,
 - 4. LIST OF ALL EXPERIENCE WORKING ON STATE OR NATIONAL REGISTERED LANDMARKS.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

SECTION 01220 - 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for unit prices.
- B. Related Sections include the following:
 - 1. Division 01 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
 - 2. Division 01 Section "Quality Requirements" for general testing and inspecting requirements.
 - 3. City of Newport News Standard Specifications, latest edition

1.3 DEFINITIONS

A. Unit price is an amount proposed by bidders and stated on the Bid Form, 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: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. The Contractor shall be responsible for acquiring the services of a licensed independent surveyor acceptable to the City, to measure and certify work that involves use of established unit prices, prior to installation of the work. The City reserves the right to request additional supporting documentation regarding materials and quantities provided for this work.
- D. List of Unit Prices: A list of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF UNIT PRICES

- A. Unit Price No. 1 Removal and replacement of unsuitable soils:
 - 1. Description: For the removal of unsuitable soils, and the replacement and compaction of new suitable fill as recommended by the Soils Engineer in accordance to Division 2, Section "Site Preparation" and "Preparation of Base".
 - 2. Unit of Measurement: Cubic yard
- B. Unit Price No. 2 Remove and replace deteriorated and/or rotted structural wood framing.
 - 1. Description: Provide unit cost for the removal and replacement of deteriorated and/or rotted structural wood framing with new wood framing of same size and length. New wood framing to be No. 2 southern yellow pine (pressure treated in areas within 18" of grade OR exposed to the exterior/in contact with masonry/concrete).
 - 2. Unit of Measurement: Board Foot.
- C. Unit Price No. 3 Remove and replace deteriorated and/or rotted roof sheathing boards.
 - 1. Description: Provide unit cost for the removal and replacement of deteriorated and/or rotted roof sheathing boards with new roof sheathing boards of same size. (Assume existing roof sheathing boards are 1" x 5.5" actual dimension).
 - 2. Unit of Measurement: Square Foot.
- D. Unit Price No. 4 Remove and replace damaged and/or rotted tongue and groove heart pine flooring.
 - 1. Description: Provide unit cost for the removal and replacement of deteriorated and/or rotted tongue and groove wood flooring with new tongue and groove heart pine flooring of the same dimensions and profile of the existing wood flooring.
 - 2. Unit of Measurement: Square Foot.
- E. Unit Price No. 5 Remove and replace beaded board ceiling/walls in pine.
 - 1. Description: Provide unit cost for the removal and replacement of tongue and groove wood bead board paneling in pine of the same dimensions and profile of the existing wood paneling.
 - 2. Unit of Measurement: Square Foot.

SECTION 01230 – OPTIONS (ALTERNATES)

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 alternates.

1.3 DEFINITIONS

- A. Option: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. The cost or credit for each option is the net addition to or deduction from the Contract Sum to incorporate the option into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

- A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include as part of each option, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of option.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each option. Indicate if options have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to options.
- C. Execute accepted options under the same conditions as other work of the Contract.
- D. Schedule: A Schedule of Options is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each option.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF OPTIONS

- A. Option No. 1 Entry ramp and steps: The General Contractor shall provide a price for all labor, materials and equipment necessary to construct the final entry ramp, step and platform as shown on the bid documents, sheet A5. Work shall include installation of new walks, extending/cutting existing masonry as required for new ramp section and construction of pressure treated ramp. Work shall include installation of all handrails and guard rails shown.
- B. Option No. 2 Exterior Painting: The General Contractor shall provide a price for all labor, materials and equipment necessary, to clean, prime and paint all the exterior of the building, and shall include, but not limited to the following: siding, trims, doors, windows, soffits, brackets, brick foundation, and flashings. All work to be done in accordance with the Secretary of the Interior's Standards for Preservation and Rehabilitation as well as the required cleaning and preparation of surfaces as required by the paint manufacturer.

SECTION 01260 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections include the following:
 - 1. Division 01 Section "Unit Prices" for administrative requirements for using unit prices.
 - 2. Division 01 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue through the Owner supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on form designated by Owner.

1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Architect

- 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
- 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
- 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
- 4. Include costs of labor and supervision directly attributable to the change.
- 5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- 6. Comply with requirements in Division 01 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.
- C. Proposal Request Form: Use forms provided by Owner.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, The Owner will issue a Change Order for signatures of Owner and Contractor on an Owner furnished form.

1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: The Architect or Owner may issue a Construction Change Directive on in Owner approved format. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 - 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 - 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.7 CLAIMS AND DISPUTES

A. Claim: Participation in contract claim awards and settlements will follow CFR635.124.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

SECTION 01290 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Sections include the following:
 - 1. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 2. Division 01 Section "Unit Prices" for administrative requirements governing use of unit prices.
 - 3. Division 01 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with Continuation Sheets.
 - b. Submittals Schedule.
 - c. Contractor's Construction Schedule.
 - 2. Submit the Schedule of Values to Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
 - 3. Subschedules: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the Schedule of Values:

- a. Project name and location.
- b. Name of Architect.
- c. Architect's project number.
- d. Contractor's name and address.
- e. Date of submittal.
- 2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value.
 - 1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
- 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
- 4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
- 5. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-inplace may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
- 6. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and Owner's onsite inspector and paid for by Owner.
 - 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Forms: Use forms provided by Owner for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect and/or Owner will return incomplete applications without action.

- 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
- 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Transmittal: Submit 4 signed and notarized original copies of each Application for Payment to Owner by a method ensuring receipt. One copy shall include waivers of lien and similar attachments if required.
 - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- F. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
 - 1. List of subcontractors.
 - 2. Schedule of Values.
 - 3. Contractor's Construction Schedule (preliminary if not final).
 - 4. Products list.
 - 5. Schedule of unit prices.
 - 6. Submittals Schedule (preliminary if not final).
 - 7. List of Contractor's staff assignments.
 - 8. List of Contractor's principal consultants.
 - 9. Copies of building permits.
 - 10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 - 11. Initial progress report.
 - 12. Report of preconstruction conference.
 - 13. Certificates of insurance and insurance policies.
 - 14. Performance and payment bonds.
 - 15. Data needed to acquire Owner's insurance.
 - 16. Initial settlement survey and damage report if required.
- G. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
 - 1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 - 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- H. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
 - 1. Evidence of completion of Project closeout requirements.
 - 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 - 3. Updated final statement, accounting for final changes to the Contract Sum.
 - 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 - 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 - 6. AIA Document G707, "Consent of Surety to Final Payment."
 - 7. Evidence that claims have been settled.
 - 8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 - 9. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

SECTION 01310 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. Coordination of Drawings.
 - 2. Administrative and supervisory personnel.
 - 3. Project meetings.
 - 4. Requests for Interpretation (RFIs).
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.
- C. Related Sections include the following:
 - 1. Division 01 Section "Overall Project Requirements" for a description of the work, phasing and sequencing of the Scope of Work for this project and responsibility for coordination activities not in this Section.
 - 2. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's Construction Schedule.
 - 3. Division 01 Section "Execution" for procedures for coordinating general installation and fieldengineering services, including establishment of benchmarks and control points.
 - 4. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.4 COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.

- 3. Make adequate provisions to accommodate items scheduled for later installation.
- 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
- 5. Review Phasing and Sequencing of the Work described in Section 0100 Overall Project Requirements for the responsibility of this contract to schedule and phase the work required under this contract with work to be performed by other Owner Contractor's under separate contract.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's Construction Schedule.
 - 2. Preparation of the Schedule of Values.
 - 3. Installation and removal of temporary facilities and controls.
 - 4. Delivery and processing of submittals.
 - 5. Progress meetings.
 - 6. Preinstallation conferences.
 - 7. Project closeout activities.
 - 8. Startup and adjustment of systems.
 - 9. Project closeout activities.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
 - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.5 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
 - 1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
 - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - b. Indicate required installation sequences.
 - c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

- 2. Sheet Size: At least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 40 inches (750 by 1000 mm).
- 3. Number of Copies: Submit 7 opaque copies of each submittal. Architect will return 3 copies.
- 4. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
 - 1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.6 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.
 - 1. Include special personnel required for coordination of operations with other contractors.

1.7 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
 - 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 - 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 - 3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
 - 1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for RFIs.
 - g. Procedures for testing and inspecting.

- h. Procedures for processing Applications for Payment.
- i. Distribution of the Contract Documents.
- j. Submittal procedures.
- k. LEED requirements.
- 1. Preparation of Record Documents.
- m. Use of the premises and existing building.
- n. Work restrictions.
- o. Owner's occupancy requirements.
- p. Responsibility for temporary facilities and controls.
- q. Construction waste management and recycling.
- r. Parking availability.
- s. Office, work, and storage areas.
- t. Equipment deliveries and priorities.
- u. First aid.
- v. Security.
- w. Progress cleaning.
- x. Working hours.
- 3. Minutes: Record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
 - 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. The Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility problems.
 - k. Time schedules.
 - 1. Weather limitations.
 - m. Manufacturer's written recommendations.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.

- 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
- 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
- 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Conduct progress meetings at biweekly intervals. Coordinate dates of meetings with preparation of payment requests.
 - 1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Status of correction of deficient items.
 - 14) Field observations.
 - 15) RFIs.
 - 16) Status of proposal requests.
 - 17) Pending changes.
 - 18) Status of Change Orders.
 - 19) Pending claims and disputes.
 - 20) Documentation of information for payment requests.
 - 3. Minutes: Record the meeting minutes.
 - 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.

- a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- E. Coordination Meetings: Conduct Project coordination meetings at biweekly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
 - 1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to Combined Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Schedule Updating: Revise Combined Contractor's Construction Schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
 - c. Review present and future needs of each contractor present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Change Orders.
 - 3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.8 REQUESTS FOR INTERPRETATION (RFIs)

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.
 - 1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
 - 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
 - 1. Project name.
 - 2. Date.
 - 3. Name of Contractor.
 - 4. Name of Architect
 - 5. RFI number, numbered sequentially.
 - 6. Specification Section number and title and related paragraphs, as appropriate.
 - 7. Drawing number and detail references, as appropriate.
 - 8. Field dimensions and conditions, as appropriate.
 - 9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 - 10. Contractor's signature.
 - 11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
 - a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.
- C. Hard-Copy RFIs:
 - 1. Identify each page of attachments with the RFI number and sequential page number.
- D. Software-Generated RFIs: Software-generated form with substantially the same content as indicated above.
 - 1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- E. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow 10 working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.
 - 1. The following RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Architect's actions on submittals.
 - f. Incomplete RFIs or RFIs with numerous errors.
 - 2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
 - 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

- G. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log biweekly. Include the following:
 - 1. Project name.
 - 2. Name and address of Contractor.
 - 3. Name and address of Architect.
 - 4. RFI number including RFIs that were dropped and not submitted.
 - 5. RFI description.
 - 6. Date the RFI was submitted.
 - 7. Date Architect's response was received.
 - 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
 - 9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

SECTION 01320 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Preliminary Construction Schedule.
 - 2. Contractor's Construction Schedule.
 - 3. Submittals Schedule.
 - 4. Daily construction reports.
 - 5. Material location reports.
 - 6. Field condition reports.
 - 7. Special reports.
- B. Related Sections include the following:
 - 1. Division 01 Section "Multiple Contract Summary" for preparing a combined Contractor's Construction Schedule.
 - 2. Division 01 Section "Payment Procedures" for submitting the Schedule of Values.
 - 3. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
 - 4. Division 01 Section "Photographic Documentation" for submitting construction photographs.
 - 5. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
 - 6. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the Schedule of Values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by Architect.

- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- D. Event: The starting or ending point of an activity.
- E. Milestone: A key or critical point in time for reference or measurement.
- F. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 SUBMITTALS

- A. Qualification Data: For scheduling consultant.
- B. Submittals Schedule: Submit seven copies of schedule. Arrange the following information in a tabular format:
 - 1. Scheduled date for first submittal.
 - 2. Specification Section number and title.
 - 3. Submittal category (action or informational).
 - 4. Name of subcontractor.
 - 5. Description of the Work covered.
 - 6. Scheduled date for Architect's final release or approval.
- C. Preliminary Construction Schedule: Submit three opaque copies.
 - 1. Approval of cost-loaded preliminary construction schedule will not constitute approval of Schedule of Values for cost-loaded activities.
- D. Contractor's Construction Schedule: Submit three opaque copies of initial schedule, large enough to show entire schedule for entire construction period.
 - 1. Submit an electronic copy of schedule, using software indicated, on CD-R, and labeled to comply with requirements for submittals. Include type of schedule (Initial or Updated) and date on label.
- E. Daily Construction Reports: Submit three copies at monthly intervals.
- F. Field Condition Reports: Submit three copies at time of discovery of differing conditions.
- G. Special Reports: Submit three copies at time of unusual event.

1.5 QUALITY ASSURANCE

- A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.
- B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:
 - 1. Review software limitations and content and format for reports.

- 2. Verify availability of qualified personnel needed to develop and update schedule.
- 3. Discuss constraints, including phasing, work stages, area separations, interim milestones, and partial Owner occupancy.
- 4. Review delivery dates for Owner-furnished products.
- 5. Review schedule for work of Owner's separate contracts.
- 6. Review time required for review of submittals and resubmittals.
- 7. Review requirements for tests and inspections by independent testing and inspecting agencies.
- 8. Review time required for completion and startup procedures.
- 9. Review and finalize list of construction activities to be included in schedule.
- 10. Review submittal requirements and procedures.
- 11. Review procedures for updating schedule.

1.6 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from parties involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
 - 1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
 - 2. Initial Submittal: Submit concurrently with preliminary bar-chart schedule Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 - a. At Contractor's option, show submittals on the Preliminary Construction Schedule, instead of tabulating them separately.
 - 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."
- B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.

- 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- C. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than 30 days, unless specifically allowed by Architect.
 - 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - 3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
 - 4. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
 - 1. Phasing: Arrange list of activities on schedule by phase.
 - 2. Work under More Than One Contract: Include a separate activity for each contract.
 - 3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 - 4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 - 5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 - 6. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use of premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
 - 7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.

- 1. Startup and placement into final use and operation.
- 8. Area Separations: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Permanent space enclosure.
 - c. Completion of mechanical installation.
 - d. Completion of electrical installation.
 - e. Substantial Completion.
- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.
- F. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.
- G. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules.
 - 1. Version for Windows 2000 operating system.

2.3 PRELIMINARY CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within seven days of date established for the Notice to Proceed.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's Construction Schedule within **15** days of date established for the Notice to Proceed. Base schedule on the Preliminary Construction Schedule and whatever updating and feedback was received since the start of Project.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
 - 1. For construction activities that require 3 months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.5 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

- 1. List of subcontractors at Project site.
- 2. List of separate contractors at Project site.
- 3. Approximate count of personnel at Project site.
- 4. Equipment at Project site.
- 5. Material deliveries.
- 6. High and low temperatures and general weather conditions.
- 7. Accidents.
- 8. Meetings and significant decisions.
- 9. Unusual events (refer to special reports).
- 10. Stoppages, delays, shortages, and losses.
- 11. Meter readings and similar recordings.
- 12. Emergency procedures.
- 13. Orders and requests of authorities having jurisdiction.
- 14. Change Orders received and implemented.
- 15. Construction Change Directives received and implemented.
- 16. Services connected and disconnected.
- 17. Equipment or system tests and startups.
- 18. Partial Completions and occupancies.
- 19. Substantial Completions authorized.
- B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.
 - 1. In-House Option: Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
 - 2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.
- B. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate Actual Completion percentage for each activity.
- C. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field offices.

2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

SECTION 01330 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Sections include the following:
 - 1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the Schedule of Values.
 - 2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes and for submitting Coordination Drawings.
 - 3. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule.
 - 4. Division 01 Section "Quality Requirements" for submitting test and inspection reports and for mockup requirements.
 - 5. Division 01 Section "Closeout Procedures" for submitting warranties.
 - 6. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 7. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 8. Division 01 Section "Demonstration and Training" for submitting videotapes of demonstration of equipment and training of Owner's personnel.
 - 9. Divisions 02 through 49 Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's responsive action.
- B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

- A. General: Electronic copies of CAD Drawings of the Contract Drawings will be made available upon written request by Architect for Contractor's use in preparing submittals for reference only.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
- 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
- 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
- D. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 - 1. Initial Review: Allow 15 working days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 - 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 - 3. Resubmittal Review: Allow 15 days for review of each resubmittal.
 - 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 20 working days for initial review of each submittal.
 - 5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 working days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.
- E. Identification: Place a permanent label or title block on each submittal for identification.
 - 1. Indicate name of firm or entity that prepared each submittal on label or title block.
 - 2. Provide a space approximately 6 by 8 inches (150 by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 - 3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Submittal number or other unique identifier, including revision identifier.
 - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 06100.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 06100.01.A).
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Location(s) where product is to be installed, as appropriate.
 - 1. Other necessary identification.

- F. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.
- G. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
 - 1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
- H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
 - 1. Transmittal Form: Provide locations on form for the following information:
 - a. Project name.
 - b. Date.
 - c. Destination (To:).
 - d. Source (From:).
 - e. Names of subcontractor, manufacturer, and supplier.
 - f. Category and type of submittal.
 - g. Submittal purpose and description.
 - h. Specification Section number and title.
 - i. Drawing number and detail references, as appropriate.
 - j. Transmittal number, numbered consecutively.
 - k. Submittal and transmittal distribution record.
 - l. Remarks.
 - m. Signature of transmitter.
 - 2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.
- I. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 - 1. Note date and content of revision in label or title block and clearly indicate extent of revision.
- J. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- K. Use for Construction: Use only final submittals with mark indicating "Approved action stamp"taken by Architect.

1.5 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

- A. General: At Contractor's written request, copies of Architect's CAD files will be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions:
 - 1. No warranty as to the accuracy or completeness of information provided. CAD files are made available for the contractor's use related to the construction of this project only. Contractor and his subcontractors assume all responsibility for use of CAD information. Use of CAD files does not relieve the Contractor or Subcontractor from compliance with the Contract Documents. CAD files are not Contract Documents. Contractor shall notify Architect of distribution of all CAD files.

Users of CAD files are derived information agree to hold the Architect harmless for any and all claims associated with use of this information, misuse of this information and damages related to such use. License to use CAD files expires at Final Completion.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
 - 1. Submit electronic submittals directly to extranet specifically established for Project.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each copy of each submittal to show which products and options are applicable.
 - 3. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.
 - d. Standard color charts.
 - e. Manufacturer's catalog cuts.
 - f. Wiring diagrams showing factory-installed wiring.
 - g. Printed performance curves.
 - h. Operational range diagrams.
 - i. Mill reports.
 - j. Standard product operation and maintenance manuals.
 - k. Compliance with specified referenced standards.
 - 1. Testing by recognized testing agency.
 - m. Application of testing agency labels and seals.
 - n. Notation of coordination requirements.
 - 4. Number of Copies: Submit 7 copies of Product Data, unless otherwise indicated. Architect will return three copies. Mark up and retain one returned copy as a Project Record Document.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
 - 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Shopwork manufacturing instructions.
 - g. Templates and patterns.
 - h. Schedules.
 - i. Design calculations.

- j. Compliance with specified standards.
- k. Notation of coordination requirements.
- 1. Notation of dimensions established by field measurement.
- m. Relationship to adjoining construction clearly indicated.
- n. Seal and signature of professional engineer if specified.
- o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
- 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 40 inches (750 by 1000 mm).
- 3. Number of Copies: Submit two opaque (bond) copies of each submittal. Architect will return one copy.
- 4. Number of Copies: Submit 7 opaque copies of each submittal, unless copies are required for operation and maintenance manuals. Architect will retain 4 copies; remainder will be returned. Mark up and retain one returned copy as a Project Record Drawing.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
 - 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 - 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of appropriate Specification Section.
 - 3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 - 4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit three full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
 - 5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned.

- 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
- 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
 - 1. Type of product. Include unique identifier for each product.
 - 2. Number and name of room or space.
 - 3. Location within room or space.
 - 4. Number of Copies: Submit three copies of product schedule or list, unless otherwise indicated. Architect will return one copies.
 - a. Mark up and retain one returned copy as a Project Record Document.
- F. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation" for Construction Manager's action.
- G. Submittals Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- H. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."
- I. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."
- J. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.
 - 4. Number of Copies: Submit 7 copies of subcontractor list, unless otherwise indicated. Architect will return **3** copies.
 - a. Mark up and retain one returned copy as a Project Record Document.

2.2 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
 - 1. Number of Copies: Submit 7 copies of each submittal, unless otherwise indicated. Architect will not return copies.
 - 2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - 3. Test and Inspection Reports: Comply with requirements specified in Division 01 Section "Quality Requirements."

- B. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."
- C. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- D. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- F. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- G. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- H. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- I. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- J. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- K. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."
- L. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- M. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- N. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- O. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."
- P. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and

other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

- Q. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
 - 1. Preparation of substrates.
 - 2. Required substrate tolerances.
 - 3. Sequence of installation or erection.
 - 4. Required installation tolerances.
 - 5. Required adjustments.
 - 6. Recommendations for cleaning and protection.
- R. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
 - 1. Name, address, and telephone number of factory-authorized service representative making report.
 - 2. Statement on condition of substrates and their acceptability for installation of product.
 - 3. Statement that products at Project site comply with requirements.
 - 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 - 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - 6. Statement whether conditions, products, and installation will affect warranty.
 - 7. Other required items indicated in individual Specification Sections.
- S. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- T. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Architect, except as required in "Action Submittals" Article.
 - 1. Architect will not review submittals that include MSDSs and will return the entire submittal for resubmittal.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S / ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 01330

SECTION 01359 - HISTORIC TREATMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes special procedures for historic treatment on Project including, but not limited to, the following:
 - 1. Storage and protection of existing historic materials.
 - 2. Temporary protection of historic materials during construction.
 - 3. Historic treatment procedures.

1.3 DEFINITIONS

- A. "Preservation": To apply measures necessary to sustain the existing form, integrity, and materials of a historic property. Work may include preliminary measures to protect and stabilize the property.
- B. "Rehabilitation": To make possible a compatible use for a property through repair, alterations, and additions while preserving those portions or features that convey its historical, cultural, or architectural values.
- C. "Restoration": To accurately depict the form, features, and character of a property as it appeared at a particular period of time by means of the removal of features from other periods in its history and the reconstruction of missing features from the restoration period.
- D. "Reconstruction": To reproduce in the exact form and detail a building, structure, or artifact as it appeared at a specific period in time.
- E. "Stabilize": To apply measures designed to reestablish a weather-resistant enclosure and the structural reinforcement of an item or portion of the building while maintaining the essential form as it exists at present.
- F. "Protect and Maintain": To remove deteriorating corrosion, reapply protective coatings, and install protective measures such as temporary guards; to provide the least degree of intervention.
- G. "Repair": To stabilize, consolidate, or conserve; to retain existing materials and features while employing as little new material as possible. Repair includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials. Within restoration, repair also includes limited replacement in kind, rehabilitation, and reconstruction, with compatible substitute materials for deteriorated or missing parts of features when there are surviving prototypes.
- H. "Replace": To duplicate and replace entire features with new material in kind. Replacement includes the following conditions:

- 1. Duplication: Includes replacing elements damaged beyond repair or missing. Original material is indicated as the pattern for creating new duplicated elements.
- 2. Replacement with New Materials: Includes replacement with new material when original material is not available as patterns for creating new duplicated elements.
- 3. Replacement with Substitute Materials: Includes replacement with compatible substitute materials. Substitute materials are not allowed, unless otherwise indicated.
- I. "Remove": To detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
- J. "Remove and Salvage": To detach items from existing construction and deliver them to Owner ready for reuse.
- K. "Remove and Reinstall": To detach items from existing construction, repair and clean them for reuse, and reinstall them where indicated.
- L. "Existing to Remain" or "Retain": Existing items of construction that are not to be removed and that are not otherwise indicated to be removed and salvaged, or removed and reinstalled.
- M. "Material in Kind": Material that matches existing materials, as much as possible, in species, cut, color, grain, and finish.

1.4 SUBMITTALS

- A. Historic Treatment Program: Submit a written plan for each phase or process including protection of surrounding materials during operations. Describe in detail materials, methods, and equipment to be used for each phase of work.
- B. Qualification Data: For historic treatment specialists and supervisory personnel. Include list of completed projects with the scope of work and budget for each.
- C. Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by historic treatment operations. Submit before work begins.

1.5 QUALITY ASSURANCE

- A. Historic Treatment Specialist Qualifications: The General Contractor shall employ a firm that employs personnel, including supervisory personnel, experienced and skilled in the processes and operations indicated.
 - 1. Specialist is to be experienced with and knowledgeable of the Secretary of the Interior's Standards and Guidelines for Historic Preservation and Rehabilitation.
 - 2. Contractor to submit qualifications of Historic Treatment Specialist for review and approval. Experience shall include previous work on state and/or national register (register-eligible) buildings.
- B. Historic Treatment Preconstruction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.6 STORAGE AND PROTECTION OF HISTORIC MATERIALS

A. Removed and Salvaged Historic Materials:

- 1. Clean salvaged historic items.
- 2. Store items in a secure area until delivery to Owner.
- 3. Transport items to Owner's storage area designated by Owner.
- 4. Protect items from damage during transport and storage.
- 5. Do not dispose of items removed from existing construction without prior written consent of Owner.
- B. Removed and Reinstalled Historic Materials:
 - 1. Clean and repair historic items to functional condition adequate for intended reuse. Document specifically where each item was removed, properly mark so item may be reinstalled into its original location
 - 2. Protect items from damage during transport and storage.
 - 3. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- C. Existing Historic Materials to Remain: Protect construction indicated to remain against damage and soiling during historic treatment. When permitted by Architect, items may be removed to a suitable, protected storage location during historic treatment and cleaned and reinstalled in their original locations after historic treatment operations are complete.
- D. Storage and Protection: When removed from their existing location, store historic materials within a weathertight enclosure where they are protected from wetting by rain, snow, or ground water, and temperature variations. Secure stored materials to protect from theft.
 - 1. Identify removed items with an inconspicuous mark indicating their original location.

1.7 PROJECT-SITE CONDITIONS

- A. Exterior Cleaning and Repairing:
 - 1. Proceed with the work only when forecasted weather conditions are favorable.
 - a. Wet Weather: Do not attempt repairs during rainy or foggy weather. Do not apply primer, paint, putty, or epoxy when the relative humidity is above 80 percent. Do not remove exterior elements of structures when rain is forecast or in progress.
 - b. Do not perform exterior wet work when the air temperature is below 40 deg F (5 deg C).
 - c. Do not begin cleaning, patching, or repairing when there is any likelihood of frost or freezing.
 - d. Do not begin cleaning when either the air or the surface temperature is below 45 deg F (7 deg C) unless approved means are provided for maintaining a 45 deg F (7 deg C) temperature of the air and materials during, and for 48 hours subsequent to, cleaning.
 - 2. Perform cleaning and rinsing of the exterior only during daylight hours.

PART 2 - PRODUCTS - (Not Used)

PART 3 - EXECUTION

3.1 PROTECTION, GENERAL

- A. Comply with manufacturer's written instructions for precautions and effects of products and procedures on adjacent building materials, components, and vegetation.
- B. Ensure that supervisory personnel are present when work begins and during its progress.
- C. Temporary Protection of Historic Materials during Construction:
 - 1. Protect existing materials during installation of temporary protections and construction. Do not deface or remove existing materials.
 - 2. Attachments of temporary protection to existing construction shall be approved by Architect prior to installation.

3.2 HISTORIC TREATMENT PROCEDURES

- A. The principal aim of preservation work is to halt the process of deterioration and stabilize the item's condition, unless otherwise indicated. Repair is required where specifically indicated. The following procedures shall be followed:
 - 1. Retain as much existing material as possible; repair and consolidate rather than replace.
 - 2. Use additional material or structure to reinforce, strengthen, prop, tie, and support existing material or structure.
 - 3. Use reversible processes wherever possible.
 - 4. Use traditional replacement materials and techniques. New work shall be distinguishable to the trained eye, on close inspection, from old work.
 - 5. Record the work before the procedure with preconstruction photos and during the work with periodic construction photos.
- B. Prohibit smoking by personnel performing work on or near historic structures.
- C. Obtain Architect's review and written approval in the form of a Constructive Change Directive or Supplemental Instruction before making changes or additions to construction or removing historic materials.
- D. Notify Architect of visible changes in the integrity of material or components whether due to environmental causes including biological attack, UV degradation, freezing, or thawing; or due to structural defects including cracks, movement, or distortion.
 - 1. Do not proceed with the work in question until directed by Architect.
- E. Where missing features are indicated to be repaired or replaced, provide features whose designs are based on accurate duplications rather than on conjectural designs, subject to the approval of Architect and Preservation Specialist.
- F. Where Work requires existing features to be removed, cleaned, and reused, perform these operations without damage to the material itself, to adjacent materials, or to the substrate.
- G. Identify new or replacement materials and features with inconspicuous, permanent marks to distinguish them from original materials. Record the legend of identification marks and the locations of these marks on Record Drawings.
- H. When cleaning, match samples of existing materials that have been cleaned and identified for acceptable cleaning levels. Avoid overcleaning to prevent damage to existing materials during cleaning.

SECTION 01400 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Contractor to provide soils testing by a qualified geotechnical engineer licensed in Virginia, as well as other testing required by this section.
- C. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- D. Related Sections include the following:
 - 1. Division 01 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.
 - 2. Division 01 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.
 - 3. Divisions 02 through 04 Sections for specific test and inspection requirements.
 - 4. Division 02, Section 02210 Building Earthwork.
 - 5. Division 03, Section 03300 Cast-in-Place Concrete.
 - 6. Division 04, Section 04200 Unit Masonry.

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

- C. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.
- D. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
- J. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

- A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

- B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Description of test and inspection.
 - 3. Identification of applicable standards.
 - 4. Identification of test and inspection methods.
 - 5. Number of tests and inspections required.
 - 6. Time schedule or time span for tests and inspections.
 - 7. Entity responsible for performing tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.
- C. Reports: Prepare and submit certified written reports that include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - 12. Name and signature of laboratory inspector.
 - 13. Recommendations on retesting and reinspecting.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.6 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind

indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

- F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirement for specialists shall not supersede building codes and regulations governing the Work.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
 - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
 - 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.

- 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
- 6. Demolish and remove mockups when directed, unless otherwise indicated.

1.7 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 - 2. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.
 - 3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.
- B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 - 1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 - 2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 - 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 - 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."
- D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- E. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 - 1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 - 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 - 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

- 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
- 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
- 6. Do not perform any duties of Contractor.
- F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar qualitycontrol services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
 - 1. Access to the Work.
 - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 - 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 - 4. Facilities for storage and field curing of test samples.
 - 5. Delivery of samples to testing agencies.
 - 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 - 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for the Notice to Proceed.
 - 1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.8 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:
 - 1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
 - 2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 - 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
 - 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 - 5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 - 6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Prepare a record of tests and inspections. Include the following:
 - 1. Date test or inspection was conducted.
 - 2. Description of the Work tested or inspected.
 - 3. Date test or inspection results were transmitted to Architect.
 - 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
 - 2. Comply with the Contract Document requirements for Division 01 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01400

SECTION 01420 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "approved," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.

- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.
- D. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents. PRIVATE tbl1

ADAAG	Americans with Disabilities Act (ADA) Architectural Barriers Act (ABA)	(800) 872-2253
	Accessibility Guidelines for Buildings and Facilities Available from Access Board www.access-board.gov	(202) 272-0080
CFR	Code of Federal Regulations Available from Government Printing Office www.gpoaccess.gov/cfr/index.html	(888) 293-6498 (202) 512-1530
CRD	Handbook for Concrete and Cement Available from Army Corps of Engineers Waterways Experiment Station www.wes.army.mil	(601) 634-2355
DOD	Department of Defense Military Specifications and Standards Available from Department of Defense Single Stock Point www.dodssp.daps.mil	(215) 697-6257
DSCC	Defense Supply Center Columbus (See FS)	
FED-STD	Federal Standard (See FS)	
FS	Federal Specification Available from Department of Defense Single Stock Point www.dodssp.daps.mil	(215) 697-6257
	Available from General Services Administration www.fss.gsa.gov	(202) 501-1021
	Available from National Institute of Building Sciences www.nibs.org	(202) 289-7800
FTMS	Federal Test Method Standard (See FS)	
ICC-ES	ICC Evaluation Service, Inc. www.icc-es.org	(800) 423-6587 (562) 699-0543
MIL	(See MILSPEC)	
MIL-STD	(See MILSPEC)	

MILSPEC	Military Specification and Standards Available from Department of Defense Single Stock Point www.dodssp.daps.mil	(215) 697-6257
NES	(Formerly: National Evaluation Service) (See ICC-ES)	
UFAS	Uniform Federal Accessibility Standards Available from Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale Research's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AA	Aluminum Association, Inc. (The) www.aluminum.org	(202) 862-5100
AAADM	American Association of Automatic Door Manufacturers www.aaadm.com	(216) 241-7333
AABC	Associated Air Balance Council www.aabchq.com	(202) 737-0202
AAMA	American Architectural Manufacturers Association www.aamanet.org	(847) 303-5664
AASHTO	American Association of State Highway and Transportation Officials www.transportation.org	(202) 624-5800
AATCC	American Association of Textile Chemists and Colorists (The) www.aatcc.org	(919) 549-8141
ABMA	American Bearing Manufacturers Association www.abma-dc.org	(202) 367-1155
ACI	ACI International (American Concrete Institute) www.aci-int.org	(248) 848-3700
ACPA	American Concrete Pipe Association www.concrete-pipe.org	(972) 506-7216
AEIC	Association of Edison Illuminating Companies, Inc. (The) www.aeic.org	(205) 257-2530

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AF&PA	American Forest & Paper Association www.afandpa.org	(800) 878-8878 (202) 463-2700
AGA	American Gas Association www.aga.org	(202) 824-7000
AGC	Associated General Contractors of America (The) www.agc.org	(703) 548-3118
AHA	American Hardboard Association (Now part of CPA)	
AHAM	Association of Home Appliance Manufacturers www.aham.org	(202) 872-5955
AI	Asphalt Institute www.asphaltinstitute.org	(859) 288-4960
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
AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
AITC	American Institute of Timber Construction www.aitc-glulam.org	(303) 792-9559
ALCA	Associated Landscape Contractors of America www.alca.org	(800) 395-2522 (703) 736-9666
ALSC	American Lumber Standard Committee, Incorporated www.alsc.org	(301) 972-1700
AMCA	Air Movement and Control Association International, Inc. www.amca.org	(847) 394-0150
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
AOSA	Association of Official Seed Analysts www.aosaseed.com	(505) 522-1437
APA	APA - The Engineered Wood Association www.apawood.org	(253) 565-6600
APA	Architectural Precast Association www.archprecast.org	(239) 454-6989
API	American Petroleum Institute www.api.org	(202) 682-8000
ARI	Air-Conditioning & Refrigeration Institute	(703) 524-8800

www.ari.org

ARMA	Asphalt Roofing Manufacturers Association www.asphaltroofing.org	(202) 207-0917
ASCE	American Society of Civil Engineers www.asce.org	(800) 548-2723 (703) 295-6300
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers	(800) 527-4723
	www.ashrae.org	(404) 636-8400
ASME	ASME International (The American Society of Mechanical Engineers International) www.asme.org	(800) 843-2763 (212) 591-7722
ASSE	American Society of Sanitary Engineering www.asse-plumbing.org	(440) 835-3040
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	(610) 832-9585
AWCI	AWCI International (Association of the Wall and Ceiling Industries International) www.awci.org	(703) 534-8300
AWCMA	American Window Covering Manufacturers Association (Now WCSC)	
AWI	Architectural Woodwork Institute www.awinet.org	(800) 449-8811 (703) 733-0600
AWPA	American Wood-Preservers' Association www.awpa.com	(334) 874-9800
AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353
AWWA	American Water Works Association www.awwa.org	(800) 926-7337 (303) 794-7711
ВНМА	Builders Hardware Manufacturers Association www.buildershardware.com	(212) 297-2122
BIA	Brick Industry Association (The) www.bia.org	(703) 620-0010
BICSI	BICSI www.bicsi.org	(813) 979-1991
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association International) www.bifma.com	(616) 285-3963

BISSC	Baking Industry Sanitation Standards Committee www.bissc.org	(773) 761-4100
	Cast Stone Institute www.caststone.org	(770) 972-3011
CCC	Carpet Cushion Council www.carpetcushion.org	(203) 637-1312
CDA	Copper Development Association Inc. www.copper.org	(800) 232-3282 (212) 251-7200
CEA	Canadian Electricity Association www.canelect.ca/connections_online/home.htm	(613) 230-9263
CFFA	Chemical Fabrics & Film Association, Inc. www.chemicalfabricsandfilm.com	(216) 241-7333
CGA	Compressed Gas Association www.cganet.com	(703) 788-2700
CGSB	Canadian General Standards Board w3.pwgsc.gc.ca/cgsb	(800) 665-2472 (819) 956-0425
CIMA	Cellulose Insulation Manufacturers Association www.cellulose.org	(888) 881-2462 (937) 222-2462
CISCA	Ceilings & Interior Systems Construction Association www.cisca.org	(630) 584-1919
CISPI	Cast Iron Soil Pipe Institute www.cispi.org	(423) 892-0137
CLFMI	Chain Link Fence Manufacturers Institute www.chainlinkinfo.org	(301) 596-2583
СРА	Composite Panel Association www.pbmdf.com	(301) 670-0604
CPPA	Corrugated Polyethylene Pipe Association www.cppa-info.org	(800) 510-2772 (202) 462-9607
CRI	Carpet & Rug Institute (The) www.carpet-rug.com	(800) 882-8846 (706) 278-3176
CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(847) 517-1200
CSA	CSA International (Formerly: IAS - International Approval Services) www.csa-international.org	(800) 463-6727 (416) 747-4000
CSI	Construction Specifications Institute (The) www.csinet.org	(800) 689-2900 (703) 684-0300
CSSB	Cedar Shake & Shingle Bureau	(604) 820-7700

www.cedarbureau.org

CTI	Cooling Technology Institute (Formerly: Cooling Tower Institute) www.cti.org	(281) 583-4087
DHI	Door and Hardware Institute www.dhi.org	(703) 222-2010
EIA	Electronic Industries Alliance www.eia.org	(703) 907-7500
EIMA	EIFS Industry Members Association www.eima.com	(800) 294-3462 (770) 968-7945
EJCDC	Engineers Joint Contract Documents Committee www.asce.org	(800) 548-2723 (703) 295-6300
EJMA	Expansion Joint Manufacturers Association, Inc. www.ejma.org	(914) 332-0040
ESD	ESD Association www.esda.org	(315) 339-6937
FCI	Fluid Controls Institute www.fluidcontrolsinstitute.org	(216) 241-7333
FIBA	Federation Internationale de Basketball Amateur (The International Basketball Federation) www.fiba.com	41 22 545 00 00
FIVB	Federation Internationale de Volleyball (The International Volleyball Federation) www.fivb.ch	41 21 345 35 35
FM	Factory Mutual System (Now FMG)	
FMG	FM Global (Formerly: FM - Factory Mutual System) www.fmglobal.com	(401) 275-3000
FRSA	Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc. www.floridaroof.com	(407) 671-3772
FSA	Fluid Sealing Association www.fluidsealing.com	(610) 971-4850
FSC	Forest Stewardship Council www.fsc.org	52 951 5146905
GA	Gypsum Association www.gypsum.org	(202) 289-5440
GANA	Glass Association of North America	(785) 271-0208

www.glasswebsite.com

GRI	(Now GSI)	
GS	Green Seal www.greenseal.org	(202) 872-6400
GSI	Geosynthetic Institute www.geosynthetic-institute.org	(610) 522-8440
HI	Hydraulic Institute www.pumps.org	(888) 786-7744 (973) 267-9700
HI	Hydronics Institute www.gamanet.org	(908) 464-8200
HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)	
HPVA	Hardwood Plywood & Veneer Association www.hpva.org	(703) 435-2900
HPW	H. P. White Laboratory, Inc. www.hpwhite.com	(410) 838-6550
IAS	International Approval Services (Now CSA International)	
IBF	International Badminton Federation www.intbadfed.org	441-24 223-4904
ICEA	Insulated Cable Engineers Association, Inc. www.icea.net	(770) 830-0369
ICRI	International Concrete Repair Institute, Inc. www.icri.org	(847) 827-0830
IEC	International Electrotechnical Commission www.iec.ch	41 22 919 02 11
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The) www.ieee.org	(212) 419-7900
IESNA	Illuminating Engineering Society of North America www.iesna.org	(212) 248-5000
IGCC	Insulating Glass Certification Council www.igcc.org	(315) 646-2234
IGMA	Insulating Glass Manufacturers Alliance (The) www.igmaonline.org	(613) 233-1510
ILI	Indiana Limestone Institute of America, Inc. www.iliai.com	(812) 275-4426
ISO	International Organization for Standardization	41 22 749 01 11

	www.iso.ch	
ISSFA	International Solid Surface Fabricators Association www.issfa.net	(702) 567-8150
ITS	Intertek www.intertek.com	(800) 345-3851 (607) 753-6711
ITU	International Telecommunication Union www.itu.int/home	41 22 730 51 11
КСМА	Kitchen Cabinet Manufacturers Association www.kcma.org	(703) 264-1690
LMA	Laminating Materials Association (Now part of CPA)	
LPI	Lightning Protection Institute www.lightning.org	(800) 488-6864 (847) 577-7200
MBMA	Metal Building Manufacturers Association www.mbma.com	(216) 241-7333
MFMA	Maple Flooring Manufacturers Association www.maplefloor.org	(847) 480-9138
MFMA	Metal Framing Manufacturers Association www.metalframingmfg.org	(312) 644-6610
MH	Material Handling (Now MHIA)	
MHIA	Material Handling Industry of America www.mhia.org	(800) 345-1815 (704) 676-1190
MIA	Marble Institute of America www.marble-institute.com	(440) 250-9222
MPI	Master Painters Institute www.paintinfo.com	(888) 674-8937
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc. www.mss-hq.com	(703) 281-6613
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	(312) 332-0405
NACE	NACE International (National Association of Corrosion Engineers International) www.nace.org	(281) 228-6200
NADCA	National Air Duct Cleaners Association www.nadca.com	(202) 737-2926
NAGWS	National Association for Girls and Women in Sport	(800) 213-7193 ext.

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	www.aahperd.org/nagws/	
NAIMA	North American Insulation Manufacturers Association (The) www.naima.org	(703) 684-0084
NBGQA	National Building Granite Quarries Association, Inc. www.nbgqa.com	(800) 557-2848
NCAA	National Collegiate Athletic Association (The) www.ncaa.org	(317) 917-6222
NCMA	National Concrete Masonry Association www.ncma.org	(703) 713-1900
NCPI	National Clay Pipe Institute www.ncpi.org	(262) 248-9094
NCTA	National Cable & Telecommunications Association www.ncta.com	(202) 775-3550
NEBB	National Environmental Balancing Bureau www.nebb.org	(301) 977-3698
NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110
NeLMA	Northeastern Lumber Manufacturers' Association www.nelma.org	(207) 829-6901
NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200
NETA	InterNational Electrical Testing Association www.netaworld.org	(303) 697-8441
NFHS	National Federation of State High School Associations www.nfhs.org	(317) 972-6900
NFPA	NFPA (National Fire Protection Association) www.nfpa.org	(800) 344-3555 (617) 770-3000
NFRC	National Fenestration Rating Council www.nfrc.org	(301) 589-1776
NGA	National Glass Association www.glass.org	(703) 442-4890
NHLA	National Hardwood Lumber Association www.natlhardwood.org	(800) 933-0318 (901) 377-1818
NLGA	National Lumber Grades Authority www.nlga.org	(604) 524-2393
NOFMA	National Oak Flooring Manufacturers Association	(901) 526-5016

www.nofma.org

NRCA	National Roofing Contractors Association www.nrca.net	(800) 323-9545 (847) 299-9070
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888) 846-7622 (301) 587-1400
NSF	NSF International (National Sanitation Foundation International) www.nsf.org	(800) 673-6275 (734) 769-8010
NSSGA	National Stone, Sand & Gravel Association www.nssga.org	(800) 342-1415 (703) 525-8788
NTMA	National Terrazzo & Mosaic Association, Inc. www.ntma.com	(800) 323-9736 (540) 751-0930
NTRMA	National Tile Roofing Manufacturers Association (Now TRI)	
NWWDA	National Wood Window and Door Association (Now WDMA)	
OPL	Omega Point Laboratories, Inc. www.opl.com	(800) 966-5253 (210) 635-8100
PCI	Precast/Prestressed Concrete Institute www.pci.org	(312) 786-0300
PDCA	Painting & Decorating Contractors of America www.pdca.com	(800) 332-7322 (314) 514-7322
PDI	Plumbing & Drainage Institute www.pdionline.org	(800) 589-8956 (978) 557-0720
PGI	PVC Geomembrane Institute http://pgi-tp.ce.uiuc.edu	(217) 333-3929
PTI	Post-Tensioning Institute www.post-tensioning.org	(602) 870-7540
RCSC	Research Council on Structural Connections www.boltcouncil.org	(800) 644-2400 (312) 670-2400
RFCI	Resilient Floor Covering Institute www.rfci.com	(301) 340-8580
RIS	Redwood Inspection Service www.calredwood.org	(888) 225-7339 (415) 382-0662
RTI	(Formerly: NTRMA - National Tile Roofing Manufacturers Association) (Now TRI)	
SAE	SAE International www.sae.org	(724) 776-4841

SDI	Steel Deck Institute www.sdi.org	(847) 462-1930
SDI	Steel Door Institute www.steeldoor.org	(440) 899-0010
SEFA	Scientific Equipment and Furniture Association www.sefalabs.com	(516) 294-5424
SEI	Structural Engineering Institute www.seinstitute.com	(800) 548-2723 (703) 295-6195
SGCC	Safety Glazing Certification Council www.sgcc.org	(315) 646-2234
SIA	Security Industry Association www.siaonline.org	(703) 683-2075
SIGMA	Sealed Insulating Glass Manufacturers Association (Now IGMA)	
SJI	Steel Joist Institute www.steeljoist.org	(843) 626-1995
SMA	Screen Manufacturers Association www.smacentral.org	(561) 533-0991
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacna.org	(703) 803-2980
SMPTE	Society of Motion Picture and Television Engineers www.smpte.org	(914) 761-1100
SPFA	Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division) www.sprayfoam.org	(800) 523-6154
SPIB	Southern Pine Inspection Bureau (The) www.spib.org	(850) 434-2611
SPI/ SPFD	Society of the Plastics Industry, Inc. (The) Spray Polyurethane Foam Division (Now SPFA)	
SPRI	SPRI (Single Ply Roofing Institute) www.spri.org	(781) 647-7026
SSINA	Specialty Steel Industry of North America www.ssina.com	(800) 982-0355 (202) 342-8630
SSPC	SSPC: The Society for Protective Coatings www.sspc.org	(877) 281-7772 (412) 281-2331

STI	Steel Tank Institute www.steeltank.com	(847) 438-8265
SWI	Steel Window Institute www.steelwindows.com	(216) 241-7333
SWRI	Sealant, Waterproofing, & Restoration Institute www.swrionline.org	(816) 472-7974
TCA	Tile Council of America, Inc. www.tileusa.com	(864) 646-8453
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance www.tiaonline.org	(703) 907-7700
TMS	The Masonry Society www.masonrysociety.org	(303) 939-9700
TPI	Truss Plate Institute, Inc. www.tpinst.org	(608) 833-5900
TPI	Turfgrass Producers International www.turfgrasssod.org	(800) 405-8873 (847) 705-9898
TRI	Tile Roofing Institute (Formerly: RTI - Roof Tile Institute) www.tileroofing.org	(312) 670-4177
UL	Underwriters Laboratories Inc. www.ul.com	(800) 285-4476 (847) 272-8800
UNI	Uni-Bell PVC Pipe Association www.uni-bell.org	(972) 243-3902
USAV	USA Volleyball www.usavolleyball.org	(888) 786-5539 (719) 228-6800
USGBC	U.S. Green Building Council www.usgbc.org	(202) 828-7422
USITT	United States Institute for Theatre Technology, Inc. www.usitt.org	(800) 938-7488 (315) 463-6463
WASTEC	Waste Equipment Technology Association www.wastec.org	(800) 424-2869 (202) 244-4700
WCLIB	West Coast Lumber Inspection Bureau www.wclib.org	(800) 283-1486 (503) 639-0651
WCMA	Window Covering Manufacturers Association (Now WCSC)	
WCSC	Window Covering Safety Council (Formerly: WCMA - Window Covering Manufacturers	(800) 506-4636 (212) 661-4261

Association) www.windowcoverings.org

WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association) www.wdma.com	(800) 223-2301 (847) 299-5200
WI	Woodwork Institute (Formerly: WIC - Woodwork Institute of California) www.wicnet.org	(916) 372-9943
WIC	Woodwork Institute of California (Now WI)	
WMMPA	Wood Moulding & Millwork Producers Association www.wmmpa.com	(800) 550-7889 (530) 661-9591
WSRCA	Western States Roofing Contractors Association www.wsrca.com	(800) 725-0333 (650) 548-0112
WWPA	Western Wood Products Association www.wwpa.org	(503) 224-3930
 C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents. PRIVATE tbl3 BOCA BOCA International, Inc. 		
CABO	Council of American Building Officials (See ICC)	
IAPMO	International Association of Plumbing and Mechanical Officials www.iapmo.org	(909) 472-4100
ICBO	International Conference of Building Officials (See ICC)	
ICBO ES	ICBO Evaluation Service, Inc. (See ICC-ES)	
ICC	International Code Council (Formerly: CABO - Council of American Building Officials) www.iccsafe.org	(703) 931-4533
ICC-ES	ICC Evaluation Service, Inc. www.icc-es.org	(800) 423-6587 (562) 699-0543
NES	National Evaluation Service (See ICC-ES)	
SBCCI	Southern Building Code Congress International, Inc. (See ICC)	

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

PRIVATE tbl4

CE	Army Corps of Engineers www.usace.army.mil	
CPSC	Consumer Product Safety Commission www.cpsc.gov	(800) 638-2772 (301) 504-6816
DOC	Department of Commerce www.commerce.gov	(202) 482-2000
DOD	Department of Defense www.dodssp.daps.mil	(215) 697-6257
DOE	Department of Energy www.eren.doe.gov	(202) 586-9220
EPA	Environmental Protection Agency www.epa.gov	(202) 272-0167
FAA	Federal Aviation Administration www.faa.gov	(202) 366-4000
FCC	Federal Communications Commission www.fcc.gov	(888) 225-5322
FDA	Food and Drug Administration www.fda.gov	(888) 463-6332
GSA	General Services Administration www.gsa.gov	(800) 488-3111 (202) 501-1888
HUD	Department of Housing and Urban Development www.hud.gov	(202) 708-1112
LBL	Lawrence Berkeley National Laboratory www.lbl.gov	(510) 486-4000
NCHRP	National Cooperative Highway Research Program (See TRB)	
NIST	National Institute of Standards and Technology www.nist.gov	(301) 975-6478
OSHA	Occupational Safety & Health Administration www.osha.gov	(800) 321-6742 (202) 693-1999
PBS	Public Building Service (See GSA)	
PHS	Office of Public Health and Science http://phs.os.dhhs.gov	(202) 690-7694

RUS	Rural Utilities Service (See USDA)	(202) 720-9540
SD	State Department www.state.gov	(202) 647-4000
TRB	Transportation Research Board www.nas.edu/trb	(202) 334-2934
USDA	Department of Agriculture www.usda.gov	(202) 720-2791
USPS	Postal Service www.usps.com	(202) 268-2000

E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and upto-date as of the date of the Contract Documents. PRIVATE tbl5

CBHF	State of California, Department of Consumer Affairs Bureau of Home Furnishings and Thermal Insulation www.dca.ca.gov/bhfti	(800) 952-5210 (916) 574-2041
CPUC	California Public Utilities Commission www.cpuc.ca.gov	(415) 703-2782
TFS	Texas Forest Service Forest Products Laboratory http://txforestservice.tamu.edu	(936) 639-8180

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01420
SECTION 01500 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Sections include the following:
 - 1. Division 01 Section "Summary" for limitations on utility interruptions and other work restrictions.
 - 2. Division 01 Section "Multiple Contract Summary" for division of responsibilities for temporary facilities and controls.
 - 3. Division 01 Section "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
 - 4. Division 01 Section "Execution" for progress cleaning requirements.
 - 5. Divisions 02 through 04 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.

1.3 DEFINITIONS

A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.4 USE CHARGES

- A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.
- B. Sewer Service: Pay sewer service use charges for sewer usage by all entities for construction operations.
- C. Water Service: Pay water service use charges for water used by all entities for construction operations.
- D. Electric Power Service: Pay electric power service use charges for electricity used by all entities for construction operations.
- E. Sewer, Water, and Electric Power Service: Use charges are specified in Division 01 Section "Multiple Contract Summary."

- F. Water Service: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- G. Electric Power Service: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.5 SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

1.6 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.7 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.76-mm-) thick, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch-(60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts.

2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of construction personnel. Keep office clean and orderly. Furnish and equip offices as follows:
 - 1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
 - 2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with not less than 1 receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- (1.2-m-) square tack board.
 - 3. Drinking water and private toilet.

- 4. Coffee machine and supplies.
- 5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F (20 to 22 deg C).
- 6. Lighting fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height.
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
 - 1. Store combustible materials apart from building.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

- 1. Toilets: Use of Owner's existing toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- E. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
- F. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
 - 2. Install lighting for Project identification sign.
- G. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line(s) for each field office.
 - 1. Provide additional telephone lines for the following:
 - a. Provide a dedicated telephone line for each facsimile machine and computer in each field office.
 - 2. At each telephone, post a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Architect's office.
 - e. Engineers' offices.
 - f. Owner's office.
 - g. Principal subcontractors' field and home offices.
 - 3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
 - 1. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines. Comply with NFPA 241.
 - 2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 - 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- C. Parking: Provide temporary parking areas for construction personnel.
- D. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

- 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
- 2. Remove snow and ice as required to minimize accumulations.
- E. Project Identification and Temporary Signs: Provide Project identification and other signs per the City's Standard Specifications. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.
- F. Waste Disposal Facilities: Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."
- G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 01 Section "Execution" for progress cleaning requirements.
- H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
 - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
 - 1. Comply with work restrictions specified in Division 01 Section "Summary."
- B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
 - 1. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- C. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- D. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- E. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.
- F. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
 - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations and where indicated on Drawings.
 - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide Owner with one set of keys.

- G. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
- H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- I. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
 - 1. Prohibit smoking in construction areas.
 - 2. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 - 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 - 2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
 - 3. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

SECTION 16401 - TVSS DEVICES

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

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

1.2 SCOPE

- A. These specifications describe the electrical and mechanical requirements for a hybrid, high energy, 200,000 Amp or 400,000 Amp class suppression filter system that integrates Transient Voltage Surge Suppression (TVSS) with high frequency electrical line noise filtering for high exposure applications.
- B. Operating voltage shall be (120/208, 3 phase).
- C. UL 1449 2^{nd} Edition Rating shall be (400 volts at 208).

1.3 REFERENCES

- A. The specified unit shall be designed, manufactured, tested and installed in compliance with the following standards:
 - (1) ANSI/IEEE C62.41-1991 and C62.45-1987;
 - (2) ANSI/IEEE C62.1 and C62.11;
 - (3) ANSI/IEE C62.33-1982;
 - (4) Canadian Standards Association (CSA);
 - (5) Federal Information Processing Standards Publication 94 (FIPS PUB 94);
 - (6) National Electrical Manufacturers Association; (NEMA LS1-1992 Guidelines);
 - (7) National Fire Protection Association (NFPA 70 [NEC], 75, and 78);
 - (8) Underwriters Laboratories (UL 1449 Second Edition 1283);
 - (9) Underwriters Laboratories (UL 489 and 198).

1.4 SUBMITTALS

- A. Contractor shall submit the following Shop Drawings and Submittals listed below for review by the Architect. Submittals shall indicate conformance with the hereinbefore listed References, or provide certification of meeting those requirements.
 - (1) Product Information.
 - (2) Category C3 Independent Clamp Voltage Test Results.
 - (3) UL 1449 Clamp Voltage Documentation.

PART 2 - PRODUCTS

2.1 SERVICE ENTRANCE

A. The unit shall include an engineered solid-state high performance suppression system

utilizing arrays of non-linear voltage dependent metal oxide varistors with similar operating characteristics. The suppression system shall incorporate field-replaceable fusing and modular replaceable TVSS modules. All internal wiring associated with the suppression filter system and subject to surge currents shall utilize low-impedance copper bus bar and/or #2 AWG copper conductor or larger. The unit shall include redundant long-life, solid state, externally and internally visible LED status indicators that monitor the on-line status of each phase of the unit. The unit shall include diagnostic switches allowing easy on-line diagnostic testing verifying the operational integrity of the units suppression filter system. Standard surface-mounted units shall be provided in a NEMA 12 type enclosure of 14 gauge steel, painted inside and out. In order to monitor on-line status, the unit shall include Form C dry contacts (N.O. or N.C.), transient surge counter and audible alarm. The unit shall include a high accurate, solid state, six (6) digit, liquid crystal display. Unit shall incorporate an audible alarm with silence switch to indicate failure of any TVSS circuit. The Disturbance Counters shall utilize self-contained lithium batteries with a nominal life of ten (10) years. System shall

- (1) Single Pulse Surge Current Capacity Testing:
 - a. Line to Ground 200 Ka
 - b. Line to Neutral 200 Ka
 - c. Neutral to Ground 200 Ka
 - d. Certified documentation of the units Single Pulse Surge Current Capacity Testing shall be available upon request.
- (2) Surge Current Fuse Testing:
 - a. This unit shall be surge tested with fusing in series to verify that a surge of maximum surge current is fully suppressed. This testing shall also verify that, in the event of fuse failure, the full magnitude of the event shall be suppressed prior to this failure.
- B. Each suppression element shall be individually fused such that the failure of a single component or the operation of a single fuse element remains isolated and does not render the entire the enti
- C. The device shall be capable of withstanding the full single pulse surge current capacity for every mode without the operation or failure of overcurrent/fault current protection of fuses.

2.2 SECONDARY PANELBOARD

- A. The unit shall include an engineered solid-state high performance suppression system utilizing arrays of non-linear voltage dependent metal oxide varistors with similar operating characteristics. The suppression system shall incorporate internal fusing. The unit shall include long-life, solid state externally visible LED status indicators that monitor the on-line status of each phase of the unit. Standard surface-mounted units shall be provided in NEMA 1 Type enclosure. In order to monitor on-line status, the unit shall include Form C dry contacts (N.O. or N.C.) and audible alarm. System shall carry a ten (10) year warranty.
 - (1) Single Pulse Surge Current Capacity Testing:
 - a. Line to Ground 100 Ka
 - b. Line to Neutral 100 Kac. Neutral to Ground 100 Ka
- PMA, Inc., Project 0205.3a

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- d. Certified documentation of the units Single Pulse Surge Current Capacity Testing shall be available upon request.
- (2) Surge Current Fuse Testing:
 - a. This unit shall be surge tested with fusing in series to verify that a surge of maximum surge current is fully suppressed. This testing shall also verify that, in the event of fuse failure, the full magnitude of the event shall be suppressed prior to this failure.
- B. Each suppression element shall be individually fused such that the failure of a single component or the operation of a single fuse element remains isolated and does not render the entire the enti
- C. The device shall be capable of withstanding the full single pulse surge current capacity for every mode without the operation or failure of overcurrent/fault current protection of fuses.

PART 3 - EXECUTION

3.1 INSTALLATION OF SUPPRESSORS

- A. Suppressors shall be installed as close as practical to the Electrical panel or electronic equipment to be protected, consistent with available space. Suppressors shall be close nippled to the device being protected in a position near the neutral bus which will minimize lead length between suppressor and the buses or control breaker to which the suppressor connects. Suppressor leads shall not extend beyond the suppressor Manufacturer's recommended maximum lead length without specific approval of the Engineer.
- B. Suppressors shall be installed in a neat, workmanlike manner that allow simple replacement. Lead dress shall be as short and as straight as possible and be consistent with recommended industry practices for the system on which these devices are installed.
- C. Provide a supplemental ground at the bonding connections between the bonding bus or ground plane for each equipment cluster and other locations as indicated herein shall be accomplished using #6 AWG core copper conductor and approved connections referenced to a common earth ground.
- D. Suppressor shall be installed with a mean of disconnecting the suppressor at the panel. At the main service entrance location, provide a dedicated 30 amp, 3 pole circuit breaker, minimum 100,000 A.I.C. for the TVSS device. At distribution secondary and/or subpanels location, provide dedicated 20 amp or 30 amp, 3 pole circuit breaker for the TVSS device. Label disconnect or circuit breaker "surge protector". Fused disconnects may be substituted for the circuit breaker with the approval of the Engineer.

SECTION 01730 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. General installation of products.
 - 4. Coordination of Owner-installed products.
 - 5. Progress cleaning.
 - 6. Starting and adjusting.
 - 7. Protection of installed construction.
 - 8. Correction of the Work.
- B. Related Sections include the following:
 - 1. Division 01 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
 - 2. Division 01 Section "Submittal Procedures" for submitting surveys.
 - 3. Division 01 Section "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.
 - 4. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 SUBMITTALS

- A. Qualification Data: For land surveyor or professional engineer.
- B. Certificates: Submit certificate signed by land surveyor or professional engineer certifying that location and elevation of improvements comply with requirements.
- C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- D. Certified Surveys: Submit 3 copies signed by land surveyor or professional engineer.
- E. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.
- 1.4 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
 - 1. Before construction, verify the location and points of connection of utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - a. Description of the Work.
 - b. List of detrimental conditions, including substrates.
 - c. List of unacceptable installation tolerances.
 - d. Recommended corrections.
 - 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a land surveyor or professional engineer to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 3. Inform installers of lines and levels to which they must comply.
 - 4. Check the location, level and plumb, of every major element as the Work progresses.
 - 5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
 - 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

- 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
- 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- C. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- D. Final Property Survey: Prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor or professional engineer, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
 - 1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
 - 2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

- G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction forces.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction forces.
 - 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 - 2. Preinstallation Conferences: Include Owner's construction forces at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction forces if portions of the Work depend on Owner's construction.

3.7 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.9 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section "Cutting and Patching."
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

SECTION 01732 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
- B. Related Sections include the following:
 - 1. Division 01, includeing Section "Selective Structure Demolition" for demolition of selected portions of the building.
 - 2. Divisions 2 through 4 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 SUBMITTALS

- A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
 - 1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
 - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
 - 3. Products: List products to be used and firms or entities that will perform the Work.
 - 4. Dates: Indicate when cutting and patching will be performed.
 - 5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.
 - 6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
 - 7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.5 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their loadcarrying capacity or load-deflection ratio.
- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operating elements include the following:
 - 1. Primary operational systems and equipment.
 - 2. Mechanical systems piping and ducts.
 - 3. Communication systems.
 - 4. Electrical wiring systems.
- C. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- D. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
 - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
 - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

- B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Utility Services and Mechanical/Electrical Systems: Contractor to coordinate disconnecting the existing utility services serving the existing structure with the Owner and CSX Transportation representative

3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
 - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - 6. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
 - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 - 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of

uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

- a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
- 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
- 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.
- D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

SECTION 01770 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Warranties.
 - 3. Final cleaning.
- B. Related Sections include the following:
 - 1. Division 01 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
 - 2. Division 01 Section "Execution" for progress cleaning of Project site.
 - 3. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 4. Divisions 02 through 04 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
 - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - 2. Advise Owner of pending insurance changeover requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
 - 6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 - 7. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 - 8. Complete final cleaning requirements, including touchup painting.
 - 9. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
 - 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 - 2. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
 - 1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
 - 2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 - 3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 - 4. Submit pest-control final inspection report and warranty.
 - 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
 - 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 - 1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
 - 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 - 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.

1.6 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 - 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
 - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark 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 Installer.
 - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Leave Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

SECTION 01782 - OPERATION AND MAINTENANCE DATA

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 preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Maintenance manuals for the care and maintenance of products, materials, and finishes and systems and equipment.
- B. Related Sections include the following:
 - 1. Division 1 Section "Summary of Multiple Contracts" for coordinating operation and maintenance manuals covering the Work of multiple contracts.
 - 2. Division 1 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
 - 3. Division 1 Section "Closeout Procedures" for submitting operation and maintenance manuals.
 - 4. Division 1 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
 - 5. Divisions 2 through 16 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 SUBMITTALS

- A. Initial Submittal: Submit 3 draft copies of each manual at least 15 days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Architect will return two copies of draft and mark whether general scope and content of manual are acceptable.
- B. Final Submittal: Submit one copy of each manual in final form at least 15 days before final inspection. Architect will return copy with comments within 15 days after final inspection.
 - 1. Correct or modify each manual to comply with Architect's comments. Submit 3 copies of each corrected manual within 15 days of receipt of Architect's comments.

1.5 COORDINATION

A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Organization: Include a section in the directory for each of the following:
 - 1. List of documents.
 - 2. List of systems.
 - 3. List of equipment.
 - 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.
 - 4. Date of submittal.
 - 5. Name, address, and telephone number of Contractor.
 - 6. Name and address of Architect.
 - 7. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

- 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
 - 1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
 - 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 - 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
 - 4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.
 - 5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
 - 1. Type of emergency.
 - 2. Emergency instructions.
 - 3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
 - 1. Fire.
 - 2. Flood.
 - 3. Water leak.
 - 4. Power failure.
 - 5. Water outage.
 - 6. System, subsystem, or equipment failure.

- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
 - 1. Instructions on stopping.
 - 2. Shutdown instructions for each type of emergency.
 - 3. Operating instructions for conditions outside normal operating limits.
 - 4. Required sequences for electric or electronic systems.
 - 5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 - 1. System, subsystem, and equipment descriptions.
 - 2. Performance and design criteria if Contractor is delegated design responsibility.
 - 3. Operating standards.
 - 4. Operating procedures.
 - 5. Operating logs.
 - 6. Wiring diagrams.
 - 7. Control diagrams.
 - 8. Piped system diagrams.
 - 9. Precautions against improper use.
 - 10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Equipment identification with serial number of each component.
 - 4. Equipment function.
 - 5. Operating characteristics.
 - 6. Limiting conditions.
 - 7. Performance curves.
 - 8. Engineering data and tests.
 - 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
 - 1. Startup procedures.
 - 2. Equipment or system break-in procedures.
 - 3. Routine and normal operating instructions.
 - 4. Regulation and control procedures.
 - 5. Instructions on stopping.
 - 6. Normal shutdown instructions.
 - 7. Seasonal and weekend operating instructions.
 - 8. Required sequences for electric or electronic systems.
 - 9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUAL

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Product Information: Include the following, as applicable:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Color, pattern, and texture.
 - 4. Material and chemical composition.
 - 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
 - 1. Inspection procedures.
 - 2. Types of cleaning agents to be used and methods of cleaning.
 - 3. List of cleaning agents and methods of cleaning detrimental to product.
 - 4. Schedule for routine cleaning and maintenance.
 - 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - 1. Standard printed maintenance instructions and bulletins.

- 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
- 3. Identification and nomenclature of parts and components.
- 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide.
 - 3. Precautions against improper maintenance.
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
 - 6. Demonstration and training videotape, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
 - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

- 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
- 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original Project Record Documents as part of operation and maintenance manuals.
 - 2. Comply with requirements of newly prepared Record Drawings in Division 1 Section "Project Record Documents."
- G. Comply with Division 1 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

SECTION 01783 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
- B. Related Sections include the following:
 - 1. Division 01 Section "Closeout Procedures" for general closeout procedures.
 - 2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 3. Divisions 02 through 04 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one set(s) of marked-up Record Prints.
- B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit one copy of each Product Data submittal.
 - 1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.

- 1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an understandable drawing technique.
 - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
- 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.
 - 1. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
- 3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
- 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
- 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
- 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 - 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 - 4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
 - 5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 - 3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

2.4 MISCELLANEOUS RECORD SUBMITTALS

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

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

SECTION 01790 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
 - 3. Demonstration and training videotapes.
- B. Related Sections include the following:
 - 1. Division 01 Section "Allowances" for administrative and procedural requirements for demonstration and training allowances.
 - 2. Division 01 Section "Project Management and Coordination" for requirements for preinstruction conferences.
 - 3. Divisions 02 through 49 Sections for specific requirements for demonstration and training for products in those Sections.
- C. Allowances: Furnish demonstration and training instruction time under the Demonstration and Training Allowance as specified in Division 01 Section "Allowances."
- D. Unit Price for Instruction Time: Length of instruction time will be measured by actual time spent performing demonstration and training in required location. No payment will be made for time spent assembling educational materials, setting up, or cleaning up.

1.3 SUBMITTALS

- A. Instruction Program: Submit three copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. At completion of training, submit two complete training manual(s) for Owner's use.
- B. Attendance Record: For each training module, submit list of participants and length of instruction time.
- C. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.
- D. Demonstration and Training Videotapes: Submit two copies within seven days of end of each training module.

- 1. Identification: On each copy, provide an applied label with the following information:
 - a. Name of Project.
 - b. Name and address of photographer.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Date videotape was recorded.
 - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
- 2. Transcript: Prepared on 8-1/2-by-11-inch (215-by-280-mm) paper, punched and bound in heavyduty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding videotape. Include name of Project and date of videotape on each page.

1.4 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.
- C. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
 - 1. Inspect and discuss locations and other facilities required for instruction.
 - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
 - 3. Review required content of instruction.
 - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

PMA, Inc., Project 0205.3a

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:
 - 1. Fire-protection systems, including fire alarm fire pumps and fire-extinguishing systems.
 - 2. Intrusion detection systems.
 - 3. Refrigeration systems, including condensers pumps and distribution piping.
 - 4. HVAC systems, including air-handling equipment air distribution systems and terminal equipment and devices.
 - 5. HVAC instrumentation and controls.
 - 6. Electrical service and distribution, including transformers switchboards panelboards uninterruptible power supplies and motor controls.
 - 7. Lighting equipment and controls.
 - 8. Communication systems, including equipment.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 - 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project Record Documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
 - 3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
 - 4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
- f. Safety procedures.
- g. Instructions on stopping.
- h. Normal shutdown instructions.
- i. Operating procedures for emergencies.
- j. Operating procedures for system, subsystem, or equipment failure.
- k. Seasonal and weekend operating instructions.
- 1. Required sequences for electric or electronic systems.
- m. Special operating instructions and procedures.
- 5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
- 6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
- 7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
- 8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.
- B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
 - 2. Owner will furnish an instructor to describe Owner's operational philosophy.
 - 3. Owner will furnish Contractor with names and positions of participants.
- C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner, through Architect, with at least seven days' advance notice.
- D. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING VIDEOTAPES

- A. General: Engage a qualified commercial photographer to record demonstration and training videotapes. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
 - 1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- B. Videotape Format: Provide high-quality VHS color videotape in full-size cassettes.
- C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.
- D. Narration: Describe scenes on videotape by audio narration by microphone while videotape is recorded. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.
- E. Transcript: Provide a typewritten transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

SECTION 01913 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes requirements for commissioning the HVAC system and its subsystems and equipment.
- **B.** The Owner will retain an independent agent for the commissioning, testing and balancing of the HVAC system, as described herein. Contractor to coordinate and assist Owner's agent in performing **HVAC Commissioning. The owner's agent will perform this work under separate contract.**

1.3 DEFINITIONS

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

1.4 CONTRACTOR'S RESPONSIBILITIES

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

- C. Mechanical Contractor:
 - 1. Attend TAB verification testing.
 - 2. Make corrections as described by the Owner's commissioning agent during inspections, testing, adjusting and balancing of the installed system.
- D. HVAC Instrumentation and Control Contractor: With the CxA, review control designs for compliance with the OPR and BoD, controllability with respect to actual equipment to be installed, and recommend adjustments to control designs and sequence of operation descriptions.
- E. TAB Contractor: (This work will be undertaken by an independent agent hired by the Owner).
 - 1. Contract Documents Review: With the CxA, review the Contract Documents before developing TAB procedures.
 - a. Verify the following:
 - 1) Accessibility of equipment and components required for TAB Work.
 - 2) Adequate number and placement of duct balancing dampers to allow proper balancing while minimizing sound levels in occupied spaces.
 - 3) Adequate number and placement of balancing valves to allow proper balancing and recording of water flow.
 - 4) Adequate number and placement of test ports and test instrumentation to allow reading and compilation of system and equipment performance data needed to conduct both TAB and commissioning testing.
 - 5) Air and water flow rates have been specified and compared to central equipment output capacities.
 - b. Identify discontinuities and omissions in the Contract Documents.
 - c. This review of the Contract Documents by the TAB Subcontractor satisfies requirements for a design review report as specified in Division 15 Section "Testing, Adjusting, and Balancing."
 - 2. Additional Responsibilities: Participate in tests specified in Division 15 Sections "HVAC Instrumentation and Controls" and "Sequence of Operation."
- F. Electrical Contractor:
 - 1. With the Mechanical Contractor, coordinate installations and connections between and among electrical and HVAC systems, subsystems, and equipment.
 - 2. Attend TAB verification testing.

1.5 COMMISSIONING DOCUMENTATION

- A. The following are in addition to documentation specified in Division 1 Section "General Commissioning Requirements."
- B. BoD HVAC: Owner will provide BoD-HVAC documents, prepared by Architect and approved by Owner, to the CxA and each Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.
- C. Test Checklists: CxA with assistance of Architect shall develop test checklists for HVAC systems, subsystems, and equipment, including interfaces and interlocks with other systems. CxA shall prepare separate checklists for each mode of operation and provide space to indicate whether the mode under test

responded as required. In addition to the requirements specified in Division 1 Section "General Commissioning Requirements," checklists shall include, but not be limited to, the following:

- 1. Calibration of sensors and sensor function.
- 2. Testing conditions under which test was conducted, including (as applicable) ambient conditions, set points, override conditions, and status and operating conditions that impact the results of test.
- 3. Control sequences for HVAC systems.
- 4. Strength of control signal for each set point at specified conditions.
- 5. Responses to control signals at specified conditions.
- 6. Sequence of response(s) to control signals at specified conditions.
- 7. Electrical demand or power input at specified conditions.
- 8. Power quality and related measurements.
- 9. Expected performance of systems, subsystems, and equipment at each step of test.
- 10. Narrative description of observed performance of systems, subsystems, and equipment. Notation to indicate whether the observed performance at each step meets the expected results.
- 11. Interaction of auxiliary equipment.
- 12. Issues log.

1.6 SUBMITTALS

- A. The following submittals are in addition to those specified in Division 1 Section "General Commissioning Requirements."
- B. Testing Procedures: CxA shall submit detailed testing plan, procedures, and checklists for each series of tests. Submittals shall include samples of data reporting sheets that will be part of the reports.
- C. Certificate of Readiness: CxA shall compile certificates of readiness from each Contractor certifying that systems, subsystems, equipment, and associated controls are ready for testing.
- D. Certificate of Completion of Installation, Prestart, and Startup: CxA shall certify that installation, prestart, and startup activities have been completed. Certification shall include completed checklists provided by TAB Contractor as specified in Division 15 Section "Testing, Adjusting, and Balancing."
- E. Certified Pipe Cleaning and Flushing Report: CxA shall certify that pipe cleaning, flushing, hydrostatic testing, and chemical treating have been completed.
- F. Test and Inspection Reports: CxA shall compile and submit test and inspection reports and certificates, and shall include them in systems manual and commissioning report.
- G. Corrective Action Documents: CxA shall submit corrective action documents.
- H. Certified TAB Reports: CxA shall submit verified, certified TAB reports.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TESTING PREPARATION

A. Prerequisites for Testing:

- 1. Certify that HVAC systems, subsystems, and equipment have been completed, calibrated, and started; are operating according to the OPR, BoD, and Contract Documents; and that Certificates of Readiness are signed and submitted.
- 2. Certify that HVAC instrumentation and control systems have been completed and calibrated; are operating according to the OPR, BoD, and Contract Documents; and that pretest set points have been recorded.
- 3. Certify that TAB procedures have been completed, and that TAB reports have been submitted, discrepancies corrected, and corrective work approved.
- 4. Test systems and intersystem performance after approval of test checklists for systems, subsystems, and equipment.
- 5. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shut down, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).
- 6. Verify each operating cycle after it has been running for a specified period and is operating in a steady-state condition.
- 7. Inspect and verify the position of each device and interlock identified on checklists. Sign off each item as acceptable, or failed. Repeat this test for each operating cycle that applies to system being tested.
- 8. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.
- 9. Annotate checklist or data sheet when a deficiency is observed.
- 10. Verify equipment interface with monitoring and control system and TAB criteria; include the following:
 - a. Supply and return flow rates for VAV and constant volume systems in each operational mode.
 - b. Operation of terminal units in both heating and cooling cycles.
 - c. Minimum outdoor-air intake in each operational mode and at minimum and maximum airflows.
 - d. Building pressurization.
 - e. Total exhaust airflow and total outdoor-air intake.
 - f. Operation of indoor-air-quality monitoring systems.
- 11. Verify proper responses of monitoring and control system controllers and sensors to include the following:
 - a. For each controller or sensor, record the indicated monitoring and control system reading and the test instrument reading. If initial test indicates that the test reading is outside of the control range of the installed device, check calibration of the installed device and adjust as required. Retest malfunctioning devices and record results on checklist or data sheet.
 - b. Report deficiencies and prepare an issues log entry.
- 12. Verify that HVAC equipment field quality-control testing has been completed and approved. CxA shall direct, witness, and document field quality-control tests, inspections, and startup specified in individual Division 15 Sections.
- B. Testing Instrumentation: Install measuring instruments and logging devices to record test data for the required test period. Instrumentation shall monitor and record full range of operating conditions and shall allow for calculation of total capacity of system for each mode of operation. For individual room cooling tests, provide temporary heaters to impose a cooling load indicated in BoD. Operational modes include the following:
 - 1. Occupied and unoccupied.
 - 2. Warm up and cool down.
 - 3. Economizer cycle.
 - 4. Emergency power supply.

- 5. Life-safety and safety systems.
- 6. Smoke control.
- 7. Fire safety.
- 8. Stair pressurization system.
- 9. Temporary upset of system operation.
- 10. Partial occupancy conditions.
- 11. Special cycles.

3.2 TAB VERIFICATION

- A. TAB Contractor shall coordinate with CxA for work required in Division 15 Section "Testing, Adjusting, and Balancing." TAB Contractor shall copy CxA with required reports, sample forms, checklists, and certificates.
- B. Each Contractor, HVAC Contractor, and CxA shall witness TAB Work.
- C. TAB Preparation:
 - 1. TAB Contractor shall provide CxA with data required for "Pre-Field TAB Engineering Reports" specified in Division 15 Section "Testing, Adjusting, and Balancing."
 - a. CxA shall use this data to certify that prestart and startup activities have been completed for systems, subsystems, and equipment installation.
- D. Ductwork Air Leakage Testing:
 - 1. Architect will identify, for HVAC Contractor and CxA, portions of duct systems to have ductwork air leakage testing. Ductwork air leakage testing shall be performed according to Division 15 Section "Metal Ducts," and shall be witnessed by the CxA.
 - 2. On approval of preliminary ductwork air leakage testing report, the CxA shall coordinate verification testing of ductwork air leakage testing. Verification testing shall include random retests of portions of duct section tests, reported in preliminary ductwork air leakage testing report. The HVAC Contractor shall perform tests using the same instrumentation (by model and serial number) as for original testing; the CxA shall witness verification testing.
- E. Verification of Final TAB Report:
 - 1. CxA shall select, at random, 10 percent of report for field verification.
 - 2. CxA shall notify TAB Contractor 10 days in advance of the date of field verification; however, notice shall not include data points to be verified. The TAB Contractor shall use the same instruments (by model and serial number) that were used when original data were collected.
 - 3. Failure of an item is defined as follows:
 - a. For all readings other than sound, a deviation of more than 10 percent.
 - 1) For sound pressure readings, a deviation of 3 dB. (Note: Variations in background noise must be considered.)
 - 4. Failure of more than 10 percent of selected items shall result in rejection of final TAB report.
- F. If deficiencies are identified during verification testing, CxA shall notify the HVAC Contractor and Architect, and shall take action to remedy the deficiency. Architect shall review final tabulated checklists and data sheets to determine if verification is complete and that system is operating according to the Contract Documents.

G. CxA shall certify that TAB Work has been successfully completed.

3.3 TESTING

- A. Test systems and intersystem performance after test checklists for systems, subsystems, and equipment have been approved.
- B. Perform tests using design conditions whenever possible.
 - 1. Simulate conditions by imposing an artificial load when it is not practical to test under design conditions and when written approval for simulated conditions is received from CxA. Before simulating conditions, calibrate testing instruments. Set and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.
 - 2. Alter set points when simulating conditions is not practical and when written approval is received from CxA.
 - 3. Alter sensor values with a signal generator when design or simulating conditions and altering set points are not practical. Do not use sensor to act as signal generator to simulate conditions or override values.
- C. Scope of HVAC Contractor Testing:
 - 1. Testing scope shall include entire HVAC installation, from central equipment for heat generation and refrigeration through distribution systems to each conditioned space. It shall include measuring capacities and effectiveness of operational and control functions.
 - 2. Test all operating modes, interlocks, control responses, responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.
- D. Detailed Testing Procedures: CxA, with HVAC Contractor, TAB Contractor, and HVAC Instrumentation and Control Contractor, shall prepare detailed testing plans, procedures, and checklists for HVAC systems, subsystems, and equipment.
- E. HVAC Instrumentation and Control System Testing:
 - 1. Field testing plans and testing requirements are specified in Division 15 Sections "HVAC Instrumentation and Controls" and "Sequence of Operation." The CxA, HVAC Contractor, and the HVAC Instrumentation and Control Contractor shall collaborate to prepare testing plans.
 - 2. CxA shall convene a meeting of appropriate entities to review test report of HVAC instrumentation and control systems.
- F. Pipe cleaning, flushing, hydrostatic tests, and chemical treatment requirements are specified in Division 15 piping Sections. HVAC Contractor shall prepare pipe system cleaning, flushing, and hydrostatic testing. CxA shall review and comment on plan and final reports. CxA shall certify that pipe cleaning, flushing, hydrostatic tests, and chemical treatment have been completed. Plan shall include the following:
 - 1. Sequence of testing and testing procedures for each section of pipe to be tested, identified by pipe zone or sector identification marker. Markers shall be keyed Drawings for each pipe sector showing the physical location of each designated pipe test section. Drawings keyed to pipe zones or sectors shall be formatted to allow each section of piping to be physically located and identified when referred to in pipe system cleaning, flushing, hydrostatic testing, and chemical treatment plan.
 - 2. Description of equipment for flushing operations.
 - 3. Minimum flushing water velocity.

- 4. Tracking checklist for managing and ensuring that all pipe sections have been cleaned, flushed, hydrostatically tested, and chemically treated.
- G. Energy Supply System Testing: HVAC Contractor shall prepare a testing plan to verify performance of gas and hot-water systems and equipment. Plan shall include the following:
 - 1. Sequence of testing and testing procedures for each equipment item and pipe section to be tested, identified by pipe zone or sector identification marker. Markers shall be keyed to Drawings for each pipe sector showing the physical location of each designated pipe test section. Drawings keyed to pipe zones or sectors shall be formatted to allow each section of piping to be physically located and identified when referred to in system testing plan.
 - 2. Tracking checklist for managing and ensuring that all pipe sections have been tested.
- H. Heat-Generation System Testing: HVAC Contractor shall prepare a testing plan to verify performance of boilers, feedwater equipment, furnaces, and auxiliary equipment. Plan shall include the following:
 - 1. Sequence of testing and testing procedures for each item of equipment and section of pipe to be tested, identified by identification marker. Markers shall be keyed to Drawings for each pipe sector showing the physical location of each item of equipment and pipe test section. Drawings shall be formatted to allow each item of equipment and section of piping to be physically located and identified when referred to in the system testing plan.
 - 2. Tracking checklist for managing and ensuring that all pipe sections have been tested.
- I. Refrigeration System Testing: HVAC Contractor shall prepare a testing plan to verify performance of chillers, cooling towers, refrigerant compressors and condensers, heat pumps, and other refrigeration systems. Plan shall include the following:
 - 1. Sequence of testing and testing procedures for each item of equipment and section of pipe to be tested, identified by identification marker. Markers shall be keyed to Drawings showing the physical location of each item of equipment and pipe test section. Drawings shall be formatted to allow each item of equipment and section of piping to be physically located and identified when referred to in the system testing plan.
 - 2. Tracking checklist for managing and ensuring that all pipe sections have been tested.
- J. HVAC Distribution System Testing: HVAC Contractor shall prepare a testing plan to verify performance of air, steam, and hydronic distribution systems; special exhaust; and other distribution systems. Include HVAC terminal equipment and unitary equipment. Plan shall include the following:
 - 1. Sequence of testing and testing procedures for each item of equipment and section of pipe to be tested, identified by identification marker. Markers shall be keyed to Drawings showing the physical location of each item of equipment and pipe test section. Drawings shall be formatted to allow each item of equipment and section of piping to be physically located and identified when referred to in the system testing plan.
 - 2. Tracking checklist for managing and ensuring that all pipe sections have been tested.
- K. Vibration and Sound Tests: HVAC Contractor shall prepare testing plans to verify performance of vibration isolation and seismic controls. CxA shall witness and certify tests and inspections.
- L. Deferred Testing:
 - 1. If tests cannot be completed because of a deficiency outside the scope of the HVAC system, the deficiency shall be documented and reported to Owner. Deficiencies shall be resolved and corrected by appropriate parties and test rescheduled.
 - 2. If the testing plan indicates specific seasonal testing, appropriate initial performance tests shall be completed and documented and additional tests scheduled.

M. Testing Reports:

- 1. Reports shall include measured data, data sheets, and a comprehensive summary describing the operation of systems at the time of testing.
- 2. Include data sheets for each controller to verify proper operation of the control system, the system it serves, the service it provides, and its location. For each controller, provide space for recording its readout, the reading at the controller's sensor(s), plus comments. Provide space for testing personnel to sign off on each data sheet.
- 3. Prepare a preliminary test report. Deficiencies will be evaluated by Architect to determine corrective action. Deficiencies shall be corrected and test repeated.
- 4. If it is determined that the system is constructed according to the Contract Documents, Owner will decide whether modifications required to bring the performance of the system to the OPR and BoD documents shall be implemented or if tests will be accepted as submitted. If corrective Work is performed, Owner will decide if tests shall be repeated and a revised report submitted.

DIVISION 15 - MECHANICAL

SECTION 15010 - GENERAL PROVISIONS

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

A. Work under this Division shall be subject to the General and Special Conditions.

1.2 SCOPE

A. The work required for this Division includes labor, materials, equipment, services and supervision required to provide complete working Plumbing and Mechanical systems as shown on the drawings and specified in this specification.

1.3 APPLICABLE SPECIFICATIONS, CODES AND STANDARDS

- A. Work shall comply with all applicable codes and ordinances. The latest effective publications of specifications, regulations, standards, codes, etc., as applicable, shall form a part of these specifications the same as if written fully herein and shall be followed as minimum requirements.
 - (1) The codes and ordinances of local governing agencies
 - (2) Air Moving and Conditioning Association (AMCA)
 - (3) American National Standard Institute (ANSI)
 - (4) Air Conditioning and Refrigeration Institute (ARI)
 - (5) American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)
 - (6) American Society of Mechanical Engineers (ASME)
 - (7) American Society for Testing and Materials (ASTM)
 - (8) National Association of Fan Manufacturers (NAFM)
 - (9) National Electric Code (NEC)
 - (10) National Electrical Manufacturers Association (NEMA)
 - (11) National Fire Protection Association (NFPA)
 - (12) Occupational Safety and Health Administration (OSHA)
 - (13) Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
 - (14) Uniform Federal Accessibility Standards (UFAS)
 - (15) Underwriters Laboratories, Inc. (UL)
 - (16) Virginia Fire Safety Regulation (VFSR)
 - (17) Virginia Uniform Statewide Building Code (VUSBC)
 - (18) Americans with Disabilities Act (ADA)
 - (19) International Plumbing Code
 - (20) International Mechanical Code

B. Contractor shall obtain and pay for permits and required inspections.

1.4 CONTRACT DOCUMENTS

A. The drawings and specifications are intended to cover all work enumerated under PMA, Inc., Project 0205.3a Section 15010 – Page 1

respective headings. The drawings are diagrammatical only. Due to the scale of the drawings, offsets, fittings, and accessories may not be indicated. Work indicated, but having details omitted shall be provided completely to perform function intended at no additional cost to the Owner.

- B. This Contractor shall examine the architectural, structural, plumbing, mechanical and electrical drawings and specifications to avoid conflict with other trades. Minor variations in location of equipment shall be made upon written approval of the Architect at no additional cost to the Owner. No Contractor shall take advantage of conflict or error between the drawings and specifications or between general drawings and Plumbing, Mechanical and/or Electrical drawings but shall request a clarification of such from the Architect /Engineer should this condition exist. If there is insufficient time to issue an addendum for this clarification, the Contractor shall be required to assume the most expensive item in conflict.
- C. Cooperate and coordinate the work of this Division with other trades.

1.5 ELECTRICAL WORK

- A. All electrical power wiring required for equipment installed under Division 15 shall be provided under Division 16 with all necessary and approved wiring diagrams and guidance provided under Division 15.
- B. Auxiliary 120 volt contacts shall be provided to give control and interlocking as required or as indicated. Where control voltages are different from motor voltages, a control voltage transformer shall be provided as a part of the starter.
- C. Control wiring shall be in conduit, except low voltage wiring in concealed, accessible non-air plenum ceiling spaces may be run without conduits and adequately supported from the building's structure with cable ties. Electrical and/or other plumbing or mechanical items shall not be used for cable support.
- D. Low voltage control cable specifically listed for application in accessible ceiling air plenums may be utilized in lieu of wiring in conduit.
- E. When substituted motors and/or equipment require electrical modifications to support said motors and/or equipment, the cost of the electrical modifications, associated work and coordination shall be included under the Division providing the substituted equipment.

1.6 DIELECTRIC CONNECTIONS

A. Dielectric connections shall be provided at all connections between ferrous and nonferrous piping or metals, except drain piping connections at drain pans for cooling coils and valves may have cast-bronze adapters.

1.7 ACCESS PANELS

 A. This Contractor shall furnish and the General Contractor shall install access panels where required for access to valves, dampers, etc. Access panels shall match the integrity PMA, Inc., Project 0205.3a
Section 15010 – Page 2 of the wall and/or ceiling in which they are being installed. Access panels shall be a minimum of 12" x 12".

1.8 PROTECTION OF EQUIPMENT AND MATERIALS

- A. Responsibility for care and protection of mechanical equipment rests with the Contractor providing the equipment until it has been tested and accepted.
- B. After delivery, before and after installation, the Contractor shall protect the equipment and materials against theft, injury, the environment and damages from all causes.
- C. The Contractor shall be responsible for protecting equipment and ductwork outlets by temporarily plugging or capping pipe openings.
- D. Temporary filters shall be provided bi-weekly for all equipment that is operated during construction. New filters shall be installed after all construction dirt has been removed from the building just prior to final acceptance of the building.
- E. Equipment not designated for exterior installation shall not be delivered to the job site until a location protected from the environment is provided. Location must be approved by the Engineer prior to the delivery.
- F. Equipment suitable for exterior installation shall not be delivered to the job site until it is ready to be installed in its permanent location.

1.9 TESTING, CLEANING AND PAINTING

- A. After the installation is complete and before final acceptance of the work, each system shall be cleaned and tested for proper operation per latest edition of the International Plumbing Code and all local requirements.
- B. Water piping systems shall be thoroughly flushed and cleaned before being placed in operation.
- C. Prior to the connection of the plumbing fixtures and before connections to the sanitary system are made, the new sanitary piping system shall be capped or plugged and filled with water to the top. Where piping must be tested in sections to facilitate construction, it shall withstand 10 psi pressure per floor for 8 hours in lieu of above. Trenches shall remain open until pipe has been properly tested and approved. Contractor shall verify required testing procedure with the Local Authority Having Jurisdiction (LAHJ) prior to commencing any work.
- D. Equipment, piping, ductwork and filters shall be cleaned thoroughly in accordance with the best practice or as specified herein.
- E. Domestic water piping must be tested and proved tight under hydrostatic pressure of 100 psi (system working pressure) applied for two (2) hours without a 5 psi drop in pressure. All pumps, gauges, etc., for tests shall be furnished by the Contractor.

F. Piping service and flow direction shall be indicated with vinyl labels identifying the PMA, Inc., Project 0205.3a Section 15010 – Page 3

service by name and the flow direction by arrows. Labels shall be used wherever piping is exposed and at all unit connections. For concealed piping located above accessible ceilings, label piping at 25 foot intervals with painted stencil-type lettering.

- G. All valves in equipment room(s) shall be identified with 1-1/2" diameter, permanently stamped, brass tags. Secure tags to valve item or wheel with brass jack chain or copper meter seals. Provide framed and mounted, under clear plastic, valve chart (8-1/2" x 11" min.) identifying valve number by system served and function.
- H. Provide seals, signs and tags on fire protection equipment at designated locations per NFPA.
- I. Exposed piping and equipment in mechanical equipment room shall be completely color code painted under this Section. Color code shall be as follows:

Red

(1)	Domestic Cold,	Hot and Hot Return Water	Green
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(2) Fire Protection

1.10 EQUIPMENT MARKING

- A. Label all mechanical equipment, including starters, control panels, and air conditioning units.
- B. Provide labels affixed to the ceiling grid for locations of all above ceiling HVAC components.
- C. Labels shall be machine engraved, laminated, Bakelite nameplate type. Labels shall be black face with white letters.
- D. Labels shall have 1/4" high letters.
- E. Labels shall be rigidly attached using rivets or screws. Adhesive backing is not acceptable.

1.11 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Furnish complete diagrams and instructions for operation and maintenance of the systems and component parts, including the automatic control system. These shall be included within a three ring binder with the record drawings and delivered to the General Contractor for the Architect.
- B. Diagrams and instructions for the maintenance and operations of the following systems shall be included:
 - 1. Plumbing:
 - a. Plumbing Fixtures
 - b. Water Heaters
 - c. Faucets
 - d. Flush Valves
 - e. Backflow Preventers

- 2. Mechanical:
 - a. Air Handling Units
 - b. Heat Pump Units
 - c. Unit Heaters
 - d. Exhaust Fans

C. Provide a minimum of two 4-hour maintenance training sessions for the Owner's Representative. These training sessions shall focus on preventative maintenance, regularly scheduled maintenance and trouble- shooting malfunctions on all equipment and systems furnished as a part of this Contract.

D. Provide a minimum of 8 hours additional training on the operation and maintenance of the temperature control system. This training shall provide a functional demonstration of the control systems, a review of the control and monitoring functions, as well as preventative and regular systems maintenance training.

Utilize the following form to certify completion of Owner training. Submit a completed form for each sub-system as required.

Owner Training Certification

Project:

Equipment:

Contractor Certification

The undersigned as the Contractor's authorized training agent for the above noted equipment certifies that all required and applicable training has been provided to the Owner's representative(s) per the project Contract.

Contractor Representative:	Date:
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Owner Certification

The undersigned as the Owners's authorized agent certifies that all required and applicable training has been provided to the Owner's satisfaction.

Owner Representative:	Date:
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1.12 WARRANTY AND SERVICE

A. This Contractor shall service the installation for one year from date of final acceptance. This shall include emergency service, on all equipment. Maintain a log book on site for service entries (i.e. date, service performed, etc.).

1.13 RECORD DRAWINGS

A. Upon completion of the work, the Contractor shall submit corrected reproducible drawings and specifications indicating deviations made in the actual installation to the contract plans.

1.14 VISIT TO THE SITE

A. The Contractor shall visit the site of the work and familiarize himself with all conditions affecting his work. Submission of his proposal shall be construed as indicating such knowledge of existing conditions. No additional payment will be made on claims that arise from a lack of such knowledge of existing conditions.

1.15 COORDINATION

- A. Before installing any of this work, the Contractor shall verify that it does not interfere with existing site conditions. If any work is so installed and it later develops that the design cannot be followed, the Contractor shall, at his own expense, make such changes in his work as the Architect may direct to permit the completion of the work in accordance with the drawings and specifications.
- B. It shall be the duty of the Contractor to report any interferences between his work and that of any other Contractor to the Architect as soon as they are discovered. The Architect will determine which equipment shall be relocated regardless of which was first installed, and his decision shall be final.

1.16 CUTTING AND PATCHING

A. Where cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings, ductwork or equipment surfaces is necessary for the proper installation, support or anchorage of the piping, it shall be carefully done in accordance with the current edition of the Building Code. Any damage to the building, piping, ductwork or equipment shall be repaired by skilled mechanics of the trades involved at no additional cost to the Owner. This work shall be carefully laid out in advance. Cutting of masonry block shall be done with a masonry saw.

1.17 TRENCH EXCAVATION AND BACKFILL

A. Excavate trenches to line and grades indicated or required. Excavate sufficient distance in advance of pipe laying but open trench shall not exceed 200 feet in advance of completed pipe work. Excavate trenches with 8" clearance on each side of barrel. Do not carry excavation below bottom of pipe. Before pipe is laid, fill space between bottom of pipe and existing surface with gravel. Excavation below required level shall be backfilled at the Contractor's expense and throughly tamped as directed. Tamp bottom of trenches hard and grade to secure required fall. Remove unstable soil to depth determined by Architect and replace with gravel or crushed stone. Do the last 2" of excavation by hand and make suitable channel for barrel of pipe. Excavate bell holes accurately by hand so pipe shall rest on solid ground the entire length. Lay sewer and water pipes in separate trenches. Banks of trenches shall be vertical and the Contractor shall be responsible for providing sheathing, bracing, and shoring necessary for safety to conform with governing laws and ordinances. Erect, maintain and safeguard temporary bridges, walks, barricades, or crossings where necessary to maintain traffic. Protect the public from sunset to sunrise with sufficient lights or flares to prevent accidents.

- B. Perform necessary pumping and bailing as required to keep trench in satisfactory condition for pipe laying. All excavation and backfilling shall be in accordance with the applicable requirements of Division 02 Site Work.
- C. Backfill after pipe lines have been tested, inspected, approved and the forms removed. Backfill shall be material from excavation, borrow of sand, gravel or other approved material free from large clods and undesirable matter. Place evenly and carefully in horizontal layers around and over pipe in 6" maximum layers. Compact and tamp each layer by hand or with suitable equipment to density that shall prevent excessive settlement or shrinkage and until pipe has 18" of cover. Continue backfill in 12" layers and tamp in an approved manner. Where excavation is made through permanent pavements, curbs, driveways, and sidewalks or where structures are undercut by excavations, make backfill of material selected by the Architect in 3" layers. Each layers shall be thoroughly compacted. Water tamping shall be permitted after compacted backfill has been placed to depth of 18" above the top of the pipe. Contractor shall compact fill so that subsidence of backfill shall not be detrimental to the structure or paved area for a period of six months. Dispose of the surplus material.

1.18 CONCRETE PADS

- A. Provide at least 24"x24"x6" concrete pad flush with grade around the storm and sanitary sewer cleanouts and other pipe projections above grade.
- B. Concrete shall conform to the requirements of the concrete section of this specification.

1.19 FLASHING

A. Provide cap flashing for roof-mounted fans, goosenecks, air intakes, vents, etc.

1.20 SCHEDULE OF VALUES

A. This Contractor shall furnish and the General Contractor shall include as a minimum the following list of items. This shall form the basis for determining the completed work as part of the Application for Payment process.

(1) Plumbing:

Below Floor/Slab Waste and Drain (material) Below Floor/Slab Waste and Drain (labor) Above Floor/Slab Waste and Drain (material) Above Floor/Slab Waste and Drain (labor)

Below Floor/Slab Water Piping (material)	Water Heaters (labor)	
Below Floor/Slab Water Piping (labor)		Demolition (Material and Labor)
Above Floor/Slab Water Piping (material)		Sprinkler System Design and Calculations
Above Floor/Slab Water Piping (labor)	Sprinkler System (material)	
Plumbing Fixtures (material)		Sprinkler System (labor)
Plumbing Fixtures (labor)		Pipe Hangers (material)
Miscellaneous Equipment, Drains, Carriers	and	Pipe Hangers (labor)
Cleanouts (material)		Pipe Insulation (material)
Miscellaneous Equipment, Drains, Carriers	and	Pipe Insulation (labor)
Cleanouts (labor)		Backflow Preventer (material)
Compressed air piping (material)		Backflow Preventer (labor)
Compressed air piping (labor)		
Water Heaters (material)		

(2) Mechanical:

Demolition Refrigerant Piping and Accessories (material) Refrigerant Piping and Accessories (labor) Heat Pump Units (material) Heat Pump Units (labor) Unit Heater Heater (material) Unit Heater Heater (labor) Ductwork and Accessories (material) Ductwork and Accessories (labor) Ductwork Insulation (material) Ductwork Insulation (labor) Fans and Vents (material) Fans and Vents (labor) Grilles and Registers (material) Grilles and Registers (labor) Condensate Drain Piping (material) Condensate Drain Piping (labor) Testing, Adjusting and Balancing Monthly Filter Changes Annual Belt Replacement

1.21 PROJECT CLOSEOUT

- A. This Contractor shall furnish the following list of items in order to achieve final project acceptance. Final payment, including retainage, shall not be processed without the required documentation as follows:
 - (1) Verification of completed punch list items.
 - (2) Start-up reports.
 - (3) Approved operations and maintenance manuals.
 - (4) Verification of Owner training.
 - (5) Warranty letters.
 - (6) Approved Testing and Balancing reports.
 - (7) Complete approval by Local Authority.
 - (8) Development and posting of service log.
 - (9) Record drawings.
 - (10) Approved Pre-Commissioning and Final Commissioning Reports

PART 2 - PRODUCTS - Not Applicable

PART 3 - EXECUTION

3.1 After balancing and adjustment operations have been completed, Contractor shall conduct system

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check tests to prove to satisfaction of Architect that all systems are performing as specified.

- 3.2 The Architect shall be given 48 hours notice before tests are made. The Contractor shall furnish the Architect a certificate of approval from the Local Authority Having Jurisdiction.
 - At the time the tests are conducted, the following personnel shall be present:
 - A. Architect

3.3

- B. Mechanical Engineer
- C. Owner
- D. Mechanical Contractor including:
 - (1) Sheetmetal sub-Contractor
 - (2) Electrical sub-Contractor
 - (3) Temperature Control sub-Contractor
- E. Other trades as may be required to successfully conduct tests.
- 3.4 Equipment shall be tested in operation for a continuous period of not less than 48 hours.
- 3.5 Automatic control systems shall be adjusted and tested to assure satisfactory operation through every cycle of operation. Safety controls shall be tested to assure performance of their required function.
- 3.6 Defects in the work provided shall be corrected and the tests repeated at no additional cost to the Owner.
- 3.7 Labor, material and instruments required for check tests shall be provided by the Contractor at no additional cost to the Owner. Any cutting of ductwork or insulation required during test shall be repaired to the satisfaction of the Architect.

SECTION 15050 - MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SCOPE

A. Materials and equipment furnished under these specifications shall be new and free of scratches or any other imperfections and shall be the current product of the Manufacturer for the intended service.

1.2 SUBSTITUTIONS

- A. The name of a certain brand, make, Manufacturer or definite specification is to denote the quality standard of article desired, but does not restrict bidders to the specified brand, make, Manufacturer or specification named. Substitution of any other brand, make, or Manufacturer, which in the opinion of the Architect or Engineer, and approved by the Owner, is recognized the equal of that specified, shall be accepted, but only if submitted within the requirements of Division 1. If substitute equipment is allowed, the Contractor shall be responsible for its use and for its ability to fulfill all intended functions in the completed system with no additional or extra cost to the Owner.
- B. When substituted equipment is dissimilar from that specified, the Contractor shall submit layout drawings (drawn to scale) indicating the proposed method of installation. Modifications required to duct, piping, access, etc. shall be clearly indicated. All cost associated with such modification shall be the responsibility of the Contractor providing the substitute equipment.
- C. When three or more Manufacturers are specified, there will be no substitution.

1.3 Submittal

- A. Contractor shall submit complete schedules of material and equipment proposed for installation to the Architect within 30 days after award of the contract, in quantities as indicated in Division 1. The submittal drawings, wiring diagrams and such other descriptive data and/or samples as identified within this Section. Schedules of material which consist of facsimiles or copies of facsimiles shall be unacceptable. If after expiration of the 30 day period or any extension thereof as authorized by the Architect the Contractor fails to submit a schedule of acceptable material or equipment, the Engineer reserves the right to accept no substitutions, and the Contractor may be required to submit material and equipment as specified. In the event any items of material or equipments, such items will be rejected and approved items shall be submitted for the items rejected. If the resubmitted material or equipment fails to comply with the specification requirements, the Contractor shall then be required to submit material and equipment as days period fails to submit material and equipment as specified without additional cost to the Owner.
- B. Submittal which do not follow the following format <u>shall be rejected without review</u>. Submittal shall contain a title page, which shall indicate the Project name and Project address, the General Contractor's name, address, phone number and contact and the Contractor's name, address, phone number and contact. The submittal shall also contain

a Table of Contents and all items <u>must</u> be identified by the Identification Number listed below. Failure to properly identify items will result in <u>rejection without review</u>. Submittal shall be suitably bound in an appropriate binder All copies shall be clear and readable. Facsimile or facsimile copies shall NOT be accepted. Submittal that do not contain the General Contractor's <u>stamp of approval</u> shall also be rejected without review.

C. Submittal data shall include, but not be limited to the following:

Identification Number	Data
General Provisions	
15010-1	Vibration Isolation and/or Sound Attenuation
Materials & Methods	
15040-1	Sample Warranty Service & Filter Replacement Logs
Plumbing Valves	
15101-1	Gate valves
15101-3	Check valves
15101-5	Temperature & pressure relief valves
15101-6	Hose bibbs
15101-7	Wall hydrants
Duct Insulation	
15181-1	Flexible blanket duct insulation
15181-2	Rigid duct insulation
Piping and Equipment Insula	ation
15182-2	Refrigerant suction pipe insulation
15182-3	Interior domestic hot, cold and hot water recirculating pipe, roof
	drain and overflow piping insulation
15182-6	Hot water converter & storage tank insulation
Domestic Water Supply and	Treatment
15200-1	Domestic water treatment certification
Plumbing Equipment	
15420-1	Interior water piping
15420-2	Soil. waste, vent & drain piping
15420-4	Water hammer arresters
15420-5	Hangers
15420-6	Water heaters
15420-8	Thermometers
15420-12	Floor drains & floor sinks
15420-13	Clean out

15420-14	Backflow preventer
Plumbing Fixtures	
15460-1	Plumbing fixtures
15460-2	Faucets
15460-3	Flush valves
15460-4	Supplies
15460-5	Traps
15460-6	Carriers
Sprinkler Equipment	
15510-1	Piping & fittings
15510-2	Control valves
15510-3	Post indicator valve
15510-4	Detector check valve
15510-5	Water motor alarm
15510-6	Dry valve with pressure switch and riser mounted compressor
15510-7	Valve supervisory switches
15510-8	Hangers
15510-9	Sprinkler heads
15510-10	Backflow preventer or double check
15510-13	Hydraulic calculations with flow graph
15510-14	Sprinkler layout with noted approval of the Local Authority Having Jurisdiction
15510-15	Water source flow test
Refrigerant Piping System	
15658-1	Piping & Accessories
Mechanical Equipment	
15700-1	Exhaust fans
15700-3	Unit heater
15700-8	Wall louvers, brick vents & wall caps
Sheet Metal Ductwork	
15840-2	Flexible round duct
15840-5	Grilles and registers
15840-6	Spiral duct and fittings
15840-7	Duct sealer
Starting Testing, Adjusting &	z Balancing
15990-1	Testing adjusting and balancing qualifications

PART 2 - PRODUCTS - Not Applicable

PART 3 - EXECUTION

- 3.1 Materials and equipment shall be properly stored and protected at the project site until installation by the Contractor and acceptance by the Owner.
- 3.2 Workmanship shall be of highest quality and shall conform to standard practice for trade involved.

SECTION 15101 - PLUMBING VALVES

PART 1 - GENERAL

- 1.1 SCOPE
 - A. Valves shall be installed where indicated or required. When valves are not shown, it shall be understood the Contractor shall provide valves necessary for the control and operation of equipment and fixtures.

PART 2 - PRODUCTS

- 2.1 Catalog numbers used are Nibco/Scott. Valves with equal characteristics by Jenkins Brothers or Lunkenheimer are acceptable.
 - A. Gate valves 3" and smaller Figure S113.
 - B. Check valves 2" and smaller Figure S-413.
 - C. Temperature and Pressure Relief Valves Watts AGA listed and ASME rate.
 - D. Hose bibbs in unfinished spaces shall be rough brass with a wheel handle and provided with a vacuum breaker.
 - E. Hose bibbs in finished spaces shall be polished chrome with removable "T" handle and provided with a vacuum breaker.

PART 3 - EXECUTION

3.1 Gate valves shall be installed in service requiring the valve to be fully opened or tightly closed.

SECTION 15181 - DUCT INSULATION

PART 1 - GENERAL

- 1.1 SCOPE
 - A. Supply, return and outside air ductwork shall be insulated as specified herein unless otherwise indicated on the contract drawings.

PART 2 - PRODUCTS

- 2.1 Interior supply, return and outside air intake ductwork and plenums, including metal on the back of diffusers and registers shall be insulated with 2" thick, 1.0 PCF, fiberglass flexible blanket type or rigid board type insulation with fire retardant, reinforced foil-backed vapor barrier.
- 2.2 Portions of duct system as indicated on Contract Documents to be double wall construction shall be insulated with 2" thick 3.0 PCF rigid insulation with solid sheet metal inner liner. No additional (exterior) insulation is required.

PART 3 - EXECUTION

- 3.1 Insulation shall be applied with 100 percent coverage of fire retardant adhesive.
- 3.2 Joints shall be sealed with minimum 3" wide strips same as vapor barrier jackets.
- 3.3 Rigid insulation shall have pins on maximum 12" centers. Self adhesive pins are not allowed.
- 3.4 Insulation that terminates at AHU's, VAV's, coils, etc... shall be sealed to the equipment with 3" wide strips same as vapor barrier jackets.
- 3.5 All transitions to and from flexible duct shall be sealed with 3" wide strips same as vapor barrier jackets.
- 3.6 Exterior insulation shall receive one coat of bitumastic, then wrapped completely with Fab-Cloth, and then receive two more complete coats of bitumastic sealer.
- 3.7 Insulation and accessories shall be applied in accordance with the Manufacturer's recommendations unless indicated otherwise.
- 3.8 Insulation shall be applied on clean, dry surfaces after inspection. Run insulation continuous through wall, floor, roof and ceiling openings. Insulation on cold surfaces where vapor barrier jackets are used, shall be applied with a continuous unbroken vapor seal. Hangers, supports, anchors, etc., that are secured directly to cold surfaces must be adequately insulated and vapor sealed to prevent condensation.

SECTION 15182 - PIPING AND EQUIPMENT INSULATION

PART 1 - GENERAL

- 1.1 SCOPE
 - A. Piping shall be insulated as specified below, unless otherwise indicated on the contract drawings.

PART 2 - PRODUCTS

- 2.1 Interior refrigerant suction piping shall be insulated with 1" thick preformed fire retardant fiberglass pipe insulation with factory applied vapor barrier jacket or 3/4" thick closed cell foam insulation. Exterior refrigerant suction piping shall be insulated with 3/4" thick closed cell foam insulation.
- 2.2 Interior condensate drain piping shall be insulated with 1" thick preformed fire retardant fiberglass pipe insulation with vapor barrier jacket or 3/8" thick closed cell foam insulation.
- 2.3 Domestic hot water and cold water shall be insulated with 1" thick preformed fire retardant fiberglass pipe insulation with vapor barrier jacket or 3/8" thick flexible closed cell type for piping up to 3" diameter.
- 2.4 Heating water converter and storage water heaters shall be insulated with 2-1/2" thick rigid fiberglass insulation held in place with bands and studs as recommended by the Manufacturer and finished with insulating and finishing cement over 2" hexagonal mesh wire.
- 2.5 Fittings, valves, flanges, strainers and piping accessories shall be insulated similar to piping systems in which they occur and finished with cement and jackets as specified for piping system. Interior exposed elbows, tees, and valves shall have one piece PVC insulated fitting covers. Piping specified with vapor barriers shall have all seam edges of fitting covers sealed with vapor barrier adhesive mastic prior to taping.

PART 3 - EXECUTION

- 3.1 Insulation shall be applied on clean, dry surfaces and, after inspection, released for insulation application. Insulation shall be run continuously through wall and ceiling openings and sleeves. Insulation on cold surfaces where vapor barrier jackets are used, shall be applied with a continuous, unbroken vapor seal. Hangers, supports, anchors, etc., that are secured directly to cold surfaces must be adequately insulated and vapor-sealed to prevent condensation.
- 3.2 Insulation shall be applied in accordance with the Manufacturer's recommendations unless specified otherwise. No insulation will be required at immediate fixture connections or on buried pipe.
- 3.3 Insulation protection shields or saddles shall be provided at pipe supports for insulated pipes 1/2" in size and larger.
- 3.4 No piping shall be run above the Electrical equipment rooms.

SECTION 15200 - DOMESTIC WATER SUPPLY AND TREATMENT

PART 1 - GENERAL

1.1 The domestic water service piping shall be from the city system.

PART 2 - PRODUCTS

- 2.1 New (and affected existing) domestic water piping shall be thoroughly sterilized with a solution containing not less than 50 parts per million of available chlorine.
- 2.2 The chlorinating materials shall be liquid chlorine gas-water mixture, calcium hypochlorite, sodium hypochlorite or chlorinated lime and water mixture conforming to the requirements of the American Water Works Association.

PART 3 - EXECUTION

3.1 After introducing the solution into the system, it shall remain in the system for a minimum period of 24 hours or until pronounced by the local Health Authority as safe and fit for human consumption. During the sterilization period, valves and outlets shall be opened and closed several times. After sterilization, the solution shall be flushed from the system with clean water until residue content is not greater than 0.2 parts per million unless otherwise directed. Submit statement of certification per Materials and Methods Section 15050 requirements.

SECTION 15400 - PLUMBING SYSTEM

PART 1 - GENERAL

1.1 Rough-in for and make final plumbing connections to equipment and fixtures, unless otherwise indicated.

PART 2 - PRODUCTS

2.1 Products shall be as specified elsewhere in this division, and shall be furnished complete.

PART 3 - EXECUTION

- 3.1 Connections to equipment and fixtures shall be in accordance with approved shop drawings and Manufacturer's written instructions.
- 3.2 Rough-in connections shall be one size larger than actual fixture connections and shall be reduced at supply fittings.
- 3.3 All connections between dis-similar metals shall be made with dielectric union.

SECTION 15420 - PLUMBING EQUIPMENT

PART 1 – GENERAL

- 1.1 SCOPE
 - A. Plumbing equipment and materials shall be furnished and installed as indicated.
 - B. Trenching and backfill for piping shall be the responsibility of this Contractor.
 - C. Coordinate all piping below slab with foundation construction.
 - D. All piping that passes through the footings shall be sleeved.

PART 2 - PRODUCTS

2.1 WATER PIPING

- A. Interior water piping buried under floor slabs on grade to 5'-0" exterior to the building shall be Type "K" or "L" copper tubing.
- B. Interior water piping above first floor slab shall be Type "L" hard copper tubing.
- C. Copper tubing shall be assembled with cast or wrought copper solder joint fittings.
- D. Joints shall be made with a non-corrosive flux and solder composed of 95% tin, 5% antimony.

2.2 SOIL, WASTE, VENT AND DRAIN PIPING

- A. Drain and waste piping buried up to a point 5'-0" outside the building shall be no-hub cast iron or Schedule 40 plastic pipe and fittings that meet the requirements of ASTM D-2665. Cell-core piping will not be allowed for any portion of drain waste and vent system. Fernco fittings are not allowed on any buried piping.
- B. Drain, waste and vent piping above grade shall be no-hub cast iron or Schedule 40 PVC piping and fittings that meet the requirements of ASTM D-2665. PVC pipe shall not be permitted for soil, waste, roof drain and overflow drain stacks or in ceiling return air plenums. Cell-core piping will not be allowed for any portion of drain waste and vent system.
- C. No-hub cast iron pipe and fittings shall be assembled using neoprene gaskets and stainless steel retaining sleeve. All stacks shall be assembled with huskey heavy couplers. MG type couplers are allowed, however they must install in strict accordance with the manufacturers instructions. Installation shall be in accordance with CISPI Pamphlet No 100.
- D. This Contractor shall furnish vent collars to Roofing Contractor for installation.

2.3 CLEANOUTS

- A. Provide cleanouts as indicated.
- B. Cleanouts shall be same size as pipe except that cleanout plugs shall not be larger than 4". Cleanouts installed in connection with cast-iron, pipe shall consist of long-sweep 1/4 bend or one or two 1/8 bends extended where indicated.
- C. Cleanout shall be cast-iron drainage T-pattern 90 degree branch, fittings with a brass screw plug at the foot of soil, waste, and drain stacks and on each building drain outside the building. Access covers to cleanouts on pipe concealed in partitions and wall shall be provided with a chromium-plated cast-brass plate secured to the plug. Exterior cleanouts shall be installed with concrete collar. Exterior wall access covers shall be chrome-plated brass or stainless steel.

2.4 TRAPS

- A. Provide a trap for each fixture and piece of equipment requiring connections to drainage system. Supply traps with fixtures. Place each trap as near to the fixture as possible. No fixture shall be double trapped. Traps installed on threaded pipe shall be recess drainage pattern. Traps on all floor drains shall be deep-seal type.
- B. Provide trap primers on floor drains as indicated on plans. Traps primers shall be by Precision or approved equal.
- C. Exposed traps and drain piping shall be chromium plated.
- D. Rough-ins for plaster trap shall ensure the device will fit in the intended location and trap can be cleaned without removal.

2.5 WATER HAMMER ARRESTERS

- A. Water hammer arresters shall be located as indicated
- B. Method of installation shall be in accordance with the Manufacturer's specifications.
- C. Coordinate access panel in walls with grab bars.

2.6 HANGERS

- A. Hangers shall be Grinnel and Automatic Sprinkler, or approved equal, of the following catalog numbers:
 - (1) Insulated piping Insul-Speed
 - (2) Uninsulated piping Auto-Grip.
- B. Hanger spacing shall be as follows:
 - (1) $\frac{1}{2}$ " to 1" maximum span 7'.

- (2) 1-1/2" to 2" maximum span 10'.
- (3) 2-1/2" to 3" maximum span 12'.
- C. Drain, waste and vent piping maximum span 5', and located at each joint.
- D. Hangers shall be secured to the structure by means of approved beam clamps and/or concrete inserts. Expansion and toggle bolts shall not be permitted. Provide intermediate supports between structural members where required to obtain proper hanger spacing.
- E. All piping below first floor and basement slab shall be supported by hangers. Attach hangers to bottom side of floor slab, insure proper slope of drainage piping is maintained.

2.7 WATER HEATERS

- A. Water heaters shall be complete with factory installed safety equipment.
- B. Provide thermal expansion tank on cold water inlet of water heater equal to Amtrol ST.

2.8 THERMOMETERS

- A. Thermometers shall be provided for water heater as indicated and shall be as manufactured by Weksler Instrument.
- B. Thermometers in pipelines shall be separable socket 9" red reading mercury insertion type with scale suitable for required temperature range. Thermometers shall be located to facilitate reading from the floor. Angle type shall be used where necessary to facilitate reading.

PART 3 - EXECUTION

3.1 PIPE INSTALLATION

- A. Piping shall be concealed throughout the building except piping may be exposed in Mechanical equipment rooms, utility spaces, at immediate connections to Plumbing fixtures and where indicated.
- B. Fire rated penetrations shall be accomplished with materials as needed to maintain the integrity of the rating. See Drawings for Details.
- C. Sleeves shall be installed where piping passes through masonry construction. Sleeves shall be Schedule 40 steel pipe sized to accommodate piping and insulation and shall be set in place as construction progresses. Set sleeves flush with finished surfaces. Seal outside surface of sleeve to maintain integrity of wall Inside diameter of sleeves shall match outside diameter of covering as detailed on the Contract Documents.
- D. Escutcheons shall be installed where pipes pass through any exposed surfaces. Escutcheons shall be split-ring hinged and sized as required. Escutcheons in the equipment rooms shall be suitable for painting. Other escutcheons shall be nickel or chromium finish.

- E. Stencil directional flow arrows and pipe identification on all piping.
- F. Grade horizontal soil, waste, and drain pipes as follows, except as approved and as indicated on the drawings.
 - (1) 2" 1/4" per foot, minimum
 - (2) 3'' and larger 1/8'' per foot, minimum
- G. Install vertical soil and waste piping with provisions for expansion and extend full size to and above roof lines as vents, except as otherwise indicated. Where practicable, connect two or more vent pipes together and extend as one pipe through roof in approved locations. Run concealed vent pipes in overhead spaces with horizontal waste or soil piping pitched down to stacks without forming traps in pipes using the required fittings. Where an end or circuit vent pipe from fixture is connected to vent line serving other fixtures, make the connect at least 4'-0" above the floor on which the fixtures are located. Vent lines shall not be used as waste, except as approved. Extend cast-iron hub-andspigot pipe inside of building 6" above the floor.
- H. Make changes in the pipe sizes on soil, waste, and drain lines with reducing fittings or recessed reducers. Make changes in direction by appropriate use of 45° wyes, longsweep 1/6, 1/8 or 1/16 bends except sanitary tees may be used where permitted by Code in soil and waste lines where changes in direction of flow is from horizontal to vertical and on discharge from water closets. Short-radius fittings shall not be permitted, except in approved location.
- I. Slip joints shall be permitted only in trap seals or on inlet side of traps. Use hub fittings for making union connections wherever practicable in connection with dry vents. The use of long screws and bushings is prohibited.
- J. PVC piping shall not be installed in the return-air plenums, through fire walls or any location not allowed by the Building Code.
- K. Coordinate the locations of all cleanouts to ensure they do not occur under built-ins or equipment.

SECTION 15460 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 Plumbing fixtures shall be as indicated.

PART 2 - PRODUCTS

- 2.1 Fixtures shall be as listed by Manufacturer in the fixture connection schedule on the drawings.
- 2.2 Fixtures shall be complete with appurtenances, including faucet set, supplies, drain, trap, etc. Fixtures shall be by one Manufacturer insofar as possible. All faucets shall meet ANSI/NSF 61, Section 9 certification.

PART 3 - EXECUTION

- 3.1 Fixtures shall be installed in accordance with Manufacturer's detailed instructions, unless otherwise indicated.
- 3.2 Wall hung fixtures not specified to be furnished with chair carriers shall be provided with a hanger bracket secured to the face of the wall.
- 3.3 Floor fixtures shall be installed on firm and even bearing. Seal fixture mounting surface at wall and/or floor with a high quality white silicone caulk and sealant.

SECTION 15510 - SPRINKLER EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE

A. Provide and install a complete dry pipe sprinkler system with inside and outside piping, including air compressor, pressure switch sprinkler heads, valves, hangers and supports, sleeves, fire department connections and accessories as indicated on the contract drawings and as specified below.

1.2 QUALITY ASSURANCE

- A. Sprinkler equipment and installation shall be approved by local Fire Commissioner.
- B. Equipment and installation shall meet requirements of NFPA No. 13 Standard for the Installation of Sprinklers Systems.
- C. The system is to be installed by an accredited automatic sprinkler company regularly engaged in the business and familiar with this type of installation.

1.3 SUBMITTALS

- A. Submit shop drawings of entire sprinkler system for review by Architect/Engineer. Partial submittals will not be acceptable. Contractor shall submit 1 set of Shop Drawings to the Structural Engineer for coordination.
- B. Annotate descriptive data to show the specific model, type and size of each item the Contractor proposes to furnish. Prepare working drawings on sheets not smaller than 24 inches by 36 inches in accordance with the requirements for "Working Plans" as specified in NFPA 13 and all other pertinent NFPA requirements, and include data essential to the proper installation of each system. No work shall begin until the design of each system and the various components have been approved by the proper departments of the City Fire Inspection Division, Virginia State Fire Marshal, Mechanical Engineer and any other organization having jurisdiction over the sprinkler system. Before the work is commenced, submit sprinkler system hydraulic calculations to show the basis for the design, graphs or tables showing the pressure discharge relationship for the sprinkler heads, and full descriptive data for pipe, fittings, alarm valves, gate valves, check valves, sprinkler heads, hangers, devices, materials, and associated equipment for approval. Indicate clearly all piping that is to be exposed.

C. Upon completion and before final acceptance of the work, furnish the Architect/Engineer record drawings and specifications showing the project as finally completed. Such drawings, specifications, and other data showing all changes specifically known to the Architect /Engineer.

D. Minor modifications shall be made to the sprinkler piping layout as required by the Architect /Engineer to accommodate the building's structural system.

1.4 WATER SOURCE FLOW TEST
- A. The Contractor shall obtain a flow test at the point at which the sprinkler system connects to the water source. The responsibility of obtaining the flow test and any costs associated with obtaining the flow test shall be borne by the Contractor. A copy of the test data shall be submitted along with the drawings and hydraulic calculations. Any flow test data provided in the Contract Documents is for the basis of obtaining a bid only and shall not be used by the Contractor for design purposes.
- B. The design shall accommodate minor modifications to the sprinkler piping layout as required by the Architect/Engineer to accommodate the building's structural system or coordination with other trades.

1.5 VERIFICATION OF EXISTING CONDITIONS

A. The Contractor shall be responsible for verifying the size of all existing piping that shall be used for the sprinkler system water source between the building and the point at which the flow test data is obtained.

1.6 SYSTEM DESCRIPTION

- A. The system shall be a dry-pipe type designed for applicable hazard. The system shall protect the entire building including the attic, roof overhangs, and below floor combustible spaces. Size system to provide protection for future build-out including glass exhibit enclosure. See architectural documents for future build-outs. Conceal sprinkler piping above ceilings in area of first floor ceiling with second floor above. The contractor shall take special care in removing second floor flooring boards to install piping and sprinkler heads. Record the location of each board before removing and reinstall in original locations.
- B. Layout and design of the system shall be by the Sprinkler Contractor. Pipe sizing shall be based on a hydraulically calculated system per applicable hazard, density and remote area square footage.

C. The design, equipment, materials, installation, and workmanship shall be in strict accordance with the required and advisory provisions of NFPA 13 and all other pertinent NFPA requirements, except as modified herein. Each system shall include all materials, accessories and equipment inside and outside the building necessary to provide each system to give full consideration to built-in spaces, piping, electrical equipment, ductwork, and all other construction and equipment to afford complete coverage and be free from operating and maintenance difficulties, all in accordance with detailed drawings to be submitted for approval. Devices and equipment for fire protection service shall be of a make and type listed by the Underwriters' Laboratories, Inc., or approved by the Factory Mutual System. In the publications referred to herein, the advisory provisions shall be considered to be mandatory, as though the word "shall" had been substituted for "should" wherever it appears. Reference to the "authority having jurisdiction" shall be interpreted to mean all organizations having jurisdiction over the sprinkler system. The work shall begin at the point indicated.

PART 2 - PRODUCTS

2.1 SECTIONAL CONTROL VALVE

A. Provide valve with non-rising stem, mechanical joint one end and flanged joint opposite end, valve box and cover at grade.

2.2 POST INDICATOR VALVE

 A. Valve shall be equal to Fairbanks Fig. 0435 gate valve with non-rising stem and mechanical joint ends. Provide complete with post indicator assembly equal to TCIW No. A-240. Seal opening with approved seals. Provide wrench for each post. See civil plans for location.

2.3 CHECK VALVE

A. Swing type check valve shall be provided with flanged connections, 175 psi wwp, brassseat, elastomer "o"-ring seat. Valve shall be equal to Viking Model D, where allowed by the underwriter and permitted by local authorities.

2.4 DETECTOR CHECK VALVE

A. Swing type valve with flanged connections, 175 psi wwp, bronze seat, neoprene seal, equal to Viking Model E-1 shall be provided. Meter isolation and check valves shall be furnished and installed by the Contractor. Meter will be installed by the Local Water Department.

2.5 WATER MOTOR ALARM

A, An 8 inch diameter gong, 3/4 inch pipe connections equal to Viking Model F-1 shall be provided.

2.6 FLOW SWITCH

A. Flow switch shall be furnished and installed by this Contractor. Wiring and connection to alarm bell and building alarm system shall be by Electrical Contractor.

2.7 REDUCED PRESSURE BACKFLOW PREVENTER

A. Reduced pressure backflow preventer shall be Ames "Silver Bullet" 4000SS. Route air gap drain to outside. Install at each main riser location.

2.8 VALVE SUPERVISORY SWITCHES

A. Switches shall be furnished and installed by this Contractor. All wiring and connection to building fire alarm panel shall be by Electrical Contractor.

2.9 SPRINKLER HEADS

A. In areas with suspended ceilings, provide flush type, concealed sprinklers with cover plate factory-finished to match color and finish of ceiling. Bronze finish pendent heads may be used in Storage Rooms and Janitor's Closets. In areas without suspended

ceilings, heads shall be bronze finish, up-right type. Temperature rating of fuses as dictated by authority having jurisdiction.

2.10 SPRINKLER CABINET

- A. Provide a wall-mounted sprinkler cabinet with a total of twelve (12) spare sprinkler heads, including all types and temperatures installed on project. Provide sprinkler wrench.
- 2.11 Dry type system alarm valve, pressure switch and riser mounted air compressor provide and install dry-pipe alarm valve with pressure switch per NFPA 13 requirements complete with sprinkler approved 112 HP 208V, 1 phase air compressor riser mounted.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Prior to installation of piping, Contractor shall coordinate all hanging methods of piping with Structural Engineer. Structural Engineer shall review methods of hanging piping and provide letter of approval before Contractor commences work.
- B. Run piping concealed above furred ceilings and in joists to minimize obstructions. Expose only heads. Piping shall be run as high as possible and closely coordinated with the structure and mechanical ductwork in order to allow maximum clearance above light fixtures. In no case should be piping be any closer than 9" above finished ceiling.
- C. Protect sprinkler heads against mechanical injury with standard guards.
- D. Locate outside alarms on wall of building as indicated.
- E. Slope piping to allow for drainage.
- F. Provide drains at base of risers, on valved sections and at other locations requiring same for complete drainage of system.
- G. Provide necessary inspector's test pipes as required by the National Fire Protection Association to discharge to a drain in accordance with the Virginia Uniform Statewide Building Code (VUSBC). All drain piping to be galvanized.
- H. All piping is to be tested to 200 psi pressure for two hours.
- I. Install underground piping in conformance with NFPA Pamphlet 24 and local governing authority requirements. Block and strap all fittings as recommended by AWWA and NFPA. Flush underground pipe prior to connection to inside piping. If Class 53 pipe is used, 3 joints on each side of fittings shall be mechanical joint type.
- J. Sprinkler System Piping shall be run in the space between the bottom of the floor slab or roof deck and the bottom chord of the steel joists. Offset around beams as required.

- K. In areas with suspended acoustic tile ceiling construction, sprinkler heads shall be located in center of tile.
- L. Pipe material and fittings per NFPA 13. Threading and cut grooving of ASTM A135 and Schedule 5 piping will not be allowed.
- 3.2 Fire rated penetrations shall be accomplished with materials as needed to maintain the integrity of the rating.
- 3.3 Sleeves shall be installed where piping passes through masonry construction. Sleeves shall be Schedule 40 steel pipe sized to accommodate piping and shall be set in place as construction progresses. Set sleeves flush with finished surfaces. Seal outside surface of sleeve to maintain integrity of wall Inside diameter of sleeves shall match outside diameter of covering. Fire wall penetrations shall be sealed with approved fire stop material.

3.4 TESTS

- A. The system shall be subjected to tests required by and in the presence of the representative agencies having jurisdiction. Details of tests not covered by agencies' requirements shall be in accordance with NFPA 13.
- B. Conduct tests required in the presence of the agencies having jurisdiction and in accordance with their instructions.
- C. Provide instruments, equipment and pay expenses incurred in performing the tests.

SECTION 15658 - REFRIGERANT PIPING SYSTEM

PART 1 - GENERAL

1.1 Refrigerant piping system shall be furnished and installed as indicated on the contract drawings and/or as specified within this division.

PART 2 - PRODUCTS

- 2.1 Refrigerant piping shall be Type "L" copper, assembled with copper soldering fittings using silver solder.
- 2.2 Accessories including expansion valves, solenoid valves, service valves, charging valves, sight glasses, filter-driers, etc. shall be provided as indicated or as required by the Equipment Manufacturer for a complete installation.

PART 3 - EXECUTION

- 3.1 Piping shall be run concealed unless otherwise indicated.
- 3.2 Piping and accessories shall be sized, provided, and installed in accordance with refrigeration equipment Manufacturer's recommendations for the particular equipment installed and the actual piping arrangement as installed in the field.
- 3.3 Piping shall be assembled, adhering to accepted industry standards and applicable codes, including the maintenance of piping cleanliness and the passage of dry Nitrogen gas through fittings, accessories, and/or piping during brazing operations.
- 3.4 Bare copper piping shall be protected from direct contact with ferrous materials.

SECTION 15700 - MECHANICAL EQUIPMENT

PART 1 - GENERAL

1.1 Heating, ventilating and air conditioning equipment shall be furnished and installed as scheduled on drawings or as specified within this division.

PART 2 - PRODUCTS

- 2.1 Sealed refrigeration systems of packaged equipment, refrigeration compressors and condensing units shall be furnished with Manufacturer's standard five-year term warranty.
- 2.2 Equipment, dampers and fans, which are specified or required by applicable codes to have UL or similar listing, shall be installed as required to meet those listings.
- 2.3 Types of refrigerants used shall meet current EPA recommendations with regard to CFC/ozone depletion restrictions. Equipment using refrigerant R-11, R-12, R-113, R-114, R-115, R-500 or refrigerants with ozone depletion factor (ODF) greater than 0.05 shall not be permitted.

PART 3 - EXECUTION

- 3.1 Equipment shall be of suitable dimension for the area in which it is to be installed. If the equipment dimensions and/or arrangements differ materially from that shown on the drawings, the Contractor shall be responsible for any redesign that is necessary at no additional cost to the Owner.
- 3.2 Unless otherwise specified or shown on the drawings, equipment installation, duct connections, supports, vibration isolation, suspension, piping and related arrangements shall be in accordance with the Manufacturer's recommended installation for the service.

SECTION 15840 - SHEET METAL DUCTWORK

PART 1 - GENERAL

- 1.1 Provide complete systems of supply, return, relief, outside and exhaust ducts as shown on the drawings. Submit ductwork shop drawings (minimum scale of 1/4" = 1'-0") for review by the Engineer prior to fabrication.
- 1.2 Duct sizes shown on drawings are clear inside dimensions. Where sizes must be varied from those indicated on the drawings, the full area of the duct shall be maintained.

PART 2 - PRODUCTS

- 2.1 Ductwork shall be galvanized steel sheets constructed and supported in accordance with the recommendations of the ASHRAE Guide and SMACNA Duct Construction Standards. <u>All</u> duct joints and seams shall be sealed with approved duct sealant.
- 2.2 Whenever practicable, elbows shall be radius type with a centerline radius of 1-1/2 times the width or diameter of the duct. Where space does not permit, the use of short radius elbows having a minimum radius of 1.0 times the width or diameter of the duct or square elbows with factory fabricated turning vanes may be used.
- 2.3 Flexible connections shall be made of neoprene covered 20 ounce glass fabric cloth and shall be installed at duct connections to all air handling equipment to prevent transmission of vibration.
- 2.4 Spiral round ductwork shall be double wall insulated with solid inner liner and have a minimum 1" fiberglass insulation. Duct shall be of spiral lockseam construction fabricated from galvanized steel meeting ASTM-A527 Standards. All fittings shall be of the same construction and material. Elbows shall be of die-stamped, gored, pleated or mitered construction. Ductwork shall be supported per Manufacturer's recommendations with factory provided hanging rings. All ductwork shall be provided with primer finish and be free of any dents for field painting (color as selected by the Architect). Any ductwork that is damaged shall be rejected and, at the Engineer's discretion, replaced with a new section at no additional cost to the Owner.
- 2.5 Furnish and install volume dampers where indicated on the drawings. Dampers shall be constructed of not lighter than 18 gauge galvanized sheet metal and shall be equipped with blade bearings. Damper shafts shall be terminated in locking quadrants. Damper blades shall be bent and center grooved for rigidity. Damper in ducts larger than 220 sq. inch in cross-sectional area shall be opposed blade dampers. All dampers shall be provided with a minimum of 2" standoffs to clear insulation.
- 2.6 Provide duct access doors at the following locations:
 - A. 50 feet on center in straight sections of duct. NOTE: A duct runout to a single diffuser less than 50 feet in length shall be provided with a single access door within 2 feet of the take-off damper.
 - B. At entering and leaving side of duct mounted coils.
 - C. Entering side of 90° elbows and tees.

- D. At leaving side of dampers.
- E. As required for access to fire dampers, duct mounted sensors, smoke detectors and devices requiring periodic service.
- F. Access doors shall be double wall, 1" thick internally insulated with solid inner panel. Provide gasketed frame with double cam-lock, hinged assembly. Doors shall be 12"x12"
 except where duct dimensions prohibits a door of this size. In smaller ducts, door shall
 be as large as possible. Doors may be omitted in ducts smaller than 10 inches in largest dimension.
- 2.7 Flexible round ductwork shall be 1" thick flexible fiberglass duct with fire-resistant aluminum pigmented plastic vapor barrier, and continuous inner barrier film. Flexible duct runouts shall not exceed 5 feet in length. Runouts longer than 5 feet shall be rigid round duct (field insulated) with the last 5 feet being flexible ducting.
- 2.8 Tie wraps and other duct accessories and materials shall be plenum-rated when located in plenum areas.

PART 3 - EXECUTION

- 3.1 Ductwork shall be true to the dimensions indicated on the drawings and shall be straight and smooth on the inside with joints neatly finished. Duct shall be supported in accordance with SMACNA duct construction standards. Ducts shall not be supported from the metal deck systems.
- 3.2 Exposed ductwork shall receive a minimum of two coats of paint suitable for the service as intended. Colors shall be as selected or approved by the Architect.
- 3.3 After the installation is complete and prior to insulation application, the Contractor shall clean inside and outside of duct system.
- 3.4 No ductwork shall be run above the Electrical equipment rooms.

SECTION 15990 - STARTING, TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. The work under this Section shall include the adjustment of each air system to design quantities, the balance of all air systems, verification of the performance of equipment and controls, electrical measurements, and all labor, materials, equipment and services required to perform the work specified in this Section.
- B. Testing, adjusting and balancing shall be performed and conducted in strict accordance with the methods and requirements of the NEBB or AABC. The Contractor shall secure the services of an independent Testing and Balancing Contractor, certified by the NEBB or AABC, to perform the work outlined herein. The TAB Agency shall have been in the TAB business for a minimum of 5 years.
- C. The TAB Contractor shall be a direct Subcontractor to the General Contractor and shall not be associated with the Mechanical Contractor.

1.2 QUALITY ASSURANCE

- A. Adhere to all standards, codes, rules and regulations listed in SECTION 15010 GENERAL PROVISIONS.
- B. All test and balance procedures shall be in accordance with Standards published by the NEBB or the AABC.

1.3 SUBMITTALS

- A. Submittals shall be in accordance with Section 15050 MATERIALS AND METHODS.
- B. Four (4) copies of a complete testing and balancing report shall be submitted to the Engineer for evaluation and approval prior to final acceptance of the project.
- C. The report shall list all test, adjust and balance work reported on NEBB approved forms. It shall also include a letter of certification listing all instruments and the last date of calibration of each. This report shall be submitted at least two (2) weeks prior to final inspection.

PART 2 - PRODUCTS

2.1 INSTRUMENTS

- A. Provide all instruments required to properly perform the test and balance work. All instruments shall be of first quality and accurately calibrated at the time of use.
- B. Whenever possible, the same instrument shall be used for the entire job to avoid possible errors in calibration. If more than one instrument of a similar type is used, check to verify the variation in instrument readings does not exceed plus or minus 5%.

2.2 ACCESSORY DEVICES

A. The Mechanical Contractor shall provide, as required by the TAB Contractor, all necessary dampers, thermometer wells and other appurtenances as required. He shall coordinate the location of these devices as construction progresses to avoid disturbing the finished systems. He shall also provide new belts and sheaves for air moving equipment as required to attain desired air quantities. These items shall be provided at no additional cost to the Owner.

PART 3 - EXECUTION

3.1 TAB work will be required to adhere to phasing requirements of the project. This will require repeated visits to the Site.

3.2 PREPARATION

- A. Notify the Engineer in writing of the date and time of all tests a minimum of one (1) week prior to start of air and water systems tests.
- B. Test, adjust and balance work shall not begin until the system installation is complete, the system is thoroughly cleaned prior to start-up, and the system is in full working order.
- C. After completion of the installation of the air conditioning, heating, ventilating, and exhaust systems, and prior to acceptance by the Owner, all systems and appurtenances applicable to the above systems shall be adjusted and balanced to deliver the air and water quantities as specified and indicated on the Drawings.

3.3 AIR SYSTEMS TESTING

- A. The test and balance agency shall perform the following for each system:
 - (1) Adjust fan RPM, tighten and align fan belts.
 - (2) Adjust volume dampers to obtain desired air flow.
 - (3) Adjust grilles, diffusers and registers to obtain desired air flow and air pattern.
 - (4) Adjust dampers to obtain desired outdoor air quantities.
 - (5) Operation of automatically operated dampers shall be verified.
- B. Total system air values shall be determined by traversing supply, return and/or outside air intake ductwork. Where this methodology is not possible, a summation of values obtained at individual outlets and inlets is acceptable. Where the summation method is used, it shall be clearly noted for each instance in the final report.
- C. A set of neatly marked plans identifying the location of all recorded data shall be submitted with the report.

3.4 REPORTING

A. The test and balance technicians shall record the following data for each system and

include it in the report. All data shall be neatly typed.

- (1) Location, Manufacturer, serial number, model number, size, design air flow and design static pressure of each air handling unit, exhaust fan, or air moving device.
- (2) Discharge and suction static pressure of each air handling unit, exhaust fan, or air moving device.
- (3) Air pressure drop across each air handling unit coil, heating coil or fan.
- (4) Supply air and mixed air temperature for each air handling unit.
- (5) Fan CFM and RPM.
- (6) Location, Manufacturer, serial number, model number, size, HP, RPM, frame size, amp draw, operating BHP and motor controller heater size, for each pump.
- (7) Tabulated flow setting of each balancing device and circuit setter valve.
- (8) Manufacturer, location, size, design and actual CFM air quantities, of each supply, return, or exhaust grille or diffuser.

3.5 FIELD QUALITY CONTROL

- A. Air side balancing tolerance shall be $\pm 10\%$ of design values unless otherwise noted. Direct drive fans associated with systems having a design of 800 cubic feet per minute or less shall have a tolerance of $\pm 15\%$ of design values.
- B. Use duct mounted dampers for rough air balance. Trim with register or diffuser mounted dampers to avoid excessive room air noise.
- C. Any work showing faults during the testing or any work not in accordance with the Contract Documents shall be corrected by the Mechanical Contractor at his own expense prior to preparation of the final report. Failure to correct faults shall result in the final report being rejected without review.

3.6 FINAL INSPECTION

A. Upon submittal and review of TAB Reports, the Contractor shall conduct a building walk-through at which time a selection of up to 10% of the air side systems may be spotchecked. If the total air flow as reported within the TAB Report differs from the verified flows then, at the discretion of the Project Engineer, that system shall be re-balanced at no additional cost to the Owner, and additional systems shall be spotchecked.

SECTION 01600 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.
- B. Related Sections include the following:
 - 1. Division 01 Section "Unit Prices" for products selected under an alternate.
 - 2. Division 01 Section "References" for applicable industry standards for products specified.
 - 3. Division 01 Section "Closeout Procedures" for submitting warranties for Contract closeout.
 - 4. Divisions 02 through 49 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.4 SUBMITTALS

- A. Product List: Submit a list, in tabular from, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
 - 1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
 - 2. Form: Tabulate information for each product under the following column headings:
 - a. Specification Section number and title.
 - b. Generic name used in the Contract Documents.
 - c. Proprietary name, model number, and similar designations.
 - d. Manufacturer's name and address.
 - e. Supplier's name and address.
 - f. Installer's name and address.
 - g. Projected delivery date or time span of delivery period.
 - h. Identification of items that require early submittal approval for scheduled delivery date.
 - 3. Initial Submittal: Within 30 days after date of commencement of the Work, submit 7 copies of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.
 - a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.
 - 4. Completed List: Within 45 days after date of commencement of the Work, submit 7 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
 - 5. Architect's Action: Architect will respond in writing to Contractor within 15 days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.
- B. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified material or product cannot be provided.
 - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
 - i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time,

include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.

- j. Cost information, including a proposal of change, if any, in the Contract Sum.
- k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
- 1. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
- 2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
 - a. Form of Acceptance: Change Order.
 - b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.
- C. Comparable Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
 - a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
 - b. Use product specified if Architect cannot make a decision on use of a comparable product request within time allocated.
- D. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
 - 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
- B. Delivery and Handling:

- 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
- 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
- 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
- 4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage:

- 1. Store products to allow for inspection and measurement of quantity or counting of units.
- 2. Store materials in a manner that will not endanger Project structure.
- 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
- 4. Store cementitious products and materials on elevated platforms.
- 5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
- 6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
- 7. Protect stored products from damage and liquids from freezing.
- 8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 - 2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 - 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
 - 3. Refer to Divisions 02 through 49 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.
 - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 - 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 - 4. Where products are accompanied by the term "as selected," Architect will make selection.
 - 5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
 - 6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
 - 7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in Part 2 "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures:
 - 1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
 - 2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
 - 3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
 - 4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
 - 5. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
 - 6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
 - 7. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.
 - 8. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.
 - 9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
 - a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.

- 10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
 - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
 - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

- A. Timing: Architect will consider requests for substitution if received within 30 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.
- B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - 1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 - 2. Requested substitution does not require extensive revisions to the Contract Documents.
 - 3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - 4. Substitution request is fully documented and properly submitted.
 - 5. Requested substitution will not adversely affect Contractor's Construction Schedule.
 - 6. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - 7. Requested substitution is compatible with other portions of the Work.
 - 8. Requested substitution has been coordinated with other portions of the Work.
 - 9. Requested substitution provides specified warranty.
 - 10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

2.3 COMPARABLE PRODUCTS

- A. Conditions: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - 1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 - 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - 3. Evidence that proposed product provides specified warranty.
 - 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 - 5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

DIVISION 16 - ELECTRICAL

SECTION 16010 - GENERAL PROVISIONS

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

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

1.2 SCOPE

A. The work required for this Division includes demolition, labor, materials, equipment, appurtenances, coordination and services to provide a complete and fully operational electrical system as shown on the drawings and specified in the specifications, including special systems indicated.

B. The Contractor shall install the systems as specified herein and indicated on the drawings and shall furnish the labor, material, tools, scaffolds, erection equipment, services and other items of expense as necessary as a part of this Contract. This Contract further includes placing the systems into operation and properly testing, adjusting, and balancing the items of equipment as specified and as approved by the Architect/Engineer.

1.3 APPLICABLE SPECIFICATIONS, CODES AND STANDARDS

- A. The latest effective publications of the following standards, codes, etc., as applicable form a part of these specifications the same as if written fully herein and shall be followed as minimum requirements. The Contractor shall be responsible for furnishing and installing higher grade materials and workmanship in excess of the minimum requirements where indicated on the drawings and in the specifications.
 - (1) National Electrical Code (NEC)
 - (2) Underwriters Laboratories (UL)
 - (3) Institute of Electrical and Electronic Engineers (IEEE)
 - (4) National Fire Protection Association (NFPA)
 - (5) National Electrical Manufacturer's Associations (NEMA)
 - (6) American National Standards Institute (ANSI)
 - (7) American Society for Testing and Materials (ASTM)
 - (8) Occupational Safety and Health Act (OSHA)
 - (9) Certified Ballast Manufacturers Association (CBMA)
 - (10) Insulated Cable Engineers Association (ICEA)
 - (11) Americans with Disabilities Act (ADA)
 - (12) International Building Code (IBC)
 - (13) Service Rules and Regulations of the local Utility Companies
 - (14) State and Local Building Codes
 - (15) Local Authority Having Jurisdiction (LAHJ)
 - (16) National Electrical Safety Code (NESC)
 - (17) Virginia Uniform Statewide Building Code (USBC)

- B. The Contractor shall give the required notices, obtain the necessary permits, and pay the permit and inspection fees.
- C. The Contractor shall provide the necessary information to assist the Owner in obtaining permanent Electrical service from the Power Company. For additional information, see Section 16410 Electrical Service.
- D. The Contractor shall coordinate with the local Power, Cable Television, and Telephone companies and install the services as required.
- E. The equipment, material, apparatus, and work shall conform to the requirements of the NEC. If the Contractor observes that the drawings and specifications are at variance therewith, he shall notify the Architect/Engineer in writing. If the Contractor performs such work contrary to the above referenced rules and regulations and without written acknowledgment or notice thereto, he shall correct this work and bear the cost arising therefrom.

1.4 SUPERVISOR

- A. As required by the laws of the Commonwealth of Virginia, the Electrical Contractor shall have a Supervisor on the job at all times that any electrical work is being installed. This shall include the work being accomplished by the contractors who are subcontractors to the prime Electrical Contractor.
- B. The Supervisor shall be licensed by the Commonwealth of Virginia as a "Master" or "Journeyman" in the electrical construction trade.

1.5 DEFINITIONS

- A. Where the word "Contractor" appears in this Division of the specifications, it shall apply to the Contractor performing the Electrical portion of the work, unless explicitly noted otherwise.
- B. "Install" shall mean to place, fix in position, secure, anchor, etc., including necessary appurtenances and labor so the equipment or installation will function as specified and intended.
- C. "Furnish" shall mean to purchase and supply equipment or components.
- D. "Provide" shall mean "Furnish and Install".
- E. "Or approved equal" shall mean equal in type, design, quality, etc., as determined by the Engineer.

1.6 CONTRACT DOCUMENTS

A. The Architectural, Structural, Mechanical, Electrical and Equipment drawings and specifications are hereby incorporated into and become a part of this Division. The Contractor shall examine all such drawings and specifications and become thoroughly familiar with provisions contained herein and the submission of this bid shall be constructed as indicating such knowledge.

- B. The drawings and specifications are intended to cover the work enumerated under respective headings. The drawings are diagrammatical only. The exact locations of apparatus, fixtures, equipment and conduits shall be ascertained from the Architect. Minor variations in location of equipment shall be made upon written approval of the Architect at no additional cost to the Owner.
- C. This Contractor shall examine the architectural, structural, plumbing, mechanical and electrical drawings and specifications to avoid conflict with other trades. Minor variations in location of equipment shall be made upon written approval of the Architect at no additional cost to the Owner. No Contractor shall take advantage of conflict or error between the drawings and specifications or between general drawings and Plumbing, Mechanical and/or Electrical drawings but shall request a clarification of such from the Architect/Engineer should this condition exist. If there is insufficient time to issue an addendum for this clarification, the Contractor shall be required to assume the most expensive item in conflict.
- D. Cooperate and coordinate the work of this Division with other trades.
- E. The Electrical drawings and specifications are intended to supplement each other and any material called for by one shall be as binding as if specifically mentioned in both. Labor and/or materials neither shown nor specified but necessary for the complete installation and proper functioning of the systems shall be provided by the Contractor.
- F. Equipment provided under this Division of the specifications shall be installed in accordance with the recommendations of the equipment or material manufacturer.

1.7 VISIT TO THE SITE

A. The Contractor shall visit the site of the work and familiarize himself with the conditions affecting his work, and submission of his proposal shall be construed as indicating such knowledge. No additional payment will be made on claims that arise from lack of such knowledge of existing conditions.

1.8 TEMPORARY LIGHTING AND POWER

- A. Provide in accordance with NEC, NFPA and Section 16410 ELECTRICAL SERVICE of this specification.
- B. Provide temporary service and wiring as required to support construction of the project. <u>Permanent wiring provided by this project shall not at anytime be used as temporary</u> <u>wiring, unless otherwise noted.</u>

1.9 COORDINATION

A. Before installing any of this work, the Contractor shall verify that it does not interfere with clearances for the erection of finish beams, columns, pilasters, walls and other structural or architectural members as shown on the Architectural drawings. If any work is so installed and it later develops that the Architectural design cannot be followed, the Contractor shall, at his own expense, make such changes in his work as the Architect may

direct to permit the completion of the Architectural work in accordance with the drawings and specifications.

- B. It shall be the duty of the Contractor to report any interferences between his work and that of any other Division to the Architect as soon as they are discovered. The Architect will determine which equipment shall be relocated regardless of which was first installed, and his decision shall be final.
- C. Installation of various conduit runs and equipment shall conform to conditions in the building and any changes shall be submitted in sketch form to the Architect for approval.
- D. The Electrical Contractor shall obtain the electrical requirements for intended motors and/or equipment from the Mechanical/Plumbing Contractor(s), the Food Service Contractor, the Civil Contractor, and the General Contractor during the Submittal/Shop Drawing phase. Any electrical modifications required to support the intended motors/and/or equipment shall be the responsibility of the Contractor providing the motor and/or equipment.

1.10 EQUIPMENT CONNECTIONS

- A. Disconnect switches, starters, controllers, variable frequency drives and line voltage connections to fan switches and thermostats shall be provided under this Division, unless otherwise indicated. The control wiring regardless of voltage shall be provided under the Division providing the motor and/or equipment. Coordinate connection requirements with given trade prior to electrical equipment order and release. The Contractor shall be responsible for reviewing the drawings and coordinating with other trades and Divisions to determine the exact quantity, sizes and locations of the equipment. Provide adequately sized power wiring and conduit and make final connections to this equipment, whether indicated or not on the Electrical drawings, to allow proper functioning of the systems. Provide junction boxes with line voltage power source for control voltage wiring by other Divisions, as required.
- B. Power wiring and power connections to the equipment shall be provided under Division 16 ELECTRICAL unless otherwise indicated on the Electrical drawings.
- C. When substituted motors and/or equipment require electrical modifications to support said motors and/or equipment, the cost of the electrical modifications, associated work and coordination shall be included under the Division providing the motor and/or equipment.

1.11 CUTTING AND PATCHING

A. The work shall be carefully laid out in advance, and where cutting, channeling, chasing, or drilling of floors, walls, partitions, ceiling, or other surfaces is necessary for the proper installation, support, or anchorage of the conduit, raceways, or other electrical work, this work shall be carefully done, and any damage to building, piping, or equipment shall be repaired by skilled mechanics of the trades involved, at no additional cost to the Owner. Cutting of masonry block shall be done with masonry saw.

1.12 EQUIPMENT MARKING AND PAINTING

- A. Panelboards, safety switches, cabinets, etc. shall be provided with permanently attached (adhesives not acceptable), laminated black phenolic label with 3/8" engraved white letters to indicate equipment or circuit controlled. Safety Switches associated with HVAC, Plumbing or Kitchen Equipment shall indicate the circuit controlled.
- B. The electrical apparatus such as switchgear, disconnect switches, panelboard enclosures, transformer housings, motor controllers, terminal cabinets, and light fixture housings, shall be post-fabrication factory painted.
- C. Interior exposed, metal, conduit, etc., in finished spaces shall be painted with two coats of paint to match adjacent surfaces as directed by the Architect. Additional marking and painting shall be as indicated in the specific equipment specification sections. Interior exposed, metal, conduit, in unfinished spaces shall be painted as directed by the Architect.

1.13 DEFACEMENT OF EQUIPMENT

- A. Equipment shall not be defaced with any form of personal advertisement, stickers, or nameplates.
- B. Manufacturers rating plates and other acceptable identification as required by code for equipment is permitted, and this material shall be applied in usual and acceptable manner.
- C. Protect the equipment provided against damage during construction to the satisfaction of the Architect/Engineer. If damage occurs to materials, refinish, repair, or replace the equipment or material as directed by the Architect/Engineer.

1.14 ACCESS DOORS

A. This Contractor shall furnish and the General Contractor shall install steel access doors where necessary and where required by the LAHJ, especially for electrical access, style necessary for surface in which placed, sized as indicated or required, with cylinder lock.

1.15 SHOP DRAWINGS

- A. Submit complete shop drawings covering the equipment listed in Section 16050 for review. The Contractor shall check the shop drawings, and arrange the shop drawings for submittal as described.
 - 16100 Fuses
 - 16111 Conduit and Fittings
 - 16120 Wire and Cable
 - 16125 Wiring Devices
 - 16130 Outlet Boxes
 - 16160 Panelboards
 - 16170 Disconnect Switches
 - 16401 Transient Voltage Surge Suppression
 - 16410 Electrical Service (conductors)
 - 16450 Grounding

16500 - Lighting Fixtures (all types)16520 - Lighting Controls16720 - Fire Alarm System16750 - Telephone System

1.16 PROJECT INSPECTIONS

- A. The Contractor shall notify the Engineer to perform project inspections to verify that the installed materials and workmanship conform to codes and the specifications. The inspections shall include, but not be limited to:
 - (1) Inspection of conduits within or below slab prior to pouring of slab.
 - (2) Electrical rough-in.
 - (3) Above ceiling inspection prior to installation of final ceiling.
- B. If any electrical material, device or workmanship does not meet the intent of these specifications, the Contractor shall remove the material and devices complete, and then reinstall the material or devices per these specifications, at no additional cost to the Owner. If any of the electrical material is damaged during this removal, the Contractor shall be required to provide new electrical devices or material.
- C. If the final ceiling has been installed prior to the inspection, the Contractor shall provide access to above the ceiling as required. This work shall be performed by the Contractor at no additional cost to the Owner.

1.17 FINAL INSPECTION AND TESTS

A. Upon completion of the entire work, the Contractor shall perform such tests as required by the Architect. The Architect shall be given 48 hours notice before tests are made. The Contractor shall provide the manpower and equipment necessary to perform the tests required by the Architect. Upon completion of the tests and inspections, the Contractor shall furnish the Architect a certificate of approval from the LAHJ.

1.18 RECORD DRAWINGS

A. Keep accurate records of the deviations in work as indicated and as actually installed. Record drawings shall be kept at the project site and available for monthly review.

B. Upon completion of the work, the Contractor shall submit corrected reproducible drawings and specifications indicating deviations made in the actual installation to the contract plans.

C. When work is completed, make one complete record set of marked prints, certify the accuracy of each print by endorsement and signature thereon, and deliver same to the Architect/Engineer who will, after approval, deliver the set to the Owner. Record drawings will be revised as required by the Engineer until the Engineer accepts them as correct and accurately reflecting the project as constructed.

1.19 WARRANTY

A. This Contractor shall furnish written warranty, countersigned and guaranteed by the General Contractor, stating that the work executed under this Division of the specifications shall be free from defects of materials and workmanship for a period of 12 months from the date of final acceptance of building, except as otherwise noted in these specifications.

1.20 SCHEDULE OF VALUES

A. This Contractor shall furnish and the General Contractor shall include as a minimum the following list of items. This shall form the basis for determining the completed work as part of the Application for Payment process.

Demolition Fire Alarm System (material) Fire Alarm System (labor) Conduit, Boxes and Fittings (material) Conduit, Boxes and Fittings (labor) Lighting Fixtures (material) Lighting Fixtures (labor) Panels, Starters, Safety Switches and Transformers (material) Panels, Starters, Safety Switches and Transformers (labor) Wiring Devices (material) Wiring Devices (labor) Wire and Cable (material) Wire and Cable (labor)

1.21 TRAINING

- A. Refer to each Section of the Specification for the required Training.
- B. The Attached form shall be utilized to document the training and shall be included in the Maintenance and Operation Manuals.

PART 2 - PRODUCTS - NOT APPLICABLE

PART 3 - EXECUTION - NOT APPLICABLE



Owner Training Certification

Project:

Equipment:

Contractor Certification

The undersigned as the Contractor's authorized training agent for the above noted equipment certifies that all required and applicable training has been provided to the Owner's representative(s) per the project Contract.

Contractor Representative:______Date:_____

Owner Certification

The undersigned as the Owner's authorized agent certifies that all required and applicable training has been provided to the Owner's satisfaction.

Owner Representative:	Date:

SECTION 16050 - MATERIALS AND METHODS

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

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

1.2 SCOPE

A. Install materials in a first class and workmanlike manner and specifically, run conduit concealed throughout building, except as indicated or approved by the Architect.

1.3 REFERENCES

A. Electrical materials furnished under these specifications shall be new and listed, inspected and approved by the Underwriters' Laboratories (UL) and shall bear the UL label where labeling service is available. Where the UL labeling service is not available, the Contractor shall submit a statement from a nationally recognized, adequately equipped testing agency indicating that the items have been tested in accordance with required procedures and that the materials and equipment comply with all contract requirements.

1.4 SUBMITTALS

- A. Contractor shall submit complete schedules of material and equipment proposed for installation to the Architect within 30 days after award of the contract, in quantities as indicated in Division 1. The schedules shall include catalogs, cuts, diagrams and such other descriptive data and/or samples as indicated in the SUBMITTALS paragraph of each Section in Division 16 - ELECTRICAL. Schedules of material which consist of facsimiles or copies of facsimiles shall be unacceptable. If after expiration of the 30 day period or any extension thereof as authorized by the Architect the Contractor fails to submit a schedule of acceptable material or equipment, the Engineer reserves the right to accept no substitutions, and the Contractor may be required to submit material and equipment as specified. In the event any items of material or equipment submitted within the 30 day period fail to comply with the specification requirements, such items will be rejected and approved items shall be submitted for the items rejected. If the resubmitted material or equipment fails to comply with the specification requirements, the Contractor shall then be required to submit material and equipment as specified without additional cost to the Owner.
- B. Submittals which do not follow the following format <u>shall be rejected without review</u>. The first page of the submittal shall be a Title page, which shall indicate the Project name and Project address, the General Contractor's name, address, phone number and contact and the Electrical Contractor's name, address, phone number and contact. The second page of the submittal shall contain a Table of Contents indicating the specification section number and name, the General Contractor's stamp of approval and the Electrical Contractor's stamp of approval. Submittals shall be arranged in ascending order by specification section. Blank page dividers shall separate each section and shall be tagged with the corresponding specification section number as listed under the SHOP

DRAWINGS paragraph, Section 16010 - GENERAL PROVISIONS. The first page of each section shall contain the Electrical Contractor's stamp of approval in the lower right corner, and the remainder of the page shall be left blank which shall be used for the Engineer's review stamp and comments for that particular section. One of the submittals shall be hole-punched and placed in a 3-ring binder, which shall be retained by the Engineer. Partial submittals shall be allowed only when requested by the Contractor in writing and approved by the Engineer. The copies shall be clear and readable. Facsimile or facsimile copies shall NOT be accepted. Approved copies of all shop drawings shall be kept on the job site at all times accessible to the Architect/Engineer.

- C. Submittals that do not contain the General Contractor's <u>stamp of approval</u> shall be rejected without review.
- D. Submittal data shall include (See individual Specification Section for detail requirements), but not be limited to the following:

Identification Number Data

Equipment Rooms	
16050-1	Equipment Room layouts - See 16050 paragraph 1.4
Fuses	
16100-1	Data as required

Conduit and Fittings

16111-1	Rigid Steel	Conduit and	Fittings
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- 16111-2 IMC Conduit and Fittings
- 16111-3 EMT Conduit and Fittings
- 16111-4 PVC Conduit and Fittings
- 16111-5 FMC Conduit and Fittings
- 16111-6 Liquid Tight FMC Conduit and Fittings
- 16111-7 Supports

Wire and Cable

- 16120-1 Required data
- 16120-2 Aluminum conversion chart

Wiring Devices

- 16125-2 Device plates
- 16125-3 Weatherproof covers

Outlet Boxes

16130-1 Metallic outlet boxes and fitting

6130-3	Multi-servi	ice flush	floor	boxes.	fittings	and	covers
10130-3	Within-Servi	ice musii	11001	UUACS,	mungs	anu	covers

Panelboards

16160-1 Cat	alog dat (cabinet,	covers circuit breakers)
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16160-2 Drawing indicating detentions, location of main, branch and solid neutral and equipment ratings for voltage, amperage and short circuit. Series rating riser diagram and calculations as required.

Disconnect Switches

- 16170-1 Catalog data-Interior mounted switches
- 16170-2 Catalog data-Nema-3Rswitches
- 16170-3 Catalog data-Nema-4 stainless steelswitches
- 16170-4 Drawings indicating dimensions, equipment ratings for voltage, amperage, horsepower and short circuit.

TVSS Devices

- 16401-1 Catalog data
- 16401-2 Category C3 independent clamp voltage test results
- 16401-3 UL 1449 clamp voltage documentation

Electrical Service

- 16410-1 Service entrance conductors
- 16641-2 Service entrance conduit

Grounding

16450-1	Ground rod and clamp
16450 2	Crown d wing

16450-2 Ground wire

Lighting Controls

16520-1	Photocells
16520-2	Timeclocks

16520-3 Contactors

Exit and Emergency Lighting System

- 16610-1 AC inverter system
- 16610-2 Battery charger

Fire Alarm System

- 16720-1 Control panel/cabinet
- 16720-2 Peripheral devices
- 16720-3 Annunciator
- 16720-4 Point to point CAD drawing
- 16720-5 Batteries with calculations
- 16720-6 Construction process narrative

Fire Control Communicator

17721-1 Product data as required

1.5 SUBSTITUTIONS

- A. The name of a certain brand, make, Manufacturer or definite specification is to denote the quality standard of article desired, but does not restrict bidders to the specified brand, make, Manufacturer or specification named. Substitution of any other brand, make, or Manufacturer, which in the opinion of the Architect or Engineer, and approved by the Owner, is recognized the equal of that specified, shall be accepted, but only if submitted within the requirements of Division 1. Where three or more manufacturers are listed, the Engineer reserves the right to deny substitution. The Contractor shall make available a sample of the substituted equipment within fourteen (14) calendar days when requested by the Engineer to determine if the equipment is equal to that specified. If substitute equipment is allowed, the Contractor shall be responsible for its use and for its ability to fulfill the intended functions in the completed system, with no additional cost to the Owner.
- B. When substituted equipment is provided, the Contractor shall submit electrical equipment room/space layout drawings (drawn to scale) indicating the proposed method of installation, including all required clearances. All cost associated with such modifications shall be the responsibility of the Contractor providing the substitute equipment.
- C. When three or more Manufacturers are specified, there will be no substitution.

PART 2 - PRODUCTS

2.1 Replace or repair defective equipment and materials, or material damaged in the course of installation or tests as approved by the Architect.

PART 3 - EXECUTION

- 3.1 Material and equipment shall be properly stored and protected until installed.
- 3.2 Panelboards, safety switches shall be manufactured by the same Manufacturer. Wiring devices shall be manufactured by the same Manufacturer.
- 3.3 Provide angle iron, channel iron, rods, supports or hangers required to install or mount panelboards, or any electrical equipment called for on the plans and in the specifications, or as necessary to mount any piece of electrical equipment, material or device.
- 3.4 Conduit, fixtures or any electrical devices shall not be supported from the steel roof deck, the ceiling, or the ceiling support wires.

3.5 CLEANING

A. Remove dirt, trash, and oil from raceways, boxes, fittings, cabinets, panelboards, and switchgear.

3.6 OPERATION AND MAINTENANCE MANUALS

A. Furnish to the Architect/Engineer a copy of maintenance manuals for the electrical

equipment. After approval by the Architect/Engineer, have two copies bound in hardback, loose-leaf binders, properly identified and indexed, and turn these copies over to the Owner's representative.

B. Maintenance manuals shall include the necessary information to provide complete instructions of servicing and maintenance of the equipment installed. Manuals shall include, but are not limited to, light fixtures, electric switchgear, panelboards, transformers, starters and controllers, contactors, disconnect switches, and auxiliary systems equipment and devices. Provide a copy of each panelboard index in the maintenance manuals.

3.7 REPAIR OF EXISTING WORK

- A. Repair of existing work, demolition, and modification of existing electrical distribution systems shall be performed as follows:
 - (1.) Workmanship: Lay out work in advance. Exercise care when cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings, or other surfaces as necessary for proper installation, support, or anchorage of conduit, raceways, or other electrical work. Repair damage to buildings, piping, and equipment using skilled craftsmen of trades involved.
 - (2.) Existing Concealed Wiring to be Removed: Existing concealed wiring to be removed shall be disconnected from its source. Remove conductors; cut conduit flush with floor, underside of floor, and through walls; and seal openings.
 - (3.) Removal of Existing Electrical Distribution System: Removal of existing electrical distribution system equipment shall include equipment's associated wiring, including conductors, cables, exposed conduit, surface metal raceways, boxes, fittings, etc., back to equipment's source as indicated.
 - (4.) Maintain access and power supplied to existing electrical installations and devices which are to remain active. Modify installation or provide access panel as required.

SECTION 16100 - FUSES

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

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

1.2 SCOPE

- A. Provide a complete set of fuses for each fusible switch and disconnect switch. Fuses shall have a voltage rating of not less than the circuit voltage.
- B. Fuses shall not be installed until equipment is ready to be energized.

1.3 REFERENCES

A. The fuses shall be UL Class RK1, J, or L as applicable.

1.4 SUBMITTALS

- A. Contractor shall submit the following Shop Drawings and Submittals for review by the Architect. Submittals shall indicate conformance with the hereinbefore listed References, or provide certification of meeting those requirements.
 - (1) Catalog Data
 - (2) Time-Current Curves
 - (3) Current Limitation Curves
 - (4) Short Circuit / Selective Coordination Study (if submitting substitute equipment)
- B. Prior to the providing submittals for fuses serving equipment provided under Division 15, the Electrical Contractor is required to coordinate with the electrical requirements as outlined within the "REVIEWED" Division 15 equipment to be furnished and installed. Any electrical cost increase necessary to meet the requirements of the "REVIEWED" equipment, shall be the responsibility of the Contractor furnishing the equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Fuses shall be time delay current limiting type as manufactured by Bussmann. Should the Contractor wish to furnish substitute materials, the fuse Manufacturer shall provide a complete short circuit and selective coordination study, which shall be submitted with the Shop Drawings.

2.2 MAINS, FEEDERS, AND BRANCH CIRCUITS

A. Circuits 601 to 6000 amperes shall be protected by UL Class L current limiting Bussmann LOW-PEAK Time-Delay fuses KRP-C(amp)SP. Fuses shall hold 500% of

rated current for a minimum of four seconds, clear 20 times rated current in 0.01 seconds or less, and have an interrupting rating of 200,000 amperes RMS symmetrical.

B. Circuits 0 to 600 amperes shall be protected by Time-Delay UL Class RK1 or UL Class J current limiting Bussmann LOW-PEAK dual-element fuses LPN-RK(amp)SP/LPS-RK(amp)SP or LPJ(amp)SP. The dual-element fuses shall have separate overload and short-circuit elements. Fuses shall hold 500% of rated current for a minimum of ten seconds (30A, 250V Class RK1 case shall be a minimum of eight seconds), and have an interrupting rating of 200,000 amperes RMS symmetrical.

2.3 MOTOR CIRCUITS

The individual motor circuits with full load ampere ratings (FLA) of 400 amperes or less A. shall be protected by UL Class RK1, or Class J, dual-element time-delay Bussmann LOW-PEAK dual-element fuses LPN-RK(amp)SP/LPS-RK(amp)SP or LPJ(amp)SP. The following guidelines apply for motors protected by properly sized overload relays: fuses for motors with a marked service factor not less than 1.15 shall be installed in ratings of 125% of motor full load current (or next larger size if 125% does not correspond to a fuse size) except where high ambient temperatures prevail, or where the motor drives a heavy revolving part which cannot be brought up to speed quickly. Under such conditions the fuse may be 150% to 175% of the motor full load current. Larger H.P. motors shall be protected by Bussman LOW-PEAK Time-Delay KRP-C(amp)SP fuses of the ratings shown on the drawings. For all other motors, (such as 1.0 service factor motors) fuses shall be sized in ratings of 115% of the motor full load current (or next larger size if 115% does not correspond to a fuse size) except as noted above. The following guidelines apply where fuses are used as the only overload protection for the motor: For motors with a 1.15 service factor or more, fuses should be sized at 125% of motor full load current (or next smaller size if 125% does not correspond to a fuse size). For other motors, fuses should be sized at 115% of motor full load current (or next smaller size if 115% does not correspond to a fuse size).

2.4 MOTOR CONTROLLERS

A. NEMA and IEC Style motor controllers shall be protected from short circuits by Bussmann LOW-PEAK dual-element, time-delay fuses, to provide Type 2 coordination for the controller. This level of protection shall allow no damage to the controller, under low and high level fault conditions, as required by IEC Publication 947-4. For IEC Style controllers, the fuses shall be installed in ratings to coordinate with the overload relays, such that the relay/fuse curves crossover at 7-10 times the IEC contactor rating. The fuses shall be LPN-RK(amp)SP/LPS-RK(amp)SP or LPJ(amp)SP.

2.5 CIRCUIT BREAKER PANELS

A. Circuit breaker panels shall be protected by UL Class RK1, Class J, or Class L Bussmann LOW-PEAK fuses LPN-RK(amp)SP/LPS-RK(amp)SP, LPJ(amp)SP or KRP-C(amp)SP as shown on the drawings.

PART 3 - EXECUTION

3.1 Final tests and inspections shall be made prior to energizing the equipment. These tests shall

include a thorough cleaning, tightening, and review of the electrical connections and inspection of the grounding conductors. The Electrical Contractor shall also verify the voltage rating of the fuse is not less than the circuit voltage.

- 3.2 "LOW-PEAK YELLOW" notice labels to alert the Owner of the engineered level of protection of the electrical equipment shall be field installed by the Electrical Contractor. They shall be marked with the proper fuse rating and placed in a conspicuous location on the enclosure.
- 3.3 Upon final acceptance of the building, the Electrical Contractor shall provide the Owner with three of each type and rating of installed fuse as spare.

SECTION 16111 - CONDUIT AND FITTINGS

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specifications section, apply to this Section.

1.2 SCOPE

- A. Conduit shall be run concealed within finished walls, ceilings, and floors unless otherwise shown on the drawings. Conduit may be exposed above joist in mechanical rooms and spaces with exposed construction as approved by the Architect. Conduit sizes shown are based on use of copper conductors with THHN/THWN insulation types, unless a specific type of insulation is called for on the drawings.
- B. Conduit shall be installed as a complete system, including fittings and hangers as specified herein or as required by the NEC, and shall be continuous from outlet to outlet and from fitting to fitting, and shall be mechanically and electrically connected to all boxes, fittings, wireways, etc., and grounded in accordance with the NEC.

1.3 REFERENCES

- A. Conduit and fittings shall conform to the following:
 - (1) Rigid Steel ANSI C80.1, UL 6
 - (2) Intermediate Metal Conduit (IMC) ANSI C80.6, UL 1242
 - (3) Electrical Metallic Tubing (EMT) ANSI C80.3, UL 797
 - (4) Flexible Metal Conduit UL 1
 - (5) Liquid-Tight Flexible Metal Conduit UL 360
 - (6) Plastic Conduit (PVC) NEMA TC2, NEMA TC3, UL 651

1.4 SUBMITTALS

- A. Contractor shall submit the following Shop Drawings and Submittals listed below for review by the Architect. Submittals shall indicate conformance with the hereinbefore listed References, or provide certification of meeting those requirements.
 - (1) Conduit
 - (2) Fittings
 - (3) Supports

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Shop Drawings shall clearly indicate Manufacturer and catalog numbers of trade sizes and type of conduit, fittings and supports which will be used on the project.

2.2 CONDUIT

- A. Minimum size conduit shall be 1/2"with larger sizes as required by the NEC for number of wires contained therein.
- B. Conduit and tubing shall be hot dipped galvanized or sheradized steel, except as hereinbefore specified.
- C. Intermediate metal conduit shall be permitted in lieu of rigid where allowed in Article 345 of the NEC.
- D. Flexible conduit shall be ¹/₂" galvanized, single strip type, minimum 18 inches and a maximum 6 feet in length. In areas subject to moisture, or where called for on the drawings, flexible conduit shall have plastic covering in accordance with NEC, Article 351-A. Flexible conduit shall be used for connections to motors, dry type transformers and other equipment subject to vibration and for connections to recessed or semi-recessed fixtures.
- E. Plastic conduit shall be PVC Type EPC-40-PVC.

2.3 FITTINGS

- A. All conduits entering or leaving panelboards, cabinets, outlet boxes, pull boxes, or junction boxes shall have lock nuts and bushings, except provide insulated throat connectors on EMT sizes 1" and smaller. Rigid steel conduit shall have a lock nut installed both inside and outside of the enclosure entered. Bushings shall be installed on the ends of IMC and rigid steel conduit and EMT larger than 1". Insulating bushings shall be O.Z. Gedney Type "A" for rigid steel and IMC, and Type "B" for EMT. Conduit entering enclosures through concentric knockouts shall have grounding-type bushings with copper bond wire to enclosure.
- B. Fittings for rigid steel and IMC shall be threaded. Where rigid steel or IMC changes to EMT above slab, fittings may be threadless type. EMT fittings shall be galvanized steel, concrete-tight, set screw type.
- C. Cast metal fittings shall not be allowed for any type of conduit or cable system.
- D. Provide O.Z. Gedney Type "AX" expansion fittings where conduits cross expansion joints.
- E. Flexible conduit fittings shall be standard UL approved with ground connector. Watertight connectors shall be used with plastic covered conduit.
- F. Provide O.Z. Gedney Type "M" cable supports as required by Article 300-19 of NEC.

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PART 3 - EXECUTION

- 3.1 Conduits and tubing concealed in walls and above ceiling shall be electrical metallic tubing, and conduits in the floor shall be rigid steel. Conduits within the slab shall be minimum 3/4" rigid steel with a minimum spacing of 2 inches between parallel runs; larger sizes shall be run below the slab. Conduits run below the first floor shall be adequately supported by approved hangers supported entirely from the building structural system if the building has a crawl space or if the building has a pile foundation.
- 3.2 Exposed conduits shall be run parallel or perpendicular to building walls and shall be supported as hereinafter specified and in accordance with NEC.
- 3.3 Conduits run outside of building perimeter shall be minimum 3/4 inch and buried a minimum of 24" below finished grade. Conduits run below slab on grade shall be minimum 3/4 inch and buried a minimum as specified in Table 300-5 of the NEC. Provide any extensions required to ensure conduits are protected below slab. These conduits shall be rigid non-metallic polyvinylchloride conduit, minimum Schedule 40, unless a specific type of conduit is specified or indicated on the drawings. Schedule 40 nonmetallic PVC conduit shall be changed to Schedule 80 non-metallic PVC conduit when passing through the floor slab and remain Schedule 80 up to the first Electrical box. The first two masonry block courses shall be grouted where conduits pass through the slab. Fiber duct shall not be allowed.
- 3.4 Metallic conduits shall be securely fastened in place at intervals not greater than 10 feet and nonmettalic conduits shall be securely fastened at intervals not greater than 3 feet. Conduits shall be securely fastened in place within 3 feet of boxes, cabinets, and fittings, with approved pipe straps, wall brackets, conduit clamps, conduit hangers, threaded C-clamps, or ceiling trapeze. C-clamps or beam clamps shall have strap or rod-type retainers. Contractor shall coordinate loads and supports with the General Contractor in order to prevent damage or deformation to the supporting structure, but no loads shall be supported from metal roof decks, from lay-in ceiling grid or run tight against metal roof decks.
- 3.5 Fastenings shall be by wood screws or screw-type nails to wood, by toggle bolts on hollow masonry units, by expansion bolts on concrete or brick, and by machine screws, welded threaded studs, heat-treated or spring-steel-tension clamps on steel work. Nail-type nylon anchors or threaded studs driven in by powder charge and provided with lock washers and nuts may be used in lieu of expansion bolts or machine screws. Raceways or pipe straps shall not be welded to steel structures. In partitions of light steel construction, sheet-metal screws may be used. Conduit shall not be supported using any type of wire or nylon ties.
- 3.6 Metal conduits installed in earth shall be field painted with two coats bitumastic paint prior to installation in the ductbank, trench or earth.
- 3.7 Conduits passing through exterior concrete walls, floors or footings below grade shall be made watertight. Provide O.Z. Gedney Type "FSK" conduit entrance seals. Provide conduit sealing bushings O.Z. Gedney Type "CSB" or "CSBG" series as applicable and provide with cabinet

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adapter plate when required.

- 3.8 Conduits and cables passing through fire rated walls and/or floors shall be sealed by approved methods, or by installing O.Z. Gedney fire-seal Type "CFSI" or "CFSF" series as applicable to maintain UL classified fire rating.
- 3.9 All empty conduits shall contain a plastic pullwire.
- 3.10 Conduits passing through roofs shall be sealed by approved methods of the Roof Manufacturer to maintain the integrity of the roof.
- 3.11 Conduits installed above grade in damp or wet locations shall be rigid galvanized steel.

SECTION 16120 - WIRE AND CABLE

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

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

1.2 SCOPE

A. Feeder and branch circuit wire and cable shall be intended for lighting and power circuits at 600 volts in residential, commercial and industrial buildings. The wire shall be operated at a minimum of 75^oC in wet or dry locations and shall be listed by UL for use in accordance with Article 310 of the NEC.

1.3 REFERENCES

- A. Wire and cable shall conform to the following:
 - (1) Type THW UL 83, Fed. Spec. J-C-30B
 - (2) Type THWN/THHN UL 83, Fed. Spec. J-C-30B
 - (3) Type XHHW-2 UL 44, Fed. Spec. J-C-30B
 - (4) Type USE-2 UL 854, UL 44, Fed. Spec. J-C-30B

1.4 SUBMITTALS

- A. Contractor shall submit the following Shop Drawings and Submittals listed below for review by the Architect. Submittals shall indicate conformance with the hereinbefore listed References, or provide certification of meeting those requirements.
 - (1) Wire and cable

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Shop Drawings shall clearly indicate Manufacturer, catalog numbers, trade sizes and type of wire and cable which will be used on the project.
- 2.2 TYPE THW
 - A. Conductors shall be solid or Class B stranded, annealed uncoated copper per UL 83.
 - B. Each conductor shall be insulated with PVC complying with the physical and electrical requirements of UL 83. In addition, the PVC insulation shall comply with the optional Oil Resistant I listing of UL 83.
 - C. The average thickness of insulation, for a given conductor size, shall be as specified in UL 83. The minimum thickness at any point shall not be less than 90% of the specified

average thickness. The insulation shall be applied tightly to the conductor and shall be free-stripping.

2.3 TYPE THWN/THHN

- A. Conductors shall be solid or Class B stranded, annealed uncoated copper per UL 83.
- B. Each conductor shall be insulated with PVC and sheathed with nylon complying with requirements of UL 83. In addition, the PVC insulation shall comply with the optional Oil Resistant II rating of UL 83, and shall comply with UL requirements for 105 degrees Centigrade Appliance Wiring material.
- C. The average thickness of PVC insulation, for a given conductor size, shall be as specified in UL 83. The minimum thickness at any point of the PVC insulation shall not be less than 90% of the specified average thickness. The minimum thickness at any point of the nylon sheath, shall be as specified in UL 83 for Types THWN or THHN. The insulation shall be applied tightly to the conductor and shall be free-stripping.

2.4 TYPE XHHW-2

- A. Conductors shall be solid or Class B stranded, annealed uncoated copper per UL 44.
- B. Each conductor shall be insulated with a crosslinked polyethylene complying with the physical and electrical requirements of UL 44.
- C. The average thickness of insulation, for a given conductor size, shall be as specified in UL 44. The minimum thickness at any point shall not be less than 90% of the specified average thickness. The insulation shall be applied tightly to the conductor and shall be free-stripping.

2.5 TYPE USE-2

- A. Conductors shall be solid or Class B stranded, annealed uncoated copper per UL 854 and UL 44.
- B. Each conductor shall be insulated with a crosslinked polyethylene complying with the physical and electrical requirements of UL 854.
- C. The average thickness of insulation, for a given conductor size, shall be as specified in UL 44. The minimum thickness at any point shall not be less than 90% of the specified average thickness. The insulation shall be applied tightly to the conductor and shall be free-stripping.

2.6 IDENTIFICATION

A. All insulated conductors shall be new and the outer covering shall be marked with the name and trademark of the Manufacturer, the voltage, insulation type, conductor size, and shall be tagged showing UL acceptance.

PART 3 - EXECUTION

- 3.1 Wire and cable shall be installed in conduit, unless otherwise indicated.
- 3.2 Wires No. 10 and 12 shall be connected with coil spring insert "Wire-Nut" or "Wing-Nut" connectors manufactured by Ideal Industries or 3M Company. Wires No. 8 and larger shall be joined or terminated with 600 volt pressure type copper connectors.
- 3.3 Wire shall be color coded as follows, and each circuit conductor of the same color shall be connected to the same ungrounded feeder conductor throughout the installation. Phase tape shall not be permitted for wires No. 2 and smaller. Other conductors shall be of other colors.

120/208 Volt System

Phase ABlackPhase BRedPhase CBlueNeutralWhiteGroundGreen

- 3.4 Electrical designs are based on copper wire and cable. Aluminum wire and cable shall be permitted to be used for panel feeders 250 kcmil and larger only. If at the option of the Contractor, aluminum is selected the equivalent ampacity aluminum conductor and corresponding conduit sizes shall be provided.
- [3.5 Should the Contractor elect to use aluminum, he shall submit for approval during the Shop Drawing review a tabulated list indicating feeder conductor and conduit sizes, sizes of protective devices and current carrying capacity of aluminum conductors.
- 3.6 Should the Contractor elect to exercise the aluminum option, it shall be the Contractor's responsibility to insure switchboards, panelboards, disconnect switches, junction boxes and applicable equipment is of sufficient size to accommodate aluminum connectors and increased conduit sizes. The Contractor shall also insure that the building construction will accommodate the increased sized equipment.
- 3.7 Should the Contractor elect to use the aluminum option as outlined above, aluminum terminations shall be made with compression type connectors in accordance with the following:
 - A. Terminations under set-screw lugs in panelboards, disconnect switches, etc., shall be made with Burndy "Hyplug" plug type compression sleeve connectors.
 - B. In-line conductor splices shall be made with two-way compression connectors.
 - C. Bolt stud connections shall be made with one-hole spade compression lugs.
 - D. Aluminum conductors shall be coated with an approved oxide-inhibiting compound before any terminations are made.
 - E. The use of wing-nuts and aluminum conductors terminating under set screw type connectors shall not be permitted.

F. Compression connections shall be made with a tool specifically approved for the use and connector being used and shall be in accordance with the Manufacturer's recommendations.

SECTION 16125 - WIRING DEVICES

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

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

1.2 SCOPE

A. Provide wiring devices complete with required adapters, wall plates, screws and device rings.

1.3 REFERENCES

- A. Wiring devices and device plates shall conform to the following:
 - (1) AC Wall Switches Fed. Spec. WS-896E, UL 20, NEMA WD-1
 - (2) Duplex and Single Receptacles Fed. Spec. WC-596F, UL 498, NEMA WD-1, NEMA WD-6
 - (3) GFCI Receptacles UL 943 Class A, UL 498, NEMA WD-1, NEMA WD-6
 - (4) Isolated Ground Receptacles UL 498, NEMA WD-1
 - (5) Hospital Grade Receptacles UL 498, UL 544, UL 943, NEMA WD-1
 - (6) Device Plates UL-514
 - (7) Weatherproof Covers UL Listed (UL File #E-18897, NEMA 3R, NEC 410-57(b)

1.4 SUBMITTALS

- A. Contractor shall submit the following Shop Drawings and Submittals listed below for review by the Architect. Submittals shall indicate conformance with the hereinbefore listed References, or provide certification of meeting those requirements.
 - (1) Wiring devices
 - (2) Device plates
 - (3) Weatherproof cover

PART 2 - PRODUCTS

- 2.1 MANUFACTURERS
 - A. Wiring devices provided on this project shall be by the same Manufacturer and shall be as manufactured by Bryant.

2.2 INDUSTRIAL SPECIFICATION GRADE DEVICES

A. Ground fault interrupter receptacles shall be molded of impact-resistant thermoplastic material, 20 ampere, 125 volt, 2 pole, 3 wire, and with NEMA 5-20R configuration. Color shall be as selected by the Architect. The receptacles shall incorporate design to

be sensitive to fault currents as low as 5 milliamperes from no-load to full-rated load, and a disconnect speed of 0.025 seconds (25 milliseconds). The receptacles shall be capable of withstanding voltage transients of 6000 volts in a ringwave configuration. Silver alloy contacts shall be required for maximum conductivity. Units shall be UL listed Hospital Grade receptacle construction where required. The device shall have dual slot terminal and installation screws and the capability of feed-through GFCI protection to other receptacles on the same circuit when connected in that configuration.

- (1) GFCI Receptacle
- (2) Hospital Grade GFCI Receptacle
- B. Isolated ground grounding type receptacles shall be 20 ampere, 125 volt, 2 pole, 3 wire, and orange color with NEMA 5-20R configuration. The receptacles shall have a smooth face molded of high-impact thermoplastic nylon. The grounding system shall include an isolated ground circuit with insulated green color steel screw and brass grounding contact mounted in isolated ground shunt. The zinc-plated steel mounted strap with riveted self-grounding clip shall be insulated from the ground contact.
 - (1) Isolated Ground Receptacles)
- C. Special devices shall be indicated on the drawings.

2.3 COMMERCIAL GRADE WIRING DEVICES

- A. A.C. switches shall be single pole, double pole, three way and/or four way as shown on the drawings, back and side wiring, 20 ampere, 120/277 volts. Color shall be selected by the Architect . Switches shall have one piece, copper alloy, rivotless contact arms and silver cadmium oxide contacts. Switch toggle shall be nylon, and have an insulation barrier between interior and yoke. Terminals shall be clamp-type, back and side wired with provision for two solid or stranded wires. One-piece yoke shall be heavy duty steel, zinc plated to resist corrosion, with an integral grounding clip and green grounding screw.
- (1) Single pole switch
 - (2) Two pole switch
 - (3) Three way switch
 - (4) Four way switch
- B. Duplex grounding type receptacles shall be nylon, 20 ampere, 125 volts, 2 pole, 3 wire, and with NEMA 5-20R configuration. <u>Color shall be selected by the Architect</u>. Receptacles shall have a wrap around, full face design, constructed of nylon to resist physical abuse and chemical attack. Yoke shall be heavy duty steel, wrapped around the device and locked in place, zinc plated to resist corrosion. Grounding system shall consist of high performance copper alloy, consisting of double wipe contacts, green terminal screw and grounding strap. Line contacts shall be one-piece, triple wipe, high performance copper alloy with clamp-type terminals, for side wiring, stranded or solid wire.
 - (1) Duplex receptacles

C. Special devices shall be as indicated on the drawings.

2.4 DEVICE PLATES

A. Unless otherwise shown on the drawings or herein specified, all plates for wiring devices shall be 0.032" thick stainless steel, satin finish on unfinished walls and smooth nylon on finished walls, as manufactured to suit devices. Color shall be selected by the Architect . Screws shall be metal with countersunk heads, in a color to match the finish of the plate. One piece type device plates shall be provided for all outlets and fittings. Sectional type device plates shall not be allowed.

2.5 OUTDOOR RECEPTACLE COVER

- A. Outdoor receptacle enclosure shall comply with NEC Article 410-57(b) and shall be clearly marked "suitable for wet locations while in use". There shall be a gasket between the enclosure and the mounting surface, and between the cover and base to assure proper seal. Outdoor enclosures shall be lockable where the receptacle is accessible to the public.
 - (1) Outdoor receptacle enclosure
 - (2) Rooftop receptacle enclosure

PART 3 - EXECUTION

- 3.1 Install wiring devices in accordance with the NEC. Device plates shall be installed with all four edges in continuous contact with finished wall surfaces without the use of mats or similar devices. Plaster fillings shall not be allowed. Plates shall be installed with an alignment tolerance of 1/16 inch.
- 3.2 Location of wiring devices shall be as indicated on drawings or as directed in field where specific requirements for location are required. Contractor shall verify location of special devices prior to roughing in.
- 3.3 Mounting heights of devices as shown on the drawings shall be from finished floor to the center of the outlet box or device, unless otherwise noted.
- 3.4 Receptacles occurring in outside walls, wet areas or areas designed for wash down such as kitchens and can wash areas shall be GFCI type.
- 3.5 Test each GFCI receptacle for proper polarity and proper operation in accordance with Manufacturer's instructions.
- 3.6 Provide blank device plates for telephone, intercommunication, data and television outlets, unless otherwise indicated.

SECTION 16130 - OUTLET BOXES

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

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

1.2 SCOPE

- A. Fixture outlets, receptacles, switches, devices, etc., requiring outlet boxes shall have steel outlet boxes as required, constructed as required by NEC and installed as indicated.
- B. Special care shall be exercised in the location of the outlet and junction boxes in order that the hanging or recessing of light fixtures will not be obstructed by the piping or ductwork installed by other trades. To this end, the work shall be coordinated with representatives of the other trades involved and by reference to the Mechanical, Plumbing, Structural, and Architectural drawings.

1.3 REFERENCES

- A. Outlet boxes shall conform to the following:
 - (1) Metallic Boxes NEMA OS1, UL 514A
 - (1) Multiservice Flush Floor Box

1.4 SUBMITTALS

- A. Contractor shall submit the following Shop Drawings and Submittals listed below for review by the Architect. Submittals shall indicate conformance with the hereinbefore listed References, or provide certification of meeting those requirements.
 - (1) Outlet boxes
 - (2) Fittings

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Shop Drawings shall clearly indicate Manufacturer, catalog numbers, trade sizes and type of outlet boxes which will be used on the project.

2.2 OUTLET BOXES

A. Outlet boxes shall be hot dipped galvanized steel type with standard knock-outs as required for conduit termination. Minimum size of outlet box shall be 4" square, 1-1/2" deep, and shall be increased in dimensions to accommodate conductors and devices as required by the NEC, and as indicated. Outlet boxes for exposed tile and block shall be provided with square cornered tile ring, size as required. Outlet boxes shall not be

installed back-to-back in any wall and thru-the-wall boxes shall not be used.

- B. Location of the outlets for lighting, devices, power, and equipment are shown on the drawings. Due to the small scale of the drawings, it is not possible to indicated the exact location. The Contractor shall examine the Architectural, Structural, Plumbing and Mechanical drawings and finish conditions and arrange his work as may be required to meet such conditions.
- C. The Contractor shall verify the exact swing of doors and locations of built-in cabinetry prior to installing outlets for switches and receptacles. The Contractor shall also coordinate outlets with change orders, addendums, and job site differences.
- D. Shallow outlet boxes may be employed where construction prohibits use of 4" square, 1-1/2" deep box specified above.
- E. Multiservice Flush Floor Box: Concrete Tight Steel Box For Pours of 2-7/16" or greater
 - (1) Box must have (2) 1/2" and (2) 3/4" knockouts per side and (1) 1/2" and (1) 3/4" knockouts per end.
 - (2) Box must have (3) 1/2", (1) 3/4", and (1) 1-1/4" knockouts located on the bottom.
 - (3) Flange provided on ends of box for nailing box to form.
 - (4) Box must be available with choice of brass or polycarbonate activation.
 - (5) Capacity must be 82.5 cubic inches total or split into two compartments of 43.8 and 38.6 cubic inches.
 - (6) Box partition to be removable.
 - (7) Floorbox to be fully adjustable and UL listed.

PART 3 - EXECUTION

- 3.1 Check door swings and built-in equipment and cabinetry prior to roughing-in boxes for switches and receptacles.
- 3.2 Mounting heights of outlets in tile or unplastered masonry shall be varied plus or minus to the nearest block joint. Outlet boxes in the same space shall be installed at the same height above finished floor.
- 3.3 Contractor shall check location of all wall outlets to verify that the outlet will clear any wall fixtures, shelving, work tables, etc. that will be installed prior to roughing-in conduit. If discrepancies are noted, contact the Architect/Engineer before proceeding.
- 3.4 Outlet boxes occurring in finished outside walls, wet areas or areas designed for wash down such as kitchens and can wash areas, shall be cast and provided with gaskets between box and waterproof cover.
- 3.5 Ceiling and bracket outlets shall be boxes suitably supported by headers and 3/8" fixture stud for supporting fixtures as required. In areas of exposed steel beams, fixture shall be supported by steel channel as required. Fixtures weighing over 20 pounds shall be supported independently of box.

- 3.6 Outlet boxes in finished areas shall be flush mounted with raised plaster rings suitable to accommodate device and hold it flush with finish wall line. Surface outlets requiring device plates shall be provided with raised covers serving both purposes. Blanked outlets and junction boxes shall be provided with flush blank covers.
- 3.7 Outlet boxes that are surface mounted on finished walls shall be of the cast type with hub sizes and number as required.
- 3.8 Junction and pull boxes shall be installed where indicated or necessary for installation of the electrical system. Junction or pull boxes not over 100 cubic inches in volume shall be standard outlet boxes. Junction boxes over 100 cubic inches in volume shall be constructed in accordance with the requirements of the NEC. Junction boxes shall have covers and be accessible after completion of the building. Where several feeders pass through a common pull box or junction box, the feeders shall be tagged to indicate clearly their electrical characteristics, circuit number, and panel designation. Paint same information on cover of the box.

SECTION 16160 - PANELBOARDS

PART 1 – GENERAL

1.1 GENERAL CONDITIONS

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

1.2 SCOPE

A. Panelboards shall be circuit breaker type conforming to the latest NEMA standards and shall bear UL label. Panels shall be flush or surface mounted as indicated, and shall have a minimum 20" wide enclosure. A directory, completely typed to identify circuits, with transparent protector shall be provided in each panel.

1.3 REFERENCES

- A. The panelboard(s) and circuit breaker(s) shall be designed and manufactured according to the latest revision of the following specifications:
 - (1) Panelboards NEMA PB 1.1, UL 67
 - (2) Molded Case Circuit Breakers NEMA AB 1, Fed. Spec. W-C-375
 - (3) Boxes and Cabinets UL 50

1.4 SUBMITTALS

- A. Contractor shall submit the following Shop Drawings and Submittals listed below for review by the Architect. Submittals shall indicate conformance with the hereinbefore listed References, or provide certification of meeting those requirements.
 - (1) Catalog Data
 - (2) Detailed drawings indicating dimensions, location of the main, branches and solid neutral, and equipment ratings for voltage, amperage and short circuit. Provide series rating riser diagram and calculations if utilizing series rated equipment.
- B. Prior to the providing submittals for panels and/or circuit breakers serving equipment provided under Division 15, the Electrical Contractor is required to coordinate with the electrical requirements as outlined within the "REVIEWED" Division 15 equipment to be furnished and installed. Any electrical cost increase necessary to meet the requirements of the "REVIEWED" equipment, shall be the responsibility of the Contractor furnishing the equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Panelboards shall be as manufactured by Square D. Panelboards manufactured by Cutler-Hammer or General Electric shall be considered equal.

2.2 PANELBOARD TYPE

A. Panelboards rated 240 volts AC shall be Square D, Type "NQOD", "NEHB", or "I-Line" as required. Minimum short circuit rating shall be as indicated on the schedules.

2.3 PANELBOARD INTERIOR

- A. Provide one continuous bus bar per phase. Each bus bar shall be suitable for plug-on or bolt-on circuit breakers. Bussing rated 100-400 amps shall be aluminum, all other bussing shall be copper. Panelboards shall be suitable for use as Service Equipment when application complies with UL 67 and NEC 230-F and 230-G.
- B. Current carrying parts shall be insulated from ground and phase-to-phase.
- C. Split solid neutral shall be plated and located in the mains compartment up to 225 amps, so all incoming neutral cables may be the same length.
- D. Interior trim shall be of dead-front construction with preformed twistouts covering unused mounting space.
- E. Metal nameplates shall be secured to dead-front with rivets or screws. Sticker or foil nameplates are not acceptable. Interior wiring diagram, neutral wiring diagram, UL label and short circuit current rating shall be displayed on the interior.
- F. Interiors shall be field convertible for top or bottom incoming feed. Interior leveling provisions shall be provided for flush mounted applications.

2.4 MAIN CIRCUIT BREAKER

- A. Molded case circuit breakers shall have an overcenter, trip-free, toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have a permanent trip unit with thermal and magnetic trip elements in each pole.
- B. Two and three pole circuit breakers shall have an internal trip crossbar to provide simultaneous tripping. Circuit breakers shall have a push-to-trip button for maintenance and testing purposes.
- C. Breaker handle and faceplate shall indicate rated ampacity. Standard construction circuit breakers shall be UL listed for reverse connection without restrictive line or load markings.
- D. Circuit breaker escutcheon shall have standard ON/OFF markings. Circuit breaker handle accessories shall provide provisions for locking handle in the "ON" or "OFF" position.
- E. Lugs shall be UL listed to accept solid or stranded copper and aluminum conductors. Lugs shall be suitable for 75 degree C rated wire and shall be bolted in place.
- F. The breakers shall be UL listed for use with the following accessories: Shunt Trip,

Ground Fault Shunt Trip, Mechanical Lug Kits, and Compression Lug Kits.

2.5 BRANCH CIRCUIT BREAKERS

- A. Branch circuit breakers shall be UL listed with amperage ratings, interrupting ratings, and number of poles as indicated on the schedules. Breakers shall have bolt-on type bus connectors.
- B. Circuit breakers shall have an overcenter toggle mechanism which will provide quickmake, quick-break contact action. Circuit breakers shall have thermal and magnetic trip elements in each pole. Two and three pole circuit breakers shall have an internal common trip crossbar to provide simultaneous tripping.
- C. Single pole 15 and 20 ampere circuit breakers intended to switch fluorescent lighting loads at the panel shall have the SWD marking and shall have lockable provisions.
- D. Two and three pole circuit breakers 15-60 amperes intended for use with air conditioning, heating and refrigeration equipment having motor group combinations and marked as such shall have the HACR marking.
- E. Provide UL Class A ground fault interrupter circuit breakers where scheduled on the drawings.
- F. The exposed faceplates of all branch circuit breakers shall be flush with one another.
- G. Lugs shall be UL listed to accept solid or stranded [copper and aluminum conductors] [copper conductors only]. Lugs shall be suitable for 75 degree C wire.
- H. Breakers shall be UL listed for use with the following factory installed accessories: Shunt Trip, Auxiliary Switch, Alarm Switch.

2.6 NEMA TYPE 1 ENCLOSURES

- A. Boxes shall be galvanized steel constructed in accordance with UL 50 requirements. Boxes shall have removable end walls with knockouts located on one end, and welded interior mounting studs. Box width shall be 20" wide minimum.
- B. Trim front steel shall meet requirements of UL 50. Trim fronts shall be 1-piece with door, and mounting shall be as indicated on the schedules.
- C. Panelboards rated 225 amps and below shall have concealed door hinges and trim screws. Front is not removable with the door locked. Panelboards rated above 225 amps shall have fronts with trim clamps and concealed door hinges. Trim front doors shall have rounded corners and edges shall be free of burrs.
- D. Front shall have cylindrical tumbler lock with catch and spring loaded stainless steel door pull. All lock assemblies shall be keyed alike. Two (2) keys shall be provided with each lock. A clear plastic directory card holder shall be mounted on the inside of the door.

PART 3 - EXECUTION

- 3.1 Install panelboards in accordance with Manufacturer's written instructions, NEMA PB 1.1 and NEC standards.
- 3.2 Panelboards shall be allowed to be series rated in developing the overall power distribution system, unless otherwise noted on the drawings. Submit riser diagrams and calculations indicating the series rating and conformance with the NEC.
- 3.3 Breaker arrangement shall be as detailed on the plans. Check tightness of bolted connections, and circuit breaker connections using calibrated torque wrench or torque screwdriver per Manufacturer's written specifications.
- 3.4 Room numbers and names shown on the drawings are Architectural designations for identification only during the construction phase. Typed panel directories shall indicate the room numbers and names and connected equipment for each circuit, with the actual room numbers or names assigned by the Owner and/or as designated by the Architect.

SECTION 16170 - DISCONNECT SWITCHES

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

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

1.2 SCOPE

A. Disconnect switches shall be rated 240 or 600 volts as required with number of poles and current rating as indicated. Switches shall be fused type where indicated and shall conform to applicable NEMA standards.

1.3 REFERENCES

- A. The disconnect switches shall be designed and manufactured according to the latest revision of the following specifications:
 - (1) Enclosed and Dead Front Switches UL 98, NEMA KS1
 - (2) Enclosures for Electrical Equipment NEMA 250

1.4 SUBMITTALS

- A. Contractor shall submit the following Shop Drawings and Submittals listed below for review by the Architect. Submittals shall indicate conformance with the hereinbefore listed References, or provide certification of meeting those requirements.
 - (1) Catalog Data
 - (2) Detailed drawings indicating dimensions, and equipment ratings for voltage, amperage, horsepower and short circuit.
- B. Prior to the providing submittals for disconnect switches serving equipment provided under Division 15, the Electrical Contractor is required to coordinate with the electrical requirements as outlined within the "REVIEWED" Division 15 equipment to be furnished and installed. Any electrical cost increase necessary to meet the requirements of the "REVIEWED" equipment, shall be the responsibility of the Contractor furnishing the equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Disconnect switches shall be as manufactured by Square D. Disconnect switches manufactured by Cutler-Hammer or General Electric shall be considered equal.

2.2 SWITCH INTERIOR

- A. Switches shall have switch blades which are visible when the switch is off and the cover is open. All current carrying parts shall be plated to resist corrosion.
- B. General duty switch lugs shall be UL listed for 60 degree C or 75 degree C conductors (30-100 amps), and 75 degree C conductors (200-800 amps).
- C. Heavy duty switch lugs shall be front removable and UL listed for 60 degree C or 75 degree C conductors (30-100 amps), 75 degree C conductors (200-1200 amps), aluminum or copper conductors. Switches shall have removable arc suppressors to facilitate easy access to line side lugs.

2.3 SWITCH MECHANISM

- A. Switch operating mechanism shall be quick-make, quick-break such that, during normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing or opening action of the contacts has started.
- B. The operating handle shall be an integral part of the box, not the cover. Provisions shall be provided for padlocking the switch in the OFF position.
- C. Heavy duty switches shall have a dual cover interlock mechanism to prevent unintentional opening of the switch cover when the switch is ON and prevent turning the switch ON when the cover is open. The cover interlock mechanism shall have an externally operated override but the override shall not permanently disable the interlock mechanism. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

2.4 SWITCH ENCLOSURES

- A. The enclosure shall be finished with gray baked enamel paint which is electrodeposited on cleaned, phosphate pre-treated steel.
- B. Heavy duty switches shall have covers attached with welded pin-type hinges, with ON and OFF markings stamped into the covers, and a dual colored, red/black position indicator.
- C. Enclosures installed in exterior locations shall be NEMA 3R.

2.5 SWITCH RATING

A. The UL short circuit current rating of the switches shall be 200,000 rms symmetrical amps when used with or protected by Class R fuses (30-600 amp switches employing appropriated fuse rejection hardware).

PART 3 - EXECUTION

3.1 Provide NEMA type "GD" or "HD" switches as required. Main disconnect switches, switches rated 600 volts and all fused switches shall be NEMA Type "HD" unless otherwise indicated with Class "R" fuse clips.

- 3.2 Switches shall be horsepower rated when used for motor disconnect means and shall be provided as required by NEC whether indicated or not.
- 3.3 Fused switches shall be provided complete with fuses.
- 3.4 Switches used as service entrance equipment shall be listed and labeled as "Suitable for Use as Service Equipment".
- 3.5 Switches shall be securely mounted to wall, structure or equipment. Provide miscellaneous accessories for mounting switches, including steel angles where required.

SECTION 16410 - ELECTRICAL SERVICE

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

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

1.2 SCOPE

A. Electrical service shall be as indicated on the drawings and as specified herein. All service work shall conform to the NEC, and the Contractor shall contact the Power Company for coordination prior to commencing any service work.

1.3 REFERENCES

- A. The electrical service shall be designed and installed according to the latest revision of the following specifications:
 - (1) Virginia Power Requirements for Electric Service (Blue Book) 2003
 - (2) Conduit shall be specified under Section 16111 CONDUIT AND FITTINGS.
 - (3) Conductors shall be specified under Section 16120 WIRE AND CABLE.

1.4 SUBMITTALS

- A. Contractor shall submit the following Shop Drawings and Submittals listed below for review by the Architect. Submittals shall indicate conformance with the hereinbefore listed References, or provide certification of meeting those requirements.
 - (1) Service entrance conductors
 - (2) Service entrance conduit

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Shop Drawings shall clearly indicate Manufacturer, catalog numbers and trade sizes of service entrance conductors and conduit which will be used on the project.
- B. Electrical service equipment and panelboards shall be by same equipment Manufacturer.

PART 3 - EXECUTION

- 3.1 Arrangement shall be as indicated and as required by the Power Company, including exact point of service and requirements of metering, etc.
- 3.2 Verify complete electrical service installation with the Power Company before commencing any work.

- 3.3 Make application with the Power Company for electric service in a manner to permit the Power Company to provide service prior to completion of work under this contract.
- 3.4 Complete and file all forms required by the Power Company in connection with application for electric services. This shall include a load letter based on the connected load schedule provided on the drawings.
- 3.5 Provide all on-site trenching and backfilling required for installation of electric service. Verify size and routing of trenches with Power Company prior to start of construction.
- 3.6 Provide sealable meter compartment, where required, for metering by electric Power Company. Install metering transformers, revenue meter and other devices furnished by Power Company. Furnish and install interconnecting raceway and conductors between metering transformers and revenue meter. Install all equipment in accordance with the Power Company's requirements.
- 3.7 Provide conduits under paved areas for Power Company use. Verify size and locations with Power Company prior to start of construction.
- 3.8 Provide underground raceways and conductors from Power Company transformer to main service equipment.
- 3.9 Make application with the Power Company for temporary service and pay any associated fees to permit the Power Company to provide temporary service.

SECTION 16450 - GROUNDING

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

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

1.2 SCOPE

A. Provide grounding for service, conduits, motor frames, metal casings, wiring devices, solid neutral, etc. and as required by NEC as a minimum. Resistance to ground shall not exceed 25 ohms.

PART 2 - PRODUCTS

2.1 GROUND WIRE

A. A green insulated ground wire, sized per NEC shall be installed in all conduits, junction and pull boxes.

2.2 GROUND ROD

A. Provide a 3/4" diameter x 10'-0" long copper clad ground rod.

PART 3 - EXECUTION

- 3.1 Grounding conductors shall be connected to the panelboard equipment ground bus and not to the panelboard neutral bus. Grounding bushings shall also be connected to the ground bus. The neutral bus shall have only the system neutral wire connected thereto.
- 3.2 Provide a bonding wire sized per NEC 250-66 between the equipment ground bus and the neutral bus in the main distribution equipment only, thus the grounding system (conduit, cabinets, enclosures, grounding conductors, etc.) and the grounded system (neutral conductors and service equipment ground) shall be a separate and independent system except at the main distribution equipment.
- 3.3 Provide a grounding electrode conductor sized per NEC Table 250-66 from the service entrance grounded conductor to the interior metal water-pipe system, and supplement this connection by bonding to the grounded building steel, the reinforcing bars in footings or foundation, and the driven ground rod, as applicable.
- 3.4 Install ground rod below ground outside of the building. Bond a grounding wire to the rod and connect to the equipment ground bus of the service entrance panel.

3.5 Provide a bonding electrode conductor sized per NEC table 250-66 from the service entrance grounded conductor to the metal gas piping and any other piping systems per NEC 250-104.
 END OF SECTION 16450

SECTION 16500 - LIGHTING FIXTURES

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

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

1.2 SCOPE

A. Lighting fixtures shall be provided complete with lamps, mounting hardware, accessories, etc., and shall be approved before installation. Lamps shall meet the requirements of the Energy Policy Act of 1992.

1.3 REFERENCES

- A. Lighting fixtures, ballasts and lamps shall conform to the following:
 - (1) Incandescent Lighting Fixtures UL 1571, NEMA LE 4
 - (2) Fluorescent Lighting Fixtures UL 1570, NEMA LE 4
 - (3) Lampholders for Fluorescent Lamps UL 542
 - (4) Electronic Ballasts for Fluorescent Lamps ANSI C82.11, ANSI C62.41, FCC
 Part 18 (Class A) for EMI and RFI, UL listed (Class P, Type 1, Outdoor)
 - (5) Ballasts for Fluorescent Lamps ANSI C82.1, UL 935
 - (6) HID Lighting Fixtures UL 1572, NEMA LE 4
 - (7) Ballasts for HID Lamps ANSI C82.4, UL 1029
 - (8) Emergency Lighting & Power Equipment UL 924
 - (9) Fixtures in Hazardous Locations UL 844

1.4 SUBMITTALS

- A. Contractor shall submit the following Shop Drawings and Submittals listed below for review by the Architect. Submittals shall indicate conformance with the hereinbefore listed References, or provide certification of meeting those requirements.
 - (1) Lighting Fixtures
 - (2) Photometric reports based on I.E.S. testing procedures
 - (3) Coefficient of Utilization Tables
 - (4) Lamps
 - (5) Ballasts and Warranty Information

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Fixtures indicated shall be UL approved for the particular installation. Fixture types shown on the drawings are indicative of the general type desired and are not intended to restrict selection to fixtures of any particular manufacturer. Fixtures of similar designs and equivalent energy efficiency, light-distribution and brightness characteristics, and of

equal finish and quality will be acceptable if approved.

- B. Shop Drawings shall clearly indicate lighting fixture Manufacturer, catalog numbers, type and number of lamps, operating voltage, type of mounting and any required options as indicated on the drawings and in the schedules.
- C. Lamps shall be as manufactured by General Electric, type as indicated on the schedules. Lamps manufactured by OSRAM-Sylvania or Phillips shall be considered equal.
- D. Electronic ballasts shall be Triad Octic type as manufactured by MagneTek. Ballasts manufactured by Advance, Motorola or Valmont shall be considered equal.

2.2 INCANDESCENT FIXTURES

A. Recessed incandescent fixtures shall have thermal protection in accordance with NEC.

2.3 FLUORESCENT FIXTURES

- A. Fluorescent fixtures shall be constructed so as to limit the ballast case temperature to 90 degrees Celsius, when installed in an ambient temperature of 104 degrees Fahrenheit.
- B. Fluorescent fixtures on the exterior of the building or in unheated spaces shall be provided with zero degree low temperature ballasts.

2.4 HID FIXTURES

A. Recessed HID fixtures shall be thermally protected and shall be so identified. Where fixtures, whether recessed or otherwise, are operated by remote ballasts, the ballasts shall also be thermally protected.

2.5 LAMPS

- A. Incandescent lamps shall be for 125 volt operation, unless otherwise indicated. Lamp types shall be as indicated in the lighting fixture schedule.
- B. T12 fluorescent lamps shall be of the energy-saving, rapid start type with a color temperature of 3500 degrees Kelvin. Full wattage T12 (40W, 75W, 110W) fluorescent lamps shall not be allowed.
- C. T8 fluorescent lamps shall be operational on either rapid start, instant start or cathode cutout types of ballasts rated for T8 lamps. T8 lamps shall have a color temperature of 3500 degrees Kelvin.
- D. T5 fluorescent biax lamps shall be instant start type with a color temperature of 3500 degrees Kelvin.
- E. T4 fluorescent lamps shall be double biax type with 4-pin base and shall be operational on electronic or dimming ballasts. T4 lamps shall have a color temperature of 3500 degrees Kelvin.

2.6 FLUORESCENT BALLASTS

A. Electronic ballasts shall operate lamps at a frequency of 20 kHz or higher with no detectable flicker. Ballasts shall be instant start with a power factor above 95%, a ballast factor below 92%, and a ballast efficacy of 1.7, or less. Lamp current crest factor shall be less than 1.6, and total harmonic distortion shall be less than 10%. Ballast circuit shall be parallel operation, such that if one lamp becomes inoperative in the fixture, it shall not affect operation of the remaining lamps.

2.7 HID BALLASTS

A. HID ballasts shall be of the core and coil type, with a constant wattage autotransformer circuit type. Where this circuit type is not available, circuit type shall be high reactance-high power factor. Where HID fixtures are located in interior spaces, ballasts shall be encapsulated.

PART 3 - EXECUTION

- 3.1 Contractor shall refer to the Architectural reflected ceiling plan for exact locations of fixtures in the ceiling. The Contractor's attention is also directed to coordination with sprinkler heads and mechanical equipment. Where recessed lighting fixtures are indicated, this Contractor shall be responsible for coordinating the type fixtures with the actual ceiling being installed. This shall include changes resulting from alternate bid items, change orders, etc.
- 3.2 Surface mounted fluorescent lighting fixtures shall be mounted independent of ceiling construction. Fluorescent lighting fixtures mounted in or on a plaster ceiling shall also be mounted independent of ceiling construction. When recessed fluorescent lighting fixtures occur in lay-in tile or concealed spline ceilings, the Electrical Contractor shall install a support hanger at each of the four corners of the fixture and fasten these hangers to the structure above the ceiling, so as to support fixtures independently of ceiling. Hanger wires shall be galvanized carbon steel wire, 12 gauge minimum. Fixtures shall not be supported from the steel roof deck, the ceiling, or the ceiling support wires.
- 3.3 No insulation shall be placed within three inches of recessed lighting fixtures, unless fixtures are listed as suitable for direct contact with insulation.
- 3.4 Contractor shall furnish written warranties and manufacturer's wiring diagrams for the electronic ballasts, which shall carry a minimum three-year warranty, including labor allowance for the entire three year warranty period.

SECTION 16520 - LIGHTING CONTROLS

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

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

1.2 SCOPE

A. Provide all labor, equipment, materials, and performance of all operations in connection with the installation of the lighting controls as shown on the drawings and as herein specified.

1.3 REFERENCES

- A. Lighting controls shall conform to the following:
 - (1) Photocells UL 273D
 - (2) Timeclocks UL 916
 - (3) Contactors NEMA ICS2, NEMA ICS6

1.4 SUBMITTALS

- A. Contractor shall submit the following Shop Drawings and Submittals listed below for review by the Architect. Submittals shall indicate conformance with the hereinbefore listed References, or provide certification of meeting those requirements.
 - (1) Photocells
 - (2) Timeclocks
 - (3) Contactors

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Shop Drawings shall clearly indicate Manufacturer, catalog numbers, type and number of lighting control devices and installation instructions. Photocells and timeclocks shall be as manufactured by Tork, and contactors shall be as manufactured by Square D.

2.2 PHOTOCELLS

- A. The photo control shall provide automatic switching for outdoor lighting loads. Control shall have built-in delay to ensure the controlled lighting does not switch off due to ambient light or lightning striking the photocell. Photo control shall have a rating of 2000 watts and 16 amps for tungsten, and 1800 watts and 15 amps for ballast loads. Photo control shall provide switching for nominal voltage fixtures of 120 volts +/-10% to accommodate fluctuations in supply voltage.
- B. Photo control wiring shall be stem mounted with necessary mounting hardware and

instructions included with control. Photo control shall have on/off adjustment which is easily accomplished by moving a light level selector to range from 2 footcandles to 50 footcandles. Turn-off shall be approximately three times turn-on. Photo control shall be 100% factory tested for function within specified light levels.

C. Photo control shall be UL listed and shall meet applicable agency requirements. Photo control shall function over temperature range of -40 degrees Farenheight to 140 degrees Farenheight.

2.3 TIMECLOCKS

- A. Timeclock shall be a 2-channel digital time switch and capable of being programmed in AM/PM or 24 hour format with one minute resolution.
- B. Timeclock shall be capable of 48 event per channel per week with separate scheduling for each day of the week.
- C. Timeclock shall have 365 day holiday capabilities with 16 single dates and 5 holiday blocks of unlimited duration utilizing 8th and 9th day schedules.
- D. Timeclock shall have user selectable Daylight Savings or Standard Time with automatic leap year correction.
- E. Timeclock shall have 72 hour memory backup with rechargeable battery.
- F. Timeclock shall have astronomic feature for both channels with 1-99 minutes plus or minus offset from Sunrise or Sunset.

2.4 CONTACTORS

- A. Multiple lighting contactor shall be mechanically held and electrically operated with encapsulated coils. Standard coil clearing contacts are to be provided so that the contactor coils shall be energized only during the instance of operation.
- B. Contactor shall have a coil voltage rating and number of poles as indicated on the drawings, with each set of contacts rated at 20 amps for all types of ballast and tungsten lighting.
- C. Contacts shall be totally enclosed, double-break silver cadmium oxide power contacts. Contact inspection and replacement shall be possible without disturbing line wiring. Contacts shall have clearly visible N.O. and N.C. contact status indicators.
- D. Wiring for the device shall be straight-through with all terminals clearly marked and shall be housed in a NEMA Type 1 enclosure.

PART 3 - EXECUTION

3.1 All lighting controls shall be installed per Manufacturer's written instructions.

SECTION 16610 - EXIT AND EMERGENCY LIGHTING SYSTEM

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

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

1.2 SCOPE

A. Provide a complete and operable exit and emergency lighting system as indicated on the drawings and as required by the NEC and State and Local Codes.

1.3 SUBMITTALS

- A. Contractor shall submit the following Shop Drawings and Submittals listed below for review by the Architect. Submittals shall indicate conformance with the hereinbefore listed References, or provide certification of meeting those requirements.
 - (1) Catalog Data
 - (2) Detailed drawings indicating dimensions, equipment voltage rating, and voltampere rating.

SECTION 16720 - FIRE ALARM SYSTEM

PART 1 – GENERAL

1.1 GENERAL CONDITIONS

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

1.2 SCOPE

- A. Furnish labor, material, tools, and equipment necessary for and incidental to the installation and test of a fully supervised manual and automatic addressable fire alarm system as described herein. Equipment shall be listed by Underwriters Laboratories for fire alarm use and approved by Factory Mutual.
- B. The fire alarm system shall be the standard design of a single supplier. Components used shall be cross-listed for use with the system as selected by the Owner. All components shall be supplied by the same Manufacturer, and shall be compatible with the existing fire alarm system, as required.

1.3 REFERENCES

- A. Fire alarm system and components shall conform to the following:
 - (1) NFPA 70
 - (2) NFPA 72
 - (3) NFPA 72E
 - (4) NFPA 72G
 - (5) NFPA 72H
 - (6) NFPA 241
 - (7) UL 164
 - (8) UL 268
- B. Equipment shall be listed as power limited by Underwriters Laboratories, Inc. or approved by Factory Mutual. The fire alarm system in its entirety shall be in compliance with all applicable fire and electrical codes. Accessory components as required shall be catalogued by the Manufacturer and UL listed to operate with the Manufacturer's control panel and other fire alarm equipment. All equipment shall be approved prior to installation by the local fire inspection official and by the Local Authority Having Jurisdiction (LAHJ).

1.4 SUBMITTALS

- A. Contractor shall submit the following Shop Drawings and Submittals listed below for review by the Architect. Submittals shall indicate conformance with the hereinbefore listed References, or provide certification of meeting those requirements.
 - (1) Control Panel / Cabinet
 - (2) Peripheral Devices-Initiating

- (3) Peripheral Devices-Signaling
- (4) Peripheral Devices-Auxiliary
- (5) Batteries with Calculations
- (6) Point-to-point CAD drawings
- (7) Annunciator
- (8) Narrative of the Construction Process
- B. Fire alarm equipment supplier qualifications shall be submitted indicating years in business, service policies, warranty definitions, and a list of similar installations. No system shall be considered unless there is a locally staffed office offering parts and service within a 50 mile radius of the job site.
- C. Contractor qualifications shall be supplied indicating years in business and prior experience with installations that include the type of equipment that is to be supplied.

1.5 RELATED WORK SPECIFIED ELSEWHERE

- A. Sprinkler water flow switches, tamper switches and bell shall be furnished and installed by the Plumbing Contractor, but wired and connected by the Electrical Contractor. The Electrical Contractor shall review the Plumbing and/or Sprinkler documents for requirements.
- B. Duct smoke detectors shall be installed by the Mechanical Contractor, but furnished, wired and connected to the fire alarm system by the Electrical Contractor.

PART 2 - PRODUCTS

2.1 SYSTEM DESIGN

- A. Furnish and install a fully operational and functional addressable fire detection system. The system shall be electrically supervised against opens and grounds on both station and signal wiring. Opens and grounds shall cause a trouble bell to sound at the control panel until manually silenced by the trouble bell silencing switch and shall not cause a false alarm to be sounded. Basic power supply for the system shall be 120 volts AC supplied from the emergency power system. Operation of all system components shall be 25 volts DC furnished by step down transformers and rectifiers within the control panel. The system shall allow for loading or editing special instructions and operation sequences as required. Software operations shall be stored in non-volatile programmable memory. Loss of primary and secondary power shall not erase the instructions stored in memory.
- B. The sequence of operation shall be that actuation of any manual or automatic sensors shall cause:
 - (1) All building alarm devices to sound.
 - (2) Appropriate zone annunciators to annunciate.
 - (3) Operate outputs to release magnetically held smoke doors.
 - (4) Operate outputs to signal the elevator recall functions.
 - (5) Operate outputs to signal shut-down of ventilation equipment.

- C. Pressing the appropriate acknowledge button shall acknowledge any alarm or trouble condition. After the points have been acknowledged, the LED's shall glow steady and the panel audible signal will be silenced.
- D. The System Reset button shall be used to return the system to its normal state after an alarm condition has been remedied. Should the alarm condition continue to exist, the system will remain in an abnormal state.

2.2 CONTROL PANEL

- A. The control panel shall be of the fully modular type with necessary control modules for system operation. The cabinet shall be constructed of code gauge steel with latch and cylinder type lock, and shall be semi-recessed mounted.
- B. Provide control modules, device alarm modules, signal modules, power supply module, automatic dual-rate battery charger and sealed, rechargeable type, electrolyte battery within the control panel.

2.3 PERIPHERAL DEVICES - INITIATING

- A. Manual stations shall be non-code type, located as shown on the drawings. Stations shall be semi-flush and remain mechanically locked until manually reset Mount stations with the base at four feet above finished floor and no more than five feet from any door, measured horizontally.
- B. Smoke detectors shall be photoelectric type, operating on the photodiode, light scattering principle, and listed to UL 268. The sensor shall contain a flashing red LED for visual supervision which goes steady in alarm conditions, and a functional test switch. Provide detector bases as required to operate on 24 volts DC and allow complete functioning of the detector with the selected fire alarm system.
- C. Detectors in ducts shall be photoelectric type and listed by UL for duct installation. Duct detectors shall be provided with approved duct housing, mounted exterior to the duct, and shall be provided with perforated sampling tubes extending across the width of the duct. Activation of duct detectors shall cause actuation of the fire alarm control panel in the same manner as other alarm initiating devices and in addition, cause all air handling units to be deactivated. The detector shall operate with a nominal line voltage of 24 volts DC and shall be provided with indicating lamp and test switch.
- D. Heat detectors shall be of the combination rate-of-rise and fixed temperature type. Sensors shall be listed to UL 268 and shall be suitable for ceiling installations. 'The sensor shall contain a flashing red LED for visual supervision which goes steady in alarm conditions. Provide detector bases as required to operate on 24 volts DC and allow complete functioning of the detector with the selected fire alarm system.

2.4 PERIPHERAL DEVICES - SIGNALING

A. Audio/visual devices shall be combination electronic horn and xenon flash tube strobe indicator. Sound levels shall be between 96 db and 103 db, and lamps shall produce a minimum of 15 candela at a flash rate of one flash per second with higher candela ratings

as required. The unit shall be self rimmed and not require trim kit for semi-flush mount. The device shall be semi-flush mounted on a 4 inch square back box.

- B. Visual devices shall be a xenon flash tube strobe indicator. The lamp shall produce a minimum of 15 candela at a flash rate of one flash per second with higher candela ratings as required. The unit shall be self rimmed and not require trim kit for semi-flush mount. The device shall be semi-flush mounted on a 4 inch square back box.
- C. Exterior horns shall be flush mounted and UL listed for use in wet locations. Sound levels shall be between 96 db and 103 db.

2.5 FIRE CONTROL COMMUNICATOR

- A. The Fire Control Communicator shall be Silent Knight Model 5104 and shall provide the following functional criteria:
 - (1) The Contractor shall provide an approved digital communicator to transmit the fire alarm and supervisory signals to a central station. The digital communicator shall be UL or FM listed for fire reporting to a central station and shall conform to the requirements of NFPA 71.
 - (2) The digital communicator shall be installed in a slave configuration and receive 24 volt DC power from the UL listed fire alarm control panel. The communicator shall have provisions for connecting an N.O. alarm contact signal and an N.C. trouble contact signal.
 - (3) The control/communicator shall have the capacity to supervise two telephone lines, seize the phone line and send the alarm signal on one or both lines without the addition of any more equipment. It shall sound a local trouble signal if the telephone service in interrupted for longer than 45 seconds and it shall transmit a signal indicating the loss of phone line service to the central station over the remaining phone line. A signal shall also be transmitted indicating the restoration of phone service. The control/communicator shall be able to report the loss of either phone line without regard to which phone line failed first. If both lines fail, a local signal shall sound.
 - (4) The control/communicator shall have the ability to send a test signal to the central station every 24 hours. The test signal shall be able to be transmitted at a specific time of day or night by setting a program within the panel.
 - (5) The communicator shall be able to transmit all signals in the Standard SIA format (Security Industry Association).
- B. Field Programming
 - (1) The Contractor shall provide the Silent Knight Model 5230 remote alphanumeric annunciator in order to perform field programming of the Model 5104 Communicator. System programming is stored in a non-volatile EEPROM chip which shall be reprogrammable hundreds of times.

2.6 SPARE PARTS

A. Provide each of the following listed devices as spare parts to the Owner:

- (1) Two of each manual station
- (2) Two of each smoke detector base
- (3) Two of each smoke detector head
- (4) Two of each heat detector
- (5) Three spare keys to the fire alarm panel

2.7 WIRING

A. The Contractor shall furnish and install in accordance with NEC (Section 70 of NFPA) and Manufacturer's instructions, all wiring, raceways, conduit and outlet boxes required for the erection of a complete system as described herein and as shown on the drawings. All wiring shall be installed in metallic conduit and of the approved type for fire alarm use. Wire and cable shall be UL listed and a minimum of 18 AWG or as required by local codes and the LAHJ. A consistent color code shall be used throughout and all wires shall be tagged at all junction points between conductors. Final connections between control equipment and the wiring system shall be made under direct supervision of a representative of the Manufacturer. Raceways containing conductors identified as "Fire Protective Alarm System" conductors shall not contain any other conductors and no AC or audio current carrying conductors shall be allowed in the same raceway with the D.C. fire alarm detection and signaling conductors.

2.8 FIRE ALARM REMOTE ANNUNCIATOR

- A. Remote annunciator shall be flush mounted. Remote annunciators shall have identical functionality and operation as the built-in annunciator. The annunciator must have an 80-character LCD display and must feature five LEDs for: General Alarm, Supervisory, System Trouble, System Silence, and System Power.
- B. Controls and programming keys are silicone Mechanical type with tactile and audible feedback. Keys have a travel of .404 inches. No membrane style buttons will be permissible.
- C. The annunciator must be able to silence and reset alarms through the use of a code entered on the annunciator keypad or by using a firefighter's key. The annunciator must have two levels of user codes that will limit the operating system programming to authorized individuals. The control panel must allow all annunciators to accommodate multiple user input simultaneously.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Wires shall be tagged at junction points and at connections to equipment. Wire markers shall be of the taped band type of permanent material and shall be suitable and permanently stamped with the proper identification. The markers shall be attached in a manner that will not permit accidental detachment. Wiring shall test free from opens, grounds, and short circuits. Final connections between equipment and the wiring system shall be made under the supervision of a representative of the Manufacturer.

- B. Installation of the Fire Control Communicator shall be in strict compliance with Manufacturer's recommendations. Consult Manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing conduits and pulling wire.
- C. Wiring for the fire alarm system shall be laid out in the most convenient form for this installation, and all such wiring shall be shown on the as-built drawings which are required under this Division of the specifications. A wiring diagram shall be mounted inside the door of the fire alarm control panel.
- D. Provide two copies of completed instructions covering the operation and maintenance of the installed system, including circuit drawings and wiring diagrams of the system as actually installed, including as-built building alarm wiring. A complete list of part numbers and names, together with the name of the Manufacturer, shall be included in each manual.
- E. Equipment shall be held firmly in place. Fastening and supports shall be adequate to support the loads with a safety factor of five.
- F. Addressable devices connected to the fire alarm system shall be identified at the control panel by the room numbers assigned by the Owner. The room numbers shown on the drawings are for reference only.

3.2 TESTS AND REPORTS

- A. Final Acceptance
 - (1) The system will be accepted only after a satisfactory test of the entire system has been accomplished by a factory-trained distributor in the presence of a representative of the Authority Having Jurisdiction and Owner's Representative. Provide 3 sets of Owner's Operation and Maintenance manuals to the Architect.
- B. On-Site Services
 - (1) Contractor shall provide the on-site services of an authorized technical representative of the Manufacturer to supervise all connections and fully test all devices and components of the system as installed. Owner's representative shall be instructed in the proper use and testing of the system.

3.3 WARRANTY

- A. The Contractor shall warrant the completed fire alarm system wiring and equipment to be free from inherent mechanical and electrical defects for a period of one (1) year from the date of the complete and certified test or from the date of first beneficial use.
- B. The Equipment Manufacturer shall make available to the Owner a maintenance contract proposal to provide a minimum of two (2) inspections and tests per year in compliance with NFPA-72H guidelines.

SECTION 16750 - TELEPHONE SYSTEM

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

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

1.2 SCOPE

A. Telephone system shall be an empty conduit system complete as indicated on the drawings and as required by the Telephone Company.

PART 2 - PRODUCTS

2.1 CONDUIT

A. Conduit shall be as specified under Section 16111 - CONDUIT.

2.2 OUTLET BOXES

A. Outlet boxes shall be as specified under Section 16130 - OUTLET BOXES.

2.3 BACKBOARD

A. Backboards shall be U.S. Plywood or approved equal of minimum 3/4 inch thickness, exterior grade B/C minimum, and installed with good side exposed.

PART 3 - EXECUTION

- 3.1 Conduits shall contain a plastic pull wire.
- 3.2 Provide pullboxes with blank cover plate minimum every 100 feet as directed by Telephone Company.
- 3.3 The telephone service shall be installed as indicated on the drawings. The Contractor shall coordinate with the Telephone Company so that the entire system is installed in accordance with the Telephone Company standards and policies.
- 3.4 Backboards shall be permanently and securely installed and given two coats of gray paint on both sides prior to the installation of any equipment.
PART 1 GENERAL

1.01 WORK INCLUDED

- A. Finish grade subsoil.
- B. Furnish, place, level, and compact topsoil.

1.02 RELATED WORK

- A. Section 02211 Rough Grading: Subsoil contouring.
- B. Section 02515 Concrete, Walks, and Paving.
- C. Section 02485 Seeding.
- D. Section 02487 Sodding.
- E. Section 02490 Trees, Shrubs, and Ground Cover

1.03 PROTECTION

- A. Protect landscaping and other features remaining as final work.
- B. Protect existing structures, fences, roads, sidewalks, paving and curbs.

1.04 QUALITY ASSURANCE

- A. Provide and pay for materials testing. Testing agency shall be acceptable to the Landscape Architect. Provide the following data:
 - 1. Test representative materials samples proposed for use.
 - 2. Topsoil:
 - a. pH factor.
 - b. Nutrient analysis.
 - c. Mechanical analysis.
 - d. Percentage of organic content.
 - 3. Recommendations on type and quantity of additives required to establish satisfactory pH factor, supply of nutrients to bring nutrients to satisfactory level for planting turf and shrubs, mechanical composition, and organic composition of topsoil.

PART 2 PRODUCTS

2.01 MATERIALS

A. Topsoil shall be SIFTED, friable loam; free of subsoil, roots, grass, excessive amount of weeds, stone over 1/2" in any dimension, and foreign matter; acidity range (pH) of 5.5 to 7.5; containing a minimum of 4 percent and a maximum of 25 percent organic matter. Topsoil obtained and prepared on site, or off site if necessary. Provide imported topsoil as required to complete the work.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify site conditions and note irregularities affecting work of this Section.
- B. Beginning work of this Section means acceptance of existing conditions.

3.02 SUBSOIL PREPARATION

- A. Eliminate uneven areas and low spots. Remove debris, roots, branches, stones, in excess of one inch in size. Remove subsoil contaminated with petroleum products.
- B. Scarify or rip subgrade to depth of 4 inches where topsoil is scheduled. Scarify or rip soil in areas where equipment used for hauling and spreading topsoil has compacted subsoil (6 inch minimum depth is required).

3.03 PLACING TOPSOIL

- A. Amend topsoil to meet the requirements of drawings and specifications.
- B. Place topsoil in areas where seeding, sodding, and planting is scheduled.
- C. Use topsoil in relatively dry state. Place during dry weather.
- D. Fine grade topsoil eliminating rough or low areas. Maintain levels, profiles, and contours of subgrade. Provide positive drainage.
- E. Remove stone, roots, grass, weeds, debris, and foreign material while spreading.
- F. Manually spread topsoil around trees, plants, building and new work to prevent damage.
- G. Lightly compact placed topsoil.
- H. Remove surplus subsoil and topsoil from site.
- I. Leave stockpile area and site clean and raked, ready to receive landscaping.

3.04 TOLERANCES

A. Top of Topsoil: Plus or minus 1/2 inch.

3.05 SCHEDULE OF LOCATIONS

- A. The following paragraphs identify compacted topsoil thickness for various locations.
- B. Seeded Grass: 6 inches.
- C. Sod: 6 inches.
- D. Shrub Beds: 12 inches.
- E. Flower Beds: 12 inches.
- F. Groundcover Beds: 12 inches.

END OF SECTION

SECTION 02260 - FINISH GRADING AND LANDSCAPING

PART 1 - GENERAL

1.01 **DESCRIPTION**

- A. Scope: Includes spreading of topsoil, fertilizing, seeding and maintenance.
- B. Related work specified elsewhere:
 - 1. Site Preparation and Rough Grading: Section 02100.

1.02 QUALITY ASSURANCE

A. Source Quality Control: Packaged Products shall indicate the manufacturer's guaranteed analysis on each package and arrive on-site as originally packaged and unopened.

1.03 SUBMITTALS

A. Test Reports: Submit laboratory test reports of the soil analysis and supplement recommendations to the Engineer for approval prior to adding any soil supplements to the topsoil.

- 1. Laboratory reports shall recommend both grade and application rates of fertilizer and such other soil supplements as required.
- 2. Take sufficient quantity of topsoil samples to give a representative analysis of on-site topsoil and topsoil from outside sources, if any.

B. Soil Supplement Product Certification: Submit certificates certifying such products to have a guaranteed analysis in conformity with the Engineer approved laboratory soil supplement recommendations report.

C. Seed Certification: Submit certificates or certifying tags indicating lawn seed mixture, seed purity percentage, seed germination percentage and weed seed content percentage to certify conformity with the Specifications.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver packaged products to the site in unopened containers with labels intact and legible.
- B. Store packaged products in such a manner to prevent moisture damage and other forms of contamination.

1.05 JOB CONDITIONS

A. Environmental Requirements: Do not perform work of this section when soil or weather conditions are unsuitable. Unsuitable conditions include moisture saturated or frozen in place soil and precipitation of any kind present or occurring during the work.

B. Seeding Dates: The following dates shall govern except when environmental conditions warrant, the Engineer may extend the seeding dates.

- 1. Spring: March 1 through May
- 2. Fall: September 1 through November 15.

C. Existing Conditions: Following performance of related construction and prior to Finish Grading do such debris removal and site leveling as necessary in preparation for Finish Grading. Dispose of such debris legally off-site.

D. Dust Control: Exercise the necessary means and methods to control dust on the site as well as in the offsite work areas where Topsoiling and Finish Grading are required.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Topsoil: Use salvaged material from rough grading as specified previously in Site Preparation and Rough Grading: Section 02100.

B. Borrow Topsoil: Use productive topsoil from Contractor's source and of a quality meeting the requirements specified above for Topsoil.

C. Water: Not available at the site. Transportation of the water from source to planting operations is the responsibility of the Contractor.

2.02 SOIL SUPPLEMENT MATERIALS

A. Agricultural Liming Materials: Products containing calcium and magnesium compounds capable of neutralizing soil acidity and containing not less than 80% of total carbonates. Use liming materials meeting requirements of ASTM Designation C602 and conforming to applicable state liming material regulations.

B. Manure: Well rotted cow manure not less than six (6) months old, not more than two (2) years old, free from sawdust, shavings, or refuse of any kind, containing roughly twenty-five (25) percent of straw or other bedding material. Approved dehydrated manure (Farmanure, Bovung, or equal) may be used instead of raw manure at the Contractor's option. If so used, proportion 250 pounds of dehydrated material for each cubic yard of raw manure.

C. Peat Moss: Reasonably free from wood substances.

D. Commercial Fertilizer: Mixed, containing by weight 10 percent nitrogen, 6 percent phosphoric acid and 4 percent potash. Free flowing and delivered in unopened containers.

E. Planting Soil: Mixture of 2 parts peat moss, 1 part manure and 10 parts of topsoil.

2.03 LAWN AND SEED MATERIALS

A. Grass Seed: 100 percent Kentucky #31 Fescue. Deliver seed in standard containers showing weight, analysis and vendor's name. Provide seed mixed and supplied by an established seed house, certified as to proper purity and germination, and at least 96 percent weed free.

B. Sod: 100 percent Kentucky #31 Fescue grass sod, well rooted and native to the locality of the work, live, not less than one year old, with no less than 1 inch of soil attached to the roots.

C. Lawn Mulch: Straw Stalks of any threshed grain or tall hay grass stalks free from seed bearing stalks or roots harmful to lawn growth. Mulch material containing noxious weeds, decomposed material or brittle weed material is not acceptable.

D. Mulch Binder: Emulsified asphalt conforming to the requirements of AASHTO Grade RS-1 and which does not contain solvents or other diluting agents toxic to plant life.

E. Surface Stabilization: The vegetative materials required for surface stabilization shall be in accordance with the approved Sediment Control Details and Notes in the Contract Drawings.

PART 3 - EXECUTION

3.01 **PREPARATION**

A. Prepare subsoil surface for finish grading by dressing and shaping to provide for the uniform placement of topsoil.

B. Prepare subsoil surface for topsoiling by loosening to a depth of 3 inches and dressing and shaping to provide for the uniform placement of topsoil.

C. Remove surface rock or other foreign objects exceeding 3 inches in greatest dimension. Dispose of such rock and debris in a lawful manner off site.

3.02 PERFORMANCE

A. Placement: Place topsoil over areas indicated for new grading contours. However, before topsoil placement, construction work in topsoiled areas shall have been completed. Observe precautions as follows:

- 1. Do not place topsoil over areas indicated to receive paving or walkways.
- 2. Do not work topsoil while frozen or wet. Do not work topsoil in a dusting condition but moisten same to prevent a dust nuisance.
- 3. Scarify subsoil to a depth of 3 inches for bonding topsoil with subsoil.
- 4. On sloped areas, work topsoil into subsoil to blend so as to eliminate any semblance of slipplaning between the two soils; but leave a sufficient cover of topsoil to insure seed germination. Perform such blending of soils by ridging or serrating the subsoil on the slopes.
- 5. Place topsoil as needed for dressing-up minor depressions due to settling and erosion and to eliminate any other minor irregularities.

B. Finished Elevations and Lines: Grade topsoiled areas of the site to within a tolerance of plus or minus onetenth of a foot of the elevations and lines indicated and in accordance with the following:

- 1. Grade a uniform longitudinal fall in swales and other surface drainage areas to provide a drainage flow line that can easily be maintained and traversed with normal lawn maintenance equipment.
- 2. Establish finish grade of topsoil 1/2 to 3/4 inch below top of abutting walks or paving to provide positive drainage of same.
- 3. Do not finish grade topsoil to a depth less than 4 inches nor greater than 12 inches.
- 4. Leave finish grade surfaces free of objectionable material larger than 2 inches in greatest dimension. Dispose of such objectionable material in a legal disposal area off site.

C. Compaction: Compact finish grades as the final operation using a light roller weighing not over 120 pounds per foot-width of roller.

D. Seeding: Seedbed preparation, soil amendments, seeding, and mulching to be done in accordance with the Erosion and Sediment Control Details and Notes in the Contract Drawings.

3.03 MAINTENANCE AND GUARANTEE

PMA, Inc., Project 0205.3a

A. Seeded Areas: Keep seed moist continually for proper germination and water thereafter as necessary to prevent drying out or burning. Reseed areas not showing a prompt catch of grass, correct depressions and irregularities and reseed; repeat until a complete coverage is obtained. Contractor shall take all necessary steps to eliminate weed growth in seeded areas. Cut seeded areas at required intervals to maintain grass at a maximum height of 2-1/2 inches.

* END OF SECTION *

SECTION 02370 - TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

- 1.01 SECTION INCLUDES
- A. Requirements for temporary soil erosion and sediment control at project site.
- B. Removal of control structures and restoration of site.

1.02 GENERAL

A. Provide necessary equipment, labor and supplies for erosion and sediment control throughout project. All work shall be in accordance with the approved erosion/sediment control plan as promulgated by the Virginia Department of Conservation and Recreation and the Accomack County Department of Planning and Zoning. The work consists of grading of the site, inlet protection measures, setting silt fence, constructing sediment basin, seeding and stabilization and other necessary measures required for effective control. Excavation work, mechanical compaction of fills, pipe outlets, seeding and mulching, and other work shall be as required by the laws of the Commonwealth of Virginia. The receipt of a proposal by a bonafide bidder shall be interpreted to mean the Contractor has familiarized himself with these Regulations and Rules of procedure and is fully cognizant of exactly what is required.

1.03 EROSION AND SEDIMENT CONTROL PLAN

A. No work shall be started until the erosion control schedules and methods of operation have been accepted by the Virginia Department of Conservation and Research or its authorized inspection agency. The Contractor shall notify appropriate agencies two week prior to the start of construction, and shall attend all required pre-construction conferences.

B. No changes or revision to the approved sediment control plan shall be made unless approved by the Virginia Department of Conservation and Research or its authorized inspection agency.

1.04 PERMITS

A. The Contractor is responsible for obtaining permits and/or approvals from the local office of the Soil Conservation Service having jurisdiction in the area for any work outside the site where such work is necessary as a result of construction. The Contractor shall follow the approved erosion/sediment control plan obtained by the Owner for on-site work.

1.05 RESTORATION

A. Upon completion of work, remove silt fence and other devices, and restore grades to conditions existing prior to start of work unless indicated otherwise. Topsoil and seed areas affected by work.

END OF SECTION 02370

SECTION 02411 - SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Demolition and removal of selected portions of building or structure.
 - 2. Demolition and removal of selected site elements.
 - 3. Salvage of existing items to be reused or recycled.
- B. Related Sections include the following:
 - 1. Division 01 Section "Summary" for use of premises, and phasing, and Owner-occupancy requirements.
 - 2. Division 01 Section "Photographic Documentation" for preconstruction photographs taken before selective demolition operations.
 - 3. Division 01 Section "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for selective demolition operations.
 - 4. Division 02 Section 02230 "Site Clearing" for site clearing and removal of above- and belowgrade improvements.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition and excavation operations remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.

1. Coordinate with Owner's archaeologist, who will establish special procedures for removal and salvage.

1.5 SUBMITTALS

- A. Qualification Data: For demolition firm and professional engineer.
- B. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
 - 2. Coordination for shutoff, capping, and continuation of utility services.
 - 3. Means of protection for items to remain and items in path of waste removal from building.
- C. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.
- D. Predemolition Photographs or Videotapes: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations. Comply with Division 01 Section "Photographic Documentation." Submit before Work begins.

1.6 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI A10.6 and NFPA 241.
- C. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."
- D. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to selective demolition including, but not limited to, the following:
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - 5. Review areas where existing construction is to remain and requires protection.

1.7 PROJECT CONDITIONS

- A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

- C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.
- D. Storage or sale of removed items or materials on-site is not permitted.
- E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. Survey of Existing Conditions and Existing Depot: Record existing conditions by use of measured drawings preconstruction photographs preconstruction videotapes and templates.
 - 1. Comply with requirements specified in Division 01 Section "Photographic Documentation."
- E. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
 - 1. Comply with requirements for existing services/systems interruptions specified in Division 01 Section "Summary."
- B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
 - 2. Arrange to shut off indicated utilities with utility companies.
 - 3. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 4. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 - 1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 - 2. Maintain adequate ventilation when using cutting torches.
 - 3. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 - 4. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - 5. Dispose of demolished items and materials promptly.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 02411

SECTION 02419 - SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Demolition and removal of selected portions of building or structure.
 - 2. Demolition and removal of selected site elements.
 - 3. Salvage of existing items to be reused or recycled.
- B. Related Sections include the following:
 - 1. Division 01 Section "Photographic Documentation" for preconstruction photographs taken before selective demolition operations.
 - 2. Division 01 Section "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for selective demolition operations.
 - 3. Division 01 Section "Cutting and Patching" for cutting and patching procedures.
 - 4. Division 01 Section "Construction Waste Management and Disposal" for disposal of demolished materials.
 - 5. Division 02 Section "Structure Demolition" for demolition of entire buildings, structures, and site improvements.
 - 6. Division 31 Section "Site Clearing" for site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to Owner.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, <**Insert description of other items,**> antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property.

Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.

1. Coordinate with Owner's [archaeologist] [historical adviser], who will establish special procedures for removal and salvage.

1.5 SUBMITTALS

- A. Qualification Data: For [demolition firm] [professional engineer] [refrigerant recovery technician].
- B. Schedule of Selective Demolition Activities: Indicate the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's [**building manager's**] [**and**] [**other tenants'**] on-site operations are uninterrupted.
 - 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 - 3. Coordination for shutoff, capping, and continuation of utility services.
 - 4. Use of elevator and stairs.
 - 5. Locations of proposed dust- and noise-control temporary partitions and means of egress[, including for other tenants affected by selective demolition operations].
 - 6. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
 - 7. Means of protection for items to remain and items in path of waste removal from building.
- C. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.
- D. Predemolition [**Photographs**] [**or**] [**Videotapes**]: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations. Comply with Division 01 Section "Photographic Documentation." Submit before Work begins.
- E. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
 - 1. Comply with submittal requirements in Division 01 Section "Construction Waste Management and Disposal."

1.6 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- B. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.
- C. LEED Requirements for Building Reuse:
 - 1. Credit MR 1.1[**and 1.2**]: Maintain existing building structure (including structural floor and roof decking) and envelope (exterior skin and framing, excluding window assemblies and nonstructural roofing material) not indicated to be demolished; do not demolish such existing construction beyond indicated limits.

- 2. Credit MR 1.3: Maintain existing interior nonstructural elements (interior walls, doors, floor coverings, and ceiling systems) not indicated to be demolished; do not demolish such existing construction beyond indicated limits.
- 3. Credit MR 1.2[and 1.3]: Maintain existing nonshell, nonstructural components (walls, flooring, and ceilings) not indicated to be demolished; do not demolish such existing construction beyond indicated limits.
- D. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- E. Standards: Comply with ANSI A10.6 and NFPA 241.
- F. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."
- G. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to selective demolition including, but not limited to, the following:
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - 5. Review areas where existing construction is to remain and requires protection.

1.7 PROJECT CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
 - 1. Comply with requirements specified in Division 01 Section "Summary."
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
 - 1. Before selective demolition, Owner will remove the following items:

a. <Insert items to be removed by Owner.>

- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. Hazardous materials [will be removed by Owner before start of the Work] [have been removed by Owner under a separate contract].
 - 2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.
- E. Hazardous Materials: It is unknown whether hazardous materials will be encountered in the Work.

- 1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.
- F. Hazardous Materials: Hazardous materials are present in construction to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.
 - 1. Hazardous material remediation is specified elsewhere in the Contract Documents.
 - 2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
- G. Storage or sale of removed items or materials on-site is not permitted.
- H. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.8 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- E. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.
- F. Survey of Existing Conditions: Record existing conditions by use of [measured drawings] [preconstruction photographs] [preconstruction videotapes] [and] [templates].
 - 1. Comply with requirements specified in Division 01 Section "Photographic Documentation."

- 2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.
- G. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
 - 1. Comply with requirements for existing services/systems interruptions specified in Division 01 Section "Summary."
- B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. **[Owner]** [**Building manager**] will arrange to shut off indicated services/systems when requested by Contractor.
 - 2. Arrange to shut off indicated utilities with utility companies.
 - 3. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 4. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
 - a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 - 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 - 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01 Section "Temporary Facilities and Controls."

- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 - 1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 - 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain[**fire watch and**] portable fire-suppression devices during flame-cutting operations.
 - 5. Maintain adequate ventilation when using cutting torches.
 - 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 - 7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 - 8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - 9. Dispose of demolished items and materials promptly.[Comply with requirements in Division 01 Section "Construction Waste Management and Disposal."]
- B. Reuse of Building Elements: Project has been designed to result in end-of-Project rates for reuse of building elements as follows. Do not demolish building elements beyond what is indicated on Drawings without Architect's approval.
 - 1. Building Structure and Shell: **[75] [100]** percent.
 - 2. Nonshell Elements: 50 percent.
- C. Removed and Salvaged Items:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area [on-site] [off-site] [designated by Owner] [indicated on Drawings].
 - 5. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items:

- 1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
- 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
- 3. Protect items from damage during transport and storage.
- 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition[**and cleaned**] and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain, using power-driven saw. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete indicated for selective demolition. Neatly trim openings to dimensions indicated.
- B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.
- C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
- D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
- E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI-WP and its Addendum.
 - 1. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.
- F. Roofing: Remove no more existing roofing than can be covered in one day by new roofing and so that building interior remains watertight and weathertight. Refer to Division 07 Section "<Insert Section name>" for new roofing requirements.
 - 1. Remove existing roof membrane, flashings, copings, and roof accessories.
 - 2. Remove existing roofing system down to substrate.
- G. Air-Conditioning Equipment: Remove equipment without releasing refrigerants.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be[**recycled**,] reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

- 4. Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."
- B. Burning: Do not burn demolished materials.
- C. Burning: Burning of demolished materials will be permitted[**only at designated areas on Owner's property,**] provided required permits are obtained. Provide full-time monitoring for burning materials until fires are extinguished.
- D. Disposal: Transport demolished materials and dispose of at designated spoil areas on Owner's property.
- E. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.8 SELECTIVE DEMOLITION SCHEDULE

- A. Existing [Items] [Construction] to Be Removed: <Insert description of items and construction to be removed.>
- B. Existing Items to Be Removed and Salvaged: <Insert description of items to be removed and salvaged.>
- C. Existing Items to Be Removed and Reinstalled: <Insert description of items to be removed and reinstalled.>
- D. Existing Items to Remain: <Insert description of items to remain.>

END OF SECTION 024119

PART 1 GENERAL

1.01 DESCRIPTION

- A. Provide seeded lawns as shown and specified. The work includes:
 - 1. Soil preparation.
 - 2. Seeding lawns, and other indicated areas.
 - 3. Mulching.
 - 4. Reconditioning existing lawns.
- B. Related work:
 - 1. Section 02218: Landscape Grading & Topsoil.
 - 2. Section 02487: Sodding.
 - 3. Section 02490: Trees, Shrubs, and Ground Covers.

1.02 QUALITY ASSURANCE

- A. Comply with the general conditions of the base contract.
- B. Provide and pay for materials testing. Testing agency shall be acceptable to the Landscape Architect. Provide the following data:
 - 1. Test representative materials samples proposed for use.
 - 2. Topsoil:
 - a. pH factor.
 - b. Nutrient analysis.
 - c. Mechanical analysis.
 - d. Percentage of organic content.
 - 3. Recommendations on type and quantity of additives required to establish satisfactory pH factor, supply of nutrients to bring nutrients to satisfactory level for planting, mechanical composition, and organic composition of topsoil.

1.03 SUBMITTALS

A. Submit seed vendor's certification for required grass seed mixture, indicating percentage by weight, and percentages of purity, germination, and weed seed for each grass species.

- B. Submit the following material certification:
 - 1. Seed.
- C. Submit the following materials certification:
 - 2. Fertilizer analysis.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver seed and fertilizer materials in original unopened containers, showing weight, analysis, and name of manufacturer. Store in a manner to prevent wetting and deterioration.

1.05 PROJECT CONDITIONS

- A. Work notification: Notify Landscape Architect at least seven working days prior to start of seeding operations.
- B. Protect existing utilities, paving, and other facilities from damage caused by seeding operations.
- C. Perform seeding work only after planting and other work affecting ground surface has been completed.
- D. Restrict traffic from lawn areas until grass is established. Erect signs and barriers as required.

1.06 WARRANTY

A. Provide a uniform stand of grass by watering, mowing, and maintaining seeded areas until final acceptance. Reseed areas, with specified materials, which fail to provide a uniform stand of grass until all affected areas are accepted by the Landscape Architect.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Lawn seed: Fresh, clean, and new crop seed mixture.
 - 1. Composed of turf type fine blade shade tolerant fescue such as 'Falcon' or 'Rebel'; Parts: 100% Purity: 97%; Minimum Germination: 80%. Rate: 7 lbs. per 1,000 SF.
- B. Fertilizer:
 - 1. Granular, non-burning product composed of not less than 50% organic slow acting, guaranteed analysis professional fertilizer.
 - a. Starter fertilizer containing 20% nitrogen, 26% phosphoric acid, and 6% potash by weight, or similar approved composition.
- C. Ground limestone: Containing not less than 85% of total carbonates and ground to such fineness that 50% will pass through a 100 mesh sieve and 90% will pass through a 20 mesh sieve.
- D. Straw mulch: Clean oat or wheat straw well seasoned before bailing, free from mature seed-bearing stalks or roots of prohibited or noxious weeds.

E. Water: Free of substance harmful to seed growth. Hoses or other methods of transportation furnished by contractor.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine finish surfaces, grades, topsoil quality, and depth. Do not start seeding work until unsatisfactory conditions are corrected.

3.02 PREPARATION

- A. Limit preparation to areas that will be immediately seeded.
- B. Loosen topsoil of lawn areas to minimum depth of 2". Remove stones over 1/2" in any dimension and sticks, roots, rubbish, and extraneous matter.
- C. Grade lawn areas to a smooth, free draining even surface with a loose, moderately coarse texture. Roll and rake, remove ridges, and fill depressions as required to drain.
- D. Apply limestone at a rate to adjust pH of topsoil to not less than 6.0 nor more than 6.8. Distribute evenly by machine and incorporate thoroughly into topsoil.
- E. Apply fertilizer to indicated turf areas at a rate equal to 1.0 lb. of actual nitrogen per 1,000 sq. ft.(220 lbs./acre).
- F. Restore prepared areas to specified condition if eroded, settled, or otherwise disturbed after fine grading and prior to seeding.

3.03 INSTALLATION

- A. Seeding:
 - 1. Seed immediately after preparation of bed. Spring seeding between April 1 and June 1 and fall seeding between August 15 and October 15 or at such other times acceptable to the Landscape Architect.
 - 2. Seed indicated areas within contact limits and areas adjoining contract limits disturbed as a result of construction operations.
 - 3. Perform seeding operations when the soil is dry and when winds do not exceed 5 miles per hour velocity.
 - 4. Apply seed with a rotary type, drop type, or hydroseed distributor. Install seed evenly by sowing equal quantities in two directions, at right angles to each other.
 - 5. Sow grass seed at a rate of 7.0 lbs. per 1,000 sq. ft.
 - 6. After seeding, rake or drag surface of soil lightly to incorporate seed into top 1/8" of soil. Roll with light lawn roller.

B. Mulching:

1. Place straw mulch on seeded areas within 24 hours after seeding.

- 2. Place straw mulch uniformly in a continuous blanket at the rate of 2 1/2 tons per acre, or two 50 lb. bales per 1,000 sq. ft. of area. A mechanical blower may be used for straw mulch application when acceptable to the Landscape Architect.
- 3. Crimp straw into soil by mechanical means.
- C. Provide straw bale checking in ditches or problem swales at intervals required to adequately slow water velocity and soil loss.

3.04 RECONDITIONING EXISTING LAWNS

- A. Recondition existing lawn areas damaged by Contractor's operations, including storage of materials or equipment and movement of construction vehicles, and existing lawn areas as indicated.
- B. Provide fertilizer, seed and soil amendments as specified for new lawns and as required to provide a satisfactorily reconditioned lawn. Provide topsoil as required to fill low areas and meet new finish grades.
- C. Cultivate bare and compacted areas thoroughly.
- D. Remove diseased or unsatisfactory lawn areas. Do not bury into soil. Remove topsoil containing foreign materials resulting from Contractor's operations, including oil drippings, stone, gravel, and other construction materials.
- E. Where substantial but thin lawn remains, rake, separate if compacted, and cultivate soil; fertilize and seed.
- F. Water newly seeded areas. Maintain adequate soil moisture until new grass is established.

3.05 MAINTENANCE

- A. Maintenance of installed seeded lawns shall be performed by the Contractor until acceptance by the Owner.
- B. Maintain seeded banks, ditches, medians, and fields to the extent of establishment and acceptance by the Owner.
- C. Maintain seeded lawn areas, including watering, spot weeding, mowing, application of herbicides, fungicides, insecticides and reseeding until a full, uniform stand of grass free of weed, undesirable grass species, disease, and insects is achieved and accepted by the Landscape Architect.
 - 1. Repair, rework, and reseed all areas that have washed out or are eroded. Replace undesirable or dead areas with new seed.
 - 2. Mow lawn areas as soon as lawn top growth reaches a 3" height. Cut back to 2" height. Repeat mowing as required to maintain specific height. Not more than 40% of grass leaf shall be removed at any single mowing.
 - 3. Apply herbicides as required to control weed growth or undesirable grass species.
 - 4. Apply fungicides and insecticides as required to control diseases and insects.

3.06 ACCEPTANCE

- A. Seeded areas will be inspected at completion of installation and accepted subject to compliance with specified materials and installation requirements.
- B. Acceptance constitutes an even stand of turf with coverage of approximately 25 germinated seeds per square inch.
- C. All seeded areas shall be totally completed and a uniform stand of grass achieved prior to the contractor calling for an inspection for acceptance. Inspection is not for the purpose of providing a 'work list' or 'to do list' for the contractor, but to ensure that installation is in accordance with the plans and specifications and quality is as specified. The general contractor shall notify the architect of completion of seeding installation or a uniform stand of grass is not complete at the time of inspection called for by the general contractor, the general contractor shall reimburse the Landscape Architect \$300.00 for each inspection of incomplete installation or lack of a uniform stand of grass. Exceptions to that will be only if the contractor discloses in full all incomplete items prior to inspection, and that the Landscape Architect and Owner agree to inspect the installation with that knowledge.
- D. Upon acceptance, the Owner will assume lawn maintenance.

3.07 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, debris, and equipment. Repair damage resulting from seeding operations.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION

- A. Provide trees, shrubs, and ground covers as shown and specified. The work includes:
 - 1. Soil preparation.
 - 2. Trees, shrubs, and ground covers.
 - 3. Planting mixes.
 - 4. Mulch and planting accessories.
 - 5. Tree relocation.
 - 6. Maintenance.
- B. Related work:
 - 1. Section 02218: Landscape Grading & Topsoil.
 - 2. Section 02485: Seeding.
 - 3. Section 02487: Sodding.

1.02 QUALITY ASSURANCE

- A. Plant names indicated; comply with "Standardized Plant Names" as adopted by the latest edition of the American Joint Committee of Horticultural Nomenclature. Names of varieties not listed conform generally with names accepted by the nursery trade. Provide stock true to botanical name and legible tagged.
- B. Comply with sizing and grading standards of the latest edition of "American Standard for Nursery Stock". A plant shall be dimensioned as it stands in its natural position.
- C. All plants shall be nursery grown under climatic conditions similar to those in the locality of the project for a minimum of 2 years.
- D. Stock furnished shall be at least the minimum size indicated. Larger stock is acceptable, at no additional cost, and providing that the larger plants will not be cut back to size indicated. Provide plants indicated by two measurements so that only a maximum of 25% are of the minimum size indicated and 75% are of the maximum size indicated.
- E. Provide "specimen" plants with a special height, shape, or character of growth. Tag specimen trees or shrubs at the source of supply. The Landscape Architect will inspect specimen selections at the source of supply for suitability and adaptability to selected location. When specimen plants cannot be purchased locally, provide sufficient photographs of the proposed specimen plants for approval.

F. Plants may be inspected and approved at the place of growth, for compliance with specification requirements for quality, size, and variety.

1.03 SUBMITTALS

- A. Submit the following material samples:
 - 1. Mulch.
 - 2. Planting accessories.
- B. Submit the following materials certification:
 - 1. Topsoil source and pH value.
 - 2. Peat moss.
 - 3. Plant fertilizer.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver fertilizer materials in original, unopened, and undamaged containers showing weight, analysis, and name of manufacturer. Store in manner to prevent wetting and deterioration.
- B. Take all precautions customary in good trade practice in preparing plants for moving. Workmanship that fails to meet the highest standards will be rejected. Spray deciduous plants in foliage with an approved "Anti-Desiccant" immediately after digging to prevent dehydration. Dig, pack, transport, and handle plants with care to ensure protection against injury. Inspection certificates required by law shall accompany each shipment invoice or order to stock and on arrival, the certificate shall be filed with the Landscape Architect.
- C. Protect all plants from drying out. If plants cannot be planted immediately upon delivery, properly protect them with soil, wet peat moss, or in a manner acceptable to the Landscape Architect. Water heeled-in plantings daily. No plant shall be bound with rope or wire in a manner that could damage or break the branches.
- D. Cover plants transported on open vehicles with a protective covering to prevent windburn.
- E. Provide dry, loose topsoil for planting bed mixes. Frozen or muddy topsoil is not acceptable.

1.05 PROJECT CONDITIONS

- A. Work notification: Notify Landscape Architect at least 7 working days prior to installation of plant material.
- B. Protect existing utilities, paving, and other facilities from damage caused by landscaping operations.
- C. A complete list of plants, including a schedule of sizes, quantities, and other requirements is shown on the drawings. In the event that quantity discrepancies or material omissions occur in the plant materials list, the planting plans shall govern.

1.06 WARRANTY

- A. Warrant plant material to remain alive and be in healthy, vigorous condition for a period of 1 year after completion and acceptance of entire project.
 - 1. Inspection of plants will be made by the Landscape Architect at completion of planting.
- B. Replace, in accordance with the drawings and specifications, all plants that are dead or, as determined by the Landscape Architect, are in an unhealthy or unsightly condition, and have lost their natural shape due to dead branches, or other causes due to the Contractor's negligence. The cost of such replacement(s) is at contractor's expense. Warrant all replacement plants for the balance of the original warranty period.
- C. Warranty shall not include damage or loss of trees, plants, or ground covers caused by fires, floods, freezing rains, lightning storms, or winds over 75 miles per hour, or acts of vandalism.
- D. Remove and immediately replace all plants, as determined by the Landscape Architect, to be unsatisfactory during the initial planting installation.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Plants: Provide plants typical of their species or variety with normal, densely developed branches and vigorous, fibrous root systems. Provide only sound, healthy, vigorous plants free from defects, disfiguring knots, sunscald injuries, frost cracks, abrasions of the bark, plant diseases, insect eggs, borers, and all forms of infestation. All plants shall have a fully developed form without voids and open spaces. Plants held in storage will be rejected if they show signs of growth during storage.
 - 1. Dig balled and burlapped plants with firm, natural balls of earth of sufficient diameter and depth to encompass the fibrous and feeding root system necessary for full recovery of the plant. Provide ball sizes complying with the latest edition of the "American Standard for Nursery Stock". Cracked or mushroomed balls are not acceptable.
 - 2. Container-grown stock: Grown in a container for sufficient length of time for the root system to have developed to hold its soil together, firm and whole.
 - a. No plants shall be loose in the container.
 - b. Container stock shall not be pot bound.
 - 3. Provide tree species that mature at heights over 25'-0" with a single main trunk. Trees that have the main trunk forming a "Y" shape are not acceptable.
 - 4. Plants planted in rows shall be matched in form.
 - 5. Plants larger than those specified in the plant list may be used when acceptable to the Landscape Architect.
 - a. If the use of larger plants is acceptable, increase the spread of roots or root ball if proportion to the size of the plant.
 - 6. The height of the trees, measured from the crown of the roots to the top of the top branch, shall not be less than the minimum size designated in the plant list.

- 7. No pruning wounds shall be present with a diameter of more than 1" and such wounds must show vigorous bark on all edges.
- 8. Shrubs and small plants shall meet the requirements for spread and height indicated in the plant list.
 - a. The measurements for height shall be taken from the ground level to the average height of the top of the plant and not the longest branch.
 - b. Single stemmed or thin plants will not be accepted.
 - c. Side branches shall be generous, well twigged, and the plant as a whole shall be full to the ground.
 - d. Plants shall be in a moist, vigorous condition, free from dead wood, bruises, or other root or branch injuries.

2.02 ACCESSORIES

- A. Topsoil for Planting Beds: Fertile, friable, natural topsoil of loamy character, without admixture of subsoil material, obtained from a well-drained arable site, reasonably free from clay, lumps, coarse sands, stones, plants, roots, sticks, and other foreign materials, with acidity range of between pH 6.0 and 6.8.
 - 1. Identify source location of topsoil proposed for use on the project.
 - 2. Provide topsoil free of substances harmful to the plants that will be grown in the soil.
- B. Peat Moss: Brown to black in color, weed and seed free granulated raw peat or baled peat, containing not more than 9% mineral on a dry basis.
 - 1. Provide ASTM D2607 sphagnum peat moss with a pH below 6.0 for ericaceous plants.
- C. Fertilizer:
 - 1. Plant Fertilizer Type "A": Commercial type approved by the Landscape Architect, containing 12% nitrogen, 12% phosphoric acid, and 12% potash by weight. 1/4 of nitrogen in the form of nitrates, 1/4 in form of ammonia salt, and 1/2 in form of organic nitrogen.
 - 2. Plant Fertilizer Type "B": Approved acid-base fertilizer.
- D. Anti-Desiccant: Protective film emulsion to provide a protective film over plant surfaces and allow transpiration. Mixed and applied in accordance with manufacturer's instructions.
- E. Mulch: 6 month old well rotted shredded native hardwood bark mulch not larger than 4" in length and 1/2" in width, free of woodchips and sawdust.
- F. Water: Free of substances harmful to plant growth. Hoses or other methods of transportation furnished by contractor.
- G. Stakes for Staking: Hardwood, 2" x 2" x 8'-0" long.
- H. Stakes for Guying: #4 rebar, 18" long.

- I. Guying/Staking Strapping: 1/2" wide nylon.
- J. Staking and Guying Hose: Two-ply, reinforced garden hose not less than 1/2" inside diameter.
- K. Tree Wrap: Standard waterproofed tree wrapping paper, 2 1/2" wide, made of 2 layers of crepe kraft paper weighing not less than 30 lbs. per ream, cemented together with asphalt.
- L. Twine: Two-ply jute material.
- M. Weed Control Barrier: Rot resistant polypropylene fabric, water and air permeable.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine proposed planting areas and conditions of installation. Do not start planting work until unsatisfactory conditions are corrected.

3.02 PREPARATION

- A. Time of planting:
 - 1. Evergreen material: Plant evergreen materials between September 1 and November 1 or in spring before new growth begins. If project requirements require planting at other times, plants shall be sprayed with anti-desiccant prior to planting operations.
 - 2. Deciduous material: Plant deciduous materials in a dormant condition. If deciduous trees are planted in-leaf, they shall be sprayed with an anti-desiccant prior to planting operation.
 - 3. Planting times other than those indicated shall be acceptable to the Landscape Architect.
- B. Planting shall be performed only by experienced workmen familiar with planting procedures under the supervision of a qualified supervisor.
- C. All plant bed edges and trees shall be clearly staked for review by landscape architect and for coordination with irrigation contractor should irrigation be provided.
- D. Locate plants as indicated or as approved in the field after staking by the Contractor. If obstructions are encountered that are not shown on the drawings, do not proceed with planting operations until alternate plant locations have been selected.
- E. Excavate circular plant pits with sloped sides, except for plants specifically indicated to be planted in beds. Provide shrub pits at least 12" greater than the diameter of the root system and 24" greater for trees. Depth of pit shall accommodate the root system. Remove excavated materials from the site.
- F. Provide topsoil planting mixture for use around the balls and roots of the plants with 1/2 lb. plant fertilizer Type "A" for each cu. yd. of mixture.
- G. Provide pre-mixed ground cover bed planting mixture consisting of and 1/2lb. plant fertilizer Type "A" per cu. yd. Provide beds a minimum of 6" deep.
- H. Provide pre-mixed planting mixture for use around the balls and roots of ericaceous plants consisting of topsoil and 1/2 lb. plant fertilizer Type "B" per cu. yd. of mixture.

3.03 INSTALLATION

- A. Set plant material in the planting pit to proper grade and alignment. Set plants upright, plumb, and faced to give the best appearance or relationship to each other or adjacent structure. Set plant material 2"-3" above the finish grade. No filling will be permitted around trunks or stems. Backfill the pit with planting mixture. Do not use frozen or muddy mixtures for backfilling. Form a ring of soil around the edge of each planting pit to retain water.
- B. After balled and burlapped plants are set, muddle planting soil mixture around bases of balls and fill all voids.
 - 1. Remove all burlap, ropes, and wires from the tops of balls. Where wire baskets are used in lieu of ropes, cut and remove the top half of wire baskets.
 - 2. Remove burlap from ericaceous plants.
- C. Space ground cover plants in accordance with indicated dimensions. Adjust spacing as necessary to evenly fill planting bed with indicated quantity of plants. Plant to within 12" of the trunks of trees and shrubs within planting bed and to within 6" of edge of bed.
- D. Mulching:
 - 1. Mulch tree and shrub planting pits and shrub beds with required mulching material 3" deep immediately after planting. Thoroughly water mulched areas. After watering, rake mulch to provide a uniform finished surface.
 - 2. Mulch ground cover beds and annual/perennial beds 1" to 1 1/2" deep immediately after planting.
- E. Wrapping, guying, staking:
 - 1. Inspect trees for injury to trunks, evidence of insect infestation, and improper pruning before wrapping.
 - 2. Wrap trunks of all trees spirally from bottom to top with specified tree wrap and secure in place.
 - a. Overlap 1/2 the width of the tree wrap strip and cover the trunk from the ground to the height of the second branch.
 - b. Secure tree wrap in place with twine wound spirally downward in opposite direction, tied around the tree in at least 3 places in addition to the top and bottom.
 - 3. Staking/Guying: Stake/guy all trees immediately after lawn seeding or sodding operations and prior to acceptance. When high winds or other conditions, which may effect tree survival or appearance occur, the Landscape Architect may require immediate staking/guying. For pedestrian safety, provide white flags or white 2" pvc pipes around guy wires.
 - 4. All work shall be acceptable to the Landscape Architect.
- F. Pruning:

- 1. Prune branches of deciduous stock, after planting to preserve the natural character appropriate to the particular plant requirements. Remove or cut back broken, damaged, and unsymmetrical growth of new wood.
- 2. Multiple leader plants: Preserve the leader that will best promote the symmetry of the plant. Cut branches flush with the trunk or main branch, at a point beyond a lateral shoot or bud a distance of not less than 1/2 the diameter of the supporting branch. Make cut on an angle.
- 3. Prune evergreens only to remove broken or damaged branches.
- G. Tree relocation:
 - 1. Transplant trees designated for relocation to locations shown on the drawings. Prune, dig, ball and burlap, move and plant in accordance with specified tree planting requirements.
 - 2. Prune, dig, ball and burlap, and move designated trees for relocation to the designated plant storage area for heeling-in of materials until final planting areas are prepared.
 - a. Maintain plants in storage areas by bracing plants in vertical bark. Water as required to maintain adequate root moisture.
 - b. Re-burlap plant balls if required before final transplanting operations.
 - c. Move to final locations shown on the drawings and plant in accordance with specified tree planting requirements.

3.04 MAINTENANCE

- A. Maintenance of installed and accepted plantings will be performed by the Owner.
- B. Maintenance until acceptance shall include pruning, cultivating, weeding, watering, and application of appropriate insecticides and fungicides necessary to maintain plants free of insects and disease.
 - 1. Re-set settled plants to proper grade and position. Restore planting saucer and adjacent material and remove dead material.
 - 2. Tighten and repair guy wires and stakes as required.
 - 3. Correct defective work as soon as possible after deficiencies become apparent and weather and season permit.
 - 4. Water trees, plants, and ground cover beds within the first 24 hours of initial planting, and not less than twice per week until final acceptance.

3.05 ACCEPTANCE

- A. Planted areas will be inspected at completion of installation and accepted subject to compliance with specified materials and installation requirements.
- B. Inspection to determine acceptance of planted areas will be made by the Landscape Architect, upon Contractor's request. Provide notification at least 10 working days before requested inspection date.
 - 1. Planted areas will be accepted provided all requirements, including maintenance, have been compiled with and plant materials are alive and in a healthy, vigorous condition.

- C. All planted areas shall be totally completed prior to contractor calling for inspection for acceptance. Inspection is not for the purpose of providing a 'work list', or 'to do list' for the contractor, but to ensure that installation is in accordance with the plans and specifications, and quality is as specified. The general contractor shall notify the architect of completion of planting installation and request an inspection for acceptance. If planting installation is not complete at the time of inspection called for by the general contractor, the general contractor shall reimburse the Landscape Architect \$300.00 for each inspection of incomplete installation. Exceptions to that will be only if the contractor discloses in full all incomplete items prior to inspection, and that the Landscape Architect and Owner agree to inspect the installation with that knowledge.
- D. Upon acceptance, the Owner will assume plant maintenance.

3.06 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, soil, debris, and equipment. Repair damage resulting from planting operations.

END OF SECTION

SECTION 03300 - CAST-IN-PLACE CONCRETE

- 1. GENERAL
 - A. Codes and Standards: ACI 301, "Specifications for Structural Concrete Buildings;" ACI 318, "Building Code Requirements for Reinforced Concrete;" comply with applicable provisions except as otherwise indicated.
 - B. Concrete-Testing Service:
 - 1. As a part of the *Special Inspections Program*, the Owner will employ separate testing laboratory to evaluate concrete delivered to and placed at the site.
 - C. Submittals:
 - 1. Manufacturer's data with installation instructions for proprietary materials including reinforcement and forming accessories, admixtures, joint materials, hardeners, curing materials, and others as requested by the Architect.
 - 2. Laboratory test or evaluation reports for concrete materials and mix designs.
 - 3. Shop drawings for fabrication, bending, and placement of concrete reinforcement. Drawings shall comply with ACI 315, "*Manual of Standard Practice for Detailing Reinforced-Concrete Structures*" and shall show all necessary information for shop fabrication and field placement.
 - D. Mix Proportions and Design: Proportion mixes complying with mix design procedures specified in ACI 301.
 - 1. Submit written report to the Architect for each proposed concrete mix at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed and are acceptable to the Architect.
 - 2. Mix designs may be adjusted when material characteristics, job condition, weather, test results, or other circumstances warrant. Do not use revised concrete mixes until submitted to and accepted by the Architect.
 - 3. Use air-entraining admixture in all concrete, providing not less than 5 percent nor more than 7 percent entrained air for concrete exposed to freezing and thawing, and from 2 percent to 4 percent for other concrete.

2. PRODUCTS

- A. Concrete Materials: As follows:
 - 1. Portland Cement: ASTM C-150, type as required.
 - 2. Fly Ash: ASTM C-618, Type C or F.
 - a. Limit use of fly ash in concrete mix design not to exceed 25 percent of total cementitious materials content by weight.
 - 3. Aggregates: ASTM C-33, except local aggregates of proven durability may be used when acceptable to the Architect.

- 4. Water: Drinkable.
- 5. Air-Entraining Admixture: ASTM C-260.
- 6. Water-Reducing Admixture: ASTM C-494; type as required to suit project conditions. Use only admixtures that have been tested and accepted in mix designs.
- B. Related Materials: As follows:
 - 1. Membrane-forming Curing Compound: ASTM C-309, Type I.
- C. Form Materials: As follows:
 - 1. Provide form materials with sufficient stability to withstand pressure of placed concrete without bow or deflection.
 - 2. Exposed Concrete Surfaces: Suitable material to suite project conditions.
- D. Reinforcing Materials: As follows:
 - 1. Deformed Reinforcing Bars: ASTM A-615, Grade 60, unless otherwise indicated.

3. EXECUTION

- A. Forming and Placing Concrete: As follows:
 - 1. Job-Site Mixing: Use drum-type batch machine mixer, mixing not less than 1-1/2 minutes for one cu. yd. or small capacity. Increase mixing time at least 15 seconds for each additional cu. yd. or fraction thereof.
 - 2. Ready-Mix Concrete: ASTM C-94.
 - 3. Formwork: Construct so that concrete members and structures are of correct size, shape, alignment, elevation, and position.
 - 4. Provide openings in formwork to accommodate work of other trades. Accurately place and securely support items built into forms.
 - 5. Clean and adjust forms prior to concrete placement. Apply form-release agents or wet forms, as required. Retighten forms during concrete placement if required to eliminate mortar leaks.
 - 6. Reinforcement: Position, support, and secure reinforcement against displacement. Locate and support with metal chairs, runners, bolsters, spacers, and hangers, as required. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
 - 7. Install welded-wire fabric in as long lengths as practicable, lapping at least one mesh.
 - 8. Joints: Provide construction, isolation, and control joints as indicated or required.
 - 9. Installation of Embedded Items: Set and built into work-anchorage devices and other embedded items required for other work which is attached to or supported by cast-in-place concrete. Use setting diagrams, templates, and instructions provided by others for locating and setting.
 - 10. Concrete Placement: Comply with ACI, placing concrete in a continuous operation within
planned joints or sections. Do not begin placement until work of other trades affecting concrete is completed.

- 11. Consolidate placed concrete using mechanical vibrating equipment with hand rodding and tamping, so that concrete is worked around reinforcement and other embedded items and into forms.
- 12. Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placing, and curing.
 - a. In cold weather comply with ACI 306.
 - b. In hot weather comply with ACI 305.
- B. Concrete Finishes: As follows:
 - 1. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
 - 2. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - a. Apply a trowel finish to surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 - b. Exposed-to-View Surfaces: Provide a smooth finish for exposed concrete surfaces and surfaces to be covered with a coating or covering material applied directly to concrete. Remove fins and projections, patch defective areas with cement grout, and rub smooth
 - 3. Exterior Slab Broom Finish: Use steel trowel to achieve a dense flat surface to required slope and finish with a light broom texture transverse to normal traffic flow.
 - 4. Curing: Begin initial curing as soon as free water has disappeared from exposed surfaces. Where possible, keep continuously moist for not less than 72 hours. Continue curing by use of moisture-retaining cover or membrane-forming curing compound. Cure formed surfaces by moist curing until forms are removed. Provide protections as required to prevent damage to exposed concrete surfaces.

4. QUALITY CONTROL

- A. The Owner's *Special Inspector* will provide the following quality assurance services:
 - 1. Materials: Review concrete-material certificates, concrete-mix design, and test data.
 - 2. Inspection and Testing for quality control during construction. The Contractor shall cooperate with the Owner's *Special Inspector* and shall provide reasonable auxiliary services as requested. Notify the *Special Inspector* at least 24 hours in advance of the time inspections or tests are required.
 - a. Reinforcing Steel: Inspect all reinforcing steel for location and installation details for compliance with approved drawings, specifications, and ACI 318, Sections 7.4, 7.5, 7.6, and 7.7.

- b. Observe concrete conveying and placing techniques for conformance to ACI 318, Sections 5.9 and 5.10.
- c. Sampling and testing during concrete placement, as follows:
 - 1. Sampling: ASTM C-172
 - 2. Slump: ASTM C-143, one test for each load at point of discharge.
 - 3. Air Content: ASTM C-173, one for each set of compressive strength specimens.
 - 4. Compressive Strength: ASTM C-39, one set for each 50 cu. yds. or fraction thereof of each class of concrete; two specimens tested at 7 days, one specimen tested at 28 days, and one retained for later testing if required.
- d. Inspect curing techniques and verify maintenance of specified curing temperature and time.

END OF SECTION 03300

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes exterior cement concrete pavement for the following:
 - 1. Driveways and roadways.
 - 2. Parking lots.
 - 3. Curbs and gutters.
 - 4. Walkways.
 - 5. Unit paver base.
- B. Related Sections include the following:
 - 1. Division 03 Section "[Cast-in-Place Concrete] [Miscellaneous Cast-in-Place Concrete]" for general building applications of concrete.
 - 2. Division 31 Section "Earth Moving" for subgrade preparation, grading, and subbase course.
 - 3. Division 32 Section "Decorative Concrete Paving" for surface-imprinted, stamped finished concrete pavement.
 - 4. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants of joints in concrete pavement and at isolation joints of concrete pavement with adjacent construction.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.4 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Samples: [10-lb (4.5-kg)] <Insert weight>sample of exposed aggregate.
- D. Qualification Data: For [manufacturer] [testing agency].
- E. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:

1. Aggregates. [Include service record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity].

- F. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:
 - 1. Cementitious materials.
 - 2. Steel reinforcement and reinforcement accessories.
 - 3. Fiber reinforcement.
 - 4. Admixtures.
 - 5. Curing compounds.
 - 6. Applied finish materials.
 - 7. Bonding agent or epoxy adhesive.
 - 8. Joint fillers.
- G. Field quality-control test reports.
- H. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
- C. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.
- D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- E. Mockups: Cast mockups of full-size sections of concrete pavement to demonstrate typical joints, surface finish, texture, color, and standard of workmanship.
 - 1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 - 3. Obtain Architect's approval of mockups before starting construction.
 - 4. Maintain approved mockups during construction in an undisturbed condition as a standard for judging the completed pavement.
 - 5. Demolish and remove approved mockups from the site when directed by Architect.
 - 6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

- 1. Before submitting design mixtures, review concrete pavement mixture design and examine procedures for ensuring quality of concrete materials and concrete pavement construction practices. Require representatives, including the following, of each entity directly concerned with concrete pavement, to attend conference:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete producer.
 - d. Concrete pavement subcontractor.

1.6 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 - 2. Products: Subject to compliance with requirements, provide one of the products specified.
 - 3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 - 4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
 - 1. Use flexible or curved forms for curves with a radius 100 feet (30.5 m) or less.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

- A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- B. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.
- C. Epoxy-Coated Welded Wire Fabric: ASTM A 884/A 884M, Class A, plain steel.

- D. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420); deformed.
- E. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A 615/A 615M, Grade 60 (Grade 420) deformed bars.
- F. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M or ASTM A 934/A 934M; with ASTM A 615/A 615M, Grade 60 (Grade 420) deformed bars.
- G. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60 (Grade 420), deformed bars; assembled with clips.
- H. Plain Steel Wire: ASTM A 82, [as drawn] [galvanized].
- I. Deformed-Steel Wire: ASTM A 496.
- J. Epoxy-Coated-Steel Wire: ASTM A 884/A 884M, Class A coated, [plain] [deformed].
- K. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60 (Grade 420). Cut bars true to length with ends square and free of burrs.
- L. Epoxy-Coated Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60 (Grade 420), plain steel bars.
- M. Tie Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- N. Hook Bolts: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), internally and externally threaded. Design hook-bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.
- O. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:
 - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
 - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
- P. Epoxy Repair Coating: Liquid two-part epoxy repair coating, compatible with epoxy coating on reinforcement.
- Q. Zinc Repair Material: ASTM A 780.

2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use[**one of**] the following cementitious materials, of the same type, brand, and source throughout the Project:
 - 1. Portland Cement: ASTM C 150, Type [I] [II] [I/II] [III] [V], [gray] [white].[Supplement with the following:]
 - a. Fly Ash: ASTM C 618, Class [C] [F].
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

- 2. Blended Hydraulic Cement: ASTM C 595, Type [IS, portland blast-furnace slag] [IP, portland-pozzolan] [I (PM), pozzolan-modified portland] [I (SM), slag-modified portland] cement.
- B. Normal-Weight Aggregates: ASTM C 33, Class [4S] [4M] [1N] <Insert class> coarse aggregate, uniformly graded. Provide aggregates from a single source[with documented service record data of at least 10 years' satisfactory service in similar pavement applications and service conditions using similar aggregates and cementitious materials].
 - 1. Maximum Coarse-Aggregate Size: [1-1/2 inches (38 mm)] [1 inch (25 mm)] [3/4 inch (19 mm)] nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Exposed Aggregate: Selected, hard, and durable; washed; free of materials with deleterious reactivity to cement or that cause staining; from a single source, with gap-graded coarse aggregate as follows:
 - 1. Aggregate Sizes: [3/4 to 1 inch (19 to 25 mm)] [1/2 to 3/4 inch (13 to 19 mm)] [3/8 to 5/8 inch (10 to 16 mm)] nominal.
 - 2. Aggregate Source, Shape, and Color: < Insert requirements.>
- D. Water: ASTM C 94/C 94M.
- E. Air-Entraining Admixture: ASTM C 260.
- F. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 FIBER REINFORCEMENT

- A. Synthetic Fiber: [Monofilament] [or] [fibrillated] polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, [1/2 to 1-1/2 inches (13 to 38 mm)]
 <Insert dimensions> long.
 - 1. [Available]Products:
 - a. Monofilament Fibers:
 - 1) Axim Concrete Technologies; Fibrasol IIP.
 - 2) Euclid Chemical Company (The); Fiberstrand 100.
 - 3) FORTA Corporation; Forta Mono.
 - 4) Grace, W. R. & Co.--Conn.; Grace MicroFiber.
 - 5) Metalcrete Industries; Polystrand 1000.
 - 6) SI Concrete Systems; Fibermix Stealth.
 - 7) <Insert manufacturer's name; product name or designation.>
 - b. Fibrillated Fibers:

- 1) Axim Concrete Technologies; Fibrasol F.
- 2) FORTA Corporation; Forta.
- 3) Euclid Chemical Company (The); Fiberstrand F.
- 4) Grace, W. R. & Co.--Conn.; Grace Fibers.
- 5) SI Concrete Systems; Fibermesh.
- 6) <Insert manufacturer's name; product name or designation.>

2.6 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
 - 1. [Available]Products:
 - a. Axim Concrete Technologies; Cimfilm.
 - b. Burke by Edeco; BurkeFilm.
 - c. ChemMasters; Spray-Film.
 - d. Conspec Marketing & Manufacturing Co., Inc.; Aquafilm.
 - e. Dayton Superior Corporation; Sure Film.
 - f. Euclid Chemical Company (The); Eucobar.
 - g. Kaufman Products, Inc.; Vapor Aid.
 - h. Lambert Corporation; Lambco Skin.
 - i. L&M Construction Chemicals, Inc.; E-Con.
 - j. MBT Protection and Repair, ChemRex Inc.; Confilm.
 - k. Meadows, W. R., Inc.; Sealtight Evapre.
 - 1. Metalcrete Industries; Waterhold.
 - m. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
 - n. Sika Corporation, Inc.; SikaFilm.
 - o. Symons Corporation; Finishing Aid.
 - p. Vexcon Chemicals, Inc.; Certi-Vex EnvioAssist.
 - q. <Insert manufacturer's name; product name or designation.>
- E. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
 - 1. [Available]Products:
 - a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
 - b. Burke by Edoko; Aqua Resin Cure.
 - c. ChemMasters; Safe-Cure Clear.
 - d. Conspec Marketing & Manufacturing Co., Inc.; W.B. Resin Cure.
 - e. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
 - f. Euclid Chemical Company (The); Kurez DR VOX.
 - g. Kaufman Products, Inc.; Thinfilm 420.
 - h. Lambert Corporation; Aqua Kure-Clear.
 - i. L&M Construction Chemicals, Inc.; L&M Cure R.
 - j. Meadows, W. R., Inc.; 1100 Clear.
 - k. Nox-Crete Products Group, Kinsman Corporation; Resin Cure E.

- 1. Symons Corporation; Resi-Chem Clear.
- m. Tamms Industries Inc.; Horncure WB 30.
- n. Unitex; Hydro Cure 309.
- o. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.
- p. <Insert manufacturer's name; product name or designation.>
- F. White Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B.
 - 1. [Available]Products:
 - a. Anti-Hydro International, Inc.; AH Curing Compound #2 WP WB.
 - b. Burke by Edoco; Resin Emulsion White.
 - c. ChemMasters; Safe-Cure 2000.
 - d. Conspec Marketing & Manufacturing Co., Inc.; W.B. Resin Cure.
 - e. Dayton Superior Corporation; Day-Chem White Pigmented Cure (J-10-W).
 - f. Euclid Chemical Company (The); Kurez VOX White Pigmented.
 - g. Kaufman Products, Inc.; Thinfilm 450.
 - h. Lambert Corporation; Aqua Kure-White.
 - i. L&M Construction Chemicals, Inc.; L&M Cure R-2.
 - j. Meadows, W. R., Inc.; 1200-White.
 - k. Symons Corporation; Resi-Chem White.
 - 1. Tamms Industries, Inc.; Horncure 200-W.
 - m. Unitex; Hydro White.
 - n. Vexcon Chemicals, Inc.; Certi-Vex Enviocure White 100.
 - o. <Insert manufacturer's name; product name or designation.>

2.7 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: [ASTM D 1751, asphalt-saturated cellulosic fiber] [or] [ASTM D 1752, cork or self-expanding cork].
- B. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, [free of carbon black,] nonfading, and resistant to lime and other alkalis.
 - 1. [Available]Manufacturers:
 - a. Bayer Corporation.
 - b. ChemMasters.
 - c. Conspec Marketing & Manufacturing Co., Inc.
 - d. Davis Colors.
 - e. Elementis Pigments, Inc.
 - f. Hoover Color Corporation.
 - g. Lambert Corporation.
 - h. Scofield, L. M.Company.
 - i. Solomon Colors.
 - j. <Insert manufacturer's name.>
 - 2. Color: [As indicated by manufacturer's designation] [Match Architect's sample] [As selected by Architect from manufacturer's full range].
- C. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

- D. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- E. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to requirements, and as follows:
 - 1. Types [I and II, non-load bearing] [IV and V, load bearing], for bonding hardened or freshly mixed concrete to hardened concrete.
- F. Chemical Surface Retarder: Water-soluble, liquid-set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch (3 to 6 mm).
 - 1. [Available]Products:
 - a. Burke by Edeco; True Etch Surface Retarder.
 - b. ChemMasters; Exposee.
 - c. Conspec Marketing & Manufacturing Co., Inc.; Delay S.
 - d. Euclid Chemical Company (The); Surface Retarder S.
 - e. Kaufman Products, Inc.; Expose.
 - f. Metalcrete Industries; Surftard.
 - g. Nox-Crete Products Group, Kinsman Corporation; Crete-Nox TA.
 - h. Scofield, L. M. Company; Lithotex.
 - i. Sika Corporation, Inc.; Rugasol-S.
 - j. Vexcon Chemicals, Inc.; Certi-Vex Envioset.
 - k. <Insert manufacturer's name; product name or designation.>
- G. Pigmented Mineral Dry-Shake Hardener: Factory-packaged dry combination of portland cement, graded quartz aggregate, color pigments, and plasticizing admixture. Use color pigments that are finely ground, nonfading mineral oxides interground with cement.
 - 1. [Available]Products:
 - a. Conspec Marketing & Manufacturing Co., Inc.; Conshake 600 Colortone.
 - b. Dayton Superior Corporation; Quartz Tuff.
 - c. Euclid Chemical Company (The); Surflex.
 - d. Lambert Corporation; Colorhard.
 - e. L&M Construction Chemicals, Inc.; Quartz Plate FF.
 - f. MBT Protection and Repair, ChemRex Inc.; Mastercron.
 - g. Metalcrete Industries; Floor Quartz.
 - h. Scofield, L. M. Company; Lithochrome Color Hardener.
 - i. Symons Corporation; Hard Top.
 - j. <Insert manufacturer's name; product name or designation.>
 - 2. Color: [As indicated by manufacturer's designation] [Match Architect's sample] [As selected by Architect from manufacturer's full range].
- H. Rock Salt: Sodium chloride crystals, kiln dried, coarse gradation with 100 percent passing 3/8-inch (9.5-mm) sieve and 85 percent retained on a No. 8 (2.36-mm) sieve.

2.8 PAVEMENT MARKINGS

A. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with FS TT-P-115, Type **[I] [II]** or AASHTO M 248, Type **[N] [F]**.

- 1. Color: [White] [Yellow] [Blue] [As indicated] <Insert color>.
- B. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, with drying time of less than [3] [45] minutes.
 - 1. Color: [White] [Yellow] [Blue] [As indicated] <Insert color>.
- C. Glass Beads: AASHTO M 247, Type 1.

2.9 WHEEL STOPS

- A. Wheel Stops: Precast, air-entrained concrete, [2500-psi (17.2-MPa)] <Insert strength> minimum compressive strength, [4-1/2 inches (115 mm) high by 9 inches (225 mm) wide by 72 inches (1820 mm) long] <Insert dimensions>. Provide chamfered corners and drainage slots on underside and holes for anchoring to substrate.
 - 1. Dowels: Galvanized steel, 3/4-inch (19-mm) diameter, 10-inch (254-mm) minimum length.
- B. Wheel Stops: Solid, integrally colored, 96 percent recycled HDPE or commingled postconsumer and postindustrial recycled plastic; UV stabilized; [4 inches (100 mm) high by 6 inches (150 mm) wide by 72 inches (1820 mm) long]
 Insert dimensions>. Provide chamfered corners and drainage slots on underside and holes for anchoring to substrate.
 - 1. Dowels: Galvanized steel, 3/4-inch (19-mm) diameter, 10-inch (254-mm) minimum length.

2.10 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.
- B. Proportion mixtures to provide normal-weight concrete with the following properties:
 - 1. Compressive Strength (28 Days): [4500 psi (31 MPa)] [4000 psi (27.6 MPa)] [3500 psi (24.1 MPa)] [3000 psi (20.7 MPa)] <Insert strength>.
 - 2. Maximum Water-Cementitious Materials Ratio at Point of Placement: [0.45] [0.50] <Insert ratio>.
 - 3. Slump Limit: [4 inches (100 mm)] [5 inches (125 mm)] [8 inches (200 mm)] <Insert dimension>, plus or minus 1 inch (25 mm).
- C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
 - 1. Air Content: [5-1/2] [4-1/2] [2-1/2] percent plus or minus 1.5 percent for 1-1/2-inch (38-mm) nominal maximum aggregate size.
 - 2. Air Content: [6] [4-1/2] [3] percent plus or minus 1.5 percent for 1-inch (25-mm) nominal maximum aggregate size.
 - 3. Air Content: [6] [5] [3-1/2] percent plus or minus 1.5 percent for 3/4-inch (19-mm) nominal maximum aggregate size

- D. Limit water-soluble, chloride-ion content in hardened concrete to [0.15] [0.30] percent by weight of cement.
- E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use [water-reducing admixture] [high-range, water-reducing admixture] [high-range, waterreducing and retarding admixture] [plasticizing and retarding admixture] in concrete, as required, for placement and workability.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
- F. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements [for concrete exposed to deicing chemicals.] [as follows:]
 - 1. Fly Ash or Pozzolan: 25 percent.
 - 2. Ground Granulated Blast-Furnace Slag: 50 percent.
 - 3. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent, with fly ash or pozzolan not exceeding 25 percent.
- G. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than [1.0 lb/cu. yd. (0.60 kg/cu. m)] [1.5 lb/cu. yd. (0.90 kg/cu. m)]
- H. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.11 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M[and ASTM C 1116]. Furnish batch certificates for each batch discharged and used in the Work.
 - 1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 - 1. For concrete mixes of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 - 2. For concrete mixes larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
 - 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

- B. Proof-roll prepared subbase surface below [concrete pavements] <Insert locations> with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.
 - 1. Completely proof-roll subbase in one direction[and repeat in perpendicular direction]. Limit vehicle speed to 3 mph (5 km/h).
 - 2. Proof-roll with a loaded 10-wheel tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
 - Subbase with soft spots and areas of pumping or rutting exceeding depth of [1/2 inch (13 mm)]
 <Insert dimension> require correction according to requirements in Division 31 Section "Earth Moving."
- C. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Zinc-Coated Reinforcement: Use galvanized steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.
- F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M.
- G. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch (50-mm) overlap of adjacent mats.

3.5 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
 - 1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.
 - 1. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
 - 2. Provide tie bars at sides of pavement strips where indicated.
 - 3. Butt Joints: Use [**bonding agent**] [**epoxy bonding adhesive**] at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
 - 5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
 - 1. Locate expansion joints at intervals of [50 feet (15.25 m)] <Insert dimension>, unless otherwise indicated.
 - 2. Extend joint fillers full width and depth of joint.
 - 3. Terminate joint filler not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished surface if joint sealant is indicated.
 - 4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
 - 5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
 - 6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows[to match jointing of existing adjacent concrete pavement]:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a [1/4-inch (6-mm)] [3/8-inch (10-mm)] radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
 - 3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.
- E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a [1/4-inch (6-mm)] [3/8-inch (10-mm)] radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery or at Project site.
- F. Do not add water to fresh concrete after testing.
- G. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- H. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
 - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.
- I. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.
 - 1. Remove and replace concrete that has been placed for more than 15 minutes without being covered by top layer, or use bonding agent if approved by Architect.
- J. Screed pavement surfaces with a straightedge and strike off.
- K. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
- L. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.
- M. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.
 - 1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.
- N. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

- O. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
 - 2. Do not use frozen materials or materials containing ice or snow.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.
- P. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
 - 1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 - 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
 - 1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
 - 2. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
 - 3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch (1.6 to 3 mm) deep with a stiff-bristled broom, perpendicular to line of traffic.

3.8 SPECIAL FINISHES

- A. Monolithic Exposed-Aggregate Finish: Expose coarse aggregate in pavement surfaces as follows:
 - 1. Immediately after float finishing, spray-apply chemical surface retarder to pavement according to manufacturer's written instructions.
 - 2. Cover pavement surface with plastic sheeting, sealing laps with tape, and remove when ready to continue finishing operations.
 - 3. Without dislodging aggregate, remove excess mortar by lightly brushing surface with a stiff, nylon-bristle broom.
 - 4. Fine-spray surface with water and brush. Repeat water flushing and brushing cycle until cement film is removed from aggregate surfaces to depth required.

- B. Seeded Exposed-Aggregate Finish: Immediately after initial floating, spread a single layer of aggregate uniformly on pavement surface. Tamp aggregate into plastic concrete, and float finish to entirely embed aggregate with mortar cover of 1/16 inch (1.6 mm).
 - 1. Spray-apply chemical surface retarder to pavement according to manufacturer's written instructions.
 - 2. Cover pavement surface with plastic sheeting, sealing laps with tape, and remove sheeting when ready to continue finishing operations.
 - 3. Without dislodging aggregate, remove excess mortar by lightly brushing surface with a stiff, nylon-bristle broom.
 - 4. Fine-spray surface with water and brush. Repeat water flushing and brushing cycle until cement film is removed from aggregate surfaces to depth required.
- C. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on pavement surface according to manufacturer's written instructions and as follows:
 - Uniformly spread [25 lb/100 sq. ft. (12 kg/10 sq. m)] [40 lb/100 sq. ft. (19.5 kg/10 sq. m)] [60 lb/100 sq. ft. (29 kg/10 sq. m)] <Insert rate of application> dampened slip-resistive aggregate over pavement surface in 2 applications. Tamp aggregate flush with surface using a steel trowel, but do not force below surface.
 - 2. Uniformly distribute approximately two-thirds of slip-resistive aggregate over pavement surface with mechanical spreader, allow to absorb moisture, and embed by power floating. Follow power floating with a second slip-resistive aggregate application, uniformly distributing remainder of material at right angles to first application to ensure uniform coverage, and embed by power floating.
 - 3. Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.
 - 4. After curing, lightly work surface with a steel wire brush or abrasive stone and water to expose nonslip aggregate.
- D. Rock-Salt Finish: After initial floating, uniformly spread 5 lb/100 sq. ft. (0.2 kg/10 sq. m) rock salt over pavement surface.
 - 1. Cover pavement surface with 1-mil- (0.025-mm-) thick polyethylene sheet and remove sheet when concrete has hardened and 7-day curing period has elapsed.
 - 2. Embed rock salt into plastic concrete, power float concrete, and trowel finish.
 - 3. After 7-day curing period, saturate concrete with water and broom-sweep surface to dissolve remaining rock salt.
- E. Pigmented Mineral Dry-Shake Hardener Finish: After initial floating, apply dry-shake materials to pavement surface according to manufacturer's written instructions and as follows:
 - 1. Uniformly spread dry-shake hardener at a rate of [100 lb/100 sq. ft. (49 kg/10 sq. m)] <Insert rate of application>, unless greater amount is recommended by manufacturer to match pavement color required.
 - 2. Uniformly distribute approximately two-thirds of dry-shake hardener over pavement surface with mechanical spreader, allow to absorb moisture, and embed by power floating. Follow power floating with a second dry-shake hardener application, uniformly distributing remainder of material at right angles to first application to ensure uniform color, and embed by power floating.
 - 3. After final floating, apply a hand-trowel finish followed by a broom finish to concrete.
 - 4. Cure concrete with curing compound recommended by dry-shake hardener manufacturer. Apply curing compound immediately after final finishing.

3.9 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
 - 1. Moist Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
 - Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.10 PAVEMENT TOLERANCES

- A. Comply with tolerances of ACI 117 and as follows:
 - 1. Elevation: 1/4 inch (6 mm).
 - 2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
 - 3. Surface: Gap below 10-foot- (3-m-) long, unleveled straightedge not to exceed 1/4 inch (6 mm).
 - 4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch (25 mm).
 - 5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch (6 mm).
 - 6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch (13 mm).
 - 7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches (6 mm per 300 mm).
 - 8. Joint Spacing: 3 inches (75 mm).
 - 9. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
 - 10. Joint Width: Plus 1/8 inch (3 mm), no minus.

3.11 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow concrete pavement to cure for [28] <Insert number> days and be dry before starting pavement marking.

- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils (0.4 mm).
 - 1. Spread glass beads uniformly into wet pavement markings at a rate of 6 lb/gal. (0.72 kg/L).

3.12 WHEEL STOPS

A. Securely attach wheel stops into pavement with not less than two galvanized steel dowels embedded in holes drilled or cast into wheel stops at one-quarter to one-third points. Firmly bond each dowel to wheel stop and to pavement. Securely install dowels into pavement and bond to wheel stop. Recess head of dowel beneath top of wheel stop.

3.13 FIELD QUALITY CONTROL

- A. Testing Agency: [**Owner will engage**] [**Engage**] a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - 1. Testing Frequency: Obtain at least 1 composite sample for each [100 cu. yd. (76 cu. m)] [5000 sq. ft. (465 sq. m)] or fraction thereof of each concrete mix placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 - 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
 - 3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
 - 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
 - 5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
 - 6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.
 - a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
- D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete

batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
- G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.14 REPAIRS AND PROTECTION

- A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.
- B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

SECTION 321373 - CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Expansion and contraction joints within cement concrete pavement.
 - 2. Joints between cement concrete and asphalt pavement.
- B. Related Sections include the following:
 - 1. Division 07 Section "Joint Sealants" for sealing nontraffic and traffic joints in locations not specified in this Section.
 - 2. Division 32 Section "Asphalt Paving" for constructing joints between concrete and asphalt pavement.
 - 3. Division 32 Section "Concrete Paving" for constructing joints in concrete pavement.

1.3 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Verification: For each type and color of joint sealant required. Install joint-sealant samples in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.
- D. Qualification Data: For [Installer] [testing agency].
- E. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for sealants.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - 1. Use [ASTM C 1087] [manufacturer's standard test methods] to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - 2. Submit not fewer than [eight] <Insert number> pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
 - 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
 - 5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.
- D. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing of current sealant products within a 36-month period preceding the [Notice to Proceed with] [commencement of] the Work.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 for testing indicated, as documented according to ASTM E 548.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
 - 2. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (4.4 deg C).
 - 3. When joint substrates are wet or covered with frost.
 - 4. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 5. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.
- B. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

2.2 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.
- B. Colors of Exposed Joint Sealants: [As indicated by manufacturer's designations] [Match Architect's samples] [As selected by Architect from manufacturer's full range].

2.3 COLD-APPLIED JOINT SEALANTS

- A. Multicomponent Jet-Fuel-Resistant Sealant for Concrete: Pourable, chemically curing elastomeric formulation complying with the following requirements for formulation and with ASTM C 920 for type, grade, class, and uses indicated:
 - 1. Urethane Formulation: Type M; Grade P; Class 12-1/2; Uses T, M, and, as applicable to joint substrates indicated, O.
 - a. [Available]Products:
 - 1) Pecora Corporation; Urexpan NR-300.
 - 2) <Insert manufacturer's name; product name or designation.>
 - 2. Coal-Tar-Modified Polymer Formulation: Type M; Grade P; Class 25; Uses T and, as applicable to joint substrates indicated, O.
 - a. [Available]Products:
 - 1) Meadows, W. R., Inc.; Sealtight Gardox.
 - 2) <Insert manufacturer's name; product name or designation.>
 - 3. Bitumen-Modified Urethane Formulation: Type M; Grade P; Class 25; Uses T, M, and, as applicable to joint substrates indicated, O.
 - a. [Available]Products:
 - 1) Tremco Sealant/Waterproofing Division; Vulkem 202.
 - 2) <Insert manufacturer's name; product name or designation.>
- B. Single-Component Jet-Fuel-Resistant Urethane Sealant for Concrete: Single-component, pourable, coaltar-modified, urethane formulation complying with ASTM C 920 for Type S; Grade P; Class 25; Uses T, M, and, as applicable to joint substrates indicated, O.
 - 1. [Available]Products:
 - a. Sonneborn, Div. of ChemRex, Inc.; Sonomeric 1.
 - b. <Insert manufacturer's name; product name or designation.>

- C. Type NS Silicone Sealant for Concrete: Single-component, low-modulus, neutral-curing, nonsag silicone sealant complying with ASTM D 5893 for Type NS.
 - 1. [Available]Products:
 - a. Crafco Inc.; RoadSaver Silicone.
 - b. Dow Corning Corporation; 888.
 - c. <Insert manufacturer's name; product name or designation.>
- D. Type SL Silicone Sealant for Concrete and Asphalt: Single-component, low-modulus, neutral-curing, self-leveling silicone sealant complying with ASTM D 5893 for Type SL.
 - 1. [Available]Products:
 - a. Crafco Inc.; RoadSaver Silicone SL.
 - b. Dow Corning Corporation; 890-SL.
 - c. <Insert manufacturer's name; product name or designation.>
- E. Multicomponent Low-Modulus Sealant for Concrete and Asphalt: Proprietary formulation consisting of reactive petropolymer and activator components producing a pourable, self-leveling sealant.
 - 1. [Available]Products:
 - a. Meadows, W. R., Inc.; Sof-Seal.
 - b. <Insert manufacturer's name; product name or designation.>

2.4 HOT-APPLIED JOINT SEALANTS

- A. Jet-Fuel-Resistant Elastomeric Sealant for Concrete: Single-component formulation complying with ASTM D 3569.
 - 1. [Available]Products:
 - a. Crafco Inc.; Superseal 444/777.
 - b. Meadows, W. R., Inc.; Poly-Jet 3569.
 - c. <Insert manufacturer's name; product name or designation.>
- B. Jet-Fuel-Resistant Sealant for Concrete and Tar Concrete: Single-component formulation complying with ASTM D 3581.
 - 1. [Available]Products:
 - a. Crafco Inc.; Superseal 1614A.
 - b. Meadows, W. R., Inc.; Poly-Jet 1614.
 - c. Meadows, W. R., Inc.; Poly-Jet 3406.
 - d. Meadows, W. R., Inc.; Poly-Jet 3569.
 - e. <Insert manufacturer's name; product name or designation.>
- C. Elastomeric Sealant for Concrete: Single-component formulation complying with ASTM D 3406.
 - 1. [Available]Products:
 - a. Crafco Inc.; Superseal 444/777.
 - b. Meadows, W. R., Inc.; Poly-Jet 3406.

c. <Insert manufacturer's name; product name or designation.>

- D. Sealant for Concrete and Asphalt: Single-component formulation complying with ASTM D 3405.
 - 1. [Available]Products:
 - a. Koch Materials Company; Product No. 9005.
 - b. Koch Materials Company; Product No. 9030.
 - c. Meadows, W. R., Inc.; Sealtight Hi-Spec.
 - d. <Insert manufacturer's name; product name or designation.>

2.5 JOINT-SEALANT BACKER MATERIALS

- A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.
- B. Round Backer Rods for Cold- and Hot-Applied Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.
- C. Backer Strips for Cold- and Hot-Applied Sealants: ASTM D 5249; Type 2; of thickness and width required to control sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.
- D. Round Backer Rods for Cold-Applied Sealants: ASTM D 5249, Type 3, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

2.6 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to

comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install backer materials of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of backer materials.
 - 2. Do not stretch, twist, puncture, or tear backer materials.
 - 3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.
- D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses provided for each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealants from surfaces adjacent to joint.
 - 2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions, unless otherwise indicated.
- G. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs,

cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations with repaired areas are indistinguishable from the original work.

END OF SECTION 321373

SECTION 04200 - UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes unit masonry assemblies consisting of the following:
 - 1. Concrete masonry units (CMUs).
 - 2. Face brick.
 - 3. Mortar and grout.
 - 4. Reinforcing steel.
 - 5. Masonry joint reinforcement.
 - 6. Ties and anchors.
 - 7. Embedded flashing.
 - 8. Miscellaneous masonry accessories.
 - 9. Masonry-cell insulation.

1.3 DEFINITIONS

A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PERFORMANCE REQUIREMENTS

- A. Unit Masonry Standard: Comply with ACI 530.1/ASCE6 "Specifications for Masonry Structures," except as otherwise indicated.
- B. System Performance Requirements: Provide unit masonry that develops the installed compressive strengths (f'm) indicated.

1.5 SUBMITTALS

- A. In addition to product data for each different masonry unit, accessory, and manufactured product indicated, submit the following:
 - 1. Samples of each different exposed masonry unit, colored masonry mortar, and accessories.
 - 2. Material certificates for each different masonry product required, from a qualified independent testing laboratory for mortar, grout mixes, and masonry units.
- B. Mix Designs: For each type of mortar. Include description of type and proportions of ingredients.

- 1. Include test reports, per ASTM C 780, for mortar mixes required to comply with property specification.
- 2. Include test reports, per ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- C. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
- D. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.
- E. Hot-Weather Procedures: Hot-weather construction procedures evidencing compliance with requirements specified in referenced unit masonry standard.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1093 for testing indicated, as documented according to ASTM E 548.
- B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.
- D. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects. Comply with requirements in Division 1 Section "Quality Requirements" for mockups.
 - 1. Build sample panels for each type of exposed unit masonry construction in sizes approximately 48 inches (1200 mm) long by 48 inches (1200 mm) high.
 - 2. Clean exposed faces of panels with masonry cleaner indicated.
 - 3. Protect approved sample panels from the elements with weather-resistant membrane.
 - 4. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
 - a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Architect in writing.
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches (600 mm) down both sides and hold cover securely in place.
 - 2. Where 1 wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches (600 mm) down face next to unconstructed wythe and hold cover in place.
- B. Immediately remove grout, mortar, and soil that come in contact with such masonry.
- C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS

- A. Concrete Masonry Units: Comply with requirements indicated below applicable to each form of concrete masonry unit required.
 - 1. Size: Manufactured to specified dimensions of 3/8 inch less than nominal widths by nominal heights by nominal lengths indicated on drawings.
 - 2. Provide Type II, non-moisture-controlled units.

- 3. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.
- 4. Hollow Load-Bearing Concrete Masonry Units: ASTM C-90, Grade N and as follows:
 - a. Net Area Compressive Strength: As required to produce concrete unit masonry construction of compressive strength indicated.
 - b. Weight Classification: Lightweight.

B. MORTAR AND GROUT

- 1. Masonry Cement: ASTM-C91, Sand ASTM-C134, Water drinkable.
- 2. Grout: Portland Cement ASTM-C150, aggregate ASTM-C404, Water drinkable.

C. REINFORCEMENT

1. Joint Reinforcing: ASTM-A951, Ladder Type, Hot-dip Galvanized.

2.2 BRICK

- A. General: Provide shapes indicated and as follows:
 - 1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
- B. Face Brick: ASTM C 216, Grade SW, Type FBS.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3000 psi (20.7 MPa).
 - 2. Initial Rate of Absorption: Less than 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C 67.
 - 3. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
 - 4. Size (Actual Dimensions): To Match existing brick on the Lee Hall Depot: (Approximate size of 3-5/8 inches (92 mm) wide by 2-1/4 inches (71 mm) high by 7-5/8 inches (194 mm) long.
 - 5. Application: Use where brick is exposed, unless otherwise indicated.
 - 6. Color and Texture: To Match Existing Brick on Lee Hall Depot.
 - Available Products: Old Virginia Brick, #24, "Ol Virginia Full Range", Modular size, ASTM C216 FBS grade SW. Contractor to confirm brick height matches existing building foundation brick height for coursing size.

C. MORTAR AND GROUT MATERIALS

- 1. Portland Cement (at 1918 Construction): ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- 2. Hydrated Lime: ASTM C 207, Type S.

- 3. Portland Cement-Lime Mix (at 1890's Construction): Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207, Type S.
- 4. Masonry Cement: ASTM C 91.
- D. Aggregate for Mortar: ASTM C 144.
 - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 - 2. For joints less than 1/4 inch (6.5 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
 - 3. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- E. Aggregate for Grout: ASTM C 404.
- F. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
 - 1. Available Products:
 - a. Addiment Incorporated; Mortar Kick.
 - b. Euclid Chemical Company (The); Accelguard 80.
 - c. Grace Construction Products, a unit of W. R. Grace & Co. Conn.; Morset.
 - d. Sonneborn, Div. of ChemRex; Trimix-NCA.
- G. Water: Potable.

2.2 EMBEDDED FLASHING MATERIALS

- A. Flexible Flashing: For flashing not exposed to the exterior, use one of the following, unless otherwise indicated:
 - 1. Copper-Laminated Flashing: 5-oz./sq. ft. (1.5-kg/sq. m) copper sheet bonded with asphalt between 2 layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.

2.3 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane or PVC.
- B. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe; in color selected from manufacturer's standard.
 - 1. Available Products: Mortar Net USA, Ltd.; Mortar Net Weep Vents, or equal.

2.4 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.5 SOURCE QUALITY CONTROL

- A. Owner will engage a qualified independent testing agency to perform source quality-control testing indicated below:
 - 1. Payment for these services will be made by Owner.
 - 2. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.
- B. Clay Masonry Unit Test: For each type of unit furnished, per ASTM C 67.
- C. Concrete Masonry Unit Test: For each type of unit furnished, per ASTM C 140.

PART 3 - EXECUTION

3.1 PRECONSTRUCTION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify that foundations are within tolerances specified. Verify that reinforcing dowels are properly placed.

3.2 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Layout bond pattern to match existing building foundation for location of running bond and header courses, unless otherwise indicated; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs. Final building foundation appearance to match existing.
- C. Lay concealed masonry with all units in a wythe in running bond. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

3.3 MORTAR BEDDING AND JOINTING

- A. Lay hollow concrete masonry units as follows:
 - 1. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
 - 2. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
 - 3. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.

3.4 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
- B. Space reinforcement not more than 8 inches o.c. in foundation walls.
- C. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- D. Provide continuity at wall intersections by using prefabricated T-shaped units.
- E. Provide continuity at corners by using prefabricated L-shaped units.
- F. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.5 GROUTED UNIT MASONRY INSTALLATION

A. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for grout placement, including minimum grout space and maximum pour height.

3.6 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
 - 1. Crush masonry waste to less than 4 inches in each dimension.
 - 2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Division 2 Section "Earthwork."
 - 3. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

- B. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.
- C. Install flashing as follows, unless otherwise indicated:
 - 1. At masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of sheathing at least 8 inches (200 mm); with upper edge tucked under building paper or building wrap, lapping at least 4 inches (100 mm).
 - 2. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.
- D. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:

- 1. Space weep holes 24 inches (600 mm) o.c., unless otherwise indicated.
- E. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in Part 2 "Miscellaneous Masonry Accessories" Article.

3.7 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 - 6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
 - 7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.1 QUALITY CONTROL

4.1 FIELD INSPECTIONS AND TESTING

- A. The Owner's Special Inspector will inspect and test the masonry construction as indicated below. The payment for these services will be by the owner. Re-testing of materials failing to meet the project specifications will be paid for by the contractor. Quality control shall be in accordance with ACI 530.1, par. 1.6, level 2.
 - 1. Testing: Testing frequency shall be one set of required tests for every 5,000 square feet of wall or fraction there of. Conduct tests at the start of masonry operations.
 - a. Mortar properties shall be tested as per ASTM C780.
 - b. Grout shall be sampled and tested for compressive strength per ASTM C1019.
 - 2. Inspection: Inspect placement of reinforcing as follows:

- a. Vertical wall reinforcing shall be inspected prior to each grout pour, for compliance with the project plans & specifications.
- b. Inspect job site for general conformance with the plans and specifications to include the presence of the proper materials on site. This inspection shall occur prior to the start of masonry operations or shortly after the start of work.

END OF SECTION 04200
SECTION 05 52 14 - ALUMINUM RAILING SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Extruded aluminum railing system with [aluminum picket] [tempered glass] [cable] infill.

1.02 SUBMITTALS

- A. Reference Section 01 33 00–Submittal Procedures; submit following items:
 - 1. Product Data including color chart for initial color selection.
 - 2. Shop Drawings: Indicate materials, sizes, styles, fabrication, anchorage and installation details for railing system and infill.
 - 3. Samples:
 - a. Post and rail sections- minimum 4 inch (100 mm) long piece of each type specified herein.
 - b. Infill:
 - 1) Cable minimum 8 inch (200 mm) long piece with end fittings.
 - 2) Glass minimum 4x4 inch (100x100 mm) glass piece.
 - 3) Aluminum chip with selected paint color for final color verification.
 - 4. Quality Assurance/Control Submittals:
 - a. Qualifications: Proof of manufacturer's qualifications.
 - b. Manufacturer's Installation Instructions.
- B. Closeout Submittals: Reference Section 01 78 00–Closeout Submittals; submit following items:
 - 1. Maintenance Instructions.
 - a. Manufacturer's recommendation for periodic cleaning, checking and adjustment of cables to maintain uniform cable tension.
 - 2. Special Warranties.

1.03 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer Qualifications: Minimum five years experience in producing aluminum railing systems.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Reference Section 01 66 00–Product Storage and Handling Requirements.

1.05 WARRANTY

- A. Special Warranty:
 - 1. Cable and Connectors: 10 year limited warranty against defects in materials and workmanship.
 - 2. Paint Finish on Aluminum Extrusions and Components: 10 year limited warranty against cracking, flaking, blister, and peeling.

1.06 MAINTENANCE

A. Extra Materials: Provide one, approximately 3 ounce (85 grams) can, of touch-up paint per 100 feet (30 m) of each color railing.

PART 2 - PRODUCTS

PMA, Inc., Project 0205.3a

2.01 MANUFACTURER

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Feeney Wire Rope & Rigging, Oakland, CA 94607, Toll Free: (800) 888-2418
 - a. Product: CableRail[™] Aluminum Railing Systems.
 - 2. Substitutions for this product, contractor to submit product data and details per Section 01 63 00–Product Substitution Procedures for review and approval by architect.

2.02 MATERIALS

- A. Extruded Aluminum Rails, Tubes, and Profiles: ASTM B 221/B 221M, alloy 6063-T5/T52.
- B. Extruded Aluminum Structural Pipes and Tubes: ASTM B 429, alloy 6063-T6.
- C. Aluminum Plate and Sheet: ASTM B 209/B 209M, alloy 6061-T6.
- D. Aluminum Castings: ASTM B 26/B 26M, alloy A356-T6.
- E. Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated), Type 1 (transparent flat), Quality q3 (glazing select), Class 1 (clear), 1/4 inch (6.4 mm) thick.
- F. Cables: 1/4 inch (6.4 mm) diameter, 1 by 19 construction, Type 316 stainless steel, polished finish, commercial, dry grade cable with fittings specified below.
 - 1. Fittings:
 - a. Horizontal Cables: Provide a 4-1/4 inch (108mm) long stainless steel Threaded Terminal factory attached to one end of each cable and a stainless steel QuickConnect-SSTM fitting for field attachment on the other end.
 - b. Include washers, nuts, end caps and any accessory items as recommended by manufacturer for installation conditions or as shown on Drawings.

2.03 COMPONENTS

- A. Posts: 2-3/8 inch (61mm) square by 3/32 inch (2.4 mm) thick extruded aluminum tube. surface mount as shown on Drawings.
- B. Cap Rail: Type(s) specified below.
 - 1. Series 200: 3-1/2 inch by 1-1/4 inch (89 by 32 mm) by 3/32 inch (2.4 mm) thick extruded aluminum rectangular profile.
- C. Cap Infill Channel: Extruded aluminum profile configured to secure specified infill.
- D. Foot Rail: Extruded aluminum profile configured to secure specified infill.
- E. Infill:
 - 1. Glass panel.
 - 2. Cables: Horizontal placement.
- F. Fasteners for Interconnecting Railing Components: Stainless steel screws of type and size recommended by railing manufacturer.

VERIFY THAT TYPE AND SIZE OF FASTENERS FOR CONNECTING POSTS AND OTHER COMPONENTS TO OTHER CONSTRUCTION ARE SHOWN ON THE DRAWINGS AND HAVE BEEN APPROVED BY A STRUCTURAL ENGINEER.

- G. Fasteners for Connecting Components to Other Construction: Type and size as required for application to meet railing loading conditions required by the ICC Building Code and jurisdictions having authority.
- H. Aluminum end caps for exposed open ends of rails, tubes, and profiles.

2.04 ACCESSORIES

A. Grab Rail: 1-1/2 inch (38 mm) diameter extruded aluminum tube. Provide where shown on Drawings.
1. Brackets: Cut from extruded aluminum profile.

2.05 FINISH

- A. Shop Finish: Powder coat aluminum components in compliance with AAMA 2603.
- B. Color: Standard color as selected by Architect.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine work upon which railings will be installed.
- B. Coordinate with responsible entity to correct unsatisfactory conditions.
- C. Commencement of work by installer is acceptance of substrate conditions.

3.02 INSTALLATION

- A. Follow manufacturer's installation instructions.
- B. Isolate dissimilar metals where required with grommets, bushings, or coatings as appropriate.
- C. Touch-up damaged paint surfaces with touch-up paint provided.

3.03 CLEANING

- A. Reference Section 01 74 00-Cleaning and Waste Management.
- B. Clean soiled surfaces, cables and glass using a mild detergent and warm water solution with soft clean cloths.
- C. Clean cables thoroughly using synthetic scotch type pads and hot soapy water (or denatured alcohol or acetone) to remove residual lubricants; rinse thoroughly with clear water and wipe dry.

END OF SECTION 055214

SECTION 057300 - DECORATIVE METAL RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Aluminum ornamental railings.
 - 2. Stainless-steel ornamental railings.
 - 3. Post-supported railings with glass infill.
- B. Related Sections include the following:
 - 1. Division 06 Section "Rough Carpentry" for wood blocking for anchoring railings.
 - 2. Division 06 Section "Interior Architectural Woodwork" for wood railings.
 - 3. Division 09 Section " Gypsum Board" for metal backing for anchoring railings.
 - 4. Division 26 Sections for electrical service and connections for illuminated railings.

1.3 DEFINITIONS

A. Railings: Guards, handrails, and similar devices used for protection of occupants at open-sided floor areas, pedestrian guidance and support, visual separation, or wall protection.

1.4 PERFORMANCE REQUIREMENTS

- A. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
 - 1. Aluminum: The lesser of minimum yield strength divided by 1.65 or minimum ultimate tensile strength divided by 1.95.
 - 2. Copper Alloys: 60 percent of minimum yield strength.
 - 3. Stainless Steel: 60 percent of minimum yield strength.
 - 4. Steel: 72 percent of minimum yield strength.
 - 5. Glass: 25 percent of mean modulus of rupture (50 percent probability of breakage), as listed in "Mechanical Properties" in AAMA's Aluminum Curtain Wall Series No. 12, "Structural Properties of Glass."
- B. Structural Performance: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails:
 - a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.

- c. Uniform and concentrated loads need not be assumed to act concurrently.
- 2. Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied horizontally and concurrently with 100 lbf/ ft. (1.46 kN/m) applied vertically downward.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
- 3. Infill of Guards:
 - a. Concentrated load of 200 lbf (0.89 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
 - b. Uniform load of 25 lbf/sq. ft. (1.2 kN/sq. m) applied horizontally.
 - c. Infill load and other loads need not be assumed to act concurrently.
- 4. Glass-Supported Railings: Support each section of top rail by a minimum of three glass panels or by other means so top rail will remain in place if any one panel fails.
- C. Thermal Movements: Provide exterior railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.5 SUBMITTALS

- A. Product Data: For the following:
 - 1. Manufacturer's product lines of railings assembled from standard components.
 - 2. Grout, anchoring cement, and paint products.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 2. For illuminated railings, include wiring diagrams and roughing-in details.
- C. Samples for Initial Selection: For products involving selection of color, texture, or design.
- D. Samples for Verification: For each type of exposed finish required.
 - 1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
 - 2. Each type of glass required.
 - 3. Fittings and brackets.
 - 4. Welded connections.
 - 5. Brazed connections.

- 6. Assembled Samples of railing systems, made from full-size components, including top rail, post, handrail, and infill. Show method of finishing members at intersections. Samples need not be full height.
- E. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- F. Welding certificates.
- G. Qualification Data: For professional engineer.
- H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according ASTM E 894 and ASTM E 935.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of railing through one source from a single manufacturer.
- B. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including structural analysis, preconstruction testing, field testing, and in-service performance.
- C. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code--Steel."
 - 2. AWS D1.2, "Structural Welding Code--Aluminum."
 - 3. AWS D1.6, "Structural Welding Code--Stainless Steel."
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating railings without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
 - 2. Provide allowance for trimming and fitting at site.

1.8 COORDINATION AND SCHEDULING

A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Aluminum Ornamental Railings:
 - a. Architectural Metal Works.
 - b. ATR Technologies, Inc.
 - c. Blum, Julius & Co., Inc.
 - d. Blumcraft of Pittsburgh.
 - e. Braun, J. G., Company; a division of the Wagner Companies.
 - f. CraneVeyor Corp.
 - g. Livers Bronze Co.
 - h. Newman Brothers, Inc.
 - i. Pisor Industries, Inc.
 - j. Platers Polishing Company; a division of Rippel Architectural Metals.
 - k. Poma Corporation.
 - 1. Sterling Dula Architectural Products, Inc.
 - m. Superior Aluminum Products, Inc.
 - n. Wagner, R & B, Inc.; a division of the Wagner Companies.
 - o. Wylie Systems.
 - p. <Insert manufacturer's name.>
 - 2. Stainless-Steel Ornamental Railings:
 - a. Architectural Metal Works.
 - b. Blum, Julius & Co., Inc.
 - c. Blumcraft of Pittsburgh.
 - d. CraneVeyor Corp.
 - e. Livers Bronze Co.
 - f. Newman Brothers, Inc.
 - g. P & P Artec.
 - h. Pisor Industries, Inc.
 - i. Platers Polishing Company; a division of Rippel Architectural Metals.
 - j. Tri Tech, Inc.
 - k. Wagner, R & B, Inc.; a division of the Wagner Companies.
 - 1. Wylie Systems.
 - m. Zephyr Southwest Ornamental, LLC.
 - n. <Insert manufacturer's name.>
 - 3. Stainless-Steel Wire Rope and Fittings:
 - a. Cable Connection (The).
 - b. Esmet, Inc.
 - c. Feeney Wire Rope & Rigging.

- d. Hayn Enterprises, LLC.
- e. Johnson, C. Sherman, Co., Inc.
- f. Loos & Co. Inc.; Cableware Division.
- g. Ronstan International Inc.
- h. Sava Industries, Inc.
- i. Seco South, Inc.
- j. <Insert manufacturer's name.>
- 4. Glass- and Plastic-Supported Railings:
 - a. Architectural Metal Works.
 - b. Blum, Julius & Co., Inc.
 - c. Blumcraft of Pittsburgh.
 - d. Clearail, Inc.
 - e. CraneVeyor Corp.
 - f. Livers Bronze Co.
 - g. Newman Brothers, Inc.
 - h. Platers Polishing Company; a division of Rippel Architectural Metals.
 - i. TACO Metals Inc.
 - j. Tri Tech, Inc.
 - k. Zephyr Southwest Ornamental, LLC.
 - l. <Insert manufacturer's name.>

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Same metal and finish as supported rails, unless otherwise indicated.
 - 1. Provide cast-metal brackets with flange tapped for concealed anchorage to threaded hanger bolt.

2.3 ALUMINUM

- A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties for each aluminum form required not less than that of alloy and temper designated below.
- B. Extruded Bars and Shapes, Including Extruded Tubing: ASTM B 221 (ASTM B 221M), Alloy 6063-T5/T52.
- C. Extruded Structural Pipe and Round Tubing: ASTM B 429, Alloy 6063-T6.
 - 1. Provide Standard Weight (Schedule 40) pipe, unless otherwise indicated.
- D. Drawn Seamless Tubing: ASTM B 210 (ASTM B 210M), Alloy 6063-T832.
- E. Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.
- F. Die and Hand Forgings: ASTM B 247 (ASTM B 247M), Alloy 6061-T6.
- G. Castings: ASTM B 26/B 26M, Alloy A356.0-T6.

- H. Woven-Wire Mesh: Intermediate-crimp, [diamond] [square] pattern, 2-inch (50-mm) woven-wire mesh, made from 0.162-inch (4.1-mm) nominal diameter wire complying with ASTM B 211 (ASTM B 211M), Alloy 6061-T94.
- 2.4 STAINLESS STEEL
 - A. Tubing: ASTM A 554, Grade MT 304.
 - B. Pipe: ASTM A 312/A 312M, Grade TP 304.
 - C. Castings: ASTM A 743/A 743M, Grade CF 8 or CF 20.
 - D. Plate and Sheet: ASTM A 666, Type 304.
 - E. Wire Rope: 1-by-19 wire rope made from wire complying with ASTM A 492, Type 316.
 - F. Wire-Rope Fittings: Connectors of types indicated, fabricated from stainless steel, and with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.
 - G. Expanded Metal: ASTM F 1267, Type I (expanded), Class 3 (corrosion-resisting steel), made from stainless-steel sheet complying with ASTM A 666, Type 304.
 - H. Woven-Wire Mesh: Intermediate-crimp, square pattern, 2-inch (50-mm) woven-wire mesh, made from 0.135-inch (3.5-mm) nominal diameter wire complying with ASTM A 580/A 580M, Type 304.

2.5 GLASS AND GLAZING MATERIALS

- A. Tempered Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated), Type 1 (transparent flat glass), Quality-Q3. Provide products that have been tested for surface and edge compression according to ASTM C 1048 and for impact strength according to 16 CFR 1201 for Category II materials.
 - 1. Clear Glass: Class 1 (clear).
 - 2. Thickness for Structural Glass Balusters: As required by structural loads, but not less than 12.0 mm.
 - 3. Thickness for Glass Infill Panels: As required by structural loads, but not less than mm.
 - 4. Provide safety glass permanently marked with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
- B. Laminated Glass: ASTM C 1172, Condition A (uncoated), Type I (transparent flat glass), Quality-Q3 with clear, polyvinyl butyral interlayer not less than 0.060 inch (1.52 mm) thick.
 - 1. Kind: LA (laminated annealed).
 - 2. Clear Glass: Class 1 (clear).
 - 3. Lites for Structural Glass Balusters: Two, each of thickness required by structural loads, but not less than 8.0 mm thick.
 - 4. Lites for Glass Infill Panels: Two, each of thickness required by structural loads, but not less than 5.0 mm.
- C. Glazing Cement and Accessories for Structural Glazing: Provide glazing cement, setting blocks, shims, and related accessories as recommended or supplied by railing manufacturer for installing structural glazing in metal subrails.

- 1. Glazing Cement: Provide nonshrinking organic cement designed for curing by passing an electric current through metal subrail holding glass panel, as standard with manufacturer.
- D. Glazing Gaskets for Glass Infill Panels: Provide glazing gaskets and related accessories recommended or supplied by railing manufacturer for installing glass infill panels in post-supported railings.

2.6 FASTENERS

- A. General: Provide the following:
 - 1. Aluminum Components: Type 304 stainless-steel fasteners.
 - 2. Stainless-Steel Components: Type 304 stainless-steel fasteners.
 - 3. Dissimilar Metals: Type 304 stainless-steel fasteners.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work, unless exposed fasteners are unavoidable.
 - 1. Provide square or hex socket flat-head machine screws for exposed fasteners, unless otherwise indicated.
- D. Anchors: Provide torque-controlled expansion anchors, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

2.7 MISCELLANEOUS MATERIALS

- A. Wood Rails: Hardwood rails of species and profile indicated complying with Division 06 Section "Interior Architectural Woodwork."
- B. Electrical Components: Provide internal, fluorescent light fixtures and electrical components, required as part of illuminated railings, that comply with NFPA 70 and that are listed and labeled by UL.
- C. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
 - 1. For aluminum railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
- D. Brazing Rods: For copper-alloy railings, provide type and alloy as recommended by producer of metal to be brazed and as required for color match, strength, and compatibility in fabricated items.
- E. Shop Primers: Provide primers that comply with Division 09 painting Sections.
- F. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.
 - 1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

- G. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
 - 1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Benjamin Moore & Co.; Epoxy Zinc-Rich Primer CM18/19.
 - b. Carboline Company; Carbozinc 621.
 - c. ICI Devoe Coatings; Catha-Coat 313.
 - d. International Coatings Limited; Interzinc 315 Epoxy Zinc-Rich Primer.
 - e. PPG Architectural Finishes, Inc.; Aquapon Zinc-Rich Primer 97-670.
 - f. Sherwin-Williams Company (The); Corothane I GalvaPac Zinc Primer.
 - g. Tnemec Company, Inc.; Tneme-Zinc 90-97.
- H. Shop Primer for Galvanized Steel: Zinc-dust, zinc-oxide primer formulated for priming zinc-coated steel and for compatibility with finish paint systems indicated, and complying with SSPC-Paint 5.
- I. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- J. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- K. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- L. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
 - 1. Water-Resistant Product: At exterior locations and where indicated provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.8 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Make up wire-rope assemblies in the shop to field-measured dimensions with fittings machine swaged. Minimize amount of turnbuckle take-up used for dimensional adjustment so maximum amount is available for tensioning wire ropes. Tag wire-rope assemblies and fittings to identify installation locations and orientations for coordinated installation.
- D. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- E. Form work true to line and level with accurate angles and surfaces.

- F. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- G. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
- J. Brazed Connections: Connect copper-alloy railings by brazing. Cope components at connections to provide close fit, or use fittings designed for this purpose. Braze corners and seams continuously.
 - 1. Use materials and methods that match color of base metal, minimize distortion, and develop maximum strength and corrosion resistance.
 - 2. Remove flux immediately.
 - 3. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and brazed surface matches contours of adjoining surfaces.
- K. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
 - 1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
- L. Form changes in direction as follows:
 - 1. By flush bends or by inserting prefabricated flush-elbow fittings.
- M. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- N. Close exposed ends of hollow railing members with prefabricated end fittings.
- O. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns, unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.
- P. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated.
 - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide fillers made from crush-resistant material, or other means to transfer wall loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

- Q. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- R. For railing posts set in concrete, provide steel sleeves not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (12 mm) greater than outside dimensions of post, with steel plate forming bottom closure.
- S. For removable railing posts, fabricate slip-fit sockets from stainless-steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.
 - 1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.
- T. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.9 GLAZING PANEL FABRICATION

- A. General: Fabricate to sizes and shapes required; provide for proper edge clearance and bite on glazing panels.
- B. Structural Glass Balusters: Factory-bond glass to aluminum base and top-rail channels in railing manufacturer's plant using glazing cement to comply with manufacturer's written specifications, unless field glazing is standard with manufacturer.
- C. Apply ceramic linework on glass to comply with GANA's "Engineering Standards Manual."
- D. Structural Balusters: Provide laminated, tempered glass panels.
- E. Structural Balusters: Provide thermoformed, curved, plastic glazing panels for curved sections and laminated, tempered glass panels for straight sections.
- F. Infill Panels: Provide laminated, tempered glass panels.

2.10 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.11 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Mechanical Finish: AA-M3x (Mechanical Finish: as specified); sand top rails, handrails, and intermediate rails in 1 direction only, parallel to length of railing, with 120- and 320-grit abrasive. After installation, polish railings with No. 0 steel wool immersed in paste wax, then rub to a luster with a soft dry cloth.
- C. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.
- D. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte: Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
- E. Class II, Color Anodic Finish: AA-M12C22A32/A34 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, integrally colored or electrolytically deposited color coating 0.010 mm or thicker) complying with AAMA 611.
- F. Class I, Color Anodic Finish: AA-M12C22A42/A44 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.
 1. Color: As selected by Architect from full range of industry colors and color densities.
- G. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Apply baked enamel complying with paint manufacturer's written instructions for cleaning, conversion coating, and painting.
 - 1. Organic Coating: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm), medium gloss.
 - 2. Color: As selected by Architect from manufacturer's full range.
- H. Siliconized Polyester Finish: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

2.12 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. Grind and polish surfaces to produce uniform finish indicated, free of cross scratches.
 - 1. Run grain of directionally textured finishes with long dimension of each piece.
- C. Directional Satin Finish: No. 4.
- D. Dull Satin Finish: No. 6.
- E. Satin, Reflective, Directional Polish: No. 7.
- F. Mirrorlike Reflective, Nondirectional Polish: No. 8.

- G. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
- H. Sputter-Coated Finish: Titanium nitride coating deposited by magnetic sputter-coating process over indicated mechanical finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
 - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).
- C. Corrosion Protection: Coat concealed surfaces of aluminum and copper alloys that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in Part 2 "Fabrication" Article whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches (50 mm) beyond joint on either side, fasten internal sleeve securely to 1 side, and locate joint within 6 inches (150 mm) of post.

3.4 ANCHORING POSTS

- A. Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Form or core-drill holes not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- C. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material.
- D. Leave anchorage joint exposed; wipe off surplus anchoring material; and leave 1/8-inch (3-mm) buildup, sloped away from post.
- E. Anchor steel posts to steel with flanges, angle or floor type as required by conditions, welded to posts and bolted to metal supporting members.
- F. Anchor posts to metal surfaces with flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For aluminum railings, attach posts as indicated using fittings designed and engineered for this purpose.
 - 2. For copper-alloy railings, attach posts as indicated using fittings designed and engineered for this purpose.
 - 3. For stainless-steel railings, weld flanges to posts and bolt to metal-supporting surfaces.
 - 4. For steel railings, weld flanges to posts and bolt to metal-supporting surfaces.
- G. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.5 ANCHORING RAILING ENDS

- A. Anchor railing ends to concrete and masonry with flanges connected to railing ends and anchored to wall construction with anchors and bolts.
- B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends or connected to railing ends using nonwelded connections.

3.6 ATTACHING HANDRAILS TO WALLS

- A. Attach handrails to walls with wall brackets. Provide brackets with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface.
- B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- C. Secure wall brackets to building construction as follows:
 - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 - 2. For hollow masonry anchorage, use toggle bolts.
 - 3. For wood stud partitions, use hanger or lag bolts set into wood backing between studs. Coordinate with carpentry work to locate backing members.

3.7 INSTALLING GLASS PANELS

- A. Glass-Supported Railings: Install assembly to comply with railing manufacturer's written instructions.
 - 1. Attach base channel to building structure, then insert and connect factory-fabricated and assembled glass panels.
 - a. Support glass panels in base channel at quarter points with channel-shaped setting blocks that also act as shims to maintain uniform space for glazing cement. Fill remaining space in base channel with glazing cement for uniform support of glass.
 - 2. Adjust spacing of glass panels so gaps between panels are equal before securing in position.
 - 3. Erect glass railings under direct supervision of manufacturer's authorized technical personnel.
- B. Post-Supported Glass Railings: Install assembly to comply with railing manufacturer's written instructions and with requirements in other Part 3 articles. Erect posts and other metal railing components, then set factory-cut glass panels. Do not cut, drill, or alter glass panels in field. Protect edges from damage.

3.8 CLEANING

- A. Clean aluminum and stainless steel by washing thoroughly with clean water and soap, rinsing with clean water, and wiping dry.
- B. Clean copper alloys according to written recommendations of metal finisher in a manner that leaves an undamaged and uniform finish matching approved Sample.
- C. Clean and polish glass.
- D. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
- E. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.9 **PROTECTION**

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in field to shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 057300

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Framing with dimension lumber.
 - 2. Framing with timber.
 - 3. Framing with engineered wood products.
 - 4. Wood blocking and nailers.
 - 5. Wood furring.
 - 6. Wood sleepers.
 - 7. Plywood backing panels.
- B. Related Sections include the following:
 - 1. Division 06 Section "Sheathing."
 - 2. Division 31 Section "Termite Control" for site application of borate treatment to wood framing.

1.3 DEFINITIONS

- A. Exposed Framing: Framing not concealed by other construction.
- B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater but less than 5 inches nominal (114 mm actual) in least dimension.
- C. Timber: Lumber of 5 inches nominal (114 mm actual) or greater in least dimension.
- D. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. NLGA: National Lumber Grades Authority.
 - 3. RIS: Redwood Inspection Service.
 - 4. SPIB: The Southern Pine Inspection Bureau.
 - 5. WCLIB: West Coast Lumber Inspection Bureau.
 - 6. WWPA: Western Wood Products Association.

1.4 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

- 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
- 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
- 3. For fire-retardant treatments specified to be High-Temperature (HT) type, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
- 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
- 5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. Fastener Patterns: Full-size templates for fasteners in exposed framing.
- C. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

1.5 QUALITY ASSURANCE

- A. Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.
- B. **NATIONAL HISTORIC REGISTER ELIGIBLE BUILDING**: The Lee Hall Depot is a national historic register eligible building. All work performed on this building is to meet the Secretary of the Interior's standards for historic preservation. The General Contractor shall be familiar with these requirements and shall obtain the services of a qualified historic carpenter to perform/oversee any work to the existing building fabric to ensure the standards and guidelines for historic preservation are adhered to during construction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.

- 3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
- 4. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
 - 1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWPA C2.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 - 2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
 - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 - 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 - 4. Wood framing members that are less than 18 inches (460 mm) above the ground in crawlspaces or unexcavated areas.
 - 5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING

- A. Maximum Moisture Content: 15 percent.
- B. Non-Load-Bearing Interior Partitions: Construction or No. 2 grade of Southern Yellow Pine.
- C. Exterior and Load-Bearing Walls: No. 2 grade and the following species:1. Southern pine; SPIB.

- D. Exterior and Load-Bearing Walls: Any species and grade with a modulus of elasticity of at least 1,500,000 psi (10 350 MPa) and an extreme fiber stress in bending of at least 1000 psi (6.9 MPa) for 2-inch nominal (38-mm actual) thickness and 12-inch nominal (286-mm actual) width for single-member use.
- E. Ceiling Joists (Non-Load-Bearing): Construction or No. 2 grade of any species.
- F. Joists, Rafters, and Other Framing Not Listed Above: No. 2 grade and the following species: 1. Southern pine; SPIB.

2.4 ENGINEERED WOOD PRODUCTS

- A. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559 and containing no urea formaldehyde.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Boise Cascade Corporation.
 - b. Georgia-Pacific.
 - c. Louisiana-Pacific Corporation.
 - d. Weyerhaeuser Company.
 - 3. Extreme Fiber Stress in Bending, Edgewise: 3100 psi (21.3 MPa) for 12-inch nominal- (286-mm actual-) depth members.
 - 4. Modulus of Elasticity, Edgewise: 2,000,000 psi (13 700 MPa).

2.5 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
 - 3. Furring.
 - 4. Grounds.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 15 percent maximum moisture content of any species.
- C. For exposed boards, provide lumber with 15 percent maximum moisture content and any of the following species and grades:
 - 1. Eastern white pine, Idaho white, lodgepole, ponderosa, or sugar pine; Premium or 2 Common (Sterling) grade; NeLMA, NLGA, WCLIB, or WWPA.
 - 2. Mixed southern pine, No. 2 grade; SPIB.
 - 3. Spruce-pine-fir (south) or spruce-pine-fir, Select Merchantable or No. 1 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

- D. For concealed boards, provide lumber with 15 percent maximum moisture content and any of the following species and grades:
 - 1. Mixed southern pine, No. 2 grade; SPIB.
 - 2. Spruce-pine-fir (south) or spruce-pine-fir, Construction or 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
- E. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- F. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- G. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.6 PLYWOOD BACKING PANELS

A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fireretardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch (13-mm) nominal thickness.

2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
 - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
 - 2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Grade A1 or A4).

2.8 METAL FRAMING ANCHORS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Simpson Strong-Tie Co., Inc.
- B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those of products of manufacturers listed. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- C. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.
 - 1. Use for interior locations where stainless steel is not indicated.
- D. Stainless-Steel Sheet: ASTM A 666, Type 304.
 - 1. Use for exterior locations and where indicated.
- E. Joist Hangers: U-shaped joist hangers with 2-inch- (50-mm-) long seat and 1-1/4-inch- (32-mm-) wide nailing flanges at least 85 percent of joist depth.
 - 1. Thickness: 0.062 inch (1.6 mm).
- F. Bridging: Rigid, V-section, nailless type, 0.050 inch (1.3 mm) thick, length to suit joist size and spacing.
- G. Post Bases: Adjustable-socket type for bolting in place with standoff plate to raise post 1 inch (25 mm) above base and with 2-inch- (50-mm-) minimum side cover, socket 0.062 inch (1.6 mm) thick, and standoff and adjustment plates 0.108 inch (2.8 mm) thick.
- H. Joist Ties: Flat straps, with holes for fasteners, for tying joists together over supports.
 - 1. Width: 1-1/4 inches (32 mm).
 - 2. Thickness: 0.062 inch (1.6 mm).
 - 3. Length: As indicated.
- I. Rafter Tie-Downs: Bent strap tie for fastening rafters or roof trusses to wall studs below, 1-1/2 inches (38 mm) wide by 0.050 inch (1.3 mm) thick.
- J. Rafter Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening rafters or roof trusses to wall studs below, 2-1/4 inches (57 mm) wide by 0.062 inch (1.6 mm) thick. Tie fits over top of rafter or truss and fastens to both sides of rafter or truss, face of top plates, and side of stud below.
- K. Floor-to-Floor Ties: Flat straps, with holes for fasteners, for tying upper floor wall studs to band joists and lower floor studs, 1-1/4 inches (32 mm) wide by 0.050 inch (1.3 mm) thick by 36 inches (914 mm) long.
- L. Hold-Downs: Brackets for bolting to wall studs and securing to foundation walls with anchor bolts or to other hold-downs with threaded rods and designed with first of two bolts placed seven bolt diameters from reinforced base.
 - 1. Bolt Diameter: 5/8 inch (15.8 mm).
 - 2. Width: 2-1/2 inches (64 mm).
 - 3. Body Thickness: 0.138 inch (3.5 mm).

- 4. Base Reinforcement Thickness: 0.239 inch (6.1 mm).
- M. Wall Bracing: T-shaped bracing made for letting into studs in saw kerf, 1-1/8 inches (29 mm) wide by 9/16 inch (14 mm) deep by 0.034 inch (0.85 mm) thick with hemmed edges.
- N. Wall Bracing: Angle bracing made for letting into studs in saw kerf, 15/16 by 15/16 by 0.040 inch (24 by 24 by 1 mm) thick with hemmed edges.

2.9 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1inch (25-mm) nominal thickness, compressible to 1/32 inch (0.8 mm); selected from manufacturer's standard widths to suit width of sill members indicated.
- B. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to suit width of sill members indicated.
- C. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
 - 1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- D. Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.
- E. Do not splice structural members between supports, unless otherwise indicated.
- F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (406 mm) o.c.

- G. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches (2438 mm) o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
 - 2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches (2438 mm) o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal- (38-mm actual-) thickness.
 - 3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. (9.3 sq. m) and to solidly fill space below partitions.
 - 4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet (6 m) o.c.
- H. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- I. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
- J. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 - 3. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in ICBO's Uniform Building Code.
 - 4. Table 2305.2, "Fastening Schedule," in BOCA's BOCA National Building Code.
 - 5. Table 2306.1, "Fastening Schedule," in SBCCI's Standard Building Code.
 - 6. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
 - 7. Table 602.3(1), "Fastener Schedule for Structural Members," and Table 602.3(2), "Alternate Attachments," in ICC's International One- and Two-Family Dwelling Code.
- K. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.
- L. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
 - 1. Comply with approved fastener patterns where applicable.
 - 2. Use finishing nails, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.

3.2 WOOD SLEEPER, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.
- C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WOOD FURRING INSTALLATION

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal- (19-by-63-mm actual-) size furring horizontally and vertically at 24 inches (610 mm) o.c.
- C. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal- (19-by-38-mm actual-) size furring vertically at 16 inches (406 mm) o.c.

3.4 WALL AND PARTITION FRAMING INSTALLATION

- A. General: Provide single bottom plate and double top plates using members of 2-inch nominal (38-mm actual) thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions and for load-bearing partitions where framing members bearing on partition are located directly over studs. Fasten plates to supporting construction, unless otherwise indicated.
 - 1. For exterior walls, provide 2-by-6-inch nominal- (38-by-140-mm actual-) size wood studs spaced 16 inches (406 mm) o.c., unless otherwise indicated.
 - 2. For interior partitions and walls, provide 2-by-4-inch nominal- (38-by-89-mm actual-) size wood studs spaced 16 inches (406 mm) o.c., unless otherwise indicated.
 - 3. Provide continuous horizontal blocking at midheight of partitions more than 96 inches (2438 mm) high, using members of 2-inch nominal (38-mm actual) thickness and of same width as wall or partitions.
- B. Construct corners and intersections with three or more studs.
- C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.
 - 1. For non-load-bearing partitions, provide double-jamb studs and headers not less than 4-inch nominal (89-mm actual) depth for openings 48 inches (1200 mm) and less in width, 6-inch nominal (140-mm actual) depth for openings 48 to 72 inches (1200 to 1800 mm) in width, 8-inch nominal (184-mm actual) depth for openings 72 to 120 inches (1800 to 3000 mm) in width, and not less than 10-inch nominal (235-mm actual) depth for openings 10 to 12 feet (3 to 3.6 m) in width.
 - 2. For load-bearing walls, provide double-jamb studs for openings 60 inches (1500 mm) and less in width, and triple-jamb studs for wider openings. Provide headers of depth indicated or, if not indicated, according to Table R502.5(1) or Table R502.5(2), as applicable, in ICC's International Residential Code for One- and Two-Family Dwellings.

3.5 FLOOR JOIST FRAMING INSTALLATION

- A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches (38 mm) of bearing on wood or metal, or 3 inches (76 mm) on masonry. Attach floor joists as follows:
 - 1. Where supported on wood members, by using metal framing anchors.
 - 2. Where framed into wood supporting members, by using wood ledgers as indicated or, if not indicated, by using metal joist hangers.
- B. Fire Cuts: At joists built into masonry, bevel cut ends 3 inches (76 mm) and do not embed more than 4 inches (102 mm).
- C. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches (1200 mm).
- D. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than 1/3 depth of joist; do not locate closer than 2 inches (50 mm) from top or bottom.
- E. Provide solid blocking of 2-inch nominal (38-mm actual) thickness by depth of joist at ends of joists unless nailed to header or band.
- F. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches (102 mm) or securely tie opposing members together. Provide solid blocking of 2-inch nominal (38-mm actual) thickness by depth of joist over supports.
- G. Anchor members paralleling masonry with 1/4-by-1-1/4-inch (6.4-by-32-mm) metal strap anchors spaced not more than 96 inches (2438 mm) o.c., extending over and fastening to 3 joists. Embed anchors at least 4 inches (102 mm) into grouted masonry with ends bent at right angles and extending 4 inches (102 mm) beyond bend.
- H. Provide solid blocking between joists under jamb studs for openings.
- I. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.
 - 1. Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.
- J. Provide bridging of type indicated below, at intervals of 96 inches (2438 mm) o.c., between joists.
 - 1. Diagonal wood bridging formed from bevel-cut, 1-by-3-inch nominal- (19-by-64-mm actual-) size lumber, double-crossed and nailed at both ends to joists.
 - 2. Steel bridging installed to comply with bridging manufacturer's written instructions.

3.6 CEILING JOIST AND RAFTER FRAMING INSTALLATION

- A. Ceiling Joists: Install ceiling joists with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.
 - 1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate and nail to first joist or anchor with framing anchors or metal straps. Provide 1-by-8-inch nominal- (19-by-184-mm actual-) size or 2-by-4-inch nominal- (38-by-89-mm actual-) size stringers spaced 48 inches (1200 mm) o.c. crosswise over main ceiling joists.

- B. Rafters: Notch to fit exterior wall plates and use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.
 - 1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches (50 mm) deeper. Bevel ends of jack rafters for full bearing against vallev rafters.
 - 2. At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches (50 mm) deeper. Bevel ends of jack rafters for full bearing against hip rafter.
- Provide collar beams (ties) as indicated or, if not indicated, provide 1-by-6-inch nominal- (19-by-140-mm C. actual-) size boards between every third pair of rafters, but not more than 48 inches (1219 mm) o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.
- D. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions, if any.

PROTECTION 3.7

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPAregistered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

SECTION 061500 - WOOD DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid-sawn wood roof and floor decking.
- B. Related Sections:
 - 1. Division 06 Section "Rough Carpentry" for dimension lumber items associated with wood decking.
 - 2. Division 06 Section "Exterior Rough Carpentry" for wood decking for elevated decks.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. For glued-laminated wood decking, include installation instructions and data on lumber, adhesives, and fabrication.
 - 2. For preservative-treated wood products, include chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
- B. Samples: 24 inches (600 mm) long, showing the range of variation to be expected in appearance of wood decking.

1.4 QUALITY ASSURANCE

- A. Standard for Solid-Sawn Wood Decking: Comply with AITC 112.
- B. Forest Certification: Provide wood decking produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Schedule delivery of wood decking to avoid extended on-site storage and to avoid delaying the Work.
- B. Store materials under cover and protected from weather and contact with damp or wet surfaces. Provide for air circulation within and around stacks and under temporary coverings. Stack wood decking with surfaces that are to be exposed in the final Work protected from exposure to sunlight.

PART 2 - PRODUCTS

2.1 WOOD DECKING, GENERAL

- A. General: Comply with DOC PS 20 and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.
- B. Moisture Content: Provide wood decking with 19 percent maximum moisture content at time of dressing.

2.2 SOLID-SAWN WOOD DECKING

- A. Decking Species: Southern pine.
- B. Decking Nominal Size: 2x6.
- C. Decking Grade: Select Dense Commercial Decking.
- D. Grade Stamps: Factory mark each item with grade stamp of grading agency. Apply grade stamp to surfaces that will not be exposed to view.
- E. Face Surface: Smooth.
- F. Preservative Treatment: Pressure treat solid-sawn wood decking according to AWPA C31 with inorganic boron (SBX) and redry wood to 19 percent maximum moisture content.

2.3 ACCESSORY MATERIALS

- A. Fasteners for Solid-Sawn Decking: Provide fastener size and type complying with decking standard for thickness of deck used.
- B. Nails: Common; complying with ASTM F 1667, Type I, Style 10.
- C. Spikes: Round; complying with ASTM F 1667, Type III, Style 3.
- D. Fastener Material: Hot-dip galvanized steel.
- E. Bolts for Anchoring Decking to Walls: Carbon steel; complying with ASTM A 307 (ASTM F 568M) with ASTM A 563/A 563M hex nuts and, where indicated, flat washers, all hot-dip zinc coated.
- F. Bolts for Anchoring Decking to Walls: Stainless steel; complying with ASTM F 593, Alloy Group 1 or 2 (ASTM F 738M, Grade A1 or A4); with ASTM F 594, Alloy Group 1 or 2 (ASTM F 836M, Grade A1 or A4) hex nuts and, where indicated, flat washers.
- G. Installation Adhesive: For glued-laminated wood decking indicated to be of diaphragm design and construction, provide adhesive that complies with research/evaluation report.
 - 1. Use adhesive that has a VOC content of [70] <Insert limit> g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- H. Penetrating Sealer: Clear sanding sealer complying with Division 09 Section "Staining and Transparent Finishing" and compatible with topcoats specified for use over it.

2.4 FABRICATION

- A. Shop Fabrication: Where preservative-treated decking is indicated, complete cutting, trimming, surfacing, and sanding before treating.
- B. Predrill decking for lateral spiking to adjacent units to comply with referenced decking standard.
- C. Seal Coat: After fabricating and surfacing decking, apply a saturation coat of penetrating sealer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and support framing in areas to receive wood decking for compliance with installation tolerances and other conditions affecting performance of wood decking.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install solid-sawn wood decking to comply with referenced decking standard.
- B. Where preservative-treated decking must be cut during erection, apply a field-treatment preservative to comply with AWPA M4.
 - 1. For solid-sawn decking, use inorganic boron (SBX).

3.3 ADJUSTING

A. Repair damaged surfaces and finishes after completing erection. Replace damaged decking if repairs are not approved by Architect.

3.4 PROTECTION

A. Provide temporary waterproof covering as the Work progresses to protect roof decking until roofing is applied.

END OF SECTION 061500

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Wall sheathing.
 - 2. Roof sheathing.
 - 3. Composite nail base insulated roof sheathing.
 - 4. Subflooring.
 - 5. Underlayment.
 - 6. Building paper.
 - 7. Building wrap.
 - 8. Sheathing joint-and-penetration treatment.
 - 9. Flexible flashing at openings in sheathing.
- B. Related Sections include the following:
 - 1. Division 06 Section "Rough Carpentry" for plywood backing panels.

1.3 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
 - 3. For fire-retardant treatments specified to be High-Temperature (HT) type, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
 - 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 - 5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
 - 6. For building wrap, include data on air-/moisture-infiltration protection based on testing according to referenced standards.
- B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

- 1. Preservative-treated plywood.
- 2. Fire-retardant-treated plywood.
- 3. Foam-plastic sheathing.
- 4. Building wrap.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory."
- B. Forest Certification: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship":
 - 1. Plywood.
 - 2. Oriented strand board.
 - 3. Fiberboard wall sheathing.
 - 4. Particleboard underlayment.
 - 5. Hardboard underlayment.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack plywood and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS, GENERAL

- A. Plywood: DOC PS 1.
- B. Oriented Strand Board: DOC PS 2.
- C. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- D. Factory mark panels to indicate compliance with applicable standard.

2.2 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWPA C9.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.3 FIRE-RETARDANT-TREATED PLYWOOD

- A. General: Comply with performance requirements in AWPA C27.
 - 1. Use treatment that does not promote corrosion of metal fasteners.
 - 2. Use Exterior type for exterior locations and where indicated.
 - 3. Use Interior Type A, High Temperature (HT) for roof sheathing and where indicated.
 - 4. Use Interior Type A, unless otherwise indicated.
- B. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Identify fire-retardant-treated plywood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.
- D. Application: Treat plywood indicated on Drawings, and the following:1. Subflooring and underlayment for raised platforms.

2.4 WALL SHEATHING

A. Plywood Wall Sheathing: Exterior, Structural I sheathing.
1. Nominal Thickness: Not less than 1/2 inch (13 mm).

2.5 ROOF SHEATHING

- A. Plywood Roof Sheathing: Exterior, Structural I sheathing.
 - 1. Span Rating: Not less than 16/0.
 - 2. Nominal Thickness: Not less than 3 / 4 inch.

2.6 SUBFLOORING AND UNDERLAYMENT

- A. Plywood Combination Subfloor-Underlayment: DOC PS 1, Exterior, Structural I, C-C Plugged singlefloor panels.
 - 1. Span Rating: Not less than 16 o.c.
 - 2. Nominal Thickness: Not less than 23/32 inch (18.3 mm).
 - 3. Edge Detail: Tongue and groove.
 - 4. Surface Finish: Fully sanded face.
- B. Plywood Subflooring: Exterior, Structural I single-floor panels or sheathing.
 - 1. Span Rating: Not less than 16 o.c..
 - 2. Nominal Thickness: Not less than 23/32 inch (18.3 mm).

2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - 1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.

2.8 WEATHER-RESISTANT SHEATHING PAPER

A. Building Paper: ASTM D 226, Type 1 (No. 15 asphalt-saturated organic felt), unperforated.

2.9 MISCELLANEOUS MATERIALS

- A. Adhesives for Field Gluing Panels to Framing: Formulation complying with ASTM D 3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.
 - 1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.025 inch (0.6 mm).
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
 - b. Grace Construction Products, a unit of W. R. Grace & Co. Conn.; Vycor Plus Self-Adhered Flashing.
- C. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.

- 2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
- 3. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in ICBO's "Uniform Building Code."
- 4. Table 2305.2, "Fastening Schedule," in BOCA's "BOCA National Building Code."
- 5. Table 2306.1, "Fastening Schedule," in SBCCI's "Standard Building Code."
- 6. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's "International Residential Code for One- and Two-Family Dwellings."
- 7. Table 602.3(1), "Fastener Schedule for Structural Members," and Table 602.3(2), "Alternate Attachments," in ICC's "International One- and Two-Family Dwelling Code."
- D. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30S, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Combination Subfloor-Underlayment:
 - a. Glue and nail to wood framing.
 - b. Space panels 1/8 inch (3 mm) apart at edges and ends.
 - 2. Subflooring:
 - a. Glue and nail to wood framing.
 - b. Space panels 1/8 inch (3 mm) apart at edges and ends.
 - 3. Wall and Roof Sheathing:
 - a. Nail to wood framing.
 - b. Space panels 1/8 inch (3 mm) apart at edges and ends.
 - 4. Underlayment:
 - a. Nail to subflooring.
 - b. Space panels 1/32 inch (0.8 mm) apart at edges and ends.
 - c. Fill and sand edge joints of underlayment receiving resilient flooring right before installing flooring.
3.3 WEATHER-RESISTANT SHEATHING-PAPER INSTALLATION

- A. General: Cover sheathing with weather-resistant sheathing paper as follows:
 - 1. Cut back barrier 1/2 inch (13 mm) on each side of the break in supporting members at expansionor control-joint locations.
 - 2. Apply barrier to cover vertical flashing with a minimum 4-inch (100-mm) overlap, unless otherwise indicated.
- B. Building Paper: Apply horizontally with a 2-inch (50-mm) overlap and a 6-inch (150-mm) end lap; fasten to sheathing with galvanized staples or roofing nails.

3.4 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing where indicated to comply with manufacturers written instructions.
 - 1. Prime substrates as recommended by flashing manufacturer.
 - 2. Lap seams and junctures with other materials at least 4 inches (100 mm), except that at flashing flanges of other construction, laps need not exceed flange width.
 - 3. Lap flashing over weather-resistant building paper at bottom and sides of openings.
 - 4. Lap weather-resistant building paper over flashing at heads of openings.
 - 5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

3.5 PROTECTION

A. Protect sheathing by covering exposed exterior surface of sheathing with weather-resistant sheathing paper securely fastened to framing. Apply covering immediately after sheathing is installed.

END OF SECTION 061600

SECTION 062013 - EXTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Exterior standing and running trim.
 - 2. Lumber siding.
 - 3. Exterior stairs and railings.
- B. Related Sections include the following:
 - 1. Division 06 Section "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view and for structural wood decking and framing exposed to view.
 - 2. Division 06 Section "Exterior Architectural Woodwork" for exterior woodwork not specified in this Section.

1.3 DEFINITIONS

- A. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. NLGA: National Lumber Grades Authority.
 - 3. RIS: Redwood Inspection Service.
 - 4. SPIB: The Southern Pine Inspection Bureau.
 - 5. WCLIB: West Coast Lumber Inspection Bureau.
 - 6. WWPA: Western Wood Products Association.

1.4 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical treatment manufacturer's written instructions for finishing treated material.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
 - 3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 - 4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

- B. Samples for Verification:
 - 1. For each species and cut of lumber and panel products, with 1/2 of exposed surface finished; 50 sq. in. (300 sq. cm) for lumber and 8 by 10 inches (200 by 250 mm) for panels.
- C. Research/Evaluation Reports: For fire-retardant-treated wood.
- D. Compliance Certificates:
 - 1. For lumber that is not marked with grade stamp.
 - 2. For preservative-treated wood that is not marked with treatment quality mark.
 - 3. For fire-retardant-treated wood that is not marked with classification marking of testing and inspecting agency.
- E. Qualifications: For Historic Carpenter.
- F. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. **NATIONAL HISTORIC REGISTER ELIGIBLE BUILDING**: The Lee Hall Depot is a national historic register eligible building. All work performed on this building is to meet the Secretary of the Interior's standards for historic preservation. The General Contractor shall be familiar with these requirements and shall obtain the services of a qualified historic carpenter to perform/oversee any work to the existing building fabric to ensure the standards and guidelines for historic preservation are adhered to during construction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect materials against weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation within and around stacks and under temporary coverings.

1.7 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Lumber: DOC PS 20 and applicable grading rules of inspection agencies certified by ALSC's Board of Review.
 - 1. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
 - 2. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by inspection agency.
- B. Softwood Plywood: DOC PS 1.
- C. Hardboard: AHA A135.4.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Water-Repellent Preservative Treatment by Nonpressure Process: AWPA N1 (dip, spray, flood, or vacuum-pressure treatment).
 - 1. Preservative Chemicals: 3-iodo-2-propynyl butyl carbamate (IPBC).
 - 2. Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated material from untreated material.
 - 3. Application: Items not required to be pressure-preservative treated.
 - 4. Application: Exterior trim and wood siding.
- B. Preservative Treatment by Pressure Process:
 - 1. Lumber: AWPA C2 except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX). Kiln dry after treatment to a maximum moisture content of 19 percent.
 - 2. Plywood: AWPA C9. Kiln dry after treatment to a maximum moisture content of 18 percent.
 - 3. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 - 4. For exposed items indicated to receive transparent finish, do not use chemical formulations that contain colorants or that bleed through or otherwise adversely affect finishes.
 - 5. Do not use material that is warped or does not comply with requirements for untreated material.
 - 6. Mark lumber with treatment quality mark of an inspection agency approved by ALSC's Board of Review.
 - a. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.
 - 7. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
 - a. For exposed plywood indicated to receive a stained or natural finish, mark back of each piece.
 - 8. Application: All exterior lumber and plywood.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. Lumber: Comply with performance requirements in AWPA C20, Exterior type. Kiln dry after treatment to a maximum moisture content of 19 percent.

- B. Plywood: Comply with performance requirements in AWPA C27, Exterior type. Kiln dry after treatment to a maximum moisture content of 15 percent.
- C. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not contain colorants and provide materials that do not have marks from spacer sticks on the exposed face.
- D. Do not use material that does not comply with requirements for untreated material or is warped or discolored.
- E. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.
 - 2. For exposed plywood indicated to receive a stained or natural finish, mark back of each piece.
- F. Application: Where indicated.

2.4 STANDING AND RUNNING TRIM

- A. Lumber Trim for Painted Finish:
 - 1. Species and Grade: Western red cedar, Grade [A] [B]; NLGA, WCLIB, or WWPA.
 - 2. Maximum Moisture Content: 19 percent.
 - 3. Finger Jointing: Not allowed.
 - 4. Face Surface: Surfaced (smooth).
- B. Moldings for Painted Finish: WMMPA WM 4, P-grade wood moldings. Made from kiln-dried stock to patterns included in WMMPA WM 12.
 - 1. Species: Western red cedar.
 - 2. Finger Jointing: Not allowed.
 - 3. Pattern and Profiles: To match existing trim profiles size, thickness, profiles and dimensions; Contractor responsible for confirmation of all trim profiles to be fabricated with existing trims.

2.5 LUMBER SIDING

- A. Provide kiln-dried lumber siding complying with DOC PS 20.
- B. Species and Grade: Clear VG (Vertical Grain) Heart western red cedar; NLGA, WCLIB, or WWPA.
- C. Species and Grade: Grade B & B, pressure-preservative-treated southern pine; SPIB.
- D. Pattern: V-edge, smooth-faced tong and groove pattern with eased edges, actual overall dimensions to match existing siding profiles size, thickness and dimensions, not less than ³/₄" thick to be verified in the field. Measured on the face and thick edge at 19 percent moisture content.

2.6 STAIRS AND RAILINGS

- A. Stairs:
 - 1. Treads: 1-1/4-inch (32-mm) thick, kiln-dried, pressure-preservative-treated stepping with half-round or rounded edge nosing.

- a. Species and Grade: Southern pine, B & B stepping; SPIB.
- 2. Risers: 3/4-inch (19-mm) thick, kiln-dried, pressure-preservative-treated finish boards.
 - a. Species and Grade: Southern pine, B & B; SPIB.
- B. Railings: Clear, kiln-dried, solid, pressure-preservative-treated southern pine; railing stock of pattern indicated.
- C. Balusters: 1-1/16-inch- (27-mm-) square, clear, kiln-dried, solid, pressure-preservative-treated southern pine.
- D. Newel Posts: Clear, kiln-dried, pressure-preservative-treated, southern pine, turned newel posts of pattern and size indicated.

2.7 MISCELLANEOUS MATERIALS

- A. Fasteners for Exterior Finish Carpentry: Provide nails or screws, in sufficient length to penetrate not less than 1-1/2 inches (38 mm) into wood substrate.
 - 1. For face-fastening siding, provide ringed-shank siding nails.
 - 2. For prefinished items, provide matching prefinished aluminum fasteners where face fastening is required.
 - 3. For pressure-preservative-treated wood, provide stainless-steel fasteners.
 - 4. For applications not otherwise indicated, provide stainless-steel fasteners.
- B. Wood Glue: Waterproof resorcinol glue recommended by manufacturer for exterior carpentry use.
- C. Adhesive for Cellular PVC Trim: Product recommended by trim manufacturer.
- D. Flashing: Comply with requirements in Division 07 Section "Sheet Metal Flashing and Trim" for flashing materials installed in exterior finish carpentry.
- E. Insect Screening for Soffit Vents: Aluminum, 18-by-16 (1.4-by-1.6-mm) mesh.
- F. Round Soffit Vents: Stamped aluminum louvered vents, 2 inches (51 mm) in diameter, made to be inserted into round holes cut into soffit.
 - 1. Finish: White paint.

2.8 FABRICATION

- A. Back out or kerf backs of standing and running trim wider than 5 inches (125 mm), except members with ends exposed in finished work.
- B. Ease edges of lumber less than 1 inch (25 mm) in nominal thickness to 1/16-inch (1.5-mm) radius and edges of lumber 1 inch (25 mm) or more in nominal thickness to 1/8-inch (3-mm) radius.

PART 3 - EXECUTION

3.1 EXAMINATION

PMA, Inc., Project 0205.3a

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Prime lumber to be painted, including both faces and edges. Cut to required lengths and prime ends. Comply with requirements in Division 09 Section "Exterior Painting."

3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
 - 1. Do not use manufactured units with defective surfaces, sizes, or patterns.
- B. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
 - 1. Scribe and cut exterior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 - 2. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2438 mm) for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.
 - 3. Install stairs with no more than 3/16-inch (4.7-mm) variation between adjacent treads and risers and with no more than 3/8-inch (9.5-mm) variation between largest and smallest treads and risers within each flight.
 - 4. Coordinate exterior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install flat grain lumber with bark side exposed to weather.
- B. Install cellular PVC trim to comply with manufacturer's written instructions.
- C. Install trim with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches (610 mm) long except where necessary.
 - 1. Use scarf joints for end-to-end joints.
 - 2. Stagger end joints in adjacent and related members.
- D. Fit exterior joints to exclude water. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.

E. Unless otherwise indicated, countersink fasteners, fill surface flush, and sand where face fastening is unavoidable.

3.5 SIDING INSTALLATION

- A. Install siding to comply with manufacturer's written instructions.
- B. Horizontal Lumber Siding: Apply starter strip along bottom edge of sheathing or sill. Install first course of siding with lower edge at least 1/8 inch (3 mm) below starter strip and subsequent courses lapped 1 inch (25 mm) over course below. Nail at each stud. Do not allow nails to penetrate more than one thickness of siding.
- C. Flashing: Install metal flashing as indicated on Drawings and as recommended by siding manufacturer.
- D. Finish: Apply finish within two weeks of installation.

3.6 STAIR AND RAILING INSTALLATION

- A. Treads and Risers at Exterior Stairs: Secure treads and risers by gluing and nailing to carriages. Countersink nail heads, fill flush, and sand filler. Extend treads over carriages and finish with bullnose edge.
- B. Balusters: Fit balusters to treads, glue, and nail in place. Countersink nail heads, fill flush, and sand filler. Let into railings and glue in place.
- C. Newel Posts: Secure newel posts to stringers and risers with through bolts.
- D. Railings: Secure wall rails with metal brackets. Fasten freestanding railings to newel posts and to trim at walls with countersunk-head wood screws or rail bolts, and glue.

3.7 ADJUSTING

A. Replace exterior finish carpentry that is damaged or does not comply with requirements. Exterior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.8 CLEANING

A. Clean exterior finish carpentry on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.9 PROTECTION

- A. Protect installed products from damage from weather and other causes during construction.
- B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 062013

SECTION 064013 - EXTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Exterior frames and jambs.
 - 2. Exterior shutters.
 - 3. Exterior ornamental work.
 - 4. Shop priming exterior woodwork.
- B. Related Sections include the following:
 - 1. Division 06 Section "Rough Carpentry" for exposed framing.
 - 2. Division 06 Section "Finish Carpentry" for exterior carpentry exposed to view that is not specified in this Section.

1.3 SUBMITTALS

- A. Product Data: For each type of product and process indicated and incorporated into items of exterior architectural woodwork during fabrication, finishing, and installation.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show details full size.
 - 2. Show locations and sizes of blocking and nailers, including concealed blocking and reinforcement specified in other Sections.
 - 3. Apply WI-certified compliance label to first page of Shop Drawings.
- C. Product Certificates: For each type of product, signed by product manufacturer.
- D. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.
- E. Qualification Data:
 - 1. For Architectural Woodwork fabricator.
 - 2. For Historic Carpenter

1.4 QUALITY ASSURANCE

- A. **NATIONAL HISTORIC REGISTER ELIGIBLE BUILDING**: The Lee Hall Depot is a national historic register eligible building. All work performed on this building is to meet the Secretary of the Interior's standards for historic preservation. The General Contractor shall be familiar with these requirements and shall obtain the services of a qualified historic carpenter to perform/oversee any work to the existing building fabric to ensure the standards and guidelines for historic preservation are adhered to during construction.
- B. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.
- C. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of exterior architectural woodwork indicated for construction, finishes, installation, and other requirements.
 - 1. Provide AWI Quality Certification Program indicating that woodwork complies with requirements of grades specified.
- D. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.
- E. Forest Certification: Provide exterior architectural woodwork produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

1.5 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation of exterior woodwork only when existing and forecasted weather conditions permit work to be performed and at least one coat of specified finish to be applied without exposure to rain, snow, or dampness.
- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed and indicate measurements on Shop Drawings.
 - 2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.6 COORDINATION

A. Coordinate sizes and locations of framing, blocking, reinforcements, and other related units of Work specified in other Sections to ensure that exterior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Wood Products: Comply with the following:
 - 1. Hardboard: AHA A135.4.
 - 2. Softwood Plywood: DOC PS 1, Exterior.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Nonpressure Process: Comply with AWPA N1 using the following preservative for woodwork items indicated to receive water-repellent preservative treatment:
 - 1. Water-Repellent Preservative: Formulation made specifically for dip treatment of woodwork items and containing 3-iodo-2-propynyl butyl carbamate (IPBC) complying with AWPA P8 as its active ingredient.
 - 2. Water-Repellent Preservative/Insecticide: Formulation made specifically for dip treatment of woodwork items and containing 3-iodo-2-propynyl butyl carbamate (IPBC) as its active ingredient, combined with an insecticide containing chlorpyrifos as its active ingredient, both complying with AWPA P8.
- B. Preservative Treatment by Pressure Process: AWPA C2 (lumber) and AWPA C9 (plywood) and the following:
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
 - 2. Kiln-dry lumber and plywood after treatment to a maximum moisture content, respectively, of 19 and 15 percent. Do not use materials that are warped or do not comply with requirements for untreated materials.
 - 3. Mark each treated item with treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.
- C. Extent of Treatment: Treat blocking and nailers by pressure process and treat other exterior architectural woodwork either by pressure or nonpressure process.
 - 1. Items fabricated from the following wood species need not be treated:
 - a. Redwood.
 - b. Western red cedar.
 - c. Teak.
 - d. African mahogany.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, provide materials that comply with performance requirements of AWPA C20 (lumber) and AWPA C27 (plywood), exterior type.

- 1. Fire-Retardant Chemicals: Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
- 2. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.
- 3. Kiln-dry materials before and after treatment to levels required for untreated materials.
- 4. Do not use treated materials that do not comply with requirements of referenced woodworking standard or that are warped, discolored, or otherwise defective.
- 5. Identify fire-retardant-treated materials with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

2.4 INSTALLATION MATERIALS

- A. Blocking, Shims, and Nailers: Softwood or hardwood lumber, pressure-preservative treated, fireretardant treated, kiln dried to less than 15 percent moisture content.
- B. Nails: stainless steel.
- C. Screws: stainless steel.
 - 1. Provide self-drilling screws for metal framing supports, as recommended by metal-framing manufacturer.
- D. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts, unless otherwise indicated. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.5 FABRICATION, GENERAL

- A. Wood Moisture Content: 7 to 12 percent.
- B. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Edges of Solid-Wood (Lumber) Members 3/4 Inch (19 mm) Thick or Less: 1/16 inch (1.6 mm).
 - 2. Edges of Rails and Similar Members More Than 3/4 Inch (19 mm) Thick: 1/8 inch (3 mm).
- C. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- D. Shop cut openings, to maximum extent possible, to receive hardware, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and seal with a water-resistant coating suitable for exterior applications.

2.6 EXTERIOR FRAMES AND JAMBS FOR OPAQUE FINISH

A. Grade: Custom.

- B. Wood Species: African mahogany.
 - 1. Do not use plain-sawn lumber with exposed, flat surfaces more than 3 inches (75 mm) wide.

2.7 EXTERIOR SHUTTERS FOR OPAQUE FINISH

- A. Grade: Custom.
- B. Wood Species: African mahogany.
 - 1. Do not use plain-sawn lumber with exposed, flat surfaces more than 3 inches (75 mm) wide.

2.8 EXTERIOR ORNAMENTAL WORK FOR OPAQUE FINISH

- A. Exterior ornamental work for opaque finish includes the following:
 - 1. Exterior Eaves and Gable Brackets.
- B. Grade: Custom.
- C. Wood Species: Western red cedar.
 - 1. Do not use plain-sawn lumber with exposed, flat surfaces more than 3 inches (75 mm) wide.

2.9 SHOP PRIMING

- A. Woodwork for Opaque Finish: Shop prime woodwork for paint finish with one coat of wood primer specified in Division 09 painting Sections.
- B. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to surfaces installed in contact with concrete or masonry and to end-grain surfaces.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.
- B. Deliver concrete inserts and similar anchoring devices to be built into substrates well in advance of time substrates are to be built.
- C. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. Quality Standard: Install woodwork to comply with same grade specified in Part 2 for type of woodwork involved.
- B. Install woodwork true and straight with no distortions. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- C. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.
- D. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.
- E. Preservative-Treated Wood: Where cut or drilled in field, treat cut ends and drilled holes according to AWPA M4.
- F. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk concealed fasteners and blind nailing. Use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork.
- G. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 36 inches (900 mm) long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.
 - 1. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches (3 mm in 2400 mm).
- H. Complete finishing work specified in this Section to extent not completed at shop or before installation of woodwork. Fill nail and screw holes with matching filler where exposed.
- I. Refer to Division 09 Sections for final finishing of installed architectural woodwork.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; replace woodwork where not possible to repair. Adjust joinery for uniform appearance.
- B. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064013

SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior standing and running trim.
 - 2. Interior frames and jambs.
 - 3. Stairwork and rails.
 - 4. Flush wood paneling and wainscots.
 - 5. Interior ornamental work.
 - 6. Wood cabinets.
 - 7. Wood countertops.
 - 8. Plastic-laminate countertops.
 - 9. Solid-surfacing-material countertops.
 - 10. Closet and utility shelving.
 - 11. Shop finishing of interior woodwork.
- B. Related Sections include the following:
 - 1. Division 06 Section "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.
 - 2. Division 06 Section "Finish Carpentry" for interior carpentry exposed to view that is not specified in this Section.
 - 3. Division 06 Section "Wood Paneling."

1.3 DEFINITIONS

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.
- B. Rough carriages for stairs are a part of interior architectural woodwork. Platform framing, headers, partition framing, and other rough framing associated with stairwork are specified in Division 06 Section "Rough Carpentry."

1.4 SUBMITTALS

A. Product Data: For each type of product indicated, including cabinet hardware and accessories handrail brackets and finishing materials and processes.

- B. Product Data: For panel products high-pressure decorative laminate solid-surfacing material fireretardant-treated materials cabinet hardware and accessories handrail brackets and finishing materials and processes.
 - 1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- C. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show details full size.
 - 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 3. Apply WI-certified compliance label to first page of Shop Drawings.
- D. Samples for Verification:
 - 1. Lumber and panel products with shop-applied opaque finish, 50 sq. in. (300 sq. cm) for lumber and 8 by 10 inches (200 by 250 mm) for panels, for each finish system and color, with [1/2 of] exposed surface finished.
 - 2. Plastic laminates, 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish, with 1 sample applied to core material and specified edge material applied to 1 edge.
 - 3. Solid-surfacing materials, 6 inches (150 mm) square.
 - 4. Corner pieces as follows:
 - a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches (450 mm) high by 18 inches (450 mm) wide by 6 inches (150 mm) deep.
 - b. Miter joints for standing trim.
 - 5. Exposed cabinet hardware and accessories, one unit for each type and finish.
- E. Product Certificates: For each type of product, signed by product manufacturer.
- F. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.
- G. Qualification Data:
 - 1. For Architectural Woodwork fabricator.
 - 2. For Historic Carpenter.

1.5 QUALITY ASSURANCE

- A. **NATIONAL HISTORIC REGISTER ELIGIBLE BUILDING**: The Lee Hall Depot is a national historic register eligible building. All work performed on this building is to meet the Secretary of the Interior's standards for historic preservation. The General Contractor shall be familiar with these requirements and shall obtain the services of a qualified historic carpenter to perform/oversee any work to the existing building fabric to ensure the standards and guidelines for historic preservation are adhered to during construction.
- B. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.
- C. Installer Qualifications: Certified participant in AWI's Quality Certification Program.

- D. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
 - 1. Provide AWI Quality Certification Program certificates indicating that woodwork complies with requirements of grades specified.
- E. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.
- F. Forest Certification: Provide interior architectural woodwork produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- G. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
 - 2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.
- B. Hardware Coordination: Distribute copies of approved hardware schedule specified in Division 08 Section "Door Hardware (Scheduled by Describing Products)" to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with hardware requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Wood Species for Opaque Finish: Any closed-grain hardwood Eastern white pine, sugar pine, or western white pine.
- C. Wood Products: Comply with the following:
 - 1. Hardboard: AHA A135.4.
 - 2. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
 - 3. Particleboard: ANSI A208.1, Grade M-2.
 - 4. Particleboard: Straw-based particleboard complying with requirements in ANSI A208.1, Grade M-2, except for density.
 - 5. Softwood Plywood: DOC PS 1, Medium Density Overlay.
 - 6. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.
- D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering highpressure decorative laminates that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates by one of the following:
 - a. Abet Laminati, Inc.
 - b. Arborite; Division of ITW Canada, Inc.
 - c. Formica Corporation.
 - d. Lamin-Art, Inc.
 - e. Nevamar Company, LLC; Decorative Products Div.
 - f. Panolam Industries International Incorporated.
 - g. Westinghouse Electric Corp.; Specialty Products Div.
 - h. Wilsonart International; Div. of Premark International, Inc.
- E. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. ABA Industries.
- b. Avonite, Inc.
- c. E. I. du Pont de Nemours and Company.
- d. Formica Corporation.
- e. LG Chemical, Ltd.
- f. Meganite Inc.; a division of the Pyrochem Group.
- g. Nevamar Company, LLC; Decorative Products Div.
- h. Samsung; Cheil Industries Inc.
- i. Swan Corporation (The).
- j. Transolid, Inc.
- k. Wilsonart International; Div. of Premark International, Inc.
- 3. Type: Standard type, unless Special Purpose type is indicated.
- 4. Colors and Patterns: As selected by Architect from manufacturer's full range.
- F. Tempered Float Glass for Cabinet Doors: ASTM C 1048, Kind FT, Condition A, Type I, Class 1 (clear), Quality-Q3, with exposed edges seamed before tempering, 6 mm thick, unless otherwise indicated.
- G. Tempered Float Glass for Cabinet Shelves: ASTM C 1048, Kind FT, Condition A, Type I, Class 1 (clear), Quality-Q3; with exposed edges seamed before tempering, 6 mm thick.

2.2 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this Article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified.
 - 1. Do not use treated materials that do not comply with requirements of referenced woodworking standard or that are warped, discolored, or otherwise defective.
 - 2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
 - 3. Identify fire-retardant-treated materials with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Comply with performance requirements of AWPA C20 (lumber) and AWPA C27 (plywood). Use the following treatment type:
 - 1. Exterior Type: Organic-resin-based formulation thermally set in wood by kiln drying.
 - 2. Interior Type A: Low-hygroscopic formulation.
 - 3. Mill lumber after treatment within limits set for wood removal that do not affect listed fire-testresponse characteristics, using a woodworking plant certified by testing and inspecting agency.
 - 4. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.
 - 5. Kiln-dry materials before and after treatment to levels required for untreated materials.
- C. Fire-Retardant Particleboard: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.
 - 1. For panels 3/4 inch (19 mm) thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: modulus of rupture, 1600 psi (11 MPa); modulus of elasticity,

300,000 psi (2070 MPa); internal bond, 80 psi (550 kPa); and screw-holding capacity on face and edge, 250 and 225 lbf (1100 and 1000 N), respectively.

- 2. For panels 13/16 to 1-1/4 inches (20 to 32 mm) thick, comply with ANSI A208.1 for Grade M-1 except for the following minimum properties: modulus of rupture, 1300 psi (9 MPa); modulus of elasticity, 250,000 psi (1720 MPa); linear expansion, 0.50 percent; and screw-holding capacity on face and edge, 250 and 175 lbf (1100 and 780 N), respectively.
- 3. Product: Subject to compliance with requirements, provide "Duraflake FR" by Weyerhaeuser.
- D. Fire-Retardant Fiberboard: Medium-density fiberboard panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84.
 - 1. Product: Subject to compliance with requirements, provide "Medite FR" by SierraPine Ltd.; Medite Div.

2.3 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide all required cabinet hardware and accessory materials associated with architectural cabinets for complete operation and function of architectural cabinets.
- B. Butt Hinges: 2-3/4-inch (70-mm), 5-knuckle steel hinges made from 0.095-inch- (2.4-mm-) thick metal, and as follows:
 - 1. Semiconcealed Hinges for Flush Doors: BHMA A156.9, B01361.
 - 2. Semiconcealed Hinges for Overlay Doors: BHMA A156.9, B01521.
- C. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, degrees of opening, selfclosing.
- D. Back-Mounted Pulls: BHMA A156.9, B02011.
- E. Wire Pulls: Back mounted, solid metal, 4 inches (100 mm) long, 5/16 inch (8 mm) in diameter.
- F. Catches: Push-in magnetic catches, BHMA A156.9, B03131.
- G. Adjustable Shelf Standards and Supports: BHMA A156.9, B04102; with shelf brackets, B04112.
- H. Shelf Rests: BHMA A156.9, B04013;metal, two-pin type with shelf hold-down clip.
- I. Drawer Slides: BHMA A156.9, B05091.
 - 1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-extension type; zincplated steel ball-bearing slides.
 - 2. File Drawer Slides: Grade 1HD-100; for drawers more than 6 inches (150 mm) high or 24 inches (600 mm) wide.
 - 3. Pencil Drawer Slides: Grade 1; for drawers not more than 3 inches (75 mm) high and 24 inches (600 mm) wide.
 - 4. Keyboard Slides: Grade 1HD-100; for computer keyboard shelves.
- J. Aluminum Slides for Sliding Glass Doors: BHMA A156.9, B07063.
- K. Door Locks: BHMA A156.11, E07121.
- L. Drawer Locks: BHMA A156.11, E07041.

- M. Grommets for Cable Passage through Countertops: 2-inch (51-mm) OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.
 - 1. Product: Subject to compliance with requirements, provide "OG series" by Doug Mockett & Company, Inc.
- N. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 1. Satin Stainless Steel: BHMA 630.
- O. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.
- B. Rough Carriages for Stairs: No. 1 grade and the following species, kiln dried to 15 percent maximum moisture content:
 - 1. Southern pine.
- C. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
- D. Handrail Brackets: Cast from stainless steel with wall flange drilled for exposed anchor and with support arm for screwing to underside of rail. Sized to provide 1-1/2-inch (38-mm) clearance between handrail and wall.
- E. Adhesives, General: Do not use adhesives that contain urea formaldehyde.
- F. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Wood Glues: 30 g/L.
 - 2. Contact Adhesive: 250 g/L.
- G. Adhesive for Bonding Plastic Laminate: Contact cement.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.5 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom-grade interior woodwork complying with referenced quality standard.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

- D. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4 Inch (19 mm) Thick or Less: 1/16 inch (1.5 mm).
 - 2. Edges of Rails and Similar Members More Than 3/4 Inch (19 mm) Thick: 1/8 inch (3 mm).
 - 3. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members and Rails: 1/16 inch (1.5 mm).
- E. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
 - 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.
- F. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 - 1. Seal edges of openings in countertops with a coat of varnish.
- G. Install glass to comply with applicable requirements in Division 08 Section "Decorative Glass Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.

2.6 INTERIOR STANDING AND RUNNING TRIM AND BEADED BOARD WALL/CEILING PANELING FOR OPAQUE FINISH

- A. Grade: Custom.
- B. Wood Species: Any closed-grain hardwood.
- C. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.
- D. Assemble casings in plant except where limitations of access to place of installation require field assembly.
- E. Assemble moldings in plant to maximum extent possible. Miter corners in plant and prepare for field assembly with bolted fittings designed to pull connections together.
- F. Profiles: All trim and beaded board wall and ceiling paneling to match existing materials size, thickness, profiles and dimensions. Contractor responsible for confirming all new trim and paneling profiles match existing prior to fabrication.

2.7 INTERIOR FRAMES AND JAMBS FOR OPAQUE FINISH

A. Grade: Custom.

B. Wood Species: Any closed-grain hardwood.

2.8 WOOD CABINETS FOR OPAQUE FINISH

- A. Grade: Custom.
- B. AWI Type of Cabinet Construction: Reveal overlay on face frame.
- C. WI Construction Style: Style B, Face Frame.
- D. Reveal Dimension: 1/2 inch (13 mm).
- E. Species for Exposed Lumber Surfaces: Any closed-grain hardwood.
- F. Panel Product for Exposed Surfaces: Cabinet grade hardwood plywood
- G. Semiexposed Surfaces: Provide surface materials indicated below:
 - 1. Surfaces Other Than Drawer Bodies: Match materials indicated for exposed surfaces.
 - 2. Drawer Sides and Backs: Solid-hardwood lumber.
 - 3. Drawer Bottoms: Hardwood plywood.
- H. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

2.9 PLASTIC-LAMINATE CABINETS

- A. Grade: Custom.
- B. AWI Type of Cabinet Construction: Flush overlay.
- C. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
 - 1. Horizontal Surfaces Other Than Tops: Grade HGS.
 - 2. Vertical Surfaces: Grade HGS.
 - 3. Edges: Grade HGS.
- D. Materials for Semiexposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS.
 - a. Edges of Plastic-Laminate Shelves: PVC tape, 0.018-inch (0.460-mm) minimum thickness, matching laminate in color, pattern, and finish.
 - b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade VGS.
 - 2. Drawer Sides and Backs: Solid-hardwood lumber.
 - 3. Drawer Bottoms: Hardwood plywood.
- E. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.

- F. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - As selected by Architect from laminate manufacturer's full range in the following categories:
 a. Patterns, matte finish.
- G. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

2.10 WOOD COUNTERTOPS

- A. Grade: Premium.
- B. Type of Top: Solid wood for transparent finish, edge glued, with crown direction reversed in adjacent boards, to produce widths indicated. Select boards for similarity of color and grain and arrange boards for optimum match between adjacent boards. Species and cut as follows:
 - 1. Wood Species and Cut: Red oak, plain sawn.
- C. Type of Top: Solid laminated for transparent finish. Narrow strips of lumber glued together with crown direction reversed in adjacent strips. Arrange strips for random mix of color and grain. Species and cut as follows:
 - 1. Wood Species: Red oak.
 - 2. Strip Thickness: 1-1/2 inches (38 mm).

2.11 PLASTIC-LAMINATE COUNTERTOPS

- A. Grade: Custom.
- B. High-Pressure Decorative Laminate Grade: HGS.
- C. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As selected by Architect from manufacturer's full range in the following categories: a. Patterns, matte finish.
- D. Grain Direction: Parallel to cabinet fronts.
- E. Edge Treatment: Same as laminate cladding on horizontal surfaces.
- F. Core Material: Exterior-grade plywood.
- G. Backer Sheet: Provide plastic-laminate backer sheet, Grade BKL, on underside of countertop substrate.
- H. Paper Backing: Provide paper backing on underside of countertop substrate.

2.12 SOLID-SURFACING-MATERIAL COUNTERTOPS

- A. Grade: Custom.
- B. Solid-Surfacing-Material Thickness: 1/2 inch (13 mm).

- C. Colors, Patterns, and Finishes: Provide materials and products that result in colors of solid-surfacing material complying with the following requirements:
 - 1. As selected by Architect from manufacturer's full range.
- D. Fabricate tops in one piece, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
 - 1. Fabricate tops with shop-applied edges of materials and configuration indicated.
 - 2. Fabricate tops with shop-applied backsplashes.
- E. Install integral sink bowls in countertops in shop.
- F. Drill holes in countertops for plumbing fittings and soap dispensers in shop.

2.13 CLOSET AND UTILITY SHELVING

- A. Grade: Custom.
- B. Shelf Material: 3/4-inch (19-mm) veneer-faced panel product with solid-lumber edge.
- C. Cleats: 3/4-inch (19-mm) solid lumber.
- D. Wood Species: Any closed-grain hardwood.

2.14 SHOP FINISHING

- A. Grade: Provide finishes of same grades as items to be finished.
- B. General: Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- C. Shop Priming: Shop apply the prime coat including backpriming, if any, for[**transparent-finished**] items specified to be field finished. Refer to Division 09 painting Sections for material and application requirements.
- D. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative panels.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.
- C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.
- F. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- G. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 36 inches (900 mm) long, except where shorter single-length pieces are necessary.
 - 1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base if finished.
 - 2. Install wall railings on indicated metal brackets securely fastened to wall framing.
 - 3. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches (3 mm in 2400 mm).
- H. Stairs: Securely anchor carriages to supporting substrates. Install stairs with treads and risers no more than 1/8 inch (3 mm) from indicated position.
- I. Railings:
 - 1. General: Install rails with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) variation from a straight line.
 - 2. Stair Rails: Glue and dowel or pin balusters to treads and railings, and railings to newel posts.
 - 3. Wall Rails: Support rails on indicated metal brackets securely fastened to wall framing.
 - a. Space rail brackets not more than 4 inches o.c.
- J. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
 - 2. Maintain veneer sequence matching of cabinets with transparent finish.

- 3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for 1-inch (25-mm) penetration into wood framing, blocking, or hanging strips.
- K. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
 - 2. Install countertops with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
 - 3. Secure backsplashes to walls with adhesive.
 - 4. Calk space between backsplash and wall with sealant specified in Division 07 Section "Joint Sealants."
- L. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.
- M. Refer to Division 09 Sections for final finishing of installed architectural woodwork not indicated to be shop finished.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064023

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Concealed building insulation.
 - 2. Vapor retarders.
- B. Related Sections include the following:
 - 1. Division 07 Section "Fire-Resistive Joint Systems" for insulation installed as part of a perimeter fire-resistive joint system.
 - 2. Division 09 Section "Gypsum Board" for installation in metal-framed assemblies of insulation specified by referencing this Section.
 - 3. Division 21 Section "Fire-Suppression Systems Insulation."
 - 4. Division 22 Section "Plumbing Insulation."
 - 5. Division 23 Section "HVAC Insulation."

1.3 DEFINITIONS

A. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers; produced in boards and blanket with latter formed into batts (flat-cut lengths) or rolls.

1.4 PERFORMANCE REQUIREMENTS

- A. Plenum Rating: Provide glass-fiber insulation where indicated in ceiling plenums whose test performance is rated as follows for use in plenums as determined by testing identical products per "Erosion Test" and "Mold Growth and Humidity Test" described in UL 181, or on comparable tests from another standard acceptable to authorities having jurisdiction.
 - 1. Erosion Test Results: Insulation shows no visible evidence of cracking, flaking, peeling, or delamination of interior surface of duct assembly, after testing for 4 hours at 2500-fpm (13-m/s) air velocity.
 - 2. Mold Growth and Humidity Test Results: Insulation shows no evidence of mold growth, delamination, or other deterioration due to the effects of high humidity, after inoculation with Chaetomium globosium on all surfaces and storing for 60 days at 100 percent relative humidity in the dark.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

- B. Samples for Verification: Full-size units for each type of exposed insulation indicated.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for insulation products.
- D. Research/Evaluation Reports: For foam-plastic insulation.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Surface-Burning Characteristics: ASTM E 84.
 - 2. Fire-Resistance Ratings: ASTM E 119.
 - 3. Combustion Characteristics: ASTM E 136.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect plastic insulation as follows:
 - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
 - 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 - 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 GLASS-FIBER BLANKET INSULATION

- A. Available Manufacturers:
 - 1. CertainTeed Corporation.
 - 2. Guardian Fiberglass, Inc.
 - 3. Johns Manville.
 - 4. Knauf Fiber Glass.
 - 5. Owens Corning.
- B. Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type III (blankets with reflective membrane facing), Class A (membrane-faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil-scrim-kraft, foil-scrim, or foil-scrim-polyethylene vapor-retarder membrane on 1 face.
- C. Where glass-fiber blanket insulation is indicated by the following thicknesses, provide blankets in batt or roll form with thermal resistances indicated:
 - 1. 3-1/2 inches (89 mm) thick with a thermal resistance of 13 deg F x h x sq. ft./Btu at 75 deg F (2.3 K x sq. m/W at 24 deg C).
 - 2. 3-5/8 inches (92 mm) thick with a thermal resistance of 11 deg F x h x sq. ft./Btu at 75 deg F (1.9 K x sq. m/W at 24 deg C).
 - 3. 5-1/2 inches (140 mm) thick with a thermal resistance of 19 deg F x h x sq. ft./Btu at 75 deg F (3.3 K x sq. m/W at 24 deg C).
 - 4. 6-1/2 inches (165 mm) thick with a thermal resistance of 21 deg F x h x sq. ft./Btu at 75 deg F (3.7 K x sq. m/W at 24 deg C).
 - 5. 9-1/2 inches (241 mm) thick with a thermal resistance of 30 deg F x h x sq. ft./Btu at 75 deg F (5.2 K x sq. m/W at 24 deg C).

2.3 VAPOR RETARDERS

- A. Reinforced-Polyethylene Vapor Retarders: 2 outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either nylon cord or polyester scrim and weighing not less than 25 lb/1000 sq. ft. (12 kg/100 sq. m), with maximum permeance rating of 0.0507 perm (2.9 ng/Pa x s x sq. m).
 - 1. Available Products:
 - a. Raven Industries Inc.; DURA-SKRIM 6WW.
 - b. Reef Industries, Inc.; Griffolyn T-65.
- B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
- C. Vapor-Retarder Fasteners: Pancake-head, self-tapping steel drill screws; with fender washers.
- D. Single-Component Nonsag Urethane Sealant: ASTM C 920, Type I, Grade NS, Class 25, Use NT related to exposure, and Use O related to vapor-barrier-related substrates.
- E. Adhesive for Vapor Retarders: Product recommended by vapor-retarder manufacturer and with demonstrated capability to bond vapor retarders securely to substrates indicated.

2.4 AUXILIARY INSULATING MATERIALS

A. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by insulation manufacturers for sealing joints and penetrations in vapor-retarder facings.

B. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, and unsolled and that has not been left exposed at any time to ice, rain, and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
- E. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF PERIMETER INSULATION

- A. On vertical surfaces, set insulation units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.
 - 1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) below exterior grade line.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
- C. Protect below-grade insulation on vertical surfaces from damage during backfilling by applying protection course with joints butted. Set in adhesive according to insulation manufacturer's written instructions.

D. Protect top surface of horizontal insulation from damage during concrete work by applying protection course with joints butted.

3.5 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Seal joints between foam-plastic insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
- C. Set vapor-retarder-faced units with vapor retarder to warm-in-winter side of construction, unless otherwise indicated.
 - 1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.
- D. Stuff glass-fiber loose-fill insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).

3.6 INSTALLATION OF VAPOR RETARDERS

- A. General: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- B. Seal vertical joints in vapor retarders over framing by lapping not less than two wall studs. Fasten vapor retarders to wood framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches (400 mm) o.c.
- C. Before installing vapor retarder, apply urethane sealant to flanges of metal framing including runner tracks, metal studs, and framing around door and window openings. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
- D. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.
- E. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarder.
- F. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarder.

3.7 PROTECTION

A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 074113 - METAL ROOF PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preformed, prefinished metal roofing and flashings.

B. Miscellaneous trim, flashing, closures, drip flashing,

and accessories.

C. Fastening devices.

1.02 RELATED SECTIONS

A. Section 06100: Rough Carpentry.

B. Section 07631: Flashing and Sheet Metal.

1.03 REFERENCES

A. American Iron & Steel Institute (AISI) Specification for the Design of Coldformed Steel Structural Members.

B. ASTM A-653 & ASTM A924 Steel Sheet, Zinc-Coated (Galvanized)

C. Spec Data Sheet - Galvalume Sheet Metal by Bethlehem Corp.

D. SMACNA - Architectural Sheet Metal Manual.

1.04 ASSEMBLY DESCRIPTION

A. The roofing assembly includes preformed sheet metal shingles, related accessories, valleys, hips, ridges, eaves, corners, rakes, miscellaneous flashing and attaching devices.

1.05 SUBMITTALS

A. Submit detailed drawings showing layout of shingles, anchoring details, joint details, trim, flashing, and accessories. Show details of weatherproofing, terminations, and penetrations of metal work.

B. Submit a sample of each type of roof shingle, complete with factory finish.

1.06 QUALITY ASSURANCE

A. Manufacturer: Company specializing in ArchitecturalSheet Metal Products with ten (10) years minimum experience.

B. No product substitutions shall be permitted without meeting specifications.

C. Substitutions shall be submitted 10 Days prior to Bid Date and acceptance put forth in an addendum.

D. No substitutions shall be made after the Bid Date.

1.07 DELIVERY, STORAGE AND HANDLING

A. Upon receipt of shingles and other materials, installershall examine the shipment for damage and completeness.

B. Shingles should be stored in a clean, dry place. One end should be elevated to allow moisture to run off.

C. Shingles with strippable film must not be stored in the open, exposed to the sun.

D. Stack all materials to prevent damage and to allow for adequate ventilation.

1.08 WARRANTY

A. Paint finish shall have a twenty year guarantee against cracking, peeling and fade (not to exceed 5 N.B.S. units).

B. Galvalume material shall have a twenty year guarantee against failure due to corrosion, rupture or perforation.

PART 2 PRODUCT

2.01 ACCEPTABLE MANUFACTURERS

A. Berridge Manufacturing Company, Houston, Texas.

B. Substitutions shall be preapproved by the architect, and fully comply with specified requirements .

2.02 SHEET MATERIALS

A. Prefinished Metal shall be Hot-Dipped Galvanized - ASTM A446-85 Grade C G90 Coating A525-86 24 Gauge core steel or prefinished Galvalume - ASTM 792-86 AZ-55.

B. Unfinished Metal shall be Grade C Galvalume ASTM 792-86, AZ 55, "Satin Finish".

C. Finish shall be full strength Kynar 500 Fluoropolymer coating, applied by the manufacturer on a continuous coil coating line, with a top side dry film thickness of 0.70 to 0.90 mil over 0.25 to 0.35 mil prime coat, to provide a total dry film thickness of 0.95 to 1.25 mil. Bottom side shall be coated with primer with a dry film thickness of 0.25 mil. Finish shall conform to all tests for adhesion, flexibility, and longevity as specified by the Kynar 500 finish supplier.

D. Strippable film shall be applied to the top side of the painted coil to protect the finish during fabrication, shipping and field handling. This strippable film must be removed before installation.

2.03 ACCESSORY MATERIALS

A. Fasteners: Stainless Steel with washers where required.
2.04 FABRICATION

A. All exposed adjacent flashing shall be of the same material and finish as the roof shingles.

B. Hem all exposed edges of flashing on underside, 1/2 inch.

2.05 PRODUCT: CLASSIC SHINGLES:

1. Stamped Shingles shall have a stamped sculptured design similar to Berridge Classic Shingle (stamped metal shingle). Each Shingle shall have 9" by 12" exposure to the weather.

2. Shingles to be of overlapping, Interlocking Design, fastened to solid substrate with hidden roofing nails.

3. Shingles to be of non-combustible 24-Gauge Steel with Class A Fire Rating.

PART 3 EXECUTION

3.01 INSPECTION

A. Substrate:

1. Examine plywood or metal deck to ensure proper attachment to framing.

2. Inspect roof deck to verify deck is clean and smooth, free of depressions, waves or projections, level to +/- 1/4" in 20', and properly sloped to [valleys] (or) [eaves].

3. Verify roof openings, curbs, pipes, sleeves, ducts or vents through roof are solidly set, cant strips and reglets in place, and nailing strips located.

4. Verify deck is dry and free of snow or ice. [Flutes in steel deck to be clean and dry] or [joints in wood deck to be solidly supported and nailed].

B. Underlayment:

1. Verify #30 unperforated asphalt saturated roofing felt underlayment has been installed over solid sheathing and fastened in place.

2. One (1) layer of #30 asphalt roofing felt paper for roof slopes of 3:12 and up, two (2) layers where dictated by roof design and climatic conditions (check with Berridge).

3. Ensure felt installed horizontally, starting at eave to ridge with a 6" minimum overlap and 18" endlaps.

4. Ensure that all nail heads are totally flush with the substrate. Nails shall be galvanized roofing nails with Berridge Coated Felt Caps.

3.02 INSTALLATION

A. Comply with manufacturers standard instructions and conform to standards set forth in the Architectural Sheet Metal Manual published by SMACNA, in order to achieve a watertight installation.

B. Install shingles in such a manner that horizontal lines are true and level and vertical lines are plumb.

C. Install starter and edge trim before installing shingles.

D. Remove protective strippable film prior to installation of roof shingles.

E. Attach shingles using manufacturer's standard clips and fasteners, spaced in accordance with approved shop drawings.

F. Do not allow shingles or trim to come into contact with dissimilar materials.

G. Do not allow traffic on completed roof. If required, provide cushioned walk boards.

H. Protect installed shingles and trim from damage caused by adjacent construction until completion of installation.

J. Remove and replace any shingles or components which are damaged beyond successful repair.

3.03 CLEANING

A. Clean any grease, finger marks or stains from the shingles per manufacturer's recommendations.

B. Remove all scrap and construction debris from the site.

3.04 FINAL INSPECTION

A. Final inspection will be performed by a firm appointed and paid for by the owner in accordance with section 01410.

END OF SECTION

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Manufactured Products:
 - a. Manufactured reglets and counterflashing.
 - 2. Formed Products:
 - a. Formed roof drainage sheet metal fabrications.
 - b. Formed low-slope roof sheet metal fabrications.
 - c. Formed steep-slope roof sheet metal fabrications.
 - d. Formed overhead-piping safety pans.
- B. Related Sections:
 - 1. Division 06 Section "Rough Carpentry" for wood nailers, curbs, and blocking.
 - 2. Division 07 Section "Insert Section title for roof shingles, shakes, or tiles" for installing sheet metal flashing and trim integral with roofing.
 - 3. Division 07 Section "Metal Roof Panels" for sheet metal flashing and trim integral with metal roof panels.
 - 4. Division 07 Section "Sheet Metal Roofing" for custom-formed sheet metal flashing and trim integral with sheet metal roofing.
 - 5. Division 07 Section "Roof Specialties" for manufactured roof specialties not part of sheet metal flashing and trim.
 - 6. Division 07 Section "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Fabricate and install roof edge flashing capable of resisting the following forces according to recommendations in FMG Loss Prevention Data Sheet 1-49:
 - 1. Wind Zone 2: For velocity pressures of 31 to 45 lbf/sq. ft. (1.48 to 2.15 kPa): 90-lbf/sq. ft. (4.31-kPa) perimeter uplift force, 120-lbf/sq. ft. (5.74-kPa) corner uplift force, and 45-lbf/sq. ft. (2.15-kPa) outward force.

- C. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:
 - 1. Identification of material, thickness, weight, and finish for each item and location in Project.
 - 2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
 - 3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 - 4. Details of termination points and assemblies, including fixed points.
 - 5. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.
 - 6. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
 - 7. Details of special conditions.
 - 8. Details of connections to adjoining work.
 - 9. Detail formed flashing and trim at a scale of not less than 1-1/2 inches per 12 inches (1:10).
- C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
 - 1. Sheet Metal Flashing: 12 inches (300 mm) long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
 - 2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches (300 mm) long and in required profile. Include fasteners and other exposed accessories.
 - 3. Accessories and Miscellaneous Materials: Full-size Sample.
 - 4. Anodized Aluminum Samples: Samples to show full range to be expected for each color required.
- D. Qualification Data: For qualified fabricator.
- E. Maintenance Data: For sheet metal flashing, trim, and accessories to include in maintenance manuals.
- F. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

- B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.
- C. Copper Sheet Metal Standard: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.
- D. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
 - 2. Review methods and procedures related to sheet metal flashing and trim.
 - 3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
 - 4. Review special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect sheet metal flashing.
 - 5. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.7 WARRANTY

- A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
- B. Copper Sheet: ASTM B 370, cold-rolled copper sheet, H00 or H01 temper.

- 1. Non-Patinated Exposed Finish: Mill.
- C. Zinc-Tin Alloy-Coated Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, dead-soft, fully annealed stainless-steel sheet of minimum uncoated thickness indicated; coated on both sides with a zinc-tin alloy (50 percent zinc, 50 percent tin), with factory-applied gray preweathering.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Follansbee Steel; TCS II.
- D. Zinc-Tin Alloy-Coated Copper Sheet: ASTM B 370, cold-rolled copper sheet, H00 temper, of minimum uncoated weight (thickness) indicated; coated on both sides with a zinc-tin alloy (50 percent zinc, 50 percent tin).
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Revere Copper Products, Inc.; FreedomGray.

2.2 UNDERLAYMENT MATERIALS

- A. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
- B. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils (0.76 to 1.0 mm) thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
 - 1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F (116 deg C).
 - 2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F (29 deg C).
 - 3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Carlisle Coatings & Waterproofing Inc.; CCW WIP 300HT.
 - b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
 - c. Henry Company; Blueskin PE200 HT.
 - d. Metal-Fab Manufacturing, LLC; MetShield.
 - e. Owens Corning; WeatherLock Metal High Temperature Underlayment.

2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
 - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

- a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factoryapplied coating.
- b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
- c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
- 2. Fasteners for Zinc-Tin Alloy-Coated Copper Sheet: Copper, hardware bronze or Series 300 stainless steel.
- 3. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
- 4. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
- 5. Fasteners for Zinc-Tin Alloy-Coated Stainless-Steel Sheet: Series 300 stainless steel.
- 6. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.
- 7. Fasteners for Zinc Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.
- C. Solder:
 - 1. For Copper: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.
 - 2. For Stainless Steel: ASTM B 32, Grade Sn60, with an acid flux of type recommended by stainless-steel sheet manufacturer.
 - 3. For Zinc-Tin Alloy-Coated Stainless Steel or Copper: ASTM B 32, 100 percent tin.
 - 4. For Zinc-Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.
 - 5. For Zinc: ASTM B 32, 40 percent tin and 60 percent lead with low antimony, as recommended by manufacturer.
- D. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
- E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- H. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.
- I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.4 MANUFACTURED SHEET METAL FLASHING AND TRIM

- A. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and welded corners and junctions.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. Cheney Flashing Company.
- b. Fry Reglet Corporation.
- c. Heckmann Building Products Inc.
- d. Hickman, W. P. Company.
- e. Hohmann & Barnard, Inc.; STF Sawtooth Flashing.
- f. Keystone Flashing Company, Inc.
- g. National Sheet Metal Systems, Inc.
- 2. Material: Copper, 16 oz./sq. ft. (0.55 mm thick).
- 3. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
- 4. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
- 5. Accessories:
 - a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
 - b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.
- 6. Finish: Mill.

2.5 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
 - 1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 - 2. Obtain field measurements for accurate fit before shop fabrication.
 - 3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
 - 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.
- C. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.
- D. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- F. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" and by FMG Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

- G. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- H. Do not use graphite pencils to mark metal surfaces.

2.6 ROOF DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- (2400-mm-) long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by SMACNA but not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters.
 - 1. Gutter Style: 6" half-round
 - 2. Expansion Joints: Lap type.
 - 3. Accessories: Wire ball downspout strainer.
 - 4. Gutters with Girth up to 15 Inches (380 mm): Fabricate from the following materials:
 - a. Copper: 16 oz./sq. ft. (0.55 mm thick).
- B. Downspouts: Fabricate round downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.
 - 1. Manufactured Hanger Style: SMACNA figure designation **1-34A**.
 - 2. Fabricate from the following materials:
 - a. Copper: 16 oz./sq. ft. (0.55 mm thick).
- C. Roof and Roof to Wall Transition Expansion-Joint Cover: Fabricate from the following materials:
 - 1. Zinc-Tin Alloy-Coated Stainless Steel: 0.024 inch (0.61 mm) thick.
 - 2. Zinc-Tin Alloy-Coated Copper: 16 oz./sq. ft. (0.55 mm thick).
- D. Base Flashing: Fabricate from the following materials:
 - 1. Zinc-Tin Alloy-Coated Stainless Steel: 0.018 inch (0.46 mm) thick.
 - 2. Zinc-Tin Alloy-Coated Copper: 20 oz./sq. ft. (0.68 mm thick).
- E. Counterflashing: Fabricate from the following materials:
 - 1. Zinc-Tin Alloy-Coated Stainless Steel: 0.018 inch (0.46 mm) thick.
 - 2. Zinc-Tin Alloy-Coated Copper: 16 oz./sq. ft. (0.55 mm thick).
- F. Flashing Receivers: Fabricate from the following materials:
 - 1. Zinc-Tin Alloy-Coated Stainless Steel: 0.015 inch (0.38 mm) thick.
 - 2. Zinc-Tin Alloy-Coated Copper: 16 oz./sq. ft. (0.55 mm thick).
- G. Roof-Penetration Flashing: Fabricate from the following materials:
 - 1. Zinc-Tin Alloy-Coated Stainless Steel: 0.018 inch (0.46 mm) thick.
 - 2. Zinc-Tin Alloy-Coated Copper: 16 oz./sq. ft. (0.55 mm thick).

2.7 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Apron, Step, Cricket, and Backer Flashing: Fabricate from the following materials:
 - 1. Zinc-Tin Alloy-Coated Stainless Steel: 0.015 inch (0.38 mm) thick.
 - 2. Zinc-Tin Alloy-Coated Copper: 16 oz./sq. ft. (0.55 mm thick).

- B. Valley Flashing: Fabricate from the following materials:
 - 1. Zinc-Tin Alloy-Coated Stainless Steel: 0.018 inch (0.46 mm) thick.
 - 2. Zinc-Tin Alloy-Coated Copper: 16 oz./sq. ft. (0.55 mm thick).
- C. Drip Edges: Fabricate from the following materials:
 - 1. Zinc-Tin Alloy-Coated Stainless Steel: 0.015 inch (0.38 mm) thick.
 - 2. Zinc-Tin Alloy-Coated Copper: 16 oz./sq. ft. (0.55 mm thick).
- D. Eave, Rake, Ridge, and Hip Flashing: Fabricate from the following materials:
 - 1. Zinc-Tin Alloy-Coated Stainless Steel: 0.015 inch (0.38 mm) thick.
 - 2. Zinc-Tin Alloy-Coated Copper: 16 oz./sq. ft. (0.55 mm thick).
- E. Counterflashing: Fabricate from the following materials:
 - 1. Zinc-Tin Alloy-Coated Stainless Steel: 0.018 inch (0.46 mm) thick.
 - 2. Zinc-Tin Alloy-Coated Copper: 16 oz./sq. ft. (0.55 mm thick).
- F. Flashing Receivers: Fabricate from the following materials:
 - 1. Zinc-Tin Alloy-Coated Stainless Steel: 0.015 inch (0.38 mm) thick.
 - 2. Zinc-Tin Alloy-Coated Copper: 16 oz./sq. ft. (0.55 mm thick).
- G. Roof-Penetration Flashing: Fabricate from the following materials:
 - 1. Zinc-Tin Alloy-Coated Stainless Steel: 0.018 inch (0.46 mm) thick.
 - 2. Zinc-Tin Alloy-Coated Copper: 16 oz./sq. ft. (0.55 mm thick).

2.8 WALL SHEET METAL FABRICATIONS

- Opening Flashings in Frame Construction: Fabricate head, sill, and similar flashings to extend 4 inches (100 mm) beyond wall openings. Form head and sill flashing with 2-inch- (50-mm-) high, end dams. Fabricate from the following materials:
 - 1. Copper: 16 oz./sq. ft. (0.55 mm thick).

2.9 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Overhead-Piping Safety Pans: Fabricate from the following materials:
 - 1. Galvanized Steel: 0.040 inch (1.02 mm) thick.
 - 2. Aluminum-Zinc Alloy-Coated Steel: 0.040 inch (1.02 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
 - 1. Verify compliance with requirements for installation tolerances of substrates.
 - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. General: Install underlayment as indicated on Drawings.
- B. Polyethylene Sheet: Install polyethylene sheet with adhesive for anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped and taped joints of not less than 2 inches (50 mm).
- C. Felt Underlayment: Install felt underlayment with adhesive for temporary anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches (50 mm).
- D. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.

3.3 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 - 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 - 3. Space cleats not more than 12 inches (300 mm) apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
 - 4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
 - 5. Install sealant tape where indicated.
 - 6. Torch cutting of sheet metal flashing and trim is not permitted.
 - 7. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.
 - 1. Coat back side of uncoated aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
 - 2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or

intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.

- D. Fastener Sizes: Use fasteners of sizes that will penetrate wood sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.
- E. Seal joints as shown and as required for watertight construction.
 - 1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
 - 2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."
- F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches (38 mm), except reduce pre-tinning where pre-tinned surface would show in completed Work.
 - 1. Do not solder metallic-coated steel and aluminum sheet.
 - 2. Pre-tinning is not required for zinc-tin alloy-coated stainless steel and zinc-tin alloy-coated copper.
 - 3. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
 - 4. Stainless-Steel Soldering: Tin edges of uncoated sheets using solder recommended for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
 - 5. Copper Soldering: Tin edges of uncoated copper sheets using solder for copper.

3.4 ROOF DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.
- B. Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored gutter brackets spaced not more than 36 inches (900 mm) apart. Provide end closures and seal watertight with sealant. Slope to downspouts.
 - 1. Fasten gutter spacers to front and back of gutter.
 - 2. Loosely lock straps to front gutter bead and anchor to roof deck.
 - 3. Anchor and loosely lock back edge of gutter to continuous cleat.
 - 4. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet (15.24 m) apart. Install expansion-joint caps.
- C. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints.
 - 1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches (1500 mm) o.c. in between.
 - 2. Provide elbows at base of downspout to direct water away from building.
 - 3. Connect downspouts to underground drainage system indicated.

D. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints a minimum of 4 inches (100 mm) in direction of water flow.

3.5 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in SMACNA's "Architectural Sheet Metal Manual" and as indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch (75-mm) centers.
- C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches (100 mm) over base flashing. Install stainless-steel draw band and tighten.
- D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches (100 mm) over base flashing. Lap counterflashing joints a minimum of 4 inches (100 mm) and bed with sealant. Secure in a waterproof manner by means of snap-in installation and sealant or lead wedges and sealant.
- E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.6 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Reglets: Installation of reglets is specified in Division 04 Section "Unit Masonry."
- C. Opening Flashings in Frame Construction: Install continuous head, sill, and similar flashings to extend 4 inches (100 mm) beyond wall openings.

3.7 MISCELLANEOUS FLASHING INSTALLATION

- A. Overhead-Piping Safety Pans: Suspend pans independent from structure above as indicated on Drawings. Pipe and install drain line to plumbing waste or drainage system.
- B. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.8 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.
- B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.9 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.
- E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

SECTION 07841 - THROUGH-PENETRATION FIRESTOP SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.
- B. Related Sections include the following:
 - 1. Division 7 Section "Fire-Resistive Joint Systems."
 - 2. Division 13 Sections specifying fire-suppression piping penetrations.
 - 3. Division 15 Sections specifying duct and piping penetrations.
 - 4. Division 16 Sections specifying cable and conduit penetrations.

1.3 PERFORMANCE REQUIREMENTS

- A. General: For penetrations through the following fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
 - 1. Fire-resistance-rated walls including fire partitions, fire barriers and smoke barriers.
 - 2. Fire-resistance-rated horizontal assemblies including floor/ceiling assemblies and ceiling membranes of roof/ceiling assemblies.
- B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per ASTM E 814 or UL 1479:
 - 1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
 - 2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
 - a. Penetrations located outside wall cavities.
 - b. Penetrations located outside fire-resistance-rated shaft enclosures.
 - 3. L-Rated Systems: Provide through-penetration firestop systems with L-ratings of not more than 3.0 cfm/sq. ft (0.01524cu. m/s x sq. m) at both ambient temperatures and 400 deg F (204 deg C).
- C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

- 1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
- 2. For floor penetrations with annular spaces exceeding 4 inches (100 mm) in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
- 3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.
 - 1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
 - 2. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.
- C. Through-Penetration Firestop System Schedule: Indicate locations of each through-penetration firestop system, along with the following information:
 - 1. Types of penetrating items.
 - 2. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
 - 3. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.
- D. Qualification Data: For Installer.
- E. Product Certificates: For through-penetration firestop system products, signed by product manufacturer.
- F. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors."
- B. Installer Qualifications: A firm experienced in installing through-penetration firestop systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance.

- C. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.
- D. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.
- E. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:
 - 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
 - 2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems complying with the following requirements:
 - a. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the following:
 - 1) UL in its "Fire Resistance Directory."
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate throughpenetration firestop systems.

- C. Notify Owner's inspecting agency at least seven days in advance of through-penetration firestop system installations; confirm dates and times on days preceding each series of installations.
- D. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by Owner's inspecting agency and building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the through-penetration firestop systems indicated for each application on Drawings or that are produced by one of the following manufacturers:
 - 1. Grace, W. R. & Co. Conn.
 - 2. Hilti, Inc.
 - 3. Johns Manville.
 - 4. 3M; Fire Protection Products Division.
 - 5. Tremco; Sealant/Weatherproofing Division.
 - 6. USG Corporation.

2.2 FIRESTOPPING, GENERAL

- A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
- B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:
 - 1. Permanent forming/damming/backing materials, including the following:
 - a. Slag-/rock-wool-fiber insulation.
 - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
 - c. Fire-rated form board.
 - d. Fillers for sealants.
 - 2. Temporary forming materials.
 - 3. Substrate primers.
 - 4. Collars.
 - 5. Steel sleeves.

2.3 FILL MATERIALS

- A. General: Provide through-penetration firestop systems containing the types of fill materials indicated in the Through-Penetration Firestop System Schedule at the end of Part 3 by referencing the types of materials described in this Article. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.
- B. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- C. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
- D. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- E. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.
- F. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- G. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- H. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- I. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives.
- J. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- K. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.
 - 2. Grade for Horizontal Surfaces: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces.
 - 3. Grade for Vertical Surfaces: Nonsag formulation for openings in vertical and other surfaces.

2.4 MIXING

A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

- A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for firestop systems by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted. Include the following information on labels:
 - 1. The words "Warning Through-Penetration Firestop System Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Through-penetration firestop system designation of applicable testing and inspecting agency.
 - 4. Date of installation.
 - 5. Through-penetration firestop system manufacturer's name.
 - 6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified, independent inspecting agency to inspect throughpenetration firestops. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.
- B. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.
- C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

3.6 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that throughpenetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

END OF SECTION 07841

SECTION 07920 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes joint sealants for the following applications, including those specified by reference to this Section:
 - 1. Exterior joints in the following vertical surfaces and horizontal nontraffic surfaces:
 - a. Construction joints in cast-in-place concrete.
 - b. Perimeter joints between materials listed above and frames of doors and windows.
 - c. Control and expansion joints in ceilings and other overhead surfaces.
 - d. Other joints as indicated.
 - 2. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints of exterior openings where indicated.
 - c. Tile control and expansion joints.
 - d. Vertical joints on exposed surfaces of walls and partitions.
 - e. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
 - f. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - g. Other joints as indicated.
 - 3. Interior joints in the following horizontal traffic surfaces:
 - a. Isolation joints in cast-in-place concrete slabs.
 - b. Control and expansion joints in stone flooring.
 - c. Control and expansion joints in tile flooring.
 - d. Other joints as indicated.
- B. Related Sections include the following:
 - 1. Division 7 Section "Fire-Resistive Joint Systems" for sealing joints in fire-resistance-rated construction.
 - 2. Division 8 Section "Glazing" for glazing sealants.
 - 3. Division 9 Section "Gypsum Board Assemblies" for sealing perimeter joints of gypsum board partitions to reduce sound transmission.
 - 4. Division 9 Section "Ceramic Tile" for sealing tile joints.
 - 5. Division 9 Section "Acoustical Panel Ceilings" for sealing edge moldings at perimeters of acoustical ceilings.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.
- D. SWRI Validation Certificate: For each elastomeric sealant specified to be validated by SWRI's Sealant Validation Program.
- E. Qualification Data: For Installer and testing agency.
- F. Preconstruction Field Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing specified in "Quality Assurance" Article.
- G. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- H. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.
- I. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period preceding the commencement of the Work.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
 - 2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.

- 3. Test elastomeric joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.
- 4. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.

1.6 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer[or are below 40 deg F (5 deg C)].
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
 - 1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
 - 2. Disintegration of joint substrates from natural causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

2.2 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Provide interior sealants and sealant primers that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.
- C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquidapplied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Suitability for Immersion in Liquids. Where elastomeric sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247 and qualify for the length of exposure indicated by reference to ASTM C 920 for Class 1 or 2. Liquid used for testing sealants is deionized water, unless otherwise indicated.
- D. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- E. Single-Component Nonsag Urethane Sealant :
 - 1. Available Products:
 - a. Sika Corporation, Inc.; Sikaflex 1a.
 - b. Sonneborn, Division of ChemRex Inc.; Ultra.
 - c. Sonneborn, Division of ChemRex Inc.; NP 1.
 - d. Tremco; Vulkem 116.
 - 2. Type and Grade: S (single component) and NS (nonsag).
 - 3. Class: 25.
 - 4. Uses Related to Exposure: T (traffic) and NT (nontraffic).
 - 5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
 - a. Use O Joint Substrates: Color anodic aluminum [aluminum coated with a highperformance coating] [galvanized steel] [brick] [granite] [marble] [ceramic tile] [wood] [and] <Insert other Use O substrates>.

2.4 ACOUSTICAL JOINT SEALANTS

A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following:

- 1. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
- 2. Available Products:
 - a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
 - b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

2.5 PREFORMED TAPE SEALANTS

- A. Back-Bedding Mastic Tape Sealant: Preformed, butyl-based elastomeric tape sealant with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 - 1. AAMA 804.3 tape, where indicated.
 - 2. AAMA 806.3 tape, for applications in which tape is subject to continuous pressure.
 - 3. AAMA 807.3 tape, for applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Tape Sealant: Closed-cell, PVC foam tape sealant; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
 - 1. Type 1, for applications in which tape acts as the primary sealant.
 - 2. Type 2, for applications in which tape is used in combination with a full bead of liquid sealant.

2.6 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), O (open-cell material), B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
- C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F (minus 32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
- D. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- F. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- G. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
 - 4. Provide flush joint configuration where indicated per Figure 5B in ASTM C 1193.
 - 5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 5C in ASTM C 1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.
- H. Installation of Preformed Tapes: Install according to manufacturer's written instructions.
- I. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, producing seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant

requires acceleration to produce seal, apply heat to sealant in compliance with sealant manufacturer's written instructions.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior vertical and horizontal nontraffic construction joints in cast-in-place concrete.
 - 1. Joint Sealant: Multicomponent nonsag immersible urethane sealant.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
- B. Joint-Sealant Application: Exterior perimeter joints between exterior building finishes and frames of doors, windows and louvers.
 - 1. Joint Sealant: Single-component nonsag urethane sealant:
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
- C. Joint-Sealant Application: Vertical control and expansion joints on exposed interior surfaces of exterior walls.
 - 1. Joint Sealant: Single-component nonsag urethane sealant.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
- D. Joint-Sealant Application : Interior perimeter joints of exterior openings.
 - 1. Joint Sealant: Single-component nonsag urethane sealant.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
- E. Joint-Sealant Application: Interior ceramic tile expansion, control, contraction, and isolation joints in horizontal traffic surfaces.
 - 1. Joint Sealant: Multicomponent pourable urethane sealant or Single-component pourable urethane sealant.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
- F. Joint-Sealant Application: Interior joints between plumbing fixtures and adjoining walls, floors, and counters.

- 1. Joint Sealant: Single-component mildew-resistant neutral acid-curing silicone sealant.
- 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
- G. Joint-Sealant Application: Perimeter joints between interior wall surfaces and frames of interior doors and windows.
 - 1. Joint Sealant: Single-component nonsag urethane sealant>.
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
- H. Joint-Sealant Application JS-[#]: Interior control, expansion, and isolation joints in horizontal traffic surfaces of [dimension stone] [brick] flooring [and] <Insert other interior joints in horizontal traffic surfaces>.
 - 1. Joint Sealant: Multicomponent nonsag urethane sealant
 - 2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION 07920

SECTION 081433 - STILE AND RAIL WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

- 1. Exterior stile and rail wood doors.
- 2. Interior stile and rail wood doors.
- 3. Priming stile and rail wood doors.
- 4. Fitting stile and rail wood doors to frames and machining for hardware.
- 5. Prehanging doors in frames.

B. Related Sections:

- 1. Division 06 Section "Interior Architectural Woodwork" for requirements for veneers from the same flitches for both architectural woodwork and stile and rail wood doors.
- 2. Division 09 Section "Exterior Painting Interior Painting" for field finishing stile and rail doors.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Include details of construction and glazing.
 - 2. Include factory finishing specifications.
- B. Shop Drawings: For stile and rail wood doors. Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data, including those for stiles, rails, panels, and moldings (sticking); and other pertinent data, including the following:
 - 1. Dimensions of doors for factory fitting.
 - 2. Locations and dimensions of mortises and holes for hardware.
 - 3. Requirements for veneer matching.
 - 4. Doors to be factory finished, and finish requirements.
 - 5. Fire ratings for fire-rated doors.
- C. Samples for Initial Selection: For factory-finished doors.
- D. Product Certificates: For each type of door, from manufacturer.
- E. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSCaccredited certification body.
- B. Source Limitations: Obtain stile and rail wood doors from single manufacturer.
- C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10B.
- D. Safety Glass: Provide products complying with testing requirements in 16 CFR 1201, for Category II materials, unless those of Category I are expressly indicated and permitted.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's written instructions and requirements of quality standard referenced in Part 2.
- B. Package doors individually in opaque plastic bags or cardboard cartons.
- C. Mark each door on top and bottom edge with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship, or have warped (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
 - 1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 2. Warranty shall be in effect during the following period of time from date of Substantial Completion:
 - a. Exterior Doors: Five years.
 - b. Interior Doors: Life of installation.
 - c. Insulating Glass Vision Panels: Five years.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Use only materials that comply with referenced standards and other requirements specified.

- 1. Assemble exterior doors and sidelites, including components, with wet-use adhesives complying with ASTM D 5572 for finger joints and with ASTM D 5751 for joints other than finger joints.
- 2. Assemble interior doors, frames, and sidelites, including components, with either dry-use or wetuse adhesives complying with ASTM D 5572 for finger joints and with ASTM D 5751 for joints other than finger joints.
- B. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea-formaldehyde resins.
- C. Panel Products: Any of the following:
 - 1. Particleboard made from wood particles, with binder containing no urea-formaldehyde resin, complying with ANSI A208.1, Grade M-2.
 - 2. Particleboard made from straw, complying with ANSI A208.1, Grade M-2, except for density.
 - 3. Medium-density fiberboard made from wood fiber, with binder containing no urea-formaldehyde resin, complying with ANSI A208.2, Grade 130.
 - 4. Hardboard, complying with AHA A135.4.
 - 5. Veneer core plywood, made with adhesive containing no urea-formaldehyde resin.
- D. Exterior Stile and Rail Wood Doors: Custom exterior doors complying with AWI's "Architectural Woodwork Quality Standards," and with other requirements specified.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Algoma Hardwoods, Inc.
 - b. Artistic Doors and Windows, Inc.
 - c. Eggers Industries.
 - d. Pinecrest, Inc.
 - 2. Panel Designs: Indicated by Drawings. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
 - 3. Grade: Custom.
 - 4. Finish: Opaque.
 - 5. Door Construction for Opaque Finish:
 - a. Stile and Rail Construction: Douglas fir or western hemlock, quarter sawed/sliced (vertical grain); may be edge glued .
 - b. Raised-Panel Construction: Douglas fir or western hemlock, quarter sawed/sliced (vertical grain); edge glued for width.
 - 6. Stile and Rail Widths: As indicated.
 - a. Stiles, Top and Intermediate Rails: As required to match existing door construction.
 - b. Bottom Rails: As required to match existing door construction.
 - 7. Raised-Panel Thickness: As required to match existing door construction.
 - 8. Molding Profile (Sticking): As required to match existing door construction, profiles and details.
 - 9. Glass: Uncoated, clear, fully tempered float glass, 5.0 mm thick historic glazing, complying with Division 08 Section "Glazing."
 - 10. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.

2.2 INTERIOR STILE AND RAIL WOOD DOORS

- A. Interior Stile and Rail Wood Doors: Stock interior doors complying with WDMA I.S.6, "Industry Standard for Wood Stile and Rail Doors," and with other requirements specified.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Belentry Doors LLC.
 - b. International Door and Latch.
 - c. Jeld-Wen, Inc.
 - d. Karona, Inc.
 - e. McPhillips Manufacturing Company.
 - f. QSM Doors, Inc.
 - g. Simpson Door Company.
 - 2. Finish and Grade: Opaque and Standard.
 - 3. Wood Species: Idaho white, lodgepole, ponderosa, or sugar pine.
 - 4. Stile and Rail Construction: Edge-glued solid lumber.
 - 5. Raised-Panel Construction: Edge-glued solid lumber.
 - 6. Flat-Panel Construction: Veneered panel product.
 - 7. Raised-Panel Thickness: As required to match existing door construction, profiles and details.
 - 8. Flat-Panel Thickness: As required to match existing door construction, profiles and details.
 - 9. Molding Profile (Sticking): As required to match existing door construction, profiles and details.
 - 10. Glass: Uncoated, clear, fully tempered float glass, 5.0 mm thick historic glazing, complying with Division 08 Section "Glazing."
 - 11. Mark, label, or otherwise identify stile and rail wood doors as complying with WDMA I.S.6 and grade specified. Include panel design number if applicable.
- B. Interior Stile and Rail Wood Doors: Custom interior doors complying with AWI's "Architectural Woodwork Quality Standards," and with other requirements specified.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Algoma Hardwoods, Inc.
 - b. Artistic Doors and Windows, Inc.
 - c. Eggers Industries.
 - d. Pinecrest, Inc.
 - 2. Panel Designs: Indicated by Drawings. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
 - 3. Grade: Custom.
 - 4. Finish: Opaque.
 - 5. Wood Species and Cut for Transparent Finish: Idaho white, lodgepole, ponderosa, or sugar pine, plain sawed/sliced.
 - 6. Door Construction for Opaque Finish:
 - a. Stile and Rail Construction: Clear softwood; may be edge glued for width.
 - b. Raised-Panel Construction: Clear softwood lumber; edge glued for width.
 - c. Flat-Panel Construction: Veneered, wood-based panel product.

- 7. Stile and Rail Widths: As required to match existing door construction, profiles and details.
 - a. Stiles, Top and Intermediate Rails: As required to match existing door construction, profiles and details.
 - b. Bottom Rails: As required to match existing door construction, profiles and details.
- 8. Raised-Panel Thickness: As required to match existing door construction, profiles and details.
- 9. Flat-Panel Thickness: As required to match existing door construction, profiles and details.
- 10. Molding Profile (Sticking): As required to match existing door construction, profiles and details.
- 11. Glass: Uncoated, clear, fully tempered float glass, 5.0 mm thick historic glazing, complying with Division 08 Section "Glazing."
- 12. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.
- C. Interior Stile and Rail Wood Doors: Fire-rated (20-minute rating) doors complying with AWI's "Architectural Woodwork Quality Standards," and with other requirements specified.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Algoma Hardwoods, Inc.
 - b. Eggers Industries.
 - c. Marshfield DoorSystems, Inc.
 - d. Pinecrest, Inc.
 - 2. Panel Designs: Indicated by Drawings. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
 - 3. Grade: Custom.
 - 4. Finish: Opaque.
 - 5. Wood Species and Cut for Transparent Finish: Idaho white, lodgepole, ponderosa, or sugar pine, plain sawed/sliced.
 - 6. Door Construction for Opaque Finish: As required to match existing door construction, profiles and details.
 - a. Stile and Rail Construction: Clear softwood; may be edge glued for width.
 - b. Raised-Panel Construction: Clear softwood lumber; edge glued for width.
 - c. Flat-Panel Construction: Veneered, wood-based panel product.
 - 7. Stile and Rail Widths: As indicated.
 - a. Stiles, Top and Intermediate Rails: As required to match existing door construction, profiles and details.
 - b. Bottom Rails: As required to match existing door construction, profiles and details.
 - 8. Molding Profile (Sticking): As required to match existing door construction, profiles and details.
 - 9. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.

2.3 STILE AND RAIL WOOD DOOR FABRICATION

A. Fabricate stile and rail wood doors in sizes indicated for field fitting.

- B. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels unless otherwise indicated:
 - 1. Clearances: Provide 1/8 inch (3 mm) at heads, jambs, and between pairs of doors. Provide 1/2 inch (13 mm) from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide not more than 3/8 inch (10 mm) from bottom of door to top of threshold.
 - a. Comply with NFPA 80 for fire-rated doors.
 - 2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
 - 3. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) on lock edge; trim stiles and rails only to extent permitted by labeling agency.
- C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W Series standards, and hardware templates.
 - 1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
- D. Glazed Openings: Trim openings indicated for glazing with solid wood moldings, with one side removable. Miter wood moldings at corner joints.
- E. Transom and Side Panels: Fabricate panels to match adjoining doors in materials, finish, and quality of construction.
- F. Exterior Doors: Factory treat exterior doors after fabrication with water-repellent preservative to comply with WDMA I.S.4. Flash top of outswinging doors with manufacturer's standard metal flashing.
- G. Prehung Doors: Provide stile and rail doors as prehung units including doors, frames, weather stripping, and hardware.
 - 1. Provide wood door frames that comply with Division 06 Section" Interior Architectural Woodwork."
 - 2. Provide hardware, including weather stripping and thresholds, that complies with Division 08 Section "Door Hardware."

2.4 SHOP PRIMING

A. Doors for Opaque Finish: Shop prime doors with one coat of wood primer specified in Division 09 Section "Exterior Painting and Interior Painting." Seal all four edges, edges of cutouts, and mortises with primer.

2.5 FINISHING

- A. Finish wood doors at factory where indicated in schedules or on Drawings. Wood doors that are not indicated to be factory finished may be field finished.
- B. For doors indicated to be factory finished, comply with AWI's "Architectural Woodwork Quality Standards," and with other requirements specified.
- 1. Finish faces and all four edges of doors, including mortises and cutouts. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
- C. Opaque Finish:
 - 1. Grade: Custom.
 - 2. Finish: AWI conversion varnish or AWI catalyzed polyurethane system.
 - 3. Color: Match Architect's sample.
 - 4. Sheen: Semigloss.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and substrates, with Installer present, for suitable conditions where wood stile and rail doors and fire-rated wood door frames will be installed.
 - 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install fire-rated wood door frames level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
 - 1. Countersink fasteners, fill surface flush, and sand smooth.
- B. Hardware: For installation, see Division 08 Section "Door Hardware."
- C. Install wood doors to comply with manufacturer's written instructions, AWI's "Architectural Woodwork Quality Standards," and other requirements specified.
 1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- D. Field-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.
 - 1. Clearances: Provide 1/8 inch (3 mm) at heads, jambs, and between pairs of doors. Provide 3/8 inch (10 mm) from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4 inch (6 mm) from bottom of door to top of threshold.
 - a. Comply with NFPA 80 for fire-rated doors.
 - 2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
 - 3. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) on lock edge; trim stiles and rails only to extent permitted by labeling agency.
- E. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

F. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081433

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

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

1.2 SUMMARY

- A. This Section includes access doors for installation in the following types of construction:
 - a. Gypsum drywall
- B. Provide fire-rated access doors where indicated or required.
- C. Roof hatches are specified in Division 7.
- D. Provide key locks on access doors, unless otherwise indicated.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data in form of manufacturer's technical data and installation instructions for each type of access door assembly, including setting drawings, templates, instructions, and directions for installation of anchorage, devices.
 - a. Include complete schedule, including types, general locations, sizes, wall and ceiling construction details, finishes, latching or locking provisions, and other data pertinent to installation.
- C. Shop drawings showing fabrication and installation of customized access doors and frames, including details of each frame type, elevations of door design types, anchorage and accessory items.

1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility: Obtain access doors for entire project from one source from a single manufacturer.
- B. Fire-Resistance Ratings: Wherever a fire-resistance classification is indicated, provide access door assembly with panel door, frame, hinge, and latch from manufacturer listed in Underwriters Laboratories, Inc.,'s "Build-ing Materials Directory" for rating shown.
 - a. Provide UL label on each fire-rated access door.
- C. Size Variations: Obtain Architect's acceptance of manufacturer's standard size units, which may vary slightly from sizes indicated.
- D. Coordination: Furnish inserts and anchoring devices that must be built into other work for installation of access doors. Coordinate delivery with other work to avoid delay.

1.5 PROJECT CONDITIONS

A. Verification: Obtain specific locations and sizes for required access doors from trades requiring access to concealed equipment, and indicate on submittal schedule.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering access doors that may be incorporated in the work include, but are not limited to, the following:
 - a. Cesco Products
 - b. J. L. Industries
 - c. Milcor, Inc.

2.2 MATERIALS AND FABRICATION

- A. General: Furnish each access door assembly manufactured as an integral unit, complete with all parts, and ready for installation.
- B. Steel Access Doors and Frames: Fabricate units of continuous welded steel construction unless otherwise indicated. Grind welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of support shown.
 - a. Frames: Fabricate from 16-gage steel.
 - b. Fabricate frame with exposed flange nominal 1-inch wide around perimeter of frame for units installed in the following construction:
 - i. Drywall finish.
- C. Flush Panel Doors: Fabricate from not less than 14-gage sheet steel, with concealed spring hinges or concealed continuous piano hinge set to open 175 degrees. Finish with manufacturer's factory-applied prime paint.
 - a. For fire-rated units, provide manufacturer's standard insulated flush panel/doors, with continuous piano hinge and self-closing mechanism.
- D. Recessed Panel Doors: Fabricate from not less than 18-gage sheet steel with face of panel formed to provide recess below surface of applied finish. Reinforce panel as required to prevent buckling. Finish with manufacturer's factory-applied prime paint.
- E. Latching Devices: Furnish flush, screwdriver-operated cam locks of number required to hold door in flush, smooth plane when closed, for typical unit.
 - a. Where locks are indicated, provide a key operated lock, finished flush with door face.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's instructions for installation of access doors.
- B. Coordinate installation with work of other trades.
- C. Set frames accurately in position and securely attach to supports with face panels plumb or level in relation to adjacent finish surfaces.

3.2 ADJUST AND CLEAN

- A. Adjust hardware and panels after installation for proper operation.
- B. Remove and replace panels or frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113

SECTION 08 52 70 - WOOD WINDOWS - REPAIR, REHABILITATION AND REPLICATION

PART 1 GENERAL

- 1.1 **REFERENCES:** The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
 - A. ASTM INTERNATIONAL (ASTM) ASTM C 1184 (2005) Standard Specification for Structural Silicone Sealants
- 1.2 SUMMARY:
- A. This section includes the repair, rehabilation and replacement of existing and new wood windows. All work windows are to be repaired or replaced in accordance with the specifications, to replicate the existing window's dimensions, sashes, profiles and trims.
- B. New Replication Windows: All new windows to be fabricated and installed to replicate the existing historic window systems, to include dimensions, sizes, sashes, muntins, trims and profiles.

1.3 SUBMITTALS

- A. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:
 - 1. SD-02 Shop Drawings: Shop drawings as specified.
 - 2. SD-03 Product Data
 - a. Hardware
 - b. Weatherstripping
 - c. Manufacturer's installation instructions for each type of hardware and weatherstripping.
 - d. Qualifications: Documentation showing qualifications of personnel proposed to perform the window repair and rehabilitation work, and a listing identifying prior installations completed by the Contractor.
 - 3. SD-04 Samples
 - 4. Hardware: Representative sample of each type of hardware with identifying tags.
 - 5. Moldings: A 300 mm 12 inch long piece of each molding type required for each window and casing with specified finish.
 - 6. Weatherstripping: A 300 mm 12 inch long sample of each type of weatherstripping required with fasteners.
- 1.2 QUALIFICATIONS: The Contractor shall provide qualified workers trained and experienced in repairing, restoring, replicating, and replacing windows in historic buildings and shall submit documentation of 5 consecutive years of work of this type. A list of installations made shall also be provided identifying when, where and for whom the installations were made.
- 1.3 STORAGE: Materials shall be stored out of contact with the ground and under weathertight covering.
- 1.4 SHOP DRAWINGS: The Contractor shall submit shop drawings indicating elevations of units, fullsize sections, fastenings, methods of installation and anchorage, method of glazing, locations of operating hardware, mullion details, method and material for weatherstripping, insect screen, details, connections with other work and window schedules showing location of each window unit.

PART 2 PRODUCTS

2.1. MATERIALS: Existing materials shall be reused whenever possible in the repair and rehabilitation of historic wood windows. This includes all wood elements, hardware and glazing that are determined to

be of historic significance. Replacement of window elements with new material shall be done only when originals are so deteriorated as to prohibit their useful function.

- 2.2. WOOD: Wood used to replace deteriorated window members shall be of the same species and grade as the original, unless otherwise noted. Finger-jointed stock may be used for interior casing and trim only where scheduled to be painted.
- 2.3. GLASS AND GLAZING: Existing intact original glass shall be reused. Any removed lights shall be reused in their original frames and positions. New glass and glazing materials shall conform to Section 08 81 00 GLAZING.
- 2.4. HARDWARE: Existing original hardware shall be reused, when it is salvageable. Replacement hardware shall match original in design, material, and finish.
- 2.5. FASTENERS: Fasteners shall be stainless steel, galvanized, or non-ferrous metal.
- 2.6. GLAZING COMPOUND: Glazing compound for single pane glass shall be oil-based, non-staining and non-bleeding. Existing insulated glass units shall be reglazed with silicone sealant complying with ASTM C 1184 and shall be compatible with the unit seal on the glass unit.
- 2.7. GLAZING POINTS: Glazing points shall be stainless steel or galvanized steel.

2.8. EPOXY CONSOLIDANTS

- A) Liquid Consolidant: Liquid wood consolidant shall consist of a two-part, low-viscosity liquid epoxy that meets the criteria of Table A.
- B) Epoxy Paste: Epoxy paste shall consist of a two-part, hixotropic paste that meets the criteria of Table A.

	LIQUID CONSOLIDANT	EPOXY PASTE
Properties	Low-Viscosity Liquid	No-Slump, Thixotropic Paste
Toxicity	Low	Very Low
Toxicity Cured	Non-Toxic	Non-Toxic
Ratios	1:1 by Volume	1:1 by Volume
Pot Life @ Room Temp.	30 min. minimum	50 min. minimum
Hardening @ Room Temp.	1 hr. or longer	1 hr. or longer
Hardening @ 60 deg. C	16 min. or less	18 min. or less
Viscosity Poises @ 22 deg. C	4.7 max.	Thixotropic paste
Solids	95% min.	98% min.

TABLE A

Tensile Strength	26 MPa 4000 psi	16.2 MPa 2500 psi
Elongation (%)	50	4

PART 3 EXECUTION

- 3.1. GENERAL: The Contractor shall repair wood windows as indicated, and shall return them to proper operation and sound condition.
- 3.2. EVALUATION: A complete evaluation survey of the existing conditions of each wood window shall be made to determine the extent of repairs necessary. The evaluation survey may be in the form of a schedule and shall note at a minimum:
 - A) window location
 - B) condition of the paint
 - C) condition of the frame and sill
 - D) condition of the interior and exterior trim
 - E) condition of the sash (including rails, stiles, and muntins)
 - F) glazing problems
 - G) window hardware and operating system
 - H) the overall condition of the window

3.3. REPAIRS

- A) Example Window: An existing window of each type to serve as an example of the quality of repairs to be provided shall be prepared for inspection and approval by the architect or City's field inspector.
- B) Sash Removal: The interior stops shall be removed first in a method so as to not scar the wood. Connecting hardware and operating mechanisms shall then be detached and the sash shall be removed from the frame. Removed sashes and frames shall be identified as to location to assure reinstallation in their original positions. Windows with counter-weight systems shall have the sash cords detached from the sides of the sash and their ends pinned with a nail or tied in a knot to prevent them from falling into the weight pocket; the lower sash can then be removed. The parting bead shall be removed so as to not scar the wood. Plastic covering or plywood shall be installed to cover the window opening during repairs.
- C) Paint Removal: Areas on frame, sill, sash and muntins where paint or varnish has peeled, alligatored, blistered or crazed shall have paint removed to bare wood or first sound paint layer, using non-destructive means such as a chemical stripper or heat gun. If chemical strippers are used, wood shall be neutralized after stripping to a litmus pH of 5 to 8.5. Wood shall be allowed to dry to a moisture content of 8 to 12 percent before repainting. If heat methods are used for paint removal, glass shall be protected from sudden temperature change to avoid breakage.
- D) Wood Repair: Badly decayed areas (with more than 30 percent wood decayed) shall be removed from wood sash, sill, frame, and trim assemblies. Moderately decayed areas (less than 30 percent decayed), weathered, or gouged wood shall be patched with approved patching compounds, and shall be sanded smooth. Intact sash rails and stiles that are loose shall be repaired with new dowels to make joints tight.
- E) Epoxy Wood Repair: Epoxy wood repair materials shall be applied in accordance with manufacturer's written instructions. Health and safety instructions shall be followed in accordance

with the manufacturer's instructions. The source or cause of wood decay shall be identified and corrected prior to application of patching materials. Wet wood shall be completely dried to a moisture content of 8 to 12 percent to its full depth before patching. Wood that is to be patched shall be clean of dust, grease, and loose paint. Clean mixing equipment shall be used to avoid contamination. Mix and proportions shall be as directed by the manufacturer. Batches shall be only large enough to complete the specific job intended. Patching materials shall be completely cured before painting or reinstallation of patched pieces.

- 1) Epoxy Liquid Wood Consolidant: Epoxy liquid wood consolidant shall be used to penetrate and impregnate deteriorated wood sections to reinforce wood fibers that have become softened or absorbent.
- 2) Epoxy Paste: Epoxy paste shall be used to fill areas where portions of wood are missing such as holes, cracks, gaps, gouges, and other voids. Areas to receive epoxy paste patching material shall be primed with compatible epoxy liquid wood consolidant or a primer recommended by the manufacturer.
- F) Wood Replacement: Pieces decayed beyond repair shall be replaced with new pieces that match originals in all respects. Joinery shall match that of existing. Muntins shall have coped mortise and tenon joints. Molded members shall have mitered or coped joints.
- G) Hardware: Existing hardware which is in good condition shall be reused unless otherwise noted. Reused existing hardware shall be stripped of paint down to bare metal. New hardware shall be installed where original is missing, damaged, or unsuitable for new operation, per manufacturer's directions to provide a secure and smoothly operating window assembly.
- H) Glazing: Lights to be reused shall be reinstalled in their original frames and positions. Rabbeted integral glazing recesses shall be brushed with boiled linseed oil prior to the application of bed glazing compound. Broken glass shall be replaced as specified in Section 08 81 00 GLAZING.
- I) Operating System: Windows with counter-weight systems shall be repaired to original operating function. Original sash weights (and sash chains, if applicable) shall be reused wherever possible. Missing weights and sash cords or chains shall be replaced. Missing or deteriorated sash cords shall be replaced with new cotton-polypropylene cord rated for sash weight. When new weights are required, they shall match the originals in weight. Replacement weights shall be cast iron or square milled steel bar stock.
- J) Weatherstripping and Moldings
 - Weatherstripping shall be installed on all operable windows. Weatherstripping shall consist of brass, compression or interlocking weather strips designed for permanent sealing under bumper or wiper action. Weatherstripping shall be provided at the perimeter of each sash including meeting rails and shall be installed per manufacturer's instructions. Weatherstripping shall be completely concealed when sash is closed.
 - 2) Moldings shall be installed per manufacturer's instructions.

3.4. REPLICATION FOR NEW WINDOWS / REPLACMENT WINDOWS:

- A) Windows determined to need to be removed and replaced due to deterioration shall be fabricated and installed to replicate historic windows as described in this specification.
- B) New window locations as shown on the contract documents shall be fabricated and installed to replicate the historic windows in the project as described in this specification. Details shall replicate existing windows to include frame construction, sash and muntin profile, and all associated trim profiles. Contractor and fabricator to document existing profiles based on existing historic windows, and include in shop drawing submittals for confirmation by the architect.

- 3.5. PAINTING PREPARATION: Areas where paint was removed or where existing paint shows crazing, wrinkling, and intercoat peeling shall be scraped, sanded, and shall have edges feathered. Paint shall be removed to bare wood or first sound paint layer. All parts shall be cleaned by brush using bleach and/or trisodium phosphate (TSP) solution, and let dry. Existing finish shall be deglossed. Open joints and cracks shall be filled with epoxy repair materials. Perimeter of fixed sash shall be caulked.
- 3.6. PAINTING: Wood elements shall be primed and painted in accordance with Section 09 90 00 PAINTS AND COATINGS.
- 3.7. REASSEMBLY: After repairs are completed, the window shall be reassembled with all parts tight, true and functioning properly. Wood surfaces shall be free of blemishes.
- 3.8. ADJUSTMENTS: Final adjustment for proper operation of ventilating unit shall be made after reassembly. Adjustments shall be made to operating sash or ventilators to assure smooth operation and weathertight performance when locked closed.
- 3.9. CLEANING: Windows shall be cleaned on both exterior and interior.

End of Section 08 52 72

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Commercial door hardware for the following:
 - a. Swinging doors.
 - b. Non-fire-rated sliding doors.
 - c. Non-fire-rated folding doors.
 - d. Other doors to the extent indicated.
 - 2. Cylinders for doors specified in other Sections.
 - 3. Electrified door hardware.
- B. Related Sections include the following:
 - 1. Division 08 Section "Flush Wood Doors" for astragals provided as part of fire-rated labeled assemblies.
 - 2. Division 08 Section "Stile and Rail Wood Doors" for astragals provided as part of fire-rated labeled assemblies.
 - 3. Division 08 Section "Access Doors and Frames" for access door hardware, including cylinders.
 - 4. Division 08 Section "All-Glass Entrances and Storefronts" for entrance door hardware, including cylinders.
 - 5. Division 26 Sections for connections to electrical power system and for low-voltage wiring work.
 - 6. Division 28 Section "Access Control" for access control devices installed at door openings and provided as part of a security access system.
 - 7. Division 28 Section "Intrusion Detection" for detection devices installed at door openings and provided as part of an intrusion detection system.
 - 8. Division 28 Section "Fire Detection and Alarm" for connections to building fire alarm system.

1.3 SUBMITTALS

- A. Product Data: Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Details of electrified door hardware, indicating the following:
 - 1. Wiring Diagrams: Power, signal, and control wiring. Include the following:
 - a. System schematic.
 - b. Point-to-point wiring diagram.
 - c. Riser diagram.

- d. Elevation of each door.
- 2. Detail interface between electrified door hardware and fire alarm and access control systems.
- 3. Operation Narrative: Describe the operation of doors controlled by electrified door hardware.
- C. Samples for Verification: For exposed door hardware of each type, in specified finish, full size. Tag with full description for coordination with the door hardware sets. Submit Samples before, or concurrent with, submission of the final door hardware sets.
 - 1. Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.
- D. Product Certificates: For electrified door hardware, signed by product manufacturer.
 - 1. Certify that door hardware approved for use on types and sizes of labeled fire doors complies with listed fire door assemblies.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for locks latches delayed-egress locks and closers.
- F. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.
- G. Warranty: Special warranty specified in this Section.
- H. Other Action Submittals:
 - 1. Door Hardware Sets: Prepared by or under the supervision of Architectural Hardware Consultant, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final door hardware sets with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - a. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
 - b. Content: Include the following information:
 - 1) Identification number, location, hand, fire rating, and material of each door and frame.
 - 2) Type, style, function, size, quantity, and finish of each door hardware item. Include description and function of each lockset and exit device.
 - 3) Complete designations of every item required for each door or opening including name and manufacturer.
 - 4) Fastenings and other pertinent information.
 - 5) Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - 6) Explanation of abbreviations, symbols, and codes contained in schedule.
 - 7) Mounting locations for door hardware.
 - 8) Door and frame sizes and materials.
 - 9) Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.
 - a) Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to exit.

- 10) List of related door devices specified in other Sections for each door and frame.
- c. Submittal Sequence: Submit initial draft of final schedule along with essential Product Data to facilitate the fabrication of other work that is critical in Project construction schedule. Submit the final door hardware sets after Samples, Product Data, coordination with Shop Drawings of other work, delivery schedules, and similar information has been completed and accepted.
- 2. Keying Schedule: Prepared by or under the supervision of Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by lock manufacturer.
 - 1. Installer's responsibilities include supplying and installing door hardware and providing a qualified Architectural Hardware Consultant available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
 - 2. Installer shall have warehousing facilities in Project's vicinity.
 - 3. Scheduling Responsibility: Preparation of door hardware and keying schedules.
 - 4. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.
 - 1. Electrified Door Hardware Consultant Qualifications: A qualified Architectural Hardware Consultant who is experienced in providing consulting services for electrified door hardware installations.
- C. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.
 - 1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.
- D. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
- E. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- F. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." In addition to Owner Contractor, and Architect, conference participants shall also include Installer's Architectural Hardware Consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
 - 1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.

- 2. Preliminary key system schematic diagram.
- 3. Requirements for key control system.
- 4. Address for delivery of keys.
- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to electrified door hardware including, but not limited to, the following:
 - 1. Inspect and discuss electrical roughing-in and other preparatory work performed by other trades.
 - 2. Review sequence of operation for each type of electrified door hardware.
 - 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review required testing, inspecting, and certifying procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification related to the final door hardware sets, and include basic installation instructions, templates, and necessary fasteners with each item or package.
- C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.
- D. Deliver keys to Owner by registered mail or overnight package service.

1.6 COORDINATION

- A. Coordinate layout and installation of recessed pivots and closers with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- B. Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- C. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies fire alarm system and detection devices access control system.
- D. Existing Openings: Where new hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide for proper operation.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of operators and door hardware.

- c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
- 2. Warranty Period: Five years from date of Substantial Completion, except as follows:
 - a. Electromagnetic Locks: Five years from date of Substantial Completion.
 - b. Exit Devices: Five years from date of Substantial Completion.
 - c. Manual Closers: 10 years from date of Substantial Completion.

1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door hardware operation. Provide parts and supplies same as those used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in this Section and door hardware sets indicated in Part 3 "Door Hardware Sets" Article.
 - 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products equivalent in function and comparable in quality to named products.
 - 2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Sets" Article. Products are identified by using door hardware designations, as follows:
 - 1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 "Door Hardware Sets" Article.
 - 2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.
- C. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 HINGES, GENERAL

- A. Quantity: Provide the following, unless otherwise indicated:
 - 1. Two Hinges: For doors with heights up to 60 inches (1524 mm).
 - 2. Three Hinges: For doors with heights 61 to 90 inches (1549 to 2286 mm).
 - 3. Four Hinges: For doors with heights 91 to 120 inches (2311 to 3048 mm).
 - 4. For doors with heights more than 120 inches (3048 mm), provide 4 hinges, plus 1 hinge for every 30 inches (750 mm) of door height greater than 120 inches (3048 mm).
- B. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
- C. Hinge Weight: Unless otherwise indicated, provide the following:
 - 1. Entrance Doors: Heavy-weight hinges.
 - 2. Doors with Closers: Antifriction-bearing hinges.
 - 3. Interior Doors: Standard-weight hinges.
- D. Hinge Base Metal: Unless otherwise indicated, provide the following:
 - 1. Exterior Hinges: Stainless steel, with stainless-steel pin.
 - 2. Interior Hinges: Brass, with stainless-steel pin body and brass protruding heads.
 - 3. Hinges for Fire-Rated Assemblies: Stainless steel, with stainless-steel pin.
- E. Hinge Options: Where indicated in door hardware sets or on Drawings:
 - 1. Historic Doors: Provide Decorator Tips to match existing hinges: Ball.
 - 2. New Doors: Provide Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed;
- F. Fasteners: Comply with the following:
 - 1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
 - 2. Wood Screws: For wood doors and frames.
 - 3. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
 - 4. Screws: Phillips flat-head; wood screws for wood doors and frames. Finish screw heads to match surface of hinges.

2.3 HINGES

- A. Butts and Hinges: BHMA A156.1.
- B. Template Hinge Dimensions: BHMA A156.7.
- C. Available Manufacturers:
 - 1. Baldwin Hardware Corporation (BH).
 - 2. Bommer Industries, Inc. (BI).
 - 3. Hager Companies (HAG).
 - 4. McKinney Products Company; an ASSA ABLOY Group company (MCK).
 - 5. Stanley Commercial Hardware; Div. of The Stanley Works (STH).

2.4 SPRING HINGES

A. Self-Closing Hinges: BHMA A156.17.

- B. Available Manufacturers:
 - 1. Baldwin Hardware Corporation (BH).
 - 2. Bommer Industries, Inc. (BI).
 - 3. Hager Companies (HAG).
 - 4. McKinney Products Company; an ASSA ABLOY Group company (MCK).
 - 5. Stanley Commercial Hardware; Div. of The Stanley Works (STH).

2.5 PIVOTS AND PIVOT HINGES

- A. Pivots: BHMA A156.4.
- B. Self-Closing Pivot Hinges: BHMA A156.17.
- C. Available Manufacturers:
 - 1. Bommer Industries, Inc. (BI).
 - 2. DORMA Architectural Hardware; Member of The DORMA Group North America (DAH).
 - 3. Glynn-Johnson; an Ingersoll-Rand Company (GJ).
 - 4. Hager Companies (HAG).
 - 5. IVES Hardware; an Ingersoll-Rand Company (IVS).
 - 6. McKinney Products Company; an ASSA ABLOY Group company (MCK).
 - 7. Rixson Specialty Door Controls; an ASSA ABLOY Group company (RIX).
 - 8. Stanley Commercial Hardware; Div. of The Stanley Works (STH).

2.6 CONTINUOUS HINGES

- A. Standard: BHMA A156.26, Grade 1-150.
 - 1. Listed under Category N in BHMA's "Certified Product Directory."
- B. General: Minimum 0.120-inch- (3.0-mm-) thick, hinge leaves with minimum overall width of 4 inches (102 mm); fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.
 - 1. Fire Pins: Steel pins to hold labeled fire doors in place if required by tested listing.
- C. Continuous, Barrel-Type Hinges: Hinge with knuckles formed around a pin that extends entire length of hinge.
 - 1. Base Metal for Exterior Hinges: Stainless steel.
 - 2. Base Metal for Interior Hinges: Stainless steel.
 - 3. Base Metal for Hinges for Fire-Rated Assemblies: Stainless steel.
 - 4. Available Manufacturers:
 - a. Hager Companies (HAG).
 - b. Markar Architectural Products, Inc.; a Subsidiary of Adams Rite Manufacturing Co. (MP).
 - c. McKinney Products Company; an ASSA ABLOY Group company (MCK).
 - d. Stanley Commercial Hardware; Div. of The Stanley Works (STH).
 - e. Zero International (ZRO).

2.7 LOCKS AND LATCHES, GENERAL

- A. Accessibility Requirements: Where indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."
 - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22 N).
- B. Latches and Locks for Means of Egress Doors: Comply with NFPA 101. Latches shall not require more than 15 lbf (67 N) to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.
- C. Electrified Locking Devices: BHMA A156.25.
- D. Lock Trim:
 - 1. Levers: Cast.
 - 2. Knobs: Cast.
 - 3. Escutcheons (Roses): Cast.
 - 4. Dummy Trim: Match knob or lever lock trim and escutcheons.
 - 5. Lockset Designs: Provide design indicated on Drawings or, if sets are provided by another manufacturer, provide designs that match those designated.
- E. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
 - 1. Bored Locks: Minimum 1/2-inch (13-mm) latchbolt throw.
 - 2. Mortise Locks: Minimum 3/4-inch (19-mm) latchbolt throw.
 - 3. Deadbolts: Minimum 1-inch (25-mm) bolt throw.
- F. Rabbeted Meeting Doors: Provide special rabbeted front and strike on locksets for rabbeted meeting stiles.
- G. Backset: 2-3/4 inches (70 mm), unless otherwise indicated.
- H. Strikes: Manufacturer's standard strike with strike box for each latchbolt or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, and as follows:
 - 1. Strikes for Bored Locks and Latches: BHMA A156.2.
 - 2. Strikes for Mortise Locks and Latches: BHMA A156.13.
 - 3. Strikes for Interconnected Locks and Latches: BHMA A156.12.
 - 4. Strikes for Auxiliary Deadlocks: BHMA A156.5.
 - 5. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 - 6. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 - 7. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.

2.8 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: Function numbers and descriptions indicated in door hardware sets comply with the following:
 - 1. Bored Locks: BHMA A156.2.
 - 2. Mortise Locks: BHMA A156.13.

- 3. Interconnected Locks: BHMA A156.12.
- B. Bored Locks: BHMA A156.2, Grade 1; Series 4000.
 - 1. Available Manufacturers:
 - a. Arrow USA; an ASSA ABLOY Group company (ARW).
 - b. Best Access Systems; Div. of The Stanley Works (BAS).
 - c. Cal-Royal Products, Inc. (CRP).
 - d. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).
 - e. Falcon Lock; an Ingersoll-Rand Company (FAL).
 - f. Marks USA (MKS).
 - g. Medeco Security Locks, Inc.; an ASSA ABLOY Group company (MED).
 - h. PDQ Manufacturing (PDQ).
 - i. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
 - j. Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).
 - k. Security Door Controls (SDC).
 - 1. Weiser Lock; a Masco Company (WEI).
 - m. Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL).
- C. Mortise Locks: Stamped steel case with steel or brass parts; BHMA A156.13, Grade 1; Series 1000.
 - 1. Available Manufacturers:
 - a. Accurate Lock & Hardware Co. (ALH).
 - b. Adams Rite Manufacturing Co. (ARM).
 - c. Arrow USA; an ASSA ABLOY Group company (ARW).
 - d. Best Access Systems; Div. of The Stanley Works (BAS).
 - e. Cal-Royal Products, Inc. (CRP).
 - f. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).
 - g. Folger Adam Security Inc.; an ASSA ABLOY Group company (FAS).
 - h. Falcon Lock; an Ingersoll-Rand Company (FAL).
 - i. Marks USA (MKS).
 - j. PDQ Manufacturing (PDQ).
 - k. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
 - 1. Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).
 - m. Security Door Controls (SDC).
 - n. Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL).
- D. Interconnected Locks: BHMA A156.12, Grade 1; Series 5000.
 - 1. Available Manufacturers:
 - a. Arrow USA; an ASSA ABLOY Group company (ARW).
 - b. Cal-Royal Products, Inc. (CRP).
 - c. Falcon Lock; an Ingersoll-Rand Company (FAL).
 - d. Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).

2.9 AUXILIARY LOCKS AND LATCHES

- A. Auxiliary Locks: BHMA A156.5, Grade 1.
 - 1. Available Manufacturers:

- a. ABLOY Security, Inc.; an ASSA ABLOY Group company (ABL).
- b. Accurate Lock & Hardware Co. (ALH).
- c. Adams Rite Manufacturing Co. (ARM).
- d. Arrow USA; an ASSA ABLOY Group company (ARW).
- e. Best Access Systems; Div. of The Stanley Works (BAS).
- f. Cal-Royal Products, Inc. (CRP).
- g. Falcon Lock; an Ingersoll-Rand Company (FAL).
- h. Marks USA (MKS).
- i. Medeco Security Locks, Inc.; an ASSA ABLOY Group company (MED).
- j. PDQ Manufacturing (PDQ).
- k. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
- 1. Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).
- m. Weiser Lock; a Masco Company (WEI).
- n. Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL).

2.10 ELECTROMAGNETIC LOCKS

- A. General: BHMA A156.23; electrically powered, of strength and configuration indicated; with electromagnet attached to frame and armature plate attached to door. Listed under Category E in BHMA's "Certified Product Directory."
 - 1. Type: Full exterior or full interior, as required by application indicated.
 - 2. Strength Ranking: 1000 lbf (4448 N).
 - 3. Inductive Kickback Peak Voltage: Not more than 0 V.
 - 4. Residual Magnetism: Not more than 0 lbf (0 N) to separate door from magnet.
- B. Available Manufacturers:
 - 1. Door Controls International (DCI).
 - 2. Doorguard Systems, Inc. (DGS).
 - 3. Dortronics Systems, Inc. (DS).
 - 4. DynaLock Corp. (DLC).
 - 5. Locknetics; an Ingersoll-Rand Company (LSE).
 - 6. Rutherford Controls Int'l. Corp. (RCI).
 - 7. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
 - 8. Securitron Magnalock Corporation; an ASSA ABLOY Group company (SMC).
 - 9. Security Door Controls (SDC).

2.11 EXIT LOCKS AND EXIT ALARMS

- A. Exit Locks: BHMA A156.29, Grade 1, surface mounted, battery powered, housed in metal case; with red-and-white lettering reading "EMERGENCY EXIT PUSH TO OPEN--ALARM WILL SOUND." Include the following features:
 - 1. Low-battery alert.
 - 2. Outside key control.
 - 3. Audible alarm that sounds when unauthorized use of door occurs.
 - 4. Silent alarm with remote signal capability for connection to remote indicating panel.
- B. Available Manufacturers:
 - 1. Arrow USA; an ASSA ABLOY Group company (ARW).
 - 2. Detex Corporation (DTX).

3. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).

2.12 DOOR BOLTS

- A. Bolt Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
 - 1. Half-Round Surface Bolts: Minimum 7/8-inch (22-mm) throw.
 - 2. Fire-Rated Surface Bolts: Minimum 1-inch (25-mm) throw; listed and labeled for fire-rated doors.
 - 3. Dutch-Door Bolts: Minimum 3/4-inch (19-mm) throw.
 - 4. Mortise Flush Bolts: Minimum 3/4-inch (19-mm) throw.
- B. Dustproof Strikes: BHMA A156.16, Grade 1.
- C. Manual Flush Bolts: BHMA A156.16, Grade 1; designed for mortising into door edge.
 - 1. Available Manufacturers:
 - a. Adams Rite Manufacturing Co. (ARM).
 - b. Burns Manufacturing Incorporated (BM).
 - c. Don-Jo Mfg., Inc. (DJO).
 - d. Door Controls International (DCI).
 - e. Glynn-Johnson; an Ingersoll-Rand Company (GJ).
 - f. Hager Companies (HAG).
 - g. Hiawatha, Inc. (HIA).
 - h. IVES Hardware; an Ingersoll-Rand Company (IVS).
 - i. Stanley Commercial Hardware; Div. of The Stanley Works (STH).
 - j. Trimco (TBM).

2.13 EXIT DEVICES

- A. Exit Devices: BHMA A156.3, Grade 1.
- B. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."
 - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22 N).
- C. Exit Devices for Means of Egress Doors: Comply with NFPA 101. Exit devices shall not require more than 15 lbf (67 N) to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.
- D. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- E. Fire Exit Devices: Devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.
- F. Removable Mullions: BHMA A156.3.

- G. Fire-Exit Removable Mullions: Provide removable mullions for use with fire exit devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252. Mullions shall be used only with exit devices for which they have been tested.
- H. Outside Trim: Lever with cylinder; material and finish to match locksets, unless otherwise indicated.
 - 1. Match design for locksets and latchsets, unless otherwise indicated.
- I. Through Bolts: For exit devices and trim on non-fire-rated wood doors.

2.14 LOCK CYLINDERS

- A. Standard Lock Cylinders: BHMA A156.5, Grade 1.
- B. High-Security Lock Cylinders: BHMA A156.30, Grade 1;.
 - 1. Key Control Level: Category A.
 - 2. Destructive Test Level: Category A.
 - 3. Surreptitious Entry Resistance Level: Category A.
- C. Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:
 - 1. Number of Pins: Six.
 - 2. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
 - 3. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 - 4. Bored-Lock Type: Cylinders with tailpieces to suit locks.
 - a. High-Security Grade: BHMA A156.5, Grade 1A, listed and labeled as complying with pick- and drill-resistant testing requirements in UL 437 (Suffix A).
- D. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
 - 1. Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturers' cylinders.
 - 2. Removable Cores: Core insert, removable by use of a special key; for use only with core manufacturer's cylinder and door hardware.
- E. Construction Keying: Comply with the following:
 - 1. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.
 - a. Replace construction cores with permanent cores as directed by Owner.
 - b. Furnish permanent cores to Owner for installation.
- F. Manufacturer: Same manufacturer as for locks and latches.
- G. Available Manufacturers:
 - 1. ABLOY Security, Inc.; an ASSA ABLOY Group company (ABL).
 - 2. Arrow USA; an ASSA ABLOY Group company (ARW).
 - 3. ASSA, Inc.; an ASSA ABLOY Group company (ASA).

- 4. Best Access Systems; Div. of The Stanley Works (BAS).
- 5. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).
- 6. Falcon Lock; an Ingersoll-Rand Company (FAL).
- 7. Medeco Security Locks, Inc.; an ASSA ABLOY Group company (MED).
- 8. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
- 9. Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).
- 10. Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL).

2.15 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference, and as follows:
 - 1. Master Key System: Cylinders are operated by a change key and a master key.
 - 2. Existing System: Re-key Owner's existing master key system into new keying system.
- B. Keys: Nickel silver.
 - 1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
 - a. Notation: "DO NOT DUPLICATE."
 - 2. Quantity: In addition to one extra key blank for each lock, provide the following:
 - a. Cylinder Change Keys: Three.
 - b. Master Keys: Five.

2.16 KEY CONTROL SYSTEM

- A. Key Control Cabinet: BHMA A156.5, Grade 1; metal cabinet with baked-enamel finish; containing keyholding hooks, labels, 2 sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers; with key capacity of 150 percent of the number of locks.
 - 1. Wall-Mounted Cabinet: Cabinet with hinged-panel door equipped with key-holding panels and pin-tumbler cylinder door lock.

2.17 ELECTRIC STRIKES

- A. Standard: BHMA A156.31, Grade 1.
- B. General: Use fail-secure electric strikes with fire-rated devices.
- C. Available Manufacturers:
 - 1. Adams Rite Manufacturing Co. (ARM).
 - 2. Folger Adam Security Inc.; an ASSA ABLOY Group company (FAS).
 - 3. Von Duprin; an Ingersoll-Rand Company (VD).

2.18 OPERATING TRIM

A. Standard: BHMA A156.6.

- B. Materials: Fabricate from brass, unless otherwise indicated.
- C. Available Manufacturers:
 - 1. Burns Manufacturing Incorporated (BM).
 - 2. Don-Jo Mfg., Inc. (DJO).
 - 3. Forms + Surfaces (FS).
 - 4. Hager Companies (HAG).
 - 5. Hiawatha, Inc. (HIA).
 - 6. IVES Hardware; an Ingersoll-Rand Company (IVS).
 - 7. Rockwood Manufacturing Company (RM).
 - 8. Trimco (TBM).

2.19 ACCESSORIES FOR PAIRS OF DOORS

- A. Carry-Open Bars: Provide carry-open bars for inactive leaves of pairs of doors unless automatic or selflatching bolts are used.
 - 1. Material: Polished brass or bronze, with strike plate.

2.20 CLOSERS

- A. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."
 - 1. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
 - b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
 - c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
- B. Door Closers for Means of Egress Doors: Comply with NFPA 101. Door closers shall not require more than 30 lbf (133 N) to set door in motion and not more than 15 lbf (67 N) to open door to minimum required width.
- C. Hold-Open Closers/Detectors: Coordinate and interface integral smoke detector and closer device with fire alarm system.
- D. Flush Floor Plates: Provide finish cover plates for floor closers unless thresholds are indicated. Match door hardware finish, unless otherwise indicated.
- E. Recessed Floor Plates: Provide recessed floor plates with insert of floor finish material for floor closers unless thresholds are indicated. Provide extended closer spindle to accommodate thickness of floor finish.
- F. Power-Assist Closers: As specified in Division 08 Section "Automatic Door Operators" for access doors for people with disabilities or where listed in the door hardware sets.
- G. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

- H. Surface Closers: BHMA A156.4, Grade 1. Provide type of arm required for closer to be located on non-public side of door, unless otherwise indicated.
 - 1. Available Manufacturers:
 - a. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).
 - b. DORMA Architectural Hardware; Member of The DORMA Group North America (DAH).
 - c. Dor-O-Matic; an Ingersoll-Rand Company (DOR).
 - d. LCN Closers; an Ingersoll-Rand Company (LCN).
 - e. Norton Door Controls; an ASSA ABLOY Group company (NDC).
 - f. Rixson Specialty Door Controls; an ASSA ABLOY Group company (RIX).
 - g. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
 - h. Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL).
- I. Concealed Closers: BHMA A156.4, Grade 1.
 - 1. Available Manufacturers:
 - a. DORMA Architectural Hardware; Member of The DORMA Group North America (DAH).
 - b. LCN Closers; an Ingersoll-Rand Company (LCN).
 - c. Norton Door Controls; an ASSA ABLOY Group company (NDC).
 - d. Rixson Specialty Door Controls; an ASSA ABLOY Group company (RIX).
 - e. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
 - f.
- J. Coordinators: BHMA A156.3.

2.21 PROTECTIVE TRIM UNITS

- A. Size: 1-1/2 inches (38 mm) less than door width on push side and 1/2 inch (13 mm) less than door width on pull side, by height specified in door hardware sets.
- B. Fasteners: Manufacturer's standard machine or self-tapping screws.
- C. Metal Protective Trim Units: BHMA A156.6; beveled top and 2 sides; fabricated from the following material:
 - 1. Material: 0.050-inch- (1.3-mm-) thick stainless steel.
 - 2. Available Manufacturers:
 - a. American Floor Products Co., Inc. (AFP).
 - b. Baldwin Hardware Corporation (BH).
 - c. Burns Manufacturing Incorporated (BM).
 - d. Don-Jo Mfg., Inc. (DJO).
 - e. Hager Companies (HAG).
 - f. Hiawatha, Inc. (HIA).
 - g. IPC Door and Wall Protection Systems, Inc.; Div. of InPro Corporation (IPC).
 - h. IVES Hardware; an Ingersoll-Rand Company (IVS).
 - i. Pawling Corporation (PAW).
 - j. Rockwood Manufacturing Company (RM).
 - k. Trimco (TBM).

2.22 STOPS AND HOLDERS

- A. Stops and Bumpers: BHMA A156.16, Grade 1.
 - 1. Provide floor stops for doors unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic. Where floor or wall stops are not appropriate, provide overhead holders.
- B. Mechanical Door Holders: BHMA A156.16, Grade 1.
- C. Combination Overhead Stops and Holders: BHMA A156.8, Grade 1.
- D. Silencers for Wood Door Frames: BHMA A156.16, Grade 1; neoprene or rubber, minimum 5/8 by 3/4 inch (16 by 19 mm); fabricated for drilled-in application to frame.
- E. Available Manufacturers:
 - 1. Architectural Builders Hardware Mfg., Inc. (ABH).
 - 2. Baldwin Hardware Corporation (BH).
 - 3. Burns Manufacturing Incorporated (BM).
 - 4. Cal-Royal Products, Inc. (CRP).
 - 5. Don-Jo Mfg., Inc. (DJO).
 - 6. Door Controls International (DCI).
 - 7. DORMA Architectural Hardware; Member of The DORMA Group North America (DAH).
 - 8. Dor-O-Matic; an Ingersoll-Rand Company (DOR).
 - 9. Glynn-Johnson; an Ingersoll-Rand Company (GJ).
 - 10. Hager Companies (HAG).
 - 11. HES, Inc.; an ASSA ABLOY Group company (HES).
 - 12. Hiawatha, Inc. (HIA).
 - 13. IVES Hardware; an Ingersoll-Rand Company (IVS).
 - 14. Rixson Specialty Door Controls; an ASSA ABLOY Group company (RIX).
 - 15. Rockwood Manufacturing Company (RM).
 - 16. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
 - 17. Stanley Commercial Hardware; Div. of The Stanley Works (STH).
 - 18. Trimco (TBM).

2.23 DOOR GASKETING

- A. Standard: BHMA A156.22.
- B. General: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.
 - 1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
 - 2. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
 - 3. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.
- C. Air Leakage: Not to exceed 0.50 cfm per foot (0.000774 cu. m/s per m) of crack length for gasketing other than for smoke control, as tested according to ASTM E 283.
- D. Smoke-Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke-control ratings indicated, based on testing according to UL 1784.
 - 1. Provide smoke-labeled gasketing on 20-minute-rated doors and on smoke-labeled doors.

- E. Fire-Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
 - 1. Test Pressure: Test at atmospheric pressure.
- F. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- G. Gasketing Materials: ASTM D 2000 and AAMA 701/702.
- H. Available Manufacturers:
 - 1. Hager Companies (HAG).
 - 2. M-D Building Products, Inc. (MD).
 - 3. National Guard Products (NGP).
 - 4. Pemko Manufacturing Co. (PEM).
 - 5. Reese Enterprises (RE).
 - 6. Sealeze; a unit of Jason Incorporated (SEL).
 - 7. Zero International (ZRO).

2.24 THRESHOLDS

- A. Standard: BHMA A156.21.
- B. Accessibility Requirements: Where thresholds are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."
 - 1. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
- C. Thresholds for Means of Egress Doors: Comply with NFPA 101. Maximum 1/2 inch (13 mm) high.
- D. Available Manufacturers:
 - 1. Hager Companies (HAG).
 - 2. National Guard Products (NGP).
 - 3. Pemko Manufacturing Co. (PEM).
 - 4. Rixson Specialty Door Controls; an ASSA ABLOY Group company (RIX).
 - 5. Zero International (ZRO).

2.25 MISCELLANEOUS DOOR HARDWARE

- A. Boxed Power Supplies: Modular unit in NEMA ICS 6, Type 4 enclosure; filtered and regulated; voltage rating and type matching requirements of door hardware served; and listed and labeled for use with fire alarm systems.
- B. Auxiliary Hardware: BHMA A156.16, Grade 1.
 - 1. Available Manufacturers:
 - a. Baldwin Hardware Corporation (BH).

- b. Hager Companies (HAG).
- c. Rockwood Manufacturing Company (RM).
- d. Stanley Commercial Hardware; Div. of The Stanley Works (STH).

2.26 FABRICATION

- A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.
 - 1. Manufacturer's identification is permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.
- C. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
 - 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
 - 2. Steel Machine or Wood Screws: For the following fire-rated applications:
 - a. Mortise hinges to doors.
 - b. Strike plates to frames.
 - c. Closers to doors and frames.
 - 3. Steel Through Bolts: For the following fire-rated applications unless door blocking is provided:
 - a. Surface hinges to doors.
 - b. Closers to doors and frames.
 - c. Surface-mounted exit devices.
 - 4. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
 - 5. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."

2.27 FINISHES

- A. Standard: BHMA A156.18, as indicated in door hardware sets.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are

not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: Comply with DHI A115 Series.
 - 1. Surface-Applied Door Hardware: Drill and tap doors and frames according to ANSI A250.6.
- B. Wood Doors: Comply with DHI A115-W Series.

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated as follows unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
 - 3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

- D. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, in equipment room. Verify location with Architect.
 - 1. Configuration: Provide one power supply for each door opening.
 - 2. Configuration: Provide the least number of power supplies required to adequately serve doors with electrified door hardware.
- E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

3.4 FIELD QUALITY CONTROL

- A. Independent Architectural Hardware Consultant: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
 - 1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
 - 2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
 - 3. Door Closers: Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.
- B. Occupancy Adjustment: Approximately six months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust, including adjusting operating forces, each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

3.8 DOOR HARDWARE SETS

HW SET 01: Doors 100, 101, 102.1, 103, 104, 104.1, 111, 113,

The existing door hardware is to remain at the following locations; Contractor to inspect and repair all door locks / hardware to operational condition:

HW SET 02: Doors 114, 114.1, 114.2, 114.3, 114.4

The existing sliding door hardware at the following locations are to remain. Contractor is to inspect and repair sliding door hardware to operational condition.

Furnish and install two (2) hasp latches with black finish at interior side of door where doors to be secured in fixed location.

HW SET 03: DOORS: 102, 112

3 1	EA EA	ADA swing-clear hinges PANIC HARDWARE	161128-656 Guard X, Model 2670 with 210DT exterior trim hardware	689 US28	STH VON
1	SET	SEALS	134NA	AL	NGP
2	EA	DOOR SWEEP	100VA	AL	NGP
1	EA	THRESHOLD	896V 36"	AL	NGP
1	EA	SURFACE CLOSER	4111 AVB EDA	689	LCN

HW SET: 04 DOORS: 107

3	EA	HINGE	Salvage and reuse existing hinges		
1	EA	STOREROOM LOCK	D80P RHO	626	SCH
1	EA	SURFACE CLOSER	4111 AVB EDA	689	LCN
1	EA	OVERHEAD STOP	100S	630	GLY

HW SET: 05 DOORS: 108, 109

3	EA	HINGE	T4A3786 4.5 X 4.5 NRP	652	MCK
2	EA	1" diam x 48" pull	D80P RHO		
2	EA	4" x 54" stainless steel backer	6211 FSE 24VDC		
		plate			
1	EA	SURFACE CLOSER	4010	689	LCN
2	EA	KICK PLATE	8400 10" X 32" LDW	630	IVE
1	EA	WALL STOP	WS406CCV	628	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 06 DOORS: 108.2

2	EA	HINGES	T4A3786 3.5 X 3.5 NRP		
1	EA	PRIVACY SET	D10S RHO	626	SCH
1	EA	WALL STOP	WS406CCV	628	IVE

HW SET: 07 DOORS: 110

DOORS: 113.1

4	EA	HINGE	T4A3786 4.5 X 4.5 NRP	652	MCK
1	EA	FIRE EXIT DEVICE	99L- 994L	626	VON
1	EA	SURFACE CLOSER	4111 AVB EDA	689	LCN
1	EA	WALL STOP	WS406CCV	628	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	THRESHOLD			

4	EA	HINGE	T4A3786 4.5 X 4.5 NRP	652	MCK
1	EA	LOCKSET	REUSE EXISTING		
1	EA	SURFACE MOUNTED		630	VON
		SLIDE BOLT			
1	EA	WALL STOP	WS406CCV	628	IVE
3	EA	SILENCER	SR64	GRY	IVE

END OF SECTION 087100

HW SET: 08

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Windows.
 - 2. Doors.
- B. Related Sections include the following:1. Division 08 Section "Glass Fin Structures"

1.3 DEFINITIONS

- A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.
- D. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.
- E. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
- F. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the

following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

- B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
 - 1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
 - a. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour (meters per second) at 33 feet (10 m) above grade, according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures" : Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.
 - 1) Basic Wind Speed: 100 mph
 - 2) Importance Factor: 1
 - 3) Exposure Category: B.
 - b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
 - 1) Load Duration: 60 seconds or less.
 - c. Maximum Lateral Deflection: For the following types of glass supported on all 4 edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch (25 mm), whichever is less.
 - 1) For monolithic-glass lites heat treated to resist wind loads.
 - 2) For insulating glass.
 - 3) For laminated-glass lites.
 - d. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
- C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
 - 1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
 - 2. For laminated-glass lites, properties are based on products of construction indicated.
 - 3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 - 4. Center-of-Glass Values: Based on using LBL-44789 WINDOW 5.0 computer program for the following methodologies:
 - a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F (W/sq. m x K).

- b. Solar Heat Gain Coefficient: NFRC 200.
- c. Solar Optical Properties: NFRC 300.

1.5 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Samples: For the following products, in the form of 12-inch- (300-mm-) square Samples for glass and of 12-inch- (300-mm-) long Samples for sealants. Install sealant Samples between two strips of material representative in color of the adjoining framing system.
- C. Samples: For the following products, in the form of 12-inch- (300-mm-) square Samples for glass.
 - 1. Each type of patterned glass / glass type.
 - 2. Coated vision glass.
- D. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
- E. Qualification Data: For installers.
- F. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.
- G. Product Test Reports: For each of the following types of glazing products:
 - 1. Tinted float glass.
 - 2. Coated float glass.
 - 3. Insulating glass.
 - 4. Glazing sealants.
 - 5. Glazing gaskets.
- H. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- B. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type: clear float glass and laminated glass.
- C. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.
- D. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.
 - 1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

- 2. Glass Testing Agency Qualifications: An independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- E. Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.
 - 1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated, as documented according to ASTM E 548.
 - 2. Test elastomeric glazing sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
- F. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing indicated below, samples of each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants:
 - 1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
 - 2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
 - 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 4. For materials failing tests, obtain sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
 - 5. Testing will not be required if elastomeric glazing sealant manufacturers submit data based on previous testing of current sealant products for adhesion to, and compatibility with, glazing materials matching those submitted.
- G. Glazing for Fire-Rated Door Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.
- H. Glazing for Fire-Rated Window Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257.
- I. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201.
 - 1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
 - 2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. (0.84 sq. m) in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. (0.84 sq. m) or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.
- J. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. GANA Publications: GANA Laminated Division's "Laminated Glass Design Guide" and GANA's "Glazing Manual."
- 2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
- 3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Sloped Glazing Guidelines."
- 4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulatingglass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 - 1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F (4.4 deg C).

1.9 WARRANTY

- A. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form, made out to Owner and signed by laminated-glass manufacturer agreeing to replace laminated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 - 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 GLASS PRODUCTS

A. Annealed Float Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; of class indicated.

- 1. Ultra-Clear (Low-Iron) Float Glass: Class I (clear); with a minimum 91 percent visible light transmission and a minimum solar heat gain coefficient of 0.87.
 - a. Available Products:
 - 1) AFG Industries Inc.; Krystal Klear.
 - 2) Pilkington Building Products North America; Optiwhite.
 - 3) PPG Industries, Inc.; Starphire.
- B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
 - 2. Provide Kind HS (heat-strengthened) float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
 - 3. For uncoated glass, comply with requirements for Condition A.
 - 4. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
 - 5. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat-strengthened) float glass where safety glass is indicated.
- C. Patterned Glass: ASTM C 1036, Type II (patterned and wired flat glass), Class 1 (clear), Form 3 (patterned); and of quality, finish, and pattern specified.
- D. Tempered Patterned Glass: ASTM C 1048, Kind FT (fully tempered), Type II (patterned flat glass), Class 1 (clear), Form 3 (patterned); and of quality, finish, and pattern specified.
- E. Laminated Glass: ASTM C 1172, and complying with other requirements specified and with the following:
 - 1. Interlayer: Polyvinyl butyral or cured resin of thickness indicated with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation.
 - a. For polyvinyl butyral interlayers, laminate lites in autoclave with heat plus pressure.
 - b. For cured-resin interlayers, laminate lites with laminated-glass manufacturer's standard cast-in-place and cured-transparent-resin interlayer.
 - 2. Laminating Process: Fabricate laminated glass to produce glass free of foreign substances and air or glass pockets.

2.3 GLAZING GASKETS

- A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
 - 1. Neoprene, ASTM C 864.
 - 2. EPDM, ASTM C 864.
 - 3. Silicone, ASTM C 1115.
 - 4. Thermoplastic polyolefin rubber, ASTM C 1115.
 - 5. Any material indicated above.

- B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:
 - 1. Neoprene.
 - 2. EPDM.
 - 3. Silicone.
 - 4. Thermoplastic polyolefin rubber.
 - 5. Any material indicated above.
- C. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

2.4 GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
 - 1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 - 3. VOC Content: For sealants used inside of the weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
 - 1. Neutral-Curing Silicone Glazing Sealants GS-1:
 - a. Available Products:
 - 1) Dow Corning Corporation; 791.
 - 2) Dow Corning Corporation; 795.
 - 3) GE Silicones; SilPruf NB SCS9000.
 - 4) GE Silicones; UltraPruf II SCS2900.
 - 5) Pecora Corporation; 865.
 - 6) Pecora Corporation; 895.
 - 7) Pecora Corporation; 898.
 - b. Type and Grade: S (single component) and NS (nonsag).
 - c. Class: 50.
 - d. Use Related to Exposure: NT (nontraffic).
 - e. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.
- C. Glazing Sealants for Fire-Resistive Glazing Products: Identical to products used in test assemblies to obtain fire-protection rating.

2.5 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 - 1. AAMA 804.3 tape, where indicated.
 - 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 - 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:
 - 1. Type 1, for glazing applications in which tape acts as the primary sealant.
 - 2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.6 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- G. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

2.7 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.
- C. Grind smooth and polish exposed glass edges and corners.

2.8 MONOLITHIC PATTERNED-GLASS UNITS

- A. Patterned-Glass Units PG-H1: Annealed, Quality-Q 5 historic glazing, thickness to match existing.
- B. Tempered Patterned-Glass Units PG-H1: Quality-Q 5, Finish F historic glazing, thickness to match existing.
- 2.9 HISTORIC GLASS: In all window and transom restoration and replacements, install historic glass panes minimum 1/8" thick (sized to match existing glass thickness).
 - 1. Provide Tempered glass panes in all doors.
 - 2. Provide Tempered glass panes in all windows beside doors.
 - 3. Provide Tempered glass panes in all windows within 18" of the finished floor surface.

2.10 LAMINATED-GLASS UNITS

- A. Laminated-Glass Units LG-1:
 - 1. Kind LA, consisting of two lites of annealed float glass.
 - Outer Lite: Class 1 (clear) float glass.
 - a. Thickness: 3.0 mm.
 - b. Self-Cleaning, Low-Maintenance Coating: Pyrolytic coating on first surface.
 - 3. Plastic Interlayer:
 - a. Thickness: 0.030 inch (0.76 mm), but not less than that required to comply as a Type II safety glass material.
 - b. Interlayer Color: Clear.
 - 4. Inner Lite: Class 1 (clear) float glass.
 - a. Thickness: 3.0 mm.

PART 3 - EXECUTION

2.

3.1 EXAMINATION

- A. Examine framing glazing, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep system.
 - 3. Minimum required face or edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm) as follows:
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 LOCK-STRIP GASKET GLAZING

A. Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system, unless otherwise indicated.

3.8 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088000

SECTION 089000 - LOUVERS AND VENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

- 1. Fixed, extruded-aluminum and formed-metal louvers.
- B. Related Sections:
 - 1. Division 09 Section "Exterior Painting" for field painting louvers.
 - 2. Division 23 Sections for louvers that are a part of mechanical equipment.
 - 3. Division 23 Section "Instrumentation and Control for HVAC" for electric, electronic, and pneumatic control of adjustable louvers.
 - 4. Division 26 Sections for electrical power connections for motor-operated adjustable louvers.

1.3 DEFINITIONS

- A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.
- B. Horizontal Louver: Louver with horizontal blades; i.e., the axes of the blades are horizontal.
- C. Vertical Louver: Louver with vertical blades; i.e., the axes of the blades are vertical.
- D. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.
- E. Storm-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural performance requirements and design criteria indicated.
- B. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.

- 1. Wind Loads: Determine loads based on a uniform pressure of 20 lbf/sq. ft. (957 Pa), acting inward or outward.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes, without buckling, opening of joints, overstressing of components, failure of connections, or other detrimental effects.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- D. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
- B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
 - 1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
 - 2. Show mullion profiles and locations.
 - 3. Wiring Diagrams: For power, signal, and control wiring for motorized adjustable louvers.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Delegated-Design Submittal: For louvers indicated to comply with structural performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain louvers and vents from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.
- B. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.2/D1.2M, "Structural Welding Code Aluminum."
 - 2. AWS D1.3, "Structural Welding Code Sheet Steel."
 - 3. AWS D1.6, "Structural Welding Code Stainless Steel."
- C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

D. UL and NEMA Compliance: Provide motors and related components for motor-operated louvers that are listed and labeled by UL and comply with applicable NEMA standards.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T5, T-52, or T6.
- B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.
- C. Aluminum Castings: ASTM B 26/B 26M, Alloy 319.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, zinc coating, mill phosphatized.
- E. Fasteners: Use types and sizes to suit unit installation conditions.
 - 1. Use hex-head or Phillips pan-head screws for exposed fasteners unless otherwise indicated.
 - 2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
 - 3. For fastening galvanized steel, use hot-dip-galvanized steel or 300 series stainless-steel fasteners.
 - 4. For fastening stainless steel, use 300 series stainless-steel fasteners.
 - 5. For color-finished louvers, use fasteners with heads that match color of louvers.
- F. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
- G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.2 FABRICATION, GENERAL

- A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.
- C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
 - 1. Frame Type: Exterior flange unless otherwise indicated.
- D. Include supports, anchorages, and accessories required for complete assembly.

- E. Provide vertical mullions of type and at spacings indicated, but not more than recommended by manufacturer, or 72 inches (1830 mm) o.c., whichever is less.
 - 1. Fully Recessed Mullions: Where indicated, provide mullions fully recessed behind louver blades. Where length of louver exceeds fabrication and handling limitations, fabricate with close-fitting blade splices designed to permit expansion and contraction.
 - 2. Semirecessed Mullions: Where indicated, provide mullions partly recessed behind louver blades so louver blades appear continuous. Where length of louver exceeds fabrication and handling limitations, fabricate with interlocking split mullions and close-fitting blade splices designed to permit expansion and contraction.
 - 3. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.
 - 4. Exterior Corners: Prefabricated corner units with mitered and welded blades and with fully recessed mullions at corners.
- F. Provide subsills made of same material as louvers or extended sills for recessed louvers.
- G. Join frame members to each other and to fixed louver blades with fillet welds, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

- A. Horizontal Storm-Resistant Louver:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Airolite Company, LLC (The).
 - b. Arrow United Industries; a division of Mestek, Inc.
 - c. Construction Specialties, Inc.
 - d. Greenheck Fan Corporation.
 - 2. Louver Depth: 4 inches (100 mm).
 - 3. Frame and Blade Nominal Thickness: Not less than 0.080 inch (2.03 mm).
 - 4. Louver Performance Ratings:
 - a. Free Area: Not less than 7.0 sq. ft. (0.65 sq. m) for 48-inch- (1220-mm-) wide by 48-inch- (1220-mm-) high louver.
 - b. Air Performance: Not more than 0.10-inch wg (25-Pa) static pressure drop at 800-fpm (4.1-m/s) free-area intake velocity.
 - c. Wind-Driven Rain Performance: Not less than 99 percent effectiveness when subjected to a rainfall rate of 8 inches (200 mm) per hour and a wind speed of 50 mph (22.4 m/s) at a core-area intake velocity of 500 fpm (2.5 m/s).
 - 5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.4 LOUVER SCREENS

- A. General: Provide screen at each exterior louver.
 - 1. Screen Location for Fixed Louvers: Interior face.

- 2. Screening Type: Insect screening.
- B. Secure screen frames to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches (150 mm) from each corner and at 12 inches (300 mm) o.c.
- C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.
 - 1. Metal: Same kind and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
 - 2. Finish: Same finish as louver frames to which louver screens are attached.
 - 3. Type: Rewirable frames with a driven spline or insert.
- D. Louver Screening for Aluminum Louvers:
 - 1. Insect Screening: Aluminum, 18-by-16 (1.4-by-1.6-mm) mesh, 0.012-inch (0.30-mm) wire.

2.5 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

2.6 ALUMINUM FINISHES

- A. Finish louvers after assembly.
- B. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
- C. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range Insert color and gloss.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

- A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.
- F. Protect unpainted galvanized and nonferrous-metal surfaces that will be in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.
- G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Division 07 Section "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

- A. Test operation of adjustable louvers and adjust as needed to produce fully functioning units that comply with requirements.
- B. Clean exposed surfaces of louvers and vents that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.
- C. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- D. Restore louvers and vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
 - 1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 089000

SECTION 096400 - WOOD FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes field-finished wood flooring.
- B. Related Sections include the following:
 - 1. Division 06 Section "Wood Decking" for wood decking.
 - 2. Division 07 Sections for waterproofing membranes.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show installation details including location and layout of each type of wood flooring and accessory.
- C. Samples for Verification: For each type of wood flooring and accessory, with stain color and finish required, approximately 12 inches (300 mm) long and of same thickness and material indicated for the Work and showing the full range of normal color and texture variations expected.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSCaccredited certification body.
- B. Source Limitations: For field-finished wood flooring, obtain each species, grade, and cut of wood from one source with resources to provide materials and products of consistent quality in appearance and physical properties.
- C. Forest Certification: Provide wood flooring produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- D. Hardwood Flooring: Comply with NOFMA's "Official Flooring Grading Rules" for species, grade, and cut.
 - 1. Certification: Provide flooring that carries NOFMA grade stamp on each bundle or piece.
- E. Softwood Flooring: Comply with WCLIB No. 17 grading rules for species, grade, and cut.

- F. Mockups: Install mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. To set quality standards for installation, install mockup of floor area as shown on Drawings.
 - 2. To set quality standards for sanding and application of field finishes, prepare finish mockup of floor area as shown on Drawings.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wood flooring materials in unopened cartons or bundles.
- B. Protect wood flooring from exposure to moisture. Do not deliver wood flooring until after concrete, masonry, plaster, ceramic tile, and similar wet work is complete and dry.
- C. Store wood flooring materials in a dry, warm, ventilated, weathertight location.

1.6 PROJECT CONDITIONS

- A. Conditioning period begins not less than seven days before wood flooring installation, is continuous through installation, and continues not less than seven days after wood flooring installation.
 - 1. Environmental Conditioning: Maintain an ambient temperature between 65 and 75 deg F (18 and 24 deg C) and relative humidity planned for building occupants in spaces to receive wood flooring during the conditioning period.
 - 2. Wood Flooring Conditioning: Move wood flooring into spaces where it will be installed, no later than the beginning of the conditioning period.
 - a. Do not install flooring until it adjusts to relative humidity of, and is at same temperature as, space where it is to be installed.
 - b. Open sealed packages to allow wood flooring to acclimatize immediately on moving flooring into spaces in which it will be installed.
- B. After conditioning period, maintain relative humidity and ambient temperature planned for building occupants.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Wood Flooring: Equal to 100 square feet for each type of wood flooring indicated.

PART 2 - PRODUCTS

2.1 FIELD-FINISHED WOOD FLOORING

A. Solid-Wood, Strip and Plank Flooring: Kiln dried to 6 to 9 percent maximum moisture content, tongue and groove and end matched, and with backs channeled (kerfed) for stress relief.

- 1. Species and Grade: Southern Yellow Heart Pine flooring (grain to match existing flooring).
- 2. Cut: Vertical grain , to match existing flooring.
- 3. Thickness: 3/4 inch (19 mm) minimum; thickness to match existing at areas of repair.
- 4. Face Width: 2-1/4 inches (57 mm); face width to match existing.
- 5. Lengths: Random-length strips complying with applicable grading rules.
- 6. Preservative Treatment: Clear, penetrating, water-repellent wood preservative that protects against mold, mildew, staining, and decay fungi; complying with MFMA's written recommendations and applied by immersion.
- 7. Simulated Wood Pegs: Contrasting wood pegs at ends of plank flooring pieces.
- B. Urethane Finish System: Complete water-based system of compatible components that is recommended by finish manufacturer for application indicated.
 - 1. VOC Content: When calculated according to 40 CFR 59, Subpart D (EPA Method 24), as follows:
 - a. Finish Coats and Floor Sealers: Not more than 350 g/L.
 - b. Stains: Not more than 250 g/L.
 - 2. Finish Coats: Formulated for multicoat application on wood flooring.
 - 3. Stain: Penetrating and nonfading type.
 - a. Color: Match existing flooring sample.
 - 4. Floor Sealer: Pliable, penetrating type.
- C. Wood Filler: Compatible with finish system components and recommended by filler and finish manufacturers for use indicated. If required to match approved Samples, provide pigmented filler.

2.2 ACCESSORY MATERIALS

- A. Wood Sleepers and Subfloor: As specified in Division 06 Section "Rough Carpentry."
- B. Wood Underlayment: As specified in Division 06 Section "Rough Carpentry."
- C. Vapor Retarder: ASTM D 4397, polyethylene sheet not less than 6.0 mils (0.15 mm) thick.
- D. Asphalt-Saturated Felt: ASTM D 4869, Type II.
- E. Wood Flooring Adhesive: Mastic recommended by flooring and adhesive manufacturers for application indicated.
 - 1. Use adhesives that have a VOC content of not more than 100 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- F. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by wood flooring manufacturer.
- G. Fasteners: As recommended by manufacturer, but not less than that recommended in NWFA's "Installation Guidelines: Wood Flooring."
- H. Cork Expansion Strip: Composition cork strip.

- I. Feature Strips: 6-inch- (51-mm-) wide, square-edged heartpine strips furnished in lengths as long as practical and in thickness to match wood flooring.
- J. Trim: In same species and grade as wood flooring, unless otherwise indicated.
 - 1. Threshold: Tapered on each side and routed at bottom of one side to accommodate wood flooring.
 - 2. Reducer Strip: 2 inches (51 mm) wide, tapered on 1 side, and in thickness matching wood flooring.
- K. Wood air vents and grilles of same species and grade as wood flooring and in sizes indicated on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of wood flooring.
 - 1. Verify that substrates comply with tolerances and other requirements specified in other Sections.
 - 2. For adhesively applied wood flooring, verify that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
 - 3. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Substrate Moisture Testing, General: Perform tests recommended by manufacturer or, if none, comply with applicable recommendations in NWFA's "Installation Guidelines: Wood Flooring."
 - 1. Proceed with installation only after substrates pass testing.

3.2 PREPARATION

- A. Grind high spots and fill low spots on concrete substrates to produce a maximum 1/8-inch (3-mm) deviation in any direction when checked with a 10-foot (3-m) straight edge.
 - 1. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
- B. Remove coatings, including curing compounds, and other substances on substrates that are incompatible with installation adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- C. Broom or vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. Comply with flooring manufacturer's written installation instructions, but not less than applicable recommendations in NWFA's "Installation Guidelines: Wood Flooring."

- B. Wood Sleepers and Subfloor: Install according to requirements in Division 06 Section "Rough Carpentry."
- C. Wood Underlayment: Install according to requirements in Division 06 Section "Rough Carpentry."
- D. Provide expansion space at walls and other obstructions and terminations of flooring as recommended by manufacturer.
- E. Asphalt-Saturated Felt: Where strip or plank flooring is nailed to solid-wood subfloor, install flooring over a layer of asphalt-saturated felt.
- F. Vapor Retarder:
 - 1. Wood Flooring Nailed to Sleepers over Concrete: Install flooring over a layer of polyethylene sheet with edges overlapped over sleepers and turned up behind baseboards.
 - 2. Wood Flooring Installed Directly on Concrete: Install a layer of polyethylene sheet according to flooring manufacturer's written instructions.
- G. Solid-Wood, Strip and Plank Flooring: Blind nail or staple flooring to substrate.
 - 1. For flooring of face width more than 3 inches (75 mm), do the following:
 - a. Install countersunk screws at each end of each piece in addition to blind nailing. Cover screw heads with wood plugs glued flush with flooring.
 - b. Install no fewer than 2 countersunk nails at each end of each piece, spaced not more than 16 inches (406 mm) along length of each piece, in addition to blind nailing. Fill holes with matching wood filler.
- H. Wood Trim: Nail baseboard to wall and nail shoe molding or other trim to baseboard; do not nail to flooring.

3.4 FIELD FINISHING

- A. Machine-sand flooring to remove offsets, ridges, cups, and sanding-machine marks that would be noticeable after finishing. Vacuum and tack with a clean cloth immediately before applying finish.
 - 1. Comply with applicable recommendations in NWFA's "Installation Guidelines: Wood Flooring."
- B. Fill open-grained hardwood.
- C. Fill and repair wood flooring seams and defects.
- D. Apply floor-finish materials in number of coats recommended by finish manufacturer for application indicated, but not less than one coat of floor sealer and three finish coats.
 - 1. Apply stains to achieve an even color distribution matching approved Samples.
 - 2. For water-based finishes, use finishing methods recommended by finish manufacturer to minimize grain raise.
- E. Cover wood flooring before finishing.
- F. Do not cover wood flooring after finishing until finish reaches full cure, and not before seven days after applying last finish coat.

3.5 PROTECTION

- A. Protect installed wood flooring during remainder of construction period with covering of heavy kraft paper or other suitable material. Do not use plastic sheet or film that might cause condensation.
 - 1. Do not move heavy and sharp objects directly over kraft-paper-covered wood flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 096400

SECTION 099113 - EXTERIOR PAINTING (OPTION 2 – See Specification Section 01230)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following exterior substrates:
 - 1. Concrete.
 - 2. Clay masonry.
 - 3. Concrete masonry units (CMU).
 - 4. Steel.
 - 5. Galvanized metal.
 - 6. Aluminum (not anodized or otherwise coated).
 - 7. Wood.
- B. Related Sections include the following:
 - 1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.
 - 2. Division 06 Sections for shop priming carpentry with primers specified in this Section.
 - 3. Division 08 Sections for factory priming windows and doors with primers specified in this Section.
 - 4. Division 09 painting Sections for special-use coatings.
 - 5. Division 09 Section "Interior Painting" for surface preparation and the application of paint systems on interior substrates.
 - 6. Division 09 Section "Staining and Transparent Finishing" for surface preparation and the application of wood stains and transparent finishes on exterior wood substrates.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of topcoat product indicated.
- C. Samples for Verification: For each type of paint system and each color and gloss of topcoat indicated.
 - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
 - 2. Label each Sample for location and application area.
- D. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.4 QUALITY ASSURANCE

- A. MPI Standards:
 - 1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
 - 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.
- B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. Other Items: Architect will designate items or areas required.
 - 2. Final approval of color selections will be based on benchmark samples.
 - a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
 - 1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Benjamin Moore & Co.
 - 2. ICI Paints.
 - 3. PPG Architectural Finishes, Inc.
 - 4. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

- A. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. Colors: Custom color matching required to match existing exterior paint colors, for siding, trims and masonry.

2.3 BLOCK FILLERS

- A. Interior/Exterior Latex Block Filler: MPI #4.
 - 1. VOC Content: E Range of E2.

2.4 PRIMERS/SEALERS

- A. Alkali-Resistant Primer: MPI #3.
 - 1. VOC Content: E Range of E1.
- B. Bonding Primer (Water Based): MPI #17.
 - 1. VOC Content: E Range of E1.
- C. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint system indicated.

2.5 METAL PRIMERS

- A. Alkyd Anticorrosive Metal Primer: MPI #79.
 - 1. VOC Content: E Range of E1.

- B. Quick-Drying Alkyd Metal Primer: MPI #76.
 - 1. VOC Content: E Range of E1.
- C. Waterborne Galvanized-Metal Primer: MPI #134.
 - 1. VOC Content: E Range of E1.
 - 2. Environmental Performance Rating: EPR 1.
- D. Quick-Drying Primer for Aluminum: MPI #95.
 - 1. VOC Content: E Range of E1.

2.6 WOOD PRIMERS

- A. Exterior Latex Wood Primer: MPI #6.
 - 1. VOC Content: E Range of E1.
- B. Exterior Alkyd Wood Primer: MPI #5.
 - 1. VOC Content: E Range of E2.

2.7 EXTERIOR LATEX PAINTS

- A. Exterior Latex (Flat): MPI #10 (Gloss Level 1).
 - 1. VOC Content: E Range of E1.
- B. Exterior Latex (Semigloss): MPI #11 (Gloss Level 5).
 - 1. VOC Content: E Range of E1.

2.8 EXTERIOR ALKYD PAINTS

- A. Exterior Alkyd Enamel (Flat): MPI #8 (Gloss Level 1).
 - 1. VOC Content: E Range of E1.
- B. Exterior Alkyd Enamel (Semigloss): MPI #94 (Gloss Level 5).
 - 1. VOC Content: E Range of E1.

2.9 QUICK-DRYING ENAMELS

- A. Quick-Drying Enamel (Semigloss): MPI #81 (Gloss Level 5).
 - 1. VOC Content: E Range of E1.

2.10 ALUMINUM PAINT

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- A. Aluminum Paint: MPI #1.
 - 1. VOC Content: E Range of E1.

2.11 FLOOR COATINGS

- A. Interior/Exterior Latex Floor and Porch Paint (Low Gloss): MPI #60 (maximum Gloss Level 3).
 - 1. VOC Content: E Range of E2.
 - 2. Environmental Performance Rating: EPR 3.
- B. Exterior/Interior Alkyd Floor Enamel (Gloss): MPI #27 (Gloss Level 6).
 - 1. VOC Content: E Range of E1.
 - 2. Additives: Manufacturer's standard additive to increase skid resistance of painted surface.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Masonry (Clay and CMU): 12 percent.
 - 3. Wood: 15 percent.
 - 4. Plaster: 12 percent.
 - 5. Gypsum Board: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 - 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Clay Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content of surfaces or alkalinity of mortar joints to be painted exceed that permitted in manufacturer's written instructions.
- F. Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- G. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. Aluminum Substrates: Remove surface oxidation.
- J. Wood Substrates:
 - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - 2. Sand surfaces that will be exposed to view, and dust off.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.
 - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- K. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.
- L. Plaster Substrates: Do not begin paint application until plaster is fully cured and dry.
- M. Exterior Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:
 - 1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
 - 2. Testing agency will perform tests for compliance of paint materials with product requirements.
 - 3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Nontraffic Surfaces:
 - 1. Latex System: MPI EXT 3.1A.
 - a. Prime Coat: Exterior latex matching topcoat.
 - b. Intermediate Coat: Exterior latex matching topcoat.
 - c. Topcoat: Exterior latex (flat).
- B. Clay-Masonry Substrates:
 - 1. Latex System: MPI EXT 4.1A.
 - a. Prime Coat: Exterior latex matching topcoat.
 - b. Intermediate Coat: Exterior latex matching topcoat.

- c. Topcoat: Exterior latex (flat).
- C. CMU Substrates:
 - 1. Latex System: MPI EXT 4.2A.
 - a. Prime Coat: Interior/exterior latex block filler.
 - b. Intermediate Coat: Exterior latex matching topcoat.
 - c. Topcoat: Exterior latex (flat).
- D. Steel Substrates:
 - 1. Quick-Drying Enamel System: MPI EXT 5.1A.
 - a. Prime Coat: Quick-drying alkyd metal primer.
 - b. Intermediate Coat: Quick-drying enamel matching topcoat.
 - c. Topcoat: Quick-drying enamel (semigloss).
 - 2. Alkyd System: MPI EXT 5.1D.
 - a. Prime Coat: Alkyd anticorrosive metal primer.
 - b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
 - c. Topcoat: Exterior alkyd enamel (semigloss).
 - 3. Aluminum Paint System: MPI EXT 5.1K.
 - a. Prime Coat: Alkyd anticorrosive metal primer.
 - b. Intermediate Coat: Aluminum paint.
 - c. Topcoat: Aluminum paint.
- E. Galvanized-Metal Substrates:
 - 1. Alkyd System: MPI EXT 5.3B.
 - a. Prime Coat: Cementitious galvanized-metal primer.
 - b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
 - c. Topcoat: Exterior alkyd enamel (semigloss).
- F. Aluminum Substrates:
 - 1. Latex System: MPI EXT 5.4H.
 - a. Prime Coat: Quick-drying primer for aluminum.
 - b. Intermediate Coat: Exterior latex matching topcoat.
 - c. Topcoat: Exterior latex (semigloss).
- G. Dressed Lumber Substrates: Including architectural woodwork and doors.
 - 1. Latex System: MPI EXT 6.3L.
 - a. Prime Coat: Exterior latex wood primer.
 - b. Intermediate Coat: Exterior latex matching topcoat.
 - c. Topcoat: Exterior latex (semigloss).
- H. Wood Panel Substrates: Including plywood siding.

- 1. Latex System: MPI EXT 6.4K.
 - a. Prime Coat: Exterior latex wood primer.
 - b. Intermediate Coat: Exterior latex matching topcoat.
 - c. Topcoat: Exterior latex (semigloss).
- I. Dimension Lumber Substrates, Nontraffic Surfaces: Including board siding and undersides of decking.
 - 1. Latex System: MPI EXT 6.2M.
 - a. Prime Coat: Exterior latex wood primer.
 - b. Intermediate Coat: Exterior latex matching topcoat.
 - c. Topcoat: Exterior latex (semigloss).
 - 2. Latex Over Alkyd Primer System: MPI EXT 6.2A.
 - a. Prime Coat: Exterior alkyd wood primer.
 - b. Intermediate Coat: Exterior latex matching topcoat.
 - c. Topcoat: Exterior latex (semigloss).
- J. Dimension Lumber Substrates, Traffic Surfaces: Including lumber decking and stairs.
 - 1. Latex System: MPI EXT 6.5E.
 - a. Prime Coat: Exterior latex wood primer.
 - b. Intermediate Coat: Interior/exterior latex floor and porch (low gloss).
 - c. Topcoat: Interior/exterior latex floor and porch (low gloss).
 - 1) With additive to increase skid resistance of painted surface.

END OF SECTION 099113

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Clay masonry.
 - 2. Steel.
 - 3. Galvanized metal.
 - 4. Aluminum (not anodized or otherwise coated).
 - 5. Wood.
 - 6. Gypsum board.
- B. Related Sections include the following:
 - 1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.
 - 2. Division 06 Sections for shop priming carpentry with primers specified in this Section.
 - 3. Division 08 Sections for factory priming windows and doors with primers specified in this Section.
 - 4. Division 09 painting Sections for special-use coatings.
 - 5. Division 09 Section "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.
 - 6. Division 09 Section "Staining and Transparent Finishing" for surface preparation and the application of wood stains and transparent finishes on interior wood substrates.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.
 - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each Sample for location and application area.
- C. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 - 2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.4 QUALITY ASSURANCE

- A. MPI Standards:
 - 1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
 - 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.
- B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
 - a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. Other Items: Architect will designate items or areas required.
 - 2. Apply benchmark samples after permanent lighting and other environmental services have been activated.
 - 3. Final approval of color selections will be based on benchmark samples.
 - a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
 - 1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Benjamin Moore & Co.
 - 2. ICI Paints.
 - 3. PPG Architectural Finishes, Inc.
 - 4. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

- A. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. VOC Content of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24); these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:
 - 1. Flat Paints, Coatings, and Primers: VOC content of not more than 50 g/L.
 - 2. Nonflat Paints, Coatings, and Primers: VOC content of not more than 150 g/L.
 - 3. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
 - 4. Floor Coatings: VOC not more than 100 g/L.
 - 5. Shellacs, Clear: VOC not more than 730 g/L.
 - 6. Shellacs, Pigmented: VOC not more than 550 g/L.
 - 7. Flat Topcoat Paints: VOC content of not more than 50 g/L.
 - 8. Nonflat Topcoat Paints: VOC content of not more than 150 g/L.
 - 9. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
 - 10. Floor Coatings: VOC not more than 100 g/L.
 - 11. Shellacs, Clear: VOC not more than 730 g/L.
 - 12. Shellacs, Pigmented: VOC not more than 550 g/L.
 - 13. Primers, Sealers, and Undercoaters: VOC content of not more than 200 g/L.
 - 14. Dry-Fog Coatings: VOC content of not more than 400 g/L.
 - 15. Zinc-Rich Industrial Maintenance Primers: VOC content of not more than 340 g/L.
 - 16. Pre-Treatment Wash Primers: VOC content of not more than 420 g/L.
- C. Chemical Components of Field-Applied Interior Paints and Coatings: Provide topcoat paints and anticorrosive and anti-rust paints applied to ferrous metals that comply with the following chemical restrictions; these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:
 - 1. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
 - 2. Restricted Components: Paints and coatings shall not contain any of the following:
 - a. Acrolein.

- b. Acrylonitrile.
- c. Antimony.
- d. Benzene.
- e. Butyl benzyl phthalate.
- f. Cadmium.
- g. Di (2-ethylhexyl) phthalate.
- h. Di-n-butyl phthalate.
- i. Di-n-octyl phthalate.
- j. 1,2-dichlorobenzene.
- k. Diethyl phthalate.
- l. Dimethyl phthalate.
- m. Ethylbenzene.
- n. Formaldehyde.
- o. Hexavalent chromium.
- p. Isophorone.
- q. Lead.
- r. Mercury.
- s. Methyl ethyl ketone.
- t. Methyl isobutyl ketone.
- u. Methylene chloride.
- v. Naphthalene.
- w. Toluene (methylbenzene).
- x. 1,1,1-trichloroethane.
- y. Vinyl chloride.

D. Colors: Match existing paint colors as indicated by Architect.

2.3 BLOCK FILLERS

- A. Interior/Exterior Latex Block Filler: MPI #4.
 - 1. VOC Content: E Range of E2 E3.

2.4 PRIMERS/SEALERS

- A. Interior Latex Primer/Sealer: MPI #50.
 - 1. VOC Content: E Range of E1.
 - 2. Environmental Performance Rating: EPR 1.
- B. Interior Alkyd Primer/Sealer: MPI #45.
 - 1. VOC Content: E Range of E1.
- C. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint systems indicated.

2.5 METAL PRIMERS

- A. Alkyd Anticorrosive Metal Primer: MPI #79.
 - 1. VOC Content: E Range of E1.

- B. Quick-Drying Alkyd Metal Primer: MPI #76.
 - 1. VOC Content: E Range of E1.
- C. Rust-Inhibitive Primer (Water Based): MPI #107.
 - 1. VOC Content: E Range of E1.
 - 2. Environmental Performance Rating: EPR 1.
- D. Cementitious Galvanized-Metal Primer: MPI #26.
 - 1. VOC Content: E Range of E1.
- E. Waterborne Galvanized-Metal Primer: MPI #134.
 - 1. VOC Content: E Range of E1.
 - 2. Environmental Performance Rating: EPR 1.
- F. Quick-Drying Primer for Aluminum: MPI #95.
 - 1. VOC Content: E Range of E1.

2.6 WOOD PRIMERS

- A. Interior Latex-Based Wood Primer: MPI #39.
 - 1. VOC Content: E Range of E1.
 - 2. Environmental Performance Rating: EPR 1.

2.7 LATEX PAINTS

- A. Interior Latex (Flat): MPI #53 (Gloss Level 1).
 - 1. VOC Content: E Range of E1.
 - 2. Environmental Performance Rating: EPR 0.5.
- B. Interior Latex (Satin): MPI #43 (Gloss Level 4).
 - 1. VOC Content: E Range of E1.
 - 2. Environmental Performance Rating: EPR 1.5.
- C. Interior Latex (Semigloss): MPI #54 (Gloss Level 5).
 - 1. VOC Content: E Range of E1.
 - 2. Environmental Performance Rating: EPR 2.
- D. Interior Latex (Gloss): MPI #114 (Gloss Level 6, except minimum gloss of 65 units at 60 deg).
 - 1. VOC Content: E Range of E1.
 - 2. Environmental Performance Rating: EPR 2.

2.8 ALKYD PAINTS

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- A. Interior Alkyd (Flat): MPI #49 (Gloss Level 1).
 - 1. VOC Content: E Range of E1.
- B. Interior Alkyd (Semigloss): MPI #47 (Gloss Level 5).
 - 1. VOC Content: E Range of E1.
 - 2. Environmental Performance Rating: EPR 1.
- C. Interior Alkyd (Gloss): MPI #48 (Gloss Level 6).
 - 1. VOC Content: E Range of E1.

2.9 QUICK-DRYING ENAMELS

- A. Quick-Drying Enamel (Semigloss): MPI #81 (Gloss Level 5).
 - 1. VOC Content: E Range of E1.
- B. Quick-Drying Enamel (High Gloss): MPI #96 (Gloss Level 7).
 - 1. VOC Content: E Range of E1.

2.10 ALUMINUM PAINT

- A. Aluminum Paint: MPI #1.
 - 1. VOC Content: E Range of E1.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Masonry (Clay and CMU): 12 percent.
 - 3. Wood: 15 percent.
 - 4. Gypsum Board: 12 percent.
 - 5. Plaster: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 - 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- D. Clay Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content of surfaces or alkalinity of mortar joints to be painted exceed that permitted in manufacturer's written instructions.
- E. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- G. Aluminum Substrates: Remove surface oxidation.
- H. Wood Substrates:
 - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - 2. Sand surfaces that will be exposed to view, and dust off.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.
 - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- I. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.
- J. Plaster Substrates: Do not begin paint application until plaster is fully cured and dry.
- K. Spray-Textured Ceiling Substrates: Do not begin paint application until surfaces are dry.
- L. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.
- 1. Use applicators and techniques suited for paint and substrate indicated.
- 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
- 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:
 - 1. Mechanical Work:
 - a. Uninsulated metal piping.
 - b. Uninsulated plastic piping.
 - c. Pipe hangers and supports.
 - d. Tanks that do not have factory-applied final finishes.
 - e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
 - f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
 - 2. Electrical Work:
 - a. Switchgear.
 - b. Panelboards.
 - c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

3.4 FIELD QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:
 - 1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
 - 2. Testing agency will perform tests for compliance with product requirements.
 - 3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

- A. Clay-Masonry Substrates:
 - 1. Latex System: MPI INT 4.1A.
 - a. Prime Coat: Interior latex matching topcoat.
 - b. Intermediate Coat: Interior latex matching topcoat.
 - c. Topcoat: Interior latex (flat).
- B. Steel Substrates:
 - 1. Quick-Drying Enamel System: MPI INT 5.1A.
 - a. Prime Coat: Quick-drying alkyd metal primer.
 - b. Intermediate Coat: Quick-drying enamel matching topcoat.
 - c. Topcoat: Quick-drying enamel (semigloss).
- C. Galvanized-Metal Substrates:
 - 1. Alkyd System: MPI INT 5.3C.
 - a. Prime Coat: Cementitious galvanized-metal primer.
 - b. Intermediate Coat: Interior alkyd matching topcoat.
 - c. Topcoat: Interior alkyd (flat).
- D. Aluminum (Not Anodized or Otherwise Coated) Substrates:
 - 1. Latex System: MPI INT 5.4H.
 - a. Prime Coat: Quick-drying primer for aluminum.
 - b. Intermediate Coat: Interior latex matching topcoat.
 - c. Topcoat: Interior latex (low sheen).
- E. Dressed Lumber Substrates: Including architectural woodwork and doors.
 - 1. Latex System: MPI INT 6.3T.
 - a. Prime Coat: Interior latex-based wood primer.

- b. Intermediate Coat: Interior latex matching topcoat.
- c. Topcoat: Interior latex (semigloss).
- 2. Alkyd System: MPI INT 6.3B.
 - a. Prime Coat: Interior alkyd primer/sealer.
 - b. Intermediate Coat: Interior alkyd matching topcoat.
 - c. Topcoat: Interior alkyd (semigloss).
- F. Wood Panel Substrates: Including painted plywood.
 - 1. Latex System: MPI INT 6.4R.
 - a. Prime Coat: Interior latex-based wood primer.
 - b. Intermediate Coat: Interior latex matching topcoat.
 - c. Topcoat: Interior latex (semigloss).
- G. Dimension Lumber Substrates, Nontraffic Surfaces: Including exposed joists.
 - 1. Latex System: MPI INT 6.2D.
 - a. Prime Coat: Interior latex-based wood primer.
 - b. Intermediate Coat: Interior latex matching topcoat.
 - c. Topcoat: Interior latex (flat).
- H. Gypsum Board Substrates:
 - 1. Latex System: MPI INT 9.2A.
 - a. Prime Coat: Interior latex primer/sealer.
 - b. Intermediate Coat: Interior latex matching topcoat.
 - c. Topcoat: Interior latex (flat).

END OF SECTION 099123