LEASE AGREEMENT
(With Option to Purchase)

Between

ALLIANCE WASATCH I, LLC,
a California limited liability company

As Landlord

and

KING COUNTY,
a political subdivision of the State of Washington

As Tenant

April 1, 2010
King County Transit Oriented Development
Parking Garage Project
Burien, Washington

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THIS LEASE AGREEMENT (WITH OPTION TO PURCHASE) ("**Lease**") dated for reference purposes as of April l, 2010 is by and between ALLIANCE WASATCH I, LLC, a California limited liability company qualified to do business in the State of Washington ("**Landlord**") and KING COUNTY, a political subdivision of the State of Washington ("**Tenant**"), with reference to the following facts:

RECITALS

A. In January of 1998, Tenant adopted a Transit Oriented Development Program (T.O.D) to encourage public or private development that creates new mixed-income housing development, including related commercial activity in close proximity to transit facilities and services to increase ridership of Tenant's metropolitan public transportation system, decrease automobile trips and traffic congestion and provide additional fare revenue to support metropolitan public transportation services through King County.

B. Pursuant to its Request for Proposals – Burien Downtown Park & Ride, Lot A: Mixed Use Development No. 1180-07 dated December 13, 2007, as amended (the "**RFP**"), Tenant requested proposals from developers for a project that would provide the greatest financial returns to Tenant, replace essential commuter parking with up to five hundred (500) stalls (the "**Garage**"), provide approximately 80 units of new affordable housing for residents of King County (the "**Mixed-Use Housing Project**") and promote the City of Burien's downtown development vision, on five (5) acres of real property owned by Tenant in the city of Burien, King County, Washington (the "**Land**") in one or more phases. The Garage and the Mixed-Use Housing Project are hereinafter referred to collectively as the "**Burien T.O.D. Project**". The Land is currently used as a park and ride lot containing 345 parking stalls. The Land is located immediately adjacent to a newly constructed regional transit center owned by Tenant which serves residents of the city of Burien and surrounding communities.

C. Landlord submitted its Response to Tenant's Request for Proposals dated March 25, 2008, whereby Landlord proposed to develop the Burien T.O.D. Project on the Land in phases, with construction of the Garage on a portion of the Land for lease and possible purchase by Tenant as Phase I and redevelopment by Landlord of the remainder of the Land with the Mixed-Use Housing Project as Phase II. The Mixed-Use Housing Project is the critical component of the Burien T.O.D. Project and Tenant would not have entered into the Ground Lease (defined below) or this Lease but for the agreement by Landlord to enter into an exclusive right to negotiate an agreement with the Tenant (the "**Exclusive Negotiation Agreement**") whereby Landlord and Tenant will agree to negotiate the terms and conditions under which Landlord will develop the Mixed-Use Housing Project on a portion of the Land. Economic circumstances arising after the issuance of the RFP adversely impacting the housing and credit markets in King County have necessitated a phased development of the Burien T.O.D. Project.

D. In order to accommodate the development of the Burien T.O.D. Project in Phases, Tenant intends to short plat the Land into two legal lots consisting of the Garage Land and the Housing Land, each as defined below. Concurrently herewith, Tenant shall enter into a ground

lease of the Land to Landlord as ground lessee on the express condition that Landlord execute this Lease and agree to design, develop, finance, construct and complete the Garage on the Land and thereafter lease the Garage together with the Landlord's rights in the Land (the "**Premises**") to Tenant at the Monthly Rent, for the Term and on the other terms and conditions hereinafter set forth. The design, development, construction, financing, and equipment of the Garage on the Premises is hereinafter referred to as the "**Project**".

E. Landlord acknowledges that the Land currently consists of a single legal lot and that initially the Premises shall constitute the entirety of the Land. Tenant shall cause the Land to be short platted into a minimum of two lots, one of which will consist of the Garage Land and the remainder of which will constitute the Housing Land, with the approximate locations of each lot to be as depicted on the map attached hereto as **Exhibit C-2**. Upon completion of the short plat of the Land creating the Garage Land and the Housing Land, the legal description of the Garage Land and the Housing Land shall be attached to this Lease as **Exhibits D** and **E** respectively. Following completion of the short plat Landlord and Tenant shall amend both the Ground Lease and this Lease to exclude the Housing Land from the definition of real property demised thereunder. The Construction Loan and the Deed of Trust shall expressly provide for the partial release of the Garage Land from the lien of the Deed of Trust upon Closing.

F. Tenant is authorized by KCC 4.56.160, RCW 36.34.205 and Chapter 35.42 RCW to acquire facilities including public parking garages by means of a lease/leaseback that contains an option to purchase. The execution by Tenant of the Ground Lease, this Lease, and the Exclusive Negotiation Agreement which together will require the redevelopment of the Land with the Burien T.O.D. Project, a phased transit oriented development consisting of the Garage and the Mixed-Use Housing Project, will promote the pubic welfare, provide additional public parking for single-trip transit commuters, provide additional safe and affordable housing for residents of King County in close proximity to existing transit facilities and advance other important public purposes.

G. Tenant desires to lease from Landlord and Landlord desires to lease to Tenant the Premises (as defined below) on the terms and conditions set forth in this Lease; provided, however, that in no event shall Tenant be liable for all or any part of the cost of design, development or construction of the Project, nor shall Tenant be liable for payment of Monthly Rent under this Lease until Substantial Completion of the Project.

H. Tenant is authorized to enter into the Ground Lease, this Lease and the Exclusive Negotiation Agreement by Ordinance 2009-0456 enacted by the King County Council on February ___, 2010.

NOW, THEREFORE, in consideration of the foregoing recitals and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, Landlord and Tenant agree as follows:

AGREEMENT

1. Incorporation of Recitals; Definitions. Each recital set forth above is incorporated into this Lease as though fully set forth herein. All capitalized terms not otherwise defined in the Recitals or elsewhere in this Lease, shall have the meaning set forth in this Section 1:

1.1 "**ADA**" means the Americans With Disabilities Act of 1990, as amended from time to time.

1.2 "**Additional Rent**" means any monetary sum required to be paid by Tenant to Landlord under the provisions of this Lease (other than Monthly Rent).

1.3 "**Architect**" means Pyatok Architects, Inc., the architect for the Project selected by Landlord with Tenant's approval.

1.4 "**Business Day**" means any day other than a Saturday, Sunday, legal holiday or day that Tenant's offices are closed by order of the King County Executive.

1.5 "**Certificate of Occupancy**" means the temporary certificate of occupancy issued by the City to Landlord certifying that the Garage may be occupied for the Permitted Use.

1.6 "**Certificates**" means any certificates of participation in Monthly Rent executed and delivered by the Trustee pursuant to the Trust Agreement.

1.7 "**Change Orders**" means any Landlord-Initiated Change Orders and any Tenant-Initiated Change Orders.

1.8 "**City**" means the City of Burien, Washington, a municipal corporation.

1.9 "**Closing**" means (i) with respect to the Option to purchase the Garage as set forth in Section 22, the delivery to Escrow Agent of all documents and funds required to be delivered to complete the purchase and sale of the Garage in accordance with the provisions of Section 22 hereof, and (ii) with respect to the assignment of this Lease to the Trustee in connection with the issuance of the Certificates as provided in Section 4.4 hereof, the delivery of documents and funds required to be delivered by Landlord, Tenant and Trustee to complete the assignment of the Ground Lease and this Lease to Trustee and payment of the Option Price to Landlord in connection with such assignment.

1.10 "**Closing Date**" means the date on which the Closing occurs.

1.11 "**Commencement Date**" means the date of Substantial Completion of the Project, which is also the date upon which Tenant's obligation to pay Monthly Rent hereunder commences.

1.12 "**Commencement of Construction**" means the later of (a) the date Tenant notifies Landlord that the Conditions Precedent set forth in Section 6 of this Lease have been met or waived in writing by Tenant, (b) the date Landlord executes and delivers to the General Contractor the notice to proceed attached to the General Construction Contract, or (c) the

commencement of mobilization, site preparation, grading, excavation for foundations of buildings or other structures to be constructed as part of the Project or any combination of such events occurs.

1.13 "**Construction Contracts**" means (i) the General Construction Contract, and (ii) all other contracts for construction services entered into between Landlord and any Contractor, including the General Contractor, for construction of any other portion of the Project not covered by the General Construction Contract.

1.14 "**Construction Documents**" mean the Construction Drawings and Detailed Specifications approved by Landlord and Tenant pursuant to Section 9.3 below, for the construction of the Project, including technical drawings, schedules, diagrams, plans and specifications setting forth in detail the requirements for construction of the Project and providing information customarily required for the use of the building trades.

1.15 "**Construction Drawings**" means drawings setting forth in detail the requirements for the construction of the Project. As used herein, the term "Construction Drawings" includes all graphic and pictorial documents depicting the design, location and dimensions of the Project and includes plans, elevations, sections, details, schedules and diagrams for the Project.

1.16 "**Construction Lender**" means a state or national bank, insurance company, pension fund, credit union or other major financial lending institution or other entity generally recognized as a source of mortgage financing with total assets as of the date of its most recent available financial statement of at least One Hundred Million Dollars ($100,000,000).

1.17 "**Construction Loan**" means a loan obtained by Landlord from the Construction Lender in an amount not to exceed the Fixed Price for the purpose of providing for the payment of Project Costs.

1.18 "**Contract Documents**" means the Construction Documents, the Construction Contracts and the other documents identified as Contract Documents in the General Construction Contract.

1.19 "**Contractors**" means the General Contractor and any other construction contractors with whom Landlord enters into direct contracts, or with whom General Contractor on behalf of and acting as the Landlord's agent, contracts for the Project.

1.20 "**Deed of Trust**" means any mortgage or deed of trust encumbering Landlord's leasehold interest under the Ground Lease and this Lease executed by Landlord in favor of Construction Lender to secure the Construction Loan.

1.21 "**Design Development Drawings**" means drawings that are a consistent development of the Schematic Drawings and further define and describe all important aspects of the Project. The Design Development Drawings will serve as the basis for the Construction Drawings.

1.22 "**Detailed Specifications**" means all written detailed requirements for materials, equipment, construction systems, standards and workmanship for the construction of the Project.

1.23 "**Effective Date**" means the date that Tenant notifies Landlord that the conditions precedent set forth in Section 6 of this Lease have been met or waived and Landlord has been authorized to proceed in writing by Tenant.

1.24 "**Environmental Laws**" means, as amended from time to time, the Federal Resource Conservation and Recovery Act of 1976, 42 U.S.C. § 6901 et seq., Federal Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. § 9601 et seq., Federal Hazardous Materials Transportation Control Act, 42 U.S.C. § 1801 et seq., Federal Clean Air Act, 42 U.S.C. § 7401 et seq., Federal Water Pollution Control Act, Federal Water Act of 1977, 93 U.S.C. § 1251 et seq., Federal Insecticide, Fungicide and Rodenticide Act, Federal Pesticide Act of 1978, 7 U.S.C. § 136 et seq., Federal Toxic Substances Control Act, 15 U.S.C. § 2601 et seq., Federal Safe Drinking Water Act, 42 U.S.C. § 300f et seq., Washington Water Pollution Control Act, RCW ch. 90.48, Washington Clean Air Act, RCW ch. 70.94, Washington Solid Waste Management Recovery and Recycling Act, RCW ch. 70.95, Washington Hazardous Waste Management Act, RCW ch. 70.105, Washington Hazardous Waste Fees Act, RCW ch. 70.95E, Washington Model Toxics Control Act, RCW ch. 70.105D, Washington Nuclear Energy and Radiation Act, RCW ch. 70.98, Washington Radioactive Waste Storage and Transportation Act of 1980, RCW ch. 70.99, Washington Underground Petroleum Storage Tanks Act, RCW ch. 70.148.

1.25 "**Escrow Agent**" means the Title Company or another nationally recognized title insurance company selected by Landlord and not objected to by Tenant which shall provide escrow services and issue the Title Policy to be delivered to Tenant in connection with the Closing.

1.26 "**Events of Default**" has the meaning set forth in Section 24 and 25 of this Lease.

1.27 "Exclusive Negotiation Agreement" means that certain agreement which grants Alliance Wasatch I, LLC the exclusive right to negotiate with King County the terms of a ground lease of the Housing Land for development of the Mixed-Use Housing Project thereon.

1.28 "Execution Date" means the date that this Lease has been fully executed, acknowledged for delivered by both Landlord and Tenant.

1.29 "**Expiration Date**" means the earliest of: (l) the date which is twenty-five (25) years after the Commencement Date; or (ii) the date on which the Ground Lease is terminated as a result of payment or defeasance in full of all Monthly Rent set forth on **Exhibit A** hereto; or (iii) any date on which this Lease terminates in accordance with its terms.

1.30 "**Final Completion of the Project**" means that the following events have occurred with respect to the Project:

(a) Substantial Completion of the Project (as defined in Section 1.72~~1.73~~ of this Lease) has occurred;

(b) The City has issued a final, unconditional Certificate of Occupancy, such that Tenant is permitted to and could physically occupy the Project for the Permitted Use.

(c) Each Contractor shall have issued its "Certificate of Substantial Completion" together with its Affidavit of Payment of Debts and Claims (AIA Forms 706 and 706A), and all Contractors and their subcontractors performing work on the Project have executed and delivered final waivers and releases of lien in form satisfactory to Landlord and Tenant.

(d) All Punch List items have been completed.

(e) Landlord shall have submitted evidence reasonably satisfactory to Tenant that all construction costs have been paid in full, including evidence of full payment for any personal property installed on the Garage Land as part of the Project Costs.

(f) The period for filing construction liens has expired or releases or discharges of construction liens in form and substance satisfactory to Tenant have been obtained by the Landlord from all Contractors and their subcontractors performing work on the Project in accordance with all Construction Contracts.

(g) Architect shall have issued its "Certificate of Final Completion" and the Tenant shall have received the certificate of any other architect or engineer requested by the Tenant.

(h) The General Contractor shall have issued a certificate that (i) the Project has been finally completed in substantial accordance with the Contract Documents, and (ii) no Hazardous Substances as defined in said certificate were incorporated into the structure of the Project.

(i) Tenant shall have received an endorsement to its Title Policy dated as of and issued on the date of Final Completion of the Project, which shall insure Tenant: (i) against any liens for labor or materials, whether or not of record, which may have arisen in connection with the construction of the Project, and (ii) show no additional exceptions to its Title Policy, if any, other than those approved by or arising through Tenant.

(j) All signage and graphics required under the Construction Documents has been installed in the Garage, all security systems have been installed and are operational, the Garage is no longer in use as a construction staging area for the storage of construction materials, machinery and equipment or to provide temporary parking for construction workers' automobiles and equipment and the entire Garage is open to members of the general public for the parking of vehicles.

(k) Each Contractor who has performed work on the Project shall have submitted its statements of intent to pay prevailing wages and affidavits of wages paid to the date of Final Completion of the Project and copies of all other documentation required by Chapter 39.12 RCW and/or the Davis Bacon Act, as applicable. Landlord has delivered Tenant its affidavit that the Construction Contracts with Contractors and subcontractors of such

Contractors for the Project required such parties to pay prevailing wages in accordance with Section 9.5.5 below, and Landlord shall have provided evidence reasonably satisfactory to Tenant that the Project has been designed, developed and constructed in accordance with the relevant provisions of the FTA Requirements set forth in **Exhibit M** attached hereto and by the reference incorporated herein; and

(l) Landlord shall have completed and delivered the matters required under Section 9.10 of this Lease.

1.31 "**Financing Costs**" means all costs incurred by Landlord in obtaining financing for the Project, including, but not limited to loan fees, origination fees, appraisal fees, legal fees, interest and all other costs incurred or payable by Landlord to obtain financing for the Project, including any and all amounts payable to Construction Lender in connection with the Construction Loan or the Security Documents.

1.32 "**Fixed Price**" means $20,518,000.00.

1.33 "**Garage**" means the five-story parking structure containing a minimum of 503 parking stalls to be constructed on the Land as part of the Project. The Garage is more particularly described in the Preliminary Plans and Outline Specifications, a schedule of which is attached hereto as **Exhibit B** and by this reference incorporated herein.

1.34 "**Garage Land**" means that portion of the Land on which the Garage will be located. The legal description of the Garage Land will be attached to this Lease as **Exhibit D** upon completion of the short plat of the Land as described in Section 2.4 of the Ground Lease.

1.35 "**General Construction Contract**" means the design-build agreement between Landlord and the General Contractor for construction of the Project, which shall provide a Guaranteed Maximum Construction Price.

1.36 "**General Contractor**" means Charles Pankow Builders, Ltd., a California limited partnership, which has registered as a foreign limited partnership authorized to transact business in the State of Washington and which is a duly licensed general contractor in the State of Washington, the design-build contractor for the Project selected by Landlord with Tenant's approval.

1.37 "**Ground Lease**" means the ground lease of the Land entered into or to be entered into of even date herewith, by and between Alliance Wasatch I, LLC, as the ground lessee and King County as the ground lessor, as the same may be amended or modified from time to time.

1.38 "**Guaranteed Maximum Construction Price**" means the maximum cost for design and construction of the Project as guaranteed by the General Contractor pursuant to the terms of the General Construction Contract.

1.39 "**Hazardous Substances**" means any material, waste, substance, industrial waste, toxic waste, chemical contaminant, petroleum, asbestos, polychlorinated biphenyls, radioactive materials, or other substances regulated or classified by Environmental Laws as hazardous, toxic or lethal to persons or property.

1.40 "**Housing Land**" means that portion of the Land on which the Mixed-Use Housing Project will be located. The legal description of the Housing Land will be attached to this Lease as **Exhibit E** upon completion of the short plat of the Land as described in Section 1.4 of the Ground Lease.

1.41 "**Land**" means the real property on which the Burien T.O.D. Project will be developed in phases, as more particularly described in **Exhibit C-1** attached hereto and by this reference incorporated herein.

1.42 "**Landlord**" means Alliance Wasatch I, LLC, a California limited liability company, qualified to do business in the State of Washington, whose sole members are Alliance Property Group Inc., a California corporation, and Wasatch Advantage Group LLC, a Utah limited liability company.

1.43 "**Landlord-Initiated Change Order**" means Change Orders during the construction of the Project that are initiated by Landlord pursuant to Section 9.6.

1.44 "**Laws**" mean any constitution, statute, ordinance, regulation, rule, resolution, judicial decision, administrative order or other requirement of any federal, state, county, municipal or other governmental agency or authority having jurisdiction over the parties or the Premises, or both, in effect either at the time of execution of this Lease or at any time during the Term, including without limitation, any regulation or order of a quasi official entity or body (e.g., board of fire examiners or public utilities) including, but not limited to Environmental Laws and all rules, laws and regulations issued thereunder, as the same may be amended from time to time.

1.45 "**Lease**" means this Lease between Alliance Wasatch I, LLC as Landlord and King County as Tenant, as the same may be amended or modified from time to time.

1.46 "**Lease Year**" means each succeeding year of the Term, commencing with the Commencement Date and ending with the date which is one (1) day less than one (1) year later.

1.47 "**Liens**" means any lien, charge, security interest or encumbrance, including the Security Documents, which may be attached to, upon or against the Premises or any portion thereof.

1.48 "**Mixed-Use Housing Project**" has the meaning set forth in Recital B of this Lease.

1.49 "**Monthly Rent**" means the rent payable by Tenant under this Lease from the Commencement Date to and including the Expiration Date in the amounts for each Lease Year as set forth on the Schedule of Monthly Rent attached hereto as **Exhibit A** and by this reference incorporated herein, as such Schedule may be amended from time to time.

1.50 "**Notice Address**" means as to each of the parties its respective address as specified in Section 34.7 of this Lease.

1.51 "**Notice Parties**" means each of Landlord, Tenant and Construction Lender.

1.52 "**Option**" means Tenant's Option to purchase the Premises as provided in Section 22 of this Lease.

1.53 "**Option Price**" means the Fixed Price less all sums paid by Tenant as Monthly Rent under this Lease payable on the Closing Date.

1.54 "**Outside Completion Date**" means twenty-four (24) months after the Effective Date.

1.55 "**Permits**" means all land use permits, authorizations and approvals required for construction of the Project.

1.56 "**Permitted Liens**" means the Security Documents.

1.57 "**Permitted Use**" has the meaning given to it in Section 7 of this Lease.

1.58 "**Permitted Exceptions**" has the meaning set forth in Section 21.3 of this Lease.

1.59 "**Person**" means a natural person, corporation, trust, partnership, limited partnership, limited liability company, governmental subdivision or agency, municipal corporation, city, state or other legal entity.

1.60 "**Preliminary Plans and Outline Specifications**" are the initial renditions for the Garage, a schedule of which Preliminary Plans and Outline Specifications is attached hereto as **Exhibit B** and by this reference incorporated herein.

1.61 "**Premises**" means the entirety of the Garage to be constructed on the Land together with a leasehold interest in the Land pursuant to the Ground Lease. From and after the completion of the short plat of the Land into the Garage Land and the Housing Land, the Premises shall mean the entirety of the Garage to be constructed on the Garage Land together with a leasehold interest in the Garage Land pursuant to the Ground Lease.

1.62 "**Project**" means the total design, development, permitting, financing, construction and equipping of the Garage, including, without limitation, all site work, landscaping, offsite improvements and road improvements, all utility relocation and installation of utilities as required to serve the Project, all professional design services and all labor, material, supplies and equipment used or incorporated in such design and construction of the Garage and ancillary improvements to be constructed on the Land. The Project shall include work which is consistent with and reasonably inferable from the approved Project Requirements as being necessary to produce the intended results.

1.63 "**Project Contingency**" means the contingency by that name set forth in the Project Budget.

1.64 "**Project Costs**" means all costs for the design, development, permitting, financing and construction of the Project, including, without limitation, all site work, landscaping, off-site improvements and road improvements, all work and other improvements required under Permits, utility relocation and installation of utilities as required to serve the

Project, all Permit fees, all costs of the Garage, HVAC electrical and other building systems, all costs of fixtures, furnishing and equipment, if any, described in the Construction Documents, all costs of architectural services provided by the Architect, all other professional design and other services provided by Architect, Contractors or other professionals engaged by Landlord or General Contractor, all amounts paid to General Contractor under the General Construction Contracts including all labor, materials, supplies and equipment used or incorporated in such design and construction, all amounts paid to other Contractors and subcontractors, if any, under any other Construction Contract or subcontract entered into by Landlord or by General Contractor including all labor, materials, equipment used or incorporated in such design and construction, services provided by engineers, attorneys, accountants, environmental consultants, surveyors and other professionals and consultants retained by Landlord or General Contractor in connection with the Project, Landlord's development fees, Landlord's overhead, general expenses, salaries or other compensation of Landlord's personnel or of General Contractor's personnel whether situated at Landlord's principal office, General Contractor's principal offices or otherwise and other administrative costs, real estate brokerage and leasing commissions, if any, and all other costs incurred in connection with the Project Financing Costs, Project Contingency, insurance, applicable state and local retail sales, business and occupation and other taxes (including real property taxes and assessments accruing from the Effective Date to Substantial Completion of the Project).

1.65 "**Project Requirements**" means the Preliminary Plans and Outline Specifications, those portions of the RFP dealing with the Garage, the FTA Requirements and other requirements for the Project specifically agreed to by Landlord and Tenant.

1.66 "**Project Schedule**" means the schedule for the Project as revised from time to time by General Contractor and Landlord; provided, however, that in no event shall the Project Schedule provide for Substantial Completion of the Project to occur later than the Required Completion Date without the consent of Tenant. The initial Project Schedule is set forth in **Exhibit G** attached hereto and by this reference incorporated herein.

1.67 "**Punch List**" means a list of items required to be completed prior to Final Completion of the Project that are minor items which do not affect Landlord's ability to lease the Premises to Tenant and do not affect Tenant's ability to use the Premises for its Permitted Use.

1.68 "**Required Completion Date**" means a date no later than twelve (12) months after the Effective Date. The Required Completion Date shall be extended to the extent of (i) Unavoidable Delays; and (ii) delays incurred as a result of the time required to remediate Hazardous Substances existing in, on or emanating from the Land and discovered during the construction of the Project, provided Landlord shall use reasonable efforts to minimize the impact on the Project Schedule due to such remediation; provided, however, that extensions due to Unavoidable Delay or delays resulting from remediation of such pre-existing Hazardous Substances shall not exceed twelve (12) months.

1.69 "**Requirements of Law**" means all requirements relating to land and building construction (including those specifically applicable to Tenant's contemplated use of the Premises for its Permitted Use), including, without limitation, planning, zoning, subdivision, environmental, air quality, flood hazard, fire safety, accessibility, and other governmental

approvals, permits, licenses and/or certificates as may be necessary from time to time to comply with all the foregoing, all Federal Transit Administration rules, regulations and requirements, including but not limited to those attached hereto as **Exhibit M** and by this reference incorporated herein, and other applicable statutes, rules, orders, regulations, laws, ordinances, and covenants, conditions and restrictions, which now apply to and/or affect the design, construction, existence, intended use, operation and/or occupancy of the Garage Land, the Premises or any part thereof.

1.70 "**Security Documents**" means the Deed of Trust, and all other documents as may be required by Construction Lender in connection with the Construction Loan to finance the Project Costs.

1.71 "**Subordination Agreement**" means the Subordination, Non-Disturbance and Attornment Agreement to be executed by Landlord, Tenant and Construction Lender in the form attached hereto as **Exhibit K** and by this reference incorporated herein.

1.72 "**Substantial Completion**" means that the Project is Substantially Complete and each of the following events shall have occurred with respect to the Project:

(a) General Contractor shall have notified Landlord and Tenant in writing that the Project is Substantially Complete in substantial accordance with the Contract Documents, subject only to the completion of normal Punch List items;

(b) Architect shall have issued its "Certificate of Substantial Completion" (AIA Document G704) stating that the work under the General Construction Contract is sufficiently complete in substantial accordance with the Contract Documents to permit Tenant to occupy or utilize the Garage for its Permitted Use;

(c) The City has issued a temporary certificate of occupancy such that Tenant is permitted to and could, pursuant to such issued certificate of occupancy, physically occupy the Garage for its Permitted Use;

(d) Tenant has received satisfactory evidence from Landlord that all real property taxes and assessments payable on the Premises have been paid;

(e) Each Contractor shall have issued its "Certificate of Substantial Completion" together with its "Affidavit of Payment of Debts and Claims" (AIA Forms 706 and 706A), together with partial waivers and releases of lien for work performed prior to the date of its "Certificate of Substantial Completion" in form and substance satisfactory to Tenant;

(f) Each Contractor who has performed work on the Project shall have submitted its statements of intent to pay prevailing wages and affidavits of wages paid to the date of Substantial Completion and copies of all other documentation required by Chapter 39.12 RCW and/or the Davis Bacon Act, as applicable. Landlord has delivered Tenant its affidavit that the Construction Contracts with Contractors and subcontractors of such Contractors for the Project required such parties to pay prevailing wages in accordance with Section 9.5.5 below,

and Landlord shall have provided evidence reasonably satisfactory to Tenant that the Project has been designed, developed and constructed in accordance with all relevant provisions of the FTA Requirements set forth in **Exhibit M** attached hereto and by the reference incorporated herein; and

(g) Tenant shall have accepted the Project as Substantially Complete, subject to completion of the Punch List items agreed upon with Landlord.

1.73 "**Substantially Complete**" means that the Garage has been constructed in substantial accordance with the Contract Documents and: (a) all elements required for the functioning of the Garage shall be operational and in good working order and condition including satisfying applicable ADA building requirements and the Washington State Law Against Discrimination, RCW ch. 49.60, as well as regulations adopted thereunder; (b) the Garage shall be weather tight and waterproof; (c) the fire and life safety systems within the Garage shall be operational and in good working order and condition; (d) the elevators within the Garage shall operate and function in good working order and condition, but may still require touch up installation and cleaning; (e) the mechanical and electrical systems, including the HVAC system, if any, shall be individually tested and in good working order able to support the Garage and shall also be tested to assure that the Garage systems operate on an integrated basis, but the HVAC system may still require final balancing work; (f) the finish work is substantially completed, including, but not limited to public entryways, elevators, doors and other partitions and the HVAC, plumbing, fire and life safety, sprinkler and electrical systems have been installed and are in good working order and condition, and all construction debris has been removed; (g) all site utilities, sidewalks and landscaping are substantially completed and construction barricades and equipment have been removed; (h) all Garage elevators and lobbies and all entrances and exits to the Garage are completed; (i) the access and security systems for the Garage are installed and operational, except in each case minor Punch List items which do not materially affect use and occupancy of the Garage for the Permitted Use.

1.74 "**Taxes**" means all real property taxes and assessments (including assessments for special improvements), license and permit fees, charges for public utilities, leasehold excise taxes, other excise taxes, levies, sales, use and occupancy taxes, any tax or charge assessed against the Monthly Rent or fair market value of the Premises and any taxes levied or assessed in addition to or in lieu of, in whole or in part, such taxes, assessments or other charges and all other governmental impositions and charges of every kind and nature, general and special, ordinary and extraordinary, foreseen and unforeseen of every character (including interest and penalties thereon) which at any time from and after the Effective Date of this Lease may be imposed, levied upon or assessed against or which arise with respect to or constitute a lien upon the Land, Project or the Premises (or any part thereof), the leasehold estate created by this Lease or the Ground Lease any part thereof, or any estate, right or interest therein, or any occupancy, use or possession of or activity conducted on the Premises or any part thereof. Taxes shall not include any tax computed on the basis of Landlord's net income.

1.75 "**Tenant**" means King County, a political subdivision of the State of Washington, and its successors and permitted assigns as the tenant under this Lease.

1.76 "**Tenant-Initiated Change Order**" means Change Orders that are initiated by Tenant pursuant to Section 9.6.

1.77 "**Tenant's Project Manager**" means the project manager for the Project identified by the Tenant's Department of Construction and Facilities Management, or his or her designee.

1.78 "**Term**" means the period beginning on the Commencement Date and ending on the Expiration Date.

1.79 "**Title Company**" means Chicago Title Insurance Company, which will be issuing the Title Policy.

1.80 "**Title Policy**" has the meaning set forth in Section 21.3 below.

1.81 "**Trust Agreement**" means the trust agreement executed by Trustee and Tenant in connection with the execution and delivery of the Certificates.

1.82 "**Trustee**" means a national bank or other financial institution with trust powers selected by Tenant to enter into the Trust Agreement and issue the Certificates in Monthly Rent or any duly authorized successor thereto appointed pursuant to the Trustee Agreement.

1.83 "**Unavoidable Delays**" means any delay in the performance by Landlord or General Contractor of its obligations with respect to the Project caused by strikes (other than those directly caused by the acts or omissions of Landlord or the General Contractor or the failure by the Landlord or the General Contractor to bargain in good faith), acts of God, unusually inclement weather, unavoidable casualties and similar causes beyond the reasonable control of Landlord or General Contractor which, after the exercise of due diligence to mitigate the effects thereof, delay construction of the Project, other than such delays resulting from (a) Landlord's failure to comply with the terms and provision of this Lease; (b) General Contractor's failure to comply with the terms of the General Construction Contract; (c) increased prices, or (d) unavailability of funds. Unavoidable Delays will entitle Landlord to request an extension of the Required Completion Date (not to exceed a total of twelve (12) months) but will in no way entitle Landlord to any increase in Monthly Rent or any increase in the Fixed Price or the Option Price.

1.84 "**Utilities**" means all utilities and services furnished to the Premises, including without limitation, gas, electricity, water, sewer, garbage collection, and telephone service.

1.85 "**Warranty Period**" means that period commencing on the date of Final Completion of the Project and expiring two (2) years thereafter.

2. Premises. Landlord leases to Tenant and Tenant leases from Landlord the Premises for the Term.

3. Term. The Term shall commence on the Effective Date and shall expire on the Expiration Date, unless sooner terminated as provided herein; provided, however, that the obligation of Tenant to pay Monthly Rent shall not commence until the Commencement Date.

Landlord and Tenant shall confirm the Commencement and Expiration Dates by executing within fifteen (15) days after the Commencement Date, a written Confirmation of Commencement and Expiration Dates in the form attached hereto as **Exhibit H** and by this reference incorporated herein, which Confirmation of Commencement and Expiration Dates shall become a part of this Lease and be binding upon Landlord and Tenant to establish the actual Commencement and Expiration Dates of the Term. Notwithstanding that the obligation of Tenant to pay Monthly Rent under this Lease shall not commence until the Commencement Date, all of the other terms and provisions of this Lease shall be effective from and after the Effective Date (except as otherwise provided herein).

4. Monthly Rent.

4.1 Obligation to Pay Rent. Commencing on the first Business Day of the first month following the Commencement Date and on the first Business Day of each and every month thereafter during the Term, Tenant shall pay to Landlord or as Landlord may otherwise direct in writing and without deduction, offset, prior notice or demand, an amount equal to Monthly Rent as set forth on the schedule of Monthly Rent attached hereto as **Exhibit A** and this reference incorporated herein; provided, however that the first payment of Monthly Rent shall also include an amount in arrears for the Monthly Rent due and owing from the Commencement Date through and including the last day of the month preceding such first payment date.

4.2 Proration of Rent. Monthly Rent for any partial month shall be prorated on a daily basis at the rate of 1/30 of the Monthly Rent. All payments of Monthly Rent under this Lease shall be paid in lawful money of the United States and in immediately available funds. In the event that the date on which Monthly Rent is due is not a Business Day, such Monthly Rent shall be due on the following Business Day.

4.3 Rent a General Obligation. Tenant's obligation to pay Monthly Rent constitutes a limited tax general obligation of Tenant. Tenant irrevocably covenants and agrees that it will include in its annual budget and levy taxes annually on all taxable property within King County, within and as a part of the tax levy permitted to Tenant without a vote of the electors, amounts sufficient, together with all other money legally available and to be used therefor, to pay Monthly Rent as the same shall become due. The full faith, credit and resources of Tenant are irrevocably pledged for the annual levy and collection of such taxes and the prompt payment of Monthly Rent.

4.4 Prepayment of Monthly Rent through Issuance of Certificates. Landlord and Tenant acknowledge that it is Tenant's intent that Certificates will be issued as a means to pay Landlord the Option Price, from which amount Landlord shall repay the Construction Loan, if Tenant has not exercised its option to purchase the Premises pursuant to Sections 21 and 22 hereof within sixty (60) days following the Substantial Completion of the Project.

(a) Tenant shall have the right to arrange for the issuance of Certificates to provide long-term financing for the Project in an amount sufficient to pay the Option Price. Tenant shall notify Landlord in writing within sixty (60) days following the Substantial Completion of the Project of Tenant's intent to issue the Certificates, the name of the Trustee who will become the successor in interest to Landlord's right, title and interest under the

Ground Lease and this Lease as to the Garage Land, and the name of the underwriter that will underwrite the Certificates (the "**Notice of Intent to Issue Certificates**"). In the event Tenant delivers Landlord the Notice of Intent to Issue Certificates, Tenant will use its best efforts to cause the issuance of the Certificates and payment of the Option Price to Landlord within ninety (90) days thereafter; provided, however, that in no event shall Closing or issuance of the Certificates occur prior to the Final Completion of the Project.

(b) In the event that Tenant has not exercised its option to purchase the Premises pursuant to Sections 21 and 22 hereof or has not delivered the Notice of Intent to Issue Certificates provided in Section 4.4(a) above within seventy-five (75) days following the Substantial Completion of the Project, then Landlord may elect to arrange for the issuance of the Certificates. The Landlord shall notify Tenant of its intent to exercise its right to cause issuance of the Certificates pursuant to this Section 4.4(b) not less than ninety (90) days prior to the expected Closing Date for the issuance of such Certificates. Such Certificates shall be issued in a principal amount equal to the anticipated Option Price as of the Closing Date, with all reasonable and typical costs of issuing the Certificates to be paid by Tenant. Tenant agrees to cooperate with Landlord in the issuance of the Certificates, including providing information on the Tenant for any offering circular, entering into an ongoing disclosure agreement and executing customary certifications; provided, however, that in no event shall Closing or issuance of the Certificates occur prior to the Final Completion of the Project.

(c) On the Closing of the issuance of the Certificates and payment of the Option Price to Landlord, all right, title and interest of Landlord under the Ground Lease and this Lease as to the Garage Land shall be assigned to Trustee. Tenant hereby consents to such assignment and from and after the Closing, Tenant shall make future payments of Monthly Rent directly to the Trustee. The Trustee shall be directed to pay Landlord the Option Price calculated as of the Closing Date in immediately available funds from the proceeds from the sale of the Certificates. Landlord shall execute such amendments to this Ground Lease and this Lease as Tenant or Trustee may request in order to cause the issuance of the Certificates, including an amended Schedule of Monthly Rent designating principal and interest components corresponding to principal and interest payments for the Certificates, so long as such amendments do not materially increase Landlord's obligations under the Ground Lease or this Lease. Tenant agrees to pay the reasonable and typical costs of issuing the Certificates. Upon the assignment of its rights under the Ground Lease and this Lease as to the Garage Land to Trustee, Landlord shall cause its interests in the Premises, the Ground Lease and this Lease as to the Garage Land to be released from any lien arising under the Security Documents or other claim in favor of Construction Lender and Landlord shall be relieved from any obligation under the Ground Lease or this Lease as to the Garage Land arising from any event occurring after the date of such assignment, other than those obligations which by their terms are expressly intended to remain Landlord's obligations after the assignment to Trustee, including, but not limited to Landlord's obligations with respect to any representations and warranties made with respect to the Project during the Warranty Period.

5. Taxes and Utilities.

5.1 Payment of Taxes by Landlord. Landlord shall be responsible for the payment of all Taxes from the Effective Date to the date prior to the Commencement Date of this Lease.

Landlord shall pay all Taxes directly to the applicable governmental agency prior to delinquency and shall provide proof of such payment promptly to Tenant upon request.

5.2 Payment of Taxes by Tenant. From and after the Commencement Date, Tenant shall pay all Taxes directly to the applicable governmental agency prior to delinquency and shall provide proof of such payment promptly to Landlord upon request. To the extent Taxes or other charges can be paid in installments, Tenant may pay such Taxes in installments and shall only be liable for Taxes which accrue from and after the Commencement Date. With respect to any general or special assessments which may be levied against or upon the Premises, or which under the Laws then in force may be evidenced by improvements or other bonds or may be paid in annual installments, only the amount of such annual installment, and interest due thereon, shall be included within the computation of Taxes.

5.3 Real Property Tax Statements. Tenant shall make appropriate arrangements to receive directly from the applicable governmental agency assessment notices and real property tax statements for the current year and Tenant shall provide a copy thereof to Landlord within five (5) days following receipt of such assessment notices or tax statements.

5.4 Right to Contest Taxes. If Landlord receives prior notice that an appraisal of the Premises, or any portion thereof, will be conducted for real property tax purposes, Landlord shall so notify Tenant and permit Tenant to be present during such appraisal if Tenant so elects. Tenant shall have the right in Landlord's name and stead, and at Tenant's sole expense, to contest the validity or amount of any real property taxes. Landlord shall cooperate with Tenant and provide reasonable assistance with respect to any such contest, including, without limitation, such information and supporting documents as may be reasonably requested by Tenant. Notwithstanding any provision of this Lease to the contrary, Tenant shall not be required, nor shall Landlord have the right, to pay, discharge or remove any such real property tax so long as no Event of Default has occurred and Tenant is contesting the existence, amount, applicability or validity thereof by appropriate proceedings conducted in good faith with due diligence. In the event Landlord shall obtain a tax refund as a result of any such tax appeal or other proceedings Tenant shall be entitled to, and Landlord shall promptly pay to Tenant, all such tax refunds.

5.5 Personal Property Taxes. Tenant shall pay prior to delinquency all personal property taxes assessed against and levied upon Tenant's furnishings, equipment and all other of Tenant's personal property contained in the Premises. If possible, Tenant shall cause all such property to be assessed and billed separately from the Premises.

5.6 Utilities. Landlord shall be responsible for the payment of all charges for utilities used or consumed at the Premises from the Effective Date to the date prior to the Commencement Date. From and after the Commencement Date of this Lease, Tenant shall be solely responsible for and shall pay separately for all charges for Utilities used or consumed in the Premises. It is understood that Landlord shall not be required to provide any Utilities to Tenant, and Tenant shall make any necessary arrangements to have all such Utilities billed directly to and paid for directly by Tenant. Landlord shall be solely responsible for and shall pay separately for all charges for Utilities provided to the Premises from the Effective Date to and including the Commencement Date of this Lease.

6. Conditions Precedent. As conditions precedent to Tenant's obligations to ground lease the Land to Landlord and Landlord's obligation to ground lease the Land pursuant to the Ground Lease, and Landlord's obligations to design, develop, construct and finance the Project and Tenant's obligation to lease the Project upon Substantial Completion thereof pursuant to the terms and conditions of this Lease, the conditions set forth in Subsections 6.1 – 6.4 must be met to the reasonable satisfaction of the parties hereto prior to June 1, 2010 ("**Initial Conditions Precedent Satisfaction Date**"). Upon execution of this Lease, Landlord and Tenant shall each work diligently and in good faith to satisfy each of the conditions set forth in Section 6.1 through 6.4 below on or before the Initial Conditions Precedent Satisfaction Date:

6.1 Short Plat of Land Completed. Tenant has completed the short plat of the Land into the Garage Land and the Housing Land, and the parties have amended the Ground Lease and this Lease to exclude the Housing Land therefrom.

6.2 FTA Approval. The FTA has approved the terms and conditions of the Ground Lease and this Lease.

6.3 Approval of Financing Plan for Project. Landlord intends to finance the development and construction of the Project with construction loan financing and equity investments. Landlord shall make the following information available in Seattle, Washington for review by Tenant's Director of the Department of Transportation or such person's designee who shall recommend approval or disapproval of such Financing Plan to the King County Executive. All financial and tax information provided by Landlord will be kept strictly confidential by Tenant and its attorneys, consultants and employees to the fullest extent permitted by law and shall not be copied or distributed by Tenant to any third party (except as required by law or in legal proceedings brought to enforce the Ground Lease or this Lease):

6.3.1 Evidence reasonably acceptable to Tenant of the source and availability of any debt and equity funding required to build the Project. Copies of executed term sheets or executed commitment letters from institutional lenders reasonably acceptable to Tenant with terms and conditions reasonably acceptable to Tenant and with terms that also satisfy the requirements of Section 10 below will be considered sufficient evidence of financing under this Section 6.3.1; and

6.3.2 Copies of Landlord's limited liability company or other organizational documents with evidence of funding commitments from existing members and proposed investors.

6.3.3 Such other information and documents as Tenant may reasonably request, including but not limited to, financial statements, tax returns, banking references or other information regarding the members or proposed equity investors in Landlord.

Upon approval of the information and agreements set forth in Section 6.3.1 and 6.3.2, such documents and the intended financing of the Project shall constitute the "**Approved Financing Plan**" for the Project. There shall be no change in the Approved Financing Plan without the prior written approval of the Tenant, which approval shall not be unreasonably withheld.

6.4 No Bankruptcy. Neither Landlord nor any of its members or managers: (a) has applied for or consented to the appointment of a receiver, custodian or trustee for it or any of its property, (b) has become insolvent, (c) has failed generally or admitted in writing its inability to pay its debts as they become due, (d) has consolidated, liquidated or dissolved, (e) has filed a petition or action for relief relating to any federal or state bankruptcy, reorganization, insolvency, moratorium or similar statute or any other law or laws for the relief or of relating to debtors, or (f) has made an assignment for the benefit of its creditors or entered into an agreement of composition with its creditors, nor (g) has a petition been filed by or against Landlord or any of its members or managers under any federal or state bankruptcy, reorganization, insolvency, moratorium or similar statute, or any other law or laws for the relief of or relating to debtors.

In addition to continued satisfaction of the conditions set forth in Section 6.1 –6.4 above, the conditions set forth in Sections 6.5 through 6.9 must be met to the reasonable satisfaction of the parties prior to October 1, 2010 (**"Conditions Precedent Satisfaction Date"**). Following satisfaction of the conditions set forth in Section 6.1 through 6.4, Landlord shall work diligently and in good faith to satisfy the conditions set forth in Section 6.5, through 6.9 on or before the Conditions Precedent Satisfaction Date:

6.5 Replacement Park and Ride Facility. Landlord has acquired by purchase or lease for a term (including renewal options) of up to three (3) years the Replacement Park and Ride Facility (as defined in Section 16 of this Lease). If Landlord has leased the Replacement Park and Ride Facility, Tenant shall have the right to approve the terms and conditions of such lease, which approval shall not be unreasonably withheld, conditioned or delayed so long as the lease terms comply with the terms and conditions set forth in Section 16 of this Lease.

6.6 Issuance of Building Permit. Landlord has participated in a pre-application meeting with the City and has submitted an overall site plan for the Burien T.O.D. Project and such other information as may be requested by the permitting jurisdiction and the City has issued a final building permit for the Project on terms and conditions which are acceptable to Landlord and Tenant.

6.7 Construction Contact. Landlord has executed the General Construction Contract containing the Guaranteed Maximum Price which General Construction Contract shall comply with all the requirements of this Lease.

6.8 Payment and Performance Bonds. Landlord has obtained payment and performance bonds for the benefit of Tenant which comply with the requirements of RCW 35.42.060 issued by a surety in an amount and otherwise in a form reasonably acceptable to Tenant.

6.9 Financing Obtained. All conditions precedent to funding of any debt and equity required under the Approved Financing Plan shall have been met or waived, Landlord has provided Tenant with copies of the fully executed Deed of Trust and other Security Documents and Construction Lender has executed and delivered the Subordination Agreement to Tenant.

The foregoing conditions contained in this Section 6 are solely for the benefit of the parties. Each party shall act reasonably and in good faith in determining whether the foregoing conditions have been satisfied.

If any of the foregoing conditions set forth in Section 6.1 through 6.4 are not satisfied by the Initial Conditions Precedent Satisfaction Date, either party shall have the right to terminate its obligations under the Ground Lease, this Lease and the Exclusive Negotiation Agreement upon written notice to the other, whereupon the Ground Lease, this Lease and the Exclusive Negotiation Agreement shall terminate, and except as otherwise expressly provided herein, neither party hereto shall have any further rights, duties or obligations under the Ground Lease, this Lease or the Exclusive Negotiation Agreement.

If any of the foregoing conditions set forth in Section 6.1 through 6.9 are not satisfied by the Conditions Precedent Satisfaction Date, either party shall have the right to terminate its obligations under the Ground Lease, this Lease and the Exclusive Negotiation Agreement upon written notice to the other, whereupon the Ground Lease and this Lease shall terminate, and except as otherwise expressly provided herein, neither party hereto shall have any further rights, duties or obligations under the Ground Lease, this Lease or the Exclusive Negotiation Agreement. Once all of the conditions precedent set forth in Section 6.1 through 6.9 have been met to the satisfaction of the parties, Tenant shall deliver Landlord the Notice to Proceed which shall establish the Effective Date of this Lease.

7. Use of Premises; Permitted Use. Tenant intends to use the Premises as a public parking garage and may use the Premises for any other lawful use consistent with the provisions of this Section 7 (the "**Permitted Use**"). Tenant has determined to its satisfaction that the Premises can be used for the Permitted Use.

7.1 Quiet Enjoyment. Upon payment by Tenant of Monthly Rent as herein provided and upon the observance and performance of the covenants, terms and conditions on the Tenant's part to be observed and performed, Landlord represents and warrants that Tenant shall peaceably and quietly hold and enjoy the Premises for the Term hereby demised without hindrance or interruption by Landlord or any person or persons lawfully or equitably claiming, by, through or under Landlord.

7.2 No Insurance Cancellation. Tenant shall not do, bring, or keep anything in or about the Premises that will cause a cancellation of any insurance covering the Premises.

7.3 No Waste, Nuisance or Damage. Tenant shall not use the Premises in any manner that will constitute waste of the Premises or a nuisance and Tenant shall not do anything on the Premises that will cause damage to the Premises.

7.4 Compliance with Laws. From and after the Commencement Date of this Lease, Tenant shall comply with all Laws concerning the Premises and Tenant's use of the Premises, including without limitation, Environmental Laws. Tenant shall not use the Premises for the transportation, storage or generation of any Hazardous Substances in violation of Environmental Laws. From and after the Commencement Date of this Lease and to the extent permitted by law, Tenant shall hold Landlord harmless from and against any and all debts, demands, obligations,

Liens, judgments, claims, liabilities, losses, damages, cleanup costs and expenses (including reasonable attorneys' fees) now or hereafter arising in connection with the presence, transportation, storage, disposal or handling of Hazardous Substances located in, on or about the Premises or Land caused by or resulting from the actions of Tenant, its agents or employees after the Commencement Date of this Lease, excluding (a) any Hazardous Substances present on the Land or the Premises prior to the Commencement Date of this Lease or which migrates onto the Land from property not owned by Tenant through no act or omission of Tenant; (b) any such debt, demand, obligation, Lien, judgment, claim, liability, loss, damage, cleanup cost or expense resulting from the actions or omissions of Landlord, General Contractor and their respective agents, employees, Contractors, subcontractors or invitees; or (c) any debt, demand, obligation, Lien, judgment, claim, liability, loss, damage, cleanup cost or expense resulting from Landlord's violation of any contractual obligation under the Ground Lease, this Lease, or any other document executed by Landlord in connection with any Security Documents. This indemnification shall survive the Expiration Date of this Lease.

7.5 Tenant's Right to Contest Requirements of Law. Tenant shall have the right to contest, by appropriate legal proceedings, any Law, rule, order, ordinance, regulation or other Requirements of Law affecting the Premises and to postpone compliance with the same during the pendency of such contest provided that the enforcement of such Law, rule, order, ordinance, regulation or other Requirements of Law is stayed during the pendency of such contest and the contest will not subject Landlord to criminal or civil penalty or fine or jeopardize title to the Premises. Landlord shall cooperate with Tenant in such contest and shall execute any documents or provide such information as Tenant may reasonably request in furtherance of such proceedings. Tenant shall proceed diligently and in good faith to resolve such contest and shall not postpone compliance with any Law, rule, order, ordinance, regulation or other Requirements of Law if the same shall invalidate any insurance required by this Lease. If Tenant is contesting any Law, rule, order, ordinance, regulation or other Requirements of Law then so long as Tenant makes all Monthly Rent payments required under this Lease, Tenant shall not be in default under this Lease by reason of such noncompliance unless and until there is a final determination entered by a court of competent jurisdiction and all applicable appeal periods have expired or, if Tenant has duly appealed the determination and enforcement is stayed pending appeal, then until all appeals have been finally decided against Tenant and Tenant has failed to comply with the resulting decision within thirty (30) days following the issuance of such final determination.

8. Liens.

8.1 Covenant Against Liens. Landlord covenants and agrees that it shall not during the Term of this Lease suffer or permit any Liens (other than Permitted Liens) to be attached to, upon or against the Premises, or any portion thereof or any Monthly Rent payable under this Lease for any reason, including without limitation, Liens arising out of the possession, use, occupancy, acquisition, construction, repair, or rebuilding of the Premises or by reason of the furnishing of labor, services, materials, or equipment to the Premises or to Landlord. Landlord shall keep the Premises free and clear of all construction liens resulting from the construction of the Project. Landlord agrees to indemnify, protect, defend and hold Tenant harmless from and against all liabilities, losses, damages, costs and expenses (including reasonable attorneys' fees and costs) incurred in connection with any such Lien. Landlord's obligations pursuant to this Section 8.1 shall survive the Expiration Date of this Lease.

8.2 Covenant to Remove Liens. Landlord will promptly, and in all events within forty-five (45) days following the attachment of same, remove and discharge any and all Liens, (other than Permitted Liens) which attach to, upon or against the Premises or any portion thereof, or any leasehold interest of Tenant created under this Lease (other than liens or encumbrances arising through the actions of Tenant). Landlord reserves the right to contest the validity or amount of any such Lien in good faith provided that, within forty-five (45) days after the filing of such Lien, Landlord discharges said Lien of record or records a bond which complies with the requirements of RCW 60.04.161 eliminating said Lien as an encumbrance against the Premises. In the event Landlord shall fail to so remove any such Lien, Tenant may take such action as Tenant shall reasonably determine to remove such Lien and all costs and expenses incurred by Tenant including, without limitation, amounts paid in good faith settlement of such Lien and attorneys' fees and costs shall be paid by Landlord to Tenant together with interest thereon at the rate of twelve percent (12%) interest per annum from the date advanced until paid. Landlord's obligations pursuant to this Section 8.2 shall survive the Expiration Date of this Lease.

8.3 Tenant's Disclaimer. Notwithstanding the consent or request of Tenant, express or implied, for the performance of any labor or services or for the furnishing of any materials or equipment for any construction, alteration, addition, repair or demolition of or to the Premises (or any part thereof), NOTICE IS HEREBY GIVEN THAT TENANT WILL NOT BE LIABLE FOR ANY LABOR, SERVICES, MATERIALS OR EQUIPMENT FURNISHED OR TO BE FURNISHED TO LANDLORD, GENERAL CONTRACTOR OR ANYONE HOLDING AN INTEREST IN THE PREMISES (OR ANY PART THEREOF) THROUGH OR UNDER LANDLORD OR GENERAL CONTRACTOR, AND THAT NO CONSTRUCTION OR OTHER LIENS FOR ANY SUCH LABOR, SERVICES, MATERIALS OR EQUIPMENT SHALL ATTACH TO OR AFFECT THE INTEREST OF TENANT IN THE PREMISES. Nothing in this Section 8.3 shall relieve Tenant of its obligations to pay Monthly Rent hereunder from and after the Commencement Date of this Lease.

9. Design and Construction of Project. Tenant would not have entered into this Lease but for the agreement by Landlord to undertake, at Landlord's sole cost and expense, the Project, including without limitation (i) the obtaining of financing for the Project, (ii) the acquisition of a leasehold interest in the Land by way of the Ground Lease, (iii) the design, development and permitting of the Project, and (iv) the construction, completion and equipping of the Garage for use by Tenant for its Permitted Use on or before the Required Completion Date. Accordingly, Landlord shall diligently cause the Project to be designed, developed, constructed and completed on or before the Required Completion Date in a good and workmanlike manner and in accordance with the provisions of this Lease, free and clear of all Liens (other than Permitted Liens) and otherwise in accordance with the requirements of this Lease shall pay all Project Costs associated therewith. In order to assure timely communications between Landlord and Tenant during the construction process, any notice to Tenant requiring or permitting a response by Tenant shall specify the outside date by which Tenant's response must be received to be effective.

9.1 Project Design. Landlord shall cause design services to be performed by qualified and Washington state licensed architects, engineers and other professionals engaged by Landlord, and not objected to by Tenant and paid by Landlord as part of Project Costs.

(a) Selection of Development Team for Project. The following entities are intended to be retained in connection with the Project:

(i) Architect: Pyatok Architects, Inc.

(ii) General Contractor: Charles Pankow Builders, Ltd.

(iii) Structural Engineers:

(iv) Garage Land Surveyors:

(v) Mechanical Engineers:

(vi) Geotech Engineers:

(vii) Environmental Consultants:

(viii) Electrical Engineers:

Tenant has no objections to the General Contractor or Architect that Landlord intends to retain in connection with the Project. In order to complete the Project, Landlord shall have the right to select other professionals as necessary or desirable for the design, permitting, and development of the Project. Landlord shall submit or cause the General Contractor to submit a list of proposed Development Team members to Tenant for Tenant's review. Tenant shall have the right to reject any proposed Development Team member if there exists substantial and reasonable cause for such rejection. All amounts paid to the entities outlined above and any others hereinafter engaged by Landlord in connection with the performance of its duties and responsibilities under this Lease shall be paid by Landlord as part of Project Costs.

Consistent with the terms and conditions of the General Construction Contract and the architect's agreement with the Architect, there shall be no material amendment to those or any other design contract or Construction Contract which would result in a material change in work or materials from those specified in the Project Requirements or which would result in a material change in appearance, diminution in quality of the Project or increase the costs of operating and maintaining the Garage following Final Completion thereof, without the prior written consent of Tenant.

9.2 Design Process; Schedule. Landlord and Tenant acknowledge and agree that the dates set forth in the initial Project Schedule attached hereto as **Exhibit G** and by this reference incorporated herein, and as revised from time to time in accordance with the terms herein, shall serve as target dates for achieving the matters set forth therein. In order to ensure to the greatest extent practicable that the Project is completed on or before the dates set forth in the Project Schedule, Landlord and Tenant shall each proceed with all necessary due diligence and in good faith to complete such matters as require action or approval on the part of Tenant and Landlord. Tenant shall promptly and diligently respond to all questions and concerns raised by Landlord or by the Architect, Contractors, engineers or other consultants.

9.3 Plans and Specifications.

9.3.1 Preliminary Plans and Outline Specifications. As of the date of this Lease, Tenant has reviewed the Preliminary Plans and Outline Specifications for the Project and hereby confirms that the Preliminary Plans and Outline Specifications are generally consistent with the Project Requirements. Following approval of the Preliminary Plans and Outline Specifications for the Project, Landlord shall proceed with preparation of Design Development Drawings for the Project.

9.3.2 Design Development Drawings and Construction Drawings.

(a) Design Development Drawings and Construction Drawings. Landlord and/or the General Contractor shall cause the Architect to prepare the Design Development Drawings and the Construction Drawings and Detailed Specifications for the Project, in each case for Tenant's review and Landlord's approval. The intention of the parties is to cooperate in good faith to provide a completed design which meets all Requirements of Law and is consistent with all Project Requirements and the building quality reflected therein.

(b) Factory Mutual Engineering Plan Review. Landlord shall submit to Factory Mutual Engineering Association at its Seattle Office ("**Factory Mutual**") for its review, the plans for design and construction of the Project. Design Development Drawings and Construction Drawings and detailed specifications for the Project shall be submitted at the 60% and 90% design phases. All Factory Mutual recommendations shall be shared immediately with the Tenant, who shall use its best efforts to submit written comments to Landlord within ten (10) days on its receipt of such recommendations. Landlord and Tenant shall work together with Factory Mutual reasonably to incorporate such recommendations into the design of the Project.

(c) ADA Compliance. Each design and Construction Contract shall include a provision requiring that upon Substantial Completion of that portion of the work covered by that design or Construction Contract, the work and the portion of the Project so constructed shall comply with the applicable ADA requirements referenced herein.

(d) Tenant's Review. Tenant may participate in all design meetings with Landlord, Architect, and other design professionals as appropriate in the course of the development of all Construction Documents in order to facilitate the approval of such Construction Documents in accordance with the terms of this Lease. Tenant shall promptly review all Design Development Drawings or Construction Drawings and Detailed Specifications submitted in accordance with this Lease and shall give Landlord written notice within ten (10) Business Days following its receipt of the Design Development Drawings or Construction Drawings and Detailed Specifications of its approval or disapproval thereof, specifying in the case of its disapproval, its reason therefor. Tenant shall only have the right to disapprove such Design Development Drawings or Construction Drawings and Detailed Specifications which: (i) do not meet the Project Requirements; (ii) are not a consistent development of the Project Requirements in all material respects; (iii) do not comply with Requirements of Law; (iv) do not comply with previous Drawings and Specifications in all material respects; (v) would violate the terms of any Permits; (vi) would cause the Project Schedule to be adversely impacted as a result of such proposed changes; or (vii) involve proposed changes in work or materials that would result in a material change in appearance or diminution in quality of the Project. If no written

objections or comments are received within such ten (10) Business Day period, then the submittals shall be deemed approved.

(e) Resubmittals. If written objections or comments are submitted in writing within the time frame and in accordance with the requirements set forth in the preceding subsection, Landlord shall cause the Architect to make changes in the Design Development Drawings, the Construction Drawings and/or Detailed Specifications consistent with reasonable objections or comments made by Tenant and shall resubmit the same to Tenant in accordance with the foregoing schedule for further review. The process of resubmittal and review shall continue until the submittals have been approved by all the parties. The final Construction Drawings and Detailed Specifications setting forth in detail the requirements for the construction of the Project which have been approved by Tenant shall be the Construction Documents. There shall be no material change in the Construction Documents except as set forth in Section 9.6 below.

(f) Permit and Construction Documents. Landlord shall cause the Architect and other design professionals to prepare Construction Documents as required for submittal of the building permit and other permit applications in accordance with Section 9.4 hereof, and as required for construction of the Project by the Contractors.

9.4 Permits; Costs; Compliance with Legal Requirements. Landlord shall secure all Permits, licenses, permissions, consents and approvals required to be obtained from governmental agencies or third parties in connection with the Project pursuant to Requirements of Law. Landlord shall submit a building application for the Project which the City has determined is substantially complete on or before August 1, 2010. Tenant shall have five (5) business days to review any Permit application Landlord intends to submit. Tenant's failure to object to terms or conditions of a Permit application shall not be construed as approval of the same. Tenant shall join in, or otherwise assist Landlord with, the application for such permits or authorizations whenever such joinder is required; provided, however, Tenant shall incur no expense or liability in connection therewith. Landlord shall pursue issuance of such Permits with all due diligence. All costs associated with issuance of the Permits shall be Project Costs. Landlord anticipates issuance of the Permits by all permitting authorities and Commencement of Construction within the time set forth in the Project Schedule attached hereto as **Exhibit G**. The Project Schedule shall be updated by Landlord from time to time as reasonably required to reflect the current status of the Project. There shall be no increase in Monthly Rent, the Fixed Price or the Option Price as a result of any delay in issuance of the Permits or commencement or completion of construction of the Project.

9.5 Construction.

9.5.1 Commencement of Construction. As soon as reasonably practical following issuance of the Permits, and satisfaction or waiver of the conditions precedent set forth in Section 6 above, Landlord shall cause Commencement of Construction to occur and to diligently and continuously prosecute such work to Final Completion of the Project. Landlord shall coordinate the sequencing of all construction and shall cause all other Contractors to commence construction of that portion of the work covered under their respective Construction Contracts and diligently and continuously prosecute such work to Final Completion of the

Project. Landlord shall cause all work on the Project to be performed in accordance with the Ground Lease, this Lease and all Requirements of Law and all directions and regulations of all governmental agencies and the representatives of such agencies having jurisdiction over the Project and/or the Premises. Landlord warrants to the Tenant that materials and equipment incorporated into the Project shall be new unless otherwise specified.

9.5.2 Substantial Completion Schedule. Landlord shall cause Substantial Completion of the Project to occur on or before the Required Completion Date in a good and workmanlike manner, free from defects in work or materials and in substantial accordance with the Contract Documents, free and clear of all liens.

9.5.3 Unavoidable Delays. The existence of Unavoidable Delays of up to twelve (12) months shall excuse General Contractor and Landlord for resulting delays and changes in the Project Schedule, and shall extend the Required Completion Date by the same amount; provided, however, that there shall not be any adjustment to the Fixed Price or the Option Price (or any increase in Monthly Rent) for additional costs resulting therefrom.

9.5.4 Guaranteed Maximum Construction Contract, Payment and Performance Bonds. As part of the Fixed Price, the Project shall be constructed pursuant to the General Construction Contract, containing the Guaranteed Maximum Construction Price, between Landlord and the General Contractor. Landlord shall provide Tenant with a copy of the General Construction Contract for Tenant's information. In addition, Tenant shall have the right to view, for its own information and to determine, prior to Landlord or General Contractor entering into any Construction Contracts for the Project that such Construction Contract is consistent with the requirements of this Lease and the Project Requirements and that the Construction Contract is consistent with the Construction Documents and the bids submitted by potential Contractors and subcontractors. Landlord shall deliver payment and performance bonds which comply with the requirements of RCW 35.42.060 issued by a surety reasonably acceptable to Tenant pursuant to which Tenant shall be named as an obligee pursuant to a rider or riders reasonably acceptable to Tenant. Landlord shall be solely responsible for payment of all Project Costs.

9.5.5 Construction Contracts. Landlord shall ensure that all Construction Contracts include recitations or provisions requiring the following:

(i) Landlord and all Contractors and subcontractors employed on the Project shall comply with the Federal Transit Administration requirements set forth on **Exhibit M** attached hereto and by this reference incorporated herein, including, but not limited to all prevailing wage requirements under the federal Davis Bacon Act, 40 U.S.C. Section 276a et seq. and regulations thereunder ("**Davis-Bacon Act**").

(ii) All Contractors and subcontractors of every tier employed on the Project shall also pay prevailing wages to workmen, laborers and mechanics as may be determined by the Washington State Department of Labor and Industries for the particular craft in the particular geographical location. In addition, all Construction Contracts shall require the Contractor to comply with all requirements set forth in Chapter 39.12 RCW, including, but not limited to, requirements relating to statements of intent to pay prevailing wages and affidavits of

wags paid. Failure to meet these requirements shall entitle Landlord and/or Tenant to seek indemnification from the Contractor for any liability incurred by Landlord and/or Tenant under Chapter 39.12 RCW or the Davis-Bacon Act. This indemnification shall survive Final Completion of the Project and the Expiration Date of this Lease.

(iii) Provisions for initiating, maintaining and providing supervision of safety precautions and programs in connection with the construction of the Project.

(iv) A statement that provides: "Notwithstanding the consent or request of Tenant, express or implied, for the performance of any labor or services or for the furnishing of any materials or equipment for any construction, alteration, addition, repair or demolition of or to the Premises (or any part thereof), Tenant shall not be liable for any labor, services, materials or equipment furnished or to be furnished to Tenant, Landlord or anyone holding an interest in the Premises (or any part thereof) through or under Tenant or Landlord, and no construction or other liens for any such labor, services, materials or equipment shall attach to or affect the interest of Tenant in the Premises."

(v) Provisions requiring that such Contractor submit verification to Landlord and Tenant that prevailing wages have been paid on the Project including copies of all documentation required by Chapter 39.12 RCW and the Davis-Bacon Act.

(vi) Provisions requiring such Contractor to indemnify Tenant for claims arising out of the negligence or willful misconduct of such Contractor and its employees, agents and subcontractors in accordance with the provisions set forth in Section 12.1 as provided in Section 12.4.

(vii) Landlord shall require the General Contractor: (a) to include the language of this section in each of its first tier subcontracts, and shall require each of its subcontractors to include the same language of this section in each of their subcontracts, adjusting only as necessary the terms used for identifying the contracting parties; and (b) upon written request of either the Landlord or the Tenant via the Landlord, to promptly provide documentation to the Landlord demonstrating that the subcontractor meets the subcontractor responsibility criteria set forth below. The requirements of this section apply to all subcontractors regardless of tier. At the time of subcontract execution, the General Contractor shall verify that each of its first tier subcontractors meets the following bidder responsibility criteria:

(A) Has a certificate of registration in compliance with chapter 18.17 RCW;

(B) Has a current state Unified Business Identifier (UBI) number;

(C) If applicable, has

1) Industrial Insurance (workers' compensation) coverage for its employees working in Washington, as required in Title 51 RCW;

2) A Washington Employment Security Department number as required in Title 50 RCW;

3) A Washington Department of Revenue state excise tax registration number as required in Title 82 RCW;

4) An electrical contractor license, if required by Chapter 19.28 RCW; and An elevator contractor license, if required by Chapter 70.87 RCW.

(D) Not be disqualified from bidding on any public works contract under RCW 39.06.010 or RCW 39.12.065(3).

(viii) Landlord shall ensure that General Contractor and each subcontractor regardless of tier is aware of the following apprenticeship goals and requirements.

(A) Apprentice Utilization Goal. There shall be a minimum apprentice utilization goal of 15% for construction of the Project. This means that 15% of the labor hours for the Project shall be worked by apprentices, or that best efforts have been made to meet the apprentice utilization goal.

(B) Apprentice Utilization Plan.

1) Prior to construction Landlord shall submit an apprentice utilization plan to Tenant for approval. The plan shall include the following elements:

i. An estimate of the total contract labor hours by trade or craft to be worked by the General Contractor and all subcontractors.

ii. An estimate of the total labor hours in each trade or craft to be worked by apprentices, and the anticipated dates when the work will start.

iii. A list that contains the names of all proposed subcontractors who will perform work on the Project.

iv. A percentage rate of apprentice utilization in each trade and/or craft and an overall percentage rate of apprentice utilization that is not less than the apprentice utilization goal.

v. If the overall percentage rate of apprentice utilization is less than the apprentice utilization goal, documentation demonstrating the best efforts used by the Landlord, including its General Contractor, to achieve the apprentice utilization goal.

vi. Specific steps proposed by Landlord for having its General Contractor and all subcontractors during construction achieve the apprentice utilization goal.

2) Tenant's approval of Landlord's apprentice utilization plan shall be a contingency that must be satisfied before this Lease shall be fully binding on Tenant. Failure to timely submit and receive approval of a satisfactory plan will allow Tenant to terminate this Lease without liability to Landlord. Landlord shall perform all steps set forth in its approved plan to maximize the use of apprentices on the Project, and, to the fullest extent reasonably possible, achieve the apprentice utilization goal.

(C) Apprentice Utilization Report.

1) Landlord shall require that the General Contractor submit, on a monthly basis, an apprentice utilization report for itself and all subcontractors showing apprentice utilization for the previous month. Landlord shall provide a copy of all such reports to Tenant's designated representative.

(D) Remedies for Noncompliance.

1) Landlord Remedies. Landlord acknowledges and agrees that it will vigorously enforce all apprentice utilization provisions for the Project. Landlord shall specifically include language in its General Construction Contract that a failure to comply with any contract provision relating to the use of apprentices on the Project, including Landlord's approved apprentice utilization plan, shall be deemed a breach of contract for which Landlord shall be entitled to all remedies at law and equity including, without limitation, to:

i. Specific performance, and the parties specifically agree that monetary damages are insufficient to make Landlord whole and that injunctive relief is therefore an appropriate remedy; and

ii. Withhold progress payments until such time as the General Contractor achieves compliance with all contract provisions relating to the use of apprentices on the Project.

2) Tenant Remedies. Landlord shall promptly notify Tenant of any failure by the General Contractor to comply with any contract provision relating to the use of apprentices on the Project. Landlord shall further identify the steps it intends to take to ensure that compliance is achieved. Landlord's failure to enforce all contract provisions relating to the use of apprentices on the Project shall be deemed a breach of this Lease which if not cured within the period of time, if any, provided herein, shall give Tenant the right to exercise all remedies provided under this Lease and all remedies at law and equity including, without limitation, specific performance, and the parties specifically agree that monetary damages are insufficient to make Tenant whole and that injunctive relief is therefore an appropriate remedy. Further, Landlord's failure to enforce any contract provision relating to the use of apprentices on the Project may be considered evidence bearing on Landlord's qualification for award of future Tenant contracts leases.

(E) Definitions

"Apprentice" means a person, including, but not limited to, women, at-risk youth, disabled persons and people of color, who has signed a written Apprenticeship Agreement with and enrolled in a training program approved by the Washington State Apprenticeship and Training Council ("SAC") to learn a skilled craft or trade as an apprentice.

"Apprentice utilization goal" means the overall percentage of labor hours established for the Project to be worked by apprentices. This goal is expressed as a percentage of the total labor hours for the Project.

"Best efforts" means taking active, good faith efforts to reasonably meet the apprentice utilization goal established for the project. Such efforts may include, but are not limited to:

i. Contacting SAC-approved program sponsors to request apprentices, and, if apprentices are available, conducting a hiring process.

ii. If apprentices are not available through SAC-approved program sponsors, contacting other recruitment/referral agencies, such as the Apprenticeship Opportunities Project and Seattle Vocational Institute and request candidates for the SAC apprenticeship program. If apprentice candidates are available through these agencies, request direct entry into the SAC-approved apprentice program and conduct a hiring process.

iii. If apprentices are not available, document all requests and obtain documentation from the SAC-approved program sponsor and other recruitment/referral agencies of that fact.

"Labor hours" means the total number of projected hours or actual hours to be worked or that have been worked by workers receiving an hourly wage who are directly employed on the Project site. Labor hours shall also include hours worked by workers employed by subcontractors on the Project. Labor hours shall not include hours worked by supervisors, professionals or clerical workers.

9.5.6 Protection of Persons and Property.

(i) Landlord shall be responsible for initiating, maintaining and providing supervision of safety precautions and programs in connection with the construction of the Project.

(ii) Landlord shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to: (l) all persons working on the Project construction site and all other persons who may be affected thereby; (2) the Project and materials and equipment to be incorporated therein; and (3) other property at or adjacent to the Land.

(iii) Landlord shall or shall cause the General Contractor and all other Contractors to give notices and comply with all applicable laws, ordinances, rules,

regulations, and orders of public authorities bearing on the safety of persons and property and their protection from damage, injury or loss.

(iv) Landlord shall be liable for all damage or loss (other than damage or loss insured under the property insurance) to the Project except to the extent caused by the negligent actions of Tenant, its agents or employees.

9.5.7 Insurance During Construction. Insurance shall be provided by Landlord, Tenant, Architect and Contractors in accordance with the provisions of Sections 13 and 14 of this Lease.

9.5.8 [Intentionally Deleted].

9.5.9 Warranties. Landlord shall cause the General Contractor to secure for the benefit of Tenant all warranties and guarantees of the work by Contractors, suppliers and manufacturers of components of the Project. Upon Final Completion of the Project, Landlord shall cause the General Contractor to assign such warranties to Tenant. After Final Completion of the Project and during the Warranty Period, Landlord shall assist Tenant to enforce any warranties or guarantees with respect to the Project upon request. The General Construction Contract shall provide a warranty of materials and workmanship for a period of two (2) years with respect to each major component of the work following Substantial Completion of the Project.

9.5.10 Correction of Work. During the Warranty Period, Landlord shall promptly correct or cause to be corrected work properly rejected by Tenant or known by Landlord to be defective or failing to conform to the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed or completed, and shall correct or caused to be corrected work found to be defective or non-conforming within the Warranty Period. Such costs (to the extent not borne by insurance) shall be Project Costs and shall be paid by Landlord from its own funds.

9.5.11 Progress Reports. Landlord shall submit written monthly progress reports to Tenant including information on the General Contractor and the General Contractor's work, showing percentages of completion. Landlord shall maintain at the project site for Tenant one record copy of all Construction Documents, all drawings, specifications, addenda, Change Orders and other modifications, in good order and marked currently to record changes and selections made during construction together with approved shop drawings, product data, samples and similar required submittals. Landlord shall maintain records, in duplicate of principal building layout lines, elevations of the bottom of the footings, floor levels and key site elevations certified by a qualified surveyor or professional engineer. All such records shall be made available to the Architect and Tenant upon request and, upon completion of the Project, duplicate originals shall be delivered to Tenant.

9.5.12 Inspection by Tenant. Tenant shall have the right to inspect the on-going construction of the Project and the Contract Documents upon reasonable prior notice to Landlord. In addition, Tenant shall have the right to have an independent consulting architect, engineer or other appropriate consultant inspect the Project and the Contract Documents.

Tenant's agents, employees and representatives shall comply with General Contractor's work site safety requirements in connection with such inspections.

9.5.13 Stop Work by Tenant. If General Contractor fails to correct defective work as required, or persistently fails to carry out work in accordance with the Construction Documents, Tenant, by written order, may order Landlord and General Contractor to stop the work, or any portion thereof, until the cause for such order has been eliminated.

9.5.14 Landlord Default. If Landlord defaults or neglects to carry out the work in accordance with the Contract Documents and fails within seven (7) calendar days after receipt of written notice from Tenant to commence and continue correction of such default or neglect with diligence and promptness, Tenant may give a second written notice to Landlord and, if Landlord fails within such second seven (7) calendar day period to commence and continue correction of such default or neglect with diligence and promptness, then Tenant may, without prejudice to other remedies Tenant may have, act to correct such deficiencies. In such case an appropriate change order shall be issued deducting from the Fixed Price (with a corresponding reduction in Monthly Rent) the costs of correcting such deficiencies. If the payments then or thereafter due Landlord are not sufficient to cover the amount of the deduction, Landlord shall pay the difference to Tenant. Such action by the Tenant shall be without prejudice to any other rights or remedies to which Tenant may be entitled under this Lease or applicable law.

9.5.15 FTA Grant Requirements. Tenant has advised Landlord that it has secured grant funding, including Federal Transit Administration funding (the "**FTA Grant**") which Tenant intends to use to purchase the Garage upon Final Completion of the Project in the event Tenant exercises its option to purchase the Garage. Landlord acknowledges receipt of Federal Transit Administration rules, regulations and requirements applicable to the design, development and construction of the Project, a copy of which is attached hereto as **Exhibit M** and by this reference incorporated herein (the "**FTA Requirements**") and agrees to design, develop and construct the Project in accordance with all Requirements of Law, including the FTA Requirements. It is of critical importance to Tenant that Landlord comply with the FTA Requirements in carrying out its obligations under this Lease, and Landlord acknowledges that Tenant will be damaged by any failure by Landlord to comply with the FTA Requirements which results in Tenant's loss of the FTA Grant. Accordingly, any failure by Landlord to comply with the FTA Requirements that results in a determination by the Federal Transit Administration not to fund the FTA Grant shall constitute an Event of Default under this Lease.

9.6 Change Orders.

9.6.1 Approval of Change Orders. For purposes of this provision, a "**Landlord-Initiated Change Order**" shall be a change in the Construction Documents requested by Landlord to address value engineering opportunities or unforeseen conditions in connection with the construction of the Project. A "**Tenant-Initiated Change Order**" shall be a change in the Construction Documents requested by Tenant to add or delete features and facilities to the Construction Documents. A Change Order can increase or decrease the costs to construct the Project.

Except as provided herein, all Change Orders shall require the mutual approval of Landlord and Tenant. However, the Tenant shall not unreasonably withhold or delay its consent to a Landlord-Initiated Change Order, provided that the proposed Change Order (i) is minor in nature and does not affect overall building appearance, safety or mechanical systems and operations, and (ii) will not result in an extension of the Required Completion Date. Landlord and Tenant anticipate that there will be field orders and Change Orders that will result in changes to the scope of work. Landlord shall use its reasonable efforts to apprise Tenant of proposed changes in the work and its recommendations regarding them prior to any action being taken. Landlord and Tenant anticipate that it may not always be possible for Landlord to receive Tenant's prior approval to these changes in a timely manner. Therefore, field orders and Change Orders may be approved by the Landlord, without prior Tenant approval, but only if the changes authorized by these field orders and Change Orders do not have the effect of extending the Required Completion Date or materially altering the work. As soon as practical, Landlord shall provide Tenant with all field orders and Change Orders approved by Landlord. For the purposes of this Section a material alteration would reduce the intended quality of the Project, result in an increase of Tenant's operational costs over time, or result in a substitution of any of the systems in the Project. In the case of either a material alteration or a change that would result in failure to achieve Final Completion of the Project by the Required Completion Date, prior written approval by Tenant of the proposed change must be received. All Landlord-Initiated Change Orders are part of Project Costs and shall be at Landlord's sole cost and expense.

With respect to Tenant-Initiated Change Orders, Landlord agrees not to unreasonably withhold or delay its consent to such Change Orders in an amount not to exceed $200,000 in the aggregate, provided (i) the consent of Landlord's Construction Lender is obtained in accordance with the Construction Loan; (ii) if required, the consent of the bonding company issuing the surety or completion bond is obtained; (iii) the parties describe the maximum anticipated financial impact in a writing mutually signed; and (iv) the Required Completion Date is extended, if necessary, to reflect the time required to implement the Change Order.

9.6.2 Payment of Tenant-Initiated Change Orders. All costs and expenses of Tenant-Initiated Change Orders shall be the responsibility of Tenant. Costs and expenses of Tenant-Initiated Change Orders shall include any costs and expenses of the Architect and other consultants to prepare and review the Change Order, the costs and expenses incurred by Landlord to obtain, revise or amend Permits for the Change Order, the costs and expenses to construct the Change Order, any other costs or expenses chargeable by the General Contractor under the General Construction Contract in connection with the Change Order, and if the Change Order results in an extension of the time period for construction or an increase in the amounts of funds that Landlord must borrow, any additional construction interest incurred by Landlord under the Construction Loan for the construction of the Project.

Tenant shall be responsible for the costs and expenses of Tenant-Initiated Change Orders, and such amount shall constitute Additional Rent hereunder payable in full upon the Commencement Date of this Lease.

Tenant hereby authorizes Tenant's Project Manager to approve all Change Orders for and on behalf of the Tenant.

9.7 Dispute Resolution Process. Tenant and Landlord agree to follow the independent resolution process set forth in this Section 9.7 and **Exhibit I** to resolve disputes regarding preparation of the Design Development Drawings and Construction Drawings and Detailed Specifications and changes to Construction Documents in an economic and time efficient manner so that such documents conform to the requirements of this Lease, the Project Schedule is not adversely impacted, and the Project as constructed will satisfy the Project Requirements. In the event that a dispute arises between Tenant and Landlord during the design or construction of the Project regarding the adequacy of any Drawings or Specifications or the responsibility for any costs associated with any design development, addition or change (e.g., whether any design development is consistent with and reasonably inferable from the Project Requirements), the parties shall attempt to resolve such dispute as expeditiously as possible and shall cooperate so that the progress of the design and construction of the Project is not delayed. If, however, the parties are unable to resolve the dispute within ten (10) Business Days, either party may, by delivering written notice to the other, refer the matter to a dispute resolution mediator as set forth on the attached **Exhibit I**.

9.8 Completion of the Project.

9.8.1 Substantial Completion of the Project. Substantial Completion of the Project shall have occurred when the events described in Section 1.72~~1.73~~ this Lease has occurred. Notwithstanding that Substantial Completion of the Project shall have occurred, Tenant shall be entitled to provide Landlord with a Punch List in accordance with the provisions of this Section 9.8.

9.8.2 Notice of Substantial Completion. Landlord shall give notice in writing to Tenant at least thirty (30) days prior to the date upon which Landlord anticipates that the Project shall be Substantially Complete. During the fifteen (15) Business Day period after the delivery of the estimated completion notice, Landlord, Tenant, Architect and General Contractor shall meet on one or more occasions, if necessary and tour to inspect and review the Project, as applicable, to determine whether it is Substantially Complete. The parties shall prepare the Punch List to be completed prior to Final Completion of the Project. The completion of the Punch List shall not be required in order for the Project to be Substantially Complete.

9.8.3 Completion of Punch List Items. Following Substantial Completion, Landlord shall cause all Punch List items to be completed promptly in accordance with the Contract Documents.

9.8.4 Final Completion of the Project. Landlord shall give notice in writing at least thirty (30) days prior to the date upon which the Project shall have achieved Final Completion. Final Completion of the Project shall have occurred when all of the events set forth in Section 1.30 of this Lease has occurred and Landlord has delivered the items described in Section 9.10 of this Lease.

9.9 Landlord's Representations; Warranties. Upon Final Completion of the Project, Landlord shall represent and warrant as follows:

(a) The Project has been completed in substantial accordance with the Contract Documents (as revised by Change Orders set forth in Section 9.6) and is, and at all times during the Warranty Period shall be, free from defects in workmanship and materials in connection with the construction thereof.

(b) Landlord has no knowledge of any structural defects, latent defects or building systems defects within the Project which would adversely affect the use of the Premises for its Permitted Uses.

(c) The Project has been constructed in accordance with all Project Requirements, all Permits and all Requirements of Law in effect at the time of construction of the Project.

(d) The Project is served by water, storm and sanitary sewage facilities, telephone, electricity, fire protection and other required public utilities adequate to serve the Premises at the time of Final Completion of the Project.

(e) The General Contractor, Architect, and all Contractors, suppliers, materialmen and consultants have been paid in full for work related to construction of the Project and there are no Liens, encumbrances or other defects affecting title to the Land other than Permitted Liens) which have been or will be filed against the Land and/or the Premises with respect thereto, or if any such Lien has been filed, Landlord and/or General Contractor shall have arranged for a bond to remove such Lien in accordance with Section 8.2.

(f) The use and operation of the Premises for public parking is permitted pursuant to the Permits.

(g) Landlord is not aware of any physical defect in the Land or the Project which would prevent Landlord from leasing the Project to Tenant for the Permitted Use.

(h) To the best of Landlord's knowledge and except as disclosed in writing, there are no condemnation, environmental, zoning or other land use regulation proceedings currently instituted which could detrimentally affect the use and operation of the Project for its Permitted Use. If during the Term of this Lease any such proceedings have been instituted, Landlord shall have used its best efforts and due diligence to resolve them prior to Final Completion of the Project.

(i) Landlord has provided Tenant with prompt notice of any special assessment proceedings affecting the Land.

(j) The Project does not encroach onto adjoining land or onto any easements and there are no encroachments of improvements from adjoining land onto the Land. The location of the Project does not violate any applicable setback requirements. The Land is not located in a flood zone.

(k) Except as disclosed to Tenant in writing, there is no litigation pending, or to the best knowledge of Landlord, threatened, with respect to the Project for matters undertaken by Landlord under this Lease.

(l) To the best of Landlord's knowledge, there are no Hazardous Substances located in, on, under or affecting the Land or the Project. No Hazardous Substances were incorporated into the structure of the Project.

(m) Prior to Final Completion of the Project, Landlord has removed or remediated and properly disposed of all known Hazardous Substances existing on the Land and discovered during the construction of the Project and if applicable, Landlord has received a no further action letter from the appropriate governmental agency with respect to such Hazardous Substances, provided the foregoing shall not make the Landlord responsible for the removal or remediation of any Hazardous Substances that Tenant is obligated to remove or remediate under the Ground Lease.

(n) All Permits necessary for the construction, use and occupancy of the Project have been obtained and are in full force and effect.

Each of the foregoing warranties with respect to the Project shall expire and be of no further force or effect, unless Tenant shall have made a claim based upon an alleged breach of such warranties by Landlord on or before the expiration of the Warranty Period; however such expiration shall not otherwise limit Tenant's rights and remedies hereunder. In the event Tenant alleges a breach of any of the foregoing warranties, Tenant shall give Landlord written notice of any such allegation together with a detailed explanation of the alleged breach ("**Tenant's Warranty Claim**"). Landlord shall, within thirty (30) days of receipt of Tenant's Warranty Claim, proceed to commence to cure the circumstances specified in Tenant's Warranty Claim, or provide Tenant with written notice of Landlord's dispute of Tenant's Warranty Claim. If Landlord commences a cure or correction of the matter alleged in Tenant's Warranty Claim, Landlord shall proceed reasonably diligently and promptly to complete such cure or correction, and the Warranty Period for the particular matter shall be extended for the period necessary to complete cure or correction.

Landlord shall warrant neither artist-made materials included in the Project nor those recycled construction products which Tenant has directed Landlord to include in the Project over Landlord's prior written objections.

9.10 Landlord Obligations. On or before Final Completion of the Project, Landlord shall obtain and submit to Tenant, the following:

9.10.1 As-Built Plans. A complete set of final as-built plans and specifications prepared by the General Contractor for the Project will be provided on CAD.

9.10.2 Manuals. All technical and service, instruction and procedure manuals relating to the operation and maintenance of all HVAC systems and other mechanical devices and equipment installed in the Project, except insofar as relating to Tenant's personal property.

9.10.3 Warranties. An assignment and delivery of all warranties, guarantees, maintenance contracts, and machinery and equipment warranties received by Landlord from the General Contractor or any subcontractor thereof, or any supplier, materialmen or manufacturer relating to the Project; provided, however, that so long as Landlord's warranty set forth in Section 9.9 herein remains in effect, and so long as Landlord is not in default of its obligations

under this Lease, Landlord reserves the right, notwithstanding the assignment and delivery of such warranties hereunder to Tenant, to fully enforce all such warranties in the place and stead of Tenant.

9.10.4 Permits and Licenses. The originals (if not posted at the Project) of all Permits, licenses and other approvals necessary for the occupation, use and operation of the Project.

9.10.5 As-Built Survey. An as-built Survey of the Land showing the location of all improvements constructed thereon.

9.11 Enforcement of Warranties. Landlord shall take all actions reasonably requested by Tenant during the Warranty Period to enforce or otherwise obtain the benefit of any warranty received from General Contractor or any other Contractors or any subcontractor thereof, or any supplier, materialman or manufacturer relating to the Project. If Landlord fails to take actions reasonably requested by Tenant to enforce or otherwise obtain the benefit of any such warranty, Landlord shall, upon written notice from Tenant, assign any such warranty to Tenant for such purposes. After expiration of any applicable warranty period, Tenant acknowledges that it shall be fully responsible for the cost of the maintenance and repair of the Premises pursuant to the terms of this Lease. Upon exercise of the Option to purchase the Premises as provided in Sections 21 and 22 of this Lease, Landlord shall cause all warranties still in effect to be assigned to Tenant.

9.12 Termination of Lease. In the event that Final Completion of the Project has not occurred for any reason whatsoever including, but not limited to Unavoidable Delays, by the Outside Completion Date of October 1, 2012, Landlord shall be in default under this Lease and Tenant shall have the right to terminate this Lease, without liability to Landlord upon sixty (60) days' prior written notice to Landlord.

9.13 No Amendment of Documents. In the event Landlord desires to amend the architect's agreement with the Architect, the General Construction Contract with the General Contractor, any Contract Document, or any other document, contract or agreement entered into in connection with the Project which would result in a material change in work or materials from those specified in the Project Requirements or which would result in a material change in appearance, diminution in quality of the Project or increase the costs of operating and maintaining the Garage following Final Completion thereof, Landlord shall submit a copy of such proposed amendment to Tenant at the addresses set forth in Section 34.7 along with a statement from the Architect delineating the nature and extent of such change and a copy of the Construction Documents (in CAD) marked to show the changes for Tenant's review and approval, which approval shall not be unreasonably withheld. In the event Tenant notifies Landlord within ten (10) Business Days following receipt of such proposed amendment of its objection to such proposed amendment, Landlord shall not enter into the proposed amendment unless Landlord first (i) responds to the concerns expressed by Tenant and (ii) any such amendment does not materially and adversely affect the Project. If Tenant fails to respond within such ten (10) Business Day period, the change shall be deemed disapproved.

9.14 Disclaimer. Notwithstanding any other provision of this Lease to the contrary, Tenant is under no obligation to design, construct or supervise construction of the Project. It is understood and agreed that Tenant's rights to inspect the Project under this Lease are for the sole purpose of protecting its interest as tenant hereunder and as the reversionary owner of fee title to the Land under the Ground Lease. Tenant's approval of any plans and specifications, Construction Contracts, or service contracts for the Project shall not be construed by the Tenant as a guaranty of sufficiency of the work. Tenant's right of inspection as provided in this Lease shall not constitute any representation or warranty, express or implied, or any obligation of Tenant to insure that work or materials are in compliance with the plans and specifications or any building requirements imposed by a governmental agency. Tenant is under no obligation or duty and disclaims all responsibility to pay for the cost of construction of the Project. Tenant is not responsible to the Contractors or any subcontractors under the Construction Contracts or any other third parties for any purpose whatsoever.

10. Landlord Financing of Project; Rights of Construction Lender.

10.1 Construction Loan Restriction. Notwithstanding any provision of this Lease to the contrary, Landlord shall not have the right to mortgage, pledge, encumber or assign its rights under the Ground Lease, this Lease or the Premises, in whole or in part, except to Construction Lender to secure the Construction Loan. The Construction Loan shall not exceed the Fixed Price. The Construction Loan shall not be modified, altered, revised or amended in any manner which would adversely affect the rights of Tenant under this Lease including its Option to purchase the Premises pursuant to Sections 21 and 22 of this Lease. On or before June 1, 2010 Landlord shall provide Tenant with evidence reasonably satisfactory to Tenant that it has an executed term sheet or obtained a commitment letter for the Construction Loan which satisfies the requirements of this Lease. Landlord shall provide Tenant with executed copies of any documents executed by Landlord in favor of Construction Lender to evidence or secure the Construction Loan on or before the Conditions Precedent Satisfaction Date set forth in Section 6 of this Lease. All proceeds of the Construction Loan shall be used solely to pay for Project Costs associated with the construction of the Project and shall not be used for any other purpose or applied to any other property or project. Landlord shall not encumber the Premises as security for a loan in which the Premises is jointly secured with or cross-defaulted with any real property which is not included within the definition of the Premises or the Project.

10.2 No Fee Subordination. Tenant shall not be required to subordinate its fee interest in the Land to any Deed of Trust or other Security Document.

10.3 Protection of Construction Lender. Tenant upon serving Landlord any notice or demand with respect to any breach or default by Landlord of its obligations or covenants under this Lease, shall at the same time forward a copy of such notice or demand to Construction Lender at the last address of Construction Lender shown on the records of Tenant. Tenant shall cooperate with Landlord in executing estoppel certificates in favor of Landlord's Construction Lender regarding the status of this Lease and shall provide such Construction Lender other non-confidential and reasonably available information about the status of the Project.

10.4 Construction Lender Right to Cure Defaults. Construction Lender shall have the right, but not the obligation, to remedy any Landlord default or cause the same to be

remedied for a period of thirty (30) days after notice from Tenant that Landlord has failed to cure such default within the cure period, if any, provided for under this Lease (or, if such default requires more than thirty (30) days to cure, such longer period as is necessary, acting diligently, including any period reasonably necessary to foreclose the Deed of Trust and take possession of the Premises) so long as Construction Lender cures monetary defaults under the Ground Lease and this Lease and continues to pay Taxes, insurance premiums and other items required to be paid by Landlord under this Lease within such thirty (30) day period and commences to cure the non-monetary defaults within such thirty (30) day period and diligently prosecutes the cure to completion. Tenant shall accept such performance by or at the instance of Construction Lender as if the same had been made by Landlord. The Construction Lender shall have the right, but not the obligation, to assume the rights, duties and obligations of Landlord under the Ground Lease and this Lease and shall thereafter construct or complete the construction of the Project in accordance with the terms, covenants, conditions and provisions of this Lease. However, nothing in this Lease shall be deemed to permit or authorize Construction Lender to devote the Premises or any portion thereof to any uses, or to construct any improvements thereon, other than the construction of the Project for lease or possible purchase by Tenant as required under this Lease. Nothing contained in this Lease shall be deemed to permit or authorize Construction Lender to undertake or continue the construction or completion of the Project (beyond the extent necessary to conserve or protect such improvements or construction already made) without first having expressly assumed in writing Landlord's obligations under the Ground Lease and this Lease. If Construction Lender determines to proceed with the construction of the Project, Construction Lender shall notify Tenant in writing of its election to assume the rights, duties and obligations of Landlord under this Lease within ninety (90) days following the Event of Default by Landlord and shall enter into an assumption agreement (or new lease on the same terms and conditions as this Lease) in form and substance satisfactory to Tenant with respect to the completion of the Project, and thereafter Construction Lender shall have all the rights, duties and obligations of Landlord with respect to the Project. If Construction Lender elects not to assume the Landlord's rights, duties and obligations under the Ground Lease or enter into a new lease on the same terms and conditions as this Lease within the time period set forth in this Section 10.4, Tenant shall have the right to exercise its rights and remedies under Section 24.2 of this Lease in the event of a Landlord Event of Default, including its right to terminate the Ground Lease, this Lease and the Exclusive Negotiation Agreement as provided in Section 24.2(a) below.

11. Maintenance and Modification.

11.1 Maintenance and Repair. Except as otherwise expressly provided herein and except for Punch List work and Warranty claims for which Landlord is responsible and except for damage caused by the negligent acts or omissions of Landlord, from and after the Commencement Date of this Lease, Tenant shall, at Tenant's sole cost and expense, maintain the Premises and appurtenances and every part thereof in good order, condition and repair and will take all action and will perform all interior and exterior, structural and non-structural, foreseen and unforeseen, ordinary and extraordinary, maintenance and repairs required to keep all parts of the Premises in good repair and condition, subject only to ordinary wear and tear and damage by fire or other casualty excepted. Except as otherwise expressly provided herein and except for Punch List items which Landlord shall complete and Warranty claims which Landlord shall cure or remedy, Landlord shall not be required to pay for the cost required to maintain all or any part of the Premises in good order, condition and repair.

11.2 Landlord's Remedies. Tenant shall diligently pursue all necessary or appropriate maintenance and repairs in accordance with its obligations under Section 11.1 hereof, but failure to do so shall not constitute an Event of Default. However, if Landlord becomes aware of needed maintenance or repairs, Landlord shall provide Tenant written notice of any maintenance or repair required to the Premises. Tenant shall have sixty (60) days after receipt of notice from Landlord detailing the need for maintenance or repair, to commence to perform such maintenance and repair, except that Tenant shall perform its obligations as soon as reasonably possible if the nature of the problem presents a hazard or emergency. If Tenant does not perform such maintenance and repair within the time limitations set forth in this Section 11.2, provided written notice has been given to Tenant as provided in this Section 11.2, Landlord may, with the prior written consent of Tenant, perform such maintenance and repair and shall, in that event, have the right to be reimbursed by Tenant for the sum it actually expends in the performance of such work invoiced as Additional Rent.

11.3 Modifications, Alterations and Additions. From and after the Commencement Date of this Lease, Tenant may, at Tenant's sole cost and expense, make modifications, alterations and additions to the Premises provided that such modifications, alterations and additions do not decrease the value of the Premises, and such modifications, alterations and additions shall be expeditiously completed in a good and workmanlike manner and in compliance with all applicable Laws and the requirements of all insurance policies required to be maintained by Tenant, without further consent from Landlord. Landlord shall, upon reasonable notice, have access to all plans and specifications relating to alterations and modifications made by Tenant to the Premises.

11.4 Construction Liens. From and after the Commencement Date of the Lease, Tenant shall pay all costs for modifications, alterations and additions done by it or caused to be done by it on the Premises as permitted by this Lease (other than the construction of the Project) and Tenant shall keep the Premises free and clear of all construction liens resulting from modifications, alterations and additions done by or for Tenant; provided, however, Tenant shall have the right to contest the correctness or validity of any such Lien by appropriate proceedings conducted in good faith with due diligence. Within thirty (30) days following written notice from Landlord, Tenant shall discharge said Lien of record or record a bond which complies with the requirements of RCW 60.04.161 eliminating said Lien as an encumbrance against the Premises if in the reasonable exercise of Landlord's judgment the protection of the Premises or Landlord's interest therein shall require such payment. In the event Tenant shall fail to so remove any such Lien, Landlord may take such action as Landlord shall reasonably determine to remove such Lien and all costs and expenses incurred by Landlord including, without limitation, amounts paid in good faith settlement of such Lien and attorneys' fees and costs shall be paid by Tenant to Landlord. Tenant's obligations pursuant to this Section 11 shall survive the Expiration Date of this Lease.

12. Indemnity/Hold Harmless.

12.1 Landlord's Indemnification. Landlord shall protect, defend, indemnify, and save harmless Tenant and its officers, officials, employees and agents, from any and all claims, demands, suits, penalties, losses, damages, judgments, or costs of any kind whatsoever (hereinafter "claims"), arising out of or in any way resulting from acts or omissions of

Landlord's officers, employees, agents, Contractors and/or subcontractors of all tiers, or the negligence, willful misconduct or breach by Landlord of its obligation under this Lease, to the maximum extent permitted by law, including RCW 4.24.115, as now enacted or as hereinafter amended.

Landlord's obligations under Section 12.1 of this Lease shall include, but not be limited to:

(a) The duty to promptly accept tender of defense and provide defense to Tenant at Landlord's own expense.

(b) The duty to indemnify and defend Tenant from any such claim, demand, and/or cause of action brought by or on behalf of any of Landlord's employees, or agents. The foregoing duty is specifically and expressly intended to constitute a waiver of Landlord's immunity under the Washington Industrial Insurance Act, RCW Title 51, as respects the Tenant only, with a full and complete indemnity and defense of claims made by Landlord's employees. The parties acknowledge that these provisions were mutually negotiated and agreed upon by them.

(c) Landlord shall indemnify and defend Tenant from and be liable for all damages and injury which shall be caused to owners of property on or in the vicinity of the construction of the Project whether or not such injury or damage is caused by negligence of the Contractor(s) or caused by the inherent nature of the work specified or which shall occur to any person or persons or property whatsoever arising out of or in any way resulting from the acts or omissions Landlord's officers, employees, agents, Contractors and/or subcontractors of all tiers, or the negligence, willful misconduct or breach by Landlord of its obligations under this Lease.

(d) In the event the Tenant incurs any judgment, award, and/or costs arising from any claim to which it is entitled to be indemnified hereunder, including attorneys' fees, to enforce the provisions of this Section 12, all such reasonable fees, expenses, and costs shall be paid by Landlord.

Notwithstanding the provisions contained in this subsection 12.1, Landlord's obligation to indemnify Tenant shall not extend to any claim, demand or cause of action to the extent caused by the negligence, willful misconduct or breach of this Lease by Tenant or its agents or employees.

12.2 Tenant's Indemnification. Tenant shall protect, defend, indemnify, and save harmless Landlord and its officers, officials, employees, and agents, from any and all claims, demands, suits, penalties, losses, damages, judgments, or costs of any kind whatsoever (hereinafter "claims"), arising out of or in any way resulting from the negligence or willful misconduct of Tenant's officers, officials or employees acting within the scope of their employment or office or breach by Tenant of its obligations under this Lease, to the maximum extent permitted by law including, RCW 4.24.115, as now enacted or as hereinafter amended.

Notwithstanding the previous paragraph contained in this subsection 12.2, Tenant's obligation to indemnify Landlord shall not extend to any claim, demand or cause of action to the

extent caused by the negligence, willful misconduct or breach of this Lease by Landlord or its agents or employees.

12.3 Notice of Claim. Any party making a claim for indemnification pursuant to this Section 12 (an "**Indemnified Party**") must give the party from whom indemnification is sought (an "**Indemnifying Party**") written notice of such claim (an "**Indemnification Claim Notice**") promptly after the Indemnified Party receives any written notice of any action, lawsuit, proceeding, investigation or other claim (a "proceeding") against or involving the Indemnified Party by a government entity or other third party, or otherwise discovers the liability, obligation or facts giving rise to such claim for indemnification; provided that the failure to notify or delay in notifying an Indemnifying Party will not relieve the Indemnifying Party of its obligations pursuant to this Section 12 except to the extent that the Indemnifying Party's ability to defend against such claim is actually prejudiced thereby. Such notice shall contain a description of the claim and the nature and amount of such loss (to the extent that the nature and amount of such loss is known at such time).

12.4 Contractors' Indemnification. Landlord shall include a provision in all Construction Contracts requiring the Contractors to indemnify Tenant, and its officers, officials, employees and agents on terms substantially equivalent to Landlord's indemnification obligations contained in Section 12.1 above, including, without limitation the RCW Title 51 waiver contained in Section 12.1(b).

13. Landlord's Insurance Requirements. From and after the Effective Date of this Lease, Landlord shall, at its sole cost and expense and as part of Project Costs, procure and maintain or cause to be procured and maintained, at a minimum, the following insurance against claims for injuries to persons or damages to property which may arise from, or in connection with the performance of work hereunder by Landlord, its agents, representatives, employees and/or subcontractors. Coverage shall be at least as broad as:

13.1 General Liability. Insurance Services Office form number (CG00 01) covering Commercial General Liability, including coverage for completed operations/product liability and contractual liability, with a limit of not less than $10,000,000 combined single limit per occurrence, $10,000,000 aggregate. Landlord shall maintain coverage for completed operations/product liability claims as part of such Commercial General Liability policy for at least one (l) year after Final Completion of the Project.

13.2 Automobile Liability. Insurance Services Office form number (CA 00 01) covering Business Automobile Coverage, symbol 1 "any auto"; or the combination of symbols 2, 8, and 9, with a limit of not less than $l,000,000 combined single limit per occurrence.

13.3 Workers' Compensation. Workers' Compensation coverage, as required by the Industrial Insurance Act of the State of Washington, statutory limits.

13.4 Employer's Liability or "**Stop Gap**". The protection provided by the Workers' Compensation Policy, Part 2 (Employer's Liability) or, in states with monopolistic state funds, the protection provided by the "Stop Gap" endorsement to the General Liability Policy in the amount of at least $l,000,000.

13.5 Builders Risk Insurance. During the period of construction of the Project, Landlord shall also provide Insurance Services Office form number (CP 00 02 Ed. 10-90) Builders All Risk Coverage Form covering all work to be done on the Premises for the full 100% replacement cost of all such improvements (except as otherwise provided below). Coverage shall be provided for (i) the perils of earth movement and flood; (ii) resultant damage from errors in design, plans, specifications, faulty workmanship, materials and construction; (iii) "extra expense"; (iv) all materials to be stored offsite and while in transit to the jobsite; (v) "cold testing" of all building systems; (vi) Landlord and Tenant's loss of use of the Project due to delays in Project completion caused by covered peril losses to the Project, including loss of income and rents and soft costs such as interest on the Construction Loan, real estate taxes and insurance premiums; (vii) the increased cost of construction, debris removal and demolition due to the operation of building laws and code upgrades; and (viii) direct physical damage to the Project and loss of use caused by an off premises power interruption. The policy shall include a waiver of subrogation provision, shall grant permission for partial occupancy of the facilities without having a detrimental effect on the coverage provided, and shall contain a separate debris removal limit of liability which is separate from, in addition to, and not part of the overall policy limit of liability. Landlord shall have the required Builder's Risk Policy in place no later than Commencement of Construction. The Builder's Risk Policy shall include Landlord, the General Contractor and their respective subcontractors, other Contractors, and Tenant as insureds in an amount equal to their interest with a loss payable clause in favor of Construction Lender and Tenant, as their interests may appear. Landlord shall keep the Builder's Risk Policy in place from Commencement of Construction to the Commencement Date of this Lease.

13.6 Deductibles and Self-Insured Retentions. Any deductibles or self-insured retentions must be declared to and approved by Tenant. The deductible and/or self-insured retention of the policies shall be the sole responsibility of Landlord.

13.7 Other Insurance Provisions. The insurance policies required by this Lease are to contain or be endorsed to contain the following provisions where applicable:

(a) Liability Policies:

(i) Tenant and its officers, officials, employees and agents are to be covered as additional insureds as respects liability arising out of activities performed by or on behalf of Landlord in connection with this Lease.

(ii) Landlord's insurance coverage shall be primary insurance as respects Tenant and its officers, officials, employees and agents (but not necessarily as respects the General Contractor) and shall include a severability of interests (cross liability). Any insurance and/or self-insurance maintained by Tenant, its officers, officials, employees and/agents shall not contribute with Landlord's insurance or benefit Landlord in any way.

(iii) Landlord's insurance shall apply separately to each insured against whom a claim is made and/or lawsuit is brought, except with respect to the limits of the insurer's liability.

(b) All Policies. Coverage shall not be canceled until after forty-five (45) days' (ten (10) days' for non-payment) prior written notice has been given to Tenant.

(c) Acceptability of Insurers.

(i) Unless otherwise approved by Tenant, insurance is to be placed with insurers with a Best's rating of no less than A:VIII, or, if not rated by Best's, with minimum surpluses the equivalent of Best's surplus size VIII.

(ii) If, at anytime, any of the foregoing policies shall fail to meet the above minimum standards, Landlord shall, upon notice to that effect from Tenant, promptly obtain a new policy, and shall submit the same to Tenant, with certificates and endorsements, for approval.

(d) Verification of Coverage. Each party shall furnish the other party with certificates of insurance and endorsements as required by this Lease. The certificates and endorsements for each policy are to be signed by a person authorized by that insurer to bind coverage on its behalf. The certificates and endorsements for Landlord's insurance are to be on forms approved by Tenant and are to be received and approved by the Tenant prior to the Effective Date of this Lease. Tenant reserves the right to require complete certified copies of all required policies at any time.

13.8 Contractors' Insurance. Landlord shall include a provision in each Construction Contract requiring the each Contractor to maintain insurance coverage substantially equivalent to that required to be maintained by Landlord pursuant to Section 13.1 above, including a limit of not less than $10,000,000 combined single limit per occurrence, $10,000,000 aggregate; provided such Contractor shall not be required to maintain builders risk coverage to the extent Landlord maintains builders risk insurance pursuant to Section 13.5 hereof.

13.9 For All Coverages.

(a) Each insurance policy shall be written on an "occurrence" form, excepting that insurance for professional liability, errors and omissions, when required, may be acceptable on a "claims made" form.

(b) If coverage is approved (if approval is required above) and purchased on a "claims made" basis, Landlord warrants continuation of coverage, either through policy renewals or the purchase of an extended discovery period, if such extended coverage is available, for not less than three years from the date of completion of the work which is subject to said insurance.

(c) By requiring such minimum insurance as specified herein, neither party shall be deemed to, or construed to, have assessed the risks that may be applicable to the other party to this Lease or any Contractor. Each party and each Contractor shall assess its own risks and, if it deems appropriate and/or prudent, maintain greater limits or broader coverage.

(d) Nothing contained within these insurance requirements shall be deemed to limit the scope, application and/or limits of coverage afforded, which coverage will

apply to each insured to the full extent provided by the terms and conditions of the policy(ies). Nothing contained within this provision shall affect and/or alter the application of any other provision contained within this Lease.

14. Tenant's Insurance Requirements.

14.1 General Liability. During the Term of this Lease, Tenant shall have the right to self-insure under Section 14.2 or, at its sole cost and expense, shall obtain and keep in force a Commercial General Liability insurance policy on an-occurrence basis insuring Tenant against claims for injuries to persons and property damage liability. "Commercial General Liability" insurance shall mean Insurance Services Office form number (CG00 01) with a limit of not less than $l,000,000 combined single limit per occurrence, $2,000,000 aggregate. Tenant agrees to add Landlord and Construction Lender as additional insureds to any Commercial General Liability insurance policy.

14.2 Self-Insurance by Tenant. Notwithstanding anything herein to the contrary, Tenant may self-insure for general liability coverage, provided that Tenant maintains at all times a program of self-insurance and provides Landlord annually with a certified actuarial statement from an independent insurance consultant or actuary that such program is in full force and effect and is actuarially sound and consistent with industry standards and prudent risk management standards. Annual evidence of Tenant's program of self-insurance shall be provided to Landlord. Tenant agrees to provide Landlord with at least thirty (30) days' prior written notice of any change in Tenant's self-insured status and will provide Landlord with a certificate of self-insurance as adequate proof of insurance. In the event Tenant fails to satisfy the condition set forth above, Tenant shall immediately procure the Commercial General Liability insurance coverage specified in Section 14.1. If Tenant elects to self-insure as set forth in this Section, Tenant acknowledges and agrees that Landlord shall have no liability for such losses or damage which would otherwise have been covered by the general liability insurance which Tenant could have provided in accordance with Section 14.1 of this Lease, nor shall Tenant's failure to obtain commercial general liability insurance have any effect on Tenant's obligations under this Lease.

14.3 Workers' Compensation. Landlord acknowledges, agrees and understands that Tenant is self-insured for all of its workers' compensation liability exposure. Tenant agrees, at its own expense, to maintain through its self-insurance program coverage for its workers' compensation liability exposure for the duration of the Term of this Lease. Tenant agrees to provide Landlord with at least thirty (30) days' prior written notice of any change in the Tenant's self-insured status and will provide Landlord with a certificate of self-insurance as adequate proof of insurance.

14.4 Property Insurance. Following the Commencement Date of this Lease, Tenant will carry or cause to be carried fire and extended coverage property insurance covering the Premises and all of Tenant's personal property in such amounts and covering such risks as Tenant may determine from time to time. Such insurance shall be carried with financially responsible insurance companies authorized to do business in the State of Washington, and may be carried under a policy or policies covering other property owned or controlled by Tenant or may be accomplished through a program of self-insurance as provided for similarly situated facilities of Tenant. Tenant shall furnish to Landlord, on or before the effective date of any such

policy, certificates of insurance or self-insurance evidencing that the insurance required by this Section 14.4 is in force and effect on the specified date and that the premiums therefor have been paid. Tenant agrees that such policies shall contain a provision that the same may not be cancelled or given notice of non-renewal nor shall the terms of conditions thereof be altered, amended or modified without at least forty-five (45) days' prior written notice being given by the insurer to Landlord (ten (10) days for nonpayment of premiums).

15. Waiver of Subrogation. Landlord and Tenant agree that neither shall make a claim against or seek recovery from the other party for any loss or damage to their property, or the property of others resulting from perils for which property insurance coverage is provided, or required to be provided hereunder (or would have been provided had Tenant not elected to self-insure) and each hereby releases the other from any such claim or liability regardless of the cause of such loss or damage. Such waiver is conditioned upon the parties' ability to enter into such a wavier and is valid only to the extent allowed by their respective insurers.

16. Interim Commuter Parking. As part of its obligations under this Lease, Landlord shall obtain, at its sole cost and expense, by purchase or lease for a term (including renewal options) of up to three (3) years, replacement parking for 300 vehicles within one-half (l/2 mile) of the Premises suitable for use as a park and ride lot by Persons utilizing Tenant's regional transit center in Burien which site shall be approved by Tenant, which approval shall not be unreasonably withheld, conditioned or delayed (the "**Replacement Park and Ride Facility**"). Landlord shall, at its sole cost and expense operate and maintain the Replacement Park and Ride Facility in good condition and repair and in a manner consistent with the standards prevailing at other park and ride facilities owned or operated by Tenant, including the installation of lighting and signage as Tenant may reasonably request. The insurance provided by Landlord under this Lease shall include the Replacement Park and Ride Facility. Landlord shall provide Tenant with a copy of the lease or deed for the Replacement Park and Ride Facility on or before the Initial Conditions Precedent Satisfaction Date and in any event prior to Commencement of Construction of the Garage on the Land.

17. Damage, Destruction and Condemnation Prior to the Commencement Date of this Lease.

17.1 Damage and Destruction. After the happening of any casualty to the Project prior to Final Completion of the Project, Landlord shall give Tenant prompt written notice thereof generally describing the nature and cause of such casualty and the extent of the damage or destruction to the Project. If, prior to the Final Completion of the Project, damage or destruction occurs to the Project, Landlord shall proceed diligently to reconstruct and restore the Project in accordance with the Contract Documents and the provisions of this Lease. Landlord will assign all insurance proceeds which Landlord may be entitled to receive prior to Final Completion of Project with respect to damage or destruction to the Construction Lender if so required by the Construction Lender, or a third party insurance trustee mutually acceptable to Landlord and Tenant and such insurance proceeds shall be disbursed to Landlord to pay for the cost of restoration or repair in periodic installments based upon the percentage of completion and otherwise in accordance with standard commercial construction loan administration. All costs of such repair or restoration of the Project exceeding the amount of the insurance proceeds shall be paid by Landlord.

17.2 Condemnation. In the event of a partial condemnation of the Project prior to the Final Completion of the Project to the extent that the Project may still be constructed in accordance with the Contract Documents, or may be constructed in accordance with the Contract Documents as modified by changes acceptable to Landlord and (including any adjustment in Monthly Rent and the Fixed Price as a result of a change in the Project) Tenant, Landlord shall proceed diligently to construct the Project in accordance with the Contract Documents, as modified, if applicable. Any such partial condemnation proceeds shall be deposited with Construction Lender or third party insurance trustee mutually acceptable to Landlord and Tenant and disbursed in accordance with the provisions of Section 17.1 above. In the event of a condemnation of all of the Project or so much thereof that the Project may no longer be constructed in accordance with the Contract Documents, this Lease shall terminate, Landlord shall be paid for all Project Costs incurred as of the date of such condemnation (including costs that Landlord is obligated to pay third parties as of that date), and the parties shall have no further obligations hereunder. After Landlord has been paid in accordance with the foregoing sentence, all remaining condemnation proceeds shall be paid to Tenant.

18. Damage and Destruction After Commencement Date of this Lease. In the event the Premises are damaged or destroyed by fire or other casualty after the Commencement Date of this Lease, this Lease shall not terminate nor shall there be any abatement of the Monthly Rent otherwise payable by Tenant hereunder. If such damage or destruction occurs after the Commencement Date of this Lease, then within 180 days following such damage or destruction, Tenant shall notify Landlord of its election to either exercise its Option to purchase the Premises or to rebuild the Premises. In the event Tenant elects to rebuild the Premises, there shall be no abatement of Monthly Rent otherwise payable by Tenant hereunder. Landlord shall have no obligation to repair, rebuild or restore any portion of the Premises damaged by any casualty after the Commencement Date of this Lease. Tenant shall use such portion of the insurance proceeds as may be necessary to repair, rebuild or restore all or any portion of the Premises that may have been damaged or destroyed as nearly as practicable in full compliance with all Requirements of Law and to the same condition, character and at least equal value and utility to that existing prior to such damage or destruction. If the insurance proceeds are insufficient to pay in full the cost of any repair, restoration, modification, or improvement of any component of the Premises, Tenant may, subject to appropriation of sufficient funds, complete the work and pay any costs in excess of the amount of the insurance proceeds. Tenant shall not be entitled to any reimbursement therefor from Landlord nor shall Tenant be entitled to any diminution of any Monthly Rent otherwise payable hereunder.

19. Condemnation After the Commencement Date of this Lease.

19.1 Total Condemnation. If there is a taking or damaging of all or any portion of the Premises by the exercise of any governmental power, whether by legal proceedings or otherwise, by a governmental agency with jurisdiction over the Premises or a transfer by Landlord either under threat of condemnation or while legal proceedings for condemnation are pending (a "**Condemnation**") such that there can be no reasonable use of the Premises by Tenant, as reasonably determined by Tenant, this Lease shall terminate on the date the condemnor has the right to possession of the property being condemned. The award with respect to a taking of the Premises shall be divided between Landlord and Tenant in proportion to the relative value of their respective interests in the Premises and the leasehold estate created under this Lease as of

the date of such Condemnation as follows: The value of Tenant's interest shall be equal to the present value of the reversionary interest in the Premises over the remainder of the then Term of this Lease. The value of Landlord's interest shall be equal to the value of its leasehold interest under this Lease over the remainder of the then Term of this Lease not to exceed the Option Price for the Premises as of the date of Condemnation, with the remainder, if any, to be paid to Tenant. If the Deed of Trust is outstanding as of the date of Condemnation, any amounts outstanding under the Construction Loan shall be charged against Landlord's share and shall be paid to the Construction Lender to the extent of the unpaid balance, if any of the Construction Loan secured by the Deed of Trust. If Certificates have been issued as of the date of Condemnation, the Condemnation proceeds shall be paid first to the Trustee in an amount sufficient to prepay in full all Certificates outstanding as of the date of Condemnation and the balance if any shall be paid to Tenant.

19.2 Partial Condemnation. If there is a partial taking of the Premises by Condemnation after the Final Completion of the Project, and Tenant determines that a reasonable use can be made of the Premises, then the condemnation proceeds shall be paid to Tenant and Landlord shall have no obligation to restore the Premises unless otherwise agreed upon by Landlord and Tenant. In no event shall this Lease terminate as a result of a partial taking nor shall there be any abatement of Monthly Rent otherwise payable by Tenant hereunder.

20. Prohibition Against Transfer of Interest in Landlord; Assignment of Project; Subletting.

20.1 Prohibition Against Transfers of Interest in Landlord or Assignment of Lease by Landlord. Landlord acknowledges that Tenant is relying upon the personal knowledge and expertise and experience of Danielle Bennett of Alliance Property Group, Inc., and Kip Sheppard of Wasatch Advantage Group LLC, the principals of the two managing members of Landlord in entering into this Lease. Prior to Final Completion of the Project, Landlord may not (a) sell, transfer, convey or assign interests in Landlord or any member or manager of Landlord, (b) admit additional or substitute members in Landlord or any member or manager of Landlord, or (c) change or transfer ownership interests in Landlord or any member or manager of Landlord except in accordance with the Approved Financing Plan. Any other transfer shall require the prior written consent of Tenant, which may be withheld by Tenant in its sole and absolute discretion. Landlord shall not assign, transfer or encumber its interest in the Ground Lease, this Lease or in the Premises (except to Construction Lender) or sublease the Premises in whole or in part without the prior written consent of Tenant, which consent may be withheld by Tenant in its sole and absolute discretion. Any request by Landlord for such consent shall be in writing which shall set forth the details as to the proposed assignment, mortgage or subletting and have annexed thereto a copy of the proposed mortgage, assignment or sublease. Except as otherwise expressly provided herein, any attempted assignment or transfer of this Lease, mortgage or encumbrance of the Premises (except to Construction Lender in accordance with the Approved Financing Plan) or subletting of the Premises without Tenant's consent shall be void and shall constitute a breach of the Ground Lease and this Lease. As used in this Section 20.1, a "transfer" includes any sale, transfer, conveyance, assignment, mortgage, pledge or other disposition of any interest in Landlord or any member or manager of Landlord, whether voluntary or involuntary, by operation of law or otherwise, including transfers in bankruptcy or appointment of a receiver or assignee for the benefit or creditors or any merger, consolidation,

liquidation or dissolution of Landlord or any member or manager of Landlord. Any transfer of Landlord's interest in the Ground Lease, this Lease or in the Premises as a result of merger, consolidation or liquidation which is not expressly approved in writing by Tenant shall be deemed to be a prohibited assignment within the meaning of this Section.

20.2 Assignment or Sublease by Tenant. Tenant may assign its interest in this Lease or sublease the Premises or any portion thereof; provided, however, that under no circumstances shall Tenant be released or relieved from any of its obligations hereunder. Any such assignment or sublease by Tenant as provided for in this Section 20 shall be in writing and shall require such assignee or sublessee to comply fully with the terms of this Lease. Tenant shall provide Landlord with written notice of any such assignment or sublease and a copy of any such assignment or sublease documentation.

21. Options To Prepay Monthly Rent And Purchase Premises.

21.1 Option to Purchase. Provided that Tenant is not in default under this Lease (including payment of any Additional Rent then due and owing), Tenant shall have the option to purchase the Premises and thereby terminate this Lease at any time on or after Substantial Completion of the Project by giving notice of its election to exercise its option and paying the purchase price as stated in this Section 21.1. The Option Price shall be an amount equal to the Fixed Price less the amount of all Monthly Rent payments made under this Lease to the date of Closing, plus an option exercise fee of one dollar ($l.00).

21.2 Exercise of Option. Tenant shall give Landlord not less than sixty (60) days' prior written notice of its election to exercise its option to purchase under Section 21.1 hereof. The Notice of Exercise of Option to Purchase the Premises shall be in the form attached hereto as **Exhibit J** and by this reference incorporated herein. The Option Price shall be paid in cash or immediately available funds on the date specified in such notice (or such other date as Tenant and Landlord may mutually agree); provided, however, that in no event shall Closing occur prior to Final Completion of the Project. Nothing herein shall be construed to require Tenant to exercise the purchase option herein granted.

21.3 Conveyance of Premises. If Tenant has exercised the Option, then at Closing, Landlord shall convey to Tenant marketable and insurable fee simple title to the Premises, by execution and delivery of a Bargain and Sale Deed to the Garage in a form reasonably acceptable to Tenant (the "**Deed**") and assignment to Tenant of all of Landlord's right, title and interest in the Garage Land under the Ground Lease and this Lease. Evidence of delivery of marketable and insurable fee simple title to the Premises shall be the issuance by the Title Company of an ALTA extended coverage Tenant's Policy of Title Insurance (Rev. 2006) with liability in the amount of the Option Price or any lesser sum as may be approved by Tenant, in Tenant's sole discretion (the "**Title Policy**") insuring fee simple title to the Premises in Tenant, subject only to (i) liens and encumbrances approved by Tenant; (ii) other exceptions created or suffered by Landlord following the Effective Date that have been approved by Tenant in writing; (iii) utility easements granted by Landlord following the Effective Date required for the use of the Premises as a public parking facility; (iv) any liens, encumbrances or defects created or incurred by Tenant after the Effective Date (collectively items (i) through (iv) are the "**Permitted Exceptions**"). The Title Policy shall include such endorsements as Tenant may reasonably request. The

indemnification of the Title Company by Landlord, or the General Contractor to induce the Title Company to insure over any otherwise unpermitted exceptions to title shall not be allowed except with the prior written consent of Tenant in its sole discretion after full disclosure to Tenant of the nature and substance of the unpermitted exception and the nature of the indemnity. The Title Policy shall provide full coverage against construction liens arising out of the construction of the Garage on the Land.

21.4 Title to Personal Property and Intangible Property. At the Closing, Landlord shall transfer title to any personal property included as part of the Project free and clear of all liens and encumbrances whatsoever except such liens and encumbrances as Tenant may approve in writing by execution and delivery of a warranty bill of sale in a form reasonably acceptable to Tenant. Landlord shall execute and delivery to Tenant any documents that Tenant may reasonably request in order to transfer to Tenant any intangible personal property included in the Project.

22. Closing of Purchase of Garage.

22.1 Closing Procedures.

(a) The Closing shall be held at the offices of Escrow Agent. The Closing Date shall be on the later of (i) (90) days following exercise of the Option, or (ii) the Final Completion of the Project. Such date may not be extended without the written approval of Landlord and Tenant except as otherwise expressly provided in this Lease. All documents shall be deemed delivered on the date the Deed is recorded.

(b) In the event the Closing does not occur on or before the Closing Date, Escrow Agent shall, unless it is notified by both parties to the contrary within five (5) days after the Closing Date, return to the depositor thereof items which may have been deposited hereunder. Any such return shall not, however, relieve either party hereto of any liability it may have for its wrongful failure to close.

22.2 Delivery by Landlord. On or prior to the Closing Date, Landlord shall deposit with Escrow Agent, and shall deliver copies to Tenant to the extent not previously delivered prior to the Closing, the following:

(a) Landlord shall execute and delivery to Tenant a good and sufficient Bargain and Sale Deed to the Premises in recordable form conveying good and marketable fee simple title free to the Garage and all of Landlord's right, title and interest to the Garage Land under the Ground Lease and this Lease and clear of all liens and encumbrances, except for the Permitted Encumbrances, and all easements and rights appurtenant thereto;

(b) A certificate from the Department of Licensing of the State of Washington indicating that, as of a date not more than five (5) business days prior to the Closing Date there are no filings against Landlord in the office of the Uniform Commercial Code division of the Department of Licensing which would be a lien on any of the Premises (other than such filings, if any, as are being released at Closing;

(c) Landlord shall furnish to Tenant, at Tenant's sole cost and expense, the Title Policy;

(d) Landlord shall deliver to Tenant the originals of all Permits, licenses, and approvals necessary for the occupation, use and operation of the Premises, including, without limitation, the building permits and the Certificate of Occupancy. In the event the original is required to be posted on the Premises, delivery of a duplicate shall be permitted;

(e) Landlord shall deliver to Tenant the originals of all warranties and guarantees of contractors, subcontractors, suppliers and materialmen received by Landlord in connection with the construction or installation of the Project and the acquisition of any equipment and personal property. Landlord shall delivery to Tenant a written assignment of such warranties and guarantees, in a form reasonably acceptable to Tenant and its counsel (hereinafter the "**Assignment of Warranties**");

(f) Landlord shall delivery to Tenant, at Landlord's expense, a complete set of final engineering plans and specifications for the Garage;

(g) Landlord shall provide, at its expense, an ALTA "as built" survey of the Premises showing all encumbrances, liens and/or defects affecting the Premises after construction of the Project and prior to Closing;

(h) Landlord shall provide a complete inventory of, and shall transfer to Tenant its interest in, any and all personal property required pursuant to Construction Documents, if any, to be located on the Premises, by warranty bill of sale in a form reasonably acceptable to Tenant and its counsel. The cost of such personal property being transferred is included in the Option Price;

(i) Landlord shall transfer to Tenant its interest in those service contracts approved by Tenant by execution and delivery of an assignment of any service contracts;

(j) Affidavit executed by Landlord which satisfies the requirements of Section 1445 of the Unites States Internal Revenue Code regarding foreign investors;

(k) Any reconveyance documents required to eliminate of record the Construction Loan, the Deed of Trust and any other Security Documents which are a Lien on the Land and any affidavit required to eliminate the Title Company exception for construction liens and the rights of parties in possession;

(l) Confirmation of warranties made by Landlord in this Lease;

(m) Copies of books and records of Landlord which Tenant would require to operate and maintain the Garage (including applicable maintenance records), together with keys to all entrance doors to equipment and utility rooms located in the Garage, which keys shall be properly tagged for identification;

(n) Such resolutions, authorizations, certificates or other limited liability documents or agreements relating to Landlord or as shall be reasonably required by Tenant or the Title Company in connection with this transaction;

(o) Landlord shall duly execute (and acknowledge if appropriate) such other documents as reasonably necessary to effectuate this transaction; and Landlord shall delivery to Tenant all other documents required to be delivered at or prior to the Closing pursuant to the terms of this Lease.

22.3 Delivery by Tenant. On or before the Closing Date, Tenant shall deposit with Escrow Agent the Option Price (less any adjustments authorized under this Lease) and shall deposit the following:

(a) Assignment of any service contracts duly accepted by Tenant;

(b) Such resolutions, authorizations, certificates or other ordinances or agreements relating to Tenant or as shall be reasonably required by Landlord or the Title Company in connection with this transaction;

(c) Tenant shall duly execute (and acknowledge if appropriate) such other documents reasonably necessary to effectuate this transaction; and Tenant shall delivery to Landlord all other documents required to be delivered by Tenant at or prior to the Closing pursuant to this Lease.

22.4 Pro-rations. All revenue and all expenses of the Premises (other than real and personal property taxes), including, but not limited to rents, water, sewer and utility charges, amounts payable under service contracts which are to be assumed by Tenant, annual permits and/or inspection fees (calculated on the basis of the respective periods covered thereby) and other expenses normal to the ownership, use, operation and maintenance of the Premises to the extent not otherwise payable by Tenant under this Lease shall be prorated as of the Closing Date. Because Tenant is exempt from property tax, no prorations of real and personal property taxes will be required, but Landlord shall pay all real and personal property taxes for the Premises for the period up to and including the Closing Date.

22.5 Costs and Expenses. Tenant shall pay the premium for the Title Policy and all real estate excise taxes. Tenant shall pay the cost to record the Deed and any sales or use tax payable in connection with any personal property included as part of the Garage. The escrow fees shall be borne equally by Landlord and Tenant.

22.6 Recordation. Provided that Escrow Agent has not received prior written notice from either party than an agreement of either party made hereunder has not been performed, or to the effect that any condition set forth herein has not been fulfilled, and further provided that Title Company has issued or is unconditionally prepared and committed to issue to Tenant the Title Policy, then Escrow Agent is authorized and instructed at 8:00 a.m. (or as soon thereafter as possible) on the Closing Date pursuant to joint escrow instructions to be executed by Tenant and Landlord to:

(a) Record the Deed and the assignment of Landlord's interest in the Garage Land under the Ground Lease and this Lease in the real property records of King County, Washington;

(b) Assemble and deliver at least one fully executed counterpart of the assignment of service contracts to both Tenant and Landlord;

(c) Deliver all documents described in Section 22 to Tenant; and Record any reconveyancing documents delivered by Landlord pursuant to Section 22.2(k) hereof.

23. Default by Tenant. The occurrence of any of the following shall constitute an Event of Default by Tenant under this Lease:

23.1 Payment. Failure (a) to make any Monthly Rent payments due under this Lease if the failure to pay is not cured within seven (7) days after written notice of such failure has been given by Landlord to Tenant, or (b) failure to make any other payment required if the failure to pay is not cured within ten (10) days after written notice of such failure has been given by Landlord to Tenant.

23.2 Other Failure to Perform. Failure to perform any other provision of this Lease if the failure to perform is not cured within thirty (30) days after written notice of such default has been given by Landlord to Tenant. If the default cannot reasonably be cured within thirty (30) days, then Tenant shall not be in default under this Lease if Tenant commences to cure the default within thirty (30) days and diligently and in good faith continues to prosecute such cure to completion.

23.3 Late Charges; Interest on Past Due Monthly Rent. Tenant acknowledges that a late payment of Monthly Rent hereunder will cause Landlord to incur costs not contemplated by this Lease, the exact amount of which is difficult to ascertain. Therefore, in the event Tenant shall fail to pay any installment of Monthly Rent due hereunder for fifteen (15) days after the date such amount is due, Tenant shall also pay Landlord a late charge equal to two percent (2%) of the amount then owing and past due together with interest on such past due amount at an interest rate of twelve percent (12%) per annum commencing ten (10) days after the date such amount is due until paid. Payment of such late charges and/or default interest shall not excuse or cure any default by Tenant under this Lease.

23.4 Remedies for Tenant Default. If Tenant commits a default under Section 23 above and fails to cure such default within the time period provided therein, then Landlord, by providing Tenant with ten (10) days' advance written notice, may cancel and terminate this Lease, evict the Tenant and re-enter the Premises, but notwithstanding such re-entry by Landlord, Tenant covenants and agrees to make good to Landlord any deficiency arising from a re-entry and reletting of the Premises at a lesser monthly rent than the Monthly Rent agreed to be paid by Tenant through the Term of this Lease, provided Landlord has taken all commercially reasonable measures to ensure that a maximum rental rate was obtained for reletting. Landlord shall provide notice to Tenant of any amount by which rentals from such reletting are less than the Monthly Rent and the due dates of such Monthly Rent. The deficiency amount for each such

Monthly Rent payment shall be paid by Tenant on or before the due date for such Monthly Rent payment. In addition to the remedy specified above for Tenant's failure to pay Monthly Rent, if Tenant commits any default and fails to cure such default within the time period provided under this Section 23.4, Landlord shall have the right to pursue any and all remedies available at law or in equity.

24. Default by Landlord.

24.1 Events of Default by Landlord. The occurrence of any of the following shall constitute an Event of Default by Landlord under this Lease:

(a) If Landlord shall fail to perform any material obligation under the Ground Lease or this Lease; or

(b) If Landlord has abandoned construction of the Project for a period of twenty (20) consecutive days (except for Unavoidable Delay); or

(c) If any permit required for construction of the Project shall be revoked or canceled; or

(d) If Landlord shall have assigned, delegated, pledged or encumbered its rights, duties or obligations under this Lease in violation of this Lease; or

(e) If Landlord has not Commenced Construction of the Project on or before November 1, 2010; or

(f) If Landlord persistently disregards and fails to comply with Laws, ordinances, rules, regulations or orders of a governmental authority having jurisdiction over the Project; or

(g) If there shall occur any Lien or other encumbrance on the Land, the Premises or the Project caused by Landlord or General Contractor (other than the Permitted Liens) which is not bonded and removed in accordance with Section 9 above; or

(h) If there shall have occurred defective workmanship or materials within the Project which is not cured within the time period provided under this Lease; or

(i) If Substantial Completion of the Garage has not occurred for any reason except for Unavoidable Delay, on or before twelve (12) months after the Effective Date; or

(j) If Final Completion of the Project has not occurred for any reason whatsoever including Unavoidable Delay on or before the Required Completion Date; or

(k) If there is any default by Landlord under a lease of the Replacement Park and Ride Facility which is not cured within the period of time, if any, provided for cure under any such lease or if at any time prior to one hundred eighty (180) days

following Final Completion of the Project Landlord fails to provide at least 300 parking spaces available for Persons using Tenant's regional transit center; or

(l) If Landlord shall file a voluntary petition in bankruptcy or shall be adjudicated a bankrupt or insolvent or shall file any petition or answer seeking any reorganization, arrangement, composition, readjustment, liquidation, dissolution or similar relief under the present or any future federal bankruptcy code or any other present or future applicable federal, state or other statute or law, or shall seek or consent to or acquiesce in the appointment of any trustee, receiver of liquidator of Landlord or of all or any substantial part of its properties or of the Premises, or within 60 days after the commencement of any proceeding against Landlord seeking any reorganization, arrangement, composition, readjustment, liquidation, dissolution or similar relief under the present or any future federal bankruptcy act or any other present or future applicable federal, state or other statute or law, such proceeding shall not have been dismissed or if, within 60 days after the appointment, without the consent or acquiescence of Landlord, of any trustee, receiver or liquidator of Landlord or of all or any substantial part or either of its properties or of the Premises, such appointment shall not have been vacated or stayed on appeal or otherwise, or if, within 60 days after the expiration of any such stay, such appointment shall not have been vacated.

24.2 Tenant Remedies upon Landlord Event of Default. Upon any Event of Default by Landlord, Tenant shall give Landlord written notice of same, whereupon following receipt of such written notice, Landlord shall have thirty (30) days within which to commence all necessary action to cure such Event of Default (and if such cure is commenced, proceed to diligently complete such cure within a reasonable period of time not to exceed sixty (60) days), except with respect to Events of Default under Sections 24.1(b), 24.1(c), 24.1(f), or 24.1(k) for which the cure period shall be ten (10) Business Days or Section 24.1(l) for which no cure period exists beyond the time period stated herein; provided, however that there shall be no cure period for failure of Landlord to achieve Final Completion of the Project on or before the date set forth in Section 24.1(j). In the event Landlord fails to cure such Event of Default within the time period set forth above, Tenant shall be entitled to exercise any one or more of the following remedies:

(a) Terminate the Ground Lease, this Lease and the Exclusive Negotiation Agreement without liability to Landlord upon ten (10) days written notice; or

(b) Bring an action for damages which damages shall include all costs and expenses incurred by Tenant in leasing, operating and maintaining 300 parking stalls for use as an interim park and ride facility if an Event of Default occurs under Section 24.1(k) above; or

(c) In the event Landlord fails to design, develop or construct the Project in accordance with the FTA Requirements and such failure results in a determination by the Federal Transit Administration not to fund the FTA Grant, such failure shall constitute an Event of Default under this Lease and in addition to any other right or remedy available to Tenant at law or equity, Tenant shall have the right to offset against the Option Price otherwise payable by Tenant hereunder at the Closing the amount of the FTA Grant in the amount of Five Million Five Hundred Eighty Two Thousand Dollars ($5,582,000) as agreed liquidated damages resulting from such breach.

(d) Seek specific performance of Landlord's obligations under this Lease; or

(e) Take over and complete the work of construction of the Project. Tenant is hereby irrevocably appointed attorney-in-fact (the appointment being coupled with an interest) to incur obligations, enforce contracts or agreements therefore made by Landlord and to do any and all things that are necessary and proper to complete the Project and to recover the costs thereof, together with interest thereon at the rate of twelve percent (12%) per annum from the date incurred until paid in full. In the event Tenant elects to complete the Project, Tenant shall have the right to offset against Monthly Rent all amounts incurred by Tenant in completing the Project pursuant to this Section 24.2(e).

25. Signs. Tenant shall have the right to place identification signage, other signage, advertisements, awnings, banners or other exterior decorations on the exterior of the Premises without any further consent or approval from Landlord. Any sign that Tenant has the right to place, construct and maintain shall comply with all Laws, and Tenant shall obtain any approval required by such Laws. Landlord makes no representation with respect to Tenant's ability to obtain such approval.

26. Landlord's Right to Enter the Premises. Landlord shall have the right to enter the Premises at reasonable times during Tenant's normal business hours for the below listed purposes; provided, however, Landlord acknowledges and agrees to comply with Tenant's requests regarding security. Landlord shall conduct its activities on the Premises as allowed in this Section in a manner that will cause the least possible inconvenience, annoyance or disturbance to Tenant. Landlord shall not be liable in any manner for any inconvenience, annoyance, disturbance, loss of business, nuisance, or other damage arising out of Landlord's entry on the Premises as provided in this Section, except damage resulting from the negligent acts or omissions of Landlord:

26.1 Condition. To determine whether the Premises are in good condition and whether Tenant is complying with its obligations under this Lease.

26.2 Notices. To serve, post or keep posted any notices required or allowed under the provisions of this Lease.

27. No Encumbrances by Landlord. Except to the extent expressly authorized in Sections 10 and 20 of this Lease, Landlord shall not at any time during the Term of this Lease sell, transfer, lease (other than to Tenant pursuant to this Lease), convey, encumber, pledge, hypothecate or otherwise grant a security interest in the Premises or any portion thereof (other than to Construction Lender pursuant to the Security Documents).

28. Right to Estoppel Certificates. Each party, within fifteen (15) days after notice from the other party, shall execute and deliver to the other party, in recordable form, a certificate stating that this Lease is unmodified and in full force and effect, or in full force and effect as modified and stating the modifications. Failure to deliver the certificate within such fifteen (15) day period shall be conclusive upon the party failing to deliver the certificate for the benefit of the party requesting the certificate and any successor to the party requesting the certificate, that

this Lease is in full force and effect and has not been modified except as may be represented by the party requesting the certificate.

29. Subordination, Nondisturbance and Attornment Agreement. This Lease shall be subject and subordinate at all times to the lien of the Security Documents; provide, however that subordination of Tenant's rights under this Lease shall be expressly conditioned upon delivery of the Subordination Agreement in the form attached to this Lease as **Exhibit K** and by this reference incorporated herein, duly executed by Landlord and Construction Lender. The Subordination Agreement shall be executed and delivered by Landlord and Construction Lender and delivered to Tenant prior to the Commencement of Construction. Tenant shall have the right to record such Subordination Agreement in the real property records of King County, Washington.

30. Limitation on Landlord's Liability. Notwithstanding any provision in this Lease to the contrary, Tenant agrees that it shall look solely to the estate and property of Landlord in the Land and buildings constituting the Premises, any insurance proceeds or condemnation proceeds payable to Landlord under this Lease, and any sums paid to Landlord under this Lease for the collection of any judgment requiring the payment of money by Landlord or for the enforcement of any other judgment or remedy against Landlord arising from Landlord's rights and obligations in this Lease, and no other assets of Landlord shall be subject to levy, execution or other procedure for the satisfaction of Tenant's remedies.

31. Attorneys' Fees. In the event either party requires the services of an attorney in connection with enforcing the terms of this Lease, or in the event suit is brought for the recovery of any Monthly Rent due under this Lease or for the breach of any covenant or condition of this Lease, or for the restitution of said Premises to Landlord and/or eviction of Tenant during said Term or after the expiration thereof, the prevailing party will be entitled to a reasonable sum for attorneys' fees, witness fees, and court costs, including costs of appeal.

32. Surrender. Landlord shall, on the Expiration Date, surrender and deliver up the Premises, including all improvements then located thereon and the appurtenances thereto, into the possession of Tenant, in good order, condition and repair, free and clear of all leases, subleases and other occupancies, and free and clear of all liens and encumbrances other than those, if any, created by Tenant, without any payment or allowance whatsoever by Tenant. Landlord shall execute, acknowledge and deliver to Tenant such instruments of further assurance as in the opinion of Tenant are necessary or desirable to confirm or perfect Tenant's right, title and interest in and to all of the above-described property. The provisions of this Section shall survive the expiration or termination of this Lease.

33. Brokers. Landlord and Tenant each represent to the other that neither is represented by any broker, agent or finder with respect to this Lease in any manner. Each party agrees, to the maximum extent permitted by law, to indemnify and hold the other party harmless from and against any and all liability, costs, damages, causes of action or other proceedings instituted by any broker, agent or finder, licensed or otherwise, claiming through, under or by reason of the conduct of the indemnifying party in any manner whatsoever in connection with this Lease, which indemnification shall survive the Expiration Date of this Lease.

34. Miscellaneous Provisions.

34.1 Entire Agreement. This Lease, including **Exhibits A** through **M** which are attached hereto and by this reference incorporated herein, sets forth the entire agreement of the parties as to the subject matter hereof and supersedes all prior discussions and understandings between them. This Lease may not be amended or rescinded in any manner except by an instrument in writing signed by a duly authorized officer or representative of each party hereto.

34.2 Governing Law. This Lease shall be governed by and construed and enforced in accordance with the laws of the State of Washington.

34.3 Severability. Should any of the provisions of this Lease be found to be invalid, illegal or unenforceable by any court of competent jurisdiction, such provision shall be stricken and the remainder of this Lease shall nonetheless remain in full force and effect unless striking such provision shall materially alter the intention of the parties.

34.4 Jurisdiction/Venue. In the event any action is brought to enforce any of the provisions of this Lease, the parties agree to be subject to exclusive in personam jurisdiction in the King County Superior Court for the State of Washington and agree that in any such action venue shall lie exclusively in King County, Washington.

34.5 Waiver. No waiver of any right under this Lease shall be effective unless contained in writing signed by a duly authorized officer or representative of the party sought to be charged with the waiver and no waiver of any right arising from any breach or failure to perform shall be deemed to be a waiver of any future right or of any other right arising under this Lease.

34.6 Captions. Section captions contained in this Lease are included for convenience only and form no part of the agreement between the parties.

34.7 Notices. All notices or requests required or permitted under this Lease shall be in writing, shall be personally delivered or sent by certified mail, return receipt requested, postage prepaid, by nationally recognized overnight courier or by facsimile transmission and shall be deemed given when so delivered, received or faxed (provided the fax machine has issued a printed confirmation of receipt). All notices or requests to any party shall be sent to all other parties as follows:

If to Landlord: Alliance Wasatch I, LLC
617 West 7th Street, Suite 405
Los Angeles, CA 90017
Attn: Danielle Bennett
Facsimile: (213) 995-1771

If to Tenant: King County Property Services Division
500 King County Administration Building
500 Fourth Avenue
Seattle, WA 98104
Facsimile: (206) 205-5070

With a copy to:	Manager, Design and Construction King County Metro Transit Division King Street Center Mail Stop KSC-TR-0435 201 Jackson Street Seattle, WA 98104 Facsimile: (206) 684-1803
If to [Construction Lender]:	[To be provided.] _____ _____ _____ Facsimile: _____

Any party may change the address to which notices shall be sent by notice to the other party in the manner and with the effect set forth in this Section 34.7.

34.8 Binding Effect. Subject to the provisions of Sections 10 and 20 hereof, this Lease shall be binding upon, and inure to the benefit of, the parties hereto and their respective successors and assigns. No permitted assignment of this Lease or Tenant's rights hereunder shall be effective against Landlord unless and until an executed counterpart of the instrument of assignment shall have been delivered to Landlord and Landlord shall have been furnished with the name and address of the assignee. The term "Tenant" shall be deemed to include the assignee under any such permitted assignment. The term "Landlord" shall include any successors to or assigns of the Landlord's interest in the Premises following any foreclosure of the Security Documents, including Construction Lender or any purchaser at a trustee's or sheriff's sale of the Premises.

34.9 Gender and Number. As used in this Lease, the masculine shall include the feminine and neuter, the feminine shall include the masculine and neuter, the neuter shall include the masculine and feminine, the singular shall include the plural and the plural shall include the singular, as the context may require.

34.10 Nondiscrimination. Landlord and Tenant each agree it will not discriminate in employment at the Premises on the basis of race, color, religion, sex, national origin, veteran status, sexual orientation or physical and mental disability in regard to any position for which the prospective employee is qualified, nor will Landlord or Tenant maintain facilities which are segregated on the basis of race, color, religion, sex or national origin at the Premises.

34.11 Recording; Memorandum of Lease. Neither Landlord nor Tenant shall record this Lease without the written consent of the other; provided, however, that Tenant shall have the right to record a Memorandum of this Lease in the form attached hereto as **Exhibit L** and by this reference incorporated herein upon the Effective Date. Such Memorandum of Lease shall be amended by the parties and a new Memorandum recorded once (a) the short plat has been completed to exclude the Housing Land from the definition of the Land demised under the

Ground Lease and this Lease, and (b) once the Commencement Date and Expiration Date of this Lease has been determined.

34.12 Time Is of the Essence. Time is of the essence in the performance of each party's obligations under this Lease. Each party will carry out its obligations under this Lease diligently and in good faith.

34.13 Authority. Landlord is a limited liability company, duly organized, validly existing and in good standing under the laws of the State of California and has registered as a foreign limited liability company duly authorized to transact business in the State of Washington. Tenant is a political subdivision of the State of Washington. By execution of this Lease, Landlord and Tenant each represent to the other that it has authority to enter into this Lease and perform its obligations hereunder.

34.14 Nature of Relationship. The relationship between Landlord and Tenant under this Lease shall be solely that of landlord and tenant of real property. It is not intended by this Lease to, and nothing contained in this Lease shall, create any partnership, joint venture or other arrangement between Landlord and Tenant. No term or provision of this Lease is intended to be, or shall be, for the benefit of any other person, firm, organization or corporation, nor shall any other person, firm, organization or corporation have any right or cause of action hereunder.

34.15 No Third Party Rights. The provisions of this Lease are intended solely for the benefit of, and may only be enforced by, the parties hereto, and their respective successors and permitted assigns. None of the rights or obligations of the parties herein set forth (or implied) is intended to confer any claim, cause of action, remedy, defense, legal justification, indemnity, contribution claim, set-off, or other right, whatsoever upon or otherwise inure to the benefit of any Contractor, Architect, subcontractor, worker, supplier, mechanic, architect, insurer, surety, guest, member of the public, or other third parties having dealings with either of the parties hereto or involved, in any manner, in the Project.

34.16 Accounting, Inspection and Audit. Landlord shall keep such full and detailed accounts as may be necessary for proper financial management under this Lease. Tenant may, at its sole discretion, from time to time whether before or after purchase of the Premises if it elects to purchase the Premises, inspect all books and records of Landlord or any Contractor relating to the Project and/or elect to have an audit conducted to verify Project Costs. If Tenant so elects to conduct such an audit, it shall give notice to Landlord, and such audit shall be conducted as soon thereafter as is reasonably feasible. Such audit shall be conducted by an auditor selected by Tenant, and Tenant shall, except as hereinafter provided, pay the cost of such audit. Landlord agrees to cooperate with the auditor and make available for examination at its principal office all of its books, records, correspondence and other documents deemed necessary to conduct the audit by the auditor. If the audit reveals a variation of one percent (1%) or more of the Project Costs, Landlord shall pay the costs of the audit. Landlord shall preserve all records for a period of six (6) years after Final Completion of the Project hereunder; provided, however, if at any time prior to the expiration of seven (7) years after Final Completion of the Project, Landlord proposes to dispose of any Contract Documents related to the Project, Landlord shall deliver the same to Tenant for disposition by Tenant.

34.17 Fair Construction. The provisions of this Lease shall be construed as a whole according to their common meaning and not strictly for or against any party and consistent with the provisions contained herein in order to achieve the objectives and purposes of this Lease. Each party hereto and its counsel has reviewed and revised this Lease and agrees that the normal rules of construction to the effect that any ambiguities are to be resolved against the drafting party shall not be construed in the interpretation of this Lease. Each agreement, term and provision of this Lease to be performed by Landlord or Tenant shall be construed to be both a covenant and a condition.

34.18 Non-Waiver of Governmental Rights. Nothing contained in this Lease shall require Tenant to take any discretionary action relating to development of the improvements to be constructed on the Land as part of the Project, including, but not limited to environmental review, zoning and land use approvals, approval of applications to vacate public streets, permitting, design review or any other governmental approvals.

34.19 Counterparts. This Lease may be executed in counterparts, each of which shall constitute an original and all of which constitute but one original.

IN WITNESS WHEREOF, the parties hereto have executed this Lease as of the date and year set forth below.

LANDLORD:

ALLIANCE WASATCH I, LLC, a California limited liability company

By _____
Name _____
Title _____

Date _____, 2010

TENANT:

APPROVED AS TO FORM:

KING COUNTY, a political subdivision of the State of Washington

By _____
Senior Deputy Prosecuting Attorney

By _____
Name _____
Title _____

Date _____, 2010

Date _____, 2010

STATE OF _____)
) ss.
COUNTY OF _____)

I certify that I know or have satisfactory evidence that _____ is the person who appeared before me, and said person acknowledged that he signed this instrument, on oath stated that he was authorized to execute the instrument and acknowledged it as the _____ of ALLIANCE WASATCH I, LLC, a California limited liability company, to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

GIVEN UNDER MY HAND AND OFFICIAL SEAL this _____ day of _____, 2010.

_____
Notary Public
Print Name _____
My commission expires _____

(Use this space for notarial stamp/seal)

STATE OF WASHINGTON)
) ss.
COUNTY OF KING)

I certify that I know or have satisfactory evidence that _____ is the person who appeared before me, and said person acknowledged that ___ signed this instrument, on oath stated that ___ was authorized to execute the instrument and acknowledged it as the _____ of KING COUNTY, a political subdivision of the State of Washington, to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

GIVEN UNDER MY HAND AND OFFICIAL SEAL this _____ day of _____, 2010.

_____
Notary Public
Print Name _____
My commission expires _____

(Use this space for notarial stamp/seal)

EXHIBIT A

Schedule of Monthly Rent[1]

Burien TOD Garage Lease Payments

	Due date	Monthly lease payment	Balance due
			$20,518,000
1	1/1/2012	$68,324	$20,449,676
2	2/1/2012	$68,324	$20,381,352
3	3/1/2012	$68,324	$20,313,028
4	4/1/2012	$68,324	$20,244,704
5	5/1/2012	$68,324	$20,176,380
6	6/1/2012	$68,324	$20,108,056
7	7/1/2012	$68,324	$20,039,732
8	8/1/2012	$68,324	$19,971,408
9	9/1/2012	$68,324	$19,903,084
10	10/1/2012	$68,324	$19,834,760
11	11/1/2012	$68,324	$19,766,436
12	12/1/2012	$68,324	$19,698,112
13	1/1/2013	$68,324	$19,629,788
14	2/1/2013	$68,324	$19,561,464
15	3/1/2013	$68,324	$19,493,140
16	4/1/2013	$68,324	$19,424,816
17	5/1/2013	$68,324	$19,356,492
18	6/1/2013	$68,324	$19,288,168
19	7/1/2013	$68,324	$19,219,844
20	8/1/2013	$68,324	$19,151,520
21	9/1/2013	$68,324	$19,083,196
22	10/1/2013	$68,324	$19,014,872
23	11/1/2013	$68,324	$18,946,548
24	12/1/2013	$68,324	$18,878,224
25	1/1/2014	$68,324	$18,809,900
26	2/1/2014	$68,324	$18,741,576
27	3/1/2014	$68,324	$18,673,252
28	4/1/2014	$68,324	$18,604,928
29	5/1/2014	$68,324	$18,536,604
30	6/1/2014	$68,324	$18,468,280
31	7/1/2014	$68,324	$18,399,956
32	8/1/2014	$68,324	$18,331,632
33	9/1/2014	$68,324	$18,263,308
34	10/1/2014	$68,324	$18,194,984
35	11/1/2014	$68,324	$18,126,660
36	12/1/2014	$68,324	$18,058,336
37	1/1/2015	$68,324	$17,990,012

[1] *Note: Monthly Rent commences upon the Commencement Date (as defined in Section 1.11 of the Project Lease). If the Commencement Date is a date other than 01/01/2012, the due date of Monthly Rent payments will be adjusted accordingly.

Burien TOD Garage Lease Payments

	Due date	Monthly lease payment	Balance due
38	2/1/2015	$68,324	$17,921,688
39	3/1/2015	$68,324	$17,853,364
40	4/1/2015	$68,324	$17,785,040
41	5/1/2015	$68,324	$17,716,716
42	6/1/2015	$68,324	$17,648,392
43	7/1/2015	$68,324	$17,580,068
44	8/1/2015	$68,324	$17,511,744
45	9/1/2015	$68,324	$17,443,420
46	10/1/2015	$68,324	$17,375,096
47	11/1/2015	$68,324	$17,306,772
48	12/1/2015	$68,324	$17,238,448
49	1/1/2016	$68,324	$17,170,124
50	2/1/2016	$68,324	$17,101,800
51	3/1/2016	$68,324	$17,033,476
52	4/1/2016	$68,324	$16,965,152
53	5/1/2016	$68,324	$16,896,828
54	6/1/2016	$68,324	$16,828,504
55	7/1/2016	$68,324	$16,760,180
56	8/1/2016	$68,324	$16,691,856
57	9/1/2016	$68,324	$16,623,532
58	10/1/2016	$68,324	$16,555,208
59	11/1/2016	$68,324	$16,486,884
60	12/1/2016	$68,324	$16,418,560
61	1/1/2017	$68,324	$16,350,236
62	2/1/2017	$68,324	$16,281,912
63	3/1/2017	$68,324	$16,213,588
64	4/1/2017	$68,324	$16,145,264
65	5/1/2017	$68,324	$16,076,940
66	6/1/2017	$68,324	$16,008,616
67	7/1/2017	$68,324	$15,940,292
68	8/1/2017	$68,324	$15,871,968
69	9/1/2017	$68,324	$15,803,644
70	10/1/2017	$68,324	$15,735,320
71	11/1/2017	$68,324	$15,666,996
72	12/1/2017	$68,324	$15,598,672
73	1/1/2018	$68,324	$15,530,348
74	2/1/2018	$68,324	$15,462,024
75	3/1/2018	$68,324	$15,393,700
76	4/1/2018	$68,324	$15,325,376
77	5/1/2018	$68,324	$15,257,052
78	6/1/2018	$68,324	$15,188,728
79	7/1/2018	$68,324	$15,120,404
80	8/1/2018	$68,324	$15,052,080
81	9/1/2018	$68,324	$14,983,756

Burien TOD Garage Lease Payments

	Due date	Monthly lease payment	Balance due
82	10/1/2018	$68,324	$14,915,432
83	11/1/2018	$68,324	$14,847,108
84	12/1/2018	$68,324	$14,778,784
85	1/1/2019	$68,324	$14,710,460
86	2/1/2019	$68,324	$14,642,136
87	3/1/2019	$68,324	$14,573,812
88	4/1/2019	$68,324	$14,505,488
89	5/1/2019	$68,324	$14,437,164
90	6/1/2019	$68,324	$14,368,840
91	7/1/2019	$68,324	$14,300,516
92	8/1/2019	$68,324	$14,232,192
93	9/1/2019	$68,324	$14,163,868
94	10/1/2019	$68,324	$14,095,544
95	11/1/2019	$68,324	$14,027,220
96	12/1/2019	$68,324	$13,958,896
97	1/1/2020	$68,324	$13,890,572
98	2/1/2020	$68,324	$13,822,248
99	3/1/2020	$68,324	$13,753,924
100	4/1/2020	$68,324	$13,685,600
101	5/1/2020	$68,324	$13,617,276
102	6/1/2020	$68,324	$13,548,952
103	7/1/2020	$68,324	$13,480,628
104	8/1/2020	$68,324	$13,412,304
105	9/1/2020	$68,324	$13,343,980
106	10/1/2020	$68,324	$13,275,656
107	11/1/2020	$68,324	$13,207,332
108	12/1/2020	$68,324	$13,139,008
109	1/1/2021	$68,324	$13,070,684
110	2/1/2021	$68,324	$13,002,360
111	3/1/2021	$68,324	$12,934,036
112	4/1/2021	$68,324	$12,865,712
113	5/1/2021	$68,324	$12,797,388
114	6/1/2021	$68,324	$12,729,064
115	7/1/2021	$68,324	$12,660,740
116	8/1/2021	$68,324	$12,592,416
117	9/1/2021	$68,324	$12,524,092
118	10/1/2021	$68,324	$12,455,768
119	11/1/2021	$68,324	$12,387,444
120	12/1/2021	$68,324	$12,319,120
121	1/1/2022	$68,324	$12,250,796
122	2/1/2022	$68,324	$12,182,472
123	3/1/2022	$68,324	$12,114,148
124	4/1/2022	$68,324	$12,045,824
125	5/1/2022	$68,324	$11,977,500

Burien TOD Garage Lease Payments

	Due date	Monthly lease payment	Balance due
126	6/1/2022	$68,324	$11,909,176
127	7/1/2022	$68,324	$11,840,852
128	8/1/2022	$68,324	$11,772,528
129	9/1/2022	$68,324	$11,704,204
130	10/1/2022	$68,324	$11,635,880
131	11/1/2022	$68,324	$11,567,556
132	12/1/2022	$68,324	$11,499,232
133	1/1/2023	$68,324	$11,430,908
134	2/1/2023	$68,324	$11,362,584
135	3/1/2023	$68,324	$11,294,260
136	4/1/2023	$68,324	$11,225,936
137	5/1/2023	$68,324	$11,157,612
138	6/1/2023	$68,324	$11,089,288
139	7/1/2023	$68,324	$11,020,964
140	8/1/2023	$68,324	$10,952,640
141	9/1/2023	$68,324	$10,884,316
142	10/1/2023	$68,324	$10,815,992
143	11/1/2023	$68,324	$10,747,668
144	12/1/2023	$68,324	$10,679,344
145	1/1/2024	$68,324	$10,611,020
146	2/1/2024	$68,324	$10,542,696
147	3/1/2024	$68,324	$10,474,372
148	4/1/2024	$68,324	$10,406,048
149	5/1/2024	$68,324	$10,337,724
150	6/1/2024	$68,324	$10,269,400
151	7/1/2024	$68,324	$10,201,076
152	8/1/2024	$68,324	$10,132,752
153	9/1/2024	$68,324	$10,064,428
154	10/1/2024	$68,324	$9,996,104
155	11/1/2024	$68,324	$9,927,780
156	12/1/2024	$68,324	$9,859,456
157	1/1/2025	$68,324	$9,791,132
158	2/1/2025	$68,324	$9,722,808
159	3/1/2025	$68,324	$9,654,484
160	4/1/2025	$68,324	$9,586,160
161	5/1/2025	$68,324	$9,517,836
162	6/1/2025	$68,324	$9,449,512
163	7/1/2025	$68,324	$9,381,188
164	8/1/2025	$68,324	$9,312,864
165	9/1/2025	$68,324	$9,244,540
166	10/1/2025	$68,324	$9,176,216
167	11/1/2025	$68,324	$9,107,892
168	12/1/2025	$68,324	$9,039,568
169	1/1/2026	$68,324	$8,971,244

Burien TOD Garage Lease Payments

	Due date	Monthly lease payment	Balance due
170	2/1/2026	$68,324	$8,902,920
171	3/1/2026	$68,324	$8,834,596
172	4/1/2026	$68,324	$8,766,272
173	5/1/2026	$68,324	$8,697,948
174	6/1/2026	$68,324	$8,629,624
175	7/1/2026	$68,324	$8,561,300
176	8/1/2026	$68,324	$8,492,976
177	9/1/2026	$68,324	$8,424,652
178	10/1/2026	$68,324	$8,356,328
179	11/1/2026	$68,324	$8,288,004
180	12/1/2026	$68,324	$8,219,680
181	1/1/2027	$68,324	$8,151,356
182	2/1/2027	$68,324	$8,083,032
183	3/1/2027	$68,324	$8,014,708
184	4/1/2027	$68,324	$7,946,384
185	5/1/2027	$68,324	$7,878,060
186	6/1/2027	$68,324	$7,809,736
187	7/1/2027	$68,324	$7,741,412
188	8/1/2027	$68,324	$7,673,088
189	9/1/2027	$68,324	$7,604,764
190	10/1/2027	$68,324	$7,536,440
191	11/1/2027	$68,324	$7,468,116
192	12/1/2027	$68,324	$7,399,792
193	1/1/2028	$68,324	$7,331,468
194	2/1/2028	$68,324	$7,263,144
195	3/1/2028	$68,324	$7,194,820
196	4/1/2028	$68,324	$7,126,496
197	5/1/2028	$68,324	$7,058,172
198	6/1/2028	$68,324	$6,989,848
199	7/1/2028	$68,324	$6,921,524
200	8/1/2028	$68,324	$6,853,200
201	9/1/2028	$68,324	$6,784,876
202	10/1/2028	$68,324	$6,716,552
203	11/1/2028	$68,324	$6,648,228
204	12/1/2028	$68,324	$6,579,904
205	1/1/2029	$68,324	$6,511,580
206	2/1/2029	$68,324	$6,443,256
207	3/1/2029	$68,324	$6,374,932
208	4/1/2029	$68,324	$6,306,608
209	5/1/2029	$68,324	$6,238,284
210	6/1/2029	$68,324	$6,169,960
211	7/1/2029	$68,324	$6,101,636
212	8/1/2029	$68,324	$6,033,312
213	9/1/2029	$68,324	$5,964,988

Burien TOD Garage Lease Payments

	Due date	Monthly lease payment	Balance due
214	10/1/2029	$68,324	$5,896,664
215	11/1/2029	$68,324	$5,828,340
216	12/1/2029	$68,324	$5,760,016
217	1/1/2030	$68,324	$5,691,692
218	2/1/2030	$68,324	$5,623,368
219	3/1/2030	$68,324	$5,555,044
220	4/1/2030	$68,324	$5,486,720
221	5/1/2030	$68,324	$5,418,396
222	6/1/2030	$68,324	$5,350,072
223	7/1/2030	$68,324	$5,281,748
224	8/1/2030	$68,324	$5,213,424
225	9/1/2030	$68,324	$5,145,100
226	10/1/2030	$68,324	$5,076,776
227	11/1/2030	$68,324	$5,008,452
228	12/1/2030	$68,324	$4,940,128
229	1/1/2031	$68,324	$4,871,804
230	2/1/2031	$68,324	$4,803,480
231	3/1/2031	$68,324	$4,735,156
232	4/1/2031	$68,324	$4,666,832
233	5/1/2031	$68,324	$4,598,508
234	6/1/2031	$68,324	$4,530,184
235	7/1/2031	$68,324	$4,461,860
236	8/1/2031	$68,324	$4,393,536
237	9/1/2031	$68,324	$4,325,212
238	10/1/2031	$68,324	$4,256,888
239	11/1/2031	$68,324	$4,188,564
240	12/1/2031	$68,324	$4,120,240
241	1/1/2032	$68,324	$4,051,916
242	2/1/2032	$68,324	$3,983,592
243	3/1/2032	$68,324	$3,915,268
244	4/1/2032	$68,324	$3,846,944
245	5/1/2032	$68,324	$3,778,620
246	6/1/2032	$68,324	$3,710,296
247	7/1/2032	$68,324	$3,641,972
248	8/1/2032	$68,324	$3,573,648
249	9/1/2032	$68,324	$3,505,324
250	10/1/2032	$68,324	$3,437,000
251	11/1/2032	$68,324	$3,368,676
252	12/1/2032	$68,324	$3,300,352
253	1/1/2033	$68,324	$3,232,028
254	2/1/2033	$68,324	$3,163,704
255	3/1/2033	$68,324	$3,095,380
256	4/1/2033	$68,324	$3,027,056
257	5/1/2033	$68,324	$2,958,732

Burien TOD Garage Lease Payments

	Due date	Monthly lease payment	Balance due
258	6/1/2033	$68,324	$2,890,408
259	7/1/2033	$68,324	$2,822,084
260	8/1/2033	$68,324	$2,753,760
261	9/1/2033	$68,324	$2,685,436
262	10/1/2033	$68,324	$2,617,112
263	11/1/2033	$68,324	$2,548,788
264	12/1/2033	$68,324	$2,480,464
265	1/1/2034	$68,324	$2,412,140
266	2/1/2034	$68,324	$2,343,816
267	3/1/2034	$68,324	$2,275,492
268	4/1/2034	$68,324	$2,207,168
269	5/1/2034	$68,324	$2,138,844
270	6/1/2034	$68,324	$2,070,520
271	7/1/2034	$68,324	$2,002,196
272	8/1/2034	$68,324	$1,933,872
273	9/1/2034	$68,324	$1,865,548
274	10/1/2034	$68,324	$1,797,224
275	11/1/2034	$68,324	$1,728,900
276	12/1/2034	$68,324	$1,660,576
277	1/1/2035	$68,324	$1,592,252
278	2/1/2035	$68,324	$1,523,928
279	3/1/2035	$68,324	$1,455,604
280	4/1/2035	$68,324	$1,387,280
281	5/1/2035	$68,324	$1,318,956
282	6/1/2035	$68,324	$1,250,632
283	7/1/2035	$68,324	$1,182,308
284	8/1/2035	$68,324	$1,113,984
285	9/1/2035	$68,324	$1,045,660
286	10/1/2035	$68,324	$977,336
287	11/1/2035	$68,324	$909,012
288	12/1/2035	$68,324	$840,688
289	1/1/2036	$68,324	$772,364
290	2/1/2036	$68,324	$704,040
291	3/1/2036	$68,324	$635,716
292	4/1/2036	$68,324	$567,392
293	5/1/2036	$68,324	$499,068
294	6/1/2036	$68,324	$430,744
295	7/1/2036	$68,324	$362,420
296	8/1/2036	$68,324	$294,096
297	9/1/2036	$68,324	$225,772
298	10/1/2036	$68,324	$157,448
299	11/1/2036	$68,324	$89,124
300	12/1/2036	$68,324	$20,800

King County

Metro Transit Division
Department of Transportation

Burien TOD Parking Garage Performance Criteria

Design Criteria and Performance Specifications

15 October 2009

BergerABAM

33301 Ninth Avenue South
Federal Way, WA 98003

In association with

Arai-Jackson-Ellison-Murakami
CB Engineers

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Prepared for:

King County

Department of Transportation

Metro Transit Division

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1 Introduction

The overall requirements for the Burien TOD Parking Garage facility are described in this Performance Criteria Document including both Design Criteria and Performance Specifications. The Building Program below sets forth the specific building area requirements for the facility.

Specific technical requirements are described in the Performance Specifications: Divisions 1 through 16, following the Construction Specifications Institute (CSI) format.

1.1 Project Description

King County Metro Transit desires to provide a parking garage facility adjacent to the Burien Transit Center. The new facility should provide at least 500 parking stalls available to Metro Transit patrons at all times.

1.2 Project Requirements/Program

The Transit Oriented Development (TOD) Developer (hereafter referred to as "Developer") shall provide a parking garage complying with this Performance Criteria document including both Design Criteria and Performance Specifications. The project is to provide a parking structure facility that is functional and high quality construction (50 year design life). The project shall comply with all applicable building codes including the International Building Code (IBC) and the Burien Municipal Code (BMC). It is the responsibility of the Developer to ensure that the project complies with, or is accepted by conditional compliance, all applicable land use and building codes and regulations.

The new building shall be designed for a minimum of a fifty (50) year useful life. This is defined as the period of time over which the building components perform in meeting the purposes to which they were designed, provide durability against the wear and tear of normal use, and protect against the degradation effects of the forces of nature and exposure to the elements. Useful life depends in part on the proper maintenance and operations procedures by the Owner and may include the replacement of wearing surface materials such as paint, sealants, floor coverings, etc. These materials shall conform to the criteria stated in the Building Construction Chapter and in the Performance Specifications.

- Exterior Enclosure System 50 years
- Interior Construction 50 years
- Floor Construction 50 years
- HVAC Systems 25 years
- Plumbing Systems 25 years
- Electrical Systems 50 years
- Power and Transformer 25 years
- Lighting Systems 15 years
- Interior Doors and other Operable Elements: 15 years

All materials shall be selected for durability, non-dust collection, and ease of maintenance.

The net floor areas given in this document shall be provided as minimum free-and-clear area within each program space. "Free-and-clear" shall be the floor areas that are unobstructed by walls, columns, and the like from finished floor to the applicable clear height given in 2.1.2.

1.3 Code References

1.3.1 Codes

Siting and Structure shall comply with all applicable local, state, and federal codes and regulations including but not limited to:

- Latest adopted edition of the International Building Code (IBC)
- 29 CFR 1920; 1997 Occupational Safety and Health Standards, as a work place.
- Americans with Disabilities Act Accessibility Guidelines (ADAAG) and local amendments
- State building code.
- State elevator code.
- International Building Code adopted by the State and the authority having jurisdiction.
- Regulatory requirements of the authority having jurisdiction (Burien Municipal Code – BMC) which incorporate and/or amend the following:
    - Zoning Code
    - Land Use Code
    - Storm Water, Grading, and Drainage Control Code
    - Fire Code
    - Energy Code

Occupancy: International Building Code classifies the building as an open parking garage occupancy containing Group S-2 uses.

King County will accept variances granted by the City of Burien. Provide all documentation of variance approval.

Electrical design codes are provided in the Electrical section of this document.

1.3.2 Standards

The following standards shall be consulted for the design of this project

- MUTCD (Manual on Uniform Traffic Control Devices)

1.4 Acronyms

ADA:	Americans with Disabilities Act
ADAAG	Americans with Disabilities Act Accessibility Guidelines
BMC	Burien Municipal Code
CPTED	Crime Prevention through Environmental Design
HVAC	Heating Ventilation and Air Conditioning
PTZ	Pan, Tilt, Zoom Cameras

2 Functional Requirements

Provide elements as required to fulfill needs described in the project program and quality described in the performance specifications.

The complete facility is comprised of the following elements:

- Substructure: Includes elements below grade and in contact with the ground.
- Shell: Includes the superstructure, exterior enclosure and the roofing.
- Interiors: Interior construction, stairs, finishes, and fixtures.
- Services: Conveying, plumbing, HVAC, compressed air, fire protection, electrical, control, communications and specialized services.
- Site work: Modifications to the site, site improvements and utilities.

2.1 Building/Garage Functional Requirements

The purpose of this project is to provide a parking garage facility adjacent to the Burien Transit Center. The new facility should provide at least 500 parking stalls available to Metro Transit patrons at all times.

The structure height is limited by the BMC, or a maximum eight levels.

The building will include the rooms and spaces listed below. The criterion for these rooms and spaces is located in Section 3.1 of this document.

- Custodial Room
- Mechanical Room
- Main Electrical Room
- Emergency Power Room
- Electrical Closets
- Elevators
- Elevator Machine Room
- Fire Suppression/Sprinkler Room
- Security/Communications Room
- Stairs

2.1.1 Parking Spaces

Parking stalls, access aisles, and numbers and size of compact, regular and ADA stall mix shall be according to the BMC. ADA stalls shall be located as close to the Burien Transit Center and garage elevators as design allows.

Provide charging stations for electric vehicles with proper directional and stall signs. Locate the charging stations on the first and second levels to be controlled by the electrical panel in the main electrical room. Preferred parking, closest to transit center, shall be provided for electric vehicles (ADA parking has first priority).

- Parking Spaces 500 spaces minimum (total)
- Standard Per BMC, 8’-6” by 19’-0” minimum size
- ADA Per BMC

- Electric Vehicle — 10 electric vehicle charging stations installed now. 40 parking spaces to be equipped for future charging stations.

2.1.2 Internal Vehicular Access/Circulation

Vehicle Entrance: Provide vehicle entrance located on the north side of the parking structure set back from 4th Avenue SW sufficient to allow a five car queue into the garage.

Vehicle Exit: Provide vehicle exit located on north side of the parking structure.

Vehicle Emergency Exit: Provide vehicle exit for emergency use only on the east side of the parking structure to 3rd Avenue SW bus way.

Clear Height: First level is 8'-6", other levels are 7'-6". Clear height is defined as the clear distance to structure and all other potential interferences such as piping, lighting, and signage. Vertical clearance warning bars shall be set at 8'-2" at the First Level and set at 7'-2" at other levels.

Ramp Slope: Maximum slope per Alliance's document on ramps with parking stalls.

2.1.3 Internal Pedestrian Access/Circulation

Basic Function: Provide access to all levels of garage.

Pedestrian Entrances/Egress: Locate one door on the west side of the parking structure accessible from the 4th Avenue sidewalk and close to the stair tower. Locate a second door on the east side of the parking structure near the elevators and stair tower for direct access to the Burien Transit Center.

Stairs: Provide stairs per code. Provide protection from inclement weather without compromising CPTED. Provide door to exterior of garage. Entrance to each stair shall have a canopy structure to provide shade and weather protection.

Elevators: Provide two elevators, 2500# per elevator. Locate in northeast corner of garage structure near Main Entrance, existing Transit Center, and ADA parking.

2.1.4 Future Fare Collection

The parking structure vehicular entrance shall be designed with provision to implement fare collection in the future.

The fare collection island shall be 5'-0" wide and 14'-0" long between the entrance and exit lanes; provide power and communication conduits (2" diameter minimum each) and foundations for future fare gates.

2.2 Site Functional Requirements

2.2.1 Pedestrian Access Ways and Plaza

The project site shall be pedestrian friendly with safe and visible pedestrian pathways from the Burien Transit Center to the parking garage.

West Sidewalk: Along 4th Avenue SW per BMC.

North Sidewalk: 8-foot minimum width, located along north side of property. Connect 4th Avenue SW to the Burien Transit Center, not crossing vehicle traffic entering/exiting garage using 4" concrete with light broom finish with texture matching Burien sidewalk standards.

South Sidewalk: 5-foot minimum width, located along north face of parking structure, 4" concrete with light broom finish with texture matching Burien sidewalk standards.

Transit Plaza: Located on the north side of the garage east of the vehicular access area. Its purpose is to provide a pedestrian connection between the garage and the existing transit center. Provide pedestrian amenities including three benches, two litter receptacles, and bike lockers for eight bikes.

2.2.2 Vehicular Access Ways

Driveway/vehicle traffic lanes: 12'-0" lane width for entrance, 12'-0" lane width for exit, 6" thickness, broom finish concrete with curb and gutter matching City of Burien standards.

Kiss-and-Ride Stalls: Provide a minimum of five 9'-0" by 20'-0" stalls for "kiss-and-ride" (15 minute parking) function as close to the Burien Transit Center as design allows. Kiss-and-ride stalls should not impede traffic entering the garage. Locate such that pedestrians can exit auto and walk directly to Burien Transit Center without crossing garage traffic lanes.

Vehicular accesses and garage circulation system/flow capacity shall be designed for peak hour traffic and to avoid creating backup traffic spilling onto 4th Avenue SW, i.e. provide garage entrance setback sufficient to provide adequate holding capacity to store five vehicles waiting to enter the garage.

Emergency exit lane: 12'-0" lane width for vehicle emergency exit from bus way along 3rd Avenue SW. No entrance access from 3rd Avenue SW bus way.

2.2.3 Landscaping and Screening

Install landscaping in open space adjacent to garage to meet City of Burien's land use code.

The Developer shall comply or exceed all screening and landscaping requirements of the applicable land use code.

The landscape design shall be coordinated with site lighting and site signage so as to not obscure either as the landscaping matures. Use landscaping to shield and enhance parking lot design as well as to maintain openness of plaza to achieve CPTED.

The streetscape will be landscaped adjacent to curb and sidewalk improvements in compliance with the requirements of the local jurisdiction.

Landscaping shall be irrigated with an automated, freeze protected, irrigation system. If an automated irrigation system is not provided, place exterior freeze-protected hose bibs at 50' spacing around the perimeter of the garage.

2.3 General Elements

2.3.1 Signage/Wayfinding

Provide the following four categories of signage sufficient to communicate essential information to the users:

1. Traffic information (directional, one way, exit etc)
2. Pedestrian information (location of stairways, elevators, way finder sign to transit center and other land marks etc)
3. Regulatory information (identify compact, ADA parking, electric vehicles, vertical clearance etc, Metro will provide usage regulation contents)
4. General information (hours of operations etc, Metro will provide content)

Provide color-coding, numbering, visual cues to locate your vehicle for easy retrieval.

Locate signs in areas where driver can read in a timely fashion.

Provide clear, simple, and direct messages.

Signage should locate major internal pedestrian access points as well as external major roads and buildings.

2.3.2 Lighting

Energy efficient lighting is very important in garages to provide safety and security but can pose problems with spillage out of the garage onto neighboring properties. A balance between daylighting, interior lighting and exterior control should be addressed. Lights should be vandal resistant and easy to maintain. For purposes of re-lamping, lights on roof of parking structure to be accessible without the use of lifts, ladders, or other equipment.

2.3.3 Security

Provide security system with adequate PTZ cameras to cover all areas and corners of each floor. Provide at least four panic stations per floor including one in each elevator. Provide fixed camera at each elevator. CCTV cameras shall be positioned to provide viewing coverage of each panic station. Position of panic stations and cameras shall prevent vehicles from blocking camera views of panic stations.

2.3.4 Fire Protection

Provide dry type sprinkler system with down-turned sprinkler heads. Sprinkler system to be compression air charged. Provide suitable-sized, high quality air compressor. The fire protection system

shall be designed by a licensed sprinkler system designer. The sprinkler system shall meet the requirements of applicable codes including meeting the fire suppression requirements of the City of Burien Fire Department.

Provide standpipes in stairwells and per code.

Provide fire extinguisher cabinets on each level, and each end of structure.

3 Construction Requirements

Construction shall have no adverse impact to transit center operations and bus traffic in the vicinity.

3.1 Building Construction

3.1.1 Rooms/Spaces/Interiors

Basic Function: Provide appropriately finished interiors for all spaces indicated in the program, equipped with interior fixtures as required to function properly for specific occupancies.

Physical Separation: Provide physical separation between spaces, constructed to achieve fire ratings required by code, appropriate security between adjacent spaces, and visual, acoustical, olfactory, and atmospheric isolation as necessary to maintain desirable conditions within each space.

Impact Resistance: Provide impact resistant walls at least four feet above finish floor in areas adjacent to vehicle pavement. Interior cladding over walls other than concrete or masonry shall be medium density fiberboard on metal furring.

Interiors comprise the following assemblies: All elements necessary to subdivide and finish spaces enclosed within the building including all elements attached to interior construction that add functionality to enclosed spaces. Provide appropriately finished interiors for all spaces required by the program. Interior construction comprises the following elements:

- Partitions: All types of space dividers, including demountable and operable partitions.
- Interior Doors: All interior doors, including hardware and frames, except for elevator doors.
- Other Interior Openings: Interior utility openings such as hatches and access panels, louvers and vents.
- Stairs and Ramps: Those interior and exterior stair and ramp elements not part of the superstructure or exterior construction.
- Interior Fixtures: Interior fixtures are elements attached to interior construction that add functionality to the enclosed spaces except for elements classified as equipment or service fixtures.
- Provide finishes for interior surfaces that are appropriate for the functions of each space and meet the requirements of the program and performance technical specification. Finishes shall be as described in this document.
- Provide interior construction and fixtures that will not be damaged by ordinary cleaning and maintenance operations.
- Wear Resistance: Provide interior construction and fixtures that are suitable in durability for the degree and type of traffic anticipated.
- Vandal Resistance: Provide interior construction and fixtures that are inherently vandal resistant or designed to be difficult to access or damage. Provide graffiti coating on exterior walls of structure and enclosure (concrete, masonry, brick) except smooth concrete walls.
- Egress: Provide egress from all interior spaces in accordance with the governing code.
- Fire Resistance: Provide a design and select materials that provide fire resistance in accordance with the governing codes.

Room enclosures (general)

- Interior – Metal studs with insulation per code, concrete or reinforced concrete masonry
- Exterior – Brick veneer, concrete masonry, concrete panel, metal ribbed siding
- Hollow metal doors, metal jambs, painted finish, commercial hardware, deadbolt lock, wired for future card access locks.
- Floor – troweled concrete
- Wall finish – gypsum wall board (5/8”), enamel paint
- Ceiling – exposed concrete
- Conditioned areas – provide insulation for conditioned spaces in accordance with the Washington Energy Code.

3.1.1.1 Custodial Room

Space Requirements

- Floor scrubber and accessory storage
- Sink
- Access
- 10’ by 10’ minimum room size

Fixtures

- Water heater
- Floor sink, vitreous china
- Wall-mounted faucet
- Pail hook

Furnishings

- Storage shelving, industrial, 48” wide x 72” high, 5-6 shelves

Finishes

- Walls – Unpainted concrete or waterproof finish to 3’ above sink
- Floor – Sealed concrete
- Ceiling – Exposed

Number of rooms: 1

Window: No

Adjacency: Elevator

Utilities: Hot and cold supply, floor drain

HVAC: Heated to a minimum of 50°F. Provide an exhaust fan suitable for a minimum of 12 air changes per hour. The fan shall be engaged when the light is turned on and shall operate for a period of at least 15 minutes every two hours to provide ventilation of cleaning materials. Heating should be on the generator power circuit for freeze protection.

3.1.1.2 Mechanical Room

Finishes

- Walls – Sealed concrete or MDF
- Floors – Sealed concrete
- Ceiling – Exposed

Configuration requirement: 100 SF minimum, 1st Level

HVAC: Heated to a minimum of 50°F and as required to maintain temperature compatible with the operation of enclosed equipment.

Provide telephone jack.

3.1.1.3 Main Electrical Room

Finishes

- Walls – Sealed concrete or MDF
- Floors – Sealed concrete
- Ceiling – Exposed

Configuration requirement: 100 SF minimum, 1st Level

Provide telephone jack

HVAC: Provide an exhaust fan capable of 12 air changes per hour. Fan shall operate with an increase of room temperature. Fans shall be on the generator power circuit.

3.1.1.4 Emergency Power Room

Finishes

- Walls – Sealed concrete or MDF
- Floors – Sealed concrete
- Ceiling – Exposed

Configuration requirement: 100 SF minimum

HVAC: Provide an exhaust fan and intake air louvers of sufficient capacity to maintain the room temperature below the maximum temperature allowed by the manufacturer of equipment including but not limited to inverters and batteries. The fan shall be operated by a wall-mounted thermostat. Fans shall be on the generator power circuit.

Provide telephone jack.

3.1.1.5 Electrical Closets

Finishes

- Walls – Sealed concrete or MDF
- Floors – Sealed concrete
- Ceiling – Exposed

Configuration requirement: 15 SF minimum, 3rd and 5th Levels (7th, if 8th floor is needed)

HVAC: Temperature controlled ventilation fans with louvered openings for air intake.

3.1.1.6 Elevator & Elevator Machine Room

Capacity: 2500# per elevator

Number: Two, side by side

Location: Northeast corner of structure, close to Main Entrance and ADA parking.

Type: Geared, traction elevator

Elevator Machine Room: if required by elevator manufacturer, and manufacturer's service staff, on 1st Floor

Machine Room Finishes:

- Walls – Sealed concrete or MDF
- Floors – Sealed concrete
- Ceiling – Exposed

HVAC: Provide exhaust fan and intake louvers capable of maintaining room at less than the maximum temperature recommended by the elevator equipment manufacturer. Provide a dedicated air conditioning system in lieu of an exhaust fan if required by the elevator equipment manufacturer.

If air conditioning is required, provide duel level temperature control, first stage exhaust fan, with split AC set to maintain temperature per WAC 296-96-02465.

Provide a telephone jack.

Elevator Lobby: 50 sf minimum for each elevator for waiting passengers.

3.1.1.7 Fire Suppression/Sprinkler Room

Finishes

- Walls – Sealed concrete or MDF
- Floors – Sealed concrete
- Ceiling – Exposed

Configuration requirement: 80 SF minimum, 1st Level

HVAC: Heated to a minimum of 50°F and as required to maintain temperature compatible with the operation of enclosed equipment. Heating should be on the generator power circuit for freeze protection and life safety.

Exterior entrance required. Knox box required for fireman entry.

3.1.1.8 Security/Communications Room

Finishes

- Walls – Sealed concrete or MDF
- Floors – Sealed concrete

- Ceiling – Exposed

Configuration requirement: 10' by 10' minimum, 1st Level

HVAC: Provide an exhaust fan with appropriate intake air louver both sized to prevent room temperature from exceeding the maximum temperature recommended by manufacturers of equipment located in the room. In the event calculations indicate an exhaust fan will not be able to maintain the recommended room temperature, provide a dedicated air conditioning system. The air conditioning system shall utilize R-410A. All HVAC to be on generator power circuit.

Provide a telephone jack.

3.1.1.9 Stairs

Configuration and Space Requirements: Shall at a minimum comply with all state and local requirements including the IBC and any amendments; federal requirements including ANSI and ADA standards.

Stairways and elevators shall be designed with CPTED (Crime Prevention through Environmental Design) provisions. Exterior stair walls shall be enclosed with a tempered glass wall system.

Material: Concrete or Steel stair with concrete treads.

Finishes:

- Walls – Sealed concrete, reinforced concrete masonry, or tempered glass
- Floors – Sealed concrete
- Ceiling – Exposed

3.1.1.10 Exterior and Interior Building Finish

Comply with King County Power and Facilities Maintenance Paint Color Scheme standards as follows:

Exterior: Three maximum colors selected from KC P&F Maintenance's standard range of nine exterior generic colors.

1. Building walls and any roof enclosures
2. Doors and jambs
3. Roof trim and caps

Interior: One base color (linen white) and up to two accent colors selected from KC P&F Maintenance's standard range of six interior generic colors.

3.1.2 Directional Signage

The configuration shall at a minimum comply with all state and local requirements including the MUTCD, the IBC and any amendments, and federal requirements including current ANSI and ADA standards.

The finish shall comply with MUTCD and King County Power and Facilities Maintenance Paint Color Scheme standards as applicable.

3.1.3 Security and Safety Features

Install panic (emergency communication) stations on each floor (four minimum per floor). Panic stations must have telephone access. CCTVs (with pan-tilt-zoom features) to allow 24 hour-surveillance

of the parking structure. CCTV shall cover every corner of the parking structure including stairways and lobbies. CCTV system shall be connected to a centralized onsite recording center and an offsite monitoring station via I-net. Emergency panic station and CCTVs shall be designed to resist vandalism.

Provide key access overhead motorized rolled gates at each vehicular entrance to the garage. The garage and its pedestrian accesses shall be designed to allow security lock-down and/or shut down during non-operating hours. Garage shall be capable of remote lock-down by King County's central monitoring and access control.

Eliminate potential hiding places, such as under open stairs.

Provide ADA accessibility from vehicles close to stair and elevators per ADAAG and local amendments.

Provide painted pathway to identify pedestrian routes.

Provide broom finish floor surface for both vehicle and pedestrian safety.

3.1.4 Structure Materials

The parking structure shall be of precast or cast-in-place concrete and shall be a minimum of Type II Construction. Parking garage is an exposed structure and must be designed to withstand all aspects of environmental conditions.

3.1.5 Floor Surfaces

Garage floor surfaces: Provide the following characteristics.

- ¼" amplitude broom finish
- Minimum 1%, maximum 3% slope, 2% preferred
- Drains at all low points
- All floors exposed directly to rain and weather shall have waterproof concrete

Ramp floor surfaces: Provide the following characteristics.

- ¼" amplitude broom finish
- Maximum slope as agreed upon between King County and Alliance
- Full-length trench drains at base of all ramps exposed to rain
- All floors exposed directly to rain and weather shall have waterproof concrete

3.1.6 Exterior Wall Panels

Permanent Enclosure: Provide a permanent enclosure for all functional areas shown in the project program, unless otherwise indicated.

Exterior façade: Minimize direct illumination of abutting properties and adjacent streets from headlights and interior garage lighting.

Fire Resistance: All walls shall comply with applicable code and zoning requirements for the specific site and type of building.

Ambient Temperature Change: Allow for daily expansion and contraction within and between elements caused by temperature range from most extreme low temperature to 70 degrees F greater than the

most extreme high temperature, in any year, without causing detrimental effect to components and anchorage.

Water Penetration: Design, select and provide materials to prevent water penetration into the enclosed areas of the garage including elevator shafts, mechanical and electrical rooms, and other interior spaces.

Weather Resistance: Design, select, and provide materials to minimize deterioration due to precipitation, sunlight, ozone, normal temperature changes, atmospheric, pollutants, materials tracked in by pedestrians and automobile tires, mold and mildew.

Impact Resistance: Exterior cladding shall be either cast-in-place concrete or pre-cast concrete panels. Use tension cabling to separate levels and ramps. Tension cables acceptable at exterior south wall.

Auto Impact: Provide concrete panels at exterior walls as a minimum structural barrier for auto safety in the garage, design per IBC. Tension cables acceptable at south side of garage.

3.1.7 Ventilation/Screening of Wall Openings

Ventilation: Provide Natural ventilation. Install mechanical ventilation only if required by code.

Screening: Screen Wall openings as required.

- First Level: Provide vandal-proof architectural screens to allow lock down of facility.
- Upper Levels: Screening as required by Burien Municipal Code and to be architectural compatible with first level of garage and surrounding developments.

3.1.8 Doors (Vehicle)

Garage Entrance and Exit doors shall have exterior lighting.

Entrance door characteristics:

- 12'-0" wide, 9'-0" high
- Jambs protected by bollards
- Overhead coiling
- Anodized aluminum
- Located on north side of structure

Exit door characteristics:

- 12'-0" wide, 9'-0" high
- Jambs protected by bollards
- Overhead coiling
- Anodized aluminum

Basic Function: Overhead Coiling Doors providing access to facility from the exterior shall be motorized with key switch and equipped with emergency stop sensors. Doors shall be capable of remote operation by King County's Central Monitoring and Access Control.

3.1.9 Main Pedestrian Entrance

Basic Function: The main pedestrian entrance provides a single entryway for facility users. It should be located on the North side of the parking structure close to the existing Transit Center. There shall be an accessible route of travel, as defined by ADAAG, from the main entrance to the Transit Center.

Materials and Size: The main entrance of the facility shall be as required by code for exiting. Provide canopy as required for weather protection and lighting as required for security.

3.1.10 Doors (Man)

3.1.10.1 Exterior Man Doors

Basic Function: Provide exterior doors necessary for the proper functioning of the facility and as required by code. Provide canopy as required for weather protection and adequate lighting for security.

Material and Size: Exterior doors, except the building main entrance, shall be 3'-0" wide by 7'-0" high, insulated, painted metal doors in painted hollow metal frames. Provide power and communication conduits from doors to security rooms for future card entry.

Exterior doors shall be capable of being remotely locked and unlocked by King County Central Monitoring and Access Control.

3.1.10.2 Interior Man Doors

Basic Function: Provide interior doors necessary for the proper functioning of the facility and as required by code.

Material and Size: Interior doors shall be 3'-0" wide by 7'-0" high, painted metal doors in painted hollow metal frames. Provide power and communication conduits from doors to rooms for future card entry system. Interior doors shall have card readers installed with electric locks and hinges.

3.2 Site Construction

3.2.1 Street Improvements

The Developer shall comply with local jurisdiction codes and regulations that may require streets adjacent to the project to be improved. This includes improvements of traffic control devices, street lights, architectural features, curbs, sidewalks, planting strips, and (when required by land use code) street trees and associated irrigation. Offsite mitigation measures and improvements shall be adequate for the proposed facilities to be granted occupancy permit. With the construction of new street improvements, drainage facilities will be required in compliance with local drainage ordinances. Offsite mitigation may be required including intersection and signal improvements. All street improvement elements will meet or exceed the site improvement material requirements.

3.2.2 Site Improvements

The Developer shall provide a Geotechnical Report to evaluate existing site conditions including soil borings and identified design limitations. The report shall present design recommendations for new construction and identify existing subsurface hazardous materials and groundwater conditions, along with Level I and Level II Environmental assessment reports and recommended remedy methodology.

The Developer shall also provide a Boundary Survey of the property prepared, stamped and signed by a licensed Professional Land Surveyor. The Boundary Survey shall include property boundaries, easements, current land use code setback requirements, 100-year floodplain, construction limits, topography, existing driveway(s) and pavement(s), existing building and structures, spot elevations, existing utilities, and utility invert elevations. The survey shall include all surface features on adjacent properties or rights of way within 25 feet of the property line, or to the extent needed to accurately describe the site and its adjacent environment.

A Grading and Paving Design shall be prepared, stamped and signed by a licensed professional Civil Engineer. Layout of the site and driveways shall conform to the requirements of all applicable local, state and federal jurisdiction and be approved by Fire Marshal and planning department of the local jurisdiction. Layout of the site shall allow safe pedestrian access from the parking facility to the neighboring sidewalks and Transit Center. The Developer's design plans shall take into account current land use code setback requirements, and the existing surface and subsurface features as they affect the Developer's construction project, including but not limited to adjacent buildings, pavement curbs, sidewalks, street appurtenances, drainage control structures, and other utilities.

Vehicle entry off 4th Avenue SW shall align with existing driveway across 4th Avenue SW (future extension of SW 149th Avenue). Variance shall be reviewed and approved by the City of Burien and King County Metro Transit. The garage driveway shall be located to prevent the queue from spilling over to 4th Avenue SW.

The north face of the garage shall be set back at least 80 ft from north property line and meet City of Burien perimeter landscaping setback. Sidewalks shall be provided along the north side of the property and along the north side of the garage. The vehicular access shall be wide enough for two-way traffic. Vehicular access on 3rd Avenue SW (transit center bus way) shall be for vehicular emergency exit from the garage only. No garage entrance shall be allowed at 3rd Avenue SW.

Emergency vehicle access shall be provided from the vehicular access area north of the garage to the existing Transit Center only if required by the Fire Department. Retractable/removable bollards or similar may be used to allow emergency vehicle access from 4th Avenue SW to the Transit Center.

3.2.3 Site Utilities

On-site and off-site utility service and revisions required by the garage development shall be designed to connect to existing utility systems including sewer, water, storm water, electrical, gas, traffic signal, telecommunication/data service, and I-net. Design shall be in strict compliance with all local, state, and federal codes (provided in Section 1.3 of this document). In the Final Construction Documents, it is the Developer's responsibility to discover and demonstrate all existing, proposed, and as-constructed utilities, structures, appurtenances, and easements on the site and within the limits of the work, and to provide for the protection of items not to be disturbed by the project.

3.2.3.1 Water System

The water system shall use ductile iron pipe, with a single tap (or tapping sleeve) and gate valve at the main located in the street. The private water main shall service the building site and hydrant installation(s) as required, given the use of sprinklers within the garage. To combine fire flow and

domestic uses in a single pipeline, a detector check valve installation is acceptable to King County, and the system can be split into fire and domestic lines in the mechanical room of the building. An additional split of the domestic line is required for separate metering of domestic and irrigation uses.

Alternative existing water system materials may be allowed if they meet the requirements stated below. Expansion or replacement of portions of existing system facilities shall conform to the requirements of the specification for new design and construction with a performance evaluation by a licensed professional engineer of the existing system required. The evaluation shall include public utility records or new fire flow and residual pressure testing to evaluate the capacity of the existing system to meet fire code requirements and shall evaluate the existing system for compliance with applicable local jurisdiction codes, and determine the capability of the system to provide uninterrupted service over a 50 year useful life assuming normal operation and maintenance, and the capacity to deliver flow and pressures throughout the proposed structure.

All existing site valves and hydrants to be inspected, exercised, and if required, serviced or replaced. New fire hydrants shall meet requirements of Fire Marshal. All existing site valve boxes to be inspected, serviced, and adjusted to finish grade. Existing water meters shall be upgraded, if necessary, to meet water demand per the building program. Provide exterior hose bibs at corners.

Provide sufficient hose bibs to water building perimeter landscaping with maximum 50' length hoses, if irrigation is not used.

Provide freeze-protection heat tape and insulation for all pipes subject to freezing.

3.2.3.2 Gas Service

Required for emergency generator.

3.2.3.3 Sanitary Sewer Systems

A sanitary sewer shall receive the sanitary drains from the building at a location nominally 5-feet outside the building envelope. Beginning at the transition, the sewer shall be a 6-inch minimum PVC SDR 35 line from the building to the sewer main in public right-of-way. To service and maintain the facility over time, cleanouts for 6-inch sewers and manholes for 8-inch or larger sewers are required at all changes in pipe material or pipe diameter, all vertical grade breaks, and all horizontal alignment changes.

3.2.3.4 Storm Sewer Systems

For the purposes of this document, a surface stormwater detention area equal to 10 percent of the impervious site area and a Landscaping Factor equal to 5 percent of the total site area have been estimated. It is the Developer's responsibility to make the proper provisions for on-site storm water detention, water quality facilities, and landscaping.

Storm drain and/or water quality facilities shall include a runoff conveyance system consisting of Type 1 catch basins and corrugated polyethylene (double wall) storm pipes, water quality structures, and detention facilities as specified in the BMC. Detention shall be below grade and meet all of the requirements of the local jurisdiction, King County, and the Department of Ecology. Locate underground vaults, catch basins, or other water retention/drainage structure outside facility footprint.

Detention and water quality systems shall be accessible and designed for minimum maintenance by King County staff. Any hatch doors for vault access shall be H-20 rated. Access shall be located outside of parking spaces and accessible for service by an "eductor" or "vactor" truck. The structures shall be maintenance accessible and equipped with built-in ladder access.

Provide stormwater system for the Transit Garage separate from the system required for the future TOD development.

All catch basins that drain to the storm sewer shall be labeled as "Dump No Waste Drains to Creek."

3.2.3.5 Site Electrical and Communication

Developer shall be required to coordinate with Seattle City Light, King County I-net and local phone company for providing new services to the garage structure.

Provide all work for a complete and fully operational electrical service for the garage and all 50 EV charging stations. Coordinate with Seattle City Light and extend power circuits from the interface point.

Provide all work for a complete and fully operational telecommunication service. Coordinate with local phone company and extend copper and fiber from the interface point.

Provide all work for a complete and fully operational King County INET (I-net) service. Coordinate with I-net and extend fiber from the existing INET service interface point across SW 150th Street in an existing Comcast/I-net vault located in the southeast corner of 4th Ave. SW. & SW. 150th Street in an underground conduit path between the I-net service interface point and the Communication Room of the as specified below.

Developer to provide and install:

- minimum (1) 4" underground conduit connection between the Communication Room of the new garage and the existing I-net fiber access point in the existing Comcast/I-net vault located across the street in the southeast corner of 4th Ave. SW. & SW. 150th Street;
- a new Communication vault (min. inside dimension of 36"X36"x36") in the northeast corner of 4th Ave. SW. & SW. 150th Street;
- a 4" underground conduit crossing SW 150th Street between this new vault and the existing Comcast/I-net vault located in the southeast corner of 4th Ave. SW. & SW. 150th Street.
- (2) 4" conduit runs between the new Communication vault and the existing King County vault in the northwest corner of SW 150th Street and the south transit center driveway.
- (2) 4" conduit runs between the new Communication room of the garage and the existing Communication vault located in the northeast corner of new garage site.
- (1) 24 strand singlemode fiber between the COMM room of the garage and the existing Security room on the platform for I-new.
- (1) 24 strand multimode fiber and/or copper trunk cables between the COMM room of the garage and the existing Security room on the platform if needed.

Provide all raceway, wiring and materials, equipment and services as required to totally conform to serving utility requirements.

3.2.4 Curb and Pavement

The driving surfaces outside the parking structure shall consist of concrete slab, 6" minimum thickness. Concrete slab shall comply with the recommendations of the Developer's Geotechnical Report.

All driving surfaces are to be fully paved with curbed edges. Acceptable curb installation types are integrated cement concrete curb and gutter or integrated cement concrete curb and sidewalk. No extruded curb will be allowed.

4 Structural

4.1 Design Code

Design shall be in accordance with the current Edition of the International Building Code, as adopted by the City of Burien and the Burien Municipal Code.

4.2 Foundation Design

Foundation design shall be based on the recommendations of a licensed geotechnical engineer. Long term settlement of foundations and slabs on grade shall be limited to no more than 1 inch. Differential settlement shall be limited to ½ inch over 50 feet.

Footing may not extend over the property line.

Provide sealant at slab joints and wall junctures.

Provide Foundation drains as recommended in the soils report.

4.3 Levels Directly Exposed to Weather

Provide waterproof concrete.

Prevent leaks to structure below. Take measures to prevent water intrusion such as caulking at joints.

Install durable and vandal-proof bird deterrent system on building parapets, light fixtures, and any potential perching area.

4.4 Minimum Live Loads

4.4.1 Vertical

- Parking Floor: 50 psf + concentrated load provisions per ASCE 7-05.
- Stairs: 100 psf
- Sidewalks, Driveways: 250 psf
- Light Storage: 125 psf
- Top Level: 40 psf + 25 psf snow + rain (2" / hour for roof drainage design)
- Design to support future exterior paneling having 10 psf dead load

4.4.2 Wind

- Basic wind speed: 85 mph
- Exposure: To be determined by engineer of record
- Importance Factor: 1.0

4.4.3 Seismic

- Importance Factor: 1.0
- Sms = 1.478 (to be verified)
- Sm1 = 0.661 (to be verified)
- Site Class C (to be verified)

4.5 Concrete

4.5.1 Codes and Specifications

- Design: ACI 318
- Construction: ACI 301

4.5.2 Minimum Strength

- Cast-in-place, F'c = 4000 psi, 28 days
- Precast, F'c = 5000 psi, 28 days

4.5.3 Other Criteria

- Concrete water / cement ratio not greater than 0.45.
- Calcium chloride additives not acceptable.
- Wall thickness to be 8 inches minimum.
- Cement concrete mix shall meet ASTM C33. Use water-reducing additives (per ASTM C494) to reduce water content of cement mix. Use corrosion inhibitors such as calcium nitrite to slow corrosion of unprotected mild steel reinforcement.
- Slab Reinforcement and reinforcement within top 4" of horizontal structural members shall be epoxy coated to prevent corrosion. (This includes slabs, stirrups, top layer of flexural steel at beams)
- Maintain 2 inch minimum coverage over reinforcement. Use sealants to keep water out of joints.
- Slab on grade minimum thickness = 6 inches. Reinforce for temperature and shrinkage

4.6 Steel

4.6.1 Codes and Specifications

Steel construction shall conform to the specifications and standards as contained in the 9th edition (or later) of the AISC Manual of Steel Construction.

4.6.2 Material

- Structural shapes: ASTM A 992, ASTM A 36, or ASTM A572 Grade 50
- Plates, bars and sheets: ASTM A 36
- Bolts: ASTM A 325 or ASTM F 1852
- Anchor bolts: ASTM A 307

4.7 Masonry

Masonry is to be used only for non-structural, non-load bearing elements.

4.7.1 Codes and Specifications

Masonry Construction shall conform to ACI 530-05 and ACI 530.1-05

4.7.2 Material

- Concrete masonry units conforming to ASTM C 90, normal weight.
- Mortar Type S
- Minimum F'm = 1500 psi
- Minimum grout strength 2,000 psi
- Solid grout cells
- Minimum rebar size to be #4
- Maximum reinforcement spacing = 24 inches, horizontal and vertical

4.8 Building Systems

Foundations shall consist of continuous or isolated concrete footings bearing on competent native soil or structural fill per the recommendations of the geotechnical engineer. The ground floor shall be a 6 inch minimum thickness concrete slab on grade. All slabs on grade shall be reinforced with a minimum of 0.2 percent shrinkage and temperature reinforcement in both directions with slab reinforcement spaced at a maximum of 12 inches on center. Control joints shall be provided at a spacing of no more than 40 feet on center.

The gravity load carrying system shall be constructed of concrete. Acceptable systems include concrete slabs supported by concrete columns and/or concrete walls. Drive aisles shall be free of vertical elements. Elevated floor slabs shall be constructed of reinforced concrete or post-tensioned concrete slabs. Live load deflection of the floor system shall be limited to span divided by 480.

The lateral load resisting system for the building shall consist of concrete shear walls and / or concrete moment frames.

Exterior walls along all areas subject to vehicular traffic shall have either cast-in-place or precast reinforced concrete vehicle barriers. Interior spaces shall be protected by bollards or curbing or tension cabling. Design vehicle barrier capable of withstanding 6,000 # concentrated force.

5 Mechanical Systems

5.1 HVAC Design Criteria

Provide ventilation to avoid carbon monoxide build-up. Ventilation to be supplied shall meet IBC with CO2 sensors for capacity control. Ventilation equipment shall be enclosed in protected mechanical space or to be vandal proof.

Enclosed spaces (rooms) shall be provided with ventilation per IBC. Heat all rooms to maintain a temperature level of 50 degrees Fahrenheit minimum and as required to maintain a temperature compatible with the operation of the enclosed equipment. Provide fixed temperature sensors or vandal-resistant, lockable thermostats. Security/communication room to be minimally heated and air conditioned as required to maintain a temperature compatible with the operation of the enclosed equipment.

5.2 Plumbing

Provide 2 hose bibs at every level, at opposite ends of the parking structure. Hose bibs to be freeze-proof, with heat tracing and jacketed insulation.

Provide floor area drains at every low point to maintain a minimum of 1% slope, 2% preferred, with a maximum of 3% slope. Provide trench drains with cast iron covers at vehicle entrance/exit and at the base of each ramp that is not covered.

Provide sand and oil/water separator at all storm drain discharge points. Provide oil/water separators exterior to the structure, accessible by cleaning truck.

Provide integral vacuum breakers on all plumbing fixtures at point of potable water service.

Provide plumbing fixtures as outlined in this document.

Provide trap primers for floor sinks and drains where required by code.

5.3 Sprinkler

The facility is to be fully sprinkled. Areas subject to freezing are to be provided with a dry-pipe sprinkler system.

Fire sprinkler system shall be designed in accordance with the IBC, NFPA, and City of Burien requirements.

Coordinate routing of sprinkler pipes and location of sprinklers with other trades.

6 Electrical

6.1 Electrical Design

6.1.1 General Requirements - Standards and Codes

The design shall conform to the latest editions of the following standards and codes:

- ANSI — American National Standards Institute
- ANSI C2 — National Electrical Safety Code
- ANSI C136-15-1986 — High Intensity Discharge and Low Pressure Sodium Lamps in Luminaires – Field Identification
- ASTM — American Society for Testing Materials
- IBC — International Building Code
- ICEA — Insulated Cable Engineers Association
- IEEE — Institute of Electrical and Electronics Engineers
- IES — Illumination Engineering Society
- IESNA — Illumination Engineering Society of North America
- NECA — National Electrical Contractors Association
- NEMA — National Electrical Manufacturers Association
- NETA — International Electrical Testing Association Inc.
- NFPA — National Fire Protection Association
- NFPA 70 — National Electrical Code as amended and administered by the State of Washington
- NFPA 72 — National Fire Alarm Code
- NFPA 101 — Life Safety Code
- NREC — Washington State Non-Residential Energy Code
- OSHA — Occupational Safety and Health Act
- UL — Underwriters Laboratories
- WISHA — Washington Industrial Safety and Health Agency
- WAC 296-46B — Electrical Safety Standards, Administration, and Installation
- WAC 296-45 — Safety Standards for Electrical Workers
- Chapter 19.28 RCW — Electricians and Electrical Installations

Where the requirements of more than one code or standard are applicable, the more stringent shall govern.

Conform will all applicable requirements of the current King County Metro Transit Electrical Design Standards.

6.2 Utilities

Provide electrical utilities as required for a complete and operational facility. Coordinate with the serving utilities to verify specific scope of electrical provisions for points of connection. Electrical services shall include: power and telecommunications. Provide additional services as required in support of unique project program requirements.

6.3 Power

6.3.1 Primary Power

Existing primary power will be tied into Seattle City Light's 26 kV distribution system. Reliable and safe power will be provided to support building lighting, mechanical, and general loads.

6.3.2 Secondary Power

Secondary power for the parking structure will be 480Y/277V, 3-phase, 4-wire fed into the building at a metered service switchboard. The service switchboard shall be sized in accordance with applicable codes and shall include planned occupancy plus 20 percent spare capacity for unplanned additional loads. The switchboard shall be free-standing, floor-mounted unit consisting of a single main breaker and feeder breakers as required. Provide a minimum of two 3-pole 200A spaces and four 3-pole 100A spaces for future loads. Provide switchboard capacity for 50 charging stations including separate utility metering.

Overcurrent protective devices will be fully rated for the available symmetrical fault current. Series-rated overcurrent protective devices will not be considered adequate protection against fault current damage to equipment.

6.3.3 Emergency Power

Provide a natural gas powered engine-generator set together with all required operating accessories assembled to give a complete and operational power generation system.

The generator set will be new, latest production model factory assembled and tested prior to delivery to job site. Size the generator to provide power for elevators, lighting, fire alarm and security.

The engine and alternator will be the product of one manufacturer or a combination of two manufacturer's equipment regularly assembled by the supplier as a complete package in this size and configuration.

Generator to be in generator room. Entire unit shall be self-contained. Provide all necessary controls and accessories.

The security / communications room electrical system shall be equipped with an uninterruptable power system to provide continuous power, in the event of a power failure, until generator supplied power comes online.

6.3.4 Power Distribution

Power distribution, large electrical loads, and motors sized at ½ HP and larger will be served by 480V power. Motors 1 HP and above will be equipped with NEMA standard magnetic starters. Power factor correction will be required for motors above 25 HP. Minimum power factor will be 95-percent. Lighting circuits will be served at 277V. Receptacles and small convenience loads will be served at120V.

Dry-type step down transformers with 480V primary to 208Y/120V secondary shall be located in spaces that provide adequate ventilation per manufacturer's requirements.

All electrical branch circuit panels will utilize bolt-on circuit breakers, and have copper bussing. Make provisions for 15 percent spare breakers plus 15 percent space for additional branch circuits in each panelboard. Fill each spare position with a 20A, single-pole spare circuit breaker device. Provide 120/208V, 3-phase, 4-wire panels in locations as required to power loads without excessive voltage drop. Conductors for 20A branch circuits will be upsized to #10 AWG if over 100 feet for 120V circuits and over 230 feet for 208V circuits. Surface mount panels in unfinished spaces; others in finished spaces will be flush mount. Interrupting ratings of panels will be per short-circuit and protective device coordination study.

6.3.5 Electric Vehicles

Ten of the 50 electric vehicle charging stations shall be installed and 40 parking spaces shall be equipped for future charging stations. Each charging station shall provide Listed and Labeled Electrical Vehicle Service Equipment (EVSE) that provides Level I and Level 2 charging capacity. Each EVSE shall provide the following:

1. Charge connections: The EVSE shall include (2) charging output connections. Only one (1) output may be enabled at any time.
    a. Level 1 Connections: NEMA 5-15 for 1.4kW, 120V, 12Amp output with cover to retain the cord connector during charging and prevent tampering
    b. Level 2 Connection: SAE J1772 plug with 15' cable for 208/240V, 32Amp output with strain detection.
2. Integral Hardware GFCI: 20mA CCID with ground continuity monitor and auto retry
3. Automatic open circuit detection: Detect and de-energize output if the charging cord disconnected or the Level 2 cord is strained.
4. Power measurement: accuracy within 1%
5. Network connection and control:
    a. Smart grid communications capability
    b. Capability for Seattle City Light demand management of charging output via wireless or wired network.
    c. Remote monitoring capability
6. Enclosure: NEMA 3R per NEMA 250-1997
7. EMI compliance: FCC Part 15 Level A
8. Operating Temperature: -30° C to 60° C
9. Humidity: up to 95%

6.3.6 Receptacles

Provide duplex receptacles along the perimeter of elevator and equipment rooms at 12 feet on center as wall space permits. Provide convenience receptacles at 25 feet on-center spacing in other areas.

Provide convenience outlets in the following areas: Mechanical Room, Main Electrical Room, Emergency Power Room, Elevator Pit, Elevator Machine Room, Fire Suppression/Sprinkler Room, and

Security/Communications Room. Receptacles will be ground fault circuit interrupting (i.e., GFCI) type where required by code.

Provide dedicated equipment receptacles for any fixed equipment loads.

Provide one outdoor weatherproof GFCI receptacle near each exterior entry door. Provide one outdoor weatherproof GFCI maintenance receptacle within 25 feet of each rooftop air handling unit. Also, provide similar receptacles for air handling units in other areas.

The maximum number of convenience receptacles on any one circuit will be limited to eight. The maximum number of receptacles on any single 20A circuit used for computer terminal power outlets will be limited to four duplex devices.

6.3.7 Miscellaneous Equipment Connections

Provide electrical power connections to all electrified equipment as required for proper operation. Provide either hard-wired connections or special equipment receptacles as needed per manufacturers' instructions.

6.4 Lighting

6.4.1 Interior

Illumination in parking garage spaces will conform to normal practices appropriate to daytime and extended nighttime use. Illumination levels will be as prescribed in the IES (Illumination Engineering Society) Handbook. Interior foot-candle levels will be calculated by the IES "Lumen" method using room cavity ratios, manufacturer published Coefficients of Utilization (CU) and the following default reflectance values for unfinished spaces (unless other specific reflectance information is available): Ceilings: 70%; Walls: 30%; Floors: 10%; and Maintenance Factor: 0.6.

Minimum maintained illumination levels shall be per IES RP-20-98 Lighting for Parking Facilities.

Interior fixtures shall be metal halide. All lighting will conform to the Washington State NREC (Non-Residential Energy Code) requirements for Lighting Power Allowance (LPA).

Provide a UL 924 exit and emergency egress lighting system in accordance with NFPA 101 and circuit to a single lighting battery inverter located in the Emergency Power Room. Keep temperatures in room below 86°F and provide ventilation as required.

Luminaires shall be selected for energy efficiency and suitable placed to minimize disability-glare and discomfort-glare.

6.4.2 Exterior

Provide exterior lighting at each exterior building entry door, all exterior egress pathways and stairwells, and roof level. Additionally, provide connection to an exterior illuminated sign at the main parking garage entry point.

Light spill onto adjacent properties shall be controlled by design, with the use of cut-off fixtures, house-shields and similar devices. Uniformity ratios will, in general, be no greater than 3.5:1 with a Max:Min ratio no greater than 12:1 based on the calculated initial horizontal footcandle levels values. Lighting for

the parking structure will be based on the enhanced security levels of the IES (RP-20-1998 Lighting for Parking Facilities).

Exterior lighting will be metal halide or high pressure sodium (HPS) and will conform to the IES standards. All illumination for the site will rely solely upon the exterior luminaires

Provide a handhole in each light pole on the roof with ground tied to the handhole lid, the ground lug in the light pole and to the code-sized equipment grounding conductor required to be run in the conduits with the circuit conductors. The light pole foundation shall also be connected to the ground system. A #4 AWG bare copper ground conductor shall be exothermically connected to the rebar in the pole foundation with enough conductor extending up the center of the foundation to provide connection to the grounding lug in the pole handhole.

6.4.3 Egress

Emergency pathway lighting fixtures will be provided as required by the most recent edition of the International Building Code (IBC). This requirement can be met by circuiting pathway fixtures from an inverter.

Supplemental emergency lighting will be included to illuminate the main electrical room and electrical distribution equipment therein.

All light fixtures on the emergency inverter system will be marked in such a manner as to be easily identified from floor level. The fixtures shall be permanently identified with an identification plate that is substantially orange in color as described in WAC 296-46B-700-009 Emergency systems – equipment identification in a manner that will not interfere with the illumination of the space the fixtures are serving.

6.4.4 Interior Control

The control of lighting shall be configured such that reliable lighting and a suitable level of light is provided at all times. The system will energy efficient and in compliance with the latest codes in Washington State and IESNA Document RP-20 and Standard 90.1, latest editions. The lighting control system will control the time and duration of lighting in all areas with both days and hours of lighting field adjustable.

All areas shall be illuminated during all hours that the facility is open for public use. The programming of the lighting management portion of the EMS will be coordinated with Power Distribution, Transit Operations, and Transit Maintenance groups.

6.4.5 Exterior Control

Exterior and roof lighting will be extinguished between daybreak and dusk. Days and hours or reduced lighting will be field adjustable.

Lighting control will be by a combination photocell and time clock arrangement operating output contactors by relay. Circuits will provide a maintenance function hand-off-auto manual control that includes a two-hour off-delay feature in the hand position (NREC requirement).

6.4.6 Circuiting

Lighting branch circuits will be loaded to no more than 12A on any single 20A circuit.

6.5 Fire Alarm and Detection

Provide an addressable-analog fire alarm system with manual and automatic alarm initiation, complete and fully operational as required by the 1997 Uniform Fire Code (UFC), Volume 1 and Volume II, and other AHJ enforced codes. Specific design criteria for fire alarm and detection systems will comply with applicable sections of NFPA 72. System will call into a main fire alarm panel located point of fire department response. System will include initiating devices (i.e., pull stations, fire protection monitoring devices, duct detectors, etc.) and annunciation devices (i.e., horns and horn/strobes) in conformance with ADA requirements.

King County Metro Transit has standardized on the Edwards System Technology EST-3, no substitutions.

6.6 Communications

Provide all data communication station wiring (CAT 5E) between the computer workstation (or remote terminal location as applicable) RJ-45 interface jacks and patch panels at the Main Distribution Frame / Intermediate Distribution Frame (MDF/IDF) location.

Provide voice telecommunication station wiring using CAT-5E unshielded twisted pair (UTP) and RJ-45 modular interface jacks.

Incoming Telecommunications service to the facility will be per King County Information and Telecommunications Services (ITS) Division requirements.

6.7 Security and Access Control

Provide a remote panel to King County Metro's existing Andover Parking Central Monitoring System Access Control System, including computer software, sub-control panels, intelligent field interface panels, card readers, door position indicators, request-to-exit devices, access cards, power supplies for electric strikes and locks, electrical connections, and wire and cable. Interface with the CCTV Digital Video Recorder. Provide all raceways, wiring, components, devices, and power for complete and operable access control system. Provide interface with elevator(s). Provide keypad access controls and induction loops for each motorized vehicle gate location, along with a power connection for the gate operator.

Provide Panic Alarm and Intercom system per King County facility standards. Provide wall and pedestal mounted Panic Alarm stations for visible and audible emergency annunciation and communication at four locations minimum on each level of the garage.

Security and access control systems shall conform to King County Metro Security Standards and Details. See Paragraph 6.9 for obtaining security documents.

6.8 CCTV

Provide a closed circuit television (CCTV) monitoring system including cameras (incl. mounts and lenses for garage, canopy and elevator), digital video recorder, UPS and equipment rack.

Provide cameras, wiring, and associated equipment to enable analog camera connectivity, including video signal, camera power, camera PTZ control signals, and environmental requirements at the equipment rack located in the garage communication room. Provide all raceway, cabling, power supplies, equipment, and other material necessary for a complete, functioning CCTV system ready for connection to networked surveillance equipment by others.

When a panic alarm is activated, cameras shall provide viewing of panic station.

6.9 Security Documents

Alliance shall request and be required to complete and submit a sensitive security information (SSI) non-disclosure agreement (NDA) before King County Metro Security Standards documents are released. Security sensitive information and drawings are subject to King County security policies. Alliance shall coordinate with King County.

Security and access control systems shall conform to King County Metro Security Standards and Details. See also Section 6.9 Security Documents.

7 Submittals

7.1 Preconstruction

Provide 30%, 60%, and 90% design review packages to King County during design for comment. Provide 100% Construction Documents and Specifications. Submittals should include construction drawings, material submittals, shop drawings, equipment submittals, structural calculations, drainage calculations, lighting calculations, copy of building permit, geotechnical report, boundary survey, grading and paving plan.

7.2 During Construction

During construction provide inspection reports, testing reports, equipment testing with photos.

7.3 Post-construction

After completion, provide as As-built construction drawings (one hard copy + one CAD copy), equipment documentation and operation manuals, certificate of occupancy.

Provide transferable equipment warranties.

APPENDIX A

King County Physical Infrastructure Standard, 05-15-2008

King County
Office of Information
Resource Management

Information Technology Governance Standards

Title	Document Code No.
PHYSICAL INFRASTRUCTURE STANDARD	**Revision draft 1.0** **05-15-2008** (twm)
Chief Information Officer Approval / Date	Effective Date.

1. PURPOSE:

This standard establishes the approved requirements for the installation and maintenance of Network infrastructure in King County Facilities for the King County Wide Area Network (KC WAN). The county will benefit from a structured and well documented Network infrastructure. King County's Network infrastructure must support a wide variety of needs at a broad range of physical locations within the county.

2. APPLICABILITY:

This standard is applicable to all King County Workforce Members, including those personnel responsible for the design, specifications, construction, procurement, or installation of Network infrastructure in new and major renovations or remodeling of existing King County Facilities. It is intended to be used early and throughout the design, planning, and construction phases of the remodeling of existing buildings, the construction of new King County Facilities, or as the county looks at leasing new spaces.

3. REFERENCES:

3.1. 5-STD-607-A-2002 Commercial Building Grounding and Bonding Requirements for Telecommunications

3.2. ANSI/TIA/EIA-568

3.3. IEEE STD-1100 (IEEE Emerald Book) IEEE Recommended Practice for Powering and Grounding Electrical Equipment

3.4. TIA-942 Telecommunications Infrastructure Standard for Data Centers

3.5. Information Technology Policy and Standards Exception Request Process

3.6. Network Equipment Standard

4. DEFINITIONS:

4.1. **AMP**: Ampere is a measurement of electrical current in a circuit. Contrast with "volts," which is a measure of force, or pressure, behind the current. Multiplying amps times volts derives "watts," the total measurement of power. One amp is 6,280,000,000,000,000,000 (6.28×10^{18}) electrons passing by the point of measurement in one second.

4.2. **ANSI:** American National Standards Institute

4.3. **Category 5 Cable:** Commonly known as **"Cat5"**, is an unshielded, twisted pair type cable designed for high signal integrity. The actual standard defines specific electrical properties of the wire, but it is most commonly known as being rated for its Ethernet capability of 100 Mbit/s. Its specific standard designation is EIA/TIA-568. Cat5 cable typically has three twists per inch of each twisted pair of 24 gauge copper wires within the cable. The twisting of the cable reduces electrical interference and crosstalk. Another important characteristic is that the wires are insulated with a plastic (FEP) that has low dispersion, that is, the dielectric constant of the plastic does not depend greatly on frequency. Special attention also has to be paid to minimizing impedance mismatches at connection points.

4.4. **County Enterprise Network:** The network commonly used to conduct county business that provides transport of data within and between county facilities and other agencies of county government. This definition also refers to the network used to transport data between the county, other government agencies and the Internet. It does not refer to networks built for the sole purpose of meeting special operations needs of county business units which include, but are not limited to, process control and supervisory control networks. Nor does it refer to the King County Institutional Network (I-Net) which is required to meet contractual obligations with I-Net customers and the local cable utility.

4.5. **Data:** Any form of information whether on paper or in electronic form. Data may refer to any electronic file no matter what the format: database data, text, images, audio and video. Everything read and written by the computer can be considered data except for instructions in a program that are executed (software). A common misconception is that software is also data. Software is executed, or run, by the computer. Data are "processed." Thus, software causes the computer to process data.

4.6. **Data and Telecommunications Area:** (Hereafter referred to as the **"Data/Telecommunications Area", "MDF" or "IDF"**) The MDF/IDF is the termination point for all station wiring for the building and floor. This area should also house any data networking and telecommunication equipment required for the facility.

4.7. **Data Closet:** See Data and Telecommunications Area above.

4.8. **Data Tail Cable:** A hardwired cable from a switch to a remote cross-connect panel.

4.9. **EIA:** Electronics Industries Association.

4.10. **EMF:** Electromagnetic Field.

4.11. **ETL:** Electrical Testing Laboratories.

4.12. **FCC:** Federal Communications Commission.

4.13. **Home Run:** A cable that begins at a central distribution point, such as a hub or PBX, and runs to its destination station without connecting to anything else.

4.14. **HVAC:** Heating, Ventilation and Air-Conditioning

4.15. **IDF:** Intermediate Distribution Frame. A wiring rack located between the MDF (main distribution frame) and the intended end user devices (telephones, routers, PCs, etc.). Cables run from the outside world to the MDF and then to the IDFs.

4.16. **King County Facilities:** Any space King County owns, leases, rents or occupies.

4.17. **Large Site:** This typically refers to multi-story or campus environments where 100 or more county staff reside in multiple locations.

4.18. **MDF:** Main Distribution Frame. A wiring rack that connects outside lines with internal lines. It is used to connect public or private lines coming into the building to internal Networks. In a telecom central office (CO), the MDF is generally in close proximity to the telephone switch.

4.19. **Network:** A system that transmits any combination of voice, video, and/or data between users. The network includes the network operating system in the client and server machines, the cables connecting them and all supporting hardware in between; such as bridges, routers and switches. In wireless systems, antennas and towers are also part of the network.

4.20. **Network Infrastructure Equipment:** Equipment that enables network connections for a facility, group or individual to other points on the County Enterprise Network. This definition includes LAN switches, routers and wireless access points serving each facility and those used to aggregate and distribute data destined to other parts of the network. It also includes appliances used to control network traffic and secure the network from unauthorized access. The appliances include, but are not limited to; network traffic shapers, network firewalls, VPN concentrators and network intrusion sensors.

4.21. **Non-infrastructure Server:** Servers that are not part of the Network's basic fundamental structure such as; video, voice and wireless controllers and servers.

4.22. **Organization:** Every county office, every officer, every institution, whether educational, correctional or other; and every department, division, board, and commission.

4.23. **SC:** "Stick and Click" or Subscription Channel. This is a type of fiber cable connector.

4.24. **Small Site:** This typically refers to environments in which less than 100 county staff reside in a single location.

4.25. **TGB:** Telecommunications Grounding Bus-bar.

4.26. **TIA:** Telecommunications Industries Association.

4.27. **TMGB:** Telecommunications Main Grounding Bus-bar.

4.28. **UPS:** Uninterruptible Power Supply.

4.29. **VAC:** Volts Alternating Current

4.30. **Workforce Member:** Employees, volunteers, and other persons whose conduct, in the performance of work for King County, is under the direct control of King County, whether or not they are paid by King County. This includes full and part time elected or appointed officials, employees, affiliates, associates, students, volunteers, and staff from third party entities who provide service to King County.

4.31. **Work Stations:** Any place a person may work. This includes reception areas, conference rooms, lunch rooms, day rooms, copier rooms, printer rooms, etc.

5. STANDARDS:

5.1. General Requirements:

5.1.1. Management of all Data Closets is the responsibility of the Office of Information and Resource Management (OIRM). No equipment shall be installed in the closet without prior approval from OIRM.

5.1.1.1. Access to Data Closets shall be restricted to OIRM approved Workforce Members.

5.1.1.2. Temporary access to a Data Closet may be granted by the OIRM Network Engineering Supervisor or his or her delegate.

5.1.1.3. OIRM reserves the right to remove any unauthorized cables, connections, and/or hardware. The affected Organization's LAN Administrator and Technology Management Board (TMB) representative shall be notified of OIRM's intentions five (5) business days prior to removal. This timeframe will allow the effected Organization sufficient time to acknowledge the removal.

5.1.2. All county owned facilities and non-county owned facilities shall use Category 5e or better, unshielded twisted pair cable.

5.1.3. For Large Sites and business critical buildings, a minimum of two (2) separate fiber paths shall enter the site from different directions.

5.1.4. A four foot (4') deep hand hole or vault shall be installed at ground level for each fiber entry at the property line.

5.1.5. Each hand hole or vault shall contain a minimum of four (4), four inch (4") electrical conduits to the interior of the building.

5.2. Workstation Wiring Requirements:

5.2.1. Each Workstation shall have a minimum of three (3) RJ-45 Cat5e (or better) jacks on a four (4) jack faceplate.

5.2.2. A minimum of three (3) Category 5e (or better) unshielded twisted pair cables shall be run to each faceplate.

5.2.3. The jacks shall be labeled as **"A", "B"** & **"C"**, prefaced by the communications faceplate numbering scheme proposed for the building.

5.2.4. All RJ-45 jacks shall be "universal", allowing voice or Data to be used in any combination.

5.2.5. All termination equipment shall be rated at Cat5e or better.

5.2.6. All Network cabling available in public areas shall be electronically or physically secured.

5.2.7. The wiring shall conform to EIA/TIA 568B standards.

5.2.8. The wiring must be certified to operate at cable rating specifications.

5.2.9. Cable length shall not exceed ninety (90) meters of installed cable from the Workstation jack to the IDF patch panel.

5.2.10. Wall or rack mounted connecting blocks shall be Systimax VisiPatch 360 System with vertical and horizontal wire management throughout.

5.2.11. Wire management for the VisiPatch wall field shall be required and specified with backboard elevations.

5.2.12. The backboard shall contain VisiPatch units for Workstation cable termination, VisiPatch units for future Workstation cable termination, VisiPatch units for copper PBX extensions, and space for VisiPatch units for future use. The VisiPatch units for the Workstation terminations and the copper PBX extensions shall occupy the bottom two thirds (2/3) of the VisiPatch field, with space left for future VisiPatch units at the top one third (1/3).

5.2.13. The top one third (1/3) of the VisiPatch field is to be used for Data Tail Cables from the rack mounted Network equipment.

5.2.14. Data shall be served from Network equipment, within Data Closets, ordered through OIRM and installed by OIRM in accordance with the **Network Equipment Standard**.

5.2.15. Data and telephone patch cables shall be Avaya Systimax VisiPatch on each end, manufactured by Systimax. Data patch cables shall connect the upper one-third (1/3), the Data tail terminations, to the lower two-thirds (2/3), the station terminations. Telephone patch cables shall connect the copper PBX extensions to the station terminations.

5.2.16. Each floor's IDF shall have a copy of its "as built" documentation, including a floor map showing all Data jacks and wire runs.

5.3. **Data Tail Cabling Requirements:**

5.3.1. King County OIRM shall approve the quantity and length of the installed patch and Data Tail Cables utilized inside the Data Closets.

5.3.2. Each Data Tail Cable shall be cut to length and terminated with an RJ-45 connector dressed neatly and tested to Workstation cable standards.

5.3.3. Service loop(s) shall be left in the Data Tail Cables to provide seismic isolation of the racks from the backboard and cable trays.

5.3.4. Data Tail Cables shall be supported in a manner consistent with seismic survivability, including slack.

5.3.5. An MDF/IDF may have the voice/Data Workstation wiring on rack or wall mounted RJ-45 patch panels to match previously installed cabling.

5.3.6. Each termination shall be uniquely labeled in accordance with the labeling scheme proposed for the building.

5.4. Cable Requirements:

5.4.1. All cable shall be rated at Cat5e or better.

5.4.2. All cable shall be rated for the plenum and air space in which it is to be installed.

5.4.3. All cable shall be installed to Cat5e installation standards (EIA/TIA).

5.4.4. All cable shall be marked with a unique identifier at each end, as well as one foot (1') in from the end, at a minimum.

5.4.5. With the exception of cable conduit and junction box installations, there shall be one foot (1') of slack in the installed cable.

5.4.6. All cables and terminations shall be tested, at the minimum, to Cat5e standards.

5.4.7. All cable shall be routed to the Data/telecommunications area in the MDF/IDF using approved cable trays or communication cable support materials. The cable shall use the most direct route.

5.4.8. A cable tray shall be installed to carry the Workstation cable from the central corridor cable tray to the backboard in the Data/Telecommunications Area.

5.4.9. Cable bundles shall be supported at intervals of not less than four feet (4').

5.4.10. Support points can not bend with less than a four inch (4") radius or pinch into jackets of the cables.

5.4.11. Cable bundles shall be tied together neatly, wherever possible, using only Velcro style material.

5.4.12. Ensure cables installed under the access flooring do not come in contact with any electrical conduits, electrical equipment, mechanical equipment, or ducts.

5.4.13. Fire suppression shall be used as required by local, county, state, and federal fire codes.

5.4.14. Cable installation, routing, and dressing shall be done following all applicable local, regional, and national codes, as well as industry best practices.

5.5. Data and Telecommunications Areas (MDF/IDF):

5.5.1. All MDF and IDF designs, including layout, elevations, and VisiPatch designs shall be pre-approved by OIRM.

5.5.2. A dedicated, secured Data/Telecommunications Area shall be available. In the case of smaller sites where the MDF/IDF can not be fully secured, every effort shall be made to protect and promote the security of the MDF/IDF space as completely as possible. In no case shall the public have unescorted access to the space.

5.5.3. This area shall contain the terminations for all Workstation wiring, equipment racks for any rack mounted equipment, PBX, and Data equipment.

5.5.4. Non-infrastructure Servers shall not be located in the MDF/IDF.

5.5.5. The MDF shall have fire-proofed, three quarter inch (¾") primed and painted plywood backboard installed. It shall be large enough to accommodate the Data/Telecommunication terminations. This backboard shall cover, at a minimum, eight by four feet (8' x 4'). This standard is meant to ensure that local, state, and federal codes are met.

5.5.6. The backboard shall be exclusively used for Data/Telecommunication terminations.

5.5.7. All Network equipment shall be installed on standard nineteen inch (19") form factor racks.

5.5.8. Each installed equipment rack shall be nineteen inches by a maximum of seven feet (19" x 7') aluminum, open frame equipment racks (Chatsworth 46353-503), and shall be installed in the area, aligned to the backboard, and bolted to the floor. These racks shall be installed to the standards stated for the remainder of the room. In cases where it is not possible to drill into the flooring, the equipment racks shall be stabilized in a manner that meets with OIRM and building owner approval.

5.5.9. Standard nineteen inch (19") cabinet enclosures may be used with OIRM approval.

5.5.10. The double-sided racks shall have a double sided vertical wire manager (Chatsworth 11729-503 or Panduit PatchRunner PRV6, PRV8 or PRV12) installed on each side.

5.5.11. The racks shall be installed in a way that allows future expansion and access to all sides. Install with a minimum of forty-eight inches (48") of clear space in front and thirty-six inches (36") in the back.

5.5.12. There shall be a twelve inch (12") cable runway above the rack and extending to the backboard. This rack and cable runway shall be used for Data networking equipment and patch cables. This cable tray may require seismic transitions to the backboard and/or racks.

5.5.13. In some instances and configurations, the rack and associated equipment may require additional seismic bracing. This bracing shall be installed in a way that does not interfere with accessibility or installation of equipment in the open frame rack.

5.5.14. A TMGB or TGB shall be available for equipment grounding.

5.5.15. The rack(s) and associated equipment shall be grounded and bonded to the TMGB or TGB.

5.6. Main Distribution Frame (MDF) to Intermediate Distribution Frame (IDF) Requirements:

5.6.1. Each IDF shall have a single, complete path to the MDF, also known as a "Home Run" path.

5.6.2. Primary wiring from the MDF to the IDF shall be twenty four (24) strands of multi-mode fiber.

5.6.3. Fiber optics shall be terminated in Fiber Distribution Units (FDU) large enough to terminate all fibers.

5.6.4. For new construction, fiber optics shall be terminated with SC or LC flat polished connectors, or as approved by OIRM.

5.6.5. For existing facilities, the fiber shall be matched to the existing fiber, as approved by OIRM.

5.6.6. Fiber optic panels shall be labeled in a consistent manner with descriptive and unique labels indicating **"to"** and **"from"** on each end. Individual fiber connectors shall be labeled with the same label on each end.

5.7. Conduit and Riser Core Drill Requirements For Infrastructure or Larger Buildings:

5.7.1. Three (3) separate four inch (4") conduits or sleeves shall be a "Home Run" from the MDF to each IDF.

5.7.2. At least one conduit or riser core drill shall be provided on any MDF to IDF run, to be open and available for future expansion.

5.7.3. Conduits shall not be successive or "daisy chained". Each cable path shall be separate.

5.7.4. Riser core drills, where required, shall be five inches (5") in diameter, with a four inch (4") sleeve and fire-stopped.

5.7.5. In buildings under five (5) floors in height, the riser core drills shall be grouped at a minimum of three (3) dedicated cores for each floor.

5.7.6. Buildings of five (5) floors and above shall have a riser core plan approved by King County OIRM.

5.8. Conduit and Riser Core Drill Requirements For Workstations:

5.8.1. The minimum size for Workstation conduit is three-quarter inch (¾").

5.8.2. Conduits shall not have a bend radius of less than one foot. * **Note:** If conduit is not necessary, there shall be at least a hole cut in the sheet rock with a mud ring installed at each Workstation. A pull string shall be installed and tied off to the ceiling above the highest point to which the sheet rock extends.

5.8.3. Each conduit or mud ring installed shall have a pull string/tape/rope with no less than twelve inches (12") excess at each end of the pull cord.

5.9. Main Distribution Frame (MDF) Requirements:

5.9.1. MDF General Requirements for Larger Sites:

5.9.1.1. The MDF shall be secured by a card key or combination lock.

5.9.1.2. The Main Data Closet shall have Cross Zone Detection and fire suppression.

5.9.1.3. Non-infrastructure Servers shall not be housed in the MDF.

5.9.1.4. The MDF may contain the IDF wiring for the ground floor. This wiring shall be in separate racks.

5.9.1.5. Wall mounted punch down connection blocks shall be Systemax VisiPatch 360 System with integrated vertical and horizontal wire management throughout.

5.9.2. **MDF General Requirements for Small Sites:**

5.9.2.1. The Small Site MDF shall be either electronically or physically secured. There shall be no unescorted public access.

5.9.2.2. The Main Data Closet shall have Cross Zone Detection and be supplied with a fire extinguisher. The fire extinguisher shall be checked annually, with the LAN Administrator's sign-off, to verify it is at the appropriate level and in proper working condition.

5.9.2.3. The MDF may contain the IDF wiring for the ground floor. This wiring shall be in separate racks.

5.9.2.4. Wall mounted punch down connection blocks shall be Systemax VisiPatch 360 System with integrated vertical and horizontal wire management throughout.

5.9.3. **MDF Space Requirements:**

5.9.3.1. The space shall not be located below grade.

5.9.3.2. The space shall not be located below water or drain pipes, bathroom or kitchen facilities, with the exception of fire suppression systems.

5.9.3.3. The space shall not be located adjacent to the elevator equipment, control room, or any EMF generating sources.

5.9.3.4. The space shall not have external windows.

5.9.3.5. The space shall be a highly secure location with 24 hour secure access, seven (7) days a week.

5.9.3.6. For security reasons, the space shall be identified only by a room number.

5.9.3.7. One thousand square feet, at a minimum, is required for large (greater than 100 employees) buildings.

5.9.3.8. At least 150 square feet of storage room is required. The storage room shall be as close to the MDF as possible.

5.9.3.9. At least 400 square feet, in or near the MDF, is required for UPS and HVAC equipment.

5.9.3.10. No ceiling tile is preferred. Ceilings may be suspended acoustical tile.

5.9.3.11. Flooring shall be antistatic tile or sealed concrete.

5.9.3.12. Four (4) 10 x 12 foot equipment/work areas are required for each MDF.

5.9.3.13. The space should contain six (6) standard 72 x 19 inch racks.

5.9.3.14. The back of each rack requires a minimum three feet (3') of clearance from the wall.

5.9.3.15. Each rack requires a minimum of four feet (4') of clearance in front.

5.9.3.16. Racks may be mounted in one or more rows with three feet (3') of clearance at either end of the row.

5.9.3.17. Racks shall be secured in a manner consistent with the seismic requirements for the facility.

5.9.3.18. "Clearance space" from the racks shall not overlap in these areas.

5.9.3.19. There shall be no less than 8 x 20 feet of backboard, with four feet (4') of clearance in front for the placement of punch down blocks and other wall mounted terminations.

5.9.4. **MDF Cable Tray Requirements:**

5.9.4.1. Overhead, twelve inch (12") open cable tray or ladder racks, dependant upon the final room shape, are required.

5.9.4.2. Cable trays shall be installed from the rack group to each work area.

5.9.4.3. Cable trays shall be installed between all racks.

5.10. **Intermediate Distribution Frame (IDF) Requirements**:

5.10.1. **IDF General Requirements:**

5.10.1.1. The IDF shall be secured by a card key or combination lock.

5.10.1.2. Cabling between IDF and Workstations shall not exceed 90 meters.

5.10.1.3. IDF wiring for the first floor may be located in the MDF, but shall be on separate racks.

5.10.1.4. The IDFs shall be shared between Data and voice and shall distribute service to the desktop.

5.10.1.5. All voice/Data Workstation wiring for a floor shall be terminated on that same floor, regardless of the cable path.

5.10.1.6. Each floor shall have a single IDF.

5.10.1.7. Primary phone wiring, from the MDF to each IDF, shall be designed or pre-approved by OIRM.

5.10.2. **IDF Space Requirements:**

5.10.2.1. The IDF shall not be located below grade.

5.10.2.2. The space shall not be located below water or drain pipes, bathroom or kitchen facilities, with the exception of fire suppression systems.

5.10.2.3. It shall not be located adjacent to the elevator equipment, control room, or any EMF generating sources.

5.10.2.4. The space shall not have external windows.

5.10.2.5. The IDF shall be a highly secure location.

5.10.2.6. The IDF requires at least 150 square feet of floor space.

5.10.2.7. The ceiling preference is no ceiling tile. Ceilings may be suspended acoustical tile.

5.10.2.8. The flooring shall be antistatic tile or sealed concrete.

5.10.2.9. The IDF should contain racks that are seven feet by nineteen inches (7'x 19").

5.10.2.10. Each rack requires a minimum 36" rear clearance from the wall.

5.10.2.11. Each rack requires a minimum of 48" front clearance or as designed or pre-approved by OIRM. In no case shall there be less than three feet (3') of front clearance.

5.10.2.12. There shall be no less than eight by four feet (8'x 4') of backboard, with four feet (4') of clearance in front, to allow for the placement of punch down blocks and other wall mounted terminations.

5.11. **Power Requirements:**

5.11.1. Electrical service for the racks shall be from panels that are separate from any large electrical loads, such as elevator or HVAC motors.

5.11.2. Circuits shall be terminated above the racks and shall be of the dedicated and isolated ground types.

5.11.3. There shall be a minimum of two (2) 20 amp, 120 VAC circuits, with 4-plex outlets (5-20R).

5.11.4. A 20 Amp, 120 VAC dedicated circuit, isolated ground with four (4) 20 Amp outlets (5-20R) shall be installed near the backboard. These outlets shall be located at each end of the backboard and no closer than twelve inches (12") from any copper telecommunications cable or termination.

5.11.5. A 30 Amp, 110 VAC dedicated circuit, with an isolated ground (L5-30R) and a 20 Amp dedicated circuit, with isolated ground with four (4) 20 Amp outlets (5-20R), shall be installed above each rack located in the MDF/IDF. These outlets shall be located no closer than twelve inches (12") from any copper telecommunications cable or termination.

5.11.6. The above circuits shall be on generator power and marked as such.

5.11.7. Larger installations may have specific individual requirements that supersede those above.

5.12. **Air Conditioning Requirements:**

5.12.1. Air conditioning for the Large Site MDF/IDFs shall be supplied from units separate from the general building HVAC.

5.12.2. The HVAC requirements of the MDF shall be pre-approved by OIRM for each individual room.

5.12.3. The HVAC requirements of the IDF shall be pre-approved by OIRM for each individual room.

5.12.4. The HVAC systems for Large Site MDF/IDF room(s) shall be required to operate 7 x 24 x 365.

5.12.4.1. Relative humidity shall be between 45% and 51%. The recommended set-point is 48%, +/- 3%, with hi/lo alarms set at 20% and 70% respectively.

5.12.4.2. The temperature shall be between 64 and 75 degrees Fahrenheit (18-24 Celsius) year round.

6. EXCEPTIONS:

6.1. Any Organization seeking an exception to this standard must follow the Information Technology Policy and Standards Exception Request Process using the Policy and Standards Exception Request form. This form can be found on the Office of Information Resource Management policies and procedures Web page at http://kcweb.metrokc.gov/oirm/policies.aspx.

7. RESPONSIBILITIES:

7.1. King County OIRM shall be the approval authority for the layout of the MDF/IDF room(s) in relation to Data/Telecommunication layouts and backboard elevations.

7.2. King County OIRM shall be the approval authority for the riser core plan where required.

7.3. King County OIRM shall be the approval authority for the submittals of all materials used in the cable plant installation.

7.4. King County OIRM shall be the approval authority for the electrical and HVAC designs for the MDF/IDF room(s).

7.5. The Chief Information Officer (CIO) is the approval authority for the **Physical Infrastructure Standard.**

7.6. OIRM Network, Systems, and Operations is the steward of the Network infrastructure and is responsible for providing all transport services across the KC WAN. As such, OIRM will become the owners of the Network policies, standards, and guidelines.

7.7. OIRM is responsible for the operations and maintenance of all Network Infrastructure Equipment connected to the King County Enterprise Network. OIRM is not responsible for Network Infrastructure Equipment that operates solely with a department **and** that OIRM has previously determined neither connects to, nor affects the operation of the County Enterprise Network.

7.8. OIRM is responsible for protecting the integrity of the County Enterprise Network. To meet this responsibility OIRM shall ensure compliance with the terms detailed in the **Physical Infrastructure Standard.**

7.9. OIRM is responsible for the security of the County Enterprise Network. Policies, standards, guidelines, and associated oversight relating to Network security are established and maintained by the Chief Information Security and Privacy Officer (CISPO). Managers in charge of information technology within each Organization or IT Service Delivery Managers are responsible for ensuring that devices, systems and applications under their control are in compliance with the **Physical Infrastructure Standard.**

7.10. King County departments/agencies are responsible for informing their employees of this policy.

7.11. The **Physical Infrastructure Standard** will be reviewed annually, or as needed, by OIRM.

8. STANDARDS GUIDELINES:

8.1. When vacating a leased space, the cabling and equipment disposal is dependent upon the Facilities Management Division's (FMD) lease agreement. King County policy dictates that the county may not gift to private enterprise. Please consult FMD about their agreement on the disposal or removal of equipment.

Burien TOD Garage Performance Criteria

Specifications

Prepared for:
King County
Department of Transportation
Metro Transit Division
201 South Jackson Street
Seattle, WA 98104-3856

15 October 2009

BergerABAM
33301 Ninth Avenue South
Federal Way, WA 98003

In association with

Arai-Jackson-Ellison-Murakami
CB Engineers

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THE END

SECTION 01300
SUBMITTALS PROCEDURE

PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies procedures for Developer submittals. Where required by the Specifications, submit descriptive information, which will enable King County METRO to assess whether the Developer's proposed materials, equipment or methods of work are in conformance to the design criteria and in compliance with the Performance Specifications.

1.02 Related Sections

A. Paragraph 00700-4.4 - Submittals

B. Paragraph 00700-4.8 - Substitution of Products

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.01 TRANSMITTAL PROCEDURE

A. General:

1. A separate form shall be used for each specific item, class of material, equipment, and items specified in separate, discrete sections for which the submittal is required. Submittals for various items shall be made with a single form when the items taken together constitute a manufacturer's package or are so functionally related that expediency indicates checking or review of the group or package as a whole.

END OF SECTION

SECTION 02200
EARTHWORK

PART 1 GENERAL

1.01 SUMMARY

A. This section specifies earthwork which consists of excavation, filling, grading, and excess material control.

1.02 REFERENCES

A. All work to be performed and materials to be used shall be in accordance with the Burien Municipal Code (BMC), unless otherwise indicated herein.

B. Washington State Department of Transportation (WSDOT) Standard Specifications 2008.

C. ASTM 1557, Method of Test for Moisture-Density Relations of Soils, Using 10 pound (4.5 kg) Rammer and 18 inch (457 mm) Drop.

1.03 SUBMITTALS

A. Submit the following:

1. Compaction test results.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. Crushed Surfacing Base and Top Course: Shall conform to the requirements of WSDOT, Paragraph 9-03.9(3).

B. Gravel Backfill for Drains: Shall conform to the requirements of WSDOT, Paragraph 9-03.12(4).

C. Bedding Material for Rigid Pipe: Shall conform to the requirements of WSDOT, Paragraph 9-03.15.

D. Structural Fill: Shall be imported, well-graded sand and gravel, free of organics, debris, and other deleterious material which can be compacted to the specified amount under the prevailing weather conditions. Structural fill shall have a maximum particle size of 3 inches and contain no more than 5 percent material by weight passing the No. 200 mesh sieve (fines) based on the weight of the 3/4-inch fraction. The gravel content shall range between 20 and 50 percent. The moisture content shall be near optimum to allow proper compaction. The fines shall be nonplastic. Recycled portland cement concrete rubble may be used as structural fill provided that it is properly crushed and screened to meet the gradation requirements of structural fill.

E. Gravel Borrow: Shall conform to the requirements of WSDOT, Paragraph 9-03.14(1).

F. Gravel Backfill for Walls: Shall conform to the requirements of WSDOT, Paragraph 9-03.12(2).

G. Gravel Backfill for Pipe Zone Bedding: Shall conform to the requirements of WSDOT, Paragraph 9-03.12(3).

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 GENERAL

A. Overexcavation: Where the undisturbed condition of natural soils is inadequate for support of the planned construction, the Developer shall overexcavate to provide adequate supporting soils. The excavated space shall be filled to the specified elevation with structural fill.

3.02 PLACEMENT AND COMPACTION OF FILL

A. Soil Improvement by Dynamic Compaction
   1. Replace overexcavated soil with on-site soil in one-foot lifts up to the design footing subgrade elevations. Place all fill in accordance to Table A.

B. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum dry density determined in accordance with ASTM D 1557-00 (Modified Proctor).

TABLE A
PLACEMENT AND COMPACTION OF FILL

Material Type	Maximum Uncompressed Layer Depth (inches)	Minimum Relative Compaction (Percent)	General Application
Structural Fill	8 (6 inches for hand-operated mechanical compactors	95	Foundation backfill, slab subgrade. Pavement subgrade, fill under pavements and sidewalks,preload, and pipeline backfill in paved areas.
Structural Fill	8 (6 inches for hand-operated mechanical compactors)	90	Pipeline backfill in unimproved/unpaved areas.
Bedding Material for Rigid Pipe	---	95	Bedding for rigid pipes.
Gravel Backfill for Pipe Zone Bedding	---	95	Bedding for thermoplastic pipes.
Excavated/Native Material	8	---	Fill in landscaped areas.

Crushed Surfacing Top and Base Course	4	95	Pavement base.
Aggregate for Gravel Base	8	95	Fill for trench overexcavation.

3.03 EARTHWORK FOR STRUCTURES

A. Structure excavation

1. If the excavation is carried below the lines and grades specified on the drawings, or if the bottom of the excavation is disturbed because of the Developer's operations and require overexcavation and backfill, the Developer shall backfill such excavated space to the proper elevation in accordance Section 3.06.A.4 at no additional expense to King County.

B. Structural Fill and Backfill

1. All fill under slab-on-grade, including backfill for utility excavations, and overexcavated areas shall consist of structural fill.

2. Provide a capillary water break under floor slab. The capillary water break shall consist of drainage sand and gravel. Compact to a dense and unyielding condition, with at least 2 passes of a vibrating plate compactor or smooth drum roller.

3. No backfill material shall be deposited against concrete structures until the concrete has developed a strength of not less than 2,500 pounds per square inch in compression or until the concrete has been in place for 28 days, whichever occurs first.

4. Compaction of structure backfill shall be accomplished by using power-operated tampers, rollers, or vibratory equipment. Compaction within 2 feet of walls shall be performed with hand-operated vibratory compactors.

3.04 SUBGRADE FOR PAVEMENT

A. Place structural fill in accordance with Table A. Compact to 95 percent of the maximum density.

3.05 SITE FILL

A. Excavated onsite soils may be used as fill in landscaping areas.

END OF SECTION

SECTION 02510
POTABLE WATER SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. The work includes the installation of potable water system pipe, fittings, valves, and appurtenances.

1.02 REFERENCES

A. All work to be performed and materials to be used shall be in accordance with the Burien Municipal Code unless otherwise indicated herein.

B. Washington State Department of Transportation (WSDOT) Standard Specifications 2008.

1.03 SUBMITTALS

A. Provide the following:

1. Submit manufacturer's technical product data.

2. Shop drawings for potable water system.

3. Record drawings at project closeout.

1.04 DEVELOPER REQUIREMENTS

A. Coordinate and schedule all water service work in the public right-of-way with the City of Burien Public Works Department.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials shall conform to the City of Burien Standards.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 INSTALLATION

A. All work shall conform to the Burien Municipal Code.

B. Pipe installation shall meet the requirements of WSDOT, Section 7-08.

C. Depth of Cover: Provide 4-foot minimum cover over piping below finished grade.

3.02 FIELD QUALITY CONTROL

A. Hydrostatic Tests: Test pipeline in accordance with the requirements of the Burien Municipal Code.

B. Disinfect and test installed water mains in accordance with City of Burien requirements.

END OF SECTION

SECTION 02535
SANITARY SEWER SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes constructing sanitary sewer lines outside of buildings.

1.02 REFERENCED STANDARDS

A. Work shall conform with the Burien Municipal Code.

Reference	Title
ASTM D-3034-04	Standard Specification for Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fitting.
2006 UPC	2006 Uniform Plumbing Code (UPC)
IAMPO	International Association of Plumbing and Mechanical Officials (IAMPO) Standards.
WSDOT	Washington State Department of Transportation (WSDOT) Standard Specifications 2008

1.03 SUBMITTALS

A. Provide the following:

1. Product data giving full description of the components proposed for the system.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements

1. Meet the applicable requirements of City of Burien.

PART 2 PRODUCTS

2.01 PIPING MATERIAL

A. Sewer pipe shall have flexible, gasketed, push-on joints and shall be PVC (Polyvinyl Chloride) SDR 35 conforming to ASTM D3034. Fittings shall be factory molded of PVC. All pipe and fittings shall be legibly and permanently marked with type and class.

2.02 CLEAN-OUTS

A. Clean-outs shall be installed at locations to meet the requirements of the Burien Municipal Code.

2.03 DETECTABLE MARKING TAPE

A. Detectable marking tape, for non-metallic piping, shall consist of inert polyethylene plastic that is impervious to all known alkalis, acids, chemical reagents, and solvents likely to be encountered in the soil, with a metallic foil core to provide the most positive detection and pipeline locators. The tape shall be color coded green and shall be

imprinted continuously over its entire length, in permanent black ink. The message shall convey that a sewer line is buried below and shall also have the word “Caution” prominently shown. The width of the tape shall be as recommended by the manufacturer for the depth of installation.

2.04 OIL-WATER SEPARATOR

A. Provide oil-water separator. See Section 15410.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 GENERAL

A. Construction shall conform to the requirements of WSDOT, 7-04.3.

B. Cleaning and testing shall conform to the requirements of WSDOT, 7-04.3(1).

END OF SECTION

SECTION 02580
PAVEMENT MARKINGS

PART 1 GENERAL

1.01 SUMMARY

A. This section specifies pavement marking consisting of furnishing and placing pavement markings for parking areas and streets, and raised pavement markers for delineation and channelization, in accordance with the plans and specifications.

1.02 REFERENCES

A. All work to be performed and materials to be used shall be in accordance with the Burien Municipal Code, unless otherwise indicated herein.

B. Washington State Department of Transportation (WSDOT) Standard Specifications 2008.

PART 2 PRODUCTS

2.01 RAISED PAVEMENT MARKERS

A. Type 1 and Type 2 raised pavement markers shall conform to WSDOT, Paragraph 9-21 in the colors and locations as identified on the drawings.

2.02 PARKING AREA PAVEMENT STRIPING MATERIALS

A. Pavement marking materials shall comply with the requirements of Paragraph 8-22.2 of WSDOT.

2.03 PAVEMENT ARROWS AND LETTERING

A. Pavement arrows and lettering, or where indicated, shall be thermoplastic meeting requirements of Paragraph 8-22.2 of WSDOT.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 02630
STORM DRAINAGE SYSTEM

PART 1 GENERAL

1.01 SUMMARY

A. This work shall consist of furnishing and installing drainage pipe and catch basins.

1.02 REFERENCES

A. All work to be performed and materials to be used shall be in accordance with the Burien Municipal Code (BMC) and details for Public Works Construction.

B. Washington State Department of Transportation (WSDOT) Standard Specifications 2008.

1.03 SUBMITTALS

A. The following shall be submitted.

1. Product data, including catalog cuts and technical specifications, shall be provided for the following:

a. Catch Basins

b. Pipe

c. Pipe Joints

d. Frames and Grates

PART 2 PRODUCTS

2.01 MATERIALS

A. Underdrain Pipe

1. Perforated PVC underdrain pipe shall comply with the requirements of WSDOT, Section 9-05.2(6).

2. PVC drain pipe shall meet the requirements of WSDOT, Section 9-05.1(5).

3. Perforated corrugated polyethylene pipe shall meet the requirements of WSDOT, Section 9-05.2(7).

4. Corrugated polyethylene drainage tubing drain pipe shall meet the requirements of WSDOT, Section 9-05.1(6).

B. Storm drain conveyance pipe shall be lined corrugated polyethylene (LCPE) pipe unless indicated otherwise and shall meet the requirements of WSDOT, Section 9-05.20.

C. Catch Basins and Manholes

1. General: Materials shall comply with the provisions in WSDOT, Section 7-05.2.

2. Catch basins and manholes shall be precast concrete structures.

3. Mortar for jointing catch basins and inlets shall be one part portland cement, and not less than one part more than two parts plaster sand mixed with the least amount of water necessary to provide a workable mortar.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 TRENCH EXCAVATION AND BACKFILL

A. Trenching in Public Right-of-Way: All trenching in public right-of-way, if required, shall be in accordance with the City of Burien standards.

B. Compaction of Trench Backfill

1. Trench excavation may be used as backfill above the bedding material if the material conforms to the requirements of structural fill of Section 02200, "Earthwork."

3.02 PIPE LAYING, JOINTING AND TESTING

A. General

1. General: Construction requirements for pipe laying and jointing shall conform to the applicable provisions of Section 7-08.3 of WSDOT.

B. Pipe Jointing

1. All storm drain pipes shall have flexible gasketed joints.

C. Pipe Testing

1. Exfiltration and Infiltration tests on Storm Sewer Pipe shall be as required in WSDOT, Section 7-04.3.

3.03 CATCH BASINS AND MANHOLES

A. Pipe Connections

1. All rigid pipes entering or leaving the catch basin shall be provided with flexible joints within 1 1/2 pipe diameters of the catch basin structure and shall be placed on firmly compacted bedding particularly within the area of the catch basin.

END OF SECTION

SECTION 02753
PORTLAND CEMENT CONCRETE PAVING, SIDEWALKS, CURBS, AND GUTTERS

PART 1 GENERAL

1.01 SUMMARY

A. This section specifies portland cement concrete for driveways, transit area, sidewalks, curbs, and gutters on a prepared subgrade within the project limits.

1.02 REFERENCES

A. This section incorporates by reference the latest revisions of the following documents.

Reference	Title
BMC	Burien Municipal Code
AASHTO M33	Preformed Expansion Joint Filler for Concrete (Bituminous)
AASHTO M85	Portland Cement
AASHTO M148	Liquid Membrane Forming Compounds for Curing Concrete
AASHTO M154	Air Entraining Admixture for Concrete
AASHTO M171	Sheet Material for Curing Concrete
AASHTO M194	Chemical Admixtures for Concrete
AASHTO M213	Preformed Expansion Joint Filler for Concrete Paving and Structural Construction
WSDOT	Washington State Department of Transportation (WSDOT) Standard Specifications 2008

1.03 SUBMITTALS

A. Provide the following:

1. Certified reports of mix designs for concrete used.
2. Manufacturer's technical data:
    a. Surface retarder
    b. Curing compounds
    c. Bonding and repair materials
    d. Surface hardener
    e. Joint materials

1.04 QUALITY ASSURANCE

A. Testing

1. Provide the services of an independent testing laboratory to verify quality of concrete placed and conformance to design.

B. Basis for Determining Quality: Portland cement concrete pavement work shall conform to the requirements of ACI 316.

PART 2 PRODUCTS

2.01 PORTLAND CEMENT CONCRETE

A. Cement: Portland cement shall be ASTM C 150. Use Types I or III. Use only one brand of cement throughout the project.

B. Aggregates

1. Fine and coarse aggregates shall conform to WSDOT, Paragraph 9-03.1, and ASTM C 33, and with the requirements of WSDOT 9-03.1 superseding the requirements of ASTM C 33 in case of conflict.

2. Fine Aggregate

a. When tested in accordance with ASTM C 136, gradation shall conform within the following units:

U.S. Standard Sieve Size	Percent by Weight Passing
3/8-inch	100
No. 4	95 - 100
No. 8	68 - 86
No. 16	47 - 65
No. 30	27 - 42
No. 50	9 - 20
No. 100	0 - 7
No. 200	0 - 2.5

b. Fine aggregate shall not exceed 40 percent by weight of combined aggregate total, except for concrete with coarse aggregate of less than maximum size 1/2-inch.

3. Coarse Aggregate

a. Coarse aggregate shall be crushed stone; processed from natural rock or stone, or washed gravel; either natural or crushed; all clean, uncoated, and containing no clay, mud, loam, or foreign matter. The combined grading requirements for aggregates, tested in accordance with ASTM C 136, shall be as follows:

U.S. Standard Sieve Size	Percent by Weight Passing Primary Aggregate Nominal Sizes			
	Grading No. 2	Grading No. 4	Grading No. 5	Grading No. 6
1 1/2 inch	100	100	--	--
1 1/4 inch	95 - 100	90 - 100	--	--
1 inch	--	--	100	--
3/4-inch	40 - 70	0 - 20	80 - 100	100
1/2-inch	--	--	--	90 - 100
3/8-inch	5 - 20	0 - 2	10 - 40	40 - 90
No. 4	0 - 2	--	0 - 4	5 - 30
No. 200	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5

b. Other tests shall be in accordance with WSDOT, Paragraph 9-03.1(3), and the following specifications:

Test	Test Method	Requirements
Amount of Material Passing No. 200 Sieve	ASTM C 117	0.5 percent maximum by weight.
Clay Lumps and Friable Particles	ASTM C 142	0.5 percent maximum by weight.
Soundness	ASTM C 88	10 percent maximum loss with sodium sulfate.
Abrasion	ASTM C 131	35 percent maximum loss after 500 revolutions in Los Angeles machine.
Reactivity	ASTM C 289	As specified in ASTM C 33, appendix.

C. Admixtures

1. Admixtures shall conform to the requirements of WSDOT, Paragraph 6-02.3(3)

2. Air-Entraining Admixture: Use air-entraining admixtures conforming to ASTM C 260 and AASHTO M 154 to produce concrete having within 4.0 percent to 6.0 percent air content at the point of placement.

3. Water-Reducing Admixture: Water-reducing admixture shall conform to ASTM C 494, Type A, and shall be "Pozzolith 344N" by Master Builders or equivalent by Euclid Chemical Company or Grace.

4. Calcium chloride, thiocynates or admixtures containing more than 0.05 percent chloride ions shall <u>not</u> be permitted.

D. Water: Water for washing aggregate, for mixing, and for curing shall be free from oil and deleterious amounts of acids, alkalis, and organic materials; shall conform to WSDOT Paragraph 9-25.1, containing no more than 2,500 parts per million of chlorides calculated as sodium chloride and no more than 1,000 parts per million of sulfates calculated as sodium sulfate. Water used for curing shall not contain an amount of impurities sufficient to discolor the concrete.

2.02 CONCRETE CHARACTERISTICS

A. Concrete Class, Mix Requirements and Use

1. Minimum Flexural Strength: 590 psi at the end of 28 days.

2. Minimum Compressive Strength: 4,000 psi at the end of 28 days for concrete paving. 3000 psi at the end of 28 days for sidewalks, curbs, and gutters.

3. Cement: ASTM C 150, Types I or III.

4. Minimum Cement Content to be no less than 565 pounds/cy of concrete.

5. Air-Entrainment: 4.0 percent minimum to 6.0 percent maximum.

6. Maximum Coarse Aggregate Size: Grading No. 5, 3/4-inch.

7. Use: Areas subject to vehicular traffic and sidewalks.

B. Concrete Slump: Proportions and design mixes shall result, when sampled per ASTM C 172 and tested per ASTM C 143, in a concrete slump at the point of placement of 2 inches.

2.03 STEEL REINFORCING BARS AND WIRE MESH

A. Dowel bars shall be plain steel bars. Comply with the chemical and physical properties of ASTM A 615, Grade 60, and AASHTO M183.

B. Reinforcing bars shall be used to reinforce pavement around castings. Reinforcing bars shall be 1/2-inch round deformed steel bars in accordance with ASTM A 615, Grade 60, and shall be a minimum length of 1 1/2 times the diameter of the castings.

C. Wire mesh for concrete reinforcement shall comply with the requirements of the Standard Specifications for Welded Steel Wire Fabric for Concrete Reinforcement (ASTM A 185) or the Standard Specifications for Welded Deformed Steel Wire Fabric for Concrete Reinforcement (ASTM A 497).

2.04 SEALANTS AND JOINT FILLERS

A. Joint Sealant: Shall be self-leveling, silicone joint sealant, delivered to the job site in the manufacturer's original sealed container. Each container shall be marked with the manufacturer's name, batch, or lot number, accompanied by the manufacturer's certification of compliance with the specified requirements. Sealant shall be Dow Corning 890SL:

1. Elongation of 1400 percent minimum when tested in accordance with ASTM D 412, Die C Modified.

2. Joint modulus of 7 psi maximum at 50 percent elongation, 8 psi maximum at 100 percent elongation, and 9 psi maximum at 150 percent elongation.

3. Adhesion to asphalt/concrete: elongation of 600 percent minimum elongation.

4. No failure of product when tested in movement, 10 cycles, +100 percent and -50 percent, in accordance with ASTM C 719.

5. No cracks, blisters, or bond loss under accelerated weathering at 5,000 hours.

B. Backer Rod: Shall be cylindrical, closed cell, expanded polyethylene foam, or open cell with impervious skin.

C. Premolded Joint Filler:

1. Premolded joint filler, when called for on the drawings for use in control joints, shall be 1/2-inch in thickness and shall consist of a suitable asphalt mastic encased in asphalt-saturated paper or asphalt-saturated felt. It shall be sufficiently rigid for easy installation in hot weather and not too brittle for handling in cool weather. It shall also meet the requirements of ASTM D 994 or AASHTO M33.

2. Premolded joint filler for expansion joints shall be of the dimensions shown on the drawings and shall conform to the requirements of ASTM D 1751 or AASHTO M213.

2.05 CURING MATERIALS

A. Sheet materials for curing concrete shall meet the requirements of AASHTO M171, "Sheet Materials for Curing Concrete," except that only white reflective type shall be used.

B. Liquid membrane forming compounds for curing concrete shall comply with the requirements of AASHTO M148 (ASTM C 309) Type 1D or 2, Class A or B, except that the moisture loss when tested in accordance with WSDOT, Test Method 814, shall be 2.5 grams maximum.

2.06 FORMS

A. General: Shall conform to ACI 347 and shall be plywood, lumber, metal or other acceptable material. Lumber shall be dressed on at least 2 edges and 1 side for tight fit.

B. Form Coating Compounds: Form coating compounds shall be of commercial formulation; shall not bond with, stain, or adversely affect the concrete surfaces; and shall not impair any subsequent concrete treatment.

2.07 BASE COURSE MATERIAL

A. Shall conform with the requirements for crushed surfacing base course as specified in Section 9.03.9 (3) of the WSDOT Standard Specifications.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 SUBGRADE

A. Prior to placing base course material prepare the subgrade as follows:

1. Scarify remaining material to a depth of 12 inches. Place and compact structural fill to bring the subgrade up to grade. Shape the entire subgrade to a uniform surface running true to the line, grade and cross-section indicated.

2. Compact the subgrade to at least 95 percent of maximum density, as determined by the tests specified under Section 02200, "Earthwork." Compact to a width of at least 1-foot beyond the pavement edge or to a width that will accommodate the paving equipment without visible distortion of the subgrade. Thoroughly compact portions that are inaccessible to large compactor units with smaller compactor units or mechanical tampers. If the underlying material is too soft to permit proper compaction, loosen, aerate, and compact or excavate, remove and replace the subgrade material with structural fill until compaction can be obtained.

3.02 BASE COURSE

A. Prior to placing portland cement concrete material prepare the base course as follows:

1. Immediately following the placing and shaping, compact each layer of the base course to at least 95 percent of maximum density, as determined by the tests specified under Section 02200, "Earthwork." Maintain optimum moisture content for compacting material during placement and compaction operations. Thoroughly compact portions that are inaccessible to large compactor units with smaller compactor units or mechanical tampers.

2. Protect the compacted base course from inclement weather and Contractor's operations at all times.

3. Thoroughly wet down the base course with water 12 to 48 hours before the placing of concrete. Wet for a depth of at least 3 inches and for such additional depth as may be required to prevent hair-checking in the concrete just before the concrete is placed.

3.03 FORMS

A. General

1. Formwork shall conform to ACI 347. Forms shall be sealed and watertight.

3.04 STEEL REINFORCING BARS AND WIRE MESH

A. Reinforcing bars shall be used to reinforce pavement around castings. A minimum of 4 bars shall be installed around each casting, oriented parallel and perpendicular to the joints.

B. Dowel bars shall be required for transverse joints and shall be installed at the midpoint of the thickness of the pavement, parallel to the surface of the pavement and perpendicular to the transverse joint.

C. Wire mesh shall be installed at the midpoint of the thickness of the pavement, parallel to the surface of the pavement and perpendicular to the transverse joint.

3.05 CONCRETE

A. General: Concrete shall be truck-mixed, ready-mixed concrete conforming to the applicable portions of ASTM C 94 and WSDOT, Paragraph 5-05.3(1-5).

B. Delivery: Deliver concrete to the site and complete discharge within 1 hour after introduction of the water to the mixture.

C. Conveying: Convey concrete from the mixer to the forms in accordance with ACI 304.

D. Placing Concrete

1. General

a. Concrete shall have a temperature of between 50 degrees F and 80 degrees F when placed.

b. Do not use calcium chloride, salt, and other materials containing antifreeze agents or chemical accelerators.

2. Concrete Placement with Wire Mesh

a. When wire mesh is called for on the drawings, place concrete in two courses. Strike-off the first course at the elevation established for the wire mesh. Immediately prior to placing the wire mesh, bring the concrete to a fairly even surface by means of a template conforming to the depth of the wire mesh. Place the wire mesh on the bottom course before the concrete attains initial set. Do not allow more than 45 minutes to elapse between mixing of the first course and placement of the second course.

3. Concrete Placement in Hot or Cold Weather

a. In hot weather (more than 80 degrees F), place concrete in accordance with ACI 305.

b. In cold weather (less than 50 degrees F), place concrete in accordance with ACI 306.

3.06 SIDEWALKS

A. Cement concrete sidewalks shall be constructed in conformance with WSDOT Section 8-14.

3.07 CONCRETE CURBS AND GUTTERS

A. Cement concrete curbs and gutters shall be constructed in conformance with WSDOT, Section 8-04.3(1).

B. Edging: Perform edging before the final texturing and before the concrete has taken the final set. Form a 1/2-inch radius at pavement edges, 1/4-inch radius at contraction joints, and a 1/2-inch radius at through or construction joints.

C. Sidewalks: Screed and slope the concrete surfaces. After screeding, give the surfaces a coarse transverse scored texture by drawing a broom or burlap belt across the surface. Round edges to a radius of 1/2-inch. Grove joints to a radius and depth of 1/4-inch.

D. Final Finish

1. The pavement surface, after edging, shall be given a uniform, gritty texture true to grade and cross-section.

2. The Contractor shall give the pavement a final finish surface by texturing with a comb and perpendicular to the centerline of the pavement. The comb shall produce striations approximately 0.015-foot in depth at approximately 1/2-inch spacing in the fresh concrete. The comb shall be operated mechanically, either singularly or in gangs, with several placed end to end. Finishing shall take place with the elements of the comb as nearly perpendicular to the concrete surface as is practical to eliminate dragging the mortar. If the pavement has a raised curb without a formed concrete gutter, the texturing shall end 2 feet from the curb line. This 2-foot untextured strip shall be hand-finished to form a light brush finish. Top of curb shall receive a broom finish.

3.08 JOINTS

A. Formed Control Joints

1. Transverse control joints shall be placed after compaction and finishing of concrete have been completed and before initial set. A groove shall be cut into the surface at the location of the joint using a tool provided with stops to prevent cutting the groove deeper than shown on the plans.

B. Contraction Joints

1. Construct joints by sawing a uniform 1/4-inch wide vertical groove in the hardened concrete before random cracks develop.

2. Where curing membrane is used, respray the area disturbed by sawing of joints immediately upon completion of the sawing operation.

C. Expansion Joints

1. Construct expansion joints with full depth, premolded, expansion joint filler material.

2. The finished joint shall be perpendicular to the paved surface.

D. Construction Joints

1. Place construction joints wherever the placing of concrete is suspended for more than 30 minutes.

3.09 JOINT SEALING

A. Immediately after the pavement is cured and before opening to traffic, thoroughly clean the joint space of loose material, dust, and debris and begin the process of sealing the joints.

3.10 CONCRETE CURING

A. Curing and Protection (Curing Compound)

1. Apply the curing compound immediately after the concrete has been finished and after surplus water collected on the surface has disappeared.

B. Curing and Protection (White Polyethylene Sheeting)

1. Place the sheeting over the pavement immediately after finishing operations are completed.

C. Curing in Cold Weather: When the air temperature is expected to reach the freezing point during the day or night, and the pavement has not cured for 50 percent of the time specified in Paragraph 3.12 A.3 of this section, the concrete shall be protected from freezing.

3.11 FIELD SAMPLING AND TESTING

A. Field sampling and testing will be performed by the independent testing laboratory specified in Paragraph 1.04.A of this section. Samples of aggregates and concrete will be taken at random locations and at such times as required to represent the quality of the materials and work throughout the project.

END OF SECTION

SECTION 02810
IRRIGATION SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. The underground irrigation system shall be constructed using the sprinkler heads, valves, piping, fittings, controllers, wiring, etc., of sizes and types as called for in these Specifications.

1.02 SCOPE OF WORK

A. Furnish and install a complete underground sprinkler irrigation system to provide efficient and even irrigation (WITH MINIMUM OVERSPRAY ONTO SIGNS, PAVED OR NON-PLANTED AREAS AND NO OVERSPRAY ONTO BUILDINGS) of all planting areas shown on the Landscape Planting Drawings and as specified in the Specifications, complete and ready for operation. Irrigation system should be equipped with adequate sensors (rain, ET and/or soil moisture) to ensure efficient operation of system. Irrigation controller should be configured properly to prevent overwatering.

1.03 SYSTEM PROTECTION

A. As part of the guarantee under this contract, the Developer shall be responsible for the deactivating and draining of the system prior to the onset of the freezing season and for reactivating the system at the onset of the spring growing season.

1.04 TESTS

A. Pressure Test

B. Performance Coverage Tests

1.05 SUBMITTALS

C. Developer shall submit manufacturer's "Catalog Cuts" of all materials.

D. Developer shall submit As-Built Drawings; Keys; Tools; Permits; Water Schedule; Instructions; Maintenance/Operation Manuals; etc.; as required per these Specifications.

1.06 GUARANTEE / WARRANTY

A. See 3.05 Guarantee / Warranty in this Section.

PART 2 - PRODUCTS

2.01 PLASTIC PIPE

A. PVC pipe upstream of the control valves shall be Schedule 40 and conform to all requirements of ASTM D 2241.

B. PVC pipe (zone lines) downstream of the control valves shall be Class 200 (pressure rated for 200 psi), and conform to all requirements of ASTM D 1785.

C. PVC Pipe sleeving shall be Schedule 40 and conform to all requirements of ASTM D 2241.

D. All fittings for lateral lines shall conform to the requirements of ASTM D 2466 SCHEDULE 40 PVC with exception to irrigation head riser assembly nipples and pipe risers, which shall be ASTM D 2464 SCHEDULE 80 PVC. All lateral line fittings shall be of the solvent weld type except where risers, valves, etc. require threaded transition fittings.

E. All threaded fittings for mainlines shall conform to requirements of ASTM D 2464, SCHEDULE 80 PVC. All glued fittings for mainlines shall conform to the requirements of ASTM D 2466, Schedule 40 PVC.

2.02 AUTOMATIC SPRINKLER CONTROLLER

A. Controller wiring that is above ground shall be installed in a conduit of painted galvanized steel.

B. Electrical wiring shall be installed according to local code.

2.03 CONTROL WIRE FOR AUTOMATIC VALVE OPERATIONS

A. Control wire must be insulated single strand copper designed for twenty (20) to fifty (50) volts and UL approved as Type U.F. (Underground Feeder).

B. Copper conductor must meet or exceed ASTM B-3 requirements.

2.04 QUICK COUPLING VALVES

A. Minimum one (1) inch valve and swing joint shall be used at "air-blow" connection to reduce air friction.

B. Provide two (2) matching valve keys, two (2) cap keys and two (2) swivel hose ells.

2.05 VALVE BOXES

A. All automatic valves and manual gate valves shall be enclosed in AMETEK Plymouth Valve Box of Superflexon with locking lid or approved equal.

B. Manual drain valves shall be enclosed in a two (2) inch PVC pipe and covered with a Weathermatic 906L locking cap and PVC pipe.

C. Backflow preventers shall be enclosed in a box as noted on Drawings.

D. Provide two (2) lid keys and two (2) valve keys per Valve Box type to King County Metro.

E. Size valve boxes as required to provide approximately three (3) inches clear between valve box and valve on all sides.

2.06 IRRIGATION WATER METER

A. Water Meter shall be per Code.

2.07 BACKFILL MATERIALS

A. Sump Gravel (For use under valve boxes only)

1. Three-quarter (3/4) minus round, water worn, washed gravel.

B. Sand (backfill soils around PVC pipe)

1. Fine granular material naturally produced by rock disintegration and free from organic material, loam, clay, and other deleterious substances.

C. Native Material (backfill soil around PVC pipe)

1. Soil native to project site free of wood and other deleterious materials and rocks over one (1) inch diameter.

D. Structural Fill (backfill soil around PVC pipe sleeve)

1. Backfill for pipe sleeves shall be structural fill. See EARTHWORK Specification Section 02230.

2.08 OTHER SUPPLIES

A. All flexible nipples or pipe joints shall be "Rainbird Swing Pipe," "Toro Funny Pipe," or "Triple Swing Joint Assembly".

B. All electrical wire splices must be made watertight with sealing 3M Direct Burial Splice Kit.

PART 3 - EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 TRENCHING

A. Trenches shall allow for a minimum of twelve (12) inches of cover over sprinkler head lateral lines, eighteen (18) inches of cover for irrigation main lines (see detail) and twenty-four (24) inches of cover for main supply line from point of connection to backflow preventer. Maintain a minimum clearance of three (3) inches between irrigation lines within a common trench. Trenches for sleeves shall allow for a minimum of eighteen (18) inches of cover.

B. Pulling of pipe is not permitted.

3.02 INSTALLATION

A. Head Locations

1. Locate sprinkler heads nine (9) inches from building foundation. Heads immediately adjacent to walks, curbs, shrub bed edge, etc. shall have one (1) inch clearance between head and walks, curbs, shrub bed edge, etc.

B. Control Wire

1. All splices must be made watertight with sealing Rainbird ST-03UL/PT-55 Snap-Tile.
2. Splices will be permitted only at the valves and never between valves or valve and controller.
3. Minimum size of wire is to be determined strictly by the wire sizing chart provided by Rainbird.
4. The control wires shall by color coded as follows:
   a. Ground Wire – White
   b. Lead-In Wire – Red
   c. Spare Wire – Yellow
5. Arrange valve stations to operate in sequence shown on “As-Built” Drawings.
6. Spare wire(s) shall be provided to all control valves. The spare wire(s) shall be shared by all the valves and shall complete the circuit back to the controller. Wire sizes shall be the same as the ground wire.

C. Risers

1. The pipe risers must have the same inlet size as the sprinkler and quick coupler heads.
2. Minimum riser size shall be the pipe size of the sprinkler head.

D. Automatic Controllers

1. Electrical wiring shall be installed according to local code.
2. A diagram or schedule sealed in a plastic cover shall be posted in the controller to facilitate the selection of the valves to be operated.

E. Backflow Preventer

1. Install in accordance with local plumbing code.
2. A manual shut-off valve shall be located upstream of Backflow Preventer to allow full isolation of system from water supply.

F. Automatic Valves

1. All automatic valves shall be enclosed in valve boxes set two (2) inches above finish grade in shrub beds where mulch is specified. Valve box extension may be required. Locate valve boxes in shrub and groundcover planting beds wherever possible and at points of easy access from paved areas.
2. Where valves occur adjacent to paved areas, install so that valve boxes will not be closer than twelve (12) inches to paving and perpendicular or parallel to it. Group boxes shall be spaced evenly to provide a neat appearance.

G. Quick Coupling Valves

1. Locate all quick couplers in shrub and groundcover planting beds wherever possible and at points of easy access from paved areas.

H. Irrigation Water Meter

2. All work shall be per code requirements.

I. Pipe Sleeves

1. All sleeves shall extend a minimum of twelve (12) inches beyond the edges of pavement.

2. Contractor shall provide and install pipe sleeves where irrigation lines cross walks, drives, parking lots or any other hard surface pavements.

J. Backfilling

1. Trenches or tunnels under roads or paved areas shall be backfilled and tamped with a mechanical tamper in successive six (6) inch lifts to at least ninety-five (95) percent density as determined by ASTM D 1557.

3.03 SYSTEM FAMILIARIZATION

A. Upon acceptance of the system, the Developer shall provide the necessary keys and/or other tools necessary to operate/drain/activate the system and spend sufficient time with King County Metro to insure that system operation/maintenance/winterizing can continue after completion of the contract.

3.04 FINAL ACCEPTANCE

A. Upon completion and approval of all tests, final acceptance of the system will be contingent upon Developer providing signed and approved sprinkler / plumbing / health /electrical permits as may be applicable in the area as well as reproducible Mylar As Built Drawings and three (3) three (3) ring binders of all catalog cuts/manufacturer's instructions/maintenance and operation information.

3.05 GUARANTEE / WARRANTY

B. The entire irrigation system shall be guaranteed by the Developer to give complete and satisfactory service as to materials and workmanship for a period of one (1) year from the date of contract acceptance of the work.

END OF SECTION

SECTION 02840
ROAD SIGNS

PART 1 GENERAL

1.01 SUMMARY

A. This section specifies road signs, consisting of furnishing and placing road signs.

1.02 REFERENCES

A. All work to be performed and materials to be used shall be in accordance with the Burien Municipal Code Downtown Design Standards, unless otherwise indicated herein.

B. MUTCD, Manual on Uniform Traffic Control Devices (2000).

C. Washington State Department of Transportation (WSDOT) Standard Specifications 2008.

PART 2 PRODUCTS

2.01 SIGN BLANKS

A. Sign blanks shall be sheet aluminum complying with Section 9-28.1 of WSDOT.

2.02 REFLECTIVE SHEETING

A. Reflective sheeting for sign faces shall be in accordance with Section 9-28.1 of WSDOT.

2.03 POSTS

A. Sign posts shall be per the Burien Municipal Code standard details.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 GENERAL

A. Sign legends shall comply with the Manual on Uniform Traffic Control Devices.

3.02 ROAD SIGN SCHEDULE

A. Provide as required to meet BMC and MUTCD.

END OF SECTION

SECTION 02848
PARKING BUMPERS

PART 1 GENERAL

1.01 SUMMARY

This Section specifies the parking bumpers at parking stalls inside and outside the garage.

PART 2 PRODUCTS

2.01 MANUFACTURERS/MATERIALS

A. Parking Bumpers: Pacific Cascade - Parking Zone, Parking Stop #SC-CCPS-06-YX standard concrete bumper, 5-1/2 inches high by 72 inches long, by 6 inches thick with two 5/8 inch securing holes, Gray solid color throughout, for normal and handicapped parking stalls, or equal.

B. Glue down adhesive suitable for application.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 02900
LANDSCAPING

PART 1 - GENERAL

1.01 SUMMARY

A. The Developer shall submit a written “watering schedule” to King County Metro to ensure adequate watering (summer, fall, winter & spring) of all plant materials.

1.02 REFERENCES

A. American Standard for Nursery Stock, ANSI Z60.1. American Nursery and Landscape Association, 1250 Eye Street NW, Suite 500, Washington, D.C. 20005.

1.03 SUBMITTALS

A. Submit the following plant material documentation:

1. List suppliers’ names, addresses, and phone numbers.

B. Soil Tests and Soil Supplier Certifications: See Paragraphs 2.01 and 2.03 of this Section.

C. Watering Schedule: See Paragraph 1.01A of this Section.

1.04 WARRANTY/MAINTENANCE

See Section 3.07.

PART 2 - PRODUCTS

2.01 EXISTING SUBGRADE SOIL

A. Soil tests of the subgrade soil shall be made by the Developer to determine mechanical analysis (per USDA Particle Size and Organic Matter Test) and fertility analysis (to determine magnesium, nitrogen, potassium, and phosphorus levels; soluble salts/conductivity and pH). Developer shall send a minimum of three (3) representative samples of subgrade soil to an approved soil testing laboratory (state laboratory or recognized commercial laboratory). Test results and laboratory recommendations for ornamental plant growth must be submitted to King County Metro.

2.02 COMPOST

A. Compost shall be a commercially available Recycled Plant Waste Compost product with 98% minimum material derived from the aerobic decomposition of recycled plant waste. It shall be free of viable weed seeds and other plant propagules and shall have a moisture content that has no visible free water or dust produced when handling the material. Compost shall also be free of Clopyralid herbicide. The material shall be comprised of fully composted and mature organic materials. Compost shall be produced at a permitted solid water composting facility (Health Permit, Department of Ecology Storm Water Permit, Puget Sound Clean Air Agency Facility and Equipment Registration) and meet the following mechanical analysis:

Size	Sieve	Percent Passing
1/2-inch	ASTM E 11	100

2.03 PLANTING SOIL

A. The Developer shall be responsible for the supply of all natural soil and soil additives required for the performance of this Contract. Soil shall be free of weeds, pests, toxic substances, and other undesirable material harmful to ornamental plant growth.

1. Soil Sources: Soil sources shall be Red-E-Topsoil, Cedar Grove Compost, Pacific Topsoils Inc., Iddings Farm Service.

B. Planting soil mix shall be a mixture of compost and sand.

Sand shall be “Washed Building Sand” and meet the following chemical and mechanical analysis:

Size	Sieve	Percent Passing
No. 4	ASTM E 11	100
No. 270	ASTM E 11	0 - 2

a. Salinity (millimhos per centimeter of saturation extract at 25 degrees C)	Nil - 3.0
b. Boron (saturation extract concentration)	Nil - 1.0 ppm
c. Sodium (sodium absorption ratio – SAR)	Nil - 6.0

C. Planting soil shall be a two-way mix soil consisting of forty (40) percent sand and sixty (60) percent compost by volume thoroughly mixed together. Mixed soil shall have pH range of 5.0 to 6.5 with dolomite limestone added as necessary to attain this range. Developer shall send minimum of one (1) representative sample of MIXED SOIL; to an approved soil testing laboratory (state or commercial laboratory) to determine FERTILITY ANALYSIS (to determine magnesium, nitrogen, potassium, phosphorus levels, calcium, minor elements, soluble salts/conductivity and pH). The results shall be submitted to King County Metro (WITH TEST RESULTS AND LABORATORY RECOMMENDATIONS FOR ORNAMENTAL PLANT GROWTH). The Developer shall be responsible for whatever soil additives may be required, as recommended by the testing laboratory.

D. Submit sand and planting soil laboratory tests and supplier’s certification of material to King County Metro.

2.04 SAWDUST MANURE MULCH

A. Sawdust Manure Mulch shall be "Steerco," "Comp-Mulch”.

2.05 FERTILIZER

A. Commercial Fertilizer "A" for trees, shrubs and groundcover during planting: AGRO "Transplanter" or equal.

B. Fifty (50) percent of the nitrogen shall be derived from Nitroform "Blue Chip." Potash shall be derived from sulfate of potash. Fertilizer shall be standard free flowing.

2.06 LIME

A. Lime shall be dolomitic limestone containing not less than eighty-five (85) percent of total carbonates. Limestone shall be ground to such fineness that one hundred (100) percent will pass a No. 20 sieve.

2.07 ANTI-DESICCANT

A. Anti-desiccant shall be "Wilt-Pruf," delivered in Manufacturer's containers and used in accordance with Manufacturer's recommendations.

2.08 PLANTS

A. Trees, Shrubs, and Groundcover

1. All plants shall be nursery grown, or normal habit of growth, healthy, vigorous and free of disease, insect eggs, and larvae. Plants shall not be pruned prior to delivery. Plants shall have all leaders and buds intact. Grading of plant material and root ball/container sizes shall be in accordance with the code of standards of the American Association of Nurserymen.

2. No less than ten (10) percent of each variety and/or species of plant delivered to the project shall be accurately labeled. Plant material labels shall be durable, legible labels stating the correct plant name.

3. Plants are required to be from stock acclimated to Project Site environmental conditions, having been consistently cultivated and grown under these conditions.

PART 3 – EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 SUBGRADE – COMPOST AREAS

A. Rototill or scarify all subgrade soils to a minimum depth of three (3) inches prior to placement of compost.

B. Remove debris and rocks over one (1) inch in size.

3.02 SUBGRADE – PLANTING SOIL AREAS

A. Rototill or scarify all subgrade soils to a minimum depth of six (6) inches prior to placement of planting soil.

B. Remove debris and rocks over one (1) inch in size.

3.03 SOIL PREPARATION – COMPOST AREAS

A. Provide and install compost to a three (3) inch compacted depth over all tree, shrub, and groundcover planting areas and rototill to a depth of three (3) inches into the subgrade.

B. Finish Grading

1. Compact finish grade to eighty-five (85) percent of maximum dry density as determined by ASTM: D 1557.

2. After settling, finish grades in tree, shrubs, and groundcover planting areas shall be two (2) inches below all walks, curbs, and/or other hard surface edges.

3.04 SOIL PREPARATION – PLANTING SOIL AREAS

A. Provide and install planting soil to a twelve (12) inch compacted depth over all shrub and groundcover planting areas.

B. Finish Grading

1. Compact finish grade to eighty-five (85) percent of maximum dry density as determined by ASTM: D 1557.

2. After settling, finish grades in shrubs and groundcover planting areas shall be two (2) inches below all walks, curbs and/or other hard surface edges.

3.05 TREE, SHRUB, AND GROUNDCOVER INSTALLATION

A. Backfill material for plantings is to be two-thirds (2/3) planting soil as specified with one-third (1/3) existing soil thoroughly mixed together. If the Contractor encounters clay soil or any unusual condition, which may be detrimental to the new planting, the removal and replacement of unsuitable materials is required.

B. Apply Fertilizer per Manufacturer's recommendation to all trees, shrubs, and groundcover.

C. Provide all planting areas with uniform two (2) inch compacted layer of sawdust manure mulch material over a properly cleaned and graded surface as noted on Drawings.

D. As necessary, a follow-up fertilizer application for all planting beds shall be in accordance with recommendations from soil test fertility analysis.

3.06 GUARANTEE

A. Guarantee work of this Specification section for one (1) year against all defects of materials and workmanship. Replace plants not in normal healthy growing condition at the end of guarantee period. Replace with plants with identical species and size.

B. Any plant material that is thirty (30) percent or more dead or disfigured shall be considered dead and must be replaced. Plants shall be considered disfigured when excessive dead wood has been removed or when the symmetry, typical habit of growth, or sculptured form has been impaired by the removal of dead wood.

C. The above guarantee shall be applicable to any growing conditions through which plants of like kind could be expected to survive, and any deformity or cause of death which could be attributed to, or affected by, the physiological condition of the plant shall be deemed replaceable cause; however, this would not apply to plant losses due to ABNORMAL WEATHER conditions such as floods, excessive wind damage, drought, severe freezing or abnormal rains, as determined by the National Weather Service.

3.07 MAINTENANCE

A. General

1. Subcontractor shall provide maintenance guarantee for one year. It is expressly understood that the Contractor will be responsible, during the one (1) year Guarantee Period, for normal landscape maintenance of the project. Maintenance of the landscape shall include, but not be limited to, watering, weeding, ivy removal, pruning, fertilizing, monitoring, and treating any disease and/or pest-problems, cultivating and any other maintenance requirements (per standard trade practices) to keep the plant materials in a normal healthy growing condition.

2. Contractor shall schedule weekly visits to site to determine conditions and perform work as required.

B. Watering

1. See “Watering Schedule” Paragraph 1.01A of this Section for the landscape/irrigation contractors’ recommended watering schedule.

C. Pruning

1. All pruning shall be completed in such a manner to enhance the plant’s natural growth and flowering characteristics.

2. All pruning shall be provided per International Society of Arborculture standards.

D. Fertilizing

1. Trees, shrubs and groundcovers shall be fertilized in March and October with a commercially available shrub and groundcover fertilizer (6-10-8 or equivalent) as recommended by manufacturer.

E. Sawdust Manure Mulch

1. Maintain a two (2) inch depth of mulch in the planting beds that were originally mulched. If mulch is disturbed by maintenance staff or others, it shall be releveled or replaced to the two (2) inch depth.

2. Keep mulch loose and raked to maintain even coverage and appearance.

F. Litter and Debris Clean-Up

1. All litter or debris deposited within planting areas shall be removed and disposed of off-site.

2. All bark mulch or soil that may erode onto paved surfaces shall be removed from sidewalk surface.

G. Irrigation

1. The Contractor shall maintain the irrigation system in good operating condition. This includes cleaning and adjusting sprinkler heads, valves, and electric controllers, etc.

2. The system will be winterized by AIR BLOWING all irrigation lines in the dormant season to remove water from the pipe lines.

END OF SECTION

SECTION 03170
EMBEDDED STEEL ITEMS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Plates and anchors for embedment into cast-in-place or precast concrete.

2. Embedded supports for architectural items.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents.

1. ACI 315 – Details and Detailing of Concrete Reinforcement.

2. AISC – Manual of Steel Construction.

3. ASTM A 36 – Standard Specification for Carbon Structural Steel.

4. ASTM A 53 – Standard Specification for Pipe, Steel, Black, and Hot-Dipped, Zinc-Coated, Welded and Seamless.

5. ASTM A 123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

6. ASTM A 153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

7. ASTM A 167 – Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.

8. ASTM A 496 – Standard for Steel, Wire, Deformed, for Concrete Reinforcement.

9. ASTM A 500 – Standard Specifications for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

10. ASTM A 615 – Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

1.03 SYSTEM DESCRIPTION

A. Provide embedded plate and anchor fabrications fashioned from structural steel materials for the purpose of structural attachment and restraint of architectural elements.

1.04 SUBMITTALS

A. General: Submit the following:

1. Shop Drawings.

2. Manufacturer Product Data Sheets.

PART 2 PRODUCTS

2.01 MATERIALS

A. Plate: ASTM A 36.

B. Structural Shapes: ASTM A 36, Grade B; EXCEPT:

1. Hot-rolled Shapes: ASTM A 572, Grade 50.

C. Structural Tubing: ASTM A 500, Grade B.

D. Pipe: ASTM A 53, Type E or S, Grade B.

E. Stainless Steel Plate, Sheet and Strip: ASTM A 167; Grade 316.

F. Reinforcing Bars: ASTM A 615, Grade 60.

G. Wire: Sixteen (16) gage or heavier; black annealed finish; provide materials conforming to ASTM A 82; and ASTM A 496.

2.02 ACCESSORIES

A. Provide hot dip galvanized hardware in conformance with ASTM A 153 where hot dip galvanized hardware is indicated.

B. Headed Welded Studs:

1. Provide headed anchors, and shear connector studs.

2. Characteristics:

a. ASTM A 108, Grades C1015 or C1020; forged steel.

b. Approved and listed with ICBO.

c. Welded to structural steel in accordance with AWS standards.

3. Provide one of the following:

a. Tru-Weld; ICBO #37341.

b. Nelson; ICBO #2614.

c. Stud Welding Associates; ICBO #4601.

C. Positioner Devices:

1. Materials: Steel wire; precast concrete; and plastic are acceptable.

a. Steel wire bar supports shall be used against formwork, and shall be in accordance with CRSI Manual of Standard Practice for Class 2 – Moderate Exposure; Type B.

b. Precast concrete bar supports shall be used against ground surfaces.

c. Plastic concrete bar supports are acceptable when used in accordance with manufacturer directions and as indicated.

2. Provide side-form spacers where appropriate to maintain side cover.

D. Shims:

1. Provide shims of non-tempered steel for purposes of stabilizing structural supports.

2. Finish: Hot dip galvanized in accordance with provisions of this Section.

2.03 MIXES

A. Precision Non-Shrink Grouting:

1. Characteristics:

a. Performance: In accordance with ASTM C 1107.

b. Hydraulic cement-based; for precision grouting; high early strength.

c. Mixing water per fifty-five (55) pound bag: Per manufacturer directions, but not more than one and three tenths (1.3) gallons.

2. Provide one of the following products:

a. Degussa/Master Builders. (800) 433-9517 – ‘Master Flow 928’

b. Fox Industries. (888) 760-0369 - ‘FX-228’.

c. CTS Cement Manufacturing Corporation. (800) 929-3030 - ‘Rapid-Set Cement AU’.

2.04 FABRICATION

A. Headed Welded Studs:

1. Comply with applicable ICBO evaluation criteria.

B. Reinforcing Bars for Work of this Section:

1. Reinforcing bars shall be shop-fabricated.

2. Conform to typical bar bends, and end hooks indicated in the CRSI Manual of Standard Practice.

a. Bends and hooks shall be formed cold.

2.05 FINISHES

A. Work of this Section shall be hot-dip galvanized finish in accordance with ASTM A 123, and these requirements.

1. Provide coating thickness grade 75 or higher; and not less than 1.75 ounces per square foot when measured in accordance with the sampling plane methodology (6.3 or as modified) described in ASTM A 123.

2. Surface Preparation:

a. Hot Dip Galvanizing: Use the following methods, together, alone or in combinations in accordance with SSPC SP-COM:

1. SSPC-SP 2 – Hand Tool Cleaning.

2. SSPC-SP 3 – Power Tool Cleaning.

3. Conventional solvent and chemical cleaning processes conducted by the hot dip galvanizer.

B. Cold-Galvanizing Repair Paint:

1. Use: For repair of coating removed and or damaged during installation and field welding.

2. System Dry Film Thickness (DFT): Three (3) mils.

a. Application DFT thickness shall be within manufacturer's indicated maximum and minimum values for system DFT.

3. Provide one of the following:

a. Nu-Wave Solutions – ' Galv Match Plus'.

b. ZRC Worldwide – 'Cold Galvanizing Compound'.

c. Alvin Products. (978) 423-7681 - 'Galvax'.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY

A. This section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes.

1.02 DEFINITIONS

A. Cementitious Materials: Portland cement alone, or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.03 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixes: For each concrete mix.

C. The submitted mix designs shall include the following:

1. Supporting test data not more than 12 months old

2. Statistical analysis in compliance with ACI 301.

3. Gradation of fine and coarse aggregates not more than 90 days old (ASTM C 33). Proportions of all ingredients, including all admixtures added either at time of batching or at job site. Aggregate weights shall be based upon saturated surface dry conditions.

4. Water/cement ratio.

5. Slump (ASTM C 143): When high range water-reducing admixtures are used, slump before and after addition of admixture is required.

6. Air content of freshly mixed concrete (ASTM C 231).

7. Strength is measured at 7 and 28 days. Strengths shall be as tested using 4" x 8" cylinders in accordance with ASTM C 31 and ASTM C 39.

8. Certification that all ingredients in each mix design are compatible.

9. Locations or intended use of each mix design.

10. Source of all materials.

D. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement.

E. Concrete Forming Drawings: Drawings indicating the in-place cast shape, size, and location of formed concrete surfaces.

F. Embedded Item Placement Drawings: Drawings indicating the location and type of plates, anchorages, or other items to be embedded in the finished concrete surfaces.

G. Material Certificates: certifying that each of the following items complies with requirements:

1. Cementitious materials and aggregates. Include mill certificates for cement.

2. Form materials and form-release agents.

3. Steel reinforcement and reinforcement accessories. For ASTM A 706 reinforcing, include results of physical and chemical analysis.

4. Fiber reinforcement.

5. Admixtures.

6. Waterstops.

7. Curing materials.

8. Floor and slab treatments.

9. Bonding agents.

10. Adhesives.

11. Vapor retarders.

12. Epoxy joint filler.

13. Joint filler strips.

14. Repair materials.

H. ICBO Reports: For each of the following items:

1. Mechanical splice couplers.

1.04 QUALITY ASSURANCE

A. Testing and Inspection: Testing and inspection shall be provided. Specific concrete inspection requirements are outlined in Paragraph 3.17 of this section.

B. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.

C. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."

D. ACI Publications: Comply with the following, unless more stringent provisions are indicated:

1. ACI 301, "Specification for Structural Concrete."

2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

3. ACI 318, "Building Code Requirements for Reinforced Concrete."

E. CRSI Publications: Comply with the following, unless more stringent provisions are indicated:

1. Manual of Standard Practice.

2. Documents 63 and 65.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store materials in accordance with ACI 301. Admixtures which have been in storage at the project site for longer than 6 months or which have been subjected to freezing shall not be used.

B. Deliver, store, and handle steel reinforcement to prevent bending and damage.

C. Store formwork above ground on framework or blocking in a ventilated or protected area to prevent deterioration from water and damage.

PART 2 PRODUCTS

2.01 FORM-FACING MATERIALS

A. Plywood Forms for Exposed Concrete: APA high density overlaid plyform Class I and Class II (Burke "Neotex," Georgia-Pacific "Fiber Ply," or approved equal). Use nonstaining oil guaranteed not to affect subsequent finish treatment.

B. Steel Forms for Exposed Concrete: Preformed steel forms, minimum 16-gage, matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

C. Rough-Formed Finished Concrete: Provide lumber dressed on at least two edges and one side for tight fit.

D. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.

E. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4-inch by 3/4-inch, minimum.

F. 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.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

G. Form Ties: Factory-fabricated, removable or snap-off metal or glass fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1-inch to the plane of the exposed concrete surface.

2. Furnish ties that, when removed, will leave holes not larger than 1-inch in diameter in concrete surface.

3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.02 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Low Alloy Steel Reinforcing Bars: ASTM A 706, deformed.

C. Epoxy Coated Reinforcing Bars: ASTM A 775, Grade 60, deformed.

1. Provide epoxy coated rebar for all structural slabs.

2. Provide epoxy coated rebar for reinforcement within 4” of the top surface of any horizontal structural elements. (Stirrups, top layer of flexural steel at beams.)

D. Plain Steel Wire: ASTM A 82, as drawn.

E. Deformed Steel Wire: ASTM A 496.

F. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

G. Deformed Steel Welded Wire Fabric: ASTM A 497, flat sheet.

2.03 REINFORCEMENT ACCESSORIES

A. Tie Wire: Minimum 16 gage, ASTM A 82, or acceptable patented system.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:

1. For concrete surfaces exposed to view or weather where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless steel bar supports, or plastic bar supports.

C. Joint Dowel Bars: Plain-steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs.

D. Mechanical Splices: Provide ICBO listed mechanical splices of Type 2 as defined by ACI 318. In transition splices, splice strength is based on the smaller bar.

E. Terminators

1. Lenton Terminator as manufactured by ERICO, Inc

2.04 CONCRETE MATERIALS

A. Portland Cement: No mixing of brands or types. Types are as follows:

1. Portland Cement: ASTM C 150, Type I.

2. Fly Ash: ASTM C 618, Class F, from a single source for the entire project.

B. Normal Weight Aggregate: ASTM C 33, uniformly graded and as follows:

1. Class: Moderate weathering region, but not less than 3M.

2. Unless maximum aggregate size is listed specifically under "Project Mix Requirements," the maximum aggregate size shall not exceed:

a. Three-fourths of the minimum clear spacing between reinforcing bars.

b. One-fifth of the narrowest dimension between the sides of the forms.

c. One-third of the thickness of the slabs or toppings.

C. Water: Potable and complying with ASTM C 94.

2.05 ADMIXTURES

A. General

1. Admixtures certified by manufacturer to contain not more than 0.05 percent water-soluble chloride ions by mass of cementitious material. Do not use admixtures containing calcium chloride or thiocyanate.

2. Where more than one admixture is used in the mix, furnish manufacturer's certification to the Project Representative that the admixtures to be used are compatible in combination with the cement and aggregates.

3. Accelerating admixtures shall be used only as approved by King County.

4. Provide admixtures from one of the suppliers listed below or approved equal.

B. Air-Entraining Admixture: ASTM C 260.

1. Micro-Air; Master Builders.

2. Davavair 1000; W.R. Grace.

3. Air Mix; Euclid Chemical Company.

C. Water-Reducing Admixture: ASTM C 494, Type A.

1. Low-Range Water-Reducing Admixture

a. Pozzolith 200-N; Master Builders.

b. WRDA G4; W.R. Grace.

c. Eucon WR; Euclid Chemical Company.

2. Mid-Range Water-Reducing Admixture

a. Polyheed; Master Builders.

b. Mira 20; W.R. Grace.

c. Eucon MR; Euclid Chemical Company.

D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.

1. Rheobuild 1000; Master Builders.

2. ADVA 100; W.R. Grace.

3. Eucon 37; Euclid Chemical Company.

E. Waterproofing Admixtures: Where indicated, as follows, the concrete slab shall be waterproofed by the addition of Everdure "Caltite" or equivalent product.

1. Performance Requirements: Waterproof concrete to comply with the following:

a. British Standard (BS) 1881-122, "Testing Concrete Methods for Determination of Water Absorption:" Corrected 30-minute water absorption not greater than 1.0 percent at test age of 7 days.

b. Manufacturer Qualifications: Manufacturer and products to have demonstrated experience on projects of similar size and complexity.

c. Performance Warranty: Provide warranty to repair water leakage through industry accepted and approved means for a period of 10 years after complete installation.

2. Areas requiring waterproof concrete.

a. The entire Roof slab.

b. Any slab or ramp that is exposed to weather.

2.06 WATERSTOPS

A. Flexible Rubber Waterstops: CE CRD-C 513 for embedding in concrete to prevent passage of fluids through joints. Factory-fabricate corners, intersections, and directional changes.

1. Profile: Flat, dumbbell without center bulb.

2. Profile: Ribbed without center bulb.

B. Flexible PVC Waterstops: CE CRD-C 572 for embedding in concrete to prevent passage of fluids through joints. Factory-fabricate corners, intersections, and directional changes.

1. Profile: Flat, dumbbell without center bulb.

2. Profile: Ribbed without center bulb.

C. Self-Expanding Strip Waterstops: Manufactured rectangular or trapezoidal strip, sodium bentonite or other hydrophylic material for adhesive bonding to concrete.

2.07 VAPOR RETARDERS

A. Vapor Retarder: ASTM E 1745, Class C, of one of the following materials; or polyethylene sheet, ASTM D 4397, not less than 10 mils thick:

1. Nonwoven, polyester-reinforced, polyethylene-coated sheet, 10 mils (0.25-millimeter) thick.

2.08 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 ounces/square yard dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap polyethylene sheet.

D. Water: Potable.

E. Clear, Solvent-Borne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

2.09 RELATED MATERIALS

A. Premolded Joint Filler: Neoprene closed cell bonded (ASTM D 1752-1), with a compression deflection of 50 percent for a pressure range of 50 to 150 psi. Use in all premolded joint filler applications

B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:

1. Types I and II, nonload-bearing for bonding hardened or freshly mixed concrete to hardened concrete.

2. Types IV and V, load-bearing for bonding hardened or freshly mixed concrete to hardened concrete.

D. Reglets: Fabricate reglets of not less than 0.0217-inch thick galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

2.10 REPAIR MATERIALS

A. Repair Topping: Traffic-bearing, cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4-inch.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.

2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.

3. Aggregate: Well-graded, washed gravel, 1/8- to 1/4-inch or coarse sand as recommended by topping manufacturer.

4. Compressive Strength: Not less than 5,700 psi at 28 days when tested according to ASTM C 109.

2.11 CONCRETE MIXES

A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases as follows:

1. Proportion normal weight concrete according to ACI 211.1 and ACI 301.

2. Proportion lightweight structural concrete according to ACI 211.2 and ACI 301.

B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.

C. Concrete mix design shall comply with the requirements of the design criteria.

D. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.

2. Combined Fly Ash and Pozzolan: 25 percent.

E. Shrinkage: Limit concrete shrinkage of post-tensioned beams and slabs to 0.00035 inches per inch. Concrete shrinkage to be tested according to the Quality Control article of this section.

F. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content of 6 percent, plus or minus 1 1/2 percent, unless otherwise indicated.

G. Limit water soluble, chloride ion content in hardened concrete to the following percentages by weight of cement:

1. 0.06 percent for post-tensioned concrete.

2. 0.15 percent for all other concrete.

H. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture or high range water-reducing admixture (superplasticizer) 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.

3. Use water-reducing admixture in pumped concrete, concrete for parking structure slabs, concrete required to be watertight, and concrete with a water cementitious materials ratio below 0.50.

2.12 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

B. Fabricate in accordance with ACI 315, providing concrete cover as specified or indicated.

C. Bending and straightening in accordance with ACI 318, Chapter 7. No bending or straightening of reinforcement will be permitted after partial embedment in concrete.

D. Welding and tacking of reinforcing bars is not permitted, unless specifically shown on the structural drawings. When welding of reinforcement is indicated and required, provide welds in accordance with AWS D1.4.

E. Splicing

1. Reinforcing bars shall be lap spliced for tension.

2. At the Developer's option, mechanical splicing may be used, provided that the mechanical splices develop the same values of strength provided by the full penetration butt welds. Threaded splices shall be capable of developing in tension at least 125 percent of the specified yield strength (Fy) of the bar.

3. Welding or tack welding of reinforcing bars to other bars or to plates, angles, etc., is prohibited.

2.13 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information.

1. When air temperature is between 85 and 90 degrees F, reduce mixing and delivery time from 1 1/2 hours to 75 minutes. When air temperature is above 90 degrees F, reduce mixing and delivery time to 60 minutes.

2. Batch Tickets: Include the amount of water in the batch from the plant and the remaining water that may be added at the site, if any.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated within the tolerance limits of ACI 117.

C. Construct forms for "Standard" concrete surfaces to meet Class C surface per ACI 117.

D. Construct forms for architectural concrete surfaces to meet Class A surface with additional requirement that a 10-foot template be used to measure irregularities.

E. At architectural concrete surfaces, vertically stagger formboards at midpoint of sheet. Use full sheets to the extent possible.

F. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class A, 1/8-inch.

2. Class B, 1/4-inch.

3. Class C, 1/2-inch.

4. Class D, 1-inch.

G. Chamfer exterior corners and edges of permanently exposed concrete (3/4-inch minimum).

H. Form openings, chases, offsets, shrinkages, keyways, reglets, blocking, screeds, and bulkheads required in the work. Coat contact surfaces of forms with form release agent, according to manufacturer's written instructions, before placing reinforcement.

3.02 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete.

3.03 REMOVING AND REUSING FORMS

A. General: Formwork, for sides of beams, walls, columns, foundations, and similar parts of the work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 degrees F for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form removal operations, and provided curing and protection operations are maintained.

B. Leave formwork, for beam soffits, joists, slabs, and other structural elements; that supports weight of concrete in place until concrete has achieved the following:

1. Minimum 7 days and at least 75 percent of 28-day whichever is longer.

2. Post-Tensioned Construction: Do not strip formwork supporting cantilever slabs or edge beams until backshores have been placed.

C. Remove formwork progressively so no unbalanced loading is imposed on structure.

D. Clean and repair surfaces of forms to be reused in the work.

3.04 SHORES AND SUPPORTS

A. Comply with ACI 318, ACI 301, and recommendations in ACI 347R for design, installation, and removal of shoring and reshoring.

B. Keep reshores or backshores in place a minimum of 15 days after placing upper tier, or longer, if required, until concrete has attained its required 28-day strength and heavy loads due to construction

3.05 VAPOR RETARDERS

A. Vapor Retarder: Place, protect, and repair vapor retarder sheets according to ASTM E 1643 and manufacturer's written instructions.

3.06 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. EPOXY COATED REINFORCEMENT

1. Special care required during delivery, storage, placement, inspection and concrete placing to protect epoxy coating from damage. Repair damaged epoxy coating where required.

3.07 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.

2. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.

3. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.

4. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

5. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

6. Use epoxy bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

7. Provide roughened surfaces at joints where shown on the drawings. Roughen to a full amplitude of approximately 1/4-inch.

C. Contraction Joints in Slabs-on-Grade: Form weakened plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8-inch . Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool 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 wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.

2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.08 WATERSTOPS

A. Flexible Waterstops: Install in construction joints as indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of work. Field-fabricate joints in waterstops according to manufacturer's written instructions.

B. Self-Expanding Strip Waterstops: Install in construction joints according to manufacturer's written instructions, bonding or mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.09 CONCRETE PLACEMENT

A. Before placing concrete, water may be added at project site, only up to the amount listed on the batch ticket, subject to limitations of ACI 301.

1. Do not add water to concrete after high range, water-reducing admixtures have been added to mix at the project site.

B. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. Deposit concrete to avoid segregation.

C. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic to avoid cold joints.

1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.

2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.

D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items, and into corners.

2. Maintain reinforcement in position on chairs during concrete placement.

3. Screed slab surfaces with a straightedge and strike off to correct elevations.

4. Slope surfaces uniformly to drains where required.

5. Begin initial floating using bull floats or darbies to form a uniform and open textured surface plane, free of humps or hollows, before excess moisture or bleedwater

E. 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 degrees F , uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F and not more than 80 degrees F at point of placement.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

F. Hot Weather Placement: Place concrete according to recommendations in ACI 305R and, as follows, when hot weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 degrees F 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.

3.10 FINISHING FORMED SURFACES

A. Smooth-Formed Finish: As-cast concrete texture imparted by form facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8-inch in height. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.

B. Rough-Formed Finish: As-cast concrete texture imparted by form facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347R limits for class of surface specified. Apply to concrete surfaces not exposed to view.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.11 FINISHING FLOORS AND SLABS

A. General: Comply with recommendations in ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Trowel and Fine Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset method. Immediately after second troweling and when concrete is still plastic, slightly scarify surface with a fine broom.

C. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, parking garage floors, and ramps.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber bristle broom perpendicular to main traffic route.

3.12 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

3.13 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying, and excessive cold or hot temperatures. Comply with ACI 306.1 for cold weather protection and with recommendations in ACI 305R for hot weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 pounds/square foot 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.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing by one or a combination of the following methods:

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than 7 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 lap over adjacent absorptive covers.

2. 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 , and sealed by waterproof tape or adhesive. Cure for not less than 7 days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.

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 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.14 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least 3 months. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints. Leave contact faces of joint clean and dry.

C. Install semirigid epoxy joint filler full depth in saw cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS (PATCHING)

A. Defective Concrete: Repair and patch defective areas. Remove and replace concrete that cannot be repaired and patched.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2 1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2-inch in any dimension in solid concrete. Remove concrete to not less than 1-inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness. Use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01-inch wide, or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

2. After concrete has cured at least 14 days, correct high areas by grinding.

3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

5. Repair defective areas, except random cracks and single holes 1-inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts, and expose steel reinforcement, with at least 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

6. Repair random cracks and single holes 1-inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

3.16 CONCRETE REPAIR (STRUCTURAL)

A. This includes the materials, testing and workmanship to structurally repair cracks in new concrete. Epoxy resin adhesive shall be used in an injection mode to effect the repairs.

B. Cracks larger than 0.01-inch and which extend through the full depth of the slab or wall, or are subject to allowing water leakage through the crack, shall be repaired by epoxy injection.

C. Provide the following quality control tests for every lot of adhesive supplied:

1. Certification and Test Report: Manufacturer shall certify that every batch of material meets test requirements and shall furnish test reports.

3.17 QUALITY CONTROL

A. This section specifies the minimum testing and inspection required. Additional testing and inspection may be required by the Testing Agency.

B. Testing Agency: The contractor shall engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement.

C. Testing Agency/Special Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, and qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

D. Independent Testing Agency shall check batch tickets for compliance with required mix design(s).

E. Continuous Field Inspection: The Independent Testing Agency shall be present at all times during the placing of structural reinforced concrete. Work shall not proceed until all inspections are completed. Prior to placing concrete, the Inspector shall inspect:

1. Accuracy, configuration, and cleanliness of all formwork

2. Quantity, cleanliness, and placement of all reinforcing steel.

F. Reinforcing Steel Testing: Independent Testing Agency will perform the following:

1. All steel bars that can be positively identified as to heat number and mill analysis shall have one tensile test bending test for each 10 tons, or fraction thereof, for all #5 bars and larger.

2. All steel bars that cannot be identified shall have one tensile and one bend test made for each 2 1/2 tons, or fraction thereof, of each size and kind of reinforcing steel.

3. Testing procedure shall conform to ASTM A 615.

4. Testing Agency need not be present during entire reinforcing steel placing operations, provided he has inspected for conformance with the approved placement drawings prior to closing of forms or the delivery of concrete to the job site.

G. Reinforcement Welding: All shop and field welds of reinforcing steel will be inspected. The Special Welding Inspector will check the materials and equipment, the

qualifications and ability of the welder, and details of construction and procedure, as well as the welds themselves. The Inspector may use gamma ray, magneflux, trepanning, ultrasonics, or any other aid to visual inspection which the Inspector may deem necessary to determine the adequacy of the welding.

H. No concrete shall be placed until placement of reinforcement steel has been inspected and approved.

I. Concrete Sampling: 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 one composite sample for each day's pour of each concrete mix exceeding 5 cubic yards , but less than 25 cubic yards , plus one set for each additional 100 cubic yards) or fraction thereof.

2. Slump: ASTM C 143; 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, for normal weight concrete; and ASTM C 173, volumetric method, for structural lightweight concrete. 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 degrees F and below, and when 80 degrees F and above, and one test for each composite sample.

5. Compression Test Specimens: ASTM C 31; cast and laboratory cure one set of standard cylinder specimens for each composite sample as follows:

   a. Four cylinders for concrete with f'c $\leq$ 5,000 psi.

   b. Six cylinders for concrete with f'c $\geq$ 5,000 psi.

6. Compressive Strength Testing of Cylinders: Cylinders shall be tested in accordance with ASTM C 31. The testing of cylinders for each mix tested shall be as follows:

7. Age 9. at Test (days)	8. Number of Cylinders Tested		
	10. Post-Tensioned Concrete	11. Nonpost-Tensioned Concrete (f'c $\leq$ 5,000 psi)	12. Nonpost-Tensioned Concrete (f'c $\geq$ 5,000 psi)
13. 3	14. 1	15. 0	16. 0
17. 7	18. 1	19. 1	20. 1
21. 28	22. 1	23. 2	24. 2
25. 56	26. 2	27. 0	28. 2

29. Strength level of an individual class of concrete for laboratory-cured specimens shall be considered satisfactory if both of the following requirements are met:

a. Average of all sets of three consecutive strength tests equals or exceeds the specified compressive strength.

b. No individual strength test (average of two cylinders) falls below the specified compressive strength by more than 500 psi.

30. Report exact mix tested, minimum size aggregate, location of pour in the work, cylinder identification, date of receipt of cylinder in laboratory, cement brand and type, and admixtures used).

31. Field-cured cylinders for determining post-tension stressing or form removal time or when a structure may be put in service shall be made in numbers directed to check the adequacy of curing and protection of concrete in the structure. The specimens shall be removed from the molds at the age of 24 hours, and shall be cured and protected, insofar as practicable, in the same manner as that given to the portion of the structure the samples represent. All field-cured cylinders are taken and tested at the Contractor's expense.

J. Linear Shrinkage Tests: Test for linear shrinkage in accordance with ASTM C 157 (air storage method for 28 days). Take a minimum of 3 test samples from each mix at the Project Representative's direction of concrete for elevated slabs and beams. Take samples at truck and discharge end of pumped mix. Consistency of the concrete must not be altered after test samples have been taken.

K. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

L. Strength of each concrete mix will be satisfactory if every average of any three 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.

M. 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 mix proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

N. 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. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42.

3.18 WASTE MANAGEMENT

A. Separate cardboard and paper packaging, pallet materials, and metals used in shipping materials related to cast-in-place concrete for later disposal and recycling at firms listed in the King County “Construction Recycling Directory”, latest edition.

END OF SECTION

SECTION 03310
POST-TENSIONING REINFORCEMENT

PART 1 GENERAL

A. SUBMITTALS

B. Submit in accordance with Section 01300.

C. Product Data: Indicate specifications, sizes, and materials used for the following:

1. Strand.

2. Anchorages.

3. Sheathing.

4. Grout.

5. Encapsulation.

6. Accessories.

7. Repair tape.

D. Shop Drawings.

E. Calculations.

F. Grout.

G. Submit project record drawings (as-builts) at the conclusion of the project. Record locations of tendons, accurate to within 1-inch, stressing sequence, tension loads established, and elongation of tendon.

PART 2 PRODUCTS

2.01 POST-TENSIONING MATERIALS

A. Post-tensioning systems shall comply with the PTI Specifications.

B. Tendons shall meet the following additional requirements:

1. ASTM A 416, Grade 270, low relaxation, stranded steel cable; ultimate tensile stress of 270 ksi, unbonded system.

C. Encapsulated Systems

1. The "Zero Void" system by General Technologies, Inc., is an acceptable encapsulated system.

2. The "Hayes Corrosion Protection System," by Hayes Industries, Inc., is an acceptable encapsulated system.

3. The "Corrosion Protection System (CPS)" by General Technologies, Inc., is an acceptable encapsulated system.

D. Anchorages

1. Anchoring devices shall be of such nature that wires will not kink, break down, or otherwise be damaged.

2. Anchorage devices shall hold the prestressing strand without slip of more than 1/8-inch at a load equal to the applied load on the wire at prestressing.

3. Distribution Plates: Welded steel or cast steel-bearing assemblies that will permanently support and distribute the load from the anchoring devices, and shall develop at least 95 percent of the minimum specified ultimate strength of the prestressing steel without exceeding anticipated set.

a. Bearing stress in the concrete shall not exceed that permitted by Equation 26-1 of ACI 318.

b. Bending stresses in the plates shall not exceed 20,000 psi for structural steel and 15,000 psi for cast steel, except as experimental data may indicate that higher stresses are satisfactory. For higher strength steel, corresponding stresses may be permitted.

c. Materials shall meet requirements of ASTM A 36 for structural shapes or ASTM A 148 for cast steel or higher quality materials as required to meet stress requirements.

d. Design and fabrication shall meet the latest AISC Standards—Welding - AWS Standards, including Qualification Test of Welders.

e. Distribution plates may be omitted if the bearing area of any anchoring device is sufficiently large so that the local concentrated bearing compressive stresses do not exceed the stresses permitted above or cause local failure.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 FABRICATION

A. Protect all prestressing strand from rust or other corrosion prior to placement. Provide sufficient protection for exposed prestressing strand at the ends of the members to prevent deterioration by corrosion.

3.02 INSTALLATION

A. Install post-tensioning tendons in accordance with the PTI Specification for Unbonded Single Strand Tendons.

B. Tolerances on installation of post-tensioning tendons shall be in accordance with ACI 117.

3.03 STRESSING

A. Compressive strength shall be a minimum of 3,000 psi for application of prestressed force.

B. Stress the post-tensioning tendons using hydraulic jacks with calibrated pressure gages to permit the stress in the prestressing steel to be computed any time. A calibration chart shall accompany each jack.

C. Measure and record elongation of the prestressing strand to the nearest 1/8-inch and compare with predicted elongations.

D. Do not exceed 80 percent of the specified minimum ultimate tensile strength of the prestressing steel. Anchor the prestressing steel at stresses (initial stress) that result in effective forces not less than those shown on the contract drawings. In no case shall the initial stress at the anchorage exceed 70 percent of the specified minimum ultimate tensile strength of the prestressing strand.

3.04 SEQUENCING

A. The Contractor shall provide complete stressing records. Provide reports on stressing of each tendon in a format which is acceptable to the Building Official and the Inspector. Stressing records shall include the following for each tendon.

1. Calculated elongation based upon elastic modulus and cross-sectional area of tendons used.

2. Actual field elongation of each tendon.

3. Calculated gage pressure and jacking force applied to each tendon.

4. Actual gage pressures and jacking forces applied at each tendon.

5. Required concrete strength at time of jacking.

6. Actual concrete strength at time of jacking.

7. Range of allowable elongations for jacking force.

B. Submit copies of actual field records.

3.05 INSPECTION AND MONITORING

A. Special inspection will be conducted by an Independent Testing Agency.

B. Independent Testing Agency will perform the following:

1. Ensure that procedures for the handling and storage of tendons do not result in damage to tendons.

2. Inspector need not be present during the post-tensioning installation, provided he has inspected for conformance with the approved placement and shop drawings prior to closing of forms or the delivery of concrete to the job site. This inspection shall include tendon profiles, plan locations and clearances, and integrity of sheathing and encapsulation systems.

3. During concrete placement, ensure that tendons are not disturbed from their specified profile and location.

4. Monitor stressing operations, including cutting of tendon tails and grouting of anchor pockets. Submitted report shall be in a format acceptable to the Building Official and the Engineer. At a minimum, record for each tendon:

    a. Calculated elongation from approved placement drawings, including allowable range.

    b. Actual field elongation.

5. Report shall also include:

    a. Calibration gage pressure and jack up force for each jack used in stressing.

    b. Required and actual concrete strength at time of stressing.

END OF SECTION

SECTION 03320
PRECAST CONCRETE STAIRS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Precast concrete stair treads and landings.

1.02 REFERENCES

A. The following is a list of standards referenced in this Section:

1. ASTM A 615 – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

2. ASTM C 33 – Standard Specification for Concrete Aggregates.

3. ASTM C 150 – Standard Specification for Portland Cement.

4. ASTM C 1107 – Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

5. PCI – MNL 117 – Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products.

6. PCI – Architectural Precast Concrete Design Manual.

1.03 QUALITY ASSURANCE

A. Work of this Section shall be in conformance with the requirements, standards, procedures, and levels of quality identified in PCI's Architectural Precast Concrete Design Manual.

B. Manufacturers of products under this Section shall be in compliance with the standards, procedures, workmanship, and quality control measures outlined in PCI's MNL 117 – Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products.

PART 2 PRODUCTS

2.01 MATERIALS

A. Concrete: Provide mix designs with compressive strengths at 28 days at or exceeding 5,000 PSI.

B. Cement: Portland cement; gray; conforming to the requirements of ASTM C 150, Type I or Type III, of same type, brand and source.

C. Aggregates: Conform to the requirements of ASTM C 33.

D. Reinforcements:

1. Conform to the requirements of ASTM C 615; Grade 60.

2. All reinforcing steel shall be weldable.

2.02 FABRICATION

A. Manufacture steel forms to produce raised, non-slip continuous parallel ridges under the tread nosings as indicated on the Drawings.

B. The underside of all precast stair treads and landings shall have a smooth trowel finish; screed finish is not acceptable.

C. Set reinforcing steel accurately, and weld at intersections.

2.03 MIXES

A. Grout:

1. Premixed, non-metallic, non-corrosive, non-staining, non-shrink grout.

2. Grout shall be composed of select silica sands, Portland cement, shrinkage compensating agents, plasticizer, and water-reducing agents complying with ASTM C 1107.

2.04 FINISH

A. Provide manufacturer's standard light sand-blast finish. Surfaces to be free of tool marks, fins, stains and surface laitance.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 INSTALLATION

A. Set units plumb, true, and square.

B. Anchor units securely and rigidly to supports.

C. Grout joints between precast stair and landing units.

D. Patch holes for lifting devices to match adjacent surfaces for color, texture, and finish.

3.02 ADJUSTING

A. Repair damage, chipped, checked, cracked, blemished, and defective units.

3.03 CLEANING

A. Remove soil from precast units by approved means.

B. Repair units that have minor visual defects.

END OF SECTION

SECTION 03410
PRECAST STRUCTURAL CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Precast structural concrete.

2. Precast structural concrete with commercial architectural finish.

1.02 PERFORMANCE REQUIREMENTS

A. Structural Performance: Precast structural concrete units and connections shall withstand design loads per IBC.

B. Design precast structural concrete framing system and connections to maintain clearances at openings, to allow for fabrication and construction tolerances, to accommodate live-load deflection, shrinkage and creep of primary building structure, and other building movements. Maintain precast structural concrete deflections within limits of ACI 318.

1. Thermal Movements: Allow for in-plane thermal movements resulting from annual ambient temperature changes of 0 to plus 100 deg F.

C. Fire-Resistance Rating: Select material and minimum thicknesses to provide per Burien Municipal Code.

D. Vehicular Impact Loads: Design spandrel beams acting as vehicular barriers for passenger cars to resist a single 6000-lbf (26.7-kN) service load and 10,000-lbf (44.5-kN) ultimate load applied horizontally in any direction to the spandrel beam, with anchorages or attachments capable of transferring this load to the structure. Design spandrel beams assuming the load to act at a height of 18 inches (460 mm) above the floor or ramp surface on an area not to exceed 1 sq. ft. (0.93 sq. m).

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each precast concrete mixture. Include compressive strength and water-absorption tests.

C. Shop Drawings: Include member locations, plans, elevations, dimensions, shapes and sections, openings, support conditions, and types of reinforcement, including special reinforcement. Detail fabrication and installation of precast structural concrete units.

D. Delegated-Design Submittal: For precast structural concrete indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

E. Installer fabricator testing agency Qualification Data.

F. Welding certificates.

G. Material Certificates: For the following, from manufacturer:

1. Cementitious materials.

2. Reinforcing materials and prestressing tendons.

3. Admixtures.

4. Bearing pads.

5. Structural-steel shapes and hollow structural sections.

6. Brick units and accessories.

7. Stone anchors and accessories.

H. Material Test Reports: For aggregates.

I. Source quality-control reports.

J. Field quality-control and special inspection reports.

1.04 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm that assumes responsibility for engineering precast structural concrete units to comply with performance requirements. Responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

1. Participates in PCI's Plant Certification program and is designated a PCI-certified plant as follows:

a. Group C, [Category C4 - Prestressed Deflected Strand Structural Members.

B. Installer Qualifications:

1. A precast concrete installer with a minimum of 2 years of experience who has completed structural precast concrete work similar in material, design, and extent to that indicated for this project and whose work has resulted in construction with a record of successful in-service performance and who meets the following requirements:

a. Retains a PCI Certified Field Auditor, at erector’s expense, to conduct a field audit of a project installed by erector in Category S2 - Complex Structural Systems prior to start of erection. Submits Erectors Post Audit Declaration according to “PCI Erector’s Manual - Standards and Guidelines for the Erection of Precast Concrete Products” MNL 127.

C. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

D. Design Standards: Comply with ACI 318 (ACI 318M) and design recommendations in PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of precast structural concrete units indicated.

E. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 116, "Manual for Quality Control for Plants and Production of Structural Precast Concrete Products."

F. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D.1.1M, "Structural Welding Code - Steel."

2. AWS D1.4, "Structural Welding Code - Reinforcing Steel."

PART 2 - PRODUCTS

2.01 MOLD MATERIALS

A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that will provide continuous and true precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required finishes.

1. Mold-Release Agent: Commercially produced liquid-release agent that will not bond with, stain or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.

B. Form Liners: Units of face design, texture, arrangement, and configuration. Furnish with manufacturer's recommended liquid-release agent that will not bond with, stain, or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.

C. Surface Retarder: Chemical set retarder, capable of temporarily delaying final hardening of newly placed concrete mixture to depth of reveal specified.

2.02 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

C. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M or ASTM A 934/A 934M epoxy coated, with less than 2 percent damaged coating in each 12-inch (300-mm) bar length.

2.03 PRESTRESSING TENDONS

A. Pretensioning Strand: ASTM A 886/A 886M, Grade 270 (Grade 1860), indented, 7-wire, low-relaxation strand.

B. Unbounded Post-Tensioning Strand: ASTM A 416/A 416M, Grade 270 (Grade 1860), uncoated, 7-wire, low-relaxation strand.

1. Coat unbonded post-tensioning strand with post-tensioning coating complying with ACI 423.6 and sheath with polypropylene tendon sheathing complying with ACI 423.6. Include anchorage devices and coupler assemblies.

C. Post-Tensioning Bars: ASTM A 722, uncoated high-strength steel bar.

2.04 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type III, gray, unless otherwise indicated.

B. Supplementary Cementitious Materials:

1. Fly Ash: ASTM C 618, Class C or F, with maximum loss on ignition of 3 percent.

2. Metakaolin Admixture: ASTM C 618, Class N.

3. Silica Fume Admixture: ASTM C 1240, with optional chemical and physical requirement.

4. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

C. Normal-Weight Aggregates: Except as modified by PCI MNL 116, ASTM C 33, with coarse aggregates complying with Class 4S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.

1. Face-Mixture-Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.

2. Face-Mixture-Fine Aggregates: Selected, natural or manufactured sand of same material as coarse aggregate unless otherwise approved by Architect.

D. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 116.

E. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.

1. Water-Reducing Admixtures: 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. Water-Reducing and Accelerating Admixture: ASTM C 494/C 494M, Type E.

5. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.

6. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.

7. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M.

G. Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

2.05 STEEL CONNECTION MATERIALS

A. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.

B. Carbon-Steel-Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished, AWS D1.1/D1.1M, Type A or B, with arc shields and with minimum mechanical properties of PCI MNL 116.

C. High-Strength, Low-Alloy Structural Steel: ASTM A 572/A 572M.

D. Carbon-Steel Structural Tubing: ASTM A 500, Grade B.

E. Deformed-Steel Wire or Bar Anchors: ASTM A 496 or ASTM A 706/A 706M.

F. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); carbon-steel, hex-head bolts and studs; carbon-steel nuts, ASTM A 563 (ASTM A 563M); and flat, unhardened steel washers, ASTM F 844.

G. Zinc-Coated Finish: For exterior steel items and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A 123/A 123M or ASTM A 153/A 153M.

1. For steel shapes, plates, and tubing to be galvanized, limit silicon content of steel to less than 0.03 percent or to between 0.15 and 0.25 percent or limit sum of silicon and 2.5 times phosphorous content to 0.09 percent.

2. Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035B or SSPC-Paint 20.

H. Welding Electrodes: Comply with AWS standards.

I. Precast Accessories: Provide clips, hangers, plastic or steel shims, and other accessories required to install precast structural concrete units.

2.06 GROUT MATERIALS

A. Sand-Cement Grout: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 144 or ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30-minute working time.

C. Epoxy-Resin Grout: Two-component, mineral-filled epoxy resin; ASTM C 881/C 881M, of type, grade, and class to suit requirements.

2.07 CONCRETE MIXTURES

A. Prepare design mixtures for each type of precast concrete required.

1. Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.

2. Limit use of fly ash to 25 percent replacement of portland cement by weight and granulated blast-furnace slag to 40 percent of portland cement by weight; metakaolin and silica fume to 10 percent of portland cement by weight.

B. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at precast structural concrete fabricator's option.

C. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 (ACI 318M) or PCI MNL 116 when tested according to ASTM C 1218/C 1218M.

D. Normal-Weight Concrete Mixtures: Proportion mixes by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 5000 psi (34.5 MPa).

2. Maximum Water-Cementitious Materials Ratio: 0.45.

3. Release strength as required by design.

E. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to PCI MNL 116.

F. Lightweight Concrete Backup Mixtures: Proportion mixtures by either laboratory trial batch or field test data methods according to ACI 211.2, with materials to be used on Project, to provide lightweight concrete with the following properties:

1. Compressive Strength (28 Days): 5000 psi (34.5 MPa).

2. Unit Weight: Calculated equilibrium unit weight of 115 lb/cu. ft. (1842 kg/cu. m), plus or minus 3 lb/cu. ft. (48 kg/cu. m), according to ASTM C 567.

G. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 116.

H. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

I. Concrete Mix Adjustments: Concrete mix design adjustments may be proposed if characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

2.08 MOLD FABRICATION

A. Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing and detensioning operations. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.

1. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during concrete placement. Coat form liner with form-release agent.

B. Maintain molds to provide completed precast structural concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.

1. Form joints are not permitted on faces exposed to view in the finished work.

2. Edge and Corner Treatment: Uniformly chamfered.

2.09 FABRICATION

A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware:

1. Weld-headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."

B. Reinforcement: Comply with recommendations in PCI MNL 116 for fabricating, placing, and supporting reinforcement.

C. Prestress tendons for precast structural concrete units by either pretensioning or post-tensioning methods. Comply with PCI MNL 116.

D. Comply with requirements in PCI MNL 116 and in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.

E. Comply with ACI 306.1 procedures for cold-weather concrete placement.

F. Comply with PCI MNL 116 procedures for hot-weather concrete placement.

G. Cure concrete, according to requirements in PCI MNL 116, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture.

2.10 FABRICATION TOLERANCES

A. Fabricate precast structural concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished unit complies with PCI MNL 116 product dimension tolerances.

2.11 COMMERCIAL FINISHES

A. Grade B Finish: Fill air pockets and holes larger than 1/4 inch (6 mm) in diameter with sand-cement paste matching color of adjacent surfaces. Fill air holes greater than 1/8 inch (3 mm) in width that occur more than once per 2 sq. in. (1300 sq. mm). Grind smooth form offsets or fins larger than 1/8 inch (3 mm). Repair surface blemishes due to holes or dents in molds. Discoloration at form joints is permitted.

B. Smooth, steel trowel finish unformed surfaces. Consolidate concrete, bring to proper level with straightedge, float, and trowel to a smooth, uniform finish.

C. Apply roughened surface finish according to ACI 318 (ACI 318M) to precast concrete units that will receive concrete topping after installation.

2.12 COMMERCIAL ARCHITECTURAL FINISHES

A. Manufacture member faces free of joint marks, grain, and other obvious defects with corners, including false joints, uniform, straight, and sharp. Finish exposed-face surfaces of precast concrete units to match approved.

1. Smooth-Surface Finish: Provide surfaces free of excessive air voids, sand streaks, and honeycombs, with uniform color and texture.

2.13 SOURCE QUALITY CONTROL

B. Testing Agency: Engage a qualified testing agency to evaluate precast structural concrete fabricator's quality-control and testing methods.

C. Testing: Test and inspect precast structural concrete according to PCI MNL 116 requirements.

D. Strength of precast structural concrete units will be considered deficient if units fail to comply with ACI 318 (ACI 318M) requirements for concrete strength.

PART 3 - EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 INSTALLATION

A. Install clips, hangers, bearing pads, and other accessories required for connecting precast structural concrete units to supporting members and backup materials.

B. Erect precast structural concrete level, plumb, and square within specified allowable tolerances. Provide temporary structural framing, supports, and bracing as required to maintain position, stability, and alignment of units until permanent connection.

1. Install temporary steel or plastic spacing shims or bearing pads as precast structural concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.

2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.

3. Remove projecting lifting devices and grout fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.

4. For hollow-core slab voids used as electrical raceways or mechanical ducts, align voids between units and tape butt joint at end of slabs.

C. Connect precast structural concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.

1. Do not permit connections to disrupt continuity of roof flashing.

D. Field cutting of precast units is not permitted without approval of the Architect.

E. Fasteners: Do not use drilled or powder-actuated fasteners for attaching accessory items to precast, prestressed concrete units without approval of the Engineer of Record..

F. Welding: Comply with applicable AWS D1.1/D1.1M and AWS D1.4 for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.

1. Protect precast structural concrete units and bearing pads from damage by field welding or cutting operations, and provide noncombustible shields as required.

2. Clean weld-affected steel surfaces with chipping hammer followed by brushing, and apply a minimum 4.0-mil- (0.1-mm-) thick coat of galvanized repair paint to galvanized surfaces according to ASTM A 780.

3. Clean weld-affected steel surfaces with chipping hammer followed by brushing, and reprime damaged painted surfaces.

4. Remove, reweld, or repair incomplete and defective welds.

G. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.

H. Grouting: Grout connections and joints and open spaces at keyways, connections, and joints where required or indicated on Shop Drawings. Retain grout in place until hard enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled.

1. Place grout to finish smooth, level, and plumb with adjacent concrete surfaces.

2. Fill joints completely without seepage to other surfaces.

3. Trowel top of grout joints on roofs smooth and uniform. Finish transitions between different surface levels not steeper than 1 to 12.

4. Place grout end cap or dam in voids at ends of hollow-core slabs.

5. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.

6. Keep grouted joints damp for not less than 24 hours after initial set.

3.02 ERECTION TOLERANCES

A. Erect precast structural concrete units level, plumb, square, true, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 135.

3.03 FIELD QUALITY CONTROL

A. Testing: Engage a qualified independent testing and inspection agency to perform field tests and inspections.

B. Field welds will be visually inspected and nondestructive tested according to ASTM E 165 or ASTM E 709. High-strength bolted connections will be subject to inspections.

C. Testing agency will report test results promptly and in writing to Contractor.

D. Prepare test and inspection reports.

3.04 REPAIRS

A. Repairs will be permitted providing structural adequacy, serviceability, durability, and appearance of units has not been impaired.

B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet (6 m).

C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780.

D. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.

3.05 CLEANING

A. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.

B. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.

1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's written recommendations. Clean soiled precast concrete surfaces with detergent and water, using stiff fiber brushes and sponges, and rinse with clean water. Protect other work from staining or damage due to cleaning operations.

2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

END OF SECTION

SECTION 04220
CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Concrete Block.
2. Mortar and Grout.
3. Reinforcement and Anchorage.
4. Flashings.
5. Lintels.
6. Accessories.

1.02 REFERENCES

A. The following is a list of standards referenced in this Section:

1. ASTM A 82 – Standard Specification for Steel Wire, Plain for Concrete Reinforcement.
2. ASTM A 615 – Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
3. ASTM A 641 – Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
4. ASTM C 91 – Standard Specification for Masonry Cement.
5. ASTM C 129 – Standard Specification for Non-loadbearing Concrete Masonry Units and Related Units.
6. ASTM C 144 – Standard Specification for Aggregrate for Masonry Mortar.
7. ASTM C 150 – Standard Specification for Portland Cement.
8. ASTM C 207 – Standard Specification for Hydrated Lime for Masonry Purposes.
9. ASTM C 270 – Standard Specification for Mortar for Unit Masonry.
10. ASTM C 404 – Standard Specification for Aggregates for Masonry Grout.
11. ASTM C 476 – Standard Specification for Grout Masonry.
12. ACI 530/ASCE 5/TMS 402 – Building Code Requirements for Masonry Structures.
13. ACI 530.1/ASCE 6/TMS 602 – Specification for Masonry Structures.

1.03 PROJECT/SITE CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of ACI 530.1/ASCE 6/TMS 602 or applicable building code, whichever is more stringent.

B. Maintain materials and surrounding air temperature to maximum ninety (90) degrees Fahrenheit prior to, during, and forty-eight (48) hours after completion of masonry work.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Masonry Cement: ASTM C91, Type N.

B. Portland Cement: ASTM C150, Type I.

1. Not more than 0.60 percent alkali.

2. Hydrated Lime: ASTM C207, Type S.

3. Mortar Aggregate: ASTM C 144.

4. Grout Aggregate: ASTM C 404.

C. Water: Clean and potable.

D. Accelerating Admixture: Non-chloride type for use in cold weather.

E. Reinforcing Steel: ASTM A 615/A 615M Grade 40 deformed billet bars; galvanized.

F. Single Wythe Joint Reinforcement: Truss type; ASTM A 82/A 82M steel wire, mill galvanized to ASTM A 641/A 641M, Class 3; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide no more than one (1) inch and not less than one-half (1/2) inch of mortar coverage on each exposure.

G. Strap Anchors: Bent steel shapes configured as required for specific situations, one and one-fourth (1 -1/4) in width, 0.105 in thick, lengths as required to provide not much than one (1) inch and not less than one-half (1/2) inch of mortar coverage from masonry face, corrugated for embedment in masonry joint, hot dip galvanized to ASTM A 153, Class B.

H. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not more than 1 inch and not less than one-half (1/2) inch of mortar coverage from masonry face.

I. Two-Piece Wall Ties: Formed steel wire, 0.1875 inch thick, adjustable, eye and pintle type, hot dip galvanized to ASTM A 153, Class B, sized to provide not more than 1 inch and not less than one-half (1/2) inch of mortar coverage from masonry face and to allow vertical adjustments of up to one and one-fourth (1-1/4) inches.

J. Flashings:

1. Stainless Steel: ASTM A 666, Type 304, soft temper; 26 gage thickness; finish 2B to 2D.

2. Lap Sealant: Butyl type as specified in Section 07900 – Joint Protection.

2.02 ACCEPTABLE PRODUCTS

A. Concrete Block: Comply with referenced standards and as follows:

1. Size: Standard units with nominal face dimensions of sixteen (16) x eight (8) inches and nominal depth of eight (8) inches.

2. Special Shapes:

1. Provide non-standard blocks configured for corners.

2. Provide ground-face corner block units as appropriate.

3. Non-loadbearing units shall comply with ASTM C 129.

4. Acceptable Manufacturers: Provide block from one of the following manufacturers:

1. Mutual Materials

2. Basalie Concrete Products, LLC. (253) 964-5000.

3. Eastside Masonry Products. (425) 868-0303.

B. Reinforcement and Anchorage: Provide products of one of the following manufacturers:

1. Dur-O-Wal.

2. Hohmann & Barnard, Inc.

3. Masonry Reinforcing Corporation of America.

2.03 MIXES

A. Mortar for Unit Masonry: ASTM C 270, using the Proportion Specification.

1. Masonry below grade and in contact with earth: Type S.

2. Exterior, non-loadbearing masonry: Type N.

B. Grout:

1. ASTM C 476.

2. Consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of two (2) inches or less.

3. Provide coarse grout for spaces with smallest horizontal dimension greater than two (2) inches.

C. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 - EXECUTION

D. Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 INSTALLATION

A. Concrete Masonry Unit Coursing:

1. Bond: Running.

2. Coursing: One unit and one mortar joint to equal eight (8) inches.

3. Mortar Joints: Concave.

B. Weeps and Cavity Vents:

1. Install weeps in veneer and cavity walls at twenty-four (24) inches on center horizontal above through-wall flashing, above shelf angles and lintels, and at bottom of walls.

2. Install cavity vents in veneer and cavity walls at thirty-two (32) inches on center horizontally below shelf angles and lintels, and near top of walls.

C. Cavity Mortar Control:

1. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

D. Reinforcement and Anchorages – General:

1. Install horizontal joint reinforcement sixteen (16) inches on center.

2. Place masonry joint reinforcement in first and second horizontal joints above and below openings.

3. Extend minimum sixteen (16) inches each side of opening.

4. Place continuous joint reinforcement in first and second joint below top of walls.

5. Lap joint reinforcement end minimum six (6) inches.

6. Reinforce stack bonded unit joint corners and intersections with strap anchors sixteen (16) inches on center

7. Unless otherwise indicated on drawings, space anchors at maximum of thirty-six (36) inches horizontally and twenty-four (24) inches vertically.

E. Reinforcement and Anchorages – Single Wythe Masonry:

1. Install horizontal joint reinforcement eight (8) inches on center.

2. Place masonry joint reinforcement in first and second horizontal joints above and below openings.

3. Extend minimum sixteen (16) inches each side of opening.

4. Place continuous joint reinforcement in first and second joint below top of walls.

5. Lap joint reinforcement ends minimum six (6) inches.

F. Reinforcement and Anchorages – Cavity Wall Masonry:

1. Install horizontal joint reinforcement sixteen (16) inches on center.

2. Place masonry joint reinforcement in first and second horizontal joints above and below openings.

3. Extend minimum sixteen (16) inches each side of openings.

4. Place continuous joint reinforcement in first and second joint below top of walls.

5. Lap joint reinforcement ends minimum six (6) inches.

6. Space anchors at maximum of twenty four (24) inches horizontally and sixteen (16) inches vertically.

G. Masonry Flashing:

1. Install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.

    1. Extend flashings full width at such interruptions and at least four (4) inches into adjacent masonry or turn up at least four (4) inches to form watertight pan at non-masonry construction.

2. Extend metal flashings through exterior face of masonry and turn down to form drip.

3. Install joint sealer below drip edge to prevent moisture migration under flashing.

4. Extend plastic flashings to within one-fourth (1/4) inch of exterior face of masonry.

5. Lap end joints of flashings at least four (4) inches and seal watertight with mastic or elastic sealant.

H. Lintels: Install loose steel lintels over openings.

I. Grouted Components:

1. Lap splices minimum twenty-four (24) bar diameters.

J. Control and Expansion Joints:

1. Do not continue horizontal joint reinforcement through control and expansion joints.

2. Install preformed control joint device in continuous lengths.

K. Built-in Work:

1. Install built-in items plumb, level, and true to line.

2. Bed anchors of metal door and glazed frames in adjacent mortar joints.

3. Fill frame voids solid with grout.

3.02 FIELD QUALITY CONTROL

A. Mortar Tests: Test each type of mortar in accordance with ASTM C 780, testing with same frequency as masonry samples.

B. Construction Tolerances:

1. Maximum Variation from Alignment of Columns: One-quarter (1/4) inch.

2. Maximum Variation From Unit to Adjacent Unit: One-sixteenth (1/16) inch.

3. Maximum Variation from Plane of Wall: One-quarter (1/4) inch in ten (10) ft and one-half (1/2) inch in twenty (20) ft or more.

4. Maximum Variation from Plumb: One-quarter (1/4) inch per story non-cumulative, one-half (1/2) inch in two stories or more.

5. Maximum Variation from Level Coursing: One-eighth (1/8) inch in three (3) ft and one-fourth (1/4) inch in ten (10) ft; one-half (1/2) inch in thirty (30) ft.

6. Maximum Variation of Joint Thickness: One-eighth (1/8) inch in three (3) ft.

7. Maximum Variation from Cross Sectional Thickness of Walls: One-quarter (1/4) inch.

END OF SECTION

SECTION 04221
BRICK MASONRY

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Face brick.
2. Reinforcements, anchorages, and accessories.
3. Mortar and grout.
4. Related flashings.

1.02 REFERENCES

A. The following is a list of standards referenced in this Section:

1. ASTM A 615 – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
2. ASTM C 91 – Standard Specification for Masonry Cement.
3. ASTM C 216 – Standard Specification for Facing Brick.
4. ASTM C 270 – Standard Specification for Mortar for Unit Masonry.
5. ASTM C 476 – Standard Specification for Grout for Unit Masonry.
6. ASTM D 1056 – Standard Specification for Flexible Cellular Materials – Sponge or Expanded Rubber.
7. International Masonry Industry All-Weather Council (IMIAWC) – Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

1.03 SUBMITTALS

A. General:

1. Product Data: Submit for all accessory components, mortar mixes, and additives.

1.04 PROJECT/SITE CONDITIONS

A. Comply with IMIAWC recommendations for cold weather masonry construction.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Exterior Face Brick:

1. Standard: Conform to ASTM C 216, Type FBX, Grade MW.

2. Surface Finish: Furnish wire cut finish.

3. Fabricate each brick type in one continuous operation with the exact same materials, equipment, and conditions to assure uniformly matching brick.

4. Provide brick masonry units from one of the following:

   a. Glen Gery Corporation, Wyomissing, PA – (610) 374-4011.

   b. Mutual Materials Company, Bellevue, WA – (206) 455-2869.

   c. The Belden Brick Company, Canton, OH – (216) 456-0031.

   d. Acme Brick Company, Fort Worth, TX – (800) 792-1234.

2.02 ACCESSORIES

A. Systems for Attachments to Structure:

1. Characteristics:

   a. Provide anchor, tie, clip and fasteners compatible with brick masonry and substrates, and suitable to receive continuous wire reinforcing.

   b. Provide special configurations where necessary to accommodate installation in vertical joints.

   c. Include continuous gasket for installation at exterior sheathing over steel stud framing.

   d. Include hot dip galvanized anchor channel and fasteners for installation at reinforced concrete substrates.

2. Provide one of the following complete systems:

   a. Hohmann & Barnard, Inc. – (516) 234-0600 – ‘DW-10 Series’.

   b. The Burke Group – (210) 658-4671 – ‘Fleming Masonry Anchor System’.

3. Anchors:

   a. Anchors for the Project shall be of the seismic masonry veneer type, with a metal anchor section, plus a connector section designed to engage continuous wire reinforcement.

   b. Provide anchors that permit vertical adjustment, but develop tension resistance for resolution of compression forces perpendicular to the plane of wall.

   c. Designs:

1. Structural Performance: Capable of withstanding a one hundred (100) pound load in both tension and compression without deformation, or developing play in excess of five-hundredths (0.05) inch.

2. Metal Stud Framing: Anchors shall be of a design that allows attachment to exterior sheathing and metal stud framing assemblies as indicated on the Drawings.

3. Reinforced Concrete: Anchors shall be of a design that allows attachment to reinforced concrete assemblies as indicated on the Drawings.

d. Characteristics:

1. Material: Twelve (12) gage.

2. Finish: Hot dip galvanized after fabrication.

4. Brick Tie:

a. Fabricate from three-sixteenths (3/16) inch diameter steel wire.

b. Finish: Hot dip galvanized after fabrication.

c. Parallel overlapping legs.

d. Fabricate to extend a minimum of one and one-half (1-1/2) inches into mortar joints, in addition to accommodation of the full width of the masonry cavity.

e. Tie Head for use at Reinforced Concrete Walls:

1. Material: Twelve (12) gage.

2. Nominal Width: One (1) inch width; fabricated to mate with channel slots, as necessary.

3. Finish: Hot-dip galvanized.

4. Incorporate brick tie.

5. Fasteners for Steel Framing: #12 galvanized self-drilling type with neoprene washers, for attachment of anchors through exterior sheathing into metal stud framing.

6. Fasteners for Reinforced Concrete Walls: One-quarter (1/4) inch diameter; one (1) inch minimum embedment length; galvanized finish; provide one of the following:

a. Hilti Fastening Systems - ‘Item No. 661397 - Metal Hit’.

b. Rawlplug Co. – ‘Rawl Zamac Nail-in’.

c. Or Approved Equal.

B. Reinforcement:

1. Wire: Provide 0.188 inch diameter, hot dip galvanized finish, continuous carbon steel wire.

2. Bars:

a. Material: Uncoated steel reinforcing; ASTM A 615 or ASTM A 996, Grade 60.

C. Building Paper: Provide one of the following:

1. Standard: FS UU-B-790 A, Grade D, 60 minute.

2. Provide one of the following:

a. Fortifiber Corporation - (800) 773-4777 – 'Super JumboTex'.

b. Simplex Products Division - (517) 263-8881 – 'R-Wrap'.

c. DuPont Company – (800) 448-9835 – 'Tyvek HomeWrap'.

D. Weeps:

1. Characteristics:

a. Plastic tube type; round; three-eighths (3/8) inch outside diameter; four (4) inches length.

b. Provide with integral insect screen.

E. Cavity Drainage Insert:

1. Characteristics:

a. Castellated profile.

b. Thickness equal to depth of cavity.

2. Provide one of the following:

a. Hohmann & Barnard, Inc. – 'Mortar Net'.

b. Or Approved Equal.

F. Flexible Flashing:

1. Primer for Flexible Flashing: Provide compatible flexible flashing primer in accordance with manufacturer's written instructions.

2. Seam Tape for Flexible Flashing: Provide in accordance with manufacturer's written installation instructions.

3. Provide one of the following:

    a. WR Grace – 'Perm-A-Barrier Wall Flashing'.

    b. Monsey Bakor – 'Blueskin'; forty (40) mil thickness.

G. Metal Flashing:

1. Material: Stainless steel.

2. Refer to Section 07600 – Custom Sheet Metal.

3. Lap Sealant for Metal Flashing: Provide one of the following:

    a. Amanda Distribution Co. – 'Seal-Once'.

    b. Tremco – 'Curtain Wall Sealant'.

    c. Adco Products, Inc. – 'Adcoseal BP-400'.

H. Compressible Filler:

1. Premolded filler strips complying with ASTM D 1056, Grade 2A1.

2. Material: Neoprene.

3. Compressible up to thirty-five (35) percent.

I. Dampproofing:

1. ASTM D 1227, Type III.

2. Characteristics: Non-fibrated, emulsified asphalt.

3. Provide one of the following:

    a. Sonneborn ' 'Hydrocide 600'.

    b. Or Approved Equal.

2.03 MIXES

A. Mortar:

1. ASTM C 270, Type S; Portland cement-lime type with pigment.

2. Comply with ASTM C 91 for masonry cement.

3. Pigment:

    a. Pigments shall be metallic oxide type; use of lampblack is prohibited.

    b. Provide products of one of the following:

1. LM Scofield Co., Los Angeles, CA – (800) 800-9900.

2. Solomon Chem-Grind Service (SGS), Springfield, IL – (800) 624-0261.

B. Grout: ASTM C 476; two-thousand (2,000) psi compressive strength.

PART 3 - EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 INSTALLATION

A. Building Paper:

1. Sequence with the installation of building paper.

2. Install one (1) ply of building paper over sheathing or substrate; lap vertical joints twelve (12) inches; weatherlap horizontal joints eight (8) inches.

B. Dampproofing:

1. Apply dampproofing continuous to cavity side of concrete unit masonry and cast in place concrete walls prior to installation of brick masonry.

C. Systems for Attachments to Structure:

1. Anchorages:

a. Install anchorages at maximum sixteen (16) inches on center spacing horizontally and vertically, and as indicated in this Section.

b. Furnish additional anchorages at top courses, openings, corners, and at each side of expansion and control joints, and at other special conditions.

c. Steel Stud Framed Walls:

1. Install manufacturer's recommended gasket in continuous vertical strips at each stud location to receive anchorages.

2. For steel studs at sixteen (16) inches on center spacing, install each anchorage at maximum eighteen (18) inches vertical spacing along each stud, spacing as necessary to correspond with masonry coursings and to special conditions.

3. Space anchorages for support of not more than two (2) square feet of brick masonry in any location.

4. Where anchor channel is used in lieu of individual anchorages, fasten channels to studs not more than sixteen (16) inches on center spacing oriented vertically, and with approved self-drilling fasteners at twelve (12) inches on center spacing.

2. Anchorages above Relief Angles, Lintels and other Structural Supports:

    a. Install anchorage assemblies in the first course below structural supports of brick masonry

    b. Install anchorage assemblies between the second and third course above structural supports of brick masonry.

    c. Space these anchorages in accordance with manufacturer's written installation instructions.

3. Reinforcement:

    a. Install reinforcement in sequence with brick masonry.

    b. Connect clip assembly to anchorages, and securely snap reinforcing into the clip assembly.

    c. Provide continuous wire reinforcement; lap as recommended by the anchorage system manufacturer.

    d. Set clips and reinforcing wire in a bed of mortar, and cover with mortar for secure and complete embedment.

D. Brick Masonry:

1. Weeps:

    a. Provide weep openings in head joints in first course immediately above all flashing.

    b. Maximum horizontal spacing is two (2) feet on center.

    c. Maintain weeps and area above flashing free from mortar droppings.

E. Flashings:

1. Position flashing accurately, and to within a range of one-eighth (1/8) to one-quarter (1/4) inch of face of brick masonry.

2. Metal Flashing:

    a. Locations:

        1. Where through-wall flashing is indicated.

        2. Where flashing will be exposed in the finished Work.

    b. Lap metal flashing minimum four (4) inches.

    c. Use approved lap sealant at lap joints.

    d. Punch flashing neatly and seal at all penetrations.

e. Dam flashing at expansion and control joints, and at ends of lintels by means up turning up the flashing vertically four (4) inches.

3. Flexible Flashing:

a. Locations: Locations which are not metal flashing.

b. Except where metal flashing is required, install flexible flashing at relief angles by adhering flashing toe edge one-quarter (1/4) to three-eighths (3/8) inch from the face of the brick in order to expose sufficient brick surface for adherence of joint protection.

c. Extend flashing back to adhere to relieving angle and up onto substrate a minimum of one and one-half (1-1/2) inches above top of relieving angle vertical leg.

d. Form flexible flashing over bolts.

e. Extend under building paper at steel stud framed walls.

f. At dampproofed walls, adhere directly to dampproofing, and terminate top edge of flashing with a troweled bead of approved mastic.

g. Dam flashing at expansion and control joints, and at ends of lintels by means up turning up the flashing vertically four (4) inches.

3.02 FIELD QUALITY CONTROL

A. Allowable Tolerances:

1. Maximum Variation from Plumb:

a. In lines and surfaces of columns, pilasters, walls and arrises:

1. One-quarter (1/4) inch in ten (10) feet.

2. Three-eighths (3/8) inch in any story, or twenty (20) feet maximum.

3. One-half (1/2) inch in forty (40) feet.

b. For external corners; at expansion joints; and other conspicuous lines:

1. One-quarter (1/4) inch in any story, or twenty (20) feet maximum.

2. One-half (1/2) inch in forty (40) feet.

2. Maximum variation from level; or grades for exposed lintels; sills; parapets; horizontal grooves; and other conspicuous lines:

a. One-quarter (1/4) inch in any bay, or twenty (20) feet maximum.

3. Maximum variation of linear building line from an established position in plan, and related portions of columns, walls, and partitions:

   a. One-half (1/2) inch in any bay, or twenty (20) feet maximum.

   b. Three-quarter (3/4) inch in forty (40) feet.

4. Head Joints: Plus or minus one-eighth (1/8) inch.

END OF SECTION

SECTION 05120
STRUCTURAL STEEL

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes the following:

1. Structural steel.

2. Architecturally exposed structural steel.

3. Grout.

1.02 DEFINITIONS

A. Architecturally exposed Structural Steel (AESS): Structural steel designated as architecturally exposed structural steel in the contract documents.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication of structural steel components.

C. Welding certificates.

1.04 QUALITY ASSURANCE

A. Welding Standards: Comply with AWS D1.1, "Structural Welding Code--Steel."

B. Comply with applicable provisions of the following specifications and documents:

1. AISC's "Code of Standard Practice for Steel Buildings and Bridges."

PART 2 - PRODUCTS

2.01 STRUCTURAL STEEL MATERIALS

A. Welding Materials: AWS A5.

1. Welding electrodes shall have a minimum tensile strength of 70 ksi using AWS A5 classification test.

2.02 BOLTS, CONNECTORS, ANCHORS, AND BEARINGS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon steel nuts; and ASTM F 436 hardened carbon steel washers.

1. Finish: Plain or Hot-dip zinc coating, ASTM A 153, Class C.

B. Welded Headed Stud Connectors: ASTM A 108, Grades 1015 through 1020, headed stud-type, cold-finished carbon steel; AWS D1.1, Type B.

C. Anchor Rods: ASTM F 1554, Grade 36.

D. Threaded Rods: ASTM A 36.

2.03 PRIMER

A. Shop Coat Primer Paint.

1. Shop-Applied Zinc-Rich Primer (for steel not galvanized and exposed to weather in its final position, including all AESS.

2. Galvanized Finish Touch-Up: Touch-up paint shall be an organic cold-galvanizing compound having a minimum of 94 percent zinc dust in dry film. "CarboZink 859" as manufactured by Carboline, St. Louis, MO, or Tnemec-Zinc 90-97" by Tnemec Company.

2.04 GROUT

A. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404, Size No. 2. Mix at ratio of 1 part cement to 2 1/2 parts sand, by volume, with minimum water required for placement and hydration.

B. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.05 FABRICATION

A. Structural Steel: Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges".

B. Architecturally exposed Structural Steel (AESS): Comply with fabrication requirements, including tolerance limits, of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel identified as architecturally exposed structural steel.

1. Fabricate with exposed surfaces smooth, square, and free of surface blemishes, including pitting, rust, scale, seam marks, roller marks, rolled trade names, and roughness.

2. Remove blemishes by filling or grinding, or by welding and grinding before cleaning, treating, and shop priming.

C. Welded Headed Stud (WHS) Connectors: Prepare steel surfaces as recommended by manufacturer of WHS connectors. Use automatic end welding of headed stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

D. Holes: Provide holes required for securing other work to structural steel and for the passage of other work through steel framing members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.

2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.

2.06 DIMENSIONAL TOLERANCES

A. Fabrication Tolerances: Unless otherwise noted, fabricate structural members to referenced AISC Specifications for allowable tolerances.

B. For members designated as AESS, tolerances shall be as allowed by the AESS Section of the AISC Code of Standard Practice for Buildings and Bridges.

2.07 SHOP PRIMING

A. Shop prime steel surfaces, except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.

2. Surfaces to be field-welded.

3. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale, and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 4, "Power Tool Cleaning to Bare Metal." For all steel, except steel receiving an epoxy or zinc-rich primer.

2. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning." For nongalvanized steel receiving an epoxy or zinc-rich primer.

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2. Apply two coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.

2.08 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel indicated, according to ASTM A 123.

1. Fill vent holes and grind smooth and touch-up after galvanizing.

2. Galvanize all steel plates, angles, and other items embedded in concrete after fabrication.

B. Where indicated to be galvanized, bolts, nuts and washers, and iron and steel hardware components shall be galvanized by the hot-dip process in accordance with ASTM A 153.

C. Surface Preparation: Steel shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter: Clean steel in accordance with Steel Structures Painting Council (SSPC) SSPC-SP-6, “Commercial Blast Cleaning.”

D. Coating Requirements

1. Weight: The weight of the galvanized coating shall conform to Table 2 of ASTM A 123 or Table 1 of ASTM A 153, as appropriate.

2. Mechanical Damage: Repair areas damaged by welding; flame cutting; or during handling, transport, or erection in accordance with ASTM A 780 by one of the following methods:

a. Cold Galvanizing Compound (zinc-rich paint): Per Part 2, "Primer" Article, in accordance with ASTM A 780, Annex A2.

1) Spray- or brush-apply the touch-up paint in multiple coats to a dry film minimum thickness of a 6 mils (4 mils for material less than 1/4-inch thick). Apply a finish coat of aluminum paint to provide a color blend with the surrounding galvanizing.

b. Zinc-Based Solder: In accordance with ASTM A 780, Annex A1.

1) Apply the zinc-based solder in a minimum thickness of 4 mils (3 mils for material less than 1/4-inch thick).

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 ERECTION

A. Maintain erection tolerances of structural steel and architecturally exposed structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

B. Do not use thermal cutting during erection.

C. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections and abraded areas of the shop paint. Apply paint to exposed areas with the same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

D. Touch-Up and Repair of Galvanizing: Immediately after erection, clean and repair any damaged galvanizing as outlined in previous section regarding galvanizing.

3.02 CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

B. Welded Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance and quality of welds, and for methods used in correcting welding work.

3.03 FIELD QUALITY CONTROL

A. Testing Agency: Contractor will engage a qualified independent testing and inspecting agency to inspect structural steel.

END OF SECTION

SECTION 05400
COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Cold-formed metal framing.

1.02 REFERENCES

A. The following is a list of standards referenced in this Section:

1. AISI SG-971 – Specification for the Design of Cold-Formed Steel Structural Members.

2. ASTM A 36 – Standard Specification for Carbon Structural Steel.

3. ASTM A 123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

4. ASTM A 153 – Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware.

5. ASTM A 653 – Standard Specification for Steel-Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

6. ASTM A 1008 – Standard Specification for Steel, Sheet, Cold-rolled, Carbon, Structural, High Strength Low Alloy and High Strength Low Alloy with Improved Formability.

7. ASTM C 955 – Standard Specification for Load-Bearing Steel Studs, Runners, and Bracing or Bridging for Screw Application of Gypsum Board and Metal Plaster Bases.

8. ASTM C 1007 – Standard Specification for Installation of Loading Bearing (Transverse and Axial) Steel Studs and Related Accessories.

9. AWS D1.3 – Structural Welding Code – Sheet Steel.

10. AWS QC 1 – Standard for AWS Certification of Welding Inspectors.

1.03 SYSTEM DESCRIPTION

A. Cold-formed metal studs, tracks and accessories to form a complete framing system for rated and non-rated wall assemblies.

B. Structural Design:

C. The Developer is responsible for selection of the appropriate cold formed metal framing material section profiles, sizes, and dimensions identified in this Section.

D. Design Criteria:

1. Horizontal Deflection: Maximum 1/180 of the span.

2. Vertical Deflection: Accommodate not less than one-half (1/2) inch.

3. Design systems to move without damage, failure of fastenings and connections, and other detrimental effects.

4. Design for day/night temperature differential.

5. Design to accommodate construction tolerances, deflection of building structural steel, deflection of post-tensioned slabs and beams and clearances for openings.

1.04 SUBMITTALS

A. Show Drawings.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide products of one of the following:

1. Steeler, Inc. (800) 275-2279.

2. LGS Systems. (360) 424-7434.

3. Dietrich Metal Framing. (425) 251-1497.

2.02 MATERIALS

A. Steel Shapes and Plates: ASTM A36, zinc-coated by hot-dip process according to ASTM A123, after fabrication.

2.03 MANUFACTURED UNITS

A. Cold-Formed Members:

1. Conform to the following reference standards:

a. AISI Specification for the Design of Cold-Formed Steel Structural Members.

b. AISI SG-971.

c. ASTM C 955.

d. ASTM C1007.

2. Material: ASTM A 607, Grade 50.

a. 16 Gage and Heavier: Structural Quality Steel Sheet; 50,000 psi minimum yield strength in accordance with ASTM A 653.

b. 18 Gage and Lighter: Structural Quality Steel Sheet; 33,000 psi minimum yield strength in accordance with ASTM A 653.

3. Finish: Galvanized.

2.04 ACCESSORIES

A. General: Provide manufacturers standard steel runners, blocking, lintels, clip angles, shoes, reinforcements, straps, and braces for a complete system meeting the design intent.

B. Metal-to-Metal Fasteners:

1. Characteristics: Self-drilling, self-tapping metal screws, with manufacturer's premium, highest quality, corrosion-resistant coating.

C. Metal-to-Concrete Fasteners:

1. Provide premium quality, powder-actuated, low velocity fasteners.

2. ICBO approved.

3. Provide products of one of the following:

a. Hilti.

b. Ramset/Red Head.

c. Powers.

D. Hot Dip Galvanized Hardware: ASTM A 153.

E. Welding Electrodes:

1. Comply with provisions of the AWS code.

2. Comply with recommendations of the cold formed metal framing manufacturer.

2.05 FABRICATION

A. Fabrication Tolerances:

1. Fabricate assemblies to a maximum allowable variation from plumb, level and true to line not to exceed 1/8 inch from locations indicated on the Drawings.

2. Fabricate each member to a maximum out of square condition not to exceed 1/8 inch true to line.

B. Connections Within Fabrications:

1. Use screw fasteners in conditions where permitted by this Section.

2. Welded connections can be substituted for some or all of the fastener connections.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 INSTALLATION

A. Fasten framing members together in accordance with provisions of AISI SG-787

1. Non-load bearing elements and furring may be fastened with two sheet metal screws, bolts, or rivets at each corner.

2. Welding: Utilize a fusion welding machine, whether AC or DC type, with a welding heat of 60 to 100 amperes.

3. Use electrodes that are compliant with AWS Classification E60.

B. Layout steel framing stud tracks.

1. Secure tracks in manner consistent with manufacturer recommendations for the wall conditions, and as indicated on the Drawings.

a. Do not exceed sixteen (16) inches on center spacing between fasteners.

b. Provide fasteners at ends and corners of tracks.

C. Stud Applications:

1. Fasten steel studs to stud tracks on both flanges of the track.

2. Set studs plumb, except:

a. Diagonal bracing.

b. Inclined walls where indicated on the Drawings.

3. Install horizontal stiffeners in the framing system spaced at not more than 54 inches on center.

a. Weld at each intersection.

4. Install fire stopping in frame walls in conformance with applicable code requirements.

D. Joist Applications:

1. Provide steel joist framing for a complete installation.

2. Reinforcement:

a. Reinforce ends with end clips, steel hangers, steel angle clips, steel stud sections.

b. Reinforce steel joist framing at supports with short lengths of steel joist framing material located directly over the support.

3. Secure joist framing to structural elements of the building in a manner to restrain the joist system, and to prevent lateral movement and displacement.

4. Bridging:

a. Use channel type bridging welded between joists.

b. Provide bridging at five (5) feet on center spacing minimum, unless indicated otherwise by the material manufacturer or designer.

3.02 FIELD QUALITY CONTROL

A. Erection Tolerances:

1. Horizontal Alignment: Within 1/960 of the span.

2. Vertical Alignment: Within 1/960 of respective lengths.

3.03 PROTECTION

A. Repair of Finish:

1. Restore galvanized coating in areas damaged during erection.

END OF SECTION

SECTION 05500
METAL FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Architecturally-Exposed Structural Steel (AESS), including, but not limited to:

a. Shop-fabricated and field-fabricated ferrous metal assemblies exposed to view in the finished Work.

b. Security Grilles and Gates.

c. Trellis Panel Supports.

d. Visual Screens.

e. Decorative Screens.

f. Steel stair towers.

g. Guardrails.

h. Stainless steel handrails.

i. Headlight Screens.

j. Bollards.

2. Non-Architecturally-Exposed Structural Steel (AESS), including, but not limited to:

a. Shop-fabricated and field-fabricated ferrous metal assemblies not exposed to view in the finished Work.

b. Elevator tower roof framing.

c. Canopy framing.

d. Concealed CMU wall lateral braces.

1.02 REFERENCES

A. The following is a list of standards referenced in this Section:

1. ASTM A 36 – Standard Specification for Carbon Structural Steel.

2. ASTM A 53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

3. ASTM A 153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

4. ASTM A 276 – Standard Specification for Steel Bars and Shapes.

5. ASTM A 307 – Standard Specification for Carbon Steel Bolts and Studs 60,000 PSI Tensile Strength.

6. ASTM A 312 – Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.

7. ASTM A 325 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120 Minimum Tensile Strength.

8. ASTM A 500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

9. ASTM A 554 – Standard Specification for Welded Stainless Steel Mechanical Tubing.

10. ASTM A 572 – Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.

11. ASTM A 653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

12. ASTM A 666 – Standard Specification for Steel Screw Spikes.

13. ASTM A 792 – Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

14. ASTM A 1011 – Standard Specification for Steel Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low Alloy, High-Strength Low Alloy with Improved Formability, and Ultra-High Strength.

1.03 SYSTEM DESCRIPTION

A. Architecturally-exposed structural steel (AESS):

1. Provide AESS quality level.

B. Non- Architecturally-exposed structural steel:

1. Fabricate in accordance with requirements of Section 05120 – Structural Steel.

1.04 SUBMITTALS

A. Submit the following:

1. Shop Drawings.

2. Product Data: Submit manufacturer’s specifications, anchor details and installation instructions for products used in miscellaneous metal fabrications, including paint products and grout.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Building Code: Meet applicable requirements of IBC Chapter 22.

2. Handrails and Guardrails: Meet or exceed applicable requirements of IBC Chapter 10.

3. Regulations - Shop Primer:

a. Comply with State of Washington Volatile Organic Compounds (VOC) Rules and Regulations (Chapter 173-490 WAC) for shop applied, non- toxic metal primer.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Hot-rolled Shapes: ASTM A 572, Grade 50.

B. Coated Sheet:

1. Zinc Coated: ASTM A 653, Grade 50, with G90 coating.

2. Aluminum-zinc Alloy Coated: ASTM A 792, Grade 50, with AZ50 coating.

C. Steel:

1. All steel to be in accordance with referenced ASTM A-36, unless more stringent requirements are indicated.

D. Tubular steel: In accordance with ASTM A500, grade B for steel tube members.

E. Stainless Steel: Type 316.

1. Tubing: ASTM A554, Grade MT.

2. Pipe: ASTM A312, Grade TP.

3. Checkered Plate: ASTM A666.

4. Bars and Shapes: ASTM A276

F. Steel Pipe, As Applicable: In accordance with ASTM A53, Type E or S, Grade B. Sizes, dimensions, and configurations as indicated or required.

G. Flat Plates and Sheets: ASTM A570, standard mill steel, Grade 30 where 3/16 inch or less thick, otherwise ASTM A36.

H. Welding Electrodes: Conform to AWS Standard D1.1.

2.02 ACCESSORIES

A. Bolts, Nuts, and Washers:

1. 316 stainless steel, unless noted otherwise.

B. Bushings:

1. Location: HSS Trellis Panel Supports.

2. Material: ASTM A325; or as approved.

C. Expansion Anchors: Phillips wedge rod anchors.

1. Characteristics:

a. Reverse cone, self-wedging, expansion type.

b. Tightening of nut or increased tension on bolt shank shall act to force wedges outward to create positive increased resistance to withdrawal.

2. Provide one of the following products:

a. Wej-It.

b. Kwik-bolt.

c. HiHi.

D. Tamperproof Fasteners:

1. Tamperproof Bolts:

a. Locations: Steel Guardrails; and Stainless Steel Handrails.

b. Characteristics: 3/8 inch diameter by 16 thread pitch; cone shape head and nut with security recess; lengths as required.

c. Materials: 316 stainless steel.

1. Zamak, zinc alloy, and aluminum materials are not acceptable.

d. Provide one of the following products:

1. Bryce Fastener. (800) 558-1082 – ‘Penta Nut’ with ‘1GPNS37’ socket.

2. Tanner Bolt. (718) 434-4500 – ‘Torx Tamper-Resistant Cap Screws’ with ‘37CNBAWS – 3/8 -16 Break-A-Way Nut’.

3. Global Fasteners. (800) 553-7998 – ‘Penta Nut’.

2. Tamperproof Screws:

a. Locations: Stainless steel handrails.

b. Characteristics: #10; self-tapping; 316 or 410 stainless steel; button and flat head configurations as appropriate for the application; lengths as required; and with tamperproof heads in one of the following styles:

1. 'Socket Pinhead'.

2. 'Torx Pinhead'.

3. 'TP3' Triangular Recessed Drive.

E. Bearing Blocks and Shims:

1. Location: HSS Security Grille Framing.

2. Materials:

a. Bearing Blocks: ASTM A 36.

b. Shims: Stainless steel.

F. Non-Shrinking Non-Metallic Grout:

1. Mix and install in accordance with Manufacturer's directions.

2. Except as otherwise indicated, install any steel set in concrete, in cast-in sleeves, with one of the following products:

a. Master Builder's – 'Master Flow 713'.

b. Sonneborne – 'Sonogrout'.

c. Degussa/Sonneborn. (800) 433-9517 – 'Sonogrout 10k'.

G. Bolts and similar threaded fasteners, in accordance with referenced Standards, including ASTM A-307 Class A, B, C, and D, as applicable.

H. Zinc-Coated Ferrous Metal Exterior Nuts, Bolts and Washers: Galvanize exterior bolts and similar threaded fasteners/ASTM A307, in accordance with reference Standard ASTM A153, Class C, and D, as applicable.

I. Powder-Actuated Fasteners:

1. Tempered steel pins with special corrosion resistant finish. Provide guide washers to accurately control penetration. Accomplish fastening by low-velocity piston-driven powder-actuated tool. Pins and tool: Hilti Fastening Systems, Impex Tool Corporation.

2. Penetration depth: Limit penetration of powder-actuated fasteners to not more than three-quarter (3/4) inch unless specifically noted otherwise on the Drawings.

2.03 COMPONENTS

A. General: Provide weep holes at the bottom of all closed steel shapes and assemblies or at any location in an assembly that may collect moisture as follows:

1. Vertical shapes (columns, supporting members, etc): Minimum of two (2) one-eighth (1/8) inch diameter weep holes to provide positive drainage at the lowest point.

2. Horizontal shapes: Minimum of one (1) 1/8” weep hole per (24) inches of horizontal run, with not less than two (2) weep holes in any single assembly.

B. Trellis Panels: Refer to Section 10245 – Trellis Panel Assemblies.

C. Security Grilles.

1. Mesh infill: 10.5 gauge wire, grid pattern ½" high x 3" wide welded wire steel mesh.

a. The mesh shall be “trimmed”, 1/8" stubs maximum.

b. Hot dip galvanize and provide with PVC coating conforming to ASTM F668, Class 2B.

c. Mounted with welding or tamperproof bolts or screws.

2. Acceptable Manufacturers:

a. Riverdale Mills Corp., “Wirewall” high security fencing mesh.

b. McNichols. (800) 237-3820 – “Weldmesh’.

c. Darby Wire. (800) 875-6374 – “Welded Utility Fabric’.

3. Meet or exceed architecturally-exposed structural steel (AESS) quality of fabrication and installation.

D. HSS Security Grille Framing: Frames and Gates:

1. Form from steel tubing, and plates.

2. Finish: Section 09960 Performance Coatings.

3. Meet or exceed architecturally-exposed structural steel (AESS) quality of fabrication and installation.

E. Decorative Screens:

1. Mesh infill: 10.5 gauge wire, grid pattern ½" high x 3" wide welded wire steel mesh.

a. The mesh shall be “trimmed”, 1/8" stubs maximum.

b. Hot dip galvanize and provide with PVC coating conforming to ASTM F668, Class 2B.

c. Mounted with welding or tamperproof bolts or screws.

2. Acceptable Manufacturers:

a. Riverdale Mills Corp., “Wirewall” high security fencing mesh.

b. McNichols. (800) 237-3820 – ‘Weldmesh’.

c. Darby Wire. (800) 875-6374 – ‘Welded Utility Fabric’.

3. Meet or exceed architecturally-exposed structural steel (AESS) quality of fabrication and installation.

F. Decorative Screen Supports:

1. Finish: Section 09960 Performance Coatings.

2. Meet or exceed architecturally-exposed structural steel (AESS) quality of fabrication and installation.

G. Box-Rib Profile Steel Panels: Refer to Section 07410 – Metal Wall Panels.

H. Headlight Screens:

1. Material: Fourteen (14) gage stainless steel.

2. Corners: Provide round cut corners, with two (2) inch radius.

3. Edges: Ease edges with a metal file for a smooth profile with no burrs.

4. Finish: Section 09960 Performance Coatings on exterior surface; No. 4 – Satin on interior surface.

5. Hardware:

a. Provide ASTM F 593 – 316; 5/16 x 18 stainless steel ‘U’ bolts with throat dimension in a range between 5/8 inch and 3/4 inch; spacers; and 5/16 inch nylon insert ‘acorn’ stainless steel locknuts for securing Headlight Screens to Cable Restraint System.

b. Quantity: Not fewer than ten (10) per Headlight Screen; and not greater than eighteen (18) inches on center spacing.

c. Refer to Section 05523 – Cable Restraint Systems.

I. Equipment Enclosure:

1. Frames and Gates: Form from steel tubing, and plates. Finish: Section 09960 Performance Coatings.

2. Un-insulated corrugated pattern architectural metal panels: Refer to Section 07410 – Manufactured Metal Panels.

3. Edge channels and trim: Refer to Section 07600 – Custom Sheet Metal.

4. Meet or exceed architecturally-exposed structural steel (AESS) quality of fabrication and installation.

J. Architectural Steel.

1. Form from structural steel shapes and plates.

2. Finish: Section 09960 Performance Coatings.

3. Meet or exceed architecturally-exposed structural steel (AESS) quality of fabrication and installation.

K. Steel Guardrails:

1. Guardrail frames:

a. Form from structural steel shapes and plates.

b. Finish: Section 09960 – Performance Coatings.

2. Stainless Steel Mesh:

a. One (1) inch square 'intercrimp' stainless steel woven wire mesh, eleven (11) gage wire.

b. Weld each wire to frame.

c. Center welded wire in frame.

d. Provide products of one of the following manufacturers:

1. McNichols Co. (800) 237-3820.

2. Darby Wire. (800) 875-6374.

3. Belleville Wire Cloth, Co. Inc., (800) 631-0490.

3. Meet or exceed architecturally-exposed structural steel (AESS) quality of fabrication and installation.

L. Stainless Steel Handrails:

1. Stainless steel pipe: ASME/ANSI B36.19 - Schedule 40S; nominal one (1) inch pipe size with 1.315 inch outside diameter, and 0.113 inch wall thickness (STD).

2. Mounting brackets and plates: Fabricate from stainless steel.

3. Finish for handrails and mounting brackets and plates: No. 4 – Satin.

a. Fasteners: Stainless steel tamperproof fasteners in accordance with the provisions of this Section.

4. Meet or exceed architecturally-exposed structural steel (AESS) quality of fabrication and installation.

M. Steel Doors: Refer to Section 08111 – Steel Doors and Frames.

N. Overhead Coiling Grille Hood: Refer to Section 08334 – Overhead Coiling Grilles.

O. Overhead Coiling Grille, Anodized Aluminum: Refer to Section 08334 – Overhead Coiling Grilles.

P. Glazed Assemblies: Refer to Section 08410 – Glazed Assemblies.

Q. Louvers and Vents: Refer to Section 10200 – Fixed Louvers and Vents.

R. Bollards:

1. Form from structural steel shapes and plates.

2. Finish: Section 09960 Section 09968 – Powder Coating.

3. Meet or exceed architecturally-exposed structural steel (AESS) quality of fabrication and installation.

S. Standing Seam Metal Roof Panels: Refer to Section 07400 – Standing-Seam Metal Roof Panels.

T. Elevator Tower roof framing:

1. Form from structural steel shapes and plates.

2. Finish: Section 09960 Performance Coatings.

U. Canopy framing:

1. Form from structural steel shapes and plates.

2. Finish: Section 09910 - Painting.

V. Concealed CMU wall top braces:

1. Form from structural steel shapes and plates. Finish: Galvanized.

PART 3 - EXECUTION

W. Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 FABRICATION

A. Fabricate steel assemblies to meet the standards of 'AESS' quality as defined in these Specifications, unless otherwise noted.

END OF SECTION

SECTION 05523
CABLE RESTRAINT SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. Work includes but is not limited to following:

1. Provide Manufacturer/Contractor designed cable restraint system materials.

1.02 REFERENCES

A. This section incorporates by reference the latest revisions of the following documents.

Reference	Title
ASTM A416	Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete.
ASTM A475	Standard Specification for Zinc-Coated Steel Wire Strand.
ASTM A780	Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

Post Tensioning Institute (PTI): “Specification for Seven Wire Strand Barrier Cable Applications”.

1.03 SUBMITTALS

A. Submit the following:

1. Shop Drawings.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cable Restraint System and Prestressing/Post-Tensioning Anchors:

1. Steel Strand: ASTM A416, seven wire. 0.5 inch diameter, stress-relieved prestressing strand, minimum ultimate tensile strength 250,000 psi. All strand manufactured by single source in North America.

2. Galvanizing: ASTM A475, continuous hot-dip coating, minimum weight of zinc coating 0.90 oz./sq. ft.

3. Anchor Bodies: Galvanized (wedge grippers electro-galvanized), compatible with strand system provided. Comply with PTI Specification, Environment; corrosive.

4. Anchor Back Seating Force: Do not exceed 80% of ultimate tensile strength unless otherwise noted.

2.02 FABRICATION

A. Allow for thermal movement in design, fabrication, and installation of assemblies to prevent over stressing resulting from maximum change (range) in ambient temperature as follows:

1. Temperature Change (Range): 80 degrees F.

B. Fabricate and space anchoring devices to secure cable restraint system rigidly in place and to support indicated loads.

C. Fabricate joints that will be exposed to weather in a manner to exclude water.

PART 3 - EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 INSTALLATION

A. Post-Tensioning of Cable Restraint System:

1. Back stress all fixed and stressing anchorages.

2. Back stress after cable restraint system has been stressed.

3. Back stress cable restraint system to a force equal to 80 percent of minimum Ultimate Tensile Strength (MUTS) of the strand.

4. Prevent damage to column or other members to which cable restraint system is anchored.

5. Refer to PTI Specifications for related procedures.

END OF SECTION

SECTION 07143
COLD FLUID-APPLIED WATERPROOFING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Cold fluid applied waterproofing.

1.02 REFERENCES

A. The following is a list of standards referenced in this Section:

1. ASTM C 836 – High Solids Content, Cold Liquid-applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course.

1.03 SYSTEM DESCRIPTION

A. Provide cold-fluid applied, polyurethane liquid waterproofing applied to above grade walls retaining soil.

1.04 QUALITY ASSURANCE

A. Concrete Mix Designs:

1. Concrete mix designs for substrates to receive cold-fluid applied waterproofing shall be reviewed prior to pour, to ensure concrete does not contain additives that affect adhesion of primer and waterproofing.

1.05 PROJECT/SITE CONDITIONS

A. Do not apply membrane if temperature is less than forty (40) degrees Fahrenheit; OR if precipitation is imminent; OR to a damp or frosty surface.

PART 2 -PRODUCTS

2.01 ACCEPTABLE PRODUCTS

A. Cold Fluid-Applied Waterproofing:

1. Provide thixotropic, two-component liquid urethane formulated for application to vertical surfaces.

2. Meet or exceed requirements of ASTM C 836.

3. Wet Film Thickness (WFT) of the applied system shall be not less than sixty (60) mils for vertical surfaces, and one-hundred (100) mils for horizontal surfaces.

4. Provide one of the following products:

a. Gaco Western (800) 456-4226 – ‘LM-60V’.

b. Carlisle Coatings and Waterproofing (253) 946-2436 – 'CCW-703-V'.

2.02 ACCESSORIES

A. Surface Primer: Provide as recommended by the waterproofing manufacturer for each type of substrate encountered.

B. Sealants: Provide as recommended by the waterproofing manufacturer.

C. Backer Rod: Closed cell polyethylene foam rod.

D. Flexible Flashing: In accordance with manufacturer recommendations.

E. Protection Course:

1. Protection course is required between cold fluid-applied waterproofing and backfilled materials.

F. Metal and Neoprene Reinforcements: Provide in accordance with manufacturer recommendations, and written installation instructions.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 07190
WATER REPELLENT COATINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes penetrating water-repellant treatments for the following vertical and horizontal surfaces:

1. Cast-in-place concrete.

2. Precast concrete.

3. Concrete unit masonry.

4. Clay brick masonry.

5. Brick veneers.

1.02 SUBMITTALS

A. Submit the following in accordance with the requirements of Section 01300 – Submittal Procedures.

1. Product Data.

1.03 PROJECT/SITE CONDITIONS

A. Environmental Requirements:

1. Do no work of this Section when surface or air temperatures are below plus forty (40) degrees Fahrenheit or above ninety-five (95) degrees Fahrenheit.

2. Weather:

a. Do no exterior work on unprotected surfaces if it is raining or moisture from any source is present or expected before finishes can dry, or attain proper cure.

b. Allow surfaces to dry and attain indicated temperatures and conditions before proceeding or continuing previously started work.

PART 2 - PRODUCTS

2.01 PENETRATING WATER REPELLENTS

A. Siloxane, Penetrating Water Repellent: Clear, containing 10 percent or more solids of oligomerous alkylalkoxysiloxanes; with alcohol, ethanol, mineral spirits, water, or other proprietary solvent carrier; and with 600 g/L or less of VOCs.

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. Dayton Superior Corporation; Weather Worker WB (J-26-WB), Weather Worker WB Heavy Duty (J-27-WB).

b. H&C Concrete Care Products, Sherwin-Williams Company (The); H&C Super V or H&C SX-7.

c. Conspec by Dayton Superior; Weather Seal WB.

B. Silane/Siloxane-Blend, Penetrating Water Repellent: Clear, silane and siloxane blend with 600 g/L or less of VOCs.

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. BASF Construction Chemicals, LLC; Enviroseal 7, Enviroseal Double 7 for Brick, Enviroseal Double 7 HD, Enviroseal PBT, White Roc 10 WB.

b. PROSOCO, Inc.; Saltguard, Saltguard WB, Siloxane PD, Siloxane WB Concentrate or Weather Seal GP.

c. Tnemec Inc.; Dur A Pell 10, Dur A Pell 20, Prime-A-Pell H2O, Prime-A-Pell Plus, Series 662 or Prime-A-Pell Plus, Series V662.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 07211
BATT AND BLANKET INSULATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Thermal glass wool blankets.

1.02 REFERENCES

A. The following is a list of standards referenced in this Section:

1. ASTM C 665 – Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

1.03 SUBMITTALS

A. Submit the following in accordance with the requirements of Section 01300 – Submittal Procedures:

1. Product Data: Provide manufacturers' published technical data for each proposed product.

2. Submit design data showing conformance with R values required by governing Energy Code as applicable to occupancy, unless higher values are indicated elsewhere.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Provide materials from one of the following manufacturers:

1. Owens-Corning. (425) 644-9707.

2. U.S. Gypsum. (425) 718-8300.

3. Johns-Manville. (800) 654-3103.

4. Certainteed. (800) 523-7844.

2.02 MATERIALS

A. Thermal Batt, and Sound Attenuation Insulation:

1. Non-Rated Thermal Glass Batt Insulation: Kraft faced glass fiber thermal insulation shall comply with referenced ASTM C665, Type II, Class C.

2. Required Thermal Values: In accordance with governing Energy Codes but no less than values indicated in the drawings.

PART 3 - EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 INSTALLATION

A. Install:

1. Thermal Insulation:

a. Fill all spaces indicated in the drawings. Install continuously.

b. Install in spaces between framing members at walls and ceilings.

2. Install vapor retarder on the warm side of all walls which separate interior, heated space from exterior space.

END OF SECTION

SECTION 07212
RIGID INSULATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Rigid board insulation, for cavity wall construction, below grade, and floor slabs.

1.02 REFERENCES

A. The following is a list of standards referenced in this Section:

1. ASTM C 1289 – Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.

2. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

3. IBCO – Chapter 26 Foam Plastic.

1.03 SUBMITTALS

A. General: Submit the following:

1. Product Data.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Products: Subject to compliance with the requirements, furnish one of each the following types:

1. Rigid Insulation for Perimeter Walls, and for Wall Cavities: Provide one of the following products:

a. Owens Corning - 'Foamular CW25'.

b. Dow - 'Styrofoam Square Edge'.

c. Insulfoam - 'Insulfoam II-40'.

2. Rigid Insulation for Concrete Slabs on Grade:

a. Owens Corning - 'Foamular 600'.

b. Dow - 'Highload 60'.

c. Insulfoam (206) 242-9424 - 'R-Tech'.

3. Rigid Insulation for Underside of Decks:

a. Characteristics:

1. Nonstructural, insulative sheathing board meeting the requirements of IBCO – Chapter 26, Section 2603 Foam Plastic.

2. Comply with ASTM C 1289; Type I; Class I.

3. Rigid polyisocyanurate plastic foam core.

4. Aluminum foil facing on exposed side: 1.5 mil thickness.

5. Provide with manufacturer's recommended aluminized tapes, and accessories.

b. Provide the following product:

1. RMAX – 'TSX-8500'.

2.02 ACCESSORIES

A. Surface Conditioner for Concrete:

1. Characteristics: water-based in accordance with manufacturer recommendations

B. Adhesive for Rigid Insulation Board - Wall Cavities:

1. Gun grade, mastic type.

2. Compatible with rigid insulation board, and fiberglass mat faced gypsum sheathing substrate.

C. Impale Fasteners:

1. Approved Products:

a. Continental Stud Welding - (403) 531-0220: 'Insul-Anchors' with 'Tactoo General Purpose Adhesive'.

b. Midwest Fasteners, Inc. - (800) 852-8352: 'IHSP' with 'IHA 170 Insulation Hanger Adhesive'.

D. Mastic Tape:

1. Approved Products:

a. 3M - 'Scotch 2228 Rubber Mastic Tape'; two (2) inch width.

b. Plymouth Rubber Company - 'Water Stop Mastic', or 'Rubber Mastic'.

c. Bluefield Manufacturing - (800) 445-4461: '#527 Two-Ply Mastic Tape Splice'; one and one-half (1-1/2_ inch width.

E. Protection Board: Cementitious, one-fourth (1/4) inch thickness.

PART 3 - EXECUTION

F. Not Used.

END OF SECTION

SECTION 07400
STANDING-SEAM METAL ROOF PANELS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Standing seam metal roofing.

2. Accessories, including but not limited to penetrations, flashings, vents, and associated trim.

1.02 REFERENCES

A. ANSI – Light Gauge Cold-Formed Steel Design Manual.

B. ASTM A 653 – Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot Dip Process.

C. ASTM A 792 – General Requirements for Aluminum-Zinc Coated Sheet.

D. ASTM A 2201 – Standard Practice for Preparation of Zinc-Coated and Zinc-Alloy Coated Steel Panels for Testing Paint and Related Coating Products.

E. ASTM D 1056 – Flexible Cellular Materials.

F. ASTM E 1592 – Structural Performance by Air Pressure Difference.

G. NAAMM – TM-I.

H. NRCA – The NCRA Construction Details.

1.03 SYSTEM DESCRIPTION

A. Provide standing seam metal roof panel system, accessories, penetrations, flashings, vents, and associated trim for a complete installation.

B. Structural Criteria:

a. Uniform load capacity shall be determined by testing in accord with the principles of ASTM E 1592.

b. Designed to safely resist the following positive and negative loads:

1. Roof covering: Negative (-) 21 Wind.

2. Roof ridges, eaves, and rakes: Positive (+) 25 Snow.

c. Weathertightness: When tested in accord with the principles of NAAM TM-I, the roof system without sealant in the ribs shall show no leakage when exposed to dynamic rain and wind velocity to seventy (70) mph for five (5) minutes.

2. Deflection of the standing seam rib shall be limited to L/240, but in no case greater than three-quarter (3/4) inch.

3. Roof panels shall be able to support walking loads and design loads without excessive distortion or telegraphing of the structural supports.

4. Roof panel and flashing attachments shall be designed to accommodate the thermal expansion and contraction of the exterior material through ninety-five (95) degrees Fahrenheit of temperature change.

5. Factors of safety on design loads to ultimate strength of fasteners shall be as stated in the industry standard for the material into which the fastener is driven.

6. Roof panel system shall have a UL Class "A" rating as a deck.

1.04 SUBMITTALS

A. General: Submit the following:

1. Product Data: Submit manufacturer’s product data sheets for each item.

2. Shop Drawings.

1.05 WARRANTY

A. Provide manufacturer’s written warranty against defects in materials and workmanship, structural defects, corrosion, and leaks, and agreeing to repair or replace components that fail during the Warranty Period.

1. The Warranty Period for Work of this Section is five (5) years commencing on the date of Substantial Completion.

PART 2 - PRODUCTS

2.01 ACCEPTABLE PRODUCTS

A. Standing-Seam Metal Roofing Panel System:

1. Characteristics:

a. Panel width: Sixteen (16) inches.

b. Panel Profile:

1. Standing ribs; two and one-half (2- 1/2) inches high with a continuous groove capillary break.

2. Two intermediate stiffener ribs (minimum 5/16" deep) shall be located in the flat pan to minimize oil-canning and telegraphing of structural members.

c. Panel Material: Twenty (20) gauge Galvalume; forty (40) ksi finished steel per ASTM A 653, A 792, and A 2201; and as recommended by the manufacturer.

d. Provide concealed clips and anchors that resist wind uplift, yet permit expansion and contraction with temperature changes.

e. Ribs shall be securely locked over anchor clips with an electric, field-operated roll-forming tool.

f. Individual panels shall be removable for replacement of damaged material.

g. Fluoropolymer Coating:

1. Provide seventy (70) percent minimum polyvinylidene fluoride (PVDF) acrylic resins.

2. System Thickness: 0.8 mil minimum dry thickness, applied over a 0.2 mil epoxy primer.

3. Comply with manufacturer's recommendations.

4. Provide color chosen by the Project Representative from the manufacturer’s premium range of colors, including metallics.

2. Provide one of the following products:

a. Metecno-Morin Corporation. (800) 640-9501 – ‘SRR’.

b. Bemo USA. (800) 926-2366 – ‘Bemo Roof’.

c. Centria. (800) 759-7474 – ‘SRS 2’.

d. Fabral. (800) 477-2741 – ‘Stand ‘N Seam’.

B. Vents:

1. Provide vents.

2. Characteristics:

a. Provide with G90 galvanized coatings; then finish with same fluoropolymer coating as metal roof panels.

3. Provide one of the following products:

a. Artis Metals Company. (800) 892-2277 – ’J-Vent’.

b. Famco. (800) 234-1903 – ‘J-Vent’.

c. Construction Metal Inc., (800) 576-9810 – ‘J-Vent’.

C. Underlayment:

1. Provide one of the following products:

    a. Grace Construction Products. – 'Ice and Water Shield'.

    b. Johns Manville. (800) 654-3103 – 'Johns Manville Ice and Water Guard'.

2.02 COMPONENTS

A. Flashing: Flashing shall be same material type, and finish as the roof panel, but the temper may be reduced to facilitate forming.

B. Panels and Sheets:

1. Panels shall be fabricated in full lengths from ridge to eave without end.

2. Minimum thickness shall be the same as the roof panel.

2.03 ACCESSORIES

A. Clips and Anchors:

1. Anchor clips (one piece or two-piece units) designed to be determined by design wind uplift resistance.

2. Clips shall be designed to allow for expansion and contraction of the roof relative to the structure throughout the specific temperature range.

B. Fasteners:

1. Fasteners in supports and screws installed in lips shall be fully recessed so that no sharp edges come into contact with the roof material.

2. Screws holding anchor clips to the structure shall be:

    a. Into wood: stainless steel (or plated steel).

    b. Into steel: stainless steel, cadmium plated self-tapping screws into predrilled holes (or plated hardened steel self-drilling screws.

3. Exposed fasteners shall be stainless steel.

4. For weather tightness, screws shall have separate washers with hot bonded neoprene faces, and pop rivets shall be set in wet sealant.

5. Exposed fasteners shall be a minimum #14 size screw or three-eighth (3/8) inch diameter rivet.

C. Foam Closures:

1. Provide materials conforming to ASTM D 1056, and as recommended by the manufacturer.

2. Precut foam profile closures shall be closed cell foam meeting specification.

3. Field fabricated hip closures shall be closed cell foam block supported and protected from weathering by a metal channel matching the roof flashing.

D. Sealants:

1. Provide in accordance with requirements of Section 07900 – Joint Protection.

2. Match colors of the metal roof panels.

3. Sealant used with the roofing shall be applied between surfaces during assembly with a minimum amount exposed on the completed installation.

a. Concealed sealant may be a non-curing, non-skinning butyl, polyisobutylene, or polybutane tape of sufficient thickness to make full contact with both surfaces.

b. Exposed sealant shall be a curing type with excellent weather and sunlight resistance.

c. Apply in accordance with the sealant manufacturers recommendations.

E. Underlayment: Install in accordance with the product manufacturer's instructions; metal roof panel manufacturer's standard details; the Drawings; and this Section.

2.04 FABRICATION

A. Flashings:

1. Minimum inside bend radius on flashing shall be three (3) times material thickness.

2. Edges shall have an open hem for stiffness.

2.05 SOURCE QUALITY CONTROL

A. Panel designs are to be in compliance with SMACNA dimensions, profile limitations, gages, and fabrication details.

B. Electrolytic Protection:

1. Provide industry-approved separation of materials of different galvanic range.

PART 3 - EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 INSTALLATION

A. Install in accordance with Specifications of this Section and Manufacturer's directions.

B. Flashing shall be installed in strict accordance with the recommended practice in the MCA, AA, without fasteners in end laps, and isolated from dissimilar materials.

C. Excess sealant shall be removed and touch-up paint applied to any areas where paint scrapes occur.

D. As much as possible, attachment screws shall be eliminated in favor of concealed cleats or clips.

E. Close all ends, and edges of panels with the required foam closures and metal accessories for a clean, trim appearance.

3.02 CLEANING

A. Vacuum all metal shavings from the roof panels.

END OF SECTION

SECTION 07410
METAL WALL PANELS

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Box-rib pattern metal wall panels.

2. Corrugated pattern metal wall panels.

1.02 REFERENCES

A. The following is a list of standards referenced in this Section:

1. AAMA 2605 – Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

2. ASTM A 792 – Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

3. ASTM D 1056 – Standard Specification for Flexible Cellular Materials – Sponge or Expanded Rubber.

4. Metal Construction Association - Preformed Metal Wall Panel Guidelines.

5. SMACNA – Sheet Metal Manual.

1.03 SYSTEM DESCRIPTION

A. Provide one piece, single length, un-insulated metal wall panels, with accessories and finishes as indicated in this Section.

1. Provide box-rib pattern panels at vehicle barriers, and walls.

2. Provide corrugated pattern panels at equipment screens.

B. Provide accessories as required by the panel manufacturer for a complete watertight installation.

1.04 SUBMITTALS

A. Submit the following:

1. Product Data.

2. Shop Drawings.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Provide products of this Section from one of the following manufacturers:

a. Metecno Morin, Inc. (800) 700-6140.

b. Centria. (800) 759-7474.

2.02 ACCEPTABLE PRODUCTS

A. Box-rib Pattern Metal Wall Panels:

1. Characteristics:

a. Un-insulated, concealed-fastener architectural metal wall panels.

b. Box-rib pattern: One and one-half (1-1/2) inch x One and one-half (1-1/2) inch rectangular ribs.

c. Twelve (12) inch panel coverage.

d. Factory-applied vinyl gasket at mating edges of panels.

e. Base metal: 20-gauge Galvalume 40 ksi prefinished steel per ASTM A 792 or equal.

f. Fasteners: Manufacturer's standard concealed fastener.

g. Trim pieces: As required by conditions of construction from manufacturer's standard accessories.

2. Corrugated Pattern Metal Wall Panels:

a. Un-insulated, exposed fastener architectural metal wall panels.

b. Corrugated Pattern: Three (3) inch deep corrugations front-to-back.

c. Thirty-six (36) inch panel coverage.

d. Factory-applied vinyl gasket at mating edges of panels.

e. Base metal: 20-gauge Galvalume 40 ksi prefinished steel per ASTM A 792 or equal.

f. Fasteners: Manufacturer's standard hex-head exposed fastener with Neoprene washer gasket.

g. Trim pieces: As required by conditions of construction from manufacturer's standard accessories.

2.03 ACCESSORIES

A. Fasteners:

1. Fasteners shall be color matched to the wall panels; snap-on color caps are not acceptable.

2. For metal-to-metal attachments:

    a. Stainless steel cadmium plated, #14 self-tapping sheet metal screws into pre-drilled holes; OR

    b. Plated, hardened steel #14 self-drilling screws.

3. For weathertightness, screws shall have washers with hot bonded neoprene faces.

4. Exposed Pop-rivet Fasteners: Where approved for use by the Project Representative, pop-rivets shall be set in wet sealant.

B. Precut Profile Closures:

1. Closed cell rubber RE-42 meeting ASTM D 1056 EPT.

2. Metal profile closures of the same material and color as the wall panel, shall be placed in front of rubber closures that have UV exposure.

C. Sealants:

1. Sealant used with the wall system shall be applied between surfaces with a minimum amount of UV exposure on the complete installation.

2. Concealed sealant may be a non-curing, non-skinning butyl polyisobutylene; OR butyl tape of sufficient thickness to make full contact with both surfaces.

    a. Caulk shall meet Federal Specification TT-C-1796A, Type I, Class A.

    b. Tape shall meet Federal Specification TT-C-1796A, Type II, Class B.

2.04 FABRICATION

A. Fabrication shall be in accordance with Metal Construction Association - Preformed Metal Wall Panel Guidelines.

B. Comply with dimensions, profile limitations, gauges, and fabrication details show on drawings; and if not shown, provide manufacturer’s standard product fabrication and details.

2.05 FINISHES

A. Finishes for Metal Wall Panels, and Accessories:

1. Characteristics:

    a. Provide coil coating formulations for applications to sheet materials.

    b. Provide spray-applied, touch-up formulations for applications to accessories, and products of other Sections required to match coil-coated products.

    c. Conform with the following general requirements of AAMA 2605.

d. Primer Dry Film Thickness: 0.45 mil.

e. Coating Dry Film Thickness: 0.70 to 0.90 mil.

f. Provide products that meet the following:

1. "3-Coat Flouropolymer: AAMA 621. Flouropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat." This is typically a factory-finish.

PART 3 - EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 INSTALLATION

A. Install in accordance with Specifications of this Section and Manufacturer's directions.

B. Flashing and trim shall be installed in strict accordance with the recommended practice of SMACNA - Sheet Metal Manual; and MCA - Preformed Metal Wall Panel Guidelines.

3.02 CLEANING

1. Wipe down each area after erection is complete for final acceptance.

END OF SECTION

SECTION 07600
CUSTOM SHEET METAL

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes the following:

a. Custom sheet metal fabrications.

1.02 REFERENCES

A. The following is a list of standards referenced in this Section:

1. ASTM A167 – Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

2. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

3. ASTM A792 – Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

4. ASTM B32 - Standard Specification for Solder Metal.

5. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

6. NRCA – National Roofing Contractors Association.

7. SMACNA – “Architectural Sheet Metal Manual" - 1993, Available Western Washington Sheet Metal Employers Association, Seattle, Washington. (206) 285-4144.

1.03 SYSTEM DESCRIPTION

A. Provide flashings, counterflashings, metal drips, louver sill flashing, condensation drip pans, reglets, pipe penetrations, gutters and downspouts, and the like for a complete and watertight installation.

1.04 SUBMITTALS

A. Submit the following.

1. Shop Drawings.

2. Product Data.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Galvanized Steel Sheet Metal Material:

1. Pre-coated Galvanized Steel:

    a. Prime Commercial Quality Sheet, ASTM A653 (coating G90-1.25 oz. per square foot), low carbon, open hearth steel, ductile, flat, accurately sheared, and evenly covered with tight coat of prime zinc spelter.

B. Stainless Steel Sheet Metal Material:

1. Sheet metal material shall conform to ASTM A167, Type 304, soft annealed, with No. 2D finish, except where harder temper is required for forming or performance; minimum 0.0187 inch (26 ga) thick, unless otherwise indicated.

C. Fastenings:

1. Nails:

    a. Same metal as sheet metal flashing or other non-corrosive metal as recommended by sheet metal manufacturer.

    b. Match finish of exposed heads with material being fastened.

2. Screws:

    a. High-dome, neoprene gasketed, hex head type, or incorporate a washer with a laminated neoprene gasket.

    b. Exposed screws to have prefinished heads of color matching the coping metal.

D. Solder:

    a. Galvanized Steel: Conform to referenced ASTM B 32, Alloy Grade Sn50, used with rosin flux.

    b. Stainless Steel: Conform to referenced ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless steel sheet manufacturer.

E. Plastic Cement: In accordance with referenced FS SS-C-153, Type I-asphaltic.

F. Underlayment (as applicable): ASTM D 226, No. 15 asphalt saturated roofing felt.

G. Reglets:

1. Characteristics:

    a. Provide in 24 gage Galvalume sheet metal, shop primed, and shop finished as indicated in this Section.

    b. Surface-mounted profiles for flashing and counterflashing.

    c. Masonry profiles for installation in brick veneer masonry.

    d. Concrete reglets for installation in concrete.

2. Provide products of one of the following manufacturers:

    a. Fry Reglet Corp.

H. Electrolytic Protection – Bituminous Paint:

1. Provide one of the following products:

    a. American Tar Company – 'No. 2221'.

    b. Farwest – 'Vitamic'.

2.02 FABRICATION

A. Conform to referenced SMACNA manual.

B. Flashing:

1. Use shop finished twenty-two (22) gauge Galvalume sheet metal.

2. Self supporting flashing shall be twenty (20) gage minimum.

3. Use twenty (20) gauge minimum for clips.

C. Single Pipe Vents:

1. Conform to SMACNA Figure 4-14B with lead flashing system.

D. External Gutters:

1. Conform to SMACNA Figure 1-2, gutter design.

E. Stainless Steel Gutters:

1. Fourteen (14) gauge stainless steel, seam molded.

2.03 FINISHES

A. Finishes:

1. Characteristics:

    a. Provide coil coating formulations for applications to sheet materials.

    b. Provide spray-applied, touch-up formulations for applications to accessories, and products of other Sections required to match coil-coated products.

    c. Conform with the following general requirements of AAMA 2605.

    d. Primer Dry Film Thickness: 0.45 mil.

    e. Coating Dry Film Thickness: 0.70 to 0.90 mil.

    f. Provide one of the following products:

1. Arkema - Kynar 500 Polyvinylidene Fluoride (PVDF); formulations of seventy (70) percent resin.

2. Solvay Solexis - Hylar 5000 Polyvinylidene Fluoride (PVDF) formulations of seventy (70) percent resin.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 INSTALLATION

A. Follow Manufacturer's directions and referenced "SMACNA Manual".

3.02 CLEANING

A. Perform in accordance with the following:

1. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

2. Provide final protection and maintain conditions that ensure sheet metal flashing and trim work during construction is without damage or deterioration other than natural weathering at the time of Substantial Completion.

3. Protect adjacent roofing membranes from work in this section.

4. Remove screws, nails, and sharp objects daily.

END OF SECTION

SECTION 07900
JOINT PROTECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Joint protection.

1.02 REFERENCES

A. The following is a list of standards referenced in this Section:

1. ASTM C 920 – Standard Specification for Elastomeric Joint Sealants.

2. ASTM C 1193 – Standard Guide of Use for Joint Sealants.

3. ASTM C 1330 – Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.

1.03 SYSTEM DESCRIPTION

A. Provide joint protection of appropriate types to close gaps between materials and products.

B. High quality products formulated from virgin materials are required.

C. Compatibility:

1. Use products determined to be fully compatible by the manufacturers.

2. Use surface conditioners where recommended by the manufacturers.

a. Surface conditioners shall be non-staining.

1.04 SUBMITTALS

A. Provide manufacturer's data for each type of sealant and all associated accessories proposed for incorporation in the Work.

PART 2 PRODUCTS

2.01 MATERIALS

A. General: refer to the Joint Sealant Schedule provided in this Section.

1. Types, uses and grades referred to in this Section refer to the applicable types, uses and grades identified in ASTM C 920.

B. Locations: Metal lap joints, and glazing units.

1. Characteristics:

a. Glazing tape.

b. Non-drying, non-curing butyl, OR polyisobutylene.

C. Locations: Horizontal joints in concrete; traffic joints.

1. Characteristics:

a. Two-component, premium grade, polyurethane-based, elastomeric sealant.

b. Type M; Grade P; Class 25; Use T, NT, M, G, A, O, and I.

c. Federal Specification TT-S-00227E, Type I, Class A.

d. Joint Widths: Between three-quarter (3/4) inch and one and one-half (1-1/2 inches).

e. Provide one of the following products:

1. Sika – 'Sikaflex-2c SL'.

2. Sonneborn – 'SL2 Sealant'.

3. Tremco – 'THC 900'.

4. Vulkem – '245'.

D. Locations: Vertical joints in concrete and masonry.

1. Characteristics:

a. Two-component, premium grade, polyurethane-based elastomeric sealant.

b. Type M; Grade NS; Class 25; Use T, NT, M, G, A, O, and I.

c. Federal Specification TT-S-00227E, Type II, Class A.

d. Joint Widths: Between three-eighths (3/8) inch and three-quarter (3/4) inch.

e. All sealed joints in concrete unit masonry and brick assemblies shall be surface sanded to match as closely as possible the appearance of the adjacent mortar joints.

f. Provide one of the following products:

1. Sika – 'Sikaflex-2c NS'.

2. Sonneborn – 'NP II'.

3. Vulkem – '922'.

E. Locations: Standing-seam metal roof panels; metal wall panels; composite panels; custom sheet metal.

1. Characteristics:

   a. Single component, premium grade, moisture-cured, polyurethane-based, non-sag elastomeric sealant.

   b. Type S; Grade NS; Class 25; Use T, NT, O, M, G, I.

   c. Federal Specification TT-S-00230C, Type II, Class A.

   d. Joint Widths: Nominal; bead characteristics shall be per manufacturer instructions.

   e. Provide one of the following products:

      1. Sika – 'Sikaflex-1a'.

      2. Sonneborn – 'Omniplus'.

      3. Dow – 'No. 795'.

      4. GE – 'Silglaze'.

F. Locations: Interior joints – other than wet condition.

   1. Characteristics: Type S – Single Component Butyl or Acrylic.

G. Locations: Interior joints – wet condition; and around plumbing fixtures.

   1. Characteristics: Type S – Single Component Mildew-resistant Silicone.

H. Locations: Thresholds.

   1. Characteristics: Type S – Moisture Cure Silicone.

I. Locations: Storefront system glazing sealant.

   1. Characteristics: Use G – Single Component Polyurethane.

2.02 ACCESSORIES

A. Bond Breaker:

   1. Polyethylene tape recommended by the manufacturer in its written instructions.

   2. Provide self-adhesive tape where appropriate.

B. Joint Fillers: In accordance with ASTM C 1330.

C. Joint Primers and Conditioners: On-corrosive, non-staining types recommended by the sealant manufacturers' written instructions, and compatible with substrates.

D. Cleaners: Provide as recommended by the sealant manufacturers written instructions.

E. Masking Tape: Non-staining, non-absorbent type compatible with materials and substrates.

2.03 SOURCE QUALITY CONTROL

A. Sealants and Fillers: Meet VOC limits Bay Area Resources Board Regulation 8, Rule 51.

PART 3 - EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 PREPARATION

A. Substrate Cleaning:

1. Clean out joints immediately before installing joint sealants.

2. Remove laitance and form-release agents from concrete surfaces.

3. Clean non-porous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

4. Comply with requirements of ASTM C 1193 for preparation of materials to receive latex and solvent-release type materials.

B. Joint Primers and Surface Conditioners:

1. Prime surfaces when indicated by:

a. The manufacturers written installation instructions.

2. Apply primer in close conformance to manufacturer recommendations.

C. Masking Tape:

1. Use masking tape where necessary to prevent sealant contact with adjacent surfaces.

3.02 INSTALLATION

A. Install system in accordance with applicable codes and regulations, manufacturer's written instructions, and this Section.

3.03 APPLICATION

A. General: Comply with requirements and procedures identified in ASTM C 1193.

B. Joint Fillers:

1. Joints Less Than one-half (1/2) inch Depth:

a. Apply bond breaker tape to bottom of joints to prevent adhesion of sealant to the bottom of the joint.

2. Joints Less Than three-quarter (3/4) inch but Greater Than one-half (1/2) inch Wide:

a. Pack joint with cylindrical joint filler tape to within one-fourth (1/4) inch of finish surface.

3. Joints three-quarter (3/4) inch and Wider:

a. Pack joint with cylindrical joint filler tape to within one-half (1/2) inch of the finish surface.

C. Sealants:

1. Conform to the profiles indicated in manufacturer installation instructions.

3.04 FIELD QUALITY CONTROL

A. Curing:

1. Cure sealants in close conformance with manufacturers written instructions and recommendations.

3.05 CLEANING

A. Remove foreign materials including dust and dirt, and excess adhesive using materials and methods in accordance with manufacturer's written instructions.

3.06 SCHEDULE

A. Joint Sealant Schedule:

MARK	TYPE	JOINT WIDTH	APPLICATION	SECTION(S)
Type S	Single component polyurethane	nominal	Roof panel (except lap joints)	07 40 00 08 62 53
Type S	Single component polyurethane	nominal	Siding panel (except lap joints)	07 40 00
Glazing Tape	Non-drying, non-skinning, non-curing butyl or polyisobutylene	nominal	Metal lap joints	07 40 00
Use G	Single component polyurethane	3/4 inch	Storefront system (glazing sealant)	08 43 15
Type S	Single component polyurethane	3/4 inch	Storefront system (perimeter)	08 43 15
Type S	Single component butyl, or acrylic sealant	3/16 inch	Miscellaneous interior joints (other than wet condition)	09 20 00
Type S	Single component mildew-resistant silicone	3/16 inch	Miscellaneous interior joints (wet condition)	various
Type M, Grade NS	Multi-component solvent release curing acrylic	3/4 inch	Masonry joint	04 22 00

SECTION 07900
JOINT PROTECTION

MARK	TYPE	JOINT WIDTH	APPLICATION	SECTION(S)
Type S	Single component polyurethane	nominal	Gutter and downspout	07 62 13
Use T	Self leveling polyurethane	1-1/2 inches	Traffic joint	various
Type S	Single component mildew-resistant silicone	3/16 inch	Plumbing fixtures	various
Type M, Grade NS	Multi-component solvent release curing acrylic	1-1/2 inches	Concrete (vertical)	various
Type S, Grade NS	Single component moisture cure silicone	nominal	Threshold	various

END OF SECTION

SECTION 08111
STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes hollow metal doors and frames, preparation to receive hardware and grouting of frames.

1.02 REFERENCES

A. The following is a list of standards referenced in this Section:

1. ANSI A250.8 – SDI-100 Recommended Specifications for Standard Steel Doors and Frames.

2. ASTM A 153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

3. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

4. DHI A115 Series – Specifications for Steel Doors and Frame Preparation for Hardware; Door and Hardware Institute.

5. NAAMM HMMA 840 – Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames.

6. NFPA – 80 – Fire Doors and Windows.

7. SDI - 100/ANSI 250.8 – Recommended Specifications for Standard Steel Doors and Frames.

8. SDI 112 – Zinc-Coated (Galvanized/Galvannealed) Standard Steel Doors and Frames.

9. SDI 117 – Manufacturing Tolerances for Standard Steel Doors and Frames.

10. UL 10B – Fire Tests of Door Assemblies.

1.03 SUBMITTALS

A. General: Submit the following:

1. Shop Drawings.

2. Product Data.

3. Certificates.

a. Furnish letter from Manufacturer stating that hollow metal doors and frames delivered to the Project conform to these Specifications.

b. Submit certification letter attesting that specified priming procedures, methods, and products have been followed.

4. Maintenance Data.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Accessibility: Comply with provisions of ANSI A117.1.

2. Fabrication and installation of steel door and frame assemblies shall comply with SDI-100 /ANSI A250.8.

B. Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved.

1. Fire / Smoke Control Door Construction: Conform to ASTM E 152, and UL 10B.

2. Fire / Smoke Control Door Installation: Conform to NFPA 80.

C. Rated Openings:

1. Provide doors, frames, and other Work of this Section that are in compliance with requirements of Underwriters Laboratories (UL), Factory Mutual, or other approved testing agency.

2. Coordinate with 08710 – Finish Hardware.

1.05 DELIVERY, STORAGE AND HANDLING

A. Inspect doors and frames on delivery for damage.

B. Minor damage may be repaired provided refinished items match new work, otherwise, remove and replace damaged items as directed.

C. Protection prior to installation:

1. Protect at all times to prevent damage to doors, frames, and finish.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Provide products of one of the following:

1. Ceco. (206) 281-3745.

2. Curries. (425) 392-2358.

3. Steelcraft. (513)745-6400.

2.02 COMPONENTS

A. Steel Doors:

1. Exterior Doors:

a. Grade: ANSI A250.8 Level 3, physical performance Level A, Model 2, seamless.

b. Core: Polyurethane.

c. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A 653 with manufacturer’s standard coating thickness.

B. Steel Frames:

1. Comply with the requirements of grade specified for corresponding door.

a. ANSI A250.8 Level 3 Doors: 14 gage frames.

b. Finish: Same as for door.

2. Exterior Door Frames: Face welded, seamless with joints filled.

a. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A 653, with manufacturer’s standard coating thickness.

2.03 ACCESSORIES

A. Support and Anchors:

1. Fabricate from minimum eighteen (18) gauge galvanized sheet steel.

2. Galvanized units after fabrication, and in conformance with ASTM A 153, Class B.

B. Astragals for Double Doors:

1. Steel, Z-shaped.

C. Inserts, Bolts, and Fasteners:

1. Provide manufacturer's standard units, EXCEPT hot-dip galvanize items to be built into exterior walls, and conform to ASTM A 153, Class C or D as applicable.

D. Bituminous Coating: Fibered asphalt emulsion.

2.04 FABRICATION

A. General:

1. Fabricate exposed faces of doors and panels from only cold rolled steel.

2. Fabricate frames, concealed stiffeners, reinforcement, edge channels and moldings from either cold-rolled OR hot-rolled steel at manufacturer's option.

3. Provide steel top cap to seal all doors.

4. Tolerances: Comply with SDI 117.

B. Doors:

1. Comply with ANSI A250.8, Level 3 – Extra Heavy Duty, Model 2; Seamless – Hollow Metal.

   a. Face Sheets: 16 gage thickness.

   b. Core: Polystyrene foam.

2. Glazing Stops:

   a. Thickness: 0.0359 inch thickness.

   b. Provide non-removable stops; locations:

      1. Outside of exterior doors.

      2. Secure side of interior doors.

   c. Glazing Beads: Screw-applied, removable.

C. Frames:

1. Provide metal door frames of the types and styles complying with Manufacturer's specifications, and ANSI A250.8 for minimum materials and construction requirements.

2. Profile: Pressed steel single rabbet; flush; with two (2) inch face; and five-eighth (5/8) inch returns, unless noted otherwise.

3. ANSI A250.8, Level 3.

   a. Material shall be in accordance with ASTM A 653, Grade A60.

   b. Metal Thickness: 16 gage; except use 14 gage for units over thirty-six (36) inches in width.

   c. Finish: Hot dip galvanized.

   d. Fabricate per SDI 112.

4. Conceal fastenings, unless otherwise indicated.

   a. Body putty frames flush over fastenings making fasteners invisible.

5. Welded Frames: Fabricate frames of welded construction as required for rated and non-rated assemblies, all corners mitered.

a. Knockdown frames not permitted.

6. Plaster Guards: Provide 26 gauge steel plaster guards or mortar boxes, welded to frame, at back of finish hardware cutouts where finish materials might obstruct hardware operation.

7. Protective Frame Coating:

a. Factory coat inside of frames indicated to be grouted, and frames indicated to be built into concrete construction.

b. Apply bituminous coating to a thickness of one-sixteenth (1/16) inch.

2.05 FINISHES

A. Preparation:

1. Weather Exposed: SSPC-SP6 Commercial Blast Cleaning.

B. Primer and Adhesion Promoter:

1. Per Section 09910 – Painting.

2. Do not shop-prime steel scheduled to receive Section 09960 – Performance Coatings.

C. Finish:

1. Per Section 09910 – Painting.

2. Special Requirement: Do not paint over labels for rated doors and frames.

PART 3 - EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 PREPARATION

A. Bituminous Coating: Back paint metal frames indicated to be installed in concrete, and masonry wall assemblies, with bituminous coating.

3.02 INSTALLATION

A. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.

B. Frames:

1. Place frames per ANSI A250.8 and SDI-105 "Recommended Erection Instructions for Steel Frames."

2. Set frames accurately in place/plumb/aligned and securely braced.

3. Jamb Anchors:

    a. Install a minimum of three (3) wall anchors per jamb at hinge and strike levels.

4. Install sealant between door and window frames and wall.

C. Grouting:

1. Grout frames located in concrete, and masonry wall assemblies.

    a. Do not grout metal frames located in metal stud wall assemblies.

2. Assure frames are back painted with bituminous coating before beginning.

D. Install doors, frames, and gasket assemblies plumb and square to provide continuous seal.

1. Install fire-rated doors in fire-rated assemblies, and in conformance with standards for fire-rated doors and assemblies.

2. Fit hollow metal doors accurately in their respective frames, within range of clearances specified in ANSI 250.8 and SDI-122.

E. Coordinate gasketing with other hardware to maintain a continuous perimeter seal.

F. Shim door closers as necessary to accommodate minor deviations in plane, and to maintain a continuous seal at the gasketing.

3.03 TOLERANCES

A. Clearances Between Door and Frame: As specified in ANSI A250.8.

B. Maximum Diagonal Distortion: One-sixteenth (1/16) inches measured with straight edge, corner to corner.

3.04 CLEANING

A. Remove foreign materials including dust and dirt, and excess adhesive using materials and methods in accordance with manufacturer’s written instructions.

B. Remove temporary labels and protective coverings.

END OF SECTION

SECTION 08311
ACCESS PANELS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Access doors in finished walls where indicated or required.

2. For access doors to Mechanical or Electrical work, see those Divisions.

1.02 SYSTEM DESCRIPTION

A. Provide manufactured, outward opening, metal panel access doors with metal frame construction, of types required to accommodate adjacent construction as indicated.

1.03 SUBMITTALS

A. Submit the following:

1. Design Data: Indicate each installation in accordance with governing code reference.

2. Shop Drawings.

3. Product Data.

1.04 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain access doors from one source, and by a single manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide products of one of the following:

1. Larsen's Manufacturing Co. (800) LARSENS.

2. Milcor, Inc. (419) 228-1411.

3. Williams Brothers Inc. (800) 255-5515.

4. Nystrom, Inc., (800) 781-3491.

5. Precision Ladders, LLC, (800) 225-7814.

B. Nystrom flush panel access doors are the basis of design for Work of this Section.

1. Provide model ‘NT’ as required for concrete unit masonry wall type.

2. Material: 16-gauge steel frame with 14-gauge door panel.

3. Phosphate dipped with baked on rust inhibitive gray prime finish.

4. Sizes: Three (3) inch x three (3) inch unless indicated otherwise on drawings.

5. Quantity: As required.

6. Hinge: Concealed spring pin hinges open to 175 degrees.

7. Provide number of hinges required in accordance with panel size.

8. Lock: Key operated cylinder lock with two keys per lock, keyed alike.

2.02 FABRICATION

A. Construction: Fabricate units on continuous welded steel construction.

B. Grind welds smooth and flush with adjacent surfaces.

C. Furnish attachment devices and fasteners of the type required to secure access panels to the types of support shown.

2.03 FINISHES

A. Paint access doors and frames in accordance with Section 09910 – Painting.

B. Paint color shall match adjacent surfaces unless noted otherwise.

PART 3 - EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 INSTALLATION

A. Install system in accordance with applicable codes and regulations, manufacturer's written instructions, and this Section.

1. Install frames plumb and level in openings. Secure rigidly in place.

2. Position units to provide convenient access to concealed work requiring access.

3.02 CLEANING

A. Leave installations clean; premises free of any residue of work of this Section.

END OF SECTION

SECTION 08334
OVERHEAD COILING GRILLES

PART 1 GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Motor operated overhead coiling grilles.

B. Related Sections:

1. 08710 – Finish Hardware: Cylinders.

1.02 SYSTEM DESCRIPTION

A. Provide motor-operated overhead coiling grilles in locations indicated on the Drawings.

B. Provide complete installations, with safety features fully incorporated, and ready for operation by the Owner.

1.03 SUBMITTALS

A. General: Submit the following in accordance with the Conditions of Contract and Section 01330 – Submittal Procedures:

1. Product Data: Submit manufacturer's project data sheets for each item.

2. Shop Drawings:

a. Provide installation and layout Shop Drawings for the specific conditions of this Project.

1) Manufacturer's standard published drawings are not sufficient for this purpose and are not acceptable to meet the requirements.

2) Include an elevation view and a section view for each respective door, at a minimum.

3) Indicate the end on which motor operators are proposed fitted.

4) Show control locations, and location for electrical disconnects.

b. Include detailed erection and installation instructions.

c. Show attachments.

d. Show critical dimensions and clearances to obstructions.

1) Show doors in relationship to clear openings, and provide dimensions for coordination of jamb and head positions.

2) Indicate tolerances for field location of attachments.

3) Show correct as-built dimensions of concrete structure, and other permanent surfaces surrounding each respective door.

4) Indicate observed slopes and surface irregularities in the installed concrete work on the Shop Drawings.

e. Show relationships to adjacent surfaces, curbs, and obstacles.

f. Show details of fabrication and dimensions.

g. Indicate door numbers on each respective drawing.

3. Samples:

a. Provide one (1) sample of door grille proposed for the Project.

b. Size: Twelve (12) inches by twelve (12) inches, and assembled so as to stay together in one unit to accommodate handling in the review process.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with requirements of the authority having jurisdiction, and referenced Safety and Health requirements.

2. Electric motor operators shall be UL Listed and approved.

B. Installers shall be authorized factory-direct distributors for the proposed manufacturer's products.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver products to the site under provisions of Section 01600 – Project Requirements.

B. Store and protect products under provisions of Section 01600 – Product Requirements.

C. Provide palletized cartons to protect doors from damage during shipping, storage, and handling.

D. Store in original protective packaging until time of installation.

E. Handle doors in strict accordance with manufacturer's instructions.

1.06 WARRANTY

A. Provide manufacturer's written warranty against defects in materials and workmanship, and agreeing to repair or replace components that fail during the Warranty Period.

1. The Warranty Period for Work of this Section is two (2) years commencing on the date of Substantial Completion.

1.07 OWNERS INSTRUCTIONS

A. Separate cardboard and paper packaging, pallet materials, and metals used in shipping overhead coiling grilles for later disposal and recycling at firms listed in the King County 'Construction Recycling Directory,' latest edition.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Products specified for Work of this Section are:

1. Cookson Co. (206) 547-1900.

2. Cornell. (800) 233-8366.

3. Overhead Door Corporation. (888) 451-0060.

4. Or Approved Equal.

2.02 ACCEPTABLE PRODUCTS

A. Overhead Coiling Grilles:

1. Doors indicated on the Drawings: Basis of design unit is Cookson Type 'FMG' face-mounted rolling grille, operated by a vertically mounted gearhead motor.

2. Mount coiling grilles to HSS columns as detailed on the Drawings

B. Grille Curtains:

1. Pattern: Cookson No. 5015-9 heavy duty grille pattern constructed of solid 5/16-inch-diameter horizontal aluminum rods with 1/2-inch tube spaces on 1-1/2 inches on-center spacing; with 3/16 inch thick aluminum hinged vertical connecting links (5/8 inch deep by 2-1/4 inches high); with 9 inches on-center spacing.

2. Finish: The finish on the rod, tube spacers, and links shall be 204-R1 clear anodized.

C. Bottom Bars:

1. Bottom bars shall consist of an extruded aluminum tube measuring 4 inches high by 1-3/4 inches deep, and shall include the Cookson 'Featheredge' safety edge system.

2. Provide sloped bottom bar assembly as required to fully close openings at irregular (non-horizontal) entrances.

a. Field verify slope angle after placement and finishing of adjacent concrete surfaces.

3. Finish: Bottom bar finish shall be 204-R1 clear anodized.

D. Door Guides:

1. Door guides shall be constructed of a 1/4-inch-thick continuous aluminum angle connected to 1-1/2 inch by 2-1/2 inch by 1/8 inch thick continuous extruded aluminum guide section. Continuous nylon wearstrips shall be inserted on both sides of the guide to eliminate metal-to-metal contact. The aluminum wall angle and the aluminum guide shall be 204-R1 clear anodized finish.

E. Brackets:

1. The brackets shall be constructed of steel not less than 1/4 inch thick.

2. Finish: Brackets shall have one coat of aluminum prime paint.

F. Barrel:

1. The barrel shall be steel tubing of not less than 6 inches in diameter. Oil tempered torsion springs shall be capable of correctly counter balancing the weight of the curtain. The barrel shall be designed to limit the maximum deflection to 0.03 inches per foot of opening width. The springs shall be adjusted by means of an exterior wheel.

2. Finish: The finish on the barrel shall be one coat of bronze rust-inhibiting paint.

G. Hood:

1. The hood shall be fabricated from 0.040 inch aluminum sheet, and shall be formed to fit the profile of the brackets.

2. Finish: The finish on the hood shall be 204-R1 clear anodized.

H. Operator:

1. The grille shall be operated at a speed of 2/3 foot per second by an open drip-proof electric motor with gear reducer in oil bath.

2. The motor operator shall include a geared limit switch and an electrically interlocked emergency chain operator.

3. The motor starter shall be housed in a NEMA 1 housing and include a magnetic reversing starter size 0, a 24-volt control transformer, and complete terminal strip to facilitate field wiring.

4. The motor operator shall be activated by a three-button push-button station in a NEMA 1 enclosure.

5. The motor shall be sized as required by the grille, 480 or 208 volts, three phase.

6. The motor operator shall be mounted to the grille bracket as shown on drawings.

7. The motor operator shall be UL listed.

I. Accessories:

1. Grilles shall be provided with 200VA transformers, timer to close, photo eyes, auxiliary limit switches (terminal block connections) for open and close limits to advise of door position (open or closed), delay on reverse function, non-resettable cycle counters, wall-mounted starter with hinged cover.

J. Control Stations:

1. Grilles shall be provided with surface-mounted three-button control stations on interior, and NEMA 4 compliant key stations on the exterior, and masterkeyed to Corbin Russwin high security cores in accordance with Section 08710 – Finish Hardware.

K. Safety Edge:

1. The grille shall be fitted with the Cookson 'Featheredge Rolling Grille Safety Edge System,' and shall include the following features:

   a. The safety edge shall be installed on the bottom bar of the grille and shall automatically reverse the grille if the device detects an obstruction in the downward travel of the grille.

   b. The grille shall be provided with cord reel to connect safety edge to operator.

   c. The safety edge shall consist of a rubber boot attached below the bottom bar with an electrical switch secured to the back of the bottom bar.

   d. The safety edge shall not rely on pneumatic pressure of electrical strip contacts to operate properly.

   e. The operation of the safety edge shall not be subject to interference by temperature, barometric pressure, water infiltration, or cuts in the rubber boot.

L. Loop Detectors:

1. Provide one loop detector at coiling door (one set of three loops). Provide wiring, conduit and auxiliary components as required for a fully functioning system. Cut loops into base slab maximum of 1-1/2 inches or as appropriate depth and cover with loop filler. The purpose of the loop detectors is, in the nighttime condition, when the coiling doors are closed, to detect the presence of a car and send a signal to the operator to open the doors to allow the car to exit.

M. Control Interface:

1. Provide control interface for doors as required for a fully functioning system to allow King County the ability to remotely operate (open and close) the coiling doors. In order to accomplish this, provide the following control interface at the controller for each door:

   a. One normally open dry contact wired between the common terminal and open terminal in motor control panel for open function.

b. One normally open dry contact wired between the common terminal and the close terminal in motor control panel for close function.

c. One normally closed dry contact wired in series with stop buttons on local control station.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 INSTALLER

A. Installer shall be an authorized factory-direct distributor of the manufacturer.

B. All electrical controls to be completed by door installer by fully licensed and trained electrician.

C. Upon completion of installation, including work by other trades, lubricate, test, and adjust grilles to operate easily, free from warp, twist, or distortion.

D. Upon completion of installation, provide training to King County personnel on the full operation of the doors. Provide operation and maintenance manual to King County.

3.02 EXAMINATION

A. Verify conditions are satisfactory to receive Work of this Section. Do not commence Work until unsatisfactory conditions have been corrected.

B. Beginning Work constitutes acceptance of conditions.

3.03 PREPARATION

A. Field Measurements: Verify on job before beginning Work

3.04 INSTALLATION

A. Install system in accordance with applicable codes and regulations, manufacturer's written instructions, and this Section.

3.05 ADJUSTING

A. Make any adjustments required to ensure proper and reliable operation.

1. Include adjustments to motor and hardware as necessary to achieve proper operation.

B. Put overhead coiling grilles into service as soon as installed and without delay.

END OF SECTION

SECTION 08410
GLAZED ASSEMBLIES

PART 1 GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Aluminum storefront assemblies.

2. Aluminum curtain wall assemblies.

1.02 REFERENCES

A. The following is a list of standards referenced in this Section:

1. AAMA 501.2-03 – Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.

2. ASTM E 283 – Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

3. ASTM E 330 – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

4. ASTM E 331 – Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

1.03 PERFORMANCE

A. Acceptable assemblies for work of this Section shall meet or exceed the following performance criteria:

1. Wind Loads: Comply with provisions of the IBC Code.

2. Air Infiltration:

a. Tested in accordance with ASTM E 283.

b. Air infiltration rate shall not exceed 0.06 cfm/ft2 at a static air pressure differential of 6.24 psf.

3. Static Water Resistance:

a. Tested in accordance with ASTM E 331.

b. There shall be no leakage at a static air pressure differential of twelve (12) psf; refer to AAMA 501.

4. Dynamic Water Resistance:

a. There shall be no leakage at a static air pressure differential of twelve (12) psf; refer to AAMA 501.1.

5. Uniform Loading:

a. In accordance with ASTM E 330, deflection shall be limited to L/175 of the span of any framing member at design load when a static air design load of forty (40) PSF is applied alternately in the positive and negative directions.

b. No glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur at structural test load equal to 1.5 times the specified design load.

6. Seismic Loading: When tested in accordance with AAMA 501.4:

a. Meet design displacement of 0.010 times the story height; AND

b. Meet ultimate displacement of 1.5 times the design displacement.

7. Expansion and Contraction: Accommodate surface temperature differential of one-hundred-ninety (190) degrees Fahrenheit.

8. Condensation Resistance: When tested in accordance with AAMA Specification 1530, the Condensation Resistance Factor (CRF) shall be sixty-six (66) or greater at the frame.

1.04 SYSTEM DESCRIPTION

A. Provide storefront, curtain wall and display.

PART 2 PRODUCTS

2.01 MATERIALS

A. Aluminum Extrusions:

1. Extruded 6063-T5 alloy and temper; OR

2. As required to be compatible with the indicated finish.

B. Fasteners:

1. Aluminum; OR

2. Stainless steel.

3. Zinc plated fasteners are not permitted.

C. Perimeter Anchors:

1. Aluminum or stainless steel.

2. Designs and configurations shall be isolated to prevent galvanic corrosion.

2.02 MANUFACTURED UNITS

A. Storefront Assemblies:

1. Face-set, non-thermal break configuration.

2. Locations as indicated on the Drawings.

3. Dimensions: Four (4) inch width; six (6) inch depth.

4. Glazing unit configuration: Prepare framing to accept one (1) inch nominal thickness insulated glazing units.

5. Provide one of the following assemblies:

a. Arcadia, Inc.

b. Commercial Arch. Prod. Inc.

c. LEED Himmel Industries, Inc.

d. United States Aluminum

e. VIstawall Arch. Products

f. Kawneer - '1600 System 1'.

B. Curtain Wall Assemblies:

1. Face-set, non-thermal break configuration.

2. Shear block construction.

3. Locations as indicated on the Drawings.

4. Dimensions: Four (4) inch width; six (6) inch depth.

5. Glazing unit configuration: Prepare framing to accept one (1) inch nominal thickness insulated glazing units.

6. Provide one of the following assemblies:

a. Arcadia, Inc.

b. Commercial Arch. Prod. Inc.

c. LEED Himmel Industries, Inc.

d. United States Aluminum

e. VIstawall Arch. Products

f. Kawneer - '1600 System 1'.

2.03 FABRICATION

A. Utilize manufacturer's standard methods.

1. Workmanship:

2.04 FINISHES

A. Aluminum Framing:

1. Class I anodized coating in accordance with AAMA AA-M12-C22-A31.

2. Color: No. 14 Clear.

3. Seven-tenths (0.7) mils minimum thickness.

4. Provide the same finish for all aluminum framing and items of this Section.

2.05 SOURCE QUALITY CONTROL

A. Provide assemblies of this Section from a single manufacturer, and installer.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 INSTALLATION

A. Install system in accordance with applicable codes and regulations, manufacturer's written instructions, and this Section.

END OF SECTION

SECTION 08710
FINISH HARDWARE

PART 1 GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Finish hardware.

1.02 REFERENCES

A. The following is a list of standards referenced in this Section:

1. ADA – ADAAG.
2. ANSI A117.1 – Accessible and Usable Buildings and Facilities.
3. ANSI/BHMA – Reference Standards 156 series.
    a. ANSI 156.1 - Butts and Hinges.
    b. ANSI 156.2 – Bored Locks and Latches.
    c. ANSI 156.3 – Exit Devices.
    d. ANSI 156.4 – Door Controls/Closers.
    e. ANSI 156.5 – Auxiliary Locks and Associated Products.
    f. ANSI 156.6 – Architectural Door Trim.
    g. ANSI 156.7 – Template Hinge Dimensions.
    h. ANSI 156.8 – Door Controls – Overhead Holders.
    i. ANSI 156.13 – Mortise Locks and Latches.
    j. ANSI 156.14 – Sliding and Folding Door Hardware.
    k. ANSI 156.15 – Closer Holder Release Devices.
    l. ANSI 156.16 – Auxiliary Hardware.
    m. ANSI 156.17 – Self-Closing Hinges and Pivots.
    n. ANSI 156.18 – Materials and Finishes.
4. NFPA 80 – Fire Doors and Windows.
5. NFPA 101 – Life Safety Code.

1.03 SUBMITTALS

A. General: Submit the following:

1. Product Data.
2. Finish Hardware Schedule:

a. List hardware schedule for each door opening separately, using a vertical format per the sample hardware set below.

SAMPLE HARDWARE SCHEDULE FORMAT:

Door 101

HW1 - One single door: 3'-0" x 7'-0" x 1-3/4" W x HM

	Butts	CB1900 US26D 4-1/2 x 4-1/2
1 ea	Lockset	ML2051 LWA 630 SA114 M17
1 ea	Closer	DC2200 689 M54 M72 M74
1 ea	Kickplate	K0050 10 x 34 630
1 ea	Wall stop	WC9X 626
3 ea	Silencers	64

b. Provide copies of catalog cuts for each item.

c. Promptly incorporate any corrections and changes in the reviewed submittal and return copies, quantity as required, of the revised Finish Hardware Schedule to the Developer for distribution.

B. Special Tools:

1. The Developer shall provide to the County two (2) sets of any special tools shipped with the finish hardware products required for maintenance and installation.

C. Operations and Maintenance Data:

1. Submit required sets of O&M manuals.

a. Include an as-built Finish Hardware Schedule, catalog cuts, template lists with templates and warranty information.

2. One (1) additional copy shall either be delivered with the permanent keys at the completion of the construction period.

a. This copy shall contain parts data for exit devices, locksets & closers, and catalog cuts of all electrical products, including manufacturer's name.

1.04 QUALITY ASSURANCE

A. Supplier Qualifications:

1. The hardware supplier shall be a factory direct authorized distributor of the material provided and shall maintain a stock and parts inventory of standard items supplied on the Project.

B. Regulatory Requirements:

1. Provide listed door hardware at fire rated openings in compliance with NFPA 80 and the requirements of the authority having jurisdiction.

2. Hardware provided for the Project is to be ADA compliant.

C. Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved.

D. Completeness:

1. Provide a complete and functional hardware installation including all products, materials and accessories necessary for the Project.

1.05 WARRANTY

A. Provide manufacturer's written warranty against defects in materials and workmanship, and agreeing to repair or replace components that fail during the Warranty Period.

1. The Warranty Period for Work of this Section is one (1) year commencing on the date of Substantial Completion EXCEPT:

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide hardware items from the following manufacturers:

1. The following manufacturers' products are the basis of design for Work of this Section:

a. Butts and Hinges: Stanley.

b. Manual Flush Bolts: Ives.

c. Mortise Locks: Corbin Russwin.

d. Cylinders: Corbin Russwin high security cores.

e. Exit Devices: Corbin Russwin.

f. Surface-mounted Closers: Norton.

g. Flat Goods and Trims: Trimco.

B. Items indicated in the Finish Hardware Schedule in Part 3 of this Section, but not specifically listed in Part 2 shall be provided as indicated in the Finish Hardware Schedule.

2.02 PRODUCTS

A. Butts:

1. Type: As indicated in the Finish Hardware Schedule.

2. Sizes:

a. For Doors 3'-0" and Under: 4-1/2 inch x 4-1/2 inch, except as required for 180 degree swing.

b. For Doors 3'-1" and over: 5 inch x 4-1/2 inch, except as required for 180 degree swing.

3. Quantities:

a. For Doors up to ninety (90) inches height: Three (3) each.

b. For Doors over ninety (90) inches height: Four (4) each.

4. Special Requirements: Exterior outswinging doors are to have non-removable pins with NRP screw set into the barrel of the hinge.

B. Locksets:

1. Type:

a. Mortise: Grade 1; extra heavy duty; and UL Listed for use on fire doors.

b. Deadbolt function; deadbolt shall have one (1) inch projection.

c. Functions shall be as listed in the Finish Hardware Schedule in this Section; and in accordance with the approved Submittals.

d. Wrought strike boxes.

e. Provide escutcheons in accordance with manufacturer's instructions.

2. Design: Lever; NSV.

3. Backset: 2-3/4 inches.

4. Furnish with strikes having curved lip, and with sufficient lip to protect trim.

a. Three-quarter (3/4) inch latch bolts require minimum three-quarter (3/4) inch clearance for trim.

b. Furnish strikes with extended lip for other configurations.

C. Keying:

1. Furnish keys in configurations and quantities as follows:

a. Master Keys: Furnish six (6).

b. Control Keys: Furnish two (2).

c. Construction Keys: Furnish ten (10).

d. Change Keys: Furnish three (3) per keyed-alike group.

D. Exit Devices: Provide as indicated in this Section.

E. Pushes and Pulls: Provide as indicated in this Section.

F. Manual Flush Bolts: Provide as indicated in this Section.

G. Surface-mounted Door Closers:

1. Furnish drop plates or other mounting plates where required.

2. Provide closers of sufficient size and mounting style for each respective opening.

H. Overhead Stops:

1. Provide proper size and configuration of overhead stop for respective door width.

2. Through-bolt with sex nuts and bolts.

2.03 FINISHES

A. Designations for the hardware finishes are those listed in ANSI/BHMA A156.18 – Materials and Finishes.

B. Finishes for products of this Section shall be as follows.

1. Butts: 630/626.

2. Locksets: 630.

3. Exit Devices: 630.

4. Closers: 689.
5. Pushes and Pulls: 630.
6. Other Items: 626.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 INSTALLATION

A. Install finish hardware in accordance with applicable codes and regulations, manufacturer's written instructions, and this Section.

B. Manufacturer's standard locations shall apply as required to meet applicable code requirements.

C. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

D. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

E. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant.

F. Weather-stripping and Seals: Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

3.02 FIELD QUALITY CONTROL

A. Allowable Tolerances: Level main runners and cross tees to within one-eighth (1/8) inch in twelve (12) feet.

3.03 ADJUSTING

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit.

B. Adjust door control devices to compensate for the final operation of mechanical air-handling systems.

C. Approximately six months after acceptance of hardware in each area, the installer shall return to the project and make any necessary adjustments to the hardware to restore proper operational function of door and hardware.

D. Consult with and instruct County's personnel in any recommended additions or maintenance procedures.

3.04 SCHEDULES

A. Finish Hardware Groups:

1. Electrical items are marked accordingly and shall be coordinated with the electrical subcontractor, for required provision of access controls (ACAMS), circuiting, conduit, cabling, terminations and boxes associated with the finish hardware requiring power and or data.

FINISH HARDWARE GROUP FOR DOORS TO ELECTRICAL ROOM, ELEVATOR MACHINE ROOM, GENERATOR ROOM, COMMUNICATIONS ROOM

		Hinges BB179
1	ea	Cylinder 1090 626
1	ea	Closer 7500SS SNB (provide corrosion resistant optional feature)
1	ea	Overhead stop 9-X36
1	ea	Threshold 171A MS & ES
1	ea	Door bottom 18061CP
1	set	Gasket S88D

FINISH HARDWARE INTERIOR DOOR TO SPRINKLER ROOM

		Hinges BB191 NRP
1	ea	Lockset ML2057VR LC
1	ea	Cylinder 1090
2	ea	Flush bolts 458B
1	ea	Dustproof strike 487B x 489B
1	ea	Closer P7500SS SNB (active leaf, provide corrosion resistant optional feature)
2	ea	Overhead stop 6-X36
1	ea	Threshold 171A MS & ES
2	ea	Door bottom 18061CP
1	set	Gasket S88D
1	set	Meeting stile gasket S77C

FINISH HARDWARE EXTERIOR DOOR TO SPRINKLER ROOM

		Hinges BB179
1	ea	Cylinder 1090 626
1	ea	Closer 7500SS SNB (provide corrosion resistant optional feature)
1	ea	Overhead stop 9-X36
1	ea	Threshold 171A MS & ES
1	ea	Door bottom 18061CP
1	set	Gasket S88D

FINISH HARDWARE OVERHEAD CEILING GRILLE / DOOR

All hardware by door manufacturer except:

1	ea	Cylinder 1090

FINISH HARDWARE DOORS TO STAIRWAYS

		Hinges BB199
1	ea	Exit device ED4200 K157 LC
1	ea	Strike 655F71-8
1	ea	Cylinder 3090
1	ea	Anti-vandal trim 1090
1	ea	Closer P7500SS SNB (provide corrosion resistant optional feature)
1	ea	Drop plate 7788
1	ea	Wall stop 1270CVCP
		Silencers

END OF SECTION

SECTION 08800
GLAZING

PART 1 GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Un-insulated glazing units.

1.02 REFERENCES

A. The following is a list of standards referenced in this Section:

1. IBC – Chapter 24 – Glass and Glazing.

2. IBC – Section 2406 – Safety Glazing.

1.03 SYSTEM DESCRIPTION

A. Provide exterior, single sheet, un-insulated glazing units.

1. Provide glazing units coordinated with the requirements of the regulations for safety glass.

1.04 SUBMITTALS

A. General: Submit the following:

1. Shop Drawings.

2. Maintenance Data.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements: See referenced codes, regulations - 01330 - Submittal Procedures.

B. Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved.

1. Mark and label glazing items in accordance with requirements of IBC - Chapter 24 – Glass and Glazing.

a. Include required labels for safety glass.

PART 2 PRODUCTS

2.01 MATERIALS

A. Glass:

1. Assure the glass materials are in conformance with the regulations and requirements.

2. Clear Float Glass: ASTM C 1036, Type 1 transparent flat, Class I Clear, Quality q3 glazing select, thicknesses as indicated.

3. Safety Glass: In accordance with the regulations.

4. Laminated Glass: Conform to ANSI Z97.1.

2.02 MANUFACTURED UNITS

A. Verify and coordinate glass and related glass and glazing materials with the performance requirements of assembly and installation and as recommended, in writing, by the applicable glass and gasket manufacturers.

B. Performance:

1. Exterior glazing units and glazing units in insulated wall assemblies are to be fabricated in compliance with the energy code performance requirements.

C. 'Category I Safety Glass':

1. Comply with requirements of IBC Section 2406 – Safety Glazing.

D. 'Category II Safety Glass':

1. Comply with requirements of IBC Section 2406 – Safety Glazing.

E. 'GL – 1':

1. Tint: Medium gray-green color tinted glass.

2. Glass: Provide types as required to meet the regulations:

a. Clear Float Glass: ASTM C1036, Type 1 transparent flat, Class 1 clear, Quality q3 glazing select; 1/4 inch thickness.

b. Tempered Glass:

1. Clear tempered with horizontal tempering; conforming to ASTM C1172 and ANSI Z97.1; 1/4 inch thick. Provide safety labeling etched on safety glass.

2. Where required at all hazardous conditions or where indicated on drawings as "T" provide tempered clear glass.

c. Laminated Glass: Provide safety labeling etched on safety glass. Clear laminated glass with 0.030 inch plastic interlayer providing 90% UV radiation screening (wavelength > 380 nanometer); conforming to ANSI Z97.1; 1/4 inch thickness.

3. Low emissivity reflective coating: Metallic deposition coating.

4. Acceptable Products: Provide glazing units manufactured by one of the following:

    a. Libbey Owens Ford.

    b. PPG Industries.

    c. Visteon.

2.03 ACCESSORIES

A. Lamination Film:

1. Characteristics: 0.030 inch clear plastic interlayer film for security and impact protection.

2. Provide products of one of the following:

    a. Stevens Urethane.

    b. 3M.

    c. Solutia.

B. Setting Blocks:

1. Neoprene blocks with 80 to 90 Shore A durometer hardness.

2. Minimum length four (4) inches.

C. Spacer Shims:

1. Neoprene, with 50 to 60 Shore A durometer hardness.

2. Minimum length three (3) inches.

3. Self-adhesive on one face.

D. Glazing Tape:

1. In accordance with Section 07900 – Joint Protection.

E. Glazing Splines: Resilient PVC extruded shape, black color.

F. Glazing Clips: Manufacturers standard type.

G. Glazing Sealants:

1. Provide in accordance with Section 07900 – Joint Protection, and this Section.

2.04 FABRICATION

A. Fabricate insulated glazing units in accordance with the following assemblies.

B. Glazing Units containing ‘Category I Safety Glass’:

1. Fabricate as scheduled, EXCEPT substitute the Category I safety glass in the position within the glazing assembly as prescribed by IBC Section 2406 – Safety Glazing.

2. Color: Provide clear transparent safety glass EXCEPT provide tinted, reflective and etched safety glass where required to comply with the regulations.

C. Glazing Units containing 'Category II Safety Glass':

1. Fabricate as scheduled EXCEPT substitute the Category II safety glass in the position within the glazing assembly as prescribed by IBC Section 2406 – Safety Glazing.

2. Color: Provide clear transparent safety glass EXCEPT provide tinted, reflective and etched safety glass where required to comply with the regulations.

D. GL-1:

1. Exterior Pane: Two (2) layers of 3/16 inch thickness glass laminated together to form a single pane.

a. The exterior material is to be clear transparent glass.

b. The inside material is to be tinted to the color and light transmittance factor selected by the Project Representative.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 INSTALLATION

A. Manufacturer's Instructions:

1. Comply with manufacturer's instructions, including technical bulletins and product catalog data.

3.02 CLEANING

1. Leave labels on glazing units until accepted, and then remove.

2. Wash glass as recommended by glass manufacturer.

B. Remove foreign materials including dust and dirt, and excess adhesive using materials and methods in accordance with manufacturer's written instructions.

C. Remove temporary labels and protective coverings.

D. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION

SECTION 09260
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Metal stud framing.
2. Gypsum board.
3. Exterior gypsum board.
4. Joint treatment and accessories.

1.02 REFERENCES

A. The following is a list of standards referenced in this Section:

1. ASTM C 475 – Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
2. ASTM C 645 – Standard Specification for Nonstructural Steel Framing Members.
3. ASTM C 754 – Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
4. ASTM C 840 – Standard Specification for Application and Finishing of Gypsum Board.
5. ASTM C 954 – Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. to 0.112 in. in Thickness.
6. ASTM C 1002 – Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
7. ASTM C 1047 – Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
8. ASTM C 1280 – Standard Specification for Application of Gypsum Sheathing.
9. ASTM C 1396 – Standard Specification for Gypsum Board.
10. GA-216 – Application and Finishing of Gypsum Board.
11. GA-253 – Application of Gypsum Sheathing.

1.03 SYSTEM DESCRIPTION

A. Provide:

1. Completed gypsum board assemblies conforming to ASTM C 840, and GA-216.

2. Completed exterior gypsum board assemblies conforming to ASTM C 1177; and GA-253.

3. Fire Rated Assemblies: Provide completed assemblies with the following characteristics:

   a. Fire Rated Partitions: UL listed assemblies for one (1) hour ratings.

   b. Design Requirements/Fire Resistive Ratings: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1.04 SUBMITTALS

A. Submit the following:

1. Product Data.

2. Submit fire resistance design data.

1.05 PROJECT CONDITIONS

A. Interior spaces shall be completely enclosed and weathertight prior to start of gypsum board finishing.

B. Room Temperatures:

1. For non-adhesive attachment of gypsum board to framing, maintain not less than forty (40) degrees Fahrenheit.

2. For adhesive attachment and finishing of gypsum board, maintain not less than fifty (50) degrees Fahrenheit for 48 hours before application and continuously after until dry.

3. Do not exceed ninety-five (95) degrees Fahrenheit when using temporary heat sources.

PART 2 PRODUCTS

2.01 ACCEPTABLE PRODUCTS

A. Light gage Metal Framing: Provide products of one of the following manufacturers:

1. Dietrich. (412) 281-2805.

2. Steeler. (206) 725-2500.

3. LGS Systems. (360) 424-7434

B. Gypsum Board: Provide one of the following products:

1. USG. (800) 874-4968 – 'Sheetrock Firecode C Gypsum Panels'.
2. GP. (800) 225-6119 – 'ToughRock Fireguard C Gypsum Board'.
3. BPB. (800) 233-8990 – 'ProRoc Type C'.

C. Exterior Gypsum Board: Provide one of the following products:

1. USG. (800) 874-4968 – 'Fiberock Aqua-Tough Sheathing Panels'.
2. GP. (800) 225-6119 - 'DensGlas Gold'.
3. BPB. (800) 233-8990 – 'ProRoc Sheathing Treated Core Type X'.

2.02 MATERIALS

A. Light Gage Metal Framing/Non-Loadbearing Framing:

1. Comply with ASTM C 645; galvanized sheet steel, of size and properties necessary to comply with ASTM C 754 for the spacings indicated, with maximum deflection of wall framing of L/240 at five (5) PSF.
2. Studs: "C" shaped; with flat or formed webs with knurled faces.
3. Runners: U shaped, sized to match studs.
4. Partition Head To Structure Connections:
    a. Comply with requirements of the authority having jurisdiction.

B. Gypsum Board:

1. Comply with ASTM C 1396.
2. IBCO approved for one-hour fire resistive system detailed.
3. Provide sizes to minimize joints in place.
4. Fire Resistant Type X: Use throughout this Project.
    a. Complying with Type X requirements; UL or WH rated.
    b. Thickness: 5/8 inch.
    c. Edges: Tapered.
    d. Ends: Square cut.

C. Exterior Gypsum Board:

1. Provide exterior gypsum sheathing panels with EITHER:

a. Moisture-resistant core, and coated inorganic fiberglass mat back surface designed to resist growth of mold and mildew, per ASTM D 3273; OR

b. Fiber-reinforced, moisture-resistant core, and designed to resist growth of mold and mildew, per ASTM C79; ASTM C 1396; and C 1278.

2. Comply with performance requirements of ASTM C 1177 for sheathing.

3. IBCO approved for one-hour fire resistive system detailed.

4. Provide with tapered long edges.

5. Provide fire-resistant Type X core; thickness 5/8 inch.

2.03 ACCESSORIES

A. Finishing Accessories:

1. Provide steel beaded units conforming to ASTM C 1047; and hot dipped in accordance with ASTM A 653; minimum G30 coating.

a. Provide with flanges for concealment beneath joint compound.

b. Provide shapes in accordance with ASTM C 1047.

2. Joint tape shall not be used for inside and outside corners on this Project; use rolled zinc profiles.

B. Joint Materials for Gypsum Board:

1. Conforming to ASTM C 475, and as recommended by gypsum board manufacturer for project conditions.

2. Tape: Two (2) inch width, coated glass fiber tape for panel butt joints, and edges.

3. Joint Compound for Gypsum Board:

a. Provide powder-type, vinyl-based joint compound, or as indicated by gypsum board manufacturer.

C. Joint Materials for Exterior Gypsum Board:

1. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film.

2. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.

D. Screws for Applications to Light Gage Metal Framing:

1. Comply with manufacturer instructions; utilize recommended fasteners for optimum holding power and corrosion-resistance for the project conditions.

2. Provide fasteners conforming to ASTM C 1002 for fastening to steel framing less than 0.0329 inch thickness.

3. Employ self-piercing, self-tapping type screws; cadmium-plated.

E. Screws for Applications to Cold-Formed Metal Framing:

1. Comply with manufacturer instructions; utilize recommended fasteners for optimum holding power and corrosion-resistance for the project conditions.

2. Provide fasteners conforming to ASTM C 954 for fastening to steel framing between 0.033 to 0.112 inch thickness.

PART 3 EXECUTION

3.01 INSTALLATION

A. Metal Framing:

1. Install in accordance with ASTM C 754; and light gage metal framing manufacturer's instructions.

B. Fire-Rated Construction:

1. Furring for Fire Ratings: Install as required for fire resistance to GA-600 requirements.

C. Gypsum Board:

1. Comply with ASTM C 840, GA-216, and manufacturer's instructions.

2. Finish gypsum board in accordance with ASTM C 840, Level 4.

a. Level 4: All joints and angles shall have tape bedded in joint compound and have three (3) separate coats of compound.

D. Exterior Gypsum Board:

1. Install in strict accordance with manufacturer's written installation instructions.

a. Comply with ASTM C 1280; and GA-253.

2. Use fiberglass joint tape, bedded and finished with chemical hardening type joint compound.

3. Control Joints.

3.02 FIELD QUALITY CONTROL

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: One-eighth (1/8) inch in ten (10) feet in any direction.

END OF SECTION

SECTION 09650
RESILIENT BASE

PART 1 GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Roll-type resilient wall base, and accessories.

1.02 REFERENCES

A. The following is a list of standards referenced in this Section:

1. ASTM F 1861 – Standard Specification for Resilient Wall Base.

1.03 SUBMITTALS

A. General: Submit the following:

1. Product Data.

2. Maintenance Data.

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

A. Resilient Base:

1. Provide product complying with ASTM F 1861.

a. Characteristics: Group I, Type TS Rubber, Thermoset Vulcanized Extruded Rubber Cove Base.

b. Style: Cove profile; Style B.

c. Finish: Satin; color: Black.

d. Length: Provide rolls; precut stock is not acceptable.

e. Dimensions: Height four (4) inches; with thickness 0.125 inch (1/8 inch).

2. Accessories: Provide pre-molded inside and outside corners, and end stops in color and finish combinations to match resilient base material.

3. Provide products of one of the following:

a. BurkeMercer Flooring Products.

b. Johnsonite.

c. Roppe.

B. Adhesives:

1. Provide in accordance with manufacturer recommendations.

C. Sealer, Filler and Primer:

1. Characteristics: Provide products with water-resistant formulations, and in accordance with manufacturer's recommendations.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 INSTALLATION

A. Manufacturer's Instructions:

1. Comply with manufacturer's instructions, including technical bulletins and product catalog data.

END OF SECTION

SECTION 09910
PAINTING

PART 1 GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Interior painting.
2. Exterior painting.
3. Surface preparation for substrates requiring painting.

1.02 REFERENCES

A. The following is a list of standards referenced in this Section:

1. PDCA – Architectural Specifications Manual.
2. MPI – Architectural Painting Specification Manual.
3. MPI – Approved Products List.
4. SSPC – Volume 1, Good Painting Practice.
5. SSPC – Volume 2, Systems and Specifications.
6. IBC – Chapter 8, Interior Finishes.

1.03 SYSTEM DESCRIPTION

A. Work of this Section is organized in accordance with the painting systems developed by the Master Painters Institute (MPI).

B. Surfaces Not Requiring Finish:

1. Metals: Brass; copper; plated metals other than galvanized; stainless steel; pre-finished metals.
2. Factory finished items; except where factory finish is incomplete; or where specifically required.
3. Plastic laminate.
4. Glass.
5. Coil-coated sheet metal.
6. Fabrics; plastics; and materials normally left unfinished.
7. Inaccessible materials and products permanently enclosed behind building construction.

8. Concrete surfaces indicated to receive sealer.

9. Concrete masonry except as indicated.

1.04 SUBMITTALS

A. General: Submit the following:

1. Material and Product List.

2. Product Data.

3. Maintenance Data: Provide in 'Project Operation and Maintenance Manual'.

1.05 PROJECT/SITE CONDITIONS

A. Environmental Requirements:

1. Do not perform work of this Section when the relative humidity exceeds 85 percent.

2. Do not perform Work of this Section when air temperatures are within 5 degrees F of the dew point.

3. Do not attempt to apply paints to any surfaces which are sweating, damp, wet or otherwise compromised by presence of moisture.

4. Interior Work:

a. Mechanical system is to be operating and maintaining temperature and relative humidity at occupancy levels during work of this Section continuously through the remainder of the construction period.

5. Exterior Work:

a. Perform exterior work of this Section when exterior temperatures and substrate temperatures are 45 degrees F or above.

b. Do not perform exterior work of this Section, including surface preparation, when conditions of snow, fog, rain, or mist.

B. Lighting:

1. Provide adequate temporary lighting to attain surface lighting level, and not less than 15 foot candles per square foot, measured at the work surface.

PART 2 PRODUCTS

2.01 FINISHES

A. MPI #35, Bituminous Coating, range E3 or E2.

i. Locations: Dissimilar metals in contact, or close contact with one another.

ii. Coats: One (1)

B. MPI #50, Interior Latex Primer/Sealer, range E3.

i. Locations: Surface primer on gypsum wall board, medium-density fiberboard or concrete interior wall surfaces to receive latex or alkyd finish coat.

ii. Coats: Per manufacturer's instructions for the surfaces intended.

C. MPI #145, Latex Interior Institutional Low VOC (MPI Gloss Level 3), range E3

i. Locations: Intermediate and topcoat on gypsum wall board, medium-density fiberboard or concrete interior wall surfaces.

ii. Coats: Two (2)

D. MPI #47, Alkyd Interior Semi-Gloss (MPI Gloss Level 5), range E3 or E2.

i. Locations: Intermediate and topcoat on gypsum wall board, medium-density fiberboard or concrete interior wall surfaces; interior metal doors and frames, metal fabrications and materials not concealed by finish construction, structural steel.

ii. Coats: Two (2)

E. MPI #23, Interior/Exterior Solvent Based Metal Primer, Surface Tolerant, range E3.

i. Locations: Surface primer on metal doors and frames, ferrous metal fabrications and materials not concealed by finish construction, structural steel.

ii. Coats: Per manufacturer's instructions for the surfaces intended.

F. MPI #79, Interior/Exterior Solvent Based Alkyd Metal Primer, Anti-Corrosive, range E2 or E3.

i. Locations: Surface primer on metal doors and frames, ferrous metal fabrications and materials not concealed by finish construction, structural steel.

ii. Coats: Per manufacturer's instructions for the surfaces intended.

G. MPI #151, Water Based Interior Light industrial Coating (MPI Gloss Level 3), range E2 or E3.

i. Locations: Intermediate and topcoat on interior metal doors and frames, ferrous metal fabrications and materials not concealed by finish construction, structural steel.

ii. Coats: Two (2)

H. MPI #153, Water Based Semi-Gloss Interior Light Industrial Coating (MPI Gloss Level 5), range E2 or E3.

i. Locations: Intermediate and topcoat on interior metal doors and frames, ferrous metal fabrications and materials not concealed by finish construction, structural steel.

ii. Coats: Two (2)

I. MPI #105, Solvent or Water Based Graffiti Protection Top Coat, range E3.

i. Locations: Exposed concrete masonry surfaces.

ii. Coats: Per manufacturer's instructions for the surfaces intended.

iii. Comply and coordinate application with the requirements of water repellant coatings applied to surface in accordance with Section 07910.

J. MPI #108, High Build Epoxy, Low Gloss, two component system, range E3.

i. Locations: Interior or exterior concrete, masonry, primed metal surfaces.

ii. Coats: Per manufacturer's instructions.

K. Polyurethane, Moisture-Cured, Pigmented, Gloss Level 5 or 6.

i. Locations: Topcoat over MPI #108 at elevator cab floors.

2.02 SOURCE QUALITY CONTROL

A. VOC Guidelines: Utilize products listed by MPI for conformance to VOC guidelines.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 09965
GRAFFITI RESISTANT COATINGS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Graffiti-resistant coatings on masonry and concrete.

1.02 RELATED SECTIONS

A. 07910 Water Repellent Coatings

B. 09910 Painting

1.03 SYSTEM DESCRIPTION

A. Install two-part graffiti resistant system.

1. Base: Water-Repellent Coating.

a. Comply with the requirements of Section 01910, and conform to manufacturer's instructions.

2. Top Coat: Graffiti Protection Top Coat.

a. Comply with the requirements of Section 09910, and conform to manufacturer's instructions.

1.04 SUBMITTALS

A. General: Submit the following in accordance with the Conditions of Contract and Section 01330 – Submittal Procedures:

1. Product Data: Submit manufacturer's product data sheets for each item.

2. Material Safety Data Sheets (MSDS).

3. Maintenance instructions for products used in this Section.

1.05 PERFORMANCE REQUIREMENTS

A. Provide anti-graffiti system complying with the following:

1. Capable of removing 100% of all types of paint and graffiti materials from treated surfaces without damaging the coating or the substrate. No evidence of graffiti shall remain on the surface.

2. Capable of withstanding a minimum of 200 cleaning cycles without measurable coating deterioration.

1.06 PROJECT/SITE CONDITIONS

A. Plan application to occur on windless days; with no rain in the forecast; and ambient temperatures in the range of forty (40) to ninety (90) degrees Fahrenheit.

1.07 MAINTENANCE

A. Maintenance Material: Manufacturer's recommended maintenance materials shall be readily available and distributed in the Pacific Northwest.

PART 2 PRODUCTS

2.01 ACCEPTABLE PRODUCTS

A. Graffiti-Resistant Coating: Per Section 09910.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 APPLICATION

A. Install coating in accordance with applicable codes and regulations, manufacturer's written instructions, and this Section.

B. Apply graffiti resistant coating within seven (7) days of application of the water repellent coating indicated in Section 07910 – Water Repellent Coatings.

3.02 CLEANING

A. Remove spills and over-spray immediately, paying particular attention to horizontal surfaces, which may subsequently become slippery.

END OF SECTION

SECTION 10200
FIXED LOUVERS AND VENTS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Exterior, fixed blade aluminum louvers.

2. Fixed vents.

1.02 REFERENCES

A. The following is a list of standards referenced in this Section:

1. ASTM B 209 – Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate.

2. ASTM B 211 – Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire.

3. AWS – Structural Welding Code.

4. NAAMM – Metal Finishes Manual.

5. SMACNA – Architectural Sheet Metal Manual.

1.03 SYSTEM DESCRIPTION

A. Provide fixed louvers and vents in locations shown on the Drawings, and in accordance with this Section.

1.04 QUALITY ASSURANCE

A. Comply with SMACNA Architectural Sheet Metal Manual recommendations for fabrication, construction details, and installation procedures.

PART 2 PRODUCTS

2.01 MATERIALS

A. Aluminum Extrusions: ASTM B 211; Alloy 6063- T5; 6063-T6; or 6061-T6.

B. Aluminum Sheet: ASTM B 209; Alloy 1100, 3003, or 5005.

2.02 ACCEPTABLE PRODUCTS

A. Fixed Extruded Aluminum Drainable Louvers:

1. Characteristics:

a. Frame: Four (4) inch depth minimum.

b. Head, sill, and jambs to be fabricated from one piece 0.081 inch thickness extruded structural aluminum sections, with integral sealant slot and retaining beads.

c. Products shall include closed-cell PVC compression gaskets between bottom of mullion or jamb and top of sill to ensure leak tight connections.

d. When tested in accordance with AMCA Standard 500L in a four (4) foot by four (4) foot sample, products shall have the following performance or better:

    1. Free area shall be fifty (50) percent or greater.

    2. Free area velocity at beginning point of water penetration: Not less than 1,000 FPM.

    3. Air volume flow rate at beginning point of water penetration: Not less than 10,000 CFM.

    4. Pressure drop at beginning point of water penetration: Not more than 0.20 inches (water).

e. Blades/Mullions:

    1. Stationary; horizontal; and inclined at an angle between 35 and 40 degrees from the horizontal; and spaced at approximately 3-1/2 inch on center spacings.

    2. Fabricated from one piece 0.081 inch thickness extruded structural aluminum sections, with gutters designed to catch and direct water to jamb and mullion drains.

    3. Where located adjacent to metal wall panels, align horizontal louver mullions with panel corrugations.

f. Finish: Manufacturer's three (3) coat fluoropolymer coating.

    1. Comply with NAAMM Metal Finishes Manual; manufacturer's factory-applied finishes data.

g. Provide end-dammed sill flashings.

h. Bird screen:

    1. One-half (1/2) inch by one-half (1/2) inch mesh from nineteen (19) gage galvanized steel wire.

    2. Bird screen shall be mounted in continuous perimeter frames, and mounted on the inside of each louver using sheet metal screws.

2. Provide one of the following products:

    a. Airolite – (740) 373-7676 - 'K6744 Drainable Louver'.

b. Greenheck (715) 359-6171 - ‘ESD 435 Stationary Louver with Drainable Blade’.

c. C/S Group – (800) 233-8493 - ‘A4097 – High Performance Drainable Fixed Mullion Louver’.

B. Fixed Vents:

1. Characteristics:

a. Depth: Four (4) inches minimum.

b. Material: Extruded aluminum, 6063-T5 alloy, minimum 0.125" thick with 1/4" structural ribs, and die-formed 7 x 7 mesh.

c. Finish: As selected from the manufacturer’s line of premium finishes.

d. Non-drainable.

e. Bird Screen: 0.028" diameter wire aluminum screen mechanically secured to interior face of vent.

f. Provide one of the following products:

1. Ruskin. (816) 761-7476 - ‘BV100 Brick Vent’.

2. Sunvent Industries. (800) 325-4115 – ‘Cast Aluminum Brick and Block Vents’.

2.03 ACCESSORIES

A. Fasteners:

1. Provide fasteners to meet manufacturer’s requirements for installation.

2. Use stainless steel, or fluoropolymer-coated fasteners for improved corrosion resistance.

B. Anchors:

1. Use drilled epoxy anchors into brick, and concrete unit masonry installations.

a. Structural epoxy: Provide one of the following products:

1. Hilti – ‘HIT HY-150’.

2. Dayton-Superior – ‘Sure-Anchor Epoxy J-50 FS’.

2. Use drilled wedge anchors in concrete installations.

a. Wedge Anchors: Provide one of the following products:

1. Hilti – ‘Kwik Bolt 3’.

2. Red Head – 'Trubolt'.

2.04 SOURCE QUALITY CONTROL

A. Design units to withstand wind and snow loads as required by the applicable codes, and in accordance with requirements of authorities having jurisdiction.

B. Design materials and products for maximum allowable deflection of the louver structural members to be 1/180, OR three-quarter (3/4) inch; whichever is less.

C. Design materials and products for maximum allowable deflection of the louver blades to be 1/120, OR one-half (1/2) inch when measured across the weak axis; whichever is less.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 INSTALLATION

A. Install fixed louvers in accordance with applicable codes and regulations, manufacturer's written instructions.

3.02 PROTECTION

A. Clean and 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

SECTION 10440
SIGNAGE

PART 1 GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Signs including cast dimensional letters, wall mounted, post mounted and overhead mounted signs complete with components required for installation from the manufacturer.

1.02 SYSTEM DESCRIPTION

A. Design criteria: Design to resist wind loads of 100 MPH, temperature fluctuations from zero (0) to one hundred (100) degrees Fahrenheit.

B. Signs are for a high use public space, all materials and installation techniques are intended to withstand this type of application.

1.03 SUBMITTALS

A. Submit for review:

1. Product data:

2. Shop drawings.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements:

a. 1. Comply with the Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.

PART 2 PRODUCTS

2.01 MATERIALS

A. 'Flag Sign':

1. Manufacturers:

a. National Sign Corporation. (206) 282-0700.

b. Shoreline Sign and Awning.

c. Foley Sign Company.

2. Characteristics:

a. Body Material: Sheet Metal to comply with Section 05500 - Metal Fabrications.

b. Backlit Sign Face:

1. Material: Acrylic.

c. Cast Dimensional Letters:

1. Produce characters with smooth flat faces, sharp corners, and precisely formed lines and profiles, free of pits, scale, sand holes, and other defects.

2. Alloy and temper cast dimensional letters as recommended by sign manufacturer for the casting process used, and for the use and finish characteristics indicated in this Section.

3. Thickness: Three-quarter (3/4) inch.

4. Finish: Clear Anodized.

5. Mounting: Routed push-through studs, When finished, cast dimensional letters shall be proud of the finished wall surface three-quarters (1/2) inch.

6. Stand-offs shall be 304 or 316 stainless steel material.

d. Support Brackets: Structural Steel to comply with Section 05500 - Metal Fabrications.

e. Lighting: Neon Grid Backlit.

f. Painting: Painted sign materials to comply with Section 09910 – Painting.

3. Lighting Controls:

a. Automatic Programmable Timer with Manual Key Override.

4. Attach sign to building by bracket.

B. ‘Dimensional Letters’:

1. Manufacturers:

a. ASI Sign Systems. (800) 274-7732.

b. Gemini, Inc. (800) 538-8377.

c. DPA Signs. (206) 362-2323.

2. Installer:

a. Messenger Sign Company.

b. Foley Sign Company.

c. Shoreline Sign & Awning.

3. Cast Dimensional Letters:

    a. Description:

        1. Cast lugs into back of characters and tap to receive threaded mounting studs (also identified in this Section as ‘stand-offs’.

        2. Alloy and temper cast dimensional letters as recommended by sign manufacturer for the casting process used, and for the use and finish characteristics indicated in this Section.

    b. Characteristics:

        1. Material: Solid Aluminum.

        2. Thickness: Three-quarter (3/4) inch.

        3. Finish: Dark bronze anodized, satin.

    c. Mounting:

        1. When finished, cast dimensional letters shall be proud of the finished wall surface three-quarters (3/4) inch.

        2. Stand-offs shall be 304 or 316 stainless steel material; threaded on one end for attachment to the cast dimensional letter; and smooth on the opposite end for attachment to the building.

        3. Provide and install an appropriate non-staining two-part epoxy adhesive approved by the manufacturer for securing stand-offs to brick masonry.

        4. Stand-offs shall penetrate the finished surface of brick masonry at least one (1) inch.

C. ‘Information Signs’:

1. Characteristics:

    a. Materials: 3mm Dibond composite aluminum sheet.

    b. The matte color bands on signs are to be 0.080 thick acrylic.

    c. Graphics: All surfaces to be painted a matte color.

    d. Paint shall be a two-part acrylic polyurethane:

        1. Matthews Paint Corp.

    e. Prime and paint according to the manufacturer’s substrate preparation instructions.

    f. Surface to be protected with a clear top coat.

g. Mounting: Wall mounting of flat sheet sign types to be with mechanical fasteners, countersunk stainless steel square drive screws to be installed at top and bottom edges.

h. Screw faces to be painted to match sign faces.

i. Attachment: Signs with acrylic color bands to be attached with 'VHB' tape by 3M.

2. Manufacturers:

a. Graphic Systems, Inc.

b. APCO Northwest. (206) 835-6830.

c. ASI Sign Systems. (800) 274-7732.

D. 'Directional Signs':

1. Locations: Mounted on beams and walls.

2. Characteristics:

a. Materials: 3mm Dibond composite aluminum sheet. The matte color bands on signs are to be 0.080 thick acrylic.

b. Font: Color shall be white; seven (7) mil 'Scotchlite #680-10' pressure sensitive reflective vinyl by 3M.

c. Graphics: All surfaces to be painted a matte color.

d. Paint shall be a two-part acrylic polyurethane:

1. Matthews Paint Corp.

e. Prime and paint according to the manufacturer's substrate preparation instructions.

f. Mounting: Wall mounting of flat sheet sign types to be with mechanical fasteners, countersunk stainless steel square drive screws to be installed at top and bottom edges.

g. Screw faces to be painted to match sign faces.

h. Flush mount to wall and columns with concealed hardware.

i. Mounting on beam at center of the drive aisle.

j. Attachment: Signs with acrylic color bands to be attached with 'VHB' tape by 3M.

3. Manufacturers:

a. Graphic Systems, Inc.

b. APCO Northwest. (206) 835-6830.

c. ASI Sign Systems. (800) 274-7732.

E. 'Traffic Signs':

1. Locations: Mounted on Security Grill, posts and columns.

2. Mounting: Mechanical fasteners in accordance with manufacturer's recommendations.

3. Manufacturers:

a. Safety Sign (800) 274-6271.

F. 'Clearance Warning Bars':

1. Location: Mounted at entrance and ramp up location.

2. Characteristics:

a. Materials: Six (6) inch pipe.

b. Font: Color shall be black; Seven (7) mil 'Scotchlite #680-85' pressure sensitive reflective vinyl by 3M.

c. Graphics: All surfaces to be painted a matte color.

d. Paint shall be a two-part acrylic polyurethane:

1. Matthews Paint Corp.

e. Prime and paint according to the manufacturer's substrate preparation instructions.

f. All exposed surfaces to be free of blemishes and imperfections.

g. Mounting: Ceiling mounted hanging pipes to be suspended with 3/32 inch '#332 CWR' wire rope by T.C. International.

h. Wire crimps to be '#05403' oval sleeves.

i. Concrete anchors shall be one-quarter (1/4) inch diameter '#52037 Trubolt Wedge Anchor' by ITW Ramset/Redhead.

G. 'Miscellaneous Informational Signs:

1. Locations: Mounted on columns and walls.

2. Characteristics:

a. Materials: 3mm Dibond composite aluminum sheet. The matte color bands on signs are to be 0.080 thick acrylic.

b. Graphics: All surfaces to be painted a matte color.

c. Paint shall be a two-part acrylic polyurethane:

    1. Matthews Paint Corp.

d. Prime and paint according to the manufacturer's substrate preparation instructions.

e. All exposed surfaces to be free of blemishes and imperfections.

f. Mounting: Wall mounting of flat sheet sign types to be with mechanical fasteners, countersunk stainless steel square drive screws to be installed at top and bottom edges. Screw faces to be painted to match sign faces.

g. Attachment: Signs with acrylic color bands to be attached with 'VHB' tape by 3M.

PART 3 EXECUTION

Not used.

END OF SECTION

SECTION 10523
FIRE EXTINGUISHERS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Portable fire extinguishers.

1.02 REFERENCES

A. The following is a list of standards referenced in this Section:

1. NFPA 10 – Standard for Portable Fire Extinguishers.
2. UL 299 – Dry Chemical Fire Extinguishers.
3. UL 711 – Determinations of Small Specimens of Material.
4. UL – Product Directory.

1.03 SYSTEM DESCRIPTION

A. Provide dry-chemical type portable fire extinguishers.

1.04 SUBMITTALS

A. General: Submit the following in accordance with the Conditions of Contract and Section 01330:

1. Product Data.
2. Shop Drawings:

a. Provide a floor plan for each level; plans shall be marked with the proposed fire extinguisher locations.

B. Operation and Maintenance Data:

1. Submit manufacturer's operation and maintenance data.
2. Provide test information; refill and recharge schedules; procedures; and re-certification requirements.

PART 2 PRODUCTS

2.01 PRODUCTS

A. Comply with governing authorities' requirements; this Section; and manufacturer's published product data.

B. Characteristics:

1. Multi-purpose dry chemical, under-pressure type OR as required by local agencies.

2. Steel tank with pressure-indicating gage.

3. Tested and listed in accordance with UL 299 and UL 711, and identified in UL Product Directory for Class A, B, and C fires.

4. Five (5) pound capacity.

5. Tank Finish: Enamel; red color.

6. Fill and service extinguishers in accordance with governing authorities' requirements.

C. Provide fire extinguishers from one of the following manufacturers:

1. Larsen's Manufacturing Company. (800) 527-7367.

2. J.L. Industries. (800) 554-6077.

3. Amerex Corp. (205) 655-3271.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 INSTALLATION

A. Install system in accordance with applicable codes and regulations, manufacturer's written instructions, and this Section.

END OF SECTION

SECTION 10524
FIRE EXTINGUISHER CABINETS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes the following:

1. Fire extinguisher cabinets.

1.02 SYSTEM DESCRIPTION

A. Provide non-rated, surface-mounted, enameled steel box fire extinguisher cabinets in locations indicated on the Drawings, and as directed.

B. Fire extinguisher cabinets shall include anodized aluminum doors and trims, with inset glazing panels.

C. Every fire extinguisher cabinet shall receive and include an approved fire extinguisher bracket.

D. Quantity:

1. Meet quantity requirements of the authority having jurisdiction.

2. Also provide one (1) each in Mechanical and Electrical Rooms and Electrical Closets.

1.03 SUBMITTALS

A. General: Submit the following in accordance with the Conditions of Contract and Section 01330:

1. Product Data.

PART 2 – PRODUCTS

2.01 ACCEPTABLE PRODUCTS

A. Provide models and types designed to accommodate the fire extinguishers identified in Section 10523 – Fire Extinguishers.

1. Characteristics:

a. Cold-rolled steel box enclosure, with manufacturer's corrosion-resistant powder coating; color shall be white. Stainless steel cabinets are acceptable.

b. Door: Matching steel door and trim; one piece; with tempered safety glass inset into door.

c. Provide manufacturer's standard pull handle with self-adjusting roller catch.

d. Provide surface-mount cabinets.

2. Fire Extinguisher Brackets:

    a. Locations: Provide inside fire extinguisher cabinets, and in each location where fire extinguishers are required.

    b. Characteristics:

        1. Material: Steel.

        2. Finish: Red enamel.

    c. Provide products of one of the following:

        1. Braden & McSweeny, Inc. (412) 279-3320.

B. Provide fire extinguisher cabinets from one of the following manufacturers:

    1. Larsen's Manufacturing Company (800) 527-7367.

    2. J.L. Industries (800) 554-6077.

PART 3 – EXECUTION

Not used.

END OF SECTION

SECTION 13010
GENERAL LOW VOLTAGE SYSTEMS PROVISIONS

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes general requirements for all Division 13 work and is supplemental and in addition to the requirements of Division 1.

1. It is the intention of this Division of the Specifications to establish minimum standards and guidelines for providing complete and operational electrical installations on a Design-Build performance basis. It shall be the Low Voltage Contractor's (LVC's) responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment, materials, devices and necessary appurtenances specified in Division 13 work to provide a complete system. Connect equipment and devices furnished and installed under other Divisions of this specification under this Division.

2. The LVC shall provide all materials, appliances and apparatus not specifically mentioned herein, but which are necessary to make a complete, fully operational installation of all electrical systems described herein.

3. The LVC shall provide all work to comply with the Electrical Design Criteria and these performance specifications.

B. Workmanship shall be of the best quality and none but competent and experienced electricians shall be employed and shall be under the supervision of a competent and experienced foreman.

C. See Division 1 for sequence of work.

1.02 DESIGN-BUILD RESPONSIBILITY

The LVC shall become the engineer of record as required by the authorities having jurisdiction (AHJ's). It shall be the LVC's responsibility to design and provide complete drawings, and load calculations as required to obtain all necessary approvals and permits, as well as to provide accurate and useful record documents. The LVC shall confirm all special local code requirements, including requirements for engineered stamped documents (signed and dated PE stamp on drawings and specifications if required by the code authority), prior to permit application.

1.03 WORK IN OTHER DIVISIONS

A. See all other specifications for other work which includes but is not limited to:

1. Temporary Power

2. Cutting and Patching

3. Door Hardware

4. Painting, Refinishing and Finishes

5. Equipment Wiring

6. Mechanical Equipment

7. Fire Protection

1.04 CODES, PERMITS, INSPECTION FEES

A. The following code and standards are referenced in the Division 13 specifications. Perform all work and provide materials and equipment in accordance with the latest referenced codes and standards of the following organizations:

1. American National Standards Institute (ANSI)

2. National Electrical Manufacturer's Association (NEMA)

3. National Fire Protection Association (NFPA)

4. Underwriter's Laboratories (UL)

5. Washington Administrative Code (WAC)

B. Install the electrical systems based on the following:

NFPA 70 National Electrical Code as adopted and amended by the Local Jurisdiction.

IBC International Building Code as adopted and amended by the Local Jurisdiction.

C. The referenced codes establish a minimum level of requirements. Where provision of the various codes conflict with each other, the more stringent provision shall govern. If any conflict occurs between referenced codes and this specification, the codes are to govern. Compliance with code requirements shall not be construed as relieving the Developer from complying with any requirements of the drawings or specifications which may be in excess of requirements of the governing codes and rules and not contrary to same.

D. Obtain and pay for all licenses, permits and inspections required by laws, ordinances and rules governing work specified herein. Arrange for inspection of work by the inspectors and give the inspectors all necessary assistance in their work of inspection.

1.05 WARRANTY

A. Refer to General Terms Conditions of the Contract.

B. All materials, equipment and systems furnished that include provisions for storing, displaying, reporting, interfacing, inputting, or functioning using date specified information shall be warranted to perform properly in all respects regardless of the century. Any interfaces to other new or existing materials, equipment or systems shall be warranted to function properly and shall be century compliant both in regards to information sent and received.

1.06 SUBMITTALS AND SHOP DRAWINGS

A. Submittals and Shop Drawings: Schedule so as not to delay construction schedule and no later than 60 days after award of contract, submit common brochure(s) with index and divider tabs by specification section (include paragraph numbers to indicate specification compliance), containing all required catalog cuts. Allow two weeks for review for each submittal and re-submittal. Incomplete submittals and shop drawings which do not comply with these requirements will be returned for correction, revision and resubmittal. See General Conditions for format, quantity, etc.

B. Submit in a three ring binder with hardboard covers. Submittals shall show:

1. Indicate listing by UL or other approved testing agency.

2. Highlight with yellow or blue marker adequate information to demonstrate materials being submitted fully comply with contract documents.

3. Review and check all material prior to submittal and stamp "Reviewed and Approved".

C. Shop drawings shall show:

1. Ratings of items and systems.

2. How the components of an item or system are assembled, interconnected, function together and how they will be installed on the project.

3. Coordinate with other division shop drawings and submittals. Identify interface points and indicate method of connection.

D. The Developer agrees:

1. The purpose of submittals and shop drawings by the Developer is to demonstrate to King County that the Developer understands the design concept.

2. Submittals demonstrate equipment and material Developer intends to furnish and install and indicate detailing fabrication and installation methods Developer intends to use.

3. To accept all responsibility for assuring that all materials furnished under this Division of the specifications meet, in full, all requirements of the contract documents.

E. The King County review is only for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Corrections or comments made during this review do not relieve Developer from compliance with the requirements of the drawings and specifications. Developer is responsible for: Dimensions that shall be confirmed and correlated at the job site; fabrication process and techniques of construction; coordination of his work with that of all other trades; performing his work in a safe and satisfactory manner.

F. Submittals and shop drawings are required per the submittals schedule at the end of this Section.

1.07 LOW VOLTAGE EQUIPMENT OPERATION AND MAINTENANCE (O&M) MANUALS

A. Provide O&M manuals required in Division 1 for all equipment furnished under Division 13 of the specifications. Deliver final bound corrected copies as noted in Division 1 prior to scheduled instruction periods. Obtain a receipt for the manuals and forward a copy of the receipt to King County with the Job Completion Form.

B. The information included must be the exact equipment installed. Where sheets show the equipment installed and other equipment, the installed equipment shall be neatly and clearly identified on such sheets.

C. These O&M manuals shall contain all the information needed to operate and maintain all systems and equipment provided in the project. Present and arrange information in a logical manner for efficient use by the County's operating personnel. The information provided shall include but not be limited to the following:

1. Equipment manufacturer, make, model number, size, nameplate data, etc.

2. Description of system configuration and operation including component identification and interrelations. A master control schematic drawings(s) may be required for this purpose.

3. Dimensional and performance data for specific unit provided as appropriate.

4. Manufacturer's recommended operation instructions.

5. Manufacturer's recommended servicing data including frequency.

6. Complete parts list including reordering information, recommended spares and anticipated useful life (if appropriate). Parts lists shall give full ordering information assigned by the original parts manufacturer. Relabeled and/or renumbered parts information as reassigned by equipment supplier not acceptable.

7. Shop drawings.

8. Wiring diagrams.

9. Equipment submittals shall contain step-by-step circuit description information designed to acquaint maintenance personnel with equipment operation in each mode of operation.

10. A complete list of local (nearest) manufacturer representative and distributor contacts for each type of equipment and manufacturer. Include name, company, address, phone, fax, e-mail address, and web site.

D. Furnish complete wiring diagrams for each system for the specific system installed under the contract. "Typical" line diagrams will not be acceptable unless revised to indicate the exact field installation.

E. Group the information contained in the manuals in an orderly arrangement by specification index. Provide a typewritten index and divider sheets between categories with identifying tabs. Bind the completed manuals with hard board covers not exceeding 5" thick. (Provide two or more volumes if required.) Signal and communication systems shall be in separate volumes. Imprint the covers with the name of the job, Owner, Architect, Electrical Engineer, Developer and year of completion. Imprint the back edge with the name of the job, Owner and year of completion. Hard board covers and literature contained may be held together with screw post binding.

1.08 INSTRUCTION PERIODS

A. After Substantial Completion of the work after the O&M manuals have been delivered to King County and after all tests and final inspection of the work by the Authority(s) Having Jurisdiction; demonstrate the electrical systems and instruct the County's designated operating and maintenance personnel in the operation and maintenance of the various electrical systems. The Developer shall arrange scheduled instruction periods with King County. The Developer's representatives shall be superintendents or foremen knowledgeable in each system and supplier's representatives when so specified. When more than one training session is specified, the second session shall be 30 to 90 days after the first as agreed to by King County.

B. Include in each instruction session an overview of the system, presentation of information in maintenance manuals with appropriate references to drawings. Conduct tours of the building areas with explanations of maintenance requirements, access methods, servicing and maintenance procedures, equipment cleaning procedures and adjustment locations.

C. Include the following scheduled instruction periods: 1st Session 2nd Session

1. Panic Alarm System 4 hours 2 hours

2. CCTV System 4 hours 4 hours

D. Factory trained suppliers representatives shall provide instruction for all systems.

E. Provide one professionally produced DVD of each training session. Furnish two (2) copies to the County.

1.09 RECORD DRAWINGS

A. Continually record the actual electrical system(s) installation on a set of prints kept readily available at the project during construction. These prints shall be used for this purpose alone.

1. Mark record prints with red erasable pencil. Mark the set to show the actual installation where the installation varies substantially from the work as originally shown.

2. Accurately locate with exact dimensions all underground and underslab raceways and stub-outs.

3. Note changes of directions and locations, by dimensions and elevations, as utilities are actually installed.

4. Include addenda items and revisions made during construction.

5. Erase conditions not constructed or "X-out" and annotate "not constructed" to clearly convey the actual "as constructed" condition.

6. Organize record drawings sheets in manageable sets, bind and print suitable titles, dates and other identification on the cover of each set.

B. Transmit the record drawing set to the King County Project Representative at the completion of the work. Final payment to the Developer will not be authorized until these prints have been submitted to and accepted by the King County Project Representative.

C. Transfer the changes marked up on the record prints into AutoCAD Release 14 (or higher) at the completion of the work. Provide two (2) sets of prints, one set of fixed line reproducible drawings and one set of AutoCAD drawing files on CD. Transmit drawings, CAD files and the record drawing mark-ups to the King County Project Representative. Final payment to the Developer will not be authorized until these document have been submitted to and accepted by the King County Project Representative.

1.10 FINAL ACCEPTANCE REQUEST

A. Submit to King County a Job Completion Form (form attached in this section) properly filled out.

1.11 ABBREVIATIONS AND DEFINITIONS

A. When the following abbreviations and definitions are used in relation to the work for Division 13 they shall have the following meanings:

Item	Meaning
AHJ	Authority Having Jurisdiction.
Boxes	Outlet, Junction or Pull Boxes.
Code	All applicable codes currently enforced at project location.
Connection	All materials and labor required for equipment to be fully operational.
Exterior Location	Outside of or penetrating the outer surfaces of the building weather protective membrane.
Fully Operational	Tested, approved, and operating to the satisfaction of the AHJ, manufacturer and contract documents.
Furnish	Deliver to the jobsite
Install	To enter permanently into the project and make fully operational.
Mfr.	Manufacturer.

NEC	National Electrical Code, National Fire Protection Association, NFPA #70.
Noted	Shown or specified in the contract documents.
Provide	Furnish and install.
Required	As required by code, AHJ, contract documents, or manufacturer for the particular installation to be fully operational.
Wiring	Raceway, conductors and connections

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials and equipment installed shall have been tested and listed by Underwriters Laboratories or other approved testing organization and shall be so labeled unless otherwise permitted by the Authority Having Jurisdiction (Inspector).

B. All materials to be new, free from defects and not less than quality herein specified. Materials shall be designated to insure satisfactory operation and operational life in the environmental conditions that will prevail where they are being installed.

C. Each type of materials furnished shall be of the same make, be standard products of manufacturers regularly engaged in production of such materials and be the manufacturer's latest standard design.

D. All materials, equipment and systems furnished that include provisions for storing, displaying, reporting, interfacing, inputting, or functioning using date specific information shall perform properly in all respects regardless of the century. Any interface to other new or existing materials, equipment or systems shall function properly and shall be century compliant.

2.02 NAMEPLATES

A. Nameplates shall conform to Section 16075.

PART 3 - EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft. Handle all equipment carefully to prevent damage, breakage, denting, and scoring of finishes. Do not install damaged equipment.

B. Store products subject to damage by the elements above ground, undercover in a weather tight enclosure, with ventilation adequate to prevent condensation.

Maintain temperature and humidity within range required by manufacturer's instruction.

3.02 CUTTING BUILDING CONSTRUCTION

A. Coordinate with other trades prior to cutting. Locate cuttings so they will not weaken structural components. Cut carefully and only the minimum amount necessary. Cut concrete with diamond core drills or concrete saws except where space limitations prevent the use of such tools.

B. All construction materials damaged or cut into during the installation of this work must be repaired or replaced with materials of like kind and quality as original materials by skilled labor experienced in that particular building trade.

3.03 PAINTING

A. Items furnished under this Division that are scratched or marred in shipment or installation shall be refinished with touchup paint selected to match installed equipment finish.

3.04 EQUIPMENT CONNECTION

A. For equipment furnished under this or other Divisions of the specifications, or by owner, provide complete all electrical connections necessary to serve such equipment and provide required control connections to all equipment so that the equipment is fully operational upon completion of the project. Provide disconnect switch as required by code whenever an equipment connection is shown on the drawings.

B. Investigate existing equipment to be relocated and provide new connections as required.

3.05 CLEAN UP

A. Contractor shall continually remove debris, cuttings, crates, cartons, etc., created by his work. Such clean up shall be done daily and at sufficient frequency to eliminate hazard to the public, other workmen, the building or the County employees. Before acceptance of the installation, Contractor shall carefully clean cabinets, panels, lighting fixtures, wiring devices, cover plates, etc., to remove dirt, cuttings, paint, plaster, mortar, concrete, etc. Blemishes to finished surfaces of apparatus shall be removed and new finish equal to the original applied.

3.06 TESTING AND DEMONSTRATION

A. Demonstrate that all electrical equipment operates as specified and in accordance with manufacturer's instructions. Perform tests in the presence of the King County Project Representative. Provide all instruments, manufacturer's operating instructions and personnel required to conduct the tests. Repair or replace any electrical equipment that fails to operate as specified and or in accordance with manufacturer's requirements.

END OF SECTION

LOW VOLTAGE JOB COMPLETION FORM

PROJECT NAME: King County DOT Metro Transit Div – Burien Transit Center
PROJECT LOCATION: _____
DATE: _____

A. Electrical Inspectors Final Acceptance (Copy of certificate attached.)

_____
Name Agency Date

D. Record Drawings Attached Transmitted previously to _____
Date

E. O & M Manuals Attached Transmitted previously to _____

F. Test Reports Attached Transmitted previously to _____
Date

G. The work is complete in accordance with contract documents at _____ on _____

_____ _____ _____
Supervisor of Low Voltage Work Time Date

_____ _____
Contractors Rep. Signature Date

SUBMITTAL LIST King County Burien Transit Center

SECTION	DESCRIPTION	SUBMIT RECEIVE DATE	STATUS
13010	GENERAL LOW VOLTAGE PROVISIONS		
13513	CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY		
13759	PANIC ALARM AND INTERCOM		
13513	CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY		
13778	ACCESS CONTROL AND MONITORING SYSTEM		
13784	CCTV SYSTEM		
13790	NETWORK EQUIPMENT AND SYSTEM INTEGRATION		

SECTION 13513
CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational electrical installations on a Design-Build performance basis. It shall be the Low Voltage Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

B. Section Includes:

1. UTP cabling.

2. Coaxial cabling.

3. Low-voltage control cabling.

4. Control-circuit conductors.

5. Identification products.

1.02 DEFINITIONS

A. Basket Cable Tray: A fabricated structure consisting of wire mesh bottom and side rails.

B. BICSI: Building Industry Consulting Service International.

C. Channel Cable Tray: A fabricated structure consisting of a one-piece, ventilated-bottom or solid-bottom channel section.

D. EMI: Electromagnetic interference.

E. IDC: Insulation displacement connector.

F. Ladder Cable Tray: A fabricated structure consisting of two longitudinal side rails connected by individual transverse members (rungs).

G. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.

H. Open Cabling: Passing telecommunications cabling through open space (e.g., between the studs of a wall cavity).

I. RCDD: Registered Communications Distribution Designer.

J. Solid-Bottom or Nonventilated Cable Tray: A fabricated structure consisting of integral or separate longitudinal side rails, and a bottom without ventilation openings.

K. Trough or Ventilated Cable Tray: A fabricated structure consisting of integral or separate longitudinal rails and a bottom having openings sufficient for the passage of air and using 75 percent or less of the plan area of the surface to support cables.

L. UTP: Unshielded twisted pair.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.

1. For coaxial cable, include the following installation data for each type used:

a. Nominal OD.

b. Minimum bending radius.

c. Maximum pulling tension.

B. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.

C. Source quality-control reports.

D. Field quality-control reports.

E. Maintenance Data: For wire and cable to include in maintenance manuals.

1.04 QUALITY ASSURANCE

A. Testing Agency Qualifications: An NRTL.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.

2. Smoke-Developed Index: 50 or less.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test each pair of UTP cable for open and short circuits.

1.06 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install UTP, optical fiber, and coaxial cables and connecting materials until 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.

PART 2 - PRODUCTS

2.01 PATHWAYS

A. Conduit and Boxes: Comply with requirements in Division 16 Section "Raceway and Boxes."

1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.

2.02 BACKBOARDS

A. Backboards: Plywood, fire-retardant treated,3/4 by 48 by 96 inches.

2.03 UTP CABLE

A. Acceptable Manufacturers:

1. Belden CDT Inc.; Electronics Division.
2. Berk-Tek; a Nexans company.
3. CommScope, Inc.
4. Draka USA.
5. Genesis Cable Products; Honeywell International, Inc.
6. KRONE Incorporated.
7. Mohawk; a division of Belden CDT.
8. Nordex/CDT; a subsidiary of Cable Design Technologies.
9. Superior Essex Inc.
10. SYSTIMAX Solutions; a CommScope, Inc. brand.
11. 3M.
12. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

B. Description: 100-ohm, 4-pair UTP, covered with a blue thermoplastic jacket.

1. Comply with ICEA S-90-661 for mechanical properties.
2. Comply with TIA/EIA-568-B.1 for performance specifications.
3. Comply with TIA/EIA-568-B.2, Category 5E or better.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:

a. Communications, General Purpose: Type CM or CMG.

b. Communications, Plenum Rated: Type CMP, complying with NFPA 262.

c. Communications, Riser Rated: Type CMR, complying with UL 1666.

d. Communications, Limited Purpose: Type CMX .

e. Multipurpose: Type MP or MPG.

f. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.

g. Multipurpose, Riser Rated: Type MPR, complying with UL 1666.

2.04 UTP CABLE HARDWARE

A. Manufacturers

1. American Technology Systems Industries, Inc.

2. Dynacom Corporation.

3. Hubbell Premise Wiring.

4. KRONE Incorporated.

5. Leviton Voice & Data Division.

6. Molex Premise Networks; a division of Molex, Inc.

7. Nordex/CDT; a subsidiary of Cable Design Technologies.

8. Panduit Corp.

9. Siemon Co. (The).

10. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

B. UTP Cable Connecting Hardware: IDC type, using modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of the same category or higher.

C. Connecting Blocks 110-style for Category 5E. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.

2.05 COAXIAL CABLE

A. Manufacturers:

1. Alpha Wire Company.

2. Belden CDT Inc.; Electronics Division.

3. Coleman Cable, Inc.

4. CommScope, Inc.

5. Draka USA.

B. General Coaxial Cable Requirements: Broadband type, recommended by cable manufacturer specifically for broadband data transmission applications. Coaxial cable and accessories shall have 75-ohm nominal impedance with a return loss of 20 dB maximum from 7 to 806 MHz.

C. RG59/U: NFPA 70, Type CATVR.

1. No. 20 AWG, solid, silver-plated, copper-covered steel conductor.

2. Gas-injected, foam-PE insulation.

3. Triple shielded with 100 percent aluminum polyester tape and 95 percent aluminum braid; covered by aluminum foil with grounding strip.

4. Color-coded PVC jacket.

D. NFPA and UL compliance, listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1655, and with NFPA 70 "Radio and Television Equipment" and "Community Antenna Television and Radio Distribution" Articles. Types are as follows:

1. CATV Riser Rated: Type CATVR, complying with UL 1666.

E. Manufacturers:

1. Aim Electronics; a brand of Emerson Electric Co.

2. Leviton Voice & Data Division.

3. Siemon Co. (The).

F. Coaxial-Cable Connectors: Type BNC, 75 ohms.

2.06 LOW-VOLTAGE CONTROL CABLE

A. Paired Lock Cable: NFPA 70, Type CMG.

1. 1 pair, twisted, No. 16 AWG, stranded (19x29) tinned copper conductors.

2. PVC insulation.

3. Unshielded.

4. PVC jacket.

5. Flame Resistance: Comply with UL 1581.

2.07 CONTROL-CIRCUIT CONDUCTORS

A. Class 1 Control Circuits: Stranded copper, Type THHN-THWN, in raceway complying with UL 83.

B. Class 2 Control Circuits: Stranded copper, Type THHN-THWN, in raceway complying with UL 83.

C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or TF, complying with UL 83.

2.08 FIRE ALARM WIRE AND CABLE

A. Provide UL listed conductors, as recommended by the manufacturer, which conforms to requirements of the AHJ.

1. Transmission cable shall be #18 AWG (minimum) multiple twisted pair with overall shield.

2. Control and alarm circuits shall be #14 AWG (minimum).

B. The system shall allow up to 2,500 feet of wire length to the furthest addressable device with a maximum of 10,000 feet total on the addressable circuit. Class A (Style 6 Signaling Line Circuits as defined by NFPA 72) communications shall be provided. Wire shall be so routed to maintain sufficient distance between the forward and return loop as called for by the Authority Having Jurisdiction. To minimize wire routing and to facilitate future additions, “t-tapping” of the communications channel will be supported, except where Class A wiring is required. Systems which are limited to the number of “t-taps” on an addressable circuit or the distance between “t-taps” are unacceptable.

2.09 IDENTIFICATION PRODUCTS

A. Manufacturers:

1. Brady Corporation

2. HellermannTyton

3. Kroy LLC.

4. Panduit Corp.

B. Comply with UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

C. Comply with requirements in Division 16 Section "Identification for Electrical Systems."

2.10 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test UTP cables according to TIA/EIA-568-B.2.

C. Factory sweep test coaxial cables at frequencies from 5 MHz to 1 GHz. Sweep test shall test the frequency response, or attenuation over frequency, of a cable by

generating a voltage whose frequency is varied through the specified frequency range and graphing the results.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

A. Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.02 INSTALLATION OF PATHWAYS

3.03 INSTALLATION OF CONDUCTORS AND CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.

2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."

3. Install 110-style IDC termination hardware.

4. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.

5. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.

6. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.

7. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.

8. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.

9. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

C. UTP Cable Installation:

1. Comply with TIA/EIA-568-B.2.

2. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.

D. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.

2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.

b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.

c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.

b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.

c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

a. Electrical Equipment Rating Less Than 2 kVA: No requirement.

b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.

c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.

5. Separation between Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.

6. Separation between Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.04 CONTROL-CIRCUIT CONDUCTORS

A. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits, No. 14 AWG.

2. Class 2 low-energy, remote-control and signal circuits, No. 16 AWG.

3. Class 3 low-energy, remote-control, alarm and signal circuits, No. 12 AWG.

3.05 FIRESTOPPING

A. Comply with requirements in Division 07 Section "Penetration Firestopping."

B. Comply with TIA/EIA-569-A, "Firestopping" Annex A.

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.06 GROUNDING

A. For communications wiring, comply with ANSI-J-STD-607-A and with BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. For low-voltage wiring and cabling, comply with requirements in Division 16 Section "Grounding."

3.07 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Division 16 Section "Electrical Identification."

3.08 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. Visually inspect UTP and optical fiber cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA/EIA-568-B.1.

2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

3. Coaxial Cable Tests: Comply with requirements in Division 13 Section "CCTV Surveillance System."

C. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.

D. Prepare test and inspection reports.

END OF SECTION

SECTION 13759
PANIC ALARM AND INTERCOM

PART 1 - GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational electrical installations on a Design-Build performance basis. It shall be the Low Voltage Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

B. The Panic Alarm and Intercom System consists of:

1. Wall and pedestal mounted Panic Alarm stations to provide visible and audible emergency annunciation and communication at several locations on each level of the garage. Provide a minimum of three panic alarm stations per floor.

1.02 RELATED SECTIONS

A. 13010 GENERAL LOW VOLTAGE SYSTEMS PROVISIONS

B. 13784 CCTV SYSTEM

C. 10440 SIGNAGE

1. Coordinate with Section 10440 for signage to be placed on the panic stations.

1.03 SCOPE

A. Provide a Panic Alarm System for the Burien Transit Center.

B. The System shall include:

1. Panic Alarm units with in-service and alarm lights, local screech alarms, intercoms, and dry contact alarm interface to access control system.

2. Elevator phones.

3. Emergency Phone PBX

4. Raceway and junction boxes.

5. Cabling, equipment, and other material necessary for a complete, functioning Panic Alarm and Intercom system.

C. Interface the panic alarm system with the Access Control system.

1.04 QUALITY ASSURANCE

A. System Integrator and/or subcontractor shall:

1. Construct the system following good engineering practices and in accordance with applicable codes and safety precautions.

2. Periodically inspect portions of the system installed by other contractors to minimize potential interference problems.

3. All materials and equipment shall be new and shall conform to the applicable requirements of the Underwriter's Laboratories and with the American National Standards Institute.

1.05 SUBMITTALS

A. Assemble in submittal brochure as specified in Section 13010 and 01300.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Code Blue, Talk-a-Phone.

2.02 PANIC ALARM STATIONS

A. Provide panic alarm slave stations.

B. Type 'L'

1. Wall Mounted Unit

2. Stainless Steel Housing.

3. Waterproof

4. Manufacturer: Talk-A-Phone # ETP - 400 WM

C. Type 'LP'

1. Pedestal unit; 10" x 8" x 8'-0" steel cylinder (bollard). Note custom height.

2. Color: Blue

3. Manufacturer: Talk-A-Phone #ETP-MT

D. Type 'E'

1. Elevator Emergency Phone - to fit behind elevator Car Operating Panel.

2. Manufacturer: Talk-A-Phone #ETP-103

E. General - All Types

1. Hands-free Communications Device:

a. Button that shall immediately and automatically dial a preprogrammed number, and close dry contacts to notify the Access Control system to identify specific unit being activated. Speakerphone, compatible with PBX.

1) (2) LEDs with "Call Being Placed", and "Call Received" labels.

2) Capable of playing up to two digitally stored voice messages upon activation.

3) Programmable from a remote location.

4) Three number dialing capability.

5) Battery backup, rated for 16 hours of active talk time and 32 hours of standby.

6) Line powered phone devices, DIP switch programming, and push-to-talk devices are not acceptable.

7) Remote speaker volume adjustment.

8) Silent monitoring.

9) Waterproof speaker and microphone

10) Operating temperatures of -40°F to +150°F (-40° to +65°C)

b. Comply with Part 68 of the FCC rules.

F. General - Types 'L' and 'LP'.

1. Polycarbonate shield over lights

2. Vandal resistant, (ADA) compliant.

3. Alarm strobe light:

a. Located at the top of the unit

b. 1,000,000 candlepower;

c. Flash rate of 60 flashes per minute or more;

d. Blue polycarbonate Lexan prismatic lens

e. Activated by 'PUSH FOR HELP' button on unit.

4. In-service beacon:

a. (HID) 70-watt, high-pressure sodium area light

b. Below alarm beacon.

c. Blue, prismatic Lexan refractor.

5. Communications Device:

a. In addition to the requirements above, button that shall activate the strobe light in the combination blue beacon and strobe. The strobe shall continue to flash until the receiving party terminates the call.

b. Provide faceplate light to illuminate the alarm station, protected by Lexan lens.

6. Graphics

a. Text: "Emergency"

b. Color: reflective red

2.03 Emergency Phone PBX

A. Provide a complete, network-based PBX with capability of integrating with the existing KC Metro Talk-A-Phone Emergency Phone System via an IP-based connection using the King County I-Net system.

B. Analog Stations:

1. Provide analog telephone station input ports for all panic station intercoms and elevator intercom stations.

C. PSTN ports:

1. Provide four (4) PSTN ports for connection to outside services:

D. Provide network configuration and connection to Ethernet Signal Transport system, including:

1. IP port via 8-pin modular jack

2. Quality of Service (QOS) management.

3. SNMP agent.

4. DHCP client.

E. Remote (via IP network) system administration.

F. General:

1. LCD display for caller ID, called party ID, call duration and real time clock

2. 6 hours battery backup

3. Use Voice over IP to communicate over LAN, WAN, DSL, Cable modem, etc.

4. Pre-wired punch down block

5. Fully programmed

6. Operating Temperature: 32ºF (0ºC) to 104ºF (40ºC)

7. Power: 115 watts nominal, 186 watts maximum

8. AC Input: 120V (108-132V), 57-63Hz, 3.4 Amps maximum current

9. Maximum dimensions: 11.5(292)H x 16.9(430)W x 12(310)D in(mm)

10. Weight: 20 lbs. (9.1kg) empty; 34.5 lbs. (15.6kg) full capacity

G. Manufacturer: Talkaphone.

2.04 POWER SUPPLY

A. Provide power supplies for the Panic Stations, connected to local 120V AC power sources. See electrical drawings.

PART 3 - EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

A. Coordinate with other trades to provide mounting for the Panic Alarm Stations.

3.02 Access control system INTERFACE

A. Activation of a panic alarm station call button shall close a dry contact and provide an interface to the Access Control system to allow it to automatically direct the associated PTZ camera to view the panic alarm station and display on selected monitors.

B. Activation of an elevator panic alarm call button shall close a dry contact and provide an interface to the Access Control system to allow it to automatically direct the closest PTZ camera to view the elevator doors and display on selected monitors.

3.03 ELEVATOR INTERFACE

A. Coordinate with the elevator installer and install elevator phone in the elevator cab.

B. Provide additional isolated dry contact from the elevator panic alarm station to the elevator controller to initiate movement of the elevator to the 1st Level on activation of the elevator panic alarm call button.

3.04 WIRING

A. Schedule all work to prevent conflicts with other activities in the building.

B. Coordinate the exact location of all devices prior to installation with the general and electrical contractors.

C. The contractor will be responsible for all raceway, signal cable routing, termination, connection and testing associated with equipment required to provide a fully operational and functioning Panic Alarm System.

D. Coordinate with Division 16 and General Contractor for routing of raceway to devices. To the extent possible, all raceway shall be run in concrete, with recessed back boxes.

E. All cabling will be run in conduit. No flex conduit is to be embedded in concrete.

F. Label each end of all cables with number and identification legend clearly identifying the connection point for cable end. Labels will be self laminating type compatible with Brady DAT-151-292.

3.05 TESTING

A. Test completed system for correct and satisfactory operation.

3.06 DEMONSTRATION

A. At the completion of the system installation, the Contractor shall demonstrate proof of performance for the system. The panic station and its associated wiring shall be permanently connected at the panic station and temporarily connected to an outside POTS (telephone) line (voice pairs) and a 24V light and battery. The test shall demonstrate proper operation of:

1. "Call Being Placed", and "Call Received" LED lights.

2. Playing of two digitally stored voice messages upon activation.

3. Remote programming.

4. Three number dialing capability to three separate cell phones.

5. Remote speaker volume adjustment.

6. Silent monitoring.

7. In-service and alarm beacon.

8. Dry contact alarm interface to CCTV system.

END OF SECTION

SECTION 13778
ACCESS CONTROL AND MONITORING SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational electrical installations on a Design-Build performance basis. It shall be the Low Voltage Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

B. This section includes specifications for a complete integrated building Access Control System and Monitoring System. The System shall include:

1. A remote panel to King County Metro's existing Andover Parking Central Monitoring System Access Control System, including computer software, sub-control panels, intelligent field interface panels, card readers, door position indicators, request-to-exit devices, access cards, power supplies for electric strikes and locks, electrical connections, and wire and cable.

2. Interface with the Digital Video Recorder provided under Section 13784.

C. All requirements of this Specification, including software modules, computer hardware, etc. shall be provided with this phase, although some may be applied or utilized in a future phase.

D. Coordinate with the Door Hardware supplier to ensure that the Access Control interface requirements are accurately shown on the Wiring Diagrams provided by the Developer under Division 8. Coordinate with the Developer and make final connections for the Access Control portion of the door hardware control wiring.

1.02 RELATED DOCUMENTS

A. Coordinate the installation with Section 13784 – "CCTV System."

1.03 DEFINITIONS

A. The following definitions shall be applied to this project, as stated herein:

- A/R: As Required
- ACAMS: Access Control and Alarm Monitoring System
- AHJ: The local authority having jurisdiction, with regards to building codes.
- Developer: The respondent to this Specification, the Systems Integrator who shall provide the systems described herein
- Consultant: Security by Design, the Owner's consultant and preparer of this Specification
- Data Rate: The maximum rate of speed of a digital transmission system or device
- dB: decibel: 10 times the common logarithm of a power ratio
- Owner: King County

- FCC: Federal Communications Commission
- Fully Operational: Tested, approved, and operating to the satisfaction of the Owner, Consultant, AHJ, manufacturers, and contract documents.
- Furnish: Deliver to the job site.
- Install: To enter permanently into the project and make fully operational.
- IMUX: Intelligent Multiplexer, Intelligent System Controller (ISC), Data Gathering Panel (DGP) – Field installed control panel controlling and allowing stand-alone operation of the input/output points .
- MACC: Maximum allowable cost of construction
- Provide: Design, prepare, submit, furnish, install, integrate, configure, program, test, conduct training, support, and warrant.
- Required: As required by code, AHJ, contract documents, specification, design documents, or manufacturer for the particular installation to be fully operational.

1.04 CODES AND STANDARDS

A. Refer to Section 13010, General Division 13 Provisions, for applicable codes.

B. The system shall be listed by Underwriters' Laboratories, Inc., for meeting the requirements of UL-294, "Standards for Access Control System Control Units".

C. In addition Codes referenced in Section 13010, the following codes shall apply:

- International Conference of Building Officials
- IBC, *International Building Code*, as adopted and amended by the Owner.
- National Fire Protection Association (NFPA):
- NFPA 70 (NEC), *National Electrical Code*, as adopted and amended by the Owner.
- NEC Article 725
- Federal Communications Commission (FCC) Rules Part 15, Subpart B, Class A Compliant, and Part 68
- FCC Rules and Regulations, Part 76, *Cable Television Service*
- Underwriters Laboratories:
- UL 13, *Power-Limited Circuit Cables*
- UL 50*, Enclosures for Electrical Equipment*
- UL 83*, Thermoplastic-Insulated Wires and Cables*
- UL 444, *Communications Cables*
- UL 452, *Antenna-Discharge Units*
- UL 467, *Grounding and Bonding Equipment*

- UL 497, *Protectors for Paired Conductor Communications Circuits*
- UL 497A, *Secondary Protectors for Communications Circuits*
- UL 497B, *Protectors for Data Communication and Fire Alarm Circuits*
- UL 910, *Test for Flame-Propagation and Smoke-Density Values for Electrical and Optical-Fiber Cables Used in Spaces Transporting Environmental Air*
- UL 1270, *Radio Receivers, Audio Systems, and Accessories*
- UL 1283, *Electromagnetic Interference Filters*
- UL 1310, *Class 2 Power Units*
- UL 1409, *Low-Voltage Video Products Without Cathode-Ray Tube Displa*ys
- UL 1585*, Class 2 and Class 3 Transformers*
- UL 1685, *Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables*
- UL 3044, *Surveillance Closed Circuit Television Equipment*
- Institute of Electrical and Electronics Engineers, Inc. (IEEE) Standards:
- IEEE C62.41-1991, *Guide for Surge Voltages in Low-Voltage AC Power Circuits*.
- IEEE Std 142, *IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems*.
- IEEE Std 241, *IEEE Recommended Practice for Electric Power Systems in Commercial Buildings*.
- IEEE Std 242, *IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems*.
- IEEE Std 446, *IEEE Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications*.
- IEEE Std 1100, *IEEE Recommended Practice for Power and Grounding Sensitive Electronic Equipment*.

1.05 QUALIFICATIONS

A. Supplier and/or subcontractor shall:

1. Have been in the business of installing and maintaining the specific type of system equipment under the present firm name for at least five years.

2. Have been distributing and/or installing the specific brand and model line of system equipment for at least three years prior to the date on the contract documents.

3. Have the capability of dispatching a maintenance or repair truck with a qualified repairman to the job site within four hours of a request for service on the equipment.

1.06 SUBMITTALS

A. Product data including but not limited to:

Central Control Unit
Card Readers
Control Relays
Control Wiring

B. Shop Drawings

1. Floor Plans: Prepare CAD based shop drawings to show device locations, raceway routing and sizes, and color coded wiring between devices.

2. Riser. Provide diagram showing vertical wiring between components.

3. Control Schematics. Provide a control schematic showing interface circuits for each piece of equipment, termination and connection diagrams including wire numbers.

4. Recessed Mounted Card Reader. Provide card reader cut out size and mounting information to the appropriate subcontractor.

5. Prepare drawings of the equipment racks.

PART 2 - PRODUCTS

2.01 ACCESS CONTROL SYSTEM

A. Control Panel

1. Andover Continuum Net Controller, NO SUBSTITUTIONS

B. Card Readers:

1. Personnel Door Proximity Card Readers. Flush mounted to 4x4 box, HID Standard ProPro 4" x 4" Proximity Reader or equivalent. Coordinate locations with Architect.

C. Panic Alarm Contact:

1. Provide an alarm contact from the panic station to the net controller I/O.

2.02 ELEVATOR INTERFACE

A. Provide input points to interface the elevator panic alarm call button auxiliary contact to the Access Control System via conductors in the traveling cable. Coordinate with the elevator supplier, elevator installer, and Section 13729 for connections.

B. Provide dry contacts to the elevator controller(s) to initiate movement of the elevator to the 1st Level on when the elevator panic alarm call button is pressed. Coordinate with the elevator supplier and elevator installer for connection points.

2.03 CIRCUITRY

A. All wiring shall be contained in steel raceways. Wiring insulation shall be one of the types required by NEC 725-4 and shall be consistently color coded throughout the

system. All terminations shall be T & B "Sta-Kon" (or equivalent) spade type lugs where connected at screw type terminals. Wiring in terminal cabinets shall be neatly arranged and bundled with Tyraps (or equivalent). Provide numbered wire markers on each terminal end of all wires, (pressure sensitive or sleeve type).

2.04 WIRE AND CABLE

A. General: Provide wire and cable, including communication media.

B. Communication Cables:

1. Communication cable shall be a minimum of 22 AWG and shall conform to REA PE20 for indoor cable.

C. Control Wiring:

1. Control wiring for digital functions shall be 18 AWG minimum with 600-volt insulation.

2. Control wiring for analog functions shall be 18 AWG minimum with 600-volt insulation, twisted and shielded, 2- or 3-wire to match analog function hardware.

2.05 INTERFACE MODULE

A. Shall consist of control relays, timers and transformer as required to provide operation indicated.

2.06 CONTROL TRANSFORMERS

A. 120V primary, fused secondary at 24 volts, VA rating as required to drive door devices connected. Provide enclosure for all transformers as required for environmental conditions.

2.07 CONTROL RELAY

A. General: Control relay contacts shall be rated for the application, with a minimum of two sets of Form C contacts, enclosed in a dust proof enclosure. Relays shall have silver-cadmium contacts with a minimum life span rating of one million operations. Operating time shall be 20 milliseconds or less, with release time of 10 milliseconds or less. Relays shall be equipped with coil transient suppression limiting transients to non-damaging levels.

B. Time Delay Relays: Time delay relay contacts shall be rated for the application with a minimum of two sets of Form C contacts enclosed in a dust proof enclosure. Relays shall have silver-cadmium contacts with a minimum life span rating of one million operations. Relays shall be equipped with coil transient suppression devices to limit transients to non-damaging levels. Delayed contact opening or closing shall be adjustable from one to 60 seconds with a minimum accuracy of plus or minus 2 percent of setting.

C. Latching Relays: Latching relay contacts shall be rated for the application with a minimum of two sets of Form C contacts enclosed in a dust proof enclosure. Relays shall have silver-cadmium contacts with a minimum life span rating of one million

operations. Operating time shall be 20 milliseconds or less, with release time of 10 milliseconds or less. Relays shall be equipped with coil transient suppression devices to limit transients to nondamaging levels.

D. Reed Relays: Reed relays shall be encapsulated in a glass-type container housed in a plastic or epoxy case. Contacts shall be rated for the application. Operating and release times shall be one millisecond or less. Reed relays shall have a minimum life span rating of 10 million operations.

E. Solid-State Relays: Input-output isolation shall be greater than 1000 megohms with a breakdown voltage of 1500V RMS or greater at 60 Hz. The contact life shall be 10 million operations or greater. The ambient temperature range shall be minus 20 degrees to plus 140 degrees F. Input impedance shall not be less than 500 ohms. Relays shall be rated for the application. Operating and release time shall be one millisecond or less. Transient suppression shall be provided as an integral part of the relay to limit transients to non-damaging levels.

F. The scope of system shall include all features and functions described herein. System shall be capable of adding optional features and components listed in the specifications, even if not initially included.

G. Complete and operational systems shall be provided.

PART 3 - .EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 SYSTEM SUPPLIER AND/OR SUBCONTRACTOR REQUIREMENTS

A. Provide and/or supervise all wiring, wire terminations and connections.

B. Provide and/or supervise all equipment installation.

C. Perform and/or supervise all testing during and after installation.

D. Certify in writing to King County at completion stating that system has been inspected, tested and is complete and fully operational in accordance with contract documents.

3.02 GENERAL

A. Install components in accordance with the specifications, submittals, manufacturer's instructions and local codes and standards.

B. Coordinate with other trades for installation of access control system interfaces with work by others.

C. Auxiliary Controls. Conductors and power supplies of sufficient size shall be installed to minimize voltage drop consistent with the proper operation of all devices. Limited energy circuits shall be routed separately from line voltage circuits as required by Code (NEC Article 725).

3.03 WIRING

A. Provide all wiring complete per system requirements, including 10% spare conductors not less than two. Install all conductors in raceway, unless noted otherwise. Provide numbered wire markers on each terminal end of all wires, in accordance with shop drawings using permanent pressure sensitive or sleeve type markers.

B. Provide all 120 volt circuits on the emergency power distribution system.

3.04 OPERATION AND MAINTENANCE MANUALS

A. Operating Manuals. Provide in accordance with 16010. Manuals shall contain a preventive maintenance program and service instructions for components of the system as a whole and each component, function and operation in detail. Manuals shall be written to aid in training of new security and operating personnel and as guide clarifying operational procedures.

B. Maintenance Manuals. Provide in accordance with 13010. Manuals shall contain a preventive maintenance program and service instruction for all components of the system. Manuals shall include illustrations, mounting instructions, wiring diagrams, parts lists, operating instructions and a trouble-shooting chart for the system, including a list of troubles, causes and recommended remedies. Include wiring diagram showing all components.

C. Spare Parts List. Submit list of spare parts and components of critical items for consideration of purchase by Owner.

3.05 TESTING

A. The completed system shall be tested and "on-line" operation demonstrated to operate satisfactorily. Tests shall include the following:

1. An operation of each card reader.

2. Operation of each elevator.

3. Operation of all features of the systems under all time zones and manual operation.

4. Operation of all safety features of the systems.

5. Operation of system under power failure conditions.

6. Operation of system under central control unit failure.

3.06 INSTRUCTION

A. Security Personnel Instruction. Provide a minimum of four training sessions of four hours each program for King County security personnel. Training program shall be conducted by a qualified installation engineer, fully familiar with the entire system as it pertains to this project. The sessions shall be clarified by the use of operating manuals.

B. Maintenance Personnel Instruction. Provide a minimum of 4 hours training. Total time shall be scheduled in sessions to be coordinated with King County. Training program shall be conducted by qualified installation engineer, fully familiar with the entire system as it pertains to this project. The sessions shall demonstrate locations and interconnection of system components, wiring paths and connections, and troubleshooting techniques. Demonstrations shall be clarified by the use of shop drawings, and operation and maintenance manuals.

3.07 MAINTENANCE AND SERVICE

A. General Requirements: Provide all services, materials, and equipment necessary for the successful operation of the entire system. Provide necessary material required for the work.

B. Description of Work: The adjustment and repair of system includes all computer equipment, software updates, transmission equipment, card readers, and all control devices. Provide the manufacturer's required adjustments and all other work necessary.

C. Emergency Service: Qualified personnel shall be available to provide service to the complete system. Furnish the Owner with a telephone number where the service supervisor can be reached at all times. Service personnel shall be at the site within 8 hours for life safety related issues and 24 hours for all other issues after receiving a request for service. Restore the control system to proper operating condition within 3 days.

END OF SECTION

SECTION 13784
CCTV SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational electrical installations on a Design-Build performance basis. It shall be the Low Voltage Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

B. Section Includes:

1. Cameras, including mounts and lenses for garage, canopy, and elevator.

2. Digital Video Recorder

3. UPS

4. Equipment Rack

1.02 REFERENCES

A. American National Standards Institute (ANSI).

B. National Electrical Manufacturer's Association (NEMA).

1.03 SYSTEM DESCRIPTION

A. Cameras, wiring, and associated equipment to provide analog camera connectivity, including video signal, camera power, camera PTZ control signals, and enclosure environmental requirements at an equipment rack in the garage communication room, including and wiring visual surveillance of the areas noted.

B. Provide all raceway, cabling, power supplies, equipment, and other material necessary for complete, functioning CCTV connectivity, ready for connection to networked surveillance equipment by others.

1.04 SUBMITTALS

A. General: Make submittals in accordance with Divisions 0 and 1, and Section 13010.

B. Product Data: Submittals shall include a compilation of manufacturer's catalogs or specifications sheet of major systems components. Items being provided shall be clearly marked. Any variations of the proposal from the specifications shall be clearly indicated in the submittal's table of contents.

C. Shop Drawings: Prepare block diagrams indicating the proposed connections of all equipment to be furnished, drawings of the camera mounting arrangements, control facilities, and equipment racks. Indicate materials, construction, layouts and quantities. Prepare and submit for review. Include complete system plans showing device layout, routing, wiring, termination, and connection diagrams.

D. Operations and Maintenance Manuals.

1. Furnish one complete set of operating instruction service maintenance manuals for the equipment employed in the systems. This shall include internal schematics and wiring diagrams. The information in the manuals and on the drawings shall be sufficiently detailed to allow a technician of normal competence to understand, install, operate, maintain, calibrate and repair the equipment.

2. Furnish simplified as-built block diagrams of the system giving the essentials of the installation and their functional relations with all numbered inputs, outputs and wires printed on the diagrams. One copy of the system diagram shall be mounted, framed behind glass with the equipment racks. Furnish a chart of line connections inside the rear door of each rack.

1.05 QUALITY ASSURANCE

A. All equipment shall be furnished and installed by an authorized factory distributor with proven experience in the design and installation of systems of this type. Distributor shall provide proof of being in the CCTV contracting business for the preceding five years.

B. Construct the system following good engineering practices and in accordance with applicable codes and safety precautions.

C. Periodically inspect portions of the system installed by other contractors to minimize potential interference problems.

D. All materials and equipment shall be new and shall conform to the applicable requirements of the Underwriter’s Laboratories and with the American National Standards Institute.

1.06 WARRANTY

A. All equipment shall be guaranteed to be free of defective components or faulty workmanship for a period of one year from the date of Final Acceptance. If any materials prove to be defective within the above period, they shall be replaced within two days at no expense to the Owner in accordance with Divisions 0 and 1.

PART 2 - PRODUCTS

2.01 GENERAL

A. The equipment manufacturers and model numbers specified herein are meant to be compatible with the Owner's existing networked Surveillance and Communications System and may not be substituted for another manufacturer or model.

B. All cameras shall be provided with outdoor enclosures and heaters.

2.02 PAN-TILT-ZOOM CAMERAS - Type 'C', 'W', 'P'

A. Camera

1. Sensitivity:

a. Color Mode (30 IRE): F1.6, 1/60 (1/50) shutter, max AGC

1) SenseUp Off: 0.6 lux

2) SenseUp On: 0.003 lux

b. Night Mode (30 IRE): F1.6, 1/60 (1/50) shutter, max AGC

1) SenseUp Off: 0.16 lux

2) SenseUp On: 0.006 lux

2. Lens: 3.4 mm to 122.4 mm, (F1.6 to F4.5).

3. Optical Zoom: 36X.

4. Digital Zoom: 12X.

5. Video Output: 1.0Vp-p +/- 0.1Vp-p, 75 ohms.

6. Synchronization: Line-lock (-120° to 120° vertical phase adjust) or internal crystal.

7. Signal to Noise Ratio: Greater than 50 dB.

8. White Balance: 2,000 K to 10,000 K.

9. Pan/Tilt Speed: 0.1°/s to 120°/s.

B. Environmental. Heater and fan.

C. Dome (Bubble)

1. Material: Rugged.

2. Color: Tinted

D. Environmental. Heater and fan.

E. Manufacturer: Bosch Autodome Series 300

F. Mount:

1. Type 'C'

a. Pipe mount from ceiling

b. Color: White

c. Manufacturer: Bosch #VG4-A-9543

2. Type 'P'

a. Pole mount with pendant arm to 4" square light pole.

b. Color: White

c. Manufacturer: Bosch #VG4-A-PA0 + LTC 9541/01

3. Type 'W'

a. Wall mount to with pendant arm.

b. Color: White

c. Manufacturer: Bosch #VG4-A-PAO

2.03 ELEVATOR CAMERA - Type 'E'

A. Camera:

1. The specified product shall consist of the following components:

a. A camera module and mounting base

b. An inner liner to disguise the viewing position of the lens

c. A clear polycarbonate dome bubble

d. A trim ring

B. Lens

1. Select lens to provide focused view within elevator.

C. Electrical Specifications:

1. Voltage range: 10.8 to 39 VDC or 12 to 28 VAC, 45-65Hz.

2. Power: 4 watts

3. Composite Video Output: 1.0 Vp-p, 75 ohms.

4. Sync: Line lock with phase adjust (0-358 degrees) or Internal crystal.

5. Sync format: NTSC (60Hz) or PAL (50Hz) as required by the application and the model selected.

6. Horizontal Resolution: 540 TVL.

7. Imager: 1/3-inch, interline transfer CCD

8. Signal to noise ratio: □50 dB.

9. Backlight compensation: Center window weighting, On/Off selectable.

D. Mechanical Specifications:

1. Weight: 440 g (1.1 lb)
2. Connectors: Video Out- BNC on flying leads. Power- flying leads.
3. Viewing adjustment: pan 360□: tilt 90□: azimuth (rotation) ±90□

E. Environmental Specifications:

1. Temperature:
   a. Operating: -10□C to +45□C (+14□F to +113□F)
   b. Storage: -40□C to +70□C (-40□F to +158□F)
2. Humidity: 5% to 93% relative, non-condensing.

F. Product Regulatory Compliance

1. EMC Requirements:
   a. Immunity: CE (EN50130-4)
   b. Emission: CE (EN50022 class B), FCC class B part 15
2. Product Electrical Safety: UL1950, CSA 22.2 No. 950 and CE (EN60950).

G. Camera Manufacturer: Bosch #VDBD5Vx-HI

H. Mount: Bosch #VDA-455CMT–Corner Mount

2.04 Power supplies

A. Rack mounted Power Supply: Capable of providing 24V power for all fixed cameras.

B. Field mounted Power Supply: One per pan-tilt-zoom camera. Capable of providing 24V power for camera control and environmental functions, including junction box and metal barrier between 120V power and 24V power terminations.

2.05 DIgital video recorder

A. 16 channel analog inputs

B. 2U chassis

C. Record resolution user selectable, 704 x 240 or 352 x 240 (NTSC)

D. 4 audio inputs

E. 1 alarm output

F. 16 alarm inputs

G. Activity detection on each camera

H. Up to 120 images/second in NTSC recording speed

I. Time, date, alarm, and camera retrieval search filters

J. FCC, UL, and CE approved

K. Power consumption - 300W maximum

L. IP-based software clients

M. IP-based integration with Andover Continuum series Net Controller version 1.6.

N. Integral Technologies (Pelco) #3540-3V-2C-2D-0S to match existing equipment or approved equal. Equal product must integrate with the existing King County Andover Continuum system.

2.06 UPS backup equipment.

A. UPS

1. Rating: 3600W, 4500 VA.

2. Batteries:

a. 120 Minutes at 2500W output

b. Sealed lead-acid, leakproof, maintenance free.

c. Hot swappable

d. Battery management

3. Input: 208V, 30A, single phase L6-30P

4. Outputs

a. (4) 120V, 20A, NEMA L5-20R

b. (2) 120V, 20A, NEMA L6-20R

5. Interface Ports: DB-9, RS-232; 8-pin modular, 10/100 Base T Ethernet.

6. Features:

a. Automatic self test.

b. Automatic voltage regulation.

c. Web/SNMP management.

d. Line interactive.

e. Load meter.

f. Line power conditioning.

g. Rack mount.

7. Manufacturer: APC Smart-UPS XL # SU5000R5XLT-TF3

2.07 EQUIPMENT RACK

A. 19-inch 4 post equipment rack for supporting 30-inch plus UPS and DVR equipment, 84-inch high, deep side rails, vertical wire management channels and standard EIA spacing.

B. Manufacturer: Panduit Corporation #CMR19X84 with WMPVS45 side channels, or approved equal.

C. Vertically mounted plug strips, each side of rack.

PART 3 - EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 INSTALLATION

A. It shall be the responsibility of the Contractor to cooperate with representatives of the Owner in order to achieve well-coordinated progress and satisfactory results.

B. Use cameras and with vari-focal lenses to ensure that each selected lens size is appropriate to the required scene coverage.

C. Rack mount all Comm Room termination equipment.

D. Wire and Cable Tags: Every conductor and every cable shall be tagged.

E. Provide proper video terminations at all times.

F. Maintain signal integrity at all times. .

3.02 Elevator supplier coordination

A. Coordinate with elevator supplier and installer for installation of elevator camera, traveling cable coax, and final connection to DVR.

3.03 TESTING

A. On completion of the system installation, demonstrate that proper signal level and quality have been maintained through all signal paths. All test equipment will be provided and calibrated by the CCTV contractor.

B. Submit copies of the test results as described above prior to training. Include copies of the test results in the O&M manuals. Include the names of the individuals performing and witnessing the tests, and the manufacturer’s name and model number of the test equipment used. Include a block diagram of the test setup for each test.

3.04 DEMONSTRATION

A. At the completion of the system installation, the Contractor shall demonstrate that each camera can provide a fully operational video signal to a temporary local monitor, and can respond to all of the manufacturer's installation, maintenance, and operational controls via the serving coax, control cabling, and local setup connections.

3.05 INSTRUCTION

A. At the satisfactory completion of the system demonstration and acceptance testing, the Contractor shall conduct a minimum two hour instruction session of the Owner's designated personnel. The session shall be conducted by a Contractor's representative thoroughly familiar with the system. The training session will include:

1. General operation of the system.

2. Specific operation of all user-accessible equipment.

3. Explanation of the system warranty and the process for the owner to follow during the warranty period for system malfunctions.

END OF SECTION

SECTION 13790
NETWORK EQUIPMENT AND SYSTEM INTEGRATION

PART 1 - GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational electrical installations on a Design-Build performance basis.

1. It shall be the Low Voltage Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

2. Configure, activate, and commission the site security system integrated to the central security monitoring station.

B. Section Includes:

1. Network Switching Equipment

2. King County I-Net interface equipment

3. Support Equipment

4. System Commissioning and Integration with the Central Monitoring Station Equipment

C. Related Sections:

1. 13010 GENERAL LOW VOLTAGE PROVISIONS

2. 13759 PANIC ALARM AND INTERCOM

3. 13778 ACCESS CONTROL AND MONITORING SYSTEM

4. 13784 CCTV SYSTEM

5. 16130 RACEWAYS AND BOXES

6. 16452 GROUNDING

D. Provide System Integration and Commissioning.

1. System integration and commissioning of the Burien Transit Center with the existing King County Central Monitoring Station equipment and network.

1.02 Work included

A. Furnish, install, and test the set-up criteria for the Access Control and Alarm Monitoring System (ACAMS), the CCTV System, the Panic Alarm System (PAS), and any other associated work.

1. Configure System – Furnish and install system control software, and configure the software, devices, and overall integrated system to achieve the specified functionality and SMS integration requirements. Review King County IT standard

operating system and firewall configurations necessary to plan and conduct the work.

2. Inspect and Test System – Inspect and test the equipment and software prior to in-service activation, to demonstrate conformance with specifications. Also, provide support during King County's inspection and testing of the system.

3. Support King County Network Installation – Provide support for King County's network installation, testing, and activation.

4. Activate System – Activate and conduct operational demonstration and system validation testing of the end-to-end system at the site interconnected to the SMS. Demonstrate system functionality, and provide technical support for inspection and testing of the activated system by King County. Closely monitor system operations for two (2) days, and troubleshoot and repair any non-performing equipment or configuration work to achieve specified performance requirements. Repeat the activation step until the system achieves specified performance. System will remain in service after this task is successfully completed.

5. Commission System – Routinely monitor system during the initial thirty (30) days of in-service operation by King County, and troubleshoot and repair any user-indentified equipment or configuration issues to achieve specified performance and functionality requirements.

B. Program the logical integration hooks between the ACAMS, CCTV SYSTEM, and the PAS.

C. Provide graphical maps with active animated icons to allow camera call-up and door and portal control for each access door. Program icons to allow for status viewing of all alarm points.

D. Provide fiber and copper cables between the Communications room of the garage and the existing Security room on the platform (Transit Center).

1. Furnish and install (1) 24-strand singlemode fiber cable between the Communications room of the garage and the existing Security room on the platform for I-net.

2. Furnish and install (1) 24-strand multimode (62.5/125 um) fiber cable between the Communications room of the garage and the existing Security room on the platform for network.

E. Initiate a backup plan for the ACAMS and the setup for the DVRs.

1.03 BASIC DEFINITIONS

A. Abbreviations:

1. 4CIF: 640x480pixels

2. ACAMS: Access Control and Alarm Monitoring System

3. CCTV: Closed Circuit Television

4. DI: 720x480pixels

5. DVR: Digital Video Recorder

6. PAS: Panic Alarm System

7. LCD: Liquid Crystal Display

8. OS: Operating System

9. PTZ: Pan Tilt and Zoom

10. RDBMS: Relational Database Management System

11. SQL: Microsoft SQL RDBMS

1.04 CODES AND STANDARDS

A. Refer to Section 13010, General Low Voltage Provisions, for applicable codes.

B. The system shall be listed by Underwriters' Laboratories, Inc., for meeting the requirements of UL-294, "Standards for Access Control System Control Units".

1.05 SUBMITTALS

A. Product data per Section 13010 including but not limited to:

1. Ethernet switching equipment

2. System Integration narrative

B. Shop Drawings

1. Floor Plans: Prepare CAD based shop drawings to show device locations, raceway routing and sizes, wiring between devices.

2. Riser. Provide diagram showing wiring between components.

3. Control Schematics. Provide a control schematic showing interface circuits for each piece of equipment, termination and connection diagrams including wire numbers.

1.06 QUALITY ASSURANCE

A. System Integrator shall:

1. Have been regularly engaged in the installation and maintenance of systems similar in size, scope, and complexity to that outlined herein under the present firm name for a period of no less than five years

2. Have been distributing and/or installing the specific brand and model line of CCTV system equipment for at least three years prior to the date on the contract documents.

3. Have business agreements with suppliers of PBX and Network components that commit those suppliers to successful integration of their equipment for this project.

4. Provide documentation demonstrating that the Integrator currently employs a minimum of one Cisco Certified Network Associate (CCNA).

5. Have the capability of dispatching a maintenance or repair truck with a factory trained repairman to the job site within four hours of a request for service on the equipment.

6. Be a local representative and factory authorized local service organization. Local shall be defined as an area in a twenty mile radius of installed location.

7. Carry a complete stock of parts and provide maintenance for the System.

8. Construct the system following good engineering practices and in accordance with applicable codes and safety precautions.

9. Periodically inspect portions of the system installed by other contractors to minimize potential interference problems.

B. All materials and equipment shall be new and shall conform to the applicable requirements of the Underwriter's Laboratories and with the American National

1.07 WARRANTY

A. Warranty period begins at acceptance of testing and commissioning approvals by King County representative. Warranty period shall cover a minimum of 1 year from acceptance by King County.

PART 2 - PRODUCTS

2.01 GENERAL

A. Equipment

1. Equipment shall be the standard product of each manufacturer. One System Integrator shall be responsible for the entire system.

2. The descriptions herein outline the functions of the Central Monitoring System. Provide all equipment necessary for a complete and fully operational system.

2.02 Ethernet signal transport

A. Network Switching Equipment

1. Description: Ethernet switches for the Garage Communication Room

a. Ethernet switch in garage communication room equipped with 10/100/1000BASE-T uplink ports for uplink to I-Net equipment rack, and 10/100 ports for patching to DVR and IP-PBX equipment.

2. Specifications:

a. 4 RU stackable, multilayer switch

b. UTP Ports: 24 ports, Ethernet 10Base-T/100Base-TX, autosensing.

c. Uplink port: D, 1000baseT.

d. Switching Fabric: 8.8 Gbps minimum

e. Memory: at least 2 megabytes, shared by ports.

f. Enhanced Multilayer Software Image

g. Features: QoS (Quality of Service)

h. Standards: 802.1D STP, 802.1p/Q

i. Per port indicators: link integrity, disabled, activity, speed, and full-duplex.

j. System indicators: system, RPS, module status, and bandwidth utilization.

k. Network (I-Net) monitoring to dry contact alarm output.

l. Power over Ethernet

3. Manufacturer: Cisco Catalyst 3750 48 10/100 + 4 SFP with “Standard” or “IP Base” image with 48 10/100. Additionally, a Cisco RPS 2300 with dual 750w.

a. King County Network Engineering must approve all network equipment purchases.

2.03 Category 6 patch cords

A. 8-Pin Modular-to-8-pin Modular UTP Patch Cords

B. Physical Specifications: 4-pair cable, with male 8-pin modular plugs with insert-molded strain relief on both ends.

C. Performance Characteristics: Superior to the individual characteristics established in EIA/TIA 568-B for category 6 (proposed draft 10), cable performance.

D. Manufacturer: AMP Inc. Type 219884-7 (7-foot, black)

2.04 Fiber Optic Cable

A. Singlemode Fiber Cable:

1. The fiber cable shall be indoor/outdoor rated and utilize gel-free design.

2. The fiber media shall be no more than 9 um in core and capable of operating at both 1310 nanometers (nm) and 1550 nm.

3. The fiber shall induce a loss of no more than 0.4 dB/km at 1310 nm and no more than 0.3 dB/km at 1550 nm.

4. The fiber shall be depressed clad.

5. The fiber shall not be dispersion shifted unless approved by county.

6. Acceptable Products: CORNING Freedm indoor/outdoor.

B. Multimode Fiber Cable:

1. The fiber cable shall be indoor/outdoor rated and utilizing gel-free design.

2. The fiber media shall be 62.5/125 multimode graded index mode, dual-window fiber.

3. Fiber cable will be of the type required by NEC Article 770. Fiber attenuation loss is not to exceed 4.0 dB/km at 850 nm and 2.0 dB/km at 1300 nm.

4. Acceptable Product: CORNING FREEDM indoor/outdoor.

C. Materials for Fiber Termination:

1. Fiber Patch Panel: CORNING-CCH-02U Rack Mounted Fiber Panel

2. Fiber Adapter Plate for Singlemode Fiber: CORNING CCH-CP06-3C

3. Fiber Adapter Plate for Multimode Fiber: CORNING CCH-CP06-15T

4. Fiber Connector for Singlemode Fiber: Regular SC style Singlemode connector

5. Fiber Connector for Multimode Fiber: ST style Multimode connector

PART 3 - EXECUTION

Sections under PART 3 are provided as recommendations to the developer in order to achieve the desired results specified in the design criteria and performance specifications.

3.01 INSTALLATION

A. Provide all raceway installation

B. Provide all wiring, wire terminations and connections.

C. Provide all equipment installation.

D. Perform all testing during and after installation.

E. Certify in writing at completion stating that system has been inspected, tested and is complete and fully operational in accordance with contract documents.

3.02 GENERAL

A. Install components in accordance with the specifications, submittals, manufacturer's instructions and local codes and standards.

B. Coordinate with other trades for installation of access control system interfaces with work by others.

C. The contractor will be responsible for all raceway, signal cable routing, termination, connection and testing associated with equipment required to provide a fully operational and functioning Panic Alarm System.

D. The network integrator will be responsible for:

1. Assignment and allocation of IP addresses for active network components as well as voice, video, and data systems as needed in accordance with IANA (Internet Assigned Numbers Authority) private network addressing schema;

2. Coordination with other system integrators to determine and provide for system network connectivity requirements, configuration of data connection type(s) (i.e half duplex and/or full duplex configurations) in accordance to system bandwidth requirements;

3. Configuration of LAN layer 2 priority mechanisms (802.1p/Q settings) in accordance with Telephone System Installation LAN Design Guidelines;

4. Verification of end-to-end network and systems connectivity upon completion of installation and configurations of network components and associated voice, video, and data systems.

E. Coordinate with Division 16 and General Contractor for routing of raceway to devices. To the extent possible, all raceway shall be run in concrete, with recessed back boxes.

F. All cabling will be run in conduit.

G. Auxiliary Controls. Conductors and power supplies of sufficient size shall be installed to minimize voltage drop consistent with the proper operation of all devices. Limited energy circuits shall be routed separately from line voltage circuits as required by Code (NEC Article 725).

3.03 WIRING

A. Provide all wiring and interconnection cabling complete per system requirements. Provide numbered wire markers on each terminal end of all wires leaving the central monitoring station area, in accordance with shop drawings using permanent pressure sensitive or sleeve type markers.

3.04 OPERATION AND MAINTENANCE MANUALS

A. Operating Manuals. Provide in accordance with 13010. Manuals shall contain a preventive maintenance program and service instructions for components of the system as a whole and each component, function and operation in detail. Manuals shall be written to aid in training of new security and operating personnel and as guide clarifying operational procedures.

B. Maintenance Manuals. Provide in accordance with 13010. Manuals shall contain a preventive maintenance program and service instruction for all components of the system. Manuals shall include illustrations, mounting instructions, wiring diagrams, parts

lists, operating instructions and a trouble-shooting chart for the system, including a list of troubles, causes and recommended remedies. Include wiring diagram showing all components.

C. Spare Parts List. Submit list of spare parts and components of critical items for consideration of purchase by Owner.

3.05 SYSTEM CONFIGURATION

A. Configure the system to achieve specified performance and functionality requirements. The work includes:

B. Submit Implementation Plan – Prepare an implementation plan that documents the requirements, work plan, and testing requirements necessary to conduct this scope of work. Work includes: a) conduct system review; b) establish project requirements, c) plan the work, and d) submit implementation plan for proposed activities. Review the configuration and functionality of Metro's existing SMS, access control, and INET systems as necessary to establish project requirements necessary for a complete and fully functional system interconnection. Identify the required software and hardware settings and configurations and establish configuration requirements necessary to achieve system functionality. Submit an implementation plan that addresses the requirements of each task scope herein and includes, at a minimum, these elements: narrative description of the overall process; proposed software and hardware settings and configuration requirements; work breakdown and schedule for the work with key milestones (including any SMS or access control system operational interruptions); contact information and communication plan; system protection plan; test plan (including at a minimum the testing requirements identified herein and pass/fail criteria); activation plan (including rollback plan); and commissioning plan. Identify information needed from Metro to complete the work. Attend one meeting to review the proposed plan and respond to comments from Metro staff prior to implementation.

C. Configure System – Furnish and install system control software, and configure system to enable specified local and remote control and monitoring functionality. Work includes: a) conduct the system configuration and integration work, b) attend one coordination meeting with Metro staff regarding the configuration work, and c) provide follow-up technical support to Metro staff as requested for the implemented configurations. Metro will provide a work station for contractor use that is configured for remote access to Metro's security and access control systems, this work station is located at King Street Center 201 S Jackson St Seattle, WA.. The work under this task includes, but is not limited to, these activities:

1. Windows OS & Firewall Installation – Metro will install its standard Windows Operating System and firewall on system devices (Digital Video Recorder, network switch, etc.). Review the software configurations as necessary to plan and execute the work. Conform to Metro network standards without exception.

2. IP Addressing – Metro will provide IP addresses for the DVRs. Review the addresses as necessary for project implementation, and implement the addressing consistently throughout the work.

3. Device Naming – Metro will provide the baseline naming conventions for all field devices (alarms, access controlled doors, cameras, help-phones and any other

installed device). Submit a detailed naming plan including information required for full functionality (aliases, graphical user interface information, alarm naming, etc.) for Metro review, consistent with Metro's conventions. Implement the approved naming convention consistently throughout the configuration work

4. Call Station and VOIP Configuration – Metro will assign VOIP phone numbers to call stations. Configure the site VOIP systems to communicate with the central VOIP system at SMS to achieve instantaneous two-way communication between the two sites. Implement the phone numbering consistently throughout the work.

5. Access Control System Configuration (Doors, Break-In Alarms, and NetController System) - The access control system is used for both door access and break-in detection. Metro will provide the baseline naming convention for the site doors, and will also configure the access rights for the doors within Metro's existing access control database (administered by Metro's Facilities Section). Configure the access control system to integrate with and function with the existing Metro access control system and access control database. Implement the approved naming convention consistently throughout the configuration work. Provide technical support to Metro during access rights configuration and testing.

6. Video Surveillance System Configuration (DVRs, cameras) – Metro will provide baseline security functionality requirements to be applied to the video surveillance system. Submit a detailed configuration plan (camera preset positions; activation, recording, and monitoring requirements; and emergency call alarm and break-in alarm conditions) for Metro review, consistent with the baseline functionality requirements. Implement the approved video surveillance system plan to achieve the required security control, monitoring and recording functionality consistently throughout the configuration work.

7. Graphical User Interface (GUI) Configuration - Metro will provide a baseline graphics/control layout. Prepare graphical representation and control functionality to be applied to the monitoring and control systems at the site and SMS. Submit a detailed GUI configuration plan (camera views, device graphics, alarm activation and acknowledgement, etc.) for Metro review, consistent with the existing SMS system conventions. Implement the approved GUI plan consistently throughout the configuration work.

3.06 SYSTEM INTEGRATION

A. Furnish, program, and install all necessary data hooks and graphics to provide graphical control of the ACAMS, CCTV System, and PAS.

1. Create a clean graphic representation of the space for each floor of the garage. Where a site plan is appropriate, include as part of the package.

2. Where a floor plan is too large to be appropriately represented on a screen, create a split plan of the floor that allows navigation between a whole floor and subparts of the same floor.

3. Provide consistent icon navigation between all graphic screens.

4. Provide a single non-map screen that shall be used for common control functions. Allow control of these functions either through a graphically applied icon on a map or through the same icon on this control screen. Assume a maximum of 10 of these icons on the non-map screen, with the specific ones to be agreed upon between Contractor and Owner prior to programming. Examples include:

    a. Remote door release, momentary unlock

    b. Remote grille or barrier arm release, momentary unlock

    c. Remote gate control for open during days and closed for night

    d. Directional signage control

B. Where possible, create the cross hooks to support camera call-up via the graphic screen.

C. Set the home position of each PTZ as directed by the Owner.

D. Program the recording of the DVRs to maximize the recorded time in history, but with the following criteria:

1. Set recording to DI or 4CIF image sizes.

2. Set recording rate for all cameras during a motion event to 7.5 images per second.

3. Set recording to only record on motion events.

4. Do not set any alarm events.

5. Set pre-motion recording to 2 seconds.

6. Set post-motion recording to 10 seconds.

7. Set pre-motion consecutive motion frames to 4 to start a motion event.

8. Set post-motion consecutive non-motion frames to 4 to end a motion event.

9. Mask areas where motion in the image is not germane to the site security.

10. Set sensitivities appropriate to capture all security germane activity, allowing for a low level of false positives (recording when there is nothing moving).

11. Set all other parameters that apply to each camera to optimize recording of activity and non-recording of non-security germane events.

12. For fixed cameras on help stations, set camera focus to achieve good images at 2 to 5 feet from the camera. Set motion detection to require motion at a close range to the camera, thus requiring a large affected percentage of the image prior to recording motion.

E. Set one or more alarm initiated set points for each PTZ, as required to cover the panic alarm, elevator intercoms, and door alarms. Where a PTZ camera has a view of an

F. Define and implement a DVR backup file process that will backup the DVR setup criteria. This criteria requires that a replacement DVR can be put in place and have the current setup files downloaded to the DVR, thereby having the unit running within a few minutes of being connected and downloaded.

3.07 TESTING AND DEMONSTRATION

A. Inspect and Test System (additional requirements specified elsewhere in document) – Test the configured system interconnection to meet the specified technical and functional requirements, prior to activation at the SMS. Conduct discrete unit, system, and performance testing activities, and demonstrate the specified performance and functionality of the installed equipment. Conduct initial readiness testing as described herein in preparation for Metro's readiness review, and make the system ready for inspection by Metro. Metro will conduct inspection testing and establish system readiness for activation. Metro's readiness review will include testing and acceptance of these items (at a minimum): unit and system functionality testing; hardware, software, application and data specification conformance; SMS systems status (ready for activation); equipment connection; back-up and recovery documentation; training documentation; approved contractor staffing plan and schedule for subsequent work tasks.

1. Test each graphic attribute, map navigation icon, alarm icon link, and CCTV link. Demonstrate and adjust as necessary to meet the complete specification and needs of the Owner.

2. Demonstrate the motion detection setup for each camera.

3. Demonstrate the alarm call up for each camera.

4. Backup setup and demonstrate backup processes to Owner.

5. Audio connection and initiation of camera views for all panic stations.

6. PTZ control of all cameras.

7. Return to normal (sequenced) operation of all camera/monitor sets.

8. Operation of all safety features of the systems.

9. Operation of system under power failure conditions.

10. Operation of system under I-Net failure.

B. Activate and Test System – Submit test documentation for review and approval by King County before system acceptance. Following successful testing, activate the system and conduct testing under simulated normal operating conditions. Demonstrate successful interactions and interconnection functionality of the new system with the existing SMS system. Confirm and demonstrate that the system operates as a complete entity between the site and the SMS, including the system user interface, data conversion requirements, and specified applications and functions. Monitor the system

continuously for a period of two (2) days, during which time Metro SMS staff will use and evaluate the complete interconnected system. Provide hands-on instruction to Metro staff to facilitate system use and testing during the activation period. Adjust the system as required by Metro during this activation period. Roll back the system interconnection if operational impacts are identified by either Contractor or Metro.

3.08 PROGRAMMING

A. Furnish, program, and install all necessary data hooks and graphics to provide graphical control of the Access Control System, CCTV System, and Panic Alarm System.

B. Create a clean graphic representation of the space for each floor of the garage.

C. Provide consistent icon navigation between all graphic screens, to match existing.

D. Provide a single, non-map screen for the Burien Transit Center which can be used for common control functions. Allow control of these functions either through a graphically applied icon on a map or through the same icon on this control screen. Examples include:

1. Remote door release, momentary unlock

2. Remote grille or barrier arm release, momentary unlock

3. Remote gate control for open during days and closed for night

E. Program the video systems to make fully functional: home positions, scheduled tours, detection windows, interface with Access Control System, recording times, rates, and resolution.

F. Define and implement backup file processes, including

1. DVR setup criteria.

2. RDBMS server SQL database.

3. Web applications server.

4. Backup of the above once a week.

5. Match the backup file processes at the other Central Monitoring remote sites.

3.09 COMMISSIONING

A. Following successful activation, provide commissioning services for the system interconnection for a period of thirty (30) days of normal operation, to run consecutively with the successful activation period.

B. Troubleshoot and adjust the system as identified by Contractor or required by Metro during this commissioning period. Submit a documentation package including the pre- and post-expansion configuration, naming/addressing, equipment interconnection diagrams, software settings, operations and maintenance information (including troubleshooting guide).

C. Work includes: prepare and submit documentation package; and attend review meeting.

3.10 INSTRUCTION

A. Security Personnel Instruction. Provide a minimum of 4 hours training program for King County security personnel. Total time shall be scheduled in sessions to be coordinated with King County building management. Training program shall be conducted by a qualified installation engineer, fully familiar with the entire system as it pertains to this project. The sessions shall be clarified by the use of operating manuals.

B. Maintenance Personnel Instruction. Provide a minimum of 4 hours training. Total time shall be scheduled in sessions to be coordinated with King County building management. Training program shall be conducted by qualified installation engineer, fully familiar with the entire system as it pertains to this project. The sessions shall demonstrate all operation modes and all operation functions. Demonstrations shall be clarified by the use of operating and maintenance manuals.

3.11 MAINTENANCE AND SERVICE

A. General Requirements: Provide all services, materials, and equipment necessary for the successful operation of the entire system. Provide necessary material required for the work.

B. Description of Work: The adjustment and repair of system includes all computer equipment, software updates, transmission equipment, card readers, and all control devices. Provide the manufacturer's required adjustments and all other work necessary.

C. Emergency Service: Qualified personnel shall be available to provide service to the complete system. Furnish King County with a telephone number where the service supervisor can be reached at all times. Service personnel shall be at the site within 24 hours after receiving a request for service. Restore the control system to proper operating condition within 2 days.

D. 5 year software service agreement.

END OF SECTION

SECTION 14210
ELECTRIC TRACTION ELEVATORS

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes electric traction passenger elevators.

1.02 QUALITY ASSURANCE

A. Installer Qualifications: Elevator manufacturer who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain elevators through one source from a single manufacturer.

1. Provide major elevator components, including driving machines, controllers, signal fixtures, door operators, car frames, cabs, and entrances, manufactured by a single manufacturer.

C. Regulatory Requirements: Comply with ASME A17.1 and elevator design requirements for earthquake loads in ASCE 7.

D. Accessibility Requirements: Comply with Section 4.10 in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."

E. Fire-Rated Hoistway Entrance Assemblies: Door and frame assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252.

1.03 WARRANTY

A. Special Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to repair, restore, or replace defective elevator work within specified warranty period.

1. Warranty Period: One year from date of Substantial Completion.

1.04 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide one year's full maintenance service by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

1. Perform maintenance, including emergency callback service, during normal working hours.

2. Include 24-hour-per-day, 7-day-per-week emergency callback service.

a. Response Time: Two hours or less.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Fujitec America, Inc.

2. KONE Inc.

3. Otis Elevator Co.

4. Schindler Elevator Corp.

5. ThyssenKrupp Elevator.

2.02 SYSTEMS AND COMPONENTS

A. General: Provide manufacturer's standard elevator systems. Where components are not otherwise indicated, provide standard components published by manufacturer as included in standard preengineered elevator systems and as required for complete system.

B. Elevator Machines: Provide variable-voltage, variable-frequency, ac-type hoisting machines. Provide solid-state power converters.

1. Limit total harmonic distortion of regenerated power to 5 percent per IEEE 519.

2. Provide means for absorbing regenerated power when elevator system is operating on standby power.

3. Provide line filters or chokes to prevent electrical peaks or spikes from feeding back into building power system.

C. Fluid for Oil Buffers: If oil buffers are used, use only fire-resistant hydraulic fluid containing antioxidant, anticorrosive, antifoaming, and metal-passivating additives.

D. Car Frame and Platform: Welded steel units.

E. Guides: Provide roller guides or polymer-coated, nonlubricated sliding guides at top and bottom of car and counterweight frames.

2.03 OPERATION SYSTEMS

A. General: Provide manufacturer's standard microprocessor operation system as required to provide type of operation system indicated.

B. Group Automatic Operation with Demand-Based Dispatching: Provide group automatic system that assigns cars to hall calls based on a dispatching program designed to minimize passenger waiting time. System automatically adjusts to changes in demand for different traffic conditions including heavy incoming, heavy two-way, heavy outgoing, and light off-hours as variations of normal two-way traffic.

2.04 DOOR REOPENING DEVICES

A. Infrared Array: Provide door reopening devices with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more of the light beams shall cause doors to stop and reopen.

2.05 FINISH MATERIALS

A. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.

2.06 CAR ENCLOSURES

A. General: Provide enameled-steel car enclosures to receive removable wall panels, with removable car roof, access doors, power door operators, and ventilation.

B. Materials and Finishes: Provide manufacturer's standards, but not less than the following:

1. Subfloor: Underlayment grade, exterior plywood, 5/8-inch (16-mm) nominal thickness.

2. Floor Finish: Industrial grade vinyl floor; color as selected by Architect from manufacturer’s full range.

3. Stainless-Steel Wall Panels: Flush, hollow-metal construction; fabricated from stainless-steel sheet.

4. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet.

5. Sight Guards: Provide sight guards on car doors.

6. Sills: Extruded metal, with grooved surface, 1/4 inch (6.4 mm) thick.

7. Luminous Ceiling: Fluorescent light fixtures and ceiling panels of translucent acrylic or other permanent rigid plastic.

8. Handrails: Manufacturer's standard handrails.

2.07 HOISTWAY ENTRANCES

A. General: Provide manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Provide frame size and profile to coordinate with hoistway wall construction.

B. Materials and Fabrication: Provide manufacturer's standards, but not less than the following:

1. Stainless-Steel Frames: Formed from stainless-steel sheet.

2. Stainless-Steel Doors and Transoms: Flush, hollow-metal construction; fabricated by laminating stainless-steel sheet to exposed faces and edges of enameled cold-rolled steel doors using adhesive that fully bonds metal to metal without telegraphing or oil-canning.

3. Sight Guards: Provide sight guards on doors matching door edges.

4. Sills: Extruded metal, with grooved surface, 1/4 inch (6.4 mm) thick.

5. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107.

2.08 SIGNAL EQUIPMENT

A. General: Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Fabricate lighted elements with long-life incandescent lamps and acrylic or other permanent, nonyellowing translucent plastic diffusers.

B. Car Control Stations: Provide manufacturer's standard car control stations. Mount in return panel adjacent to car door.

C. Emergency Communication System: Provide system that complies with ASME A17.1 and the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."

D. Car Position Indicator: Provide digital-type car position indicator, located above car door or above car control station. Also provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served.

1. Include travel direction arrows if not provided in car control station.

E. Hall Push-Button Stations:

1. Provide manufacturer's standard wall-mounted units.

F. Hall Lanterns:

1. Manufacturer's standard wall-mounted units, for mounting above entrance frames.

G. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel.

H. Hall Position Indicators: Provide digital-display-type position indicators, located above each hoistway entrance at ground floor. Provide units with flat faceplate for mounting with body of unit recessed in wall.

1. Integrate ground-floor hall lanterns with hall position indicators.

2.09 ELEVATORS

A. Elevator Description:

1. Elevator Number(s)

2. Type: Geared traction.

3. Machine Location: Machine room above hoistway.

4. Rated Load: 2500 lb (1135 kg).

5. Rated Speed: 350 fpm (1.8 m/s).

6. Operation System: Group automatic operation.

7. Car Enclosures:

a. Front Walls (Return Panels): Satin stainless steel, No. 4 finish.

b. Car Fixtures: Satin stainless steel, No. 4 finish.

c. Side and Rear Wall Panels: Satin stainless steel, No. 4 finish.

d. Door Faces (Interior): Satin stainless steel, No. 4 finish.

e. Door Sills: Aluminum, mill finish.

f. Ceiling: Luminous ceiling.

g. Handrails: 1-1/2 inches (38 mm) round.

h. Floor: Manufacturer's standard carpet.

8. Hoistway Entrances: As follows:

a. Type: Single-speed side sliding.

b. Frames: Satin stainless steel, No. 4 finish.

c. Doors: Satin stainless steel, No. 4 finish.

d. Sills Aluminum, mill finish.

9. Hall Fixtures Satin stainless steel, No. 4 finish.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 INSTALLATION

A. Comply with manufacturer's written instructions.

B. Lubricate operating parts of systems, including ropes, as recommended by manufacturers.

C. Leveling Tolerance: 1/8 inch (3 mm), up or down, regardless of load and direction of travel.

D. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.

E. Locate hall signal equipment for elevators as follows, unless otherwise indicated:

1. For groups of elevators, locate hall push-button stations between two elevators at center of group or at location most convenient for approaching passengers.

2. Place hall lanterns either above or beside each hoistway entrance.

3. Mount hall lanterns at a minimum of 72 inches (1829 mm) above finished floor.

3.02 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of elevator installation and before permitting use (either temporary or permanent) of elevators, perform acceptance tests as required and recommended by ASME A17.1 and by governing regulations and agencies.

3.03 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate elevator(s). Refer to Division 01 Section "Demonstration and Training."

B. Check operation of each elevator with Owner's personnel present not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.

END OF SECTION

SECTION 15010
BASIC MECHANICAL DESIGN BUILD REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational mechanical installations on a Design-Build basis. It shall be the Mechanical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

1.02 REQUIREMENTS

A. Scope: The Mechanical Contractor is responsible for the design and mechanical construction of a complete and operating facility. The Mechanical Contractor is responsible for providing all labor and materials, equipment, and transportation necessary or reasonably inferable as being necessary for the execution of the work. Division 15 Specifications are not intended to include ALL mechanical system requirements, equipment, or coordination with other trades. These specifications are intended to provide general design criteria and construction guidelines and shall be used as such.

B. The Mechanical Contractor shall submit design drawings and equipment submittals for design build criteria compliance review and resubmit as necessary to comply with requirements. Submit design drawings to the Owner. Details of equipment sizing and configuration shall be the responsibility of the Designer of Record. Submit catalog cuts as indicated herein to the Owner.

C. Contract requirements of the General Conditions, Supplementary Conditions and Division 1 apply to all work in this Section.

D. The Mechanical Contractor is required to review and coordinate all requirements with the architectural and structural drawings, and with the electrical design build contractor.

1.03 SUBMITTALS AND SHOP DRAWINGS

Submit full sized, scaled (1/8" = 1'-0") floor plan drawings, calculations, and equipment submittals for design build criteria compliance review. Submit design drawings to the Owner with the following data indicated:

A. Drawings
   1. Equipment schedule with following:
   2. External pressure drop
   3. Btu input and output
   4. Entering and leaving design air temperature
   5. Supply, return, exhaust, and outside air airflows
   6. Duct and pipe routing with sizes

7. Diffuser, grilles, dampers, and louver manufacturer, models, and sizes
8. Air flow rates for all inlets and outlets
9. Thermostat and other control component locations
10. Plumbing fixture locations with unique callouts for each fixture

B. Calculations:
   1. Ventilation and air change calculations
   2. Sprinkler systems calculations
   3. Plumbing fixture connection schedule with the following:
      a. Fixture callout
      b. Hot and cold water supply sizes
      c. Waste piping size
      d. Supply and waste fixture units per fixture
   4. Storm drainage piping

C. Shop Drawings
   1. Equipment submittal sheets with model and relevant data clearly indicated using an arrow pointing at data relevant to this project.

1.04 COMPLIANCE AND COORDINATION

Contract requirements of the General Conditions, Supplementary Conditions and Division 1 apply to all work in this Section.

A. Comply with all applicable codes, rules, regulations, design, and construction standards including, but not limited to:
   a. ASHRAE Standards
   b. Washington Energy Code
   c. IBC - International Building Code with Washington Amendments
   d. IMC - International Mechanical Code with Washington Amendments
   e. UPC - Uniform Plumbing Code with Washington Amendments
   f. NFPA - National Fire Protection Association
   g. IFGC - International Fuel Gas Code
   h. SMACNA - Sheet Metal and Air Conditioning Contractors National Association
   i. Local Codes
   j. And other trades.

1.05 INTENT

Examination of Site and Drawings: Submittal of bid shall indicate that the Developer has examined the site, architectural drawings, and has determined that the drawings, specifications and existing conditions are sufficient, adequate, and satisfactory for the construction of the Work under this Contract.

A. Discrepancies: Bring to the Owner Representative's attention any discrepancies between the Contract Documents and field conditions, and any design and layout changes required due to specific equipment selection, etc., prior to purchasing and

installing equipment and material. Corrective work necessitated by discrepancies after purchasing and installation shall be at the Developer's expense.

1.06 WORK SPECIFIED ELSEWHERE

Where other divisions call for work under this division of the specifications, comply with all requirements herein. Mechanical work required by other divisions which is not shown on the mechanical drawings and/or specified in this division of these specifications shall be provided by the trade or subtrade requiring the mechanical work.

1.07 DEFINITIONS AND ABBREVIATIONS

A. Organizations:

1.	ANSI	American National Standards Institute
2.	ASME	American Society of Mechanical Engineers
3.	ASTM	American Society of Testing and Materials
4.	AMCA	Air Movement and Control Association
5.	IBC	International Building Code
6.	IMC	International Mechanical Code

1.08 DESIGN CRITERIA

Mechanical systems design by the Developer shall be in accordance with IBC.

A. Coordinate mechanical systems design and equipment locations with the Architect. Insure that all code and service clearance requirements are defined on the drawings, accessible and coordinated with other trades. Install back flow preventers in strict accordance with all State standards, paying special attention to mounting details, required clearances, and elevations. Locating equipment in areas which cannot be easily serviced will be unacceptable.

1.09 DRAWINGS

The Developer shall provide detailed shop drawings to include but not limited to, exact duct and pipe routing, equipment sizes, service clearance requirements, diffuser and grille sizes and locations, thermostat locations, louver sizes and locations, roof and wall penetration locations and details, volume damper and plumbing shut-off valve locations and access panels in walls and ceilings. Do not proceed with construction until the design has been approved by the Architect.

1.10 SUBMITTALS, APPROVALS, AND REVIEWS

Shop Drawings and Product Data: After the Contract is awarded but prior to manufacture or installation of any equipment, prepare complete Design Drawings and Brochures for materials and equipment as required by each section of the specification. Submit seven (6) complete sets for review within 30 days after award of

Contract. Prior to submission of the Design Drawings and Project Data, review and certify that they are in compliance with the Contract Documents. Verify dimensional information to ensure proper clearance for installation of equipment. Check all materials and equipment after arrival on the job site and verify compliance with the Contract Documents. A minimum period of two weeks, exclusive of transmittal time, shall be required each time a Design Drawing and/or Brochure is submitted or resubmitted for review. This time period shall be considered by the Developer when scheduling submittal data.

A. Review of Design Drawings and Brochures shall not relieve the Developer of responsibility for dimensions and/or errors that may be contained therein, or deviations from Contract Document requirements. The noting of some errors, but the overlooking of others, does not grant the Developer permission to proceed in error. Regardless of any information contained in the Shop Drawings and Brochures, the requirements of the Contract Documents shall govern and are not waived or superseded in any way by the review of the Design Drawings and Brochures. Certify in writing or in the form of rubber stamp impressions as follows:

B.

1. Each Design Drawing shall indicate in the lower right hand corner and each Brochure shall indicate on the front cover the following: Title of the sheet or brochure, name and location of the building; names of the Mechanical Engineer, Developer, subcontractors, manufacturer, supplier/vendor, etc., date of submittal, and the date of correction and revision. Unless the above information is included, the submittal will be returned for resubmittal.
2. Design Drawings shall contain sufficient plans, elevations, sections, and isometrics to clearly describe the equipment or apparatus, and its location. Drawings shall be prepared by an Engineer/Drafter skilled in this type of work. Provide drawings drawn to at least 1/8” = 1'-0” scale
3. Submit manufacturers' brochures and data published by the manufacturers containing complete and detailed engineering and dimensional information relevant to the particular equipment or materials to be furnished in this Contract. Do not submit information which describes several different items in addition to those items to be used, unless all irrelevant information is marked out, or unless relevant information is clearly highlighted. Review all submittals and stamp approved before forwarding to the Owner's Representative for review. Establish quantities, verify space requirements, dimensions, and possible interferences with other trades. Include all specified materials in submittal. Partial submittals of individual items, or those that do not follow specified format, will not be accepted.
4. Identify each item submitted with the pertinent specification paragraph number.
5. Submittal documents shall be complete, covering all items of work. No piecemeal submittals permitted.

C. QUALITY ASSURANCE

All materials shall be new. Properly store all materials and equipment for protection from physical damage or damage due to corrosion.

D. Standardization of Manufacturer: Make every effort to furnish all equipment of any variance with these specifications.

E. Equipment Furnished by Others: For installation of equipment furnished by others and installed by this Developer, obtain rough-in dimensions from approved shop drawings, by measurements from the actual equipment, from details shown on drawings or as directed by the Engineer.

1.11 STORAGE AND PROTECTION OF MATERIALS

Provide a secure storage space for storage of materials and apparatus and assume complete responsibility for all losses and damage. Protect completed work, work underway, and apparatus against loss or damage.

A. Temporary Heating: Apply temporary heat according to customary and accepted good practices, as well as manufacturer's recommendations within equipment enclosures during periods when equipment is not energized and is not in a space that is continuously under normal control of temperature and humidity.

1.12 PERMITS AND FEES

Obtain and pay for all permits relating to the work in this Contract. Contact the various agencies involved relating to the mechanical work and include all inspection and other fees in the Contract.

1.13 COOPERATION

Cooperate completely with all other crafts in the matter of planning and laying out of the Work. Every reasonable effort shall be made to prevent conflicts as to space requirements, dimensions, locations, access openings or other matters tending to obstruct or delay the work of any craft.

1.14 COORDINATION AND SCHEDULING

Coordinate all mechanical work with other trades. Any changes required in the Work caused by the Developer’s neglect to coordinate with others shall be made at the Developer’s expense.

A. Review all Contract Documents and verify at the site all measurements necessary for the proper installation of the work.

B. Refer to all Construction Drawings, details, and specifications, including Architectural, Structural, and Electrical, and fully coordinate all Mechanical work with other trades.

C. Provide all required offsets and special fittings.

D. Pay special attention to all visible devices and equipment in finished areas. Verify the exact location and receive approval from the Owner's Representative prior to installation.

E. Schedule work with all other Developers in order to maintain job progress schedule and to avoid conflicts in the installation of work by other trades. Coordinate with the General Contractor to provide adequate access for installing large equipment.

1.15 SAFETY AND PROTECTION

Safety Measures To Be Taken: The Developer will be solely and completely responsible for conditions of the job site, including safety of all persons and property during performance of the work. This requirement will apply continuously and not be limited to normal working hours. The duty of the Engineer to conduct construction observations of the Developer's performance is not intended to include review of the adequacy of the Developer's safety measures, in, on or near the construction site. It shall be the Developer's responsibility to comply with “Safety and Health Regulations for Construction,” Volume 36, No. 75, Part II of the Federal Register by the U.S. Department of Labor. Developer shall be responsible for providing all such safety measures and shall consult with the state or federal safety inspector for interpretation whenever in doubt as to whether safe conditions do or do not exist or whether he is or is not in compliance with state or federal regulations.

A. Protection: Ensure that mechanical safety and protection are maintained, including the proper covering, signage, and securing of pressurized pipe.

1.16 GUARANTEE

Ensure that the mechanical system installed under this Contract is in proper working order and in compliance with drawings, specifications, and/or authorized changes. Without additional charge, replace any work or materials that develop defects, except from ordinary wear and tear, within one year from the date of substantial completion.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 SITE CLEAN UP

Remove from site all waste and rubbish resulting from the work. Keep Site clean on a day-to-day basis.

3.02 SERVICE OUTAGES

Keep outages to an absolute minimum. Any essential outages required in the course of construction, whether for temporary services, cutovers or testing, shall be closely coordinated with the Owner and Engineer. They shall occur at times convenient with the Owner.

A. Submit written request at least seven days in advance of any scheduled outage and proceed with the outage only after receiving authorization from the Owner's Representative.

3.03 MECHANICAL CONNECTIONS FOR EQUIPMENT

General: Provide mechanical connection of all equipment having ductwork and/or piping requirements.

IMC Compliance: Comply with applicable portions of IMC as to the type of products used and provisions for mechanical ductwork and piping connections.

A. Underwriters Laboratories acceptance: All material and equipment within the scope of the UL re-examination service shall be approved by Underwriters Laboratories, Inc. for the purpose for which they are used and shall bear their label.

B. Execution: Make mechanical ductwork and piping connections in accordance with connector manufacturer's written instructions, with recognized industry practices, and complying with requirements of ASME and SMACNA standards. Coordinate installation of mechanical connections for equipment with equipment installation work. Verify all mechanical loads (voltage, phase, full load amperes, number and point of connections, minimum circuit capacity, etc.) for equipment furnished under other divisions of this specification by reviewing respective shop drawings furnished under each division. Obtain and review equipment shop drawings to determine all final connection requirements before rough-in begins for each equipment item. Meet with each subcontractor furnishing equipment requiring mechanical service and review mechanical characteristics. Report any variances from mechanical characteristics noted on the mechanical drawings to Engineer before proceeding with rough-in work.

3.04 EQUIPMENT ACCESSIBILITY AND INSTALLATION

Accessibility of Equipment: Comply with applicable codes and install equipment so as to be accessible for operation, maintenance, test or repair. Equipment deemed inaccessible shall be relocated as directed.

A. Manufacturer's Installation Details: Follow Manufacturer's installation details exactly, where available. Provide special ductwork, piping or fittings as required.

3.05 MECHANICAL WORK EXPOSED TO WEATHER

Provide corrosion protection for all copper and ferrous metal portions of mechanical work exposed to weather, including ductwork, piping, supports, valves and other items. All ferrous metal shall be hot-dip galvanized after fabrication, painted or cadmium plated, or similarly protected against corrosion. All enclosures and equipment shall be weathertight.

3.06 EQUIPMENT BASES AND FASTENING

Housekeeping Bases: Provide appropriately sized concrete housekeeping bases for all floor-mounted equipment unless noted otherwise. Bases shall be 4" thick reinforced concrete, 3000-psi, 28-day compressive strength, with #4 rebar each way on 12" centers and doweled to floor slab. Trowel finish with 1" bevel edge all around.

A. Floor-Mounted Equipment Fastening: All floor-mounted equipment shall be secured to the housekeeping bases with ductile steel anchor bolts, preset in the concrete base. Secure vibration mounts, where required, to the concrete bases such that the equipment is free to vibrate but cannot move from the base.

B. Roof-Mounted Equipment and Roof Penetrations: Provide sealed roof curbs per local jurisdiction and Owner's requirements for all rooftop equipment and ductwork or piping penetrations of the roof. Flash and seal weathertight to the existing roof structure and cover to match existing roof construction.

3.07 ANCHORAGE AND BRACING OF MECHANICAL SYSTEMS

General: Provide complete seismic anchorage and bracing for the lateral and vertical support of conduit and mechanical equipment as required by Section 1621 of the International Building Code and local codes and ordinances.

A. Ductwork and/or Piping Crossing Structural Separations: Install ductwork and piping that crosses structured separations between buildings or building units with flexible connections, suitable to accommodate longitudinal and transverse displacements.

B. Anchorage of Equipment: Brace or anchor all mechanical and mechanical equipment to resist a horizontal force acting in any direction per requirements of the International Building Code for seismic zone 4.

C. All anchorage and bracing must be designed by a licensed structural engineer and submitted to the project structural engineer for review and approval. The Contractor shall pay all costs.

3.08 CUTTING AND PATCHING

Coordinate location of all openings required in the building construction for the installation of the work. Any cutting and patching made necessary through the neglect of the Contractor will be done at the expense of the Contractor.

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of the trades involved. In no case shall any structural member be cut.

B. Repair disturbed surfaces to match adjacent undisturbed surfaces.

3.09 SLEEVES AND OPENINGS

Sleeves and openings required through floors and walls for mechanical work shall be the responsibility of this Contractor. Carefully coordinate this work with the other trades involved. Use approved sleeves and seal all openings around conduits in sleeves with a material of equal fire rating as the surface penetrated.

3.10 PAINTING

Equipment painted at the factory shall not be repainted unless damaged or as otherwise specified. Touchup equipment using paint provided by the equipment manufacturer and selected to match the equipment finish.

A. Touchup damaged non-equipment surfaces with paint matching type and color of existing undamaged adjacent finish.

B. Touchup damaged galvanized surfaces using zinc-rich paint as recommended by the item manufacturer.

C. All exposed mechanical materials (ductwork, piping, hangers and supports, equipment and registers or diffusers) shall be painted with color per the Architect’s discretion.

3.11 TESTS

Fully test and adjust the equipment installed under this specification and demonstrate its proper operation to the Engineer. No equipment shall be tested or operated for any other purpose, such as checking motor rotation, until it has been fully checked in accordance with the manufacturer's instructions. Test and adjust equipment prior to employee instruction. Submit test report for each system or component to the Engineer for approval. Where specified, submit certified test reports by certified service organizations representing the system or equipment involved. Include all test reports in operation and maintenance manuals.

3.12 CLEANING

Clean up all equipment to factory condition. Use touch-up paint where required. Remove all packing cartons and other debris that is a direct result of the installation of the work of this Division.

A. Clean registers and diffusers, interiors and exteriors of all equipment in accordance with manufacturer's recommendations.

B. Vacuum the interior of all ductwork. Wipe all mechanical work down to remove dust and dirt.

3.13 PROJECT FINALIZATION AND START UP

Upon completion of equipment and system installation, assemble all equipment factory representatives and subcontractors for system start up.

A. Each major equipment and system representative and subcontractor shall assist in start-up and shall check out their respective system and remain at the site until the total system operation is accepted by the Owner's Representative.

B. The project foreman shall accompany the reviewing party and remove cover plates, panel covers and other access panels as requested in order to allow review of the entire mechanical system.

3.14 CERTIFICATION OF INSPECTION

Present Owner with Certification of Inspection from the code enforcing agency upon completion of work stating that all work complies with all applicable Codes and Ordinances.

3.15 RECORD DRAWINGS

Maintain, on a daily basis, a complete set of “Record Drawings,” reflecting an accurate dimensional record of the precise locations of all buried or concealed work. This requirement shall not be construed as authorization for the Contractor to make changes in the layout or work without definite authorization for such changes. The “Record Drawings” for daily recording shall consist of a set of blue line prints of the Contract Drawings.

A. Record dimensions clearly and accurately, delineating the work as installed. Identify locations by at least two dimensions to permanent reference points. Upon completion of the work, provide a complete set of electronic files of mechanical systems including all “Record” information to the Owner.

3.16 OPERATION AND MAINTENANCE MANUALS

General: Prepare instruction manuals describing the operation, servicing and maintenance requirements of all mechanical equipment provided, including complete parts lists.

A. Equipment Described in the Manual: Include all equipment submitted for approval. Each section shall have a separate index tab.

B. Information Contained in the Manual:
   1. Each manual shall contain the following information:
      a. Complete and legible equipment data cut sheets.

b. Legend of all symbols and abbreviations.
c. A complete instruction manual necessary for the proper operation and maintenance of the system.
d. Complete list of all test and diagnostic equipment, including testing procedures to utilize same.
e. Replacement parts list for each piece of equipment in the system with a brief description of functions.

2. Index all contents listed in an orderly presentation. Include tabulations describing the type of equipment, frequency and type of service.

C. Binding: Bind material in a post-type expandable three-hole binder with cloth-covered heavy-duty hardboard cover and cloth back panel. Imprint the front cover with the name of the project, the Owner, year of completion, the words “Mechanical Equipment,” and the names of the Engineer and Mechanical Contractor. Imprint the back edge with the name of the project, Owner and year of completion. If the thickness of the manual exceeds 3”, provide separate volumes, each not to exceed 3” thick, with each volume imprinted as described above. Electronic equivalent of a complete operations and maintenance manual recorded on CD or DVD is considered acceptable alternative.

D. Number of Copies: Submit one preliminary copy for review approval. Deliver three final bound copies to the Owner upon final approval.

3.17 OPERATING PERSONNEL INSTRUCTION

General: Provide instruction of facility operating personnel sufficiently prior to facility acceptance, upon mutually satisfactory arrangement with the Owner.

A. Instruction: Instruction shall not begin until the component, assembly, or system has been tested and is in acceptable operating condition. Otherwise, instruction shall be deemed incomplete. Instruction shall encompass normal operation, emergency operation, fire and other hazards, safety provisions, provisions for pollution prevention, and maintenance procedures for all work provided.

B. Instructors: Instructors shall include the Contractor's staff, supplemented by authorized representatives of the component, assembly or system manufacturer.

C. Time: Provide all necessary instruction to the complete understanding of the operating personnel. Instruction periods shall be as recommended by manufacturer with a minimum of 8 hours instruction provided. Provide a time schedule to the Owner for review and approval.

END OF SECTION

SECTION 15060
HANGERS AND SUPPORTS

PART 1 GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational mechanical installations on a Design-Build basis. It shall be the Mechanical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Division 0 and Division 1 Specification Sections, apply to this Section.

B. Related Sections include the following:
   1. Division 15 Sections on fire-suppression piping for fire-suppression pipe hangers.
   2. Division 15 Section "Mechanical Vibration Controls and Seismic Restraints" for vibration isolation and seismic restraint devices for equipment.

1.03 SUMMARY

A. This Section includes hangers and supports for mechanical system piping and equipment.

1.04 DEFINITIONS

A. MSS: Manufacturers Standardization Society for the Valve and Fittings Industry.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.05 PERFORMANCE REQUIREMENTS

A. Design channel support systems for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

B. Comply with SMACNA "Seismic Restraint Manual Guidelines for Mechanical Systems," 2nd Edition, February 1998.

1.06 SUBMITTALS

A. Product Data: For each type of pipe hanger, channel support system component, and thermal-hanger shield insert indicated.

B. Shop Drawings: Signed and sealed by a qualified professional engineer for multiple piping supports and trapeze hangers. Include design calculations and indicate size and characteristics of components and fabrication details.

C. Welding Certificates: Copies of certificates for welding procedures and operators.

1.07 QUALITY ASSURANCE

A. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

B. Engineering Responsibility: Design and preparation of Shop Drawings and calculations for each multiple pipe support, trapeze, and seismic restraint by a qualified professional engineer.
   1. 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 hangers and supports that are similar to those indicated for this Project in material, design, and extent.

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

A. Pipe Hangers, Supports, and Components: MSS SP-58, factory-fabricated components. Refer to "Hanger and Support Applications" Article in Part 3 for where to use specific hanger and support types.
   1. Galvanized, Metallic Coatings: For piping and equipment that will not have field-applied finish.
   2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.

B. Channel Support Systems: MFMA-2, factory-fabricated components for field assembly.
   1. Material: Steel, structural quality, ASTM 570.
   2. Coatings: Hot-dipped galvanized coating. Threaded hardware, zinc plated.
   3. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.

C. Thermal-Hanger Shield Inserts: 100-psi minimum compressive-strength insulation, encased in sheet metal shield.
   1. Material for Cold Piping: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate with vapor barrier.
   2. Material for Hot Piping: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate.
   3. For Trapeze or Clamped System: Insert and shield cover entire circumference of pipe.
   4. For Clevis or Band Hanger: Insert and shield cover lower 180 degrees of pipe.
   5. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.02 MISCELLANEOUS MATERIALS

A. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. No powder actuated type anchors permitted for any portion of the installation.

B. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.

C. Grout: ASTM C 1107, Grade B, factory-mixed and -packaged, nonshrink, and nonmetallic, dry, hydraulic-cement grout.
   1. Characteristics: Post hardening and volume adjusting; recommended for both interior and exterior applications.
   2. Properties: Nonstaining, noncorrosive, and nongaseous.
   3. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger requirements are specified in Sections specifying equipment and systems.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Specification Sections.

C. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
   1. Adjustable Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
   2. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24, if little or no insulation is required.
   3. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
   4. Adjustable Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
   5. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
   6. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, NPS 2-1/2 to NPS 20, from single rod if horizontal movement caused by expansion and contraction might occur.
   7. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42, if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

D. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
   1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.

E. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
   1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.

2. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.

F. Building Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
   1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
   2. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
   3. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
   4. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
      a. Light (MSS Type 31): 750 lb.
      b. Medium (MSS Type 32): 1500 lb.
      c. Heavy (MSS Type 33): 3000 lb.

G. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
   1. Protection Shields (MSS Type 40): Of length recommended by manufacturer to prevent crushing insulation.
   2. Thermal-Hanger Shield Inserts: For supporting insulated pipe, 360-degree insert of high-density, 100-psi minimum compressive-strength, water-repellent-treated calcium silicate, or cellular-glass pipe insulation, same thickness as adjoining insulation with vapor barrier and encased in 360-degree sheet metal shield.

H. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
   1. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
   2. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from hanger.
   3. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from trapeze support.

3.02 HANGER AND SUPPORT INSTALLATION

A. Pipe Hanger and Support Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Channel Support System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems.
   1. Field assemble and install according to manufacturer's written instructions.

C. Heavy-Duty Steel Trapeze Installation: Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated, heavy-duty trapezes.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.

D. Install building attachments within concrete slabs or attach to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

E. Pipe Seismic Restraint: Install pipe seismic restraints in accordance with SMACNA “Seismic Restraint Manual Guidelines for Mechanical Systems.”

F. If concrete inserts cannot be used, install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

G. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

J. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping," is not exceeded.

K. Insulated Piping: Comply with the following:
   1. Attach clamps and spacers to piping.
      a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
      b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
      c. Do not exceed pipe stress limits according to ASME B31.9.
   2. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span arc of 180 degrees.
      a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
   3. Shield Dimensions for Pipe: Not less than the following:
      a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
      b. NPS 4: 12 inches long and 0.06 inch thick.
      c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
      d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
      e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

4. Pipes NPS 8 and Larger: Include wood inserts.
5. Insert Material: Length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.03 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure above or to support equipment above floor where indicated.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

3.04 METAL FABRICATION

A. Cut, drill, and fit miscellaneous metal fabrications for heavy-duty steel trapezes and equipment supports.

B. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
   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 welding flux immediately.
   4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.05 ADJUSTING

A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.06 PAINTING

A. Touching Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
   1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
   2. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 15075
MECHANICAL IDENTIFICATION

PART 1 GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational mechanical installations on a Design-Build basis. It shall be the Mechanical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Division 0 and Division 1 Specification Sections, apply to this Section.

B. Related sections include the following:

1. Division 9 for painting.

1.03 SUMMARY

A. This Section includes the following mechanical identification materials and their installation:

1. Equipment nameplates.

2. Pipe markers.

3. Duct markers.

4. Valve tags.

5. Valve schedules.

6. Warning tags.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Valve numbering scheme.

D. Valve Schedules: For each piping system. Furnish extra copies (in addition to mounted copies) to include in maintenance manuals.

1.05 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

1.06 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with location of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 PRODUCTS

2.01 EQUIPMENT IDENTIFICATION DEVICES

A. Equipment Nameplates: Metal, with data engraved or stamped, for permanent attachment on equipment.

1. Data:

a. Manufacturer, product name, model number, and serial number.

b. Capacity, operating and power characteristics, and essential data.

c. Labels of tested compliances.

2. Location: Accessible and visible.

3. Fasteners: As required to mount on equipment.

2.02 PIPING IDENTIFICATION DEVICES

A. Self-Adhesive Pipe Markers: Vinyl with pressure-sensitive, permanent type, self-adhesive back. Preprinted, color-coded, with lettering indicating service, and showing direction of flow.

1. Colors: Comply with ASME A13.1, unless otherwise indicated.

2. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.

3. Full-band pipe markers extending 360 degrees around pipe at each location.

4. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.

2.03 DUCT IDENTIFICATION DEVICES

A. Self Adhesive Duct Markers: Vinyl with pressure-sensitive, permanent-type, self-adhesive back. Preprinted, color-coded, with lettering indicating service, and showing direction of flow.

1. Colors: Comply with ASME A13.1, unless otherwise indicated.

2. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.

3. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.

2.04 VALVE TAGS

A. Valve Tags: Two-ply engraved black plastic with lettering cut through to white background.

1. Data: Service, identification number, and temperature of the line controlled.

2. 2-inch round, 1/16-inch thick, with 3/16-inch hole.

3. Fastener: Brass chain or S-hook.

2.05 VALVE SCHEDULES

A. Valve Schedules: For each piping system, on standard-size bond paper. Assign and tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating) and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-Schedule Frame: Mount valve schedule in frame with clear plastic cover, include mounting screws.

2.06 WARNING TAGS

A. Warning Tags: Preprinted plasticized card stock with matte finish.

1. Size: 4 by 7 inches.

2. Fasteners: Brass grommet and chain.

3. Nomenclature: Large-size primary caption such as CAUTION: NONPOTABLE WATER, DO NOT DRINK.

4. Color: Yellow background with 1/2-inch black lettering.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 APPLICATIONS, GENERAL

A. Products specified are for applications referenced in other Division 15 Sections.

3.02 EQUIPMENT IDENTIFICATION

A. Nameplate Installation: Install and permanently fasten equipment nameplates on each major item of mechanical equipment that does not have nameplate or has nameplate that is damaged or located where not easily visible. Locate nameplates where accessible and visible. Include nameplates for the following general categories of equipment:

1. Fans, blowers and air terminals.

3.03 PIPING IDENTIFICATION

A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows completely around pipe showing direction of flow. Apply to clean surface.

B. Locate pipe markers where piping is exposed in finished spaces, mechanical spaces; accessible maintenance spaces such as removable accessible ceilings, shafts, tunnels, and plenums; and exterior nonconcealed locations as follows:

1. Near each valve and control device.

2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.

3. Near penetrations through walls, floors, ceilings, and nonaccessible enclosures.

4. At access doors, manholes, and similar access points that permit view of concealed piping.

5. Near major equipment items and other points of origination and termination.

6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.

7. On piping above removable acoustical ceilings. Omit intermediately spaced markers, minimum one in each space.

3.04 DUCT IDENTIFICATION

A. Install manufactured duct markers indicating service on each duct system. Install with flow arrows showing direction of flow.

B. Locate markers near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.05 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; plumbing fixture supply stops; shutoff valves; faucets; convenience and lawn-watering hose connections; and air terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

3.06 VALVE-SCHEDULE INSTALLATION

A. Mount valve schedule on wall in accessible location in each major equipment room.

3.07 WARNING-TAG INSTALLATION

A. Attach warning tags to equipment and other items where required.

3.08 ADJUSTING

A. Relocate mechanical identification materials and devices that have become visually blocked by other work.

3.09 CLEANING

1. Clean faces of mechanical identification devices.

END OF SECTION

SECTION 15083
PIPE INSULATION

PART 1 GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational mechanical installations on a Design-Build basis. It shall be the Mechanical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Division 0 and Division 1 Specification Sections, apply to this Section.

B. Related Sections include the following:

1. Division 15 Section "Hangers and Supports" for pipe insulation shields and protection saddles.

1.03 SUMMARY

A. This Section includes preformed, rigid, and flexible pipe insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.

1.04 SUBMITTALS

A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the U.S. Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.

2. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type, and grade, and maximum use temperature.

1.07 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 15 Section "Hangers and Supports."

B. Coordinate clearance requirements with piping Installer for insulation application.

C. Coordinate installation of electric heat tracing.

1.08 SCHEDULING

A. Schedule insulation application after testing piping systems and, where required, after installing and testing heat-trace tape. Insulation application may begin on segments of piping that have satisfactory test results.

PART 2 PRODUCTS

2.01 INSULATION MATERIALS

A. Mineral-Fiber Insulation: Glass fibers bonded with a thermosetting resin complying with the following:

1. Preformed Pipe Insulation: Comply with ASTM C 547, Type 1, with factory-applied, all-purpose, vapor-retarder jacket.

2. Blanket Insulation: Comply with ASTM C 553, Type II, without facing.

3. Fire-Resistant Adhesive: Comply with MIL-A-3316C in the following classes and grades:

a. Class 1, Grade A for bonding glass cloth and tape to unfaced glass-fiber insulation, for sealing edges of glass-fiber insulation, and for bonding lagging cloth to unfaced glass-fiber insulation.

b. Class 2, Grade A for bonding glass-fiber insulation to metal surfaces.

4. Vapor-Retarder Mastics: Fire- and water-resistant, vapor-retarder mastic for indoor applications. Comply with MIL-C-19565C, Type II.

5. Mineral-Fiber Insulating Cements: Comply with ASTM C 195.

6. Expanded or Exfoliated Vermiculite Insulating Cements: Comply with ASTM C 196.

7. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

B. Flexible Elastomeric Thermal Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Adhesive: As recommended by insulation material manufacturer.

2. Ultraviolet-Protective Coating: As recommended by insulation manufacturer.

2.02 FIELD-APPLIED JACKETS

A. General: ASTM C 921, Type 1, unless otherwise indicated.

B. Foil and Paper Jacket: Laminated, glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.

C. PVC Jacket: High-impact, ultraviolet-resistant PVC; 20 mils thick; roll stock ready for shop or field cutting and forming.

1. Adhesive: As recommended by insulation material manufacturer.

2. PVC Jacket Color: White or gray.

3. PVC Jacket Color: Color-code piping jackets based on materials contained within the piping system.

D. Heavy PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 30-mil-thick, high-impact, ultraviolet-resistant PVC.

1. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories for the disabled.

2. Adhesive: As recommended by insulation material manufacturer.

E. Standard PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20-mil- thick, high-impact, ultraviolet-resistant PVC.

1. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories for the disabled.

2. Adhesive: As recommended by insulation material manufacturer.

F. Aluminum Jacket: Factory cut and rolled to indicated sizes. Comply with ASTM B 209, 3003 alloy, H-14 temper.

G. Aluminum Jacket: Aluminum roll stock, ready for shop or field cutting and forming to indicated sizes. Comply with ASTM B 209, 3003 alloy, H-14 temper.

1. Finish and Thickness: Smooth finish, 0.010 inch thick.

2. Finish and Thickness: Corrugated finish, 0.010 inch thick.

3. Finish and Thickness: Stucco-embossed finish, 0.016 inch thick.

4. Finish and Thickness: Painted finish, 0.016 inch thick.

5. Moisture Barrier: 1-mil- thick, heat-bonded polyethylene and kraft paper.

6. Elbows: Preformed, 45- and 90-degree, short- and long-radius elbows; same material, finish, and thickness as jacket.

2.03 ACCESSORIES AND ATTACHMENTS

A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8-oz./sq. yd.

1. Tape Width: 4 inches.

B. Bands: 3/4 inch wide, in one of the following materials compatible with jacket:

1. Stainless Steel: ASTM A 666, Type 304; 0.020 inch thick.

2. Galvanized Steel: 0.005 inch thick.

3. Aluminum: 0.007 inch thick.

4. Brass: 0.010 inch thick.

5. Nickel-Copper Alloy: 0.005 inch thick.

C. Wire: 0.080-inch, nickel-copper alloy; 0.062-inch, soft-annealed, stainless steel; or 0.062-inch, soft-annealed, galvanized steel.

2.04 THERMAL INSULATION REMOVABLE PADS

A. The inner and outer jacketing on the removable pads shall be Lewco 1550 SA silicone impregnated.

B. The insulation material inside the pads shall be Owens/Corning fiberglass thermal insulating wool.

C. Lacing hooks, and washers shall be Lewco, or approved.

D. Tie wire shall be stainless steel.

E. Fasteners shall be stainless steel staples STCR 5019-3/8-inch, or approved.

F. Thickness for all pads: 2-inch thick thermal insulating wool.

2.05 VAPOR RETARDERS

A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Preparation: Clean and dry pipe and fitting surfaces. Remove materials that will adversely affect insulation application.

3.03 GENERAL APPLICATION REQUIREMENTS

A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.

B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each piping system.

C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Apply insulation with longitudinal seams at top and bottom of horizontal pipe runs.

E. Apply multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.

H. Keep insulation materials dry during application and finishing.

I. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

J. Apply insulation with the least number of joints practical.

K. Apply insulation over fittings, valves, and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated. Refer to special instructions for applying insulation over fittings, valves, and specialties.

L. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic.

1. Apply insulation continuously through hangers and around anchor attachments.

2. For insulation application where vapor retarders are indicated, extend insulation on anchor legs at least 12 inches from point of attachment to pipe and taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

3. Install insert materials and apply insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by the insulation material manufacturer.

4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect the jacket from tear or puncture by the hanger, support, and shield.

M. Insulation Terminations: For insulation application where vapor retarders are indicated, taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

N. Apply adhesives and mastics at the manufacturer's recommended coverage rate.

O. Apply insulation with integral jackets as follows:

1. Pull jacket tight and smooth.

2. Circumferential Joints: Cover with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip and spaced 4 inches o.c.

3. Longitudinal Seams: Overlap jacket seams at least 1-1/2 inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.

a. Exception: Do not staple longitudinal laps on insulation having a vapor retarder.

4. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to flanges, unions, valves, and fittings.

5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor-retarder mastic.

P. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.

1. Seal penetrations with vapor-retarder mastic.

2. Apply insulation for exterior applications tightly joined to interior insulation ends.

3. Extend metal jacket of exterior insulation outside roof flashing at least 2 inches below top of roof flashing.

4. Seal metal jacket to roof flashing with vapor-retarder mastic.

Q. Exterior Wall Penetrations: For penetrations of below-grade exterior walls, terminate insulation flush with mechanical sleeve seal. Seal terminations with vapor-retarder mastic.

R. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and floors.

S. Fire-Rated Wall and Partition Penetrations: Apply insulation continuously through penetrations of fire-rated walls and partitions or abut fireproofing or stopping materials, when required for the type or size of penetration.

T. Floor Penetrations: Apply insulation continuously through floor assembly.

1. For insulation with vapor retarders, seal insulation with vapor-retarder mastic where floor supports penetrate vapor retarder.

3.04 MINERAL-FIBER INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Secure each layer of preformed pipe insulation to pipe with wire, tape, or bands without deforming insulation materials.

2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic. Apply vapor retarder to ends of insulation at intervals of 15 to 20 feet to form a vapor retarder between pipe insulation segments.

3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches o.c.

4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.

B. Apply insulation to flanges as follows:

1. Apply preformed pipe insulation to outer diameter of pipe flange.

2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.

4. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch, and seal joints with vapor-retarder mastic.

C. Apply insulation to fittings and elbows as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.

2. When premolded insulation elbows and fittings are not available, apply mitered sections of pipe insulation, or glass-fiber blanket insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire, tape, or bands.

3. Cover fittings with standard PVC fitting covers.

D. Apply insulation to valves and specialties as follows:

1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.

2. When premolded insulation sections are not available, apply glass-fiber blanket insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to stainer basket without disturbing insulation.

3. Apply insulation to flanges as specified for flange insulation application.

4. Use preformed standard PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.

5. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

3.05 FLEXIBLE ELASTOMERIC THERMAL INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Follow manufacturer's written instructions for applying insulation.

2. Seal longitudinal seams and end joints with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

B. Apply insulation to flanges as follows:

1. Apply pipe insulation to outer diameter of pipe flange.

2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of the same thickness as pipe insulation.

4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

C. Apply insulation to fittings and elbows as follows:

1. Apply mitered sections of pipe insulation.

2. Secure insulation materials and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

D. Apply insulation to valves and specialties as follows:

1. Apply preformed valve covers manufactured of the same material as pipe insulation and attached according to the manufacturer's written instructions.

2. Apply cut segments of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, fabricate removable sections of insulation arranged to allow access to stainer basket.

3. Apply insulation to flanges as specified for flange insulation application.

4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive. Cement to avoid openings in insulation that will allow passage of air to the pipe surface.

3.06 FIELD-APPLIED JACKET APPLICATION

A. Apply glass-cloth jacket, where indicated, directly over bare insulation or insulation with factory-applied jackets.

1. Apply jacket smooth and tight to surface with 2-inch overlap at seams and joints.

2. Embed glass cloth between two 0.062-inch- thick coats of jacket manufacturer's recommended adhesive.

3. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.

B. Foil and Paper Jackets: Apply foil and paper jackets where indicated.

1. Draw jacket material smooth and tight.

2. Apply lap or joint strips with the same material as jacket.

3. Secure jacket to insulation with manufacturer's recommended adhesive.

4. Apply jackets with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.

5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-retarder mastic.

C. Apply PVC jacket where indicated, with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

D. Apply metal jacket where indicated, with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

E. King County prefers metal jackets over all insulation for durability and bird-proofing.

3.07 FINISHES

A. Glass-Cloth Jacketed Insulation: Paint insulation finished with glass-cloth jacket as specified in Division 9 Section "Painting."

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of the insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by the Project Representative. Vary first and second coats to allow visual inspection of the completed Work.

3.08 PIPING SYSTEM APPLICATIONS

A. Insulation materials and thicknesses are specified in schedules at the end of this Section.

B. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:

1. Flexible connectors.

2. Vibration-control devices.

3. Fire-suppression piping.

4. Drainage piping located in crawl spaces, unless otherwise indicated.

5. Below-grade piping, unless otherwise indicated.

6. Unions, strainers, check valves, plug valves, and flow regulators.

3.09 FIELD QUALITY CONTROL

A. Inspection: Perform the following field quality-control inspections, after installing insulation materials, jackets, and finishes, to determine compliance with requirements:

1. Inspect fittings and valves randomly selected by the Project Representative.

2. Remove fitting covers from 20 elbows or 1 percent of elbows, whichever is less, for various pipe sizes.

3. Remove fitting covers from 20 valves or 1 percent of valves, whichever is less, for various pipe sizes.

B. Insulation applications will be considered defective if sample inspection reveals noncompliance with requirements. Remove defective Work and replace with new materials according to these Specifications.

C. Reinstall insulation and covers on fittings and valves uncovered for inspection according to these Specifications.

3.10 THERMAL INSULATION REMOVABLE PADS

A. All flanges and valves including control valves, gate valves and butterfly valves shall be insulated with removable pads for systems that are indicated under the applications schedule.

3.11 INSULATION APPLICATION SCHEDULE, GENERAL

A. Refer to insulation application schedules for required insulation materials, vapor retarders, and field-applied jackets.

B. Application schedules identify piping system and indicate pipe size ranges and material, thickness, and jacket requirements.

3.12 INTERIOR INSULATION APPLICATION SCHEDULE

A. Service: Hose bibb cold water.

1. Operating Temperature: 35 to 60 deg F.

2. Insulation Material: Mineral fiber.

3. Insulation Thickness: Apply the following insulation thicknesses:

a. Copper Pipe, 1-inch.

4. Field-Applied Jacket: Aluminum Jacket.

5. Vapor Retarder Required: Yes.

6. Finish: None.

7. Insulation Conductivity Range: 0.23 – 0.27 BTU·in/(hr·ft^2·°F).

B. Service: Fire protection where heat tracing is installed for freeze protection.

1. Operating Temperature: 35 to 60 deg F.

2. Insulation Material: Mineral fiber.
3. Insulation Thickness: Apply the following insulation thicknesses:
   a. Copper Pipe, 1-inch.
4. Field-Applied Jacket: Aluminum Jacket.
5. Vapor Retarder Required: Yes.
6. Finish: None.

C. Service: Rainwater conductors.
1. Operating Temperature: 32 to 100 deg F.
2. Insulation Material: Mineral fiber.
3. Insulation Thickness: Apply the following insulation thicknesses:
   a. Cast Iron Pipe, 1/2-inch.
4. Field-Applied Jacket: Aluminum Jacket.
5. Vapor Retarder Required: Yes.
6. Finish: None.

D. Service: Roof drain bodies.
1. Operating Temperature: 32 to 100 deg F.
2. Insulation Material: Mineral fiber.
3. Insulation Thickness: 1/2-inch.
4. Field-Applied Jacket: PVC.
5. Vapor Retarder Required: Yes.
6. Finish: None.

E. Service: Domestic hot and recirculated hot water.
1. Operating Temperature: 60 to 140 deg F.
2. Insulation Material: Mineral fiber.
3. Insulation Thickness: Apply the following insulation thicknesses:
   a. Pipe, 1/2-inch – 2-inch: 1-inch.
4. Field-Applied Jacket: Aluminum Jacket.

5. Vapor Retarder Required: Yes.

6. Finish: None.

7. Insulation Conductivity Range: 0.24 – 0.28 BTU·in/(hr·ft^2·°F).

F. Service: Domestic cold water.

1. Operating Temperature: 35 to 60 deg F.

2. Insulation Material: Mineral fiber.

3. Insulation Thickness: Apply the following insulation thicknesses:

a. Pipe, 3/4-inch to 2-inch: 1-inch.

4. Field-Applied Jacket: Aluminum Jacket.

5. Vapor Retarder Required: Yes.

6. Finish: None.

7. Insulation Conductivity Range: 0.23 – 0.27 BTU·in/(hr·ft^2·°F).

3.13 EXTERIOR INSULATION APPLICATION SCHEDULE

A. Service: Domestic cold water.

1. Operating Temperature: 60 to 140deg F.

2. Insulation Material: Mineral fiber.

3. Insulation Thickness: Apply the following insulation thicknesses:

a. Copper Pipe, 1-1/2 inch.

4. Field-Applied Jacket: Aluminum Jacket.

5. .Vapor Retarder Required: Yes.

6. Finish: None.

END OF SECTION

SECTION 15100
VALVES

PART 1 GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational mechanical installations on a Design-Build basis. It shall be the Mechanical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Division 0 and Division 1 Specification Sections, apply to this Section.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Special purpose valves are specified in other Division 15 piping system sections.

2. Valve tags and charts are specified in Division 15 Section "Mechanical Identification."

1.03 SUMMARY

A. This Section includes general duty valves common to several mechanical piping systems.

1.04 SUBMITTALS

A. General: Submit each item in this Paragraph according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each valve type. Include body material, valve design, pressure and temperature classification, end connection details, seating materials, trim material and arrangement, dimensions and required clearances, and installation instructions. Include list indicating valve and its application.

C. Maintenance data for valves to include in the operation and maintenance manual specified in Division 1. Include detailed manufacturer's instructions on adjusting, servicing, disassembling, and repairing.

1.05 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME B31.9 for building services piping and ASME B31.1 for power piping.

B. MSS Compliance: Comply with the various MSS Standard Practice documents referenced.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.

2. Protect threads, flange faces, grooves, and weld ends.

3. Set globe and gate valves closed to prevent rattling.

4. Set ball and plug valves open to minimize exposure of functional surfaces.

5. Set butterfly valves closed or slightly open.

6. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.

2. Store indoors and maintain valve temperature higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use a sling to handle large valves. Rig to avoid damage to exposed parts. Do not use handwheels and stems as lifting or rigging points.

PART 2 PRODUCTS

2.01 BASIC, COMMON FEATURES

A. Design: Rising stem or rising outside screw and yoke stems, except as specified below.

1. Nonrising stem valves may be used only where headroom prevents full extension of rising stems.

B. Pressure and Temperature Ratings: As indicated in the "Application Schedule" of Part 3 of this Section and as required to suit system pressures and temperatures.

C. Sizes: Same size as upstream pipe, unless otherwise indicated.

D. Operators: Use specified operators and handwheels, except provide the following special operator features:

1. Handwheels: For valves other than quarter turn.

2. Lever Handles: For quarter-turn valves 6 inches and smaller, except for plug valves, which shall have square heads. Furnish Owner with one wrench for every 10-plug valves.

3. Chain-Wheel Operators: For valves 4 inches and larger, installed 96 inches or higher above finished floor elevation.

4. Gear-Drive Operators: For quarter-turn valves 8 inches and larger.

E. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation.

F. Bypass and Drain Connections: Comply with MSS SP-45 bypass and drain connections.

G. Threads: ASME B1.20.1.

H. Flanges: ASME B16.1 for cast iron, ASME B16.5 for steel, and ASME B16.24 for bronze valves.

I. Solder Joint: ASME B16.18.

1. Caution: Where soldered end connections are used, use solder having a melting point below 840 deg F for gate, globe, and check valves; below 421 deg F for ball valves.

2.02 GATE VALVES

A. Gate Valves, 2-1/2 Inches and Smaller: MSS SP-80; Class 125, 200-psi cold working pressure (CWP), or Class 150, 300-psi CWP as required in Application Schedule; ASTM B 62 cast-bronze body and bonnet, solid-bronze wedge, copper-silicon alloy rising stem, teflon-impregnated packing with bronze packing nut, threaded or soldered end connections; and with aluminum, zinc plated steel, or malleable-iron handwheel.

B. Gate Valves, 3 Inches and Larger: MSS SP-70, Class 125, 200-psi CWP, ASTM A 126 cast-iron body and bonnet, solid cast-iron wedge, brass-alloy stem, outside screw and yoke, teflon-impregnated packing with 2-piece packing gland assembly, flanged end connections; and with cast-iron handwheel.

2.03 BALL VALVES

A. Ball Valves, 4 Inches and Smaller: MSS SP-110, 600-psi CWP, ASTM B 584 bronze body, 2-piece or 3-piece construction as required in the Application Schedule; chrome-plated brass ball, full port for 3/4-inch valves and smaller and conventional port for 1-inch valves and larger; blowout proof; bronze or brass stem; teflon seats and seals; threaded or soldered end connections. Operator: Vinyl-covered steel lever handle.

1. Options:

a. Stem Extension: For valves installed in insulated piping (if required in Application Schedule).

b. Memory Stop: For operator handles (if required in Application Schedule).

2.04 GLOBE VALVES

A. Globe Valves, 2-1/2 Inches and Smaller: MSS SP-80; Class 125, 200-psi CWP, Class 150, 300-psi CWP or Class 300, 600-psi CWP as required in the Application Schedule; ASTM B 62 cast-bronze body and screwed bonnet, rubber, bronze, or teflon

disc, silicon bronze-alloy stem, teflon-impregnated packing with bronze nut, threaded or soldered end connections; and with aluminum or malleable-iron handwheel.

B. Globe Valves, 3 Inches and Larger: MSS SP-85, Class 125, 200-psi CWP or Class 250, 500-psi CWP; ASTM A 126 cast-iron body and bolted bonnet with bronze fittings, renewable bronze seat and disc, brass-alloy stem, outside screw and yoke, teflon-impregnated packing with cast-iron follower, flanged end connections; and with cast-iron handwheel.

2.05 BUTTERFLY VALVES

A. Butterfly Valves: MSS SP-67, 200-psi CWP, 150-psi maximum pressure differential, ASTM A 126 cast-iron body and bonnet, extended neck, stainless-steel stem, field-replaceable EPDM or Buna N sleeve and stem seals, non-slam, lug, or grooved style:

1. Disc Type: Nickel-plated ductile iron.

2. Disc Type: Aluminum bronze.

3. Disc Type: Elastomer-coated ductile iron.

4. Disc Type: Epoxy-coated ductile iron.

5. Operator for Sizes 2 Inches to 6 Inches: Standard lever handle with memory stop.

6. Operator for Sizes 8 Inches to 24 Inches: Gear operator with position indicator.

7. Operator for Sizes 8 Inches and Larger, 96 Inches or Higher above Floor: Chain-wheel operator.

2.06 CHECK VALVES

A. Swing Check Valves, 2-1/2 Inches and Smaller: MSS SP-80; Class 125, 200-psi CWP, Class 150, 300-psi CWP, or Class 300, 600-psi CWP as required in the Application Schedule; horizontal swing, Y-pattern, ASTM B 62 (ASTM B 61 for Class 300) cast-bronze body and cap, rotating bronze disc with renewable seat, threaded or soldered end connections.

B. Swing Check Valves, 3 Inches and Larger: MSS SP-71, Class 125, 200-psi CWP or Class 250, 500-psi CWP as required in the Application Schedule, ASTM A 126 Class B cast-iron body and bolted cap, horizontal-swing bronze disc, flanged or grooved end connections.

C. Non-Slam Check Valves: Class 125 or Class 250 as required in the Application Schedule, ASTM A 48 Class 35, cast-iron body, bronze disc, stainless-steel pins and springs, Buna N bonded to bronze seat, flanged connections.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 EXAMINATION

A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance of valves. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

C. Operate valves from fully open to fully closed positions. Examine guides and seats made accessible by such operation.

D. Examine threads on valve and mating pipe for form and cleanliness.

E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Check gasket material for proper size, material composition suitable for service, and freedom from defects and damage.

F. Do not attempt to repair defective valves; replace with new valves.

3.02 INSTALLATION

A. Install valves as indicated, according to manufacturer's written instructions.

B. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate the general arrangement of piping, fittings, and specialties.

C. Install valves with unions or flanges at each piece of equipment arranged to allow servicing, maintenance, and equipment removal without system shutdown.

D. Locate valves for easy access and provide separate support where necessary.

E. Install valves in horizontal piping with stem a minimum of 30° above horizontal at or above the center of the pipe.

F. Install valves in a position to allow full stem movement.

G. For chain-wheel operators, extend chains to 60 inches above finished floor elevation.

H. Installation of Check Valves: Install for proper direction of flow as follows:

1. Swing Check Valves: Horizontal position with hinge pin level or vertical upflow position.

2. Non-Slam Check Valves: Horizontal or vertical position, between flanges.

3.03 SOLDERED CONNECTIONS (FOR DOMESTIC WATER SYSTEMS ONLY)

A. Cut tube square and to exact lengths.

B. Clean end of tube to depth of valve socket with steel wool, sand cloth, or a steel wire brush to a bright finish. Clean valve socket.

C. Apply proper soldering flux in an even coat to inside of valve socket and outside of tube.

D. Open gate and globe valves to fully open position.

E. Remove the cap and disc holder of swing check valves having composition discs.

F. Insert tube into valve socket, making sure the end rests against the shoulder inside valve. Rotate tube or valve slightly to ensure even distribution of the flux.

G. Apply heat evenly to outside of valve around joint until solder melts on contact. Feed solder until it completely fills the joint around tube. Avoid hot spots or overheating valve. Once the solder starts cooling, remove excess amounts around the joint with a cloth or brush.

3.04 THREADED CONNECTIONS

A. Note the internal length of threads in valve ends and proximity of valve internal seat or wall to determine how far pipe should be threaded into valve.

B. Align threads at point of assembly.

C. Apply appropriate tape or thread compound to the external pipe threads, except where dry seal threading is specified.

D. Assemble joint, wrench tight. Wrench on valve shall be on the valve end into which the pipe is being threaded.

3.05 FLANGED CONNECTIONS

A. Align flange surfaces parallel.

B. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly with a torque wrench.

C. For dead-end service, butterfly valves require flanges both upstream and downstream for proper shutoff and retention.

3.06 VALVE END SELECTION

A. Select valves with the following ends or types of pipe/tube connections:

1. Copper Tube Size, 2 Inches and Smaller: Threaded ends, except solder ends can be used for plumbing cold water, hot water, non-potable water and compressed air systems.

2. Copper Tube Size, 2-1/2 Inches and Larger: Flanged ends. Grooved ends acceptable if specified in Division 15 Section “Water Distribution Piping.”

3. Steel Pipe Sizes, 2 Inches and Smaller: Threaded ends.

3.07 APPLICATION SCHEDULE

A. General Application: Use gate, ball, and butterfly valves for shutoff duty; globe for throttling duty as indicated. Refer to piping system Specification Sections for specific valve applications and arrangements.

B. Domestic Water Systems: Use the following valve types:

1. Gate Valves: Class 125.

2. Ball Valves: 2-piece with stem extension.

3. Globe Valves: Class 125.

4. Butterfly Valves: Nickel-plated ductile iron disc; EPDM or Buna N sleeve and stem seals.

5. Swing Check Valve: Class 125.

3.08 ADJUSTING

1. Adjust or replace packing after piping systems have been tested and put into service, but before final adjusting and balancing. Replace valves if leak persists.

END OF SECTION

SECTION 15122
METERS AND GAGES

PART 1 GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational mechanical installations on a Design-Build basis. It shall be the Mechanical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Division 0 and Division 1 Specification Sections, apply to this Section.

B. Related Sections include the following:

1. Division 2 Section "Potable Water Systems" for water meters outside the building.

2. Mechanical equipment Sections that specify meters and gages as part of factory-fabricated equipment.

1.03 SUMMARY

A. This Section includes meters and gages for mechanical systems and water meters installed outside the building.

1.04 SUBMITTALS

A. Product Data: Include scale range, ratings, and calibrated performance curves for each meter, gage, fitting, specialty, and accessory specified.

B. Shop Drawings: Include schedule indicating manufacturer's number, scale range, fittings, and location for each meter and gage.

C. Product Certificates: Signed by manufacturers of meters and gages certifying accuracies under specified operating conditions and compliance with specified requirements.

D. Shop Drawings: For brackets for duct-mounting thermometers.

PART 2 PRODUCTS

2.01 THERMOMETERS, GENERAL

A. Scale Range: Temperature ranges for services listed are as follows:

1. Domestic Hot Water: 30 to 240 deg F, with 2-degree scale divisions.

2. Domestic Cold Water: 0 to 100 deg F, with 2-degree scale divisions.

3. Hot Water: 30 to 300 deg F, with 2-degree scale divisions.

4. Condenser Water: 0 to 160 deg F, with 2-degree scale divisions.

B. Accuracy: Plus or minus 1 percent of range span or plus or minus one scale division to maximum of 1.5 percent of range span.

2.02 LIQUID-IN-GLASS THERMOMETERS

A. Description: ASTM E 1, U.S. standard only, no dual scales.

B. Case: Die cast and aluminum finished in baked-epoxy enamel, glass front, spring secured, 9-inches long.

C. Adjustable Joint: Finish to match case, 180-degree adjustment in vertical plane, 360-degree adjustment in horizontal plane, with locking device.

D. Tube: Red or blue reading, organic-liquid filled with magnifying lens.

E. Tube: Red or blue reading, mercury filled with magnifying lens.

F. Scale: Satin-faced nonreflective aluminum with permanently etched markings.

G. Stem: Copper-plated steel, aluminum, or brass for separable socket; of length to suit installation.

2.03 BIMETAL DIAL THERMOMETERS

A. Description: ASME B40.3; direct-mounting, universal-angle dial type.

B. Case: Stainless steel with 5-inch- diameter, glass lens.

C. Adjustable Joint: Finish to match case, 180-degree adjustment in vertical plane, 360-degree adjustment in horizontal plane, with locking device.

D. Element: Bimetal coil.

E. Scale: Satin-faced nonreflective aluminum with permanently etched markings.

F. Stem: Stainless steel for separable socket, of length to suit installation.

2.04 PRESSURE GAGES

A. Description: ASME B40.1, phosphor-bronze bourdon-tube type with bottom connection; dry type, unless liquid-filled-case type is indicated. U.S. standard only, no dual scales.

B. Case: Drawn steel, brass, or aluminum with 4-1/2-inch- diameter, glass lens.

C. Connector: Brass, NPS 1/4.

D. Scale: White-coated aluminum with permanently etched markings.

E. Accuracy: Grade A, plus or minus 1 percent of middle 50 percent of scale.

F. Accuracy: Grade B, plus or minus 2 percent of middle 50 percent of scale.

G. Accuracy: Grade C, plus or minus 3 percent of middle 50 percent of scale.

H. Accuracy: Grade D, plus or minus 5 percent of whole scale.

I. Range: Comply with the following:

1. Vacuum: 30 inches Hg of vacuum to 15 psig of pressure.

2. Fluids under Pressure: Two times the operating pressure.

2.05 PRESSURE-GAGE FITTINGS

A. Valves: NPS 1/4 brass or stainless-steel needle type.

B. Syphons: NPS 1/4 coil of brass tubing with threaded ends.

C. Snubbers: ASME B40.5, NPS 1/4 brass bushing with corrosion-resistant porous-metal disc of material suitable for system fluid and working pressure.

2.06 TEST PLUGS

A. Description: Nickel-plated, brass-body test plug in NPS 1/2 fitting.

B. Body: Length as required to extend beyond insulation.

C. Pressure Rating: 500 psig minimum.

D. Core Inserts: One or two self-sealing valves, suitable for inserting 1/8-inch OD probe from dial-type thermometer or pressure gage.

E. Core Inserts: Two self-sealing valves, suitable for inserting 1/8-inch OD probe from dial-type thermometer or pressure gage.

F. Core Insert: Self-sealing valve, suitable for inserting 1/8-inch OD probe from dial-type thermometer or pressure gage.

G. Core Material for Air, Water, Oil, and Gas: 20 to 200 deg F, chlorosulfonated polyethylene synthetic rubber.

H. Core Material for Air and Water: Minus 30 to plus 275 deg F, ethylene-propylene-diene terpolymer rubber.

I. Test-Plug Cap: Gasketed and threaded cap, with retention chain or strap.

J. Test Kit: Pressure gage and adapter with probe, two bimetal dial thermometers, and carrying case. Turn test kit over to Owner's Project Representative at end of project.

1. Pressure Gage and Thermometer Ranges: Are specified in this Section.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 METER AND GAGE INSTALLATION, GENERAL

A. Install meters, gages, and accessories according to manufacturer's written instructions for applications where used.

3.02 THERMOMETER INSTALLATION

A. Install thermometers and adjust vertical and tilted positions.

B. Install in the following locations:

1. Inlet and outlet of each thermal storage tank.

C. Install thermometer wells in vertical position in piping tees where test thermometers are indicated.

1. Install with stem extending a minimum of 2 inches into fluid.

2. Install with stem extending to one-third of diameter of pipe.

3. Install with stem extending to center of pipe.

4. Fill wells with oil or graphite and secure caps.

3.03 PRESSURE-GAGE INSTALLATION

A. Install pressure gages in piping tees with pressure-gage valve located on pipe at most readable position.

B. Install dry-type pressure gages in the following locations:

1. Discharge of each pressure-reducing valve.

2. Building water-service entrance.

C. Install liquid-filled-type pressure gages at suction and discharge of each pump.

D. Install pressure-gage needle valve and snubber in piping to pressure gages.

1. Exception: Install syphon instead of snubber in piping to steam pressure gages.

3.04 ADJUSTING AND CLEANING

A. Adjust faces of gages to proper angle for best visibility.

1. Clean windows of gages and clean factory-finished surfaces. Replace cracked and broken windows, and repair scratched and marred surfaces with manufacturer's touchup paint.

END OF SECTION

SECTION 15170
MOTORS

PART 1 GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational mechanical installations on a Design-Build basis. It shall be the Mechanical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Terms and Conditions and Division 1 Specification Sections, apply to this Section.

B. Related Sections include the following:

1. Division 15 Sections for application of motors and reference to specific motor requirements for motor-driven equipment.

1.03 SUMMARY

A. This Section includes basic requirements for factory-installed and field-installed motors.

1.04 SUBMITTALS

A. Product Data: Show nameplate data and ratings; characteristics; mounting arrangements; size and location of winding termination lugs, conduit entry, and grounding lug; and coatings.

B. Factory Test Reports: For specified tests.

C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.05 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Listing and Labeling: Provide motors specified in this Section that are listed and labeled.

1. Terms "Listed and Labeled": As defined in the National Electrical Code, Article 100.

2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

PART 2 PRODUCTS

2.01 BASIC MOTOR REQUIREMENTS

A. Basic requirements apply to mechanical equipment motors, unless otherwise indicated.

B. Motors Smaller than 1/2 HP: Single phase.

C. Frequency Rating: 60 Hz.

D. Voltage Rating: Determined by voltage of circuit to which motor is connected or as indicated.

E. Service Factor: According to NEMA MG 1, unless otherwise indicated.

F. Capacity and Torque Characteristics: Rated for continuous duty and sufficient to start, accelerate, and operate connected loads at designated speeds, in indicated environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

G. Enclosure:

1. Indoor Service: Open Drip-proof, unless otherwise indicated.

2.02 POLYPHASE MOTORS

A. Description: NEMA MG 1, medium induction motor.

1. Design Characteristics: NEMA MG 1, Design B, unless otherwise indicated.

2. Energy-Efficient Design: Minimum motor efficiency as required by Washington State Energy Code. Test according to IEEE 112, Test Method B. Provide higher efficiency motors where indicated.

3. Stator: Copper windings, unless otherwise indicated. Multispeed motors have separate winding for each speed.

4. Rotor: Squirrel cage, unless otherwise indicated.

5. Bearings: Double-shielded, prelubricated ball bearings suitable for radial and thrust loading.

6. Temperature Rise: Match insulation rating, unless otherwise indicated.

7. Insulation: Class F, unless otherwise indicated.

8. Motors shall be inverter duty rated when used in VFD applications.

B. Source Quality Control: Perform the following routine tests according to NEMA MG 1:

1. Measurement of winding resistance.

2. No-load readings of current and speed at rated voltage and frequency.

3. Locked rotor current at rated frequency.

4. High-potential test.

5. Alignment.

2.03 SINGLE-PHASE MOTORS

A. Type: As indicated or selected by manufacturer from one of the following, to suit starting torque and other requirements of specific motor application.

1. Permanent-split capacitor.

2. Split-phase start, capacitor run.

3. Capacitor start, capacitor run.

B. Shaded-Pole Motors: Do not use, unless motors are smaller than 1/20 hp.

C. Thermal Protection: Where indicated or required, internal protection automatically opens power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal protection device automatically resets when motor temperature returns to normal range, unless otherwise indicated.

D. Bearings: Ball-bearing type for belt-connected motors and other motors with high radial forces on motor shaft. Sealed, prelubricated sleeve bearings for other single-phase motors.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 INSTALLATION

A. Use adjustable motor mounting bases for belt-driven motors.

B. Align pulleys and install belts.

C. Tension according to manufacturer's written instructions.

1. Ground Equipment: Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

END OF SECTION

SECTION 15195
FUEL GAS PIPING

PART 1 GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational mechanical installations on a Design-Build basis. It shall be the Mechanical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Terms and Conditions and Division 1 Specification Sections, apply to this Section.

B. Related Sections include the following:

1. Division 9 for painting of exterior piping, regulators, and valves.

2. Division 15 Section "Meters and Gages" for pressure gages.

3. Division 15 Section "Mechanical Identification" for nameplates, signs, and pipe identification.

4. Division 15 Section "Hangers and Supports" for pipe hangers, support devices, and seismic restraint of piping.

1.03 SUMMARY

A. This section includes fuel gas piping, specialties, and accessories within the building and to the point of connection to the utility provided gas service.

1.04 PROJECT CONDITIONS

A. Gas System Pressure: One pressure range. 0.5 psig or less.

B. Gas System Pressures: Two pressure ranges. Primary pressure is not more than 0.5psig but not more than 2.0 psig, and is reduced to secondary pressure of 0.5 psig or less.

C. Gas System Pressures: Two pressure ranges. Primary pressure is more than 2.0 psig but not more than 5.0 psig, and is reduced to secondary pressure of more than 0.5 psig but not more than 2.0 psig.

D. Gas System Pressures: Three pressure ranges. Primary pressure is more than 2.0 psig but not more than 5.0 psig, and is reduced to secondary pressures of more than 0.5 psig but not more than 2.0 psig, and is reduced again to pressures of 0.5 psig or less.

E. Design values of fuel gas supplied for these systems are as follows:

1. Natural Gas:

a. Nominal Heating Value: 1000 Btu/cu. ft.

b. Nominal Specific Gravity: 0.6.

1.05 SUBMITTALS

A. General: See Section 15050 for general requirements of Product Data, Shop Drawings, Reports and Certificates, and Operation and Maintenance data submittals.

B. Product Data: Provide submittals of the following:

1. Pipes, Fittings, and Joining Materials

2. Valves

3. Pressure Regulators

4. Wiring Diagrams

C. Shop Drawings: In addition to requirements set forth in Section 15050, shop drawings for piping layout and elevations, sections, and details for fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

D. Welding certificates.

E. Field quality-control reports.

F. Operation and Maintenance Data: For natural gas specialties and accessories to include in maintenance manuals specified in Division 1.

1.06 QUALITY ASSURANCE

A. Electrical Components and Devices: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. ANSI Standard: Comply with ANSI Z223.1, “National Fuel Gas Code.”

C. FM Standard: Provide components listed in FM’s “Fire Protection Approval Guide” if specified to be FM Approved.

D. IAS Standard: Provide components listed in IAS’s “Directory of A.G.A. and C.G.A Certified Appliances and Accessories” if specified to be IAS listed.

E. UL Standard: Provide components listed in UL’s “Gas and Oil Equipment Directory” if specified to be UL listed.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and legally dispose of liquids from drips in existing gas piping. Handle cautiously to avoid spillage and ignition. Notify fuel gas supplier. Handle flammable liquids used by installer with proper precautions and do not leave on premises form end of one day to beginning of next day.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

A. General: Refer to Part 3 “Piping Applications” article for applications of pipe, fittings, and joining materials.

B. Steel Pipe: ASTM A 53; Type E or S; Grade B; Schedule 40; black.

2.02 PIPES, FITTINGS, AND JOINING MATERIALS

A. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150.

B. Forged Socket-Welding Fittings: ASME B16.11, Class 2000 (Schedule 40).

C. Unions: ASME B16.39, Class 150, malleable-iron with ground joint.

D. Steel Welding Fittings: ASTM A 234, Schedule 40.

E. Cast Iron Flanges and Flanged Fittings: ASME B16.1, Class 125.

F. Threaded Joint Compound and Tape: Suitable for natural gas.

G. Gasket Material: Thickness, material, and type suitable for natural gas.

2.03 PROTECTIVE COATING

A. Coating for Piping: Corrosive resistant polyethylene coating.

B. Polyethylene Encasement for Piping: ASTM A 674 polyethylene film, 0.008-inch minimum thickness, tube, or sheet.

2.04 PIPING SPECIALTIES

A. Flexible Connectors: ANSI Z21.24, copper alloy.

B. Strainers: Y-pattern type:

1. NPS 3/4 to 2-Inch: Cast-iron body with threaded connections, stainless steel 20 mesh screen.

C. Quick-Disconnect Devices: ANSI Z21.41, convenience outlets and matching plug connector.

2.05 VALVES

A. General: Valves NPS 2 and smaller, threaded ends; valves NPS 2-1/2 and larger, flanged ends.

B. Gas Stops: Bronze body with AGA stamp, plug type with bronze plug and flat or square head, ball type with chrome-plated brass ball and lever handle, or butterfly valve with stainless-steel disc and fluorocarbon elastomer seal and lever handle; 2-psig minimum pressure rating.

C. Gas Valves, NPS 2 and Smaller: Bronze-body ball valve, two-piece construction, rated for 125-psig natural gas, ASME B16.33 and UL-listed.

1. Tamperproof Feature: Include design for locking.

D. Automatic Gas Valves: ANSI Z21.21, with mechanical operator for actuation by appliance automatic shutoff device.

E. Electrically Operated Gas Valves: UL 429, bronze, aluminum, or cast-iron body solenoid valves; 120-V ac, 60 Hz, Class B, continuous-duty molded coil. Include NEMA ISC 6, Type 4, coil enclosure and electrically opened and closed dual coils. Valve position shall normally be closed.

F. Earthquake Valves: FM approved or listed in IAS Directory as complying with ANSI Z21.70 and UL listed. Include mechanical operator.

2.06 PRESSURE REGULATORS

A. Description: Single stage and suitable for fuel gas service. Include steel jacket and corrosion-resistant components, elevation compensator, and atmospheric vent.

1. NPS 2-Inch and Smaller: Threaded ends according to ASME B1.20.1 for pipe threads.

2. Line Pressure Regulators: ANSI Z21.80 with 2-psig minimum, 10-psig maximum inlet pressure rating. Over pressure internal relief diaphragm assembly and vent valve.

3. Appliance Pressure Regulators: ANSI Z21.18. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.

B. Pressure Regulator Vents: Factory or field installed, corrosion-resistant screen in opening if not connected to vent piping.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 PREPARATION

A. Close equipment shutoff valves before turning off fuel gas to premises or section of piping. Perform leakage test as specified in “Field Quality Control” Article to determine that all equipment is turned off in affected piping section.

B. Comply with ANSI Z223.1, “Prevention of Accidental Ignition” Paragraph.

3.02 SERVICE ENTRANCE PIPING

A. Connect to fuel gas service and extend fuel gas piping into the building. Exterior fuel gas distribution system piping up to and including the service pressure regulator and service meter will be provided by gas utility.

B. Install earthquake valve downstream of service and prior to line penetrating building wall. Install strainer upstream from each earthquake valve. Refer to Division 15 Section “Plumbing Specialties” for strainers.

3.03 PIPING APPLICATIONS

A. General Requirements: Flanges, unions, transition, and special fittings with pressure ratings same as or higher than system pressure rating may be used in applications below, unless otherwise indicated. 1/2-inch steel pipe is not allowed, use 3/4-inch where 1/2-inch is indicated.

B. Exposed, Interior, and Exterior Fuel Gas Piping, below 2-psig: Use the following unless otherwise indicated:

1. NPS 3/4 to 2-Inch: Steel pipe with threaded joints and malleable-iron threaded fittings.

2. NPS 1-1/4 to 2-Inch: Steel pipe with welded joints and socket-welded fittings. Threaded joints allowed at connections to strainers, valves, and regulators.

C. Fuel Gas Piping, 2 to 5 psig: Use the following:

1. NPS 3/4 to 2-Inch: Steel pipe with welded joints and socket-welded fittings. Threaded joints allowed at connections to strainers, valves, and regulators.

D. Containment Conduits: Steel pipe, steel welding fittings, and welded joints.

3.04 VALVE APPLICATIONS

A. Appliance Shutoff Valves for Pressure up to 2 psig: Gas stop or gas valve.

B. Piping Line Valves, NPS 2-Inch and Smaller: Gas valves.

3.05 PIPING INSTALLATION

A. Refer to Division 15 Section “Basic Mechanical Materials and Methods” for basic piping installation requirements.

B. Route interior fuel gas piping concealed above ceilings, in hollow walls and pipe spaces; and exposed in mechanical equipment spaces.

C. Do not locate valves, regulators, strainers or any fuel gas equipment in concealed spaces.

D. Prohibited Locations: Do not install gas piping in or through electrical rooms, air ducts, floor slabs, solid walls, clothes or trash chutes, chimneys or gas vents or elevator shafts.

E. Underground Fuel Gas Piping Outside of Building: Provide polyethylene encasement of piping. Provide fitting to electrically isolate the below grade piping, located a minimum of 6-inches above grade.

F. Underground Fuel Gas Piping Beneath Building: Install containment conduits for gas piping below slabs, within building, in gastight conduits extending minimum of 4 inches outside the building, and vented to atmosphere. Terminate vents with turned-down, reducing-elbow fittings with corrosion-resistant insect screens in large end. Provide polyethylene encasement of conduit.

G. Drips and Sediment Traps: Install drips at points where condensate may collect. Locate where readily accessible for cleaning and emptying. Do not install where condensate would be subject to freezing.

    1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use minimum-length nipple of 3 pipe diameters, but not less than 10 inches long, and same size as connected pipe. Install with space between bottom of drip and floor for removal of plug or cap.

H. Install fuel gas piping at uniform grade of 0.1 percent slope upward toward risers.

I. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

J. Connect branch piping from top or side of horizontal piping.

K. Install unions in pips NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment, and elsewhere as indicated. Unions are not required on flanged devices.

L. Install strainer on inlet of each line pressure regulator and automatic and electrically operated valves.

M. Install piping line valves upstream of line pressure regulators.

N. Install pressure gage downstream from each line pressure regulator.

O. Install vent piping for gas pressure regulators and gas trains, extend outside buildings, and vent to atmosphere. Terminate vents with turned-down, reducing-elbow fittings with corrosion-resistant insect screens in large end.

3.06 JOINT CONSTRUCTION

A. Refer to Division 15 Section “Basic Mechanical Materials and Methods” for basic piping joint construction.

B. Use materials suitable for fuel gas.

3.07 HANGER AND SUPPORT INSTALLATION

A. Refer to Division 15 Section “Hangers and Supports” for pipe hanger, support devices, and seismic restraints.

B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

Nominal Pipe Size (Inches)	Maximum Pipe Span (Feet)	Minimum Rod Diameter (Inches)
3/4	8	3/8
1	8	3/8
1-1/4	10	3/8
1-1/2	10	3/8
2	10	3/8

3.08 CONNECTIONS

A. Drawings indicate general arrangement of fuel gas piping, fittings, and specialties.

B. Install piping adjacent to appliances to allow service and maintenance.

C. Connect piping to gas appliances with shutoff valves, appliance pressure regulators, and unions. Install flexible connectors on connection to appliance unless indicated otherwise. Install valve upstream from and within 72 inches of each appliance. Install union downstream from valve.

D. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance using gas.

E. Electrical Connections: Provide electrical connections per manufacturer’s recommendations.

1. Do not use gas pipe as grounding electrode.

3.09 LABELING AND IDENTIFYING

A. Refer to Division 15 Section “Mechanical Identification” for nameplates and signs.

3.10 PAINTING

A. Paint exterior piping, pressure regulators, and specialty valves. Use materials and procedures in Division 9 for painting exterior ferrous metal.

1. Color: Color as selected by Project Representative.

3.11 FIELD QUALITY CONTROL

A. Inspect, test, and purge piping according to ANSI Z223.1, Part 4 “Inspection, Testing, and Purging,” and requirements of the gas utility and authorities having jurisdiction.

B. Repair leaks and defects with new materials and retest system until satisfactory results are obtained.

C. Report test results promptly and in writing to Project Representative and authorities having jurisdiction.

D. Verify capacities and pressure ratings of pressure regulators, valves, and specialties.

E. Verify correct pressure settings for pressure regulators.

F. Verify that specified piping tests are complete.

3.12 ADJUSTING

A. Adjust controls and safety devices. Replace damaged and malfunctioning controls and safety devices.

END OF SECTION

SECTION 15241
MECHANICAL VIBRATION CONTROLS AND SEISMIC RESTRAINTS

PART 1 GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational mechanical installations on a Design-Build basis. It shall be the Mechanical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Division 0 and Division 1 Specification Sections, apply to this Section.

B. Related Sections include the following:

1. Division 15 Section "Hangers and Supports" for pipe hangers and pipe seismic requirements.

2. Division 15 Section "Duct Accessories" for flexible connectors.

3. Division 15 piping sections for flexible pipe connectors.

1.03 SUMMARY

A. This Section includes vibration isolators, vibration isolation bases, vibration isolation roof curbs, and seismic restraints and snubbers.

1.04 SUBMITTALS

A. Product Data: Indicate types, styles, materials, and finishes for each type of isolator specified. Include load deflection curves.

B. Shop Drawings: Show designs and calculations, certified by a professional engineer, for the following:

1. Design Calculations: Calculations for selection of vibration isolators, design of vibration isolation bases, and selection of seismic restraints.

2. Seismic Restraint Details: Detail fabrication and attachment of restraints and snubbers.

1.05 QUALITY ASSURANCE

A. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where the 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 vibration isolation bases and seismic restraints that are similar to those indicated for this Project in material, design, and extent.

1.06 PROJECT CONDITIONS

A. Project seismic zone is 3 with a zone factor of 0.030.

B. Building Importance Factor: 1.0.

1.07 COORDINATION

A. Coordinate layout and installation of vibration isolation and seismic-restraint devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

PART 2 PRODUCTS

2.01 VIBRATION ISOLATORS

A. Spring Isolators: Freestanding, laterally stable, open-spring-type isolators.

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.

2. Minimum Additional Travel: 50 percent of the required deflection at rated load.

3. Lateral Stiffness: More than 1.2 times the rated vertical stiffness.

4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

5. Baseplates: Factory drilled for bolting to structure and bonded to a 1/4-inch- thick, rubber isolator pad attached to the baseplate underside. Size baseplates to limit floor loading to 100 psig.

6. Top Plates: Provide threaded studs for fastening and leveling equipment.

7. Finishes: Manufacturer's standard corrosive-resistant finish.

B. Rubber Hangers: Double-deflection type, with molded, oil-resistant rubber or neoprene isolator elements bonded to formed-steel housings with threaded connections for hanger rods. Color-code to indicate capacity range.

C. Spring Hangers: Combination spring and elastomeric hanger with coil spring and elastomeric insert in compression.

1. Frame: Formed steel, fabricated for connection to threaded rods and to allow for 30 degrees of angular hanger rod misalignment without binding or reducing isolation efficiency.

2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.

3. Minimum Additional Travel: 50 percent of the required deflection at rated load.

4. Elastomeric Element: Molded, oil-resistant rubber or neoprene.

5. Finishes: Baked enamel for metal components. Color-code to indicate capacity range.

2.02 SEISMIC CONTROLS

A. Thrust Restraints: Combination spring and elastomeric restraints with coil spring and elastomeric insert in compression. Factory set for thrust.

1. Frame: Formed steel, fabricated for connection to threaded rods and to allow for 30 degrees of angular hanger rod misalignment without binding or reducing isolation efficiency.

2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.

3. Minimum Additional Travel: 50 percent of the required deflection at rated load.

4. Elastomeric Element: Molded, oil-resistant rubber or neoprene.

5. Finishes: Baked enamel for metal components. Color-code to indicate capacity range.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 INSTALLATION

A. Install and anchor vibration-, sound-, and seismic-control products according to manufacturer's written instructions and authorities having jurisdiction.

3.02 ADJUSTING AND CLEANING

A. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operations.

1. Adjust thrust restraints for a maximum of 1/4 inch of movement at start and stop.

END OF SECTION

SECTION 15300
FIRE SPRINKLER AND STANDPIPE SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational mechanical installations on a Design-Build basis. It shall be the Fire Protection Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Division 0 and Division 1 Specification Sections, apply to this Section.

B. Related Sections include the following:

1. Division 16 Section "Fire Alarm System" for alarm devices not in this Section.

1.03 SUMMARY

A. This Section includes fire-suppression piping and equipment for the following building systems:

1. Dry-pipe fire-suppression Ordinary Hazard Group 1 sprinkler system and Class I standpipes, including piping, valves, specialties, automatic sprinklers, air compressor(s), and accessories.

1.04 DEFINITIONS

A. Hose Connection: Valve with threaded outlet matching fire hose coupling thread for attaching fire hose.

B. Working Plans: Documents, including drawings, calculations, and material specifications prepared according to NFPA 13 and NFPA 14 for obtaining approval from authorities having jurisdiction.

1.05 SYSTEM PERFORMANCE REQUIREMENTS

A. Design standpipes and sprinklers obtain approval from authorities having jurisdiction. Include minimum residual pressures at hydraulically remote outlets. Existing Utility District estimated minimum water pressure at 472-feet elevation is 117± psi.

1. NPS 2-1/2 Hose Connections: 100 psig.

B. Design sprinkler piping according to the following and obtain approval from authorities having jurisdiction:

1. Include 10 percent margin of safety for available water flow and pressure.

2. Include losses through water-service piping, valves, backflow preventers, and hose allowance of calculated GPM appropriate for this project.

3. Sprinkler Occupancy Hazard Classifications: As follows:

   a. Building Service Areas: Ordinary Hazard, Group 1.

   b. Electrical Equipment Rooms: Ordinary Hazard, Group 1.

   c. General Storage Areas: Ordinary Hazard, Group 1.

   d. Garage Public Areas: Ordinary Hazard, Group 1.

4. Minimum Density for Closed Head Automatic-Sprinkler Piping Design: As follows:

   a. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 3500- sq. ft. area.

5. Maximum Protection Area per Sprinkler: As follows:

   a. Electrical Equipment Rooms: 130 sq. ft.

   b. According to NFPA 13 recommendations, unless otherwise indicated.

C. Components and Installation: Capable of producing piping systems with 175-psig minimum working-pressure rating, unless otherwise indicated.

D. Telecommunications Room / Network Room: No water sprinkler system to be installed in Telecommunications Room / Network Room.

1.06 SUBMITTALS

A. Product Data: For the following:

1. Pipe and fitting materials and methods of joining for standpipe piping.

2. Pipe and fitting materials and methods of joining for sprinkler piping.

3. Pipe hangers and supports.

4. Piping seismic restraints.

5. Valves, including specialty valves, accessories, and devices.

6. Alarm devices. Include electrical data.

7. Air compressors. Include electrical data.

8. Hose connections. Include size, type, and finish.

9. Sprinklers, escutcheons, and guards. Include sprinkler flow characteristics, mounting, finish, and other pertinent data.

10. Fire Department Connections: Include type, number, size, and arrangement of inlets, caps and chains, size and direction of outlet, escutcheon and marking, and finish.

B. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been stamped approved by Burien Fire Marshal. Include hydraulic calculations, if applicable and seismic bracing calculations.

C. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13 and NFPA 14. Include "Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping."

D. Maintenance Data: For each type of standpipe and sprinkler specialty to include in maintenance manuals specified in Division 1.

E. Developer shop drawings, product data, hydraulic and seismic calculations to be submitted to the Owner’s mutual insurance company for compliance review in addition to the other required parties.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has designed and installed fire-suppression piping similar to that indicated for this Project and obtained design approval and inspection approval from authorities having jurisdiction.

B. Engineering Responsibility: Design and preparation of stamped working plans, calculations, and field test reports by a qualified licensed fire protection engineer. Base calculations on flow information included under "System Performance Requirements."

C. Professional Qualifications: A professional 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 fire-suppression piping that are similar to those indicated for this Project in material, design, and extent.

D. Manufacturer Qualifications: Firms whose equipment, specialties, and accessories are listed by product name and manufacturer in UL's "Fire Protection Equipment Directory" and FM's "Fire Protection Approval Guide" and that comply with other requirements indicated.

E. Standpipe and Sprinkler Components: Listing/approval stamp, label, or other marking by a testing agency acceptable to authorities having jurisdiction.

F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

G. NFPA Standards: Equipment, specialties, accessories, installation, and testing complying with the following:

1. NFPA 13, "Installation of Sprinkler Systems."

2. NFPA 14, "Standpipe and Hose Systems."

H. All sprinkler systems work shall conform to FM Global Property Loss Statement Data Sheets 2-8. Earthquake protection for water-based fire protection systems, 2-8N installation of sprinkler systems and 3-26 fire protection water demand for non-storage sprinkler and D properties.

1.08 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Sprinkler Cabinets: Finished, wall-mounting steel cabinet and hinged cover, with space for a minimum of six spare sprinklers plus sprinkler wrench. Include the number of sprinklers required by NFPA 13 and wrench for sprinklers. Include separate cabinet with sprinklers and wrench for each type of sprinkler on Project.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Paragraph for applications of pipe, tube, fitting, and joining materials.

2.02 PIPES AND TUBES

A. Ductile-Iron Pipe: AWWA C151, mechanical-joint type; with cement-mortar lining and seal coat according to AWWA C104. Include gland, rubber gasket, and bolts and nuts according to AWWA C111.

B. Standard-Weight Steel Pipe: Galvanized interior and exterior, ASTM A 53, ASTM A 135, or ASTM A 795; Schedule 40 in NPS 6 and smaller, and Schedule 30 in NPS 8 and larger. Schedule 10 pipe is not allowed on project.

C. Copper Tube: ASTM B 88, water tube, drawn temper.

2.03 PIPE AND TUBE FITTINGS

A. Ductile-Iron Fittings: ASTM A 47, malleable-iron or ASTM A 536, ductile-iron casting complying with AWWA pipe size; with ends factory grooved according to AWWA C606. Include cement-mortar lining and seal coat according to AWWA C104 or epoxy, interior coating according to AWWA C550.

B. Malleable-Iron Threaded Fittings: ASME B16.3. Shall be Ward, American Anvil, or Grinnell.

C. Steel, Threaded Couplings: ASTM A 865.

D. Steel Welding Fittings: ASTM A 234/A 234M, ASME B16.9, or ASME B16.11.

E. Steel Flanges and Flanged Fittings: ASME B16.5.

F. Steel, Grooved-End Fittings: UL-listed and FM-approved, ASTM A 47, malleable iron or ASTM A 536, ductile iron; with dimensions matching steel pipe and ends factory grooved according to AWWA C606.

2.04 JOINING MATERIALS

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for pipe-flange gasket materials and welding filler metals.

B. Ductile-Iron, Keyed Couplings: UL 213 and AWWA C606, for ductile-iron pipe dimensions. Include ASTM A 536, ductile-iron housing, rubber gaskets, and steel bolts and nuts.

C. Ductile-Iron, Flanged Joints: AWWA C115, ductile-iron or gray-iron pipe flanges, rubber gaskets, and steel bolts and nuts.

D. Steel, Keyed Couplings: UL 213 and AWWA C606, for steel-pipe dimensions. Include ASTM A 536, ductile-iron housing, rubber gaskets, and steel bolts and nuts. Include listing for dry-pipe service for couplings for dry piping.

E. Brazing Filler Metals: AWS A5.8, Classification BCuP-3 or BCuP-4.

F. Copper, Keyed Couplings: UL 213 and equivalent to AWWA C606, for copper-tube dimensions. Include ASTM A 47, malleable-iron or ASTM A 536, ductile-iron housing with copper-colored enamel finish, rubber gaskets, and steel bolts and nuts.

G. Transition Couplings: AWWA C219, sleeve type, or other manufactured fitting the same size as, with pressure rating at least equal to, and with ends compatible with piping to be joined.

2.05 POLYETHYLENE ENCASEMENT

A. Polyethylene Encasement for Ductile-Iron Piping: ASTM A 674 or AWWA C105, film, 0.008-inch minimum thickness, tube or sheet.

2.06 GENERAL-DUTY VALVES

A. Refer to Division 15 Section "Valves" for gate, ball, butterfly, globe, and check valves not required to be UL listed and FM approved.

2.07 FIRE-PROTECTION-SERVICE VALVES

A. General: UL listed and FM approved, with minimum 175-psig nonshock working-pressure rating. Valves for grooved-end piping may be furnished with grooved ends instead of type of ends specified.

B. Gate Valves, NPS 2 and Smaller: UL 262; cast-bronze, threaded ends; solid wedge; OS&Y; and rising stem.

C. Indicating Valves, NPS 2-1/2 and Smaller: UL 1091; butterfly or ball-type, bronze body with threaded ends; and integral indicating device.

1. Indicator: Visual.

2. Indicator: Electrical 115-V ac, prewired, single-circuit, supervisory switch.

3. Indicator: Electrical 115-V ac, prewired, two-circuit, supervisory switch.

D. Gate Valves, NPS 2-1/2 and Larger: UL 262, iron body, bronze mounted, taper wedge, OS&Y, and rising stem. Include replaceable, bronze, wedge facing rings and flanged ends.

E. Swing Check Valves, NPS 2 and Smaller: UL 312 or MSS SP-80, Class 150; bronze body with bronze disc and threaded ends.

F. Swing Check Valves, NPS 2-1/2 and Larger: UL 312, cast-iron body and bolted cap, with bronze disc or cast-iron disc with bronze-disc ring and flanged ends.

2.08 SPECIALTY VALVES

A. Alarm Check Valves: UL 193, 175-psig working pressure; designed for horizontal or vertical installation, with cast-iron flanged inlet and outlet, bronze grooved seat with O-ring seals, and single-hinge pin and latch design. Include trim sets for bypass, drain, electric sprinkler alarm switch, pressure gages, retarding chamber, and fill-line attachment with strainer.

1. Option: Grooved-end connections for use with keyed couplings.

2. Drip Cup Assembly: Pipe drain without valves, and separate from main drain piping.

3. Drip Cup Assembly: Pipe drain with check valve to main drain piping.

B. Dry-Pipe Valves: UL 260; differential type; 175-psig working pressure; with cast-iron flanged inlet and outlet, bronze seat with O-ring seals, and single-hinge pin and latch design. Include UL 1486, quick-opening devices, trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.

1. Option: Grooved-end connections for use with keyed couplings.

2. Air-Pressure Maintenance Devices: Automatic device to maintain correct air pressure in piping. Include shutoff valves to permit servicing without shutting down sprinkler piping, bypass valve for quick filling, pressure regulator or switch to maintain pressure, strainer, pressure ratings with 14- to 60-psig adjustable range, and 175-psig maximum inlet pressure.

3. Air Compressor: Fractional horsepower, 120-V ac, 60 Hz, single phase.

C. Pressure-Regulating Valves: UL 1468, 400-psig minimum rating, brass. Include NPS 1-1/2 or NPS 2-1/2, female NPS inlet and outlet; adjustable setting feature; and straight or 90-degree angle pattern design as indicated.

1. Finish: Rough chrome-plated.

D. Ball Drip Valves: UL 1726, automatic drain valve, NPS 3/4, ball check device with threaded ends.

2.09 MANUAL CONTROL STATIONS

A. Manual Control Stations: Hydraulic operation, with union, NPS 1/2 pipe nipple, and bronze ball valve. Include metal enclosure labeled "MANUAL CONTROL STATION" with operating instructions and cover held closed by breakable strut to prevent accidental opening.

2.10 SPRINKLERS

A. Automatic Sprinklers: With heat-responsive element complying with the following:

1. UL 199, for applications except residential.

2. UL 1626, for residential applications.

3. UL 1767, for early suppression, fast-response applications.

B. Sprinkler Types and Categories: Nominal 1/2-inch orifice for "Ordinary" temperature classification rating, unless otherwise indicated or required by application.

1. Open Sprinklers: UL 199, without heat-responsive element.

a. Orifice: 1/2 inch, with discharge coefficient K between 5.3 and 5.8.

b. Orifice: 17/32 inch, with discharge coefficient K between 7.4 and 8.2.

C. Sprinkler types, features, and options include the following:

1. Pendent, dry-type sprinklers.

2. Sidewall, dry-type sprinklers.

D. Sprinkler Finishes: Chrome-plated, bronze, and painted.

E. Special Coatings: Wax, lead, and corrosion-resistant paint.

F. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Sidewall Mounting: Chrome-plated steel, one piece, flat.

G. Sprinkler Guards: Wire-cage type, including fastening device for attaching to sprinkler.

2.11 SPECIALTY SPRINKLER FITTINGS

A. Specialty Fittings: UL listed and FM approved; made of steel, ductile iron, or other materials compatible with piping.

B. Dry-Pipe-System Fittings: UL listed for dry-pipe service.

C. Press-Seal Fittings: UL 213, steel housing with butylene O-rings and pipe stop.

D. Locking-Lug Fittings: UL 213, ductile-iron body with locking-lug ends.

E. Drop-Nipple Fittings: UL 1474, with threaded inlet, threaded outlet, and seals; adjustable.

F. Sprinkler, Drain and Alarm Test Fittings: UL-listed, cast- or ductile-iron body; with threaded inlet and outlet, test valve, and orifice and sight glass.

G. Sprinkler, Branch-Line Test Fittings: UL-listed, brass body; with threaded inlet and capped drain outlet and threaded outlet for sprinkler.

H. Sprinkler, Inspector's Test Fittings: UL-listed, cast- or ductile-iron housing; with threaded inlet and drain outlet and sight glass.

2.12 HOSE CONNECTIONS

A. Description: UL 668, 300-psig minimum pressure rating, brass, hose valve for connecting fire hose. Include 90-degree angle pattern design; female NPS inlet and male hose outlet; and lugged cap, gasket, and chain. Include NPS 2-1/2 as indicated, and hose valve threads according to NFPA 1963 and matching local fire department threads.

1. Valve Operation: Nonadjustable type, unless pressure-regulating type is indicated.

2. Finish: Rough brass.

2.13 ALARM DEVICES

A. General: Types matching piping and equipment connections.

B. Electric-Motor-Operated Alarms: Sleeve to suit wall construction and 10-inch- diameter, cast-aluminum alarm gong with red-enamel factory finish.

C. Water-Flow Indicators: UL 346; electrical-supervision, vane-type water-flow detector; with 250-psig pressure rating; and designed for horizontal or vertical installation. Include two single-pole, double-throw, circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.

D. Pressure Switches: UL 753; electrical-supervision-type, water-flow switch with retard feature. Include single-pole, double-throw, normally closed contacts and design that operates on rising pressure and signals water flow.

E. Valve Supervisory Switches: UL 753; electrical; single-pole, double throw; with normally closed contacts. Include design that signals controlled valve is in other than fully open position.

F. Indicator-Post Supervisory Switches: UL 753; electrical; single-pole, double throw; with normally closed contacts. Include design that signals controlled indicator-post valve is in other than fully open position.

2.14 PRESSURE GAGES

A. Pressure Gages: UL 393, 3-1/2- to 4-1/2-inch- diameter dial with dial range of 0 to 250 psig.

2.15 CONTROL PANELS

A. Description: Single-area, two-area, or single-area cross-zoned type as indicated. Control panel includes NEMA ICS 6, Type 1 enclosure, detector, alarm, and solenoid-valve circuitry for operation of deluge valves. Panels contain power supply; battery charger; standby batteries; field-wiring terminal strip; electrically supervised solenoid valves and polarized fire alarm bell; lamp test facility; single-pole, double-throw auxiliary alarm contacts; and rectifier.

1. Panels: UL listed and FM approved when used with thermal detectors and Class A detector circuit wiring. Electrical characteristics are 120-V ac, 60 Hz, with 24-V dc rechargeable batteries.

2. Manual Control Stations: Electric operation, metal enclosure, labeled "MANUAL CONTROL STATION" with operating instructions and a cover held closed by breakable strut.

2.16 FIRE DEPARTMENT CONNECTIONS

A. Wall, Fire Department Connections: UL 405; cast-brass body with brass, wall, escutcheon plate; brass, lugged caps with gaskets and brass chains; and brass, lugged swivel connections. Include inlets with threads according to NFPA 1963 and matching local fire department sizes and threads, outlet with pipe threads, extension pipe nipples, check devices or clappers for inlets, and escutcheon plate with marking “AUTO SPKR & STANDPIPE.”

1. Type: Flush mounting.

2. Escutcheon Plates: Rectangular.

3. Finish: Polished Brass.

2.17 BACKFLOW PREVENTERS

A. General: ASSE standard, backflow preventers.

1. NPS 2 (DN 50) and Smaller: Bronze body with threaded ends.

2. NPS 2-1/2 (DN 65) and Larger: Bronze, cast-iron, steel, or stainless steel body with flanged ends.

a. Interior Lining: AWWA C550 or FDA approved, epoxy coating for backflow preventers having cast-iron or steel body.

3. Interior Components: Corrosion-resistant materials.

4. Exterior Finish: Polished chrome plate if used in chrome-plated piping system.

5. Strainer: On inlet, if indicated.

B. Double-Check Backflow Prevention Assemblies: ASSE 1015, suitable for continuous pressure application. Include shutoff valves on inlet and outlet, and strainer on inlet; test cocks; and two positive-seating check valves. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.

C. Double-Check Detector Assembly Backflow Preventers: ASSE 1048, FM approved and UL listed, and suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet. Include test cocks; two positive-seating check valves; and bypass with displacement-type water meter, valves, and double-check backflow preventer. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 PREPARATION

A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article in Part 1 of this Section.

B. Report test results promptly and in writing.

3.02 EARTHWORK

A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.03 EXAMINATION

A. Examine roughing-in for hose connections and stations to verify actual locations of piping connections before installation.

B. Examine walls and partitions for suitable thickness, fire- and smoke-rated construction, framing for hose-station cabinets, and other conditions where hose connections and stations are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.04 PIPING APPLICATIONS

A. Do not use welded joints with galvanized steel pipe.

B. Flanges, unions, and transition and special fittings with pressure ratings the same as or higher than system's pressure rating may be used in aboveground applications, unless otherwise indicated.

C. Piping between Fire Department Connections and Check Valves: Use galvanized, standard-weight steel pipe with grooved ends; steel, grooved-end fittings; steel, keyed couplings; and grooved joints.

D. Underground Service-Entrance Piping: Use ductile-iron, grooved-end pipe and fittings; ductile-iron, keyed couplings; and grooved joints.

E. Service-Entrance Piping Inside Building: If backflow preventer is not within 5 feet underground service-entrance piping, use Type K hard drawn copper tubing upstream of backflow preventer. Do not use steel pipe on municipal water system upstream of backflow preventer.

F. Dry-Pipe Sprinklers: Use the following:

1. NPS 1-1/2 and Smaller: Galvanized, standard-weight steel pipe with threaded ends; cast- or malleable-iron threaded fittings; and threaded joints.

2. NPS 1-1/2 and Smaller: Galvanized, standard-weight steel pipe with plain ends; locking-lug fittings; and twist-locked joints.

3. NPS 2: Galvanized, standard-weight steel pipe with threaded ends; cast- or malleable-iron threaded fittings; and threaded joints.

4. NPS 2: Galvanized, standard-weight steel pipe with plain ends; locking-lug fittings; and twist-locked joints.

5. NPS 2: Galvanized, standard-weight steel pipe with grooved ends; steel, grooved-end fittings; steel, keyed couplings; and grooved joints.

6. NPS 2-1/2 to NPS 4: Galvanized, standard-weight steel pipe with threaded ends; cast- or malleable-iron threaded fittings; and threaded joints.

7. NPS 2-1/2 to NPS 4: Galvanized, standard-weight steel pipe with grooved ends; steel, grooved-end fittings; steel, keyed couplings; and grooved joints.

G. Wet-Pipe Sprinklers: Use the following:

1. NPS 1-1/2 and Smaller: Standard-weight steel pipe with threaded ends, cast-iron threaded fittings, and threaded joints.

2. NPS 1-1/2 and Smaller: Standard-weight steel pipe with plain ends, locking-lug fittings, and twist-locked joints.

3. NPS 1-1/2 and Smaller: Standard-weight steel pipe with plain ends, steel welding fittings, and welded joints.

4. NPS 1-1/2 and Smaller: Galvanized, standard-weight steel pipe with threaded ends; cast-iron threaded fittings; and threaded joints.

5. NPS 1-1/2 and Smaller: Galvanized, standard-weight steel pipe with plain ends; locking-lug fittings; and twist-locked joints.

6. NPS 2: Standard-weight steel pipe with plain ends, locking-lug fittings, and twist-locked joints.

7. NPS 2: Standard-weight steel pipe with grooved ends; steel, grooved-end fittings; steel, keyed couplings; and grooved joints.

8. NPS 2: Standard-weight steel pipe with plain ends, steel welding fittings, and welded joints.

9. NPS 2: Galvanized, standard-weight steel pipe with plain ends; locking-lug fittings; and twist-locked joints.

10. NPS 2: Galvanized, standard-weight steel pipe with grooved ends; steel, grooved-end fittings; steel, keyed couplings; and grooved joints.

11. NPS 2-1/2 and Larger: Galvanized, standard-weight steel pipe with grooved ends; steel, grooved-end fittings; steel, keyed couplings; and grooved joints.

12. NPS 2-1/2 and Larger: Standard weight steel pipe with roll-grooved ends; steel, grooved-end fittings; and grooved joints.

13. NPS 2-1/2 and Larger: Standard Weight steel pipe with plain ends, steel welding fittings, and welded joints.

3.05 VALVE APPLICATIONS

A. Where specific valve types are not indicated, the following requirements apply:

1. Fire-Protection-Service Valves: UL listed and FM approved for applications where required by NFPA 13 and NFPA 14.

a. Shutoff Duty: Use gate valves.

2. General-Duty Valves: For applications where UL-listed and FM-approved valves are not required by NFPA 13 and NFPA 14.

a. Shutoff Duty: Use gate, ball, or butterfly valves.

b. Throttling Duty: Use globe, ball, or butterfly valves.

3.06 JOINT CONSTRUCTION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.

B. Ductile-Iron-Piping, Grooved Joints: Use ductile-iron pipe with radius-cut-grooved ends; ductile-iron, grooved-end fittings; and ductile-iron, keyed couplings. Assemble joints with couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions.

C. Steel-Piping, Grooved Joints: Use Schedule 40 steel pipe with cut or roll-grooved ends; steel, grooved-end fittings; and steel, keyed couplings. Assemble joints with couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions. Use gaskets listed for dry-pipe service for dry piping.

3.07 SERVICE-ENTRANCE PIPING

A. Connect standpipe and sprinkler piping to water-service piping of size and in location indicated for service entrance to building.

B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-service piping. Refer to Division 15 Section "Plumbing Specialties" for backflow preventers.

3.08 WATER-SUPPLY CONNECTION

A. Connect standpipe and sprinkler piping to building interior water distribution piping. Refer to Division 15 Section "Water Distribution Piping" for interior piping.

B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water distribution piping. Refer to Division 15 Section "Plumbing Specialties" for backflow preventers.

3.09 PIPING INSTALLATION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation.

B. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Project Representative before deviating from approved working plans.

C. Install underground service-entrance piping according to NFPA 24 and with restrained joints.

D. Use approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install unions adjacent to each valve in pipes NPS 2 and smaller. Unions are not required on flanged devices or in piping installations using grooved joints.

F. Install flanges or flange adapters on valves, apparatus, and equipment having NPS 2-1/2 and larger connections.

G. Install "Inspector's Test Connections" in sprinkler piping, complete with shutoff valve, sized and located according to NFPA 13.

H. Install sprinkler piping with drains for complete system drainage.

I. Install sprinkler zone control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.

J. Install drain valves on standpipes.

K. Install ball drip valves to drain piping between fire department connections and check valves. Drain to floor drain or outside building.

L. Install alarm devices in piping systems.

M. Hangers and Supports: Comply with NFPA 13 for hanger materials. Install according to NFPA 13 for sprinkler piping and to NFPA 14 for standpipes.

N. Earthquake Protection: Install piping according to NFPA 13 to protect from earthquake damage.

O. Install piping with grooved joints according to manufacturer's written instructions. Construct rigid piping joints, unless otherwise indicated.

P. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.

3.10 SPECIALTY SPRINKLER FITTING INSTALLATION

A. Install specialty sprinkler fittings according to manufacturer's written instructions.

3.11 VALVE INSTALLATION

A. Refer to Division 15 Section "Valves" for installing general-duty valves. Install fire-protection specialty valves, trim, fittings, controls, and specialties according to NFPA 13 and NFPA 14, manufacturer's written instructions, and authorities having jurisdiction.

B. Gate Valves: Install fire-protection-service valves supervised-open, located to control sources of water supply except from fire department connections. Provide permanent identification signs indicating portion of system controlled by each valve.

C. Valves for Wall Fire Hydrants: Install gate valve with nonrising stem in supply pipe.

D. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water supply sources.

E. Alarm Check Valves: Install valves in vertical position for proper direction of flow, including bypass check valve and retard chamber drain-line connection.

F. Dry-Pipe Valves: Install trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.

1. Air-Pressure Maintenance Devices for Dry-Pipe Systems: Install shutoff valves to permit servicing without shutting down sprinkler system; bypass valve for quick system filling; pressure regulator or switch to maintain system pressure; strainer;

2. Install air compressor and compressed-air supply piping.

3.12 SPRINKLER APPLICATIONS

A. General: Use sprinklers according to the following applications:

1. Rooms without Ceilings: Upright sprinklers.

2. Wall Mounting: Sidewall sprinklers.

3. Spaces Subject to Freezing: Dry-pendent type and/or dry-sidewall type sprinklers.

4. Sprinkler Finishes: Use sprinklers with the following finishes:

a. Upright, Pendent, and Sidewall Sprinklers: Chrome-plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.

3.13 SPRINKLER INSTALLATION

A. Install sprinklers in patterns indicated on approved shop drawings.

3.14 HOSE-CONNECTION INSTALLATION

A. Install hose connections adjacent to standpipes, unless otherwise indicated.

B. Install freestanding hose connections for access and minimum passage restriction.

C. Install NPS 2-1/2 hose connections with quick-disconnect NPS 2-1/2 by NPS 1-1/2 reducer adapter and flow- restricting device, unless otherwise indicated.

3.15 CONNECTIONS

A. Connect water supplies to standpipes and sprinklers. Include backflow preventers.

B. Install ball drip valves at each check valve for fire department connection. Drain to floor drain or outside building.

C. Connect piping to specialty valves, hose valves, specialties, fire department connections, and accessories.

D. Electrical Connections: Power wiring is specified in Division 16.

E. Connect alarm devices to fire alarm.

F. Connect compressed-air supply to dry-pipe sprinkler piping.

G. Connect air compressor to the following piping and wiring:

1. Pressure gages and controls.

2. Electrical power system.

3. Fire alarm system devices, including low-pressure alarm.

3.16 LABELING AND IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13 and NFPA 14 and in Division 15 Section "Basic Mechanical Materials and Methods."

B. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13 and NFPA 14 and in Division 15 Section "Mechanical Identification."

3.17 FIELD QUALITY CONTROL

A. Flush, test, and inspect sprinkler piping according to NFPA 13, "System Acceptance" Chapter.

B. Flush, test, and inspect standpipes according to NFPA 14, "Tests and Inspection" Chapter.

C. Replace piping system components that do not pass test procedures and retest to demonstrate compliance. Repeat procedure until satisfactory results are obtained.

D. Report test results promptly and in writing to project representative and authorities having jurisdiction.

3.18 CLEANING

A. Clean dirt and debris from sprinklers.

B. Remove and replace sprinklers having paint other than factory finish.

3.19 PROTECTION

A. Protect sprinklers from damage.

3.20 START-UP PROCEDURES

A. Verify that specialty valves, trim, fittings, controls, and accessories are installed and operate correctly.

B. Verify that excess-pressure pumps and accessories are installed and operate correctly.

C. Verify that air compressors and their accessories are installed and operate correctly.

D. Verify that specified tests of piping are complete.

E. Verify that damaged sprinklers and sprinklers with paint or coating not specified are replaced with new, correct type.

F. Verify that sprinklers are correct types, have correct finishes and temperature ratings, and have guards as required for each application.

G. Verify that potable-water supplies have correct types of backflow preventers.

H. Drain dry-pipe sprinkler piping.

I. Pressurize and check dry-pipe sprinkler piping air-pressure maintenance devices and air compressors.

J. Verify that hose connections and fire department connections have threads compatible with local fire department equipment.

K. Fill standpipes with water.

L. Verify that hose stations are correct type and size.

M. Energize circuits to electrical equipment and devices.

N. Start and run air compressors.

O. Adjust operating controls and pressure settings.

P. Coordinate with fire alarm tests. Operate as required.

3.21 DEMONSTRATION

A. Demonstrate equipment, specialties, and accessories. Review operating and maintenance information.

1. Schedule demonstration with Owner with at least seven days' advance notice.

END OF SECTION

SECTION 15410
PLUMBING FIXTURES, EQUIPMENT AND COMPONENTS

PART 1 GENERAL

1.01 SUMAMRY

A. This specification establishes minimum standards and guidelines for providing complete and operational mechanical installations on a Design-Build basis. It shall be the Mechanical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

1.02 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

C. Cast Polymer: Cast-filled-polymer-plastic material. This material includes cultured-marble and solid-surface materials.

D. Fitting: Device that controls the flow of water into or out of the plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

E. FRP: Fiberglass-reinforced plastic.

F. PMMA: Polymethyl methacrylate (acrylic) plastic.

G. PVC: Polyvinyl chloride plastic.

H. Solid Surface: Nonporous, homogeneous, cast-polymer-plastic material with heat-, impact-, scratch-, and stain-resistance qualities.

1.03 SUBMITTALS

A. Developer shall submit Plumbing Fixture shop drawings to Architect for review and acceptance prior to designing plumbing system.

B. Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.

1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.

B. 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.

C. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.

D. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

E. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

PART 2 PRODUCTS

2.01 FAUCETS

A. S-1

1. Service Sink:

a. Description: Service sink faucet, wall mounted, with stops in shanks, vacuum breaker, hose-thread outlet, and pail hook.

2.02 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Cover:

1. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

2.03 WATER HEATERS

A. EWH-1:

1. Instant Hot Water Dispenser:

a. General: Electrically heated, insulated water tank with drain, adjustable temperature control (120°F to 200°F).

b. NSF, IAPMO, approvals, UL Listing.

c. 1 year parts and labor warranty.

2.04 HYDRANTS AND HOSE BIBBS

A. Interior Hose Bibb:

1. Description: Polished chrome wall outlet with vacuum breaker, removable tee key.

B. Exterior Wall Hydrant:

1. Description: Freeze proof, integral vacuum breaker, wheel type handle.

2.05 FLOOR DRAINS AND FLOOR SINKS

A. Description: Coated cast iron, trap primer connection, flashing collar, Adjustable height, nickel bronze strainer.

B. Size: To be determined by Architect as appropriate for the application.

C. Locations:

1. As a minimum, provide floor drains in every toilet room

2. Provide floor sinks at each fire sprinkler alarm room and room where backflow prevention device is to be installed.

2.06 TRAP PRIMERS, WATER HAMMER ARRESTORS

A. Trap Primers:

1. Description: Brass body, activated by pressure fluctuation of 5 psig, integral backflow preventer, isolation valve with screwdriver operator.

2. Provide with Flush Valve Primer Fitting where required.

B. Water Hammer Arrestors:

1. Description: Stainless steel bellows with brass piston, factory air charge.

2.07 DOUBLE CHECK VALVE ASSEMBLIES

1. Description: Two independent check valves, shutoff valves, with test ports. Bronze or stainless steel body, rubber check assembly, stainless steel test ports, and bronze or stainless steel strainer.

2.08 CLEANOUTS

A. Wall Cleanouts: Cast iron spigot, bronze thread, nickel bronze cover.

B. Floor Cleanouts: Adjustable cast iron, screwed nickel bronze cap with vandal proof screws. Provide adjustable carpet clamp frame where required.

2.09 OIL WATER SEPARATOR

A. Type: Flush-with-floor, deep rough-in.

B. Body: Welded steel with corrosion-resistant coating inside and outside

C. Coating: Factory fabricated, welded steel with corrosion-resistant coating, height as required to match invert of inlet pipe

D. Cover: Gasketed, non-skid surface, secured, flush with finished floor

E. Hatch Doors: H20 rated

F. Features: Cascade bottom, removable baffle and sediment bucket, integral deep-seal trap, and adjustable draw-off assembly

G. Flow Control Fitting: Sized for rated GPM, for installation on inlet pipe

H. Access: Locate oil water separator outside facility footprint, outside of parking spaces and accessible by a vactor truck (no more than 20' away).

I. Provide separation from sewer system to prevent back-wash or odors from sewer system. (Pumped or backflow-enabled system acceptable)

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 INSTALLATION

A. Install in accordance with the manufacturer's requirements and recommendations. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.

1. Use carrier supports with waste fitting and seal for back-outlet fixtures.

2. Use carrier supports without waste fitting for fixtures with tubular waste piping.

3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

C. Install fixtures level and plumb according to roughing-in drawings.

D. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

1. Exception: Use ball, gate, or globe valves if supply stops are not specified with fixture. Valves are specified in Division 15 Section "Pipe, Pipe Materials, and Valves."

E. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

F. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

G. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

H. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.

I. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

J. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 15 Section "Basic Mechanical Materials and Methods."

K. Set service basins in leveling bed of cement grout. Grout is specified in Division 15 Section "Basic Mechanical Materials and Methods."

L. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 7 Section "Joint Sealants."

3.02 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

C. Coordinate with Division 16 for wiring installation and connection.

D. Connect Instant Hot Water Dispenser to cold water supply only.

3.03 FIELD QUALITY CONTROL

A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.

B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

E. Install fresh batteries in sensor-operated mechanisms.

3.04 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Operate and adjust disposers. Replace damaged and malfunctioning units.

C. Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.

D. Replace washers and seals of leaking and dripping faucets and stops.

E. Install fresh batteries in sensor-operated mechanisms.

3.05 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.

2. Remove sediment and debris from drains.

B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

3.06 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION

SECTION 15411
WATER DISTRIBUTION PIPING

PART 1 GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational mechanical installations on a Design-Build basis. It shall be the Mechanical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Terms and Conditions and Division 1 Specification Sections, apply to this Section.

1. Washington State Department of Transportation (WSDOT) Standard Specifications 2008.

B. Related Sections include the following:

1. Division 15 Section "Hangers and Supports" for pipe hangers and seismic restraints.

2. Division 15 Section "Pipe Insulation" for pipe insulation requirements.

3. Division 15 Section "Meters and Gages" for thermometers, pressure gages, and fittings.

4. Division 15 Section "Plumbing Specialties" for water distribution piping specialties.

1.03 SUMMARY

A. This Section includes water distribution piping from locations indicated to fixtures and equipment inside building.

1.04 DEFINITIONS

A. Water Service Piping: Water piping outside building that conveys water to building.

B. Service Entrance Piping: Water piping at entry into building between water service piping and water distribution piping.

C. Water Distribution Piping: Water piping inside building that conveys water to fixtures and equipment throughout the building.

1.05 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:

1. Service Entrance Piping: 160 psig.

2. Water Distribution Piping: 125 psig.

1.06 SUBMITTALS

A. Water Samples, Test Results, and Reports: Specified in "Field Quality Control."

1.07 QUALITY ASSURANCE

A. Provide listing/approval stamp, label, or other marking on piping made to specified standards.

B. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

C. Comply with ANSI/NSF 61, "Drinking Water System Components--Health Effects," Sections 1 through 9 for potable-water piping and components.

PART 2 PRODUCTS

2.01 PIPE AND TUBE MATERIALS

A. General: Applications of the following pipe and tube materials are indicated in Part 3 "Piping Applications" Paragraph.

B. Soft Copper Tube: ASTM B 88, Types K, and L, water tube, annealed temper.

C. Hard Copper Tube: ASTM B 88, Type L, water tube, drawn temper.

D. Ductile-Iron Pipe: AWWA C151, 250-psig minimum pressure rating with mechanical-joint bell, plain spigot end, and AWWA C104 cement-mortar lining. Include AWWA C111 ductile-iron gland, rubber gasket, and steel bolts.

2.02 PIPE AND TUBE FITTINGS

A. General: Applications of the following pipe and tube fitting materials are indicated in Part 3 "Piping Applications" Paragraph.

B. Copper, Solder-Joint Pressure Fittings: ASME B16.22 wrought copper.

C. Copper, Grooved-End Fittings shall be Victaulic full flow copper fittings with grooved ends. Standard fittings shall be wrought copper per ASTM B-16.22.

D. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.

E. Copper Unions: ASME B16.22, wrought copper, hexagonal-stock body with ball-and-socket joint, metal-to-metal seating surfaces, and solder-joint, threaded, or solder-joint and threaded ends. Include threads conforming to ASME B1.20.1 on threaded ends.

F. Ductile-Iron, Mechanical-Joint Fittings: AWWA C110, ductile- or gray-iron standard pattern; with 250-psig minimum pressure rating and AWWA C104 cement-mortar lining. Include AWWA C111 ductile- or gray-iron glands, rubber gaskets, and steel bolts.

G. Ductile-Iron Flanged Fittings: AWWA C110, ductile- or gray-iron standard pattern; with 250-psig minimum pressure rating and AWWA C104 cement-mortar lining.

2.03 JOINING MATERIALS

A. General: Applications of the following piping joining materials are indicated in Part 3 "Piping Applications" Paragraph.

B. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for commonly used joining materials.

C. Solder: ASTM B 32, Alloy Sn95, Sn94, or E; lead free.

D. Brazing Filler Metal: AWS A5.8, BCuP, copper phosphorus or BAg, silver classification.

E. Copper keyed couplings shall have angle bolt pads and shall be cast of ductile iron conforming to ASTM A-536, Grade 65-45-12 with a copper color alkyd enamel paint coating. Couplings rated to 300 psi. Gaskets shall be flush-seal style Grade 'F'. FPDM compound molded of materials conforming to ASTM B-2000, UL/ULC classified to ANSI/NSF 61 for cold and hot potable water service.

F. Transition Couplings: Coupling or other manufactured fitting same size as, with pressure rating at least equal to, and with ends compatible with piping to be joined.

2.04 POLYETHYLENE ENCASEMENT

A. Polyethylene Encasement for Piping: ASTM A 674 or AWWA C105 polyethylene film, 0.008-inch minimum thickness, tube, or sheet.

2.05 VALVES

A. Refer to Division 15 Section "Valves" for general-duty valves.

B. Refer to Division 15 Section "Plumbing Specialties" for special-duty valves.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 EXCAVATION

A. Refer WSDOT, Section 7-08 for excavating, trenching, and backfilling.

3.02 PIPING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.

B. Flanges may be used on aboveground piping, unless otherwise indicated.

C. Underground, Service Entrance Piping: Double wrap with plastic tape. Do not use valves underground. Use the following:

1. 4-Inch NPS and Smaller: Soft copper tube, Type K; copper, solder-joint pressure fittings; and brazed joints.

2. 6- to 12-Inch NPS: Ductile-iron pipe and fittings, and mechanical joints.

D. Aboveground, Water Distribution Piping: Use the following:

1. 4-Inch NPS and Smaller: Hard copper tube, Type L; copper, solder-joint fittings; and soldered joints.

2. The Victaulic Copper Groove Piping System may be used on 2-1/2 – 4-inch Type L copper. System consists of mechanical couplings with angular bolt pads with flush-seal style gaskets, UL classified in accordance with ANSI/NSF 61, copper or cast bronze fittings with grooved ends. Install per latest edition of the Manufacturer's Installation Instruction Handbook.

3. 6 to 12-Inch NPS: Hard copper tube, Type L with grooved ends; copper, grooved-end fittings. Install per manufacturers recommendations.

E. Underground, Water Distribution Piping: Do not use flanges or valves underground. Use the following:

1. 2-Inch NPS and Smaller: Soft copper tube, Type K; wrought-copper, solder-joint pressure fittings; and brazed joints.

2. 2-1/2- to 4-Inch NPS: Hard copper tube, Type L; wrought-copper, solder-joint pressure fittings; and brazed joints.

F. Non-Potable-Water Piping: Use the following:

1. 4-Inch NPS and Smaller: Hard copper tube, Type L; solder-joint pressure fittings; and brazed joints.

3.03 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use gate, ball, or butterfly valves. Grooved-end butterfly valves may be used with grooved-end piping.

2. Balancing: Use circuit balancing valve.

3.04 PIPING INSTALLATION, GENERAL

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation.

3.05 SERVICE ENTRANCE PIPING INSTALLATION

A. Extend service entrance piping to exterior water service piping in sizes and locations indicated for service entrances into building.

B. Install shutoff valve, hose-end drain valve, strainer and pressure gage inside building at each service entrance pipe.

C. Install water-pressure regulators and backflow preventers downstream from shutoff valves. Refer to Division 15 Section "Plumbing Specialties" for water-pressure regulators and backflow preventers.

D. Ductile-Iron, Service Entrance Piping: Comply with AWWA C600. Install buried piping between shutoff valve and connection to water service piping with restrained joints. Anchor pipe to wall or floor at entrance. Include thrust-block supports at vertical and horizontal offsets.

1. Encase piping with polyethylene film according to ASTM A 674 or AWWA C105.

E. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service entrance pipe penetration through exterior wall. Select number of interlocking rubber links required to make installation watertight. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for sleeves and mechanical sleeve seals.

3.06 WATER DISTRIBUTION PIPING INSTALLATION

A. Install piping with 0.25 percent slope downward toward drain.

3.07 JOINT CONSTRUCTION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.

B. Grooved Joints: Assemble joints with coupling, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

C. Mechanically Formed Copper Tube Tee Fittings: Mechanically formed tee fitting, as created by T-Drill Industries, Inc. is an acceptable method of installation. Installers shall be trained and certified in using this technique. Limited to applications where the branch line is smaller than the main line. Form tee in copper tube according to equipment manufacturer’s written instructions. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar. Soft Solder joints shall not be permitted.

3.08 VALVE INSTALLATION

A. Sectional Valves: Install sectional valves close to main on each branch and riser serving plumbing fixtures or equipment, and where indicated. Use gate or ball valves for piping 2-inch NPS and smaller. Use gate or butterfly valves for piping 2-1/2-inch NPS and larger.

B. Shutoff Valves: Install shutoff valves on each water supply to equipment, close to main, on each plumbing fixture without supply stops, and where indicated. Use ball valves for piping 2-inch NPS and smaller. Use gate or butterfly valves for piping 2-1/2-inch NPS and larger.

C. Drain Valves: Install hose end drain valves for equipment, at base of each water riser, at low points in horizontal piping, and where required to drain water piping.

1. Install hose-end drain valves at low points in water mains, risers, and branches.

2. Install stop-and-waste drain valves where indicated.

D. Circuit Balancing Valves: Install in each hot-water circulation return branch, discharge side of each pump and circulator, and where indicated. Refer to Division 15 Section "Plumbing Specialties" for calibrated balancing valves.

3.09 HANGER AND SUPPORT INSTALLATION

A. Refer to Division 15 Section "Hangers and Supports" for pipe hanger and support devices. Install the following:

1. Riser clamps, MSS Type 8 or Type 42, for vertical runs.

2. Adjustable steel clevis hangers, MSS Type 1, for individual, straight, horizontal runs of cold water and hot water 100 feet and less.

3. Adjustable roller hangers, MSS Type 43, for individual, straight, horizontal runs of hot water longer than 100 feet.

4. Pipe rolls, MSS Type 44, for multiple, straight, horizontal runs of hot water 100 feet or longer. Support pipe rolls on trapeze.

5. Spring hangers, MSS Type 52, for supporting base of vertical runs.

B. Install supports and seismic restraints according to Division 15 Section "Hangers and Supports."

C. Support vertical piping and tubing at base and at each floor and at maximum distance of 15 feet (whichever is less).

D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

E. Horizontal pipe hanger spacing and rod diameters:

Nom. Pipe Size (inches)	Steel Pipe Max. Span (feet)	Copper Tube Max. Span (feet)	Min. Rod Diameter (inches)
Up to 1	7	5	3/8
1 1/4	7	7	3/8
1 1/2	9	8	3/8
2	10	8	3/8
2 1/2	11	9	1/2
3	12	10	1/2

F. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.10 CONNECTIONS

A. Connect service entrance piping to exterior water service piping. Use transition fitting to join dissimilar piping materials.

B. Connect water distribution piping to service entrance piping at shutoff valve, and extend to and connect to the following:

1. Water Heaters: Connect cold-water supply and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.

2. Plumbing Fixtures: Connect hot- and cold-water supply piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Fixtures."

3.11 FIELD QUALITY CONTROL

A. Inspect water distribution piping as follows:

B. Inspect service entrance piping and water distribution piping as follows:

1. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

a. Roughing-In Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.

b. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

C. Test service entrance piping and water distribution piping as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced water piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.

3. Cap and subject piping to static water pressure of 150 psig or 1-1/2 times the operating pressure, whichever is greater, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for 24 hours. Leaks and loss in test pressure constitute defects that must be repaired.

4. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.

5. Prepare and submit reports for tests and required corrective action.

6. Test hose bibb system to ensure proper temperature settings have been made at the riser drain valves and the main fill valve, provide report.

3.12 CLEANING

A. Clean and disinfect potable-water distribution piping as follows:

1. Purge new piping and parts of existing water piping that have been altered, extended, or repaired before using.

2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed, procedure described in either AWWA C651 or AWWA C652 or as described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.

b. Fill and isolate system according to either of the following:

1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.

2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for 3 hours.

c. Flush system with clean, potable water until chlorine is no longer in water coming from system after the standing time.

d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows contamination.

B. Prepare and submit reports for purging and disinfecting activities.

C. Clean interior of piping system. Remove dirt and debris as work progresses.

3.13 START-UP PROCEDURES

A. Fill water piping. Check components to determine that they are not air bound and that piping is full of water.

B. Perform the following steps before putting into operation:

1. Close drain valves, hydrants, and hose bibbs.

2. Open shutoff valves to fully open position.

3. Open throttling valves to proper setting.

4. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.

5. Remove and clean strainer screens. Close drain valves and replace drain plugs.

6. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and that cartridges are clean and ready for use.

C. Check plumbing equipment and verify proper settings, adjustments, and operation. Do not operate water heaters before filling with water.

D. Check plumbing specialties and verify proper settings, adjustments, and operation.

1. Water-Pressure Regulators: Set outlet pressure at 80 psig maximum, unless otherwise indicated.

END OF SECTION

SECTION 15415
HEAT TRACE

PART 1 GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational mechanical installations on a Design-Build basis. It shall be the Mechanical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

B. Furnish and install a UL listed system of electric self-regulating heating cable and components for maintaining the water temperature in the pipes as indicated on the drawings.

1.02 SUBMITTALS

A. Manufacturer's catalog cuts showing materials and performance data and UL Compliance.

B. Project list of at least 20 projects, installed for at least 5 years, with at least 2000 ft (600m) of heating cable in each project.

PART 2 PRODUCTS

2.01 CONSTRUCTION

A. The self-regulating heating cable shall consist of two (2) 16-AWG nickel-coated copper bus wires embedded in a radiation-crosslinked conductive polymer core. It shall be covered by a radiation-crosslinked, polyolefin, dielectric jacket and enclosed in a tinned copper braid of 14 AWG equivalent ware size. The braid shall be covered with a (nominal) 40-mil polyolefin outer jacket, color-coded for easy identification. The cable shall be specifically designed, manufactured, and UL listed for freeze-protection.

2.02 MECHANICAL

A. The cable shall have a minimum cut-through resistance of 600 lb per CSA 22.2 0.3. Cutting test 4.14. The cable shall have a minimum impact resistance of 25 ft lb per UL 1588.11. The cable shall withstand a glancing impact of 22 ft lb per UL 1581.590. The cable shall have a minimum abrasion resistance of 7000 cycles per UL 719.19. The cable shall withstand a crush resistance of 4500 N per IEEE 515 Deformation Test 5.1.5.

2.03 EXPERIENCE

A. The manufacturer shall have more than ten years experience with self-regulating heating cables for temperature maintenance of domestic hot water.

B. The manufacturer's Quality Assurance Program shall be certified to ISO 9001 standard.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 OPERATING TEMPERATURES

A. The freeze protection system shall not exceed a nominal temperature of 40ºF.

3.02 MAINTENANCE TEMPERATURE

A. Each freeze protection system shall be maintained using only one product. Temperatures shall be maintained with straight runs of heating cable on the pipe. The use of a 40ºF fixed thermostat shall ensure heating cable is off when pipe temperature is over 40ºF.

3.03 INSTALLATION

A. The system shall be installed by factory trained certified installers.

B. The system shall be installed according to the drawings and the manufacturer's instruction. The installer shall be responsible for providing a functional system, installed in accordance with applicable national and local code requirements. Each circuit shall be protected with a 30-mA ground-fault protection device.

C. Electrical Connections: The following requirements apply:
   1. Electrical power wiring is specified in Division 16.
   2. Freeze protection for the fire line shall be monitored by the fire alarm control panel.

3.04 TESTING

A. Procedure: Measure the heater circuit continuity and the insulation resistance between the braid and bus wires with a 2500-Vdc megohmmeter (megger).

B. Acceptable Results: The heater circuit shall be continuous and megger readings shall be at least 20 megohms regardless of heater length. Circuits yielding unacceptable readings must be repaired or replaced.

C. Submittal of Results: Submit records of the test data to the Project Representative.

END OF SECTION

SECTION 15420
DRAINAGE AND VENT PIPING

PART 1 GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational mechanical installations on a Design-Build basis. It shall be the Mechanical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Division 1 Specification Sections, apply to this Section.

B. Related Sections include the following:

1. Division 2 for sanitary sewage and storm drainage.

2. Division 2 for foundation drains.

3. Division 2 for excavating, trenching, and backfilling.

4. Division 2 for sewage and drainage system interceptors.

5. Division 15 Section "Hangers and Supports" for support installation and seismic restraints.

6. Division 15 Section "Pipe Insulation."

7. Division 15 Section "Valves."

8. Division 15 Section "Plumbing Specialties" for drainage and vent piping system specialties.

1.03 SUMMARY

A. This Section includes sanitary drainage and vent piping inside building and to locations indicated.

1.04 DEFINITIONS

A. Service Entrance Piping: Drainage piping at entry into building between outside building sewer piping and inside drainage piping.

B. Soil, Waste, and Vent Piping: Piping inside building that conveys wastewater and vapors from fixtures and equipment throughout the building.

C. Force-Main Piping: Drainage piping, under pressure.

1.05 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:

1. Soil, Waste, and Vent Systems: 10-foot head of water.

2. Sewage, Force-Main Piping Systems: 50 psig.

1.06 SUBMITTALS

A. Test Results and Reports: Specified in "Quality Control" Paragraph.

1.07 QUALITY ASSURANCE

A. Provide listing/approval stamp, label, or other marking on piping made to specified standards.

B. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" for applications of pipe, tube, fitting, and joining materials.

B. Flexible Transition Couplings for Underground Nonpressure Piping: ASTM C 1173 with elastomeric sleeve. Include ends of same sizes as piping to be joined and include corrosion-resistant metal band on each end.

C. Transition Couplings for Underground Pressure Piping: AWWA C219 metal, sleeve-type coupling or other manufactured fitting same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.02 CAST-IRON SOIL PIPING

A. Hubless Pipe and Fittings: CISPI 301.

1. Couplings: Assembly of metal housing, corrosion-resistant fasteners, and ASTM C 564 rubber sleeve with integral, center pipe stop.

a. Compact, Stainless-Steel Couplings: CISPI 310 with Type 301, or ASTM A 666, Type 301, stainless-steel corrugated shield; two stainless-steel bands; and sleeve.

b. Heavy-Duty, Type 301, Stainless-Steel Couplings: Stainless-steel shield; stainless-steel bands; and sleeve.

1) NPS 1-1/2 to NPS 4: 4 bands.

2) NPS 5 to NPS 10: 6 bands.

2. Sovent Fittings: ASME B16.45 or ASSE 1043, hubless, aerator and deaerator.

2.03 VALVES

A. Refer to Division 15 Section "Valves" for general-duty valves. Use valves specified for "Domestic Water Systems" applications.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 EXCAVATION

A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.02 PIPING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.

B. Flanges may be used on aboveground piping, unless otherwise indicated.

C. Aboveground, Soil, Waste, and Vent Piping: Use the following:

1. Hubless, cast-iron soil pipe and fittings:

a. Couplings: Compact, stainless steel, CISPI 310.

b. Couplings: Heavy-duty, Type 304, stainless steel.

2. 1-1/4- and 1-1/2-Inch NPS: Copper drainage tube; wrought copper, solder-joint drainage fittings; and soldered joints.

D. Underground, Soil, Waste, and Vent Piping: Use the following:

1. Hubless, cast-iron soil pipe and fittings:

a. Double Couplings: Heavy-duty, Type 304, stainless steel.

b. Double Couplings: Compact, stainless steel, CISPI 310.

E. Aboveground, Sewage Force-Mains: Use the following:

1. Galvanized steel pipe and cast-iron, threaded fittings.

F. Underground Sanitary-Sewage Force Mains: Use any of the following piping materials for each size range:

1. NPS 2 to NPS 4: Hard copper tube, Type L; wrought-copper pressure fittings; and soldered joints.

2. NPS 2 to NPS 4: Soft copper tube, Type L; wrought-copper pressure fittings; and soldered joints.

3. NPS 2 to NPS 4: Use NPS 3 and NPS 4 mechanical-joint, ductile-iron pipe and fittings.

3.03 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use gate or ball valves.

3.04 PIPING INSTALLATION, GENERAL

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation.

3.05 SERVICE ENTRANCE PIPING INSTALLATION

A. Refer to Division 2 Section "Sanitary Sewers and Storm Drainage" for sanitary and storm sewer piping.

B. Extend building sanitary drain piping and connect to sanitary sewer piping in sizes and locations indicated. Install cleanout and extension to grade at connections of building sanitary drains with building sanitary sewers.

C. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service entrance pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for sleeves and mechanical sleeve seals.

3.06 DRAINAGE AND VENT PIPING INSTALLATION

A. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

B. Make changes in direction for drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not make change in direction of flow greater than 90 degrees. Use proper size of standard increasers and reducers if different sizes of piping are connected. Reducing size of drainage piping in direction of flow is prohibited.

C. Install drainage and vent piping at the following minimum slopes, unless otherwise indicated:

1. All building drainage systems at 1/4 per foot downward in direction of flow.

2. Vent Piping: 1/8-inch per foot down toward vertical fixture vent.

D. Install engineered, sanitary drainage and vent systems in locations indicated and as follows:

1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.

E. Sleeves are not required for cast-iron soil piping passing through concrete slab on grade if slab is without membrane waterproofing.

3.07 JOINT CONSTRUCTION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.

B. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

3.08 VALVE INSTALLATION

A. Shutoff Valves: Install shutoff valve on each pump discharge and where indicated. Use gate or ball valves for piping 2-inch NPS and smaller. Use gate valves for piping 2-1/2-inch NPS and larger.

B. Check Valves: Install swing check valve on each pump discharge, downstream from shutoff valve.

3.09 HANGER AND SUPPORT INSTALLATION

A. Refer to Division 15 Section "Hangers and Supports" for pipe hanger and support devices. Install the following:

1. Riser clamps, MSS Type 8 or Type 42, for vertical runs.

2. Adjustable steel clevis hangers, MSS Type 1, for individual, straight, horizontal runs 100 feet and less.

3. Adjustable roller hangers, MSS Type 43, for individual, straight, horizontal runs longer than 100 feet.

4. Spring cushion rolls, MSS Type 49, if indicated, for individual, straight, horizontal runs longer than 100 feet.

5. Pipe rolls, MSS Type 44, for multiple, straight, horizontal runs 100 feet or longer. Support pipe rolls on trapeze.

6. Spring hangers, MSS Type 52, for supporting base of vertical runs.

B. Install supports according to Division 15 Section "Hangers and Supports" and "Seismic Restraints."

C. Support vertical piping and tubing at base and at each floor (15-ft. maximum).

D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

E. Install hangers for horizontal piping with following maximum spacing and minimum rod sizes:

Nom. Pipe Size (inches)	Steel Pipe Max. Span (feet)	Copper Tube Max. Span (feet)	Min. Rod Diameter (inches)
Up to 3/4	7	5	3/8
1	7	6	3/8
1 1/4	7	7	3/8
1 1/2	9	8	3/8
2	10	8	3/8
2 1/2	11	9	1/2
3	12	10	1/2
3 1/2	13	11	1/2
4	14	12	5/8, 1/2 for copper
5	16	13	5/8, 1/2 for copper
6	17	14	3/4, 5/8 for copper

1. Support vertical steel pipe at each floor.

F. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.10 CONNECTIONS

A. Connect service entrance piping to exterior sewage and drainage piping. Use transition fitting to join dissimilar piping materials.

B. Connect drainage piping to service entrance piping, and extend to and connect to the following:

1. Plumbing Fixtures: Connect soil, waste, and vent piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Fixtures."

2. Plumbing Specialties: Connect soil, waste, and vent piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Specialties."

3. Equipment: Connect waste piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections 2-1/2-inch NPS and larger.

3.11 FIELD QUALITY CONTROL

A. Inspect soil, waste, and vent piping as follows:

1. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

   a. Roughing-In Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.

   b. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

B. Test drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedure, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.

3. Roughing-In Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10 feet of head. Water level must not drop from 15 minutes before inspection starts through completion of inspection (24 hours). Inspect joints for leaks.

4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects using new materials and retest piping or portion thereof until satisfactory results are obtained.

6. Prepare reports for tests and required corrective action.

C. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedure, as follows:

1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.

2. Cap and subject sipping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for 4 hours. Leaks and loss in test pressure constitute defects that must be repaired. Repair leaks and defects using new materials and retest piping or portion thereof until satisfactory results are obtained.

3. Prepare reports for tests and required corrective action.

3.12 CLEANING AND PROTECTING

A. Clean interior of piping system. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION

SECTION 15421
STORM DRAINAGE PIPING

PART 1 GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational mechanical installations on a Design-Build basis. It shall be the Mechanical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Division 1 Specification Sections, apply to this Section.

B. Related Sections include the following:

1. Division 15 Section "Plumbing Specialties" for storm drainage piping system specialties.

1.03 SUMMARY

A. This Section includes storm-drainage piping inside the building and to locations indicated.

1.04 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:

1. Storm Drainage Piping: 10-foot head of water.

1.05 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

B. Shop Drawings: For controlled-flow storm drainage system, include calculations, plans, and details.

C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.06 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

A. Refer to Part 3 “Piping Applications” Paragraph for applications of pipe, tube, fitting, and joint materials.

B. Flexible Transition Couplings for Underground Nonpressure Piping: ASTM C 1173 with elastomeric sleeve. Include ends of same sizes as piping to be joined and include corrosion-resistant metal band on each end.

C. Transition Couplings for Underground Pressure Piping: AWWA C219 metal, sleeve-type coupling or other manufactured fitting same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.02 CAST-IRON SOIL PIPING

A. Hub-and-Spigot Pipe and Fittings: ASTM A 74, service class.

1. Gaskets: ASTM C 564, rubber.

B. Hubless Pipe and Fittings: ASTM A 888 or CISPI 301.

1. Couplings: ASTM C 1277 assembly of metal housing, corrosion-resistant fasteners, and ASTM C 564 rubber sleeve with integral center pipe stop.

a. Heavy-Duty, Type 304, Stainless-Steel Couplings: ASTM A 666, Type 304, stainless-steel shield; stainless-steel bands; and sleeve.

1) NPS 1-1/2 to NPS 4: 3-inch wide shield with 4 bands.

2) NPS 5 to NPS 10: 4-inch wide shield with 6 bands.

2.03 DUCTILE-IRON PIPING

A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end, unless grooved or flanged ends are indicated.

1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile or gray-iron standard pattern, or AWWA C153, ductile-iron compact pattern.

a. Glands, Gaskets, and Bolts: AWWA C111, ductile or gray-iron glands, rubber gaskets, and steel bolts.

2. Ductile-Iron Piping, Grooved-End Fittings: ASTM A 47, malleable-iron castings, or ASTM A 536, ductile-iron castings with dimensions matching pipe.

a. Ductile-Iron Piping, Keyed Couplings: AWWA C606, for ductile-iron pipe dimensions. Include ferrous housing sections, gasket suitable for water, and bolts and nuts.

B. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end, unless grooved or flanged ends are indicated.

1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile or gray-iron standard pattern, or AWWA C153, ductile-iron compact pattern.

a. Gaskets: AWWA C111, rubber.

2. Ductile-Iron, Grooved-End Fittings: ASTM A 47, malleable-iron castings, or ASTM A 536, ductile-iron castings with dimensions matching pipe.

a. Ductile-Iron Piping, Keyed Couplings: AWWA C606, for ductile-iron pipe dimensions. Include ferrous housing sections, gasket suitable for water, and bolts and nuts.

3. Ductile-Iron, Flexible Expansion Joints: Compound, ductile-iron fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections. Assemble components for offset and expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

4. Ductile-Iron, Deflection Fittings: Compound, ductile-iron coupling fitting with sleeve and flexing sections for up to 20-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

5. Ductile-Iron, Expansion Joints: Three-piece, ductile-iron assembly consisting of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Select and assemble components for expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

2.04 PE ENCASEMENT

A. PE Encasement for Underground Metal Piping: ASTM A 674 or AWWA C105 PE film, 0.008-inch minimum thickness, tube, or sheet.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 EXCAVATION

A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.02 PIPING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.

B. Flanges may be used on aboveground pressure piping, unless otherwise indicated.

C. Aboveground Storm Drainage Piping: Use any of the following piping materials for each size range:

1. NPS 2 to NPS 4: Service class, cast-iron soil piping; gaskets; and gasketed joints.

2. NPS 2 to NPS 4: Hubless, cast-iron soil piping and one of the following:

   a. Couplings: Heavy-duty, Type 304, stainless steel.

   b. Couplings: Heavy-duty, cast iron.

   c. Couplings: Compact, stainless steel.

3. NPS 5 and NPS 6: Service class, cast-iron soil piping; gaskets; and gasketed joints.

4. NPS 5 and NPS 6: Hubless, cast-iron soil piping and one of the following:

   a. Couplings: Heavy-duty, Type 304, stainless steel.

   b. Couplings: Heavy-duty, cast iron.

5. NPS 8: Service class, cast-iron soil piping; gaskets; and gasketed joints.

6. NPS 8: Hubless, cast-iron soil piping and one of the following:

   a. Couplings: Heavy-duty, Type 304, stainless steel.

   b. Couplings: Heavy-duty, cast iron.

D. Underground Storm Drainage Piping: Use the following piping materials for each size range:

1. NPS 3 and NPS 4: Hubless, cast-iron soil piping and one of the following:

   a. Couplings: Heavy-duty, Type 304, stainless steel.

   b. Couplings: Heavy-duty, cast iron.

   c. Couplings: Compact, stainless steel.

2. NPS 5 and NPS 6: Service class, cast-iron soil piping; gaskets; and gasketed joints.

3. NPS 5 and NPS 6: Extra-Heavy class, cast-iron soil piping; gaskets; and gasketed joints.

4. NPS 5 and NPS 6: Hubless, cast-iron soil piping and one of the following:

   a. Couplings: Heavy-duty, Type 304, stainless steel.

   b. Couplings: Heavy-duty, cast iron.

   c. Couplings: Compact, stainless steel.

5. NPS 8 and NPS 10: Service class, cast-iron soil piping; gaskets; and gasketed joints.

6. NPS 8 and NPS 10: Extra-Heavy class, cast-iron soil piping; gaskets; and gasketed joints.

7. NPS 8 and NPS 10: Hubless, cast-iron soil piping and one of the following:

   a. Couplings: Heavy-duty, Type 304, stainless steel.

   b. Couplings: Heavy-duty, cast iron.

   c. Couplings: Compact, stainless steel.

3.03 PIPING INSTALLATION

A. Refer to Division 2 Section "Storm Drainage" for Project site storm sewer and drainage piping.

B. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation.

C. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers.

D. Install cleanout fitting with closure plug inside the building in storm drainage force-main piping.

E. Underground, Ductile-Iron, Force-Main Piping: Comply with AWWA C600. Install buried piping inside building between wall and floor penetrations and connection to storm sewer piping outside building with restrained joints. Anchor pipe to wall or floor. Install thrust-block supports at vertical and horizontal offsets.

   1. Encase piping with PE film according to ASTM A 674 or AWWA C105.

F. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for sleeves and mechanical sleeve seals.

G. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for wall penetration systems.

H. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

   1. Encase underground piping with PE film according to ASTM A 674 or AWWA C105.

I. Make changes in direction for storm piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size

of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

J. Lay buried building drain piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

K. Install storm drainage piping at the following minimum slopes, unless otherwise indicated:

1. Building Storm Drain: 1 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.

2. Horizontal Storm-Drainage Piping: 2 percent downward in direction of flow.

L. Install engineered controlled-flow storm drainage piping in locations indicated.

M. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

N. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.04 JOINT CONSTRUCTION

A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.

B. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Gasketed Joints: Make with rubber gasket matching class of pipe and fittings.

2. Hubless Joints: Make with rubber gasket and sleeve or clamp.

C. Grooved Joints: Assemble joint with keyed coupling, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

3.05 VALVE INSTALLATION

A. Refer to Division 15 Section "Valves" for general-duty valves.

B. Backwater Valves: Install backwater valves in piping subject to backlog.

1. Horizontal Piping: Horizontal backwater valves.

2. Install backwater valves in accessible locations.

3. Refer to Division 15 Section "Plumbing Specialties" for backwater valves.

3.06 HANGER AND SUPPORT INSTALLATION

A. Refer to Division 15 Section "Mechanical Vibration Controls and Seismic Restraints" for seismic-restraint devices.

B. Refer to Division 15 Section "Hangers and Supports" for pipe hanger and support devices. Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.

2. Individual, Straight, Horizontal Piping Runs: According to the following:

a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.

b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Install supports according to Division 15 Section "Hangers and Supports."

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.

2. NPS 3: 60 inches with 1/2-inch rod.

3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.

4. NPS 6: 60 inches with 3/4-inch rod.

5. NPS 8 to NPS 12: 60 inches with 7/8-inch rod.

6. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

G. Install supports for vertical cast-iron soil piping every 15 feet.

H. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.07 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect storm drainage piping to roof drains and storm drainage specialties.

3.08 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.

2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.

3. Test Procedure: Test storm drainage piping on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.

4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.

5. Prepare reports for tests and required corrective action.

E. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.

2. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.

4. Prepare reports for tests and required corrective action.

3.09 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

1. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION

SECTION 15430
PLUMBING SPECIALTIES

PART 1 GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational mechanical installations on a Design-Build basis. It shall be the Mechanical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including Division 1 Specification Sections, apply to this Section.

B. Related Sections include the following:

1. Division 15 Section "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, basic installation requirements, and labeling and identifying requirements; and escutcheons, dielectric fittings, sleeves, and sleeve seals that are not in this Section.

2. Division 15 Section "Hangers and Supports" for pipe hangers and seismic restraints.

3. Division 15 Section "Mechanical Identification" for labeling and identifying requirements.

4. Division 15 Section "Valves" for general-duty ball, butterfly, check, gate, and globe valves.

5. Division 15 Section "Water Distribution Piping" for water-supply piping and connections.

6. Division 15 Section "Drainage and Vent Piping" for drainage and vent piping and connections.

1.03 SUMMARY

A. This Section includes plumbing specialties for the following:

1. Water distribution systems.

2. Soil, waste, and vent systems.

3. Storm drainage systems.

1.04 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:

1. Water Distribution Piping: 125 psig.

2. Soil, Waste, and Vent Piping: 10-foot head of water.

3. Storm Drainage Piping: 10-foot head of water.

1.05 SUBMITTALS

A. Product Data: For each plumbing specialty indicated. Include rated capacities of selected equipment and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following plumbing specialty products:

1. Backflow preventers.

2. Water pressure regulators.

3. Strainers.

4. Trap seal primer valves.

5. Cleanouts.

6. Drains.

7. Miscellaneous piping specialties.

8. Sand/oil interceptors.

B. Reports: Specified in "Quality Control" Paragraph.

C. Maintenance Data: For specialties to include in the maintenance manuals specified in Division 1. Include the following:

1. Backflow preventers.

2. Water pressure regulators.

3. Trap seal primer valves.

4. Miscellaneous piping specialties.

1.06 QUALITY ASSURANCE

A. Provide listing/approval stamp, label, or other marking on plumbing specialties made to specified standards.

B. Listing and Labeling: Provide electrically operated plumbing specialties specified in this Section that are listed and labeled.

1. Terms "Listed" and "Labeled": As defined in National Electrical Code, Article 100.

2. Listing and Labeling Agency Qualifications: "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

C. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

D. Comply with NFPA 70, "National Electrical Code," for electrical components.

1.07 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Operating Key Handles: Furnish one extra key for each key-operated hose bibb and hydrant installed.

2. Backflow Preventer Test Kits: Provide one test kit suitable for testing backflow preventers for each backflow preventer.

PART 2 PRODUCTS

2.01 BACKFLOW PREVENTERS

A. General: ASSE standard, backflow preventers, of size indicated for maximum flow rate and maximum pressure loss indicated.

1. 2-Inch NPS and Smaller: Bronze body with threaded ends.

2. 2-1/2-Inch NPS and Larger: Bronze, cast-iron, steel, or stainless steel body with flanged ends.

a. Interior Lining: AWWA C550 or FDA-approved, epoxy coating for backflow preventers having cast-iron or steel body.

3. Interior Components: Corrosion-resistant materials.

4. Exterior Finish: Polished chrome-plate if used in chrome-plated piping system.

5. Strainer on inlet, if indicated.

B. Pipe-Applied, Atmospheric-Type Vacuum Breakers: ASSE 1001, with floating disc and atmospheric vent.

C. Hose-Connection Vacuum Breakers: ASSE 1011, nickel-plated, with nonremovable and manual drain features, and ASME B1.20.7 garden-hose threads on outlet. Units attached to rough-bronze-finish hose connections may be rough bronze.

D. Reduced-Pressure Backflow Assemblies: ASSE 1013, suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet; test cocks; and pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between two positive-seating check valves.

1. Pressure Loss: 12 psig maximum, through middle one-third of flow range.

E. Double-Check Backflow Prevention Assemblies: ASSE 1015, suitable for continuous pressure application. Include shutoff valves on inlet and outlet, and strainer on inlet; and test cocks with two positive-seating check valves.

1. Pressure Loss: Five psig maximum, through middle one-third of flow range.

F. Antisiphon-Pressure-Type Vacuum Breakers: ASSE 1020, suitable for continuous pressure application. Include shutoff valves, spring-loaded check valve, spring-loaded floating disc, test cocks, and atmospheric vent.

1. Pressure Loss: Five psig maximum, through middle one-third of flow range.

G. Hose-Connection Backflow Preventers: ASSE 1052, suitable for at least 3-gpm flow and applications with up to 10-foot head back pressure. Include two check valves; intermediate atmospheric vent; and nonremovable, ASME B1.20.7 garden-hose thread on outlet.

H. Back-Siphonage Backflow Vacuum Breakers: ASSE 1056, suitable for continuous pressure and backflow applications. Include shutoff valves, check valve, test cocks, and vacuum vent.

2.02 WATER PRESSURE REGULATORS

A. General: ASSE 1003, water regulators, rated for initial working pressure of 150 psig minimum, of size, flow rate, and inlet and outlet pressures indicated. Include integral factory-installed or separate field-installed Y-pattern strainer.

1. 2-Inch NPS and Smaller: Bronze body with threaded ends.

2. 2-1/2-Inch NPS and Larger: Bronze or cast-iron body with flanged ends. Include AWWA C550 or FDA-approved interior epoxy coating for regulators with cast-iron body.

3. Interior Components: Corrosion-resistant materials.

4. Exterior Finish: Polished chrome-plate if used in chrome-plated piping system.

B. Single-seated, direct-operated type.

C. Single-seated, direct-operated, integral-bypass type.

D. Pilot-operated type, single- or double-seated, cast-iron-body main valve, with bronze-body pilot valve.

2.03 STRAINERS

A. Strainers: Y-pattern, unless otherwise indicated, and full size of connecting piping. Include ASTM A 666, Type 304, stainless-steel screens with 3/64-inch round perforations, unless otherwise indicated.

1. Pressure Rating: 125-psig minimum steam working pressure, unless otherwise indicated.

2. 2-Inch NPS and Smaller: Bronze body, with female threaded ends.

3. 2-1/2-Inch NPS and Larger: Cast-iron body, with interior AWWA C550 or FDA-approved epoxy coating and flanged ends.

4. Y-Pattern Strainers: Screwed screen retainer with centered blowdown.

   a. Drain: Pipe plug.

   b. Drain: Factory- or field-installed, hose-end drain valve.

5. T-Pattern Strainers: Malleable-iron or ductile-iron body with grooved ends; access end cap with drain plug and access coupling with rubber gasket.

6. Basket Strainers: Bolted flange or clamp cover, and basket with lift-out handle.

   a. Simplex Type: Single unit, with one basket.

   b. Duplex Type: Double unit, with bronze or stainless-steel diverter valve and 2 baskets.

   c. Drain: Pipe plug.

   d. Drain: Factory- or field-installed, hose-end drain valve.

B. Drainage Basket Strainers: Non-pressure-rated, cast-iron or coated-steel body; with bolted flange or clamp cover and drain with plug.

1. Basket: Bronze or stainless steel with 1/8- or 3/16-inch- diameter holes and lift-out handle.

2. Female threaded ends for 2-inch NPS and smaller, and flanged ends for 2-1/2-inch NPS and larger.

2.04 TRAP SEAL PRIMER VALVES

A. Trap Seal Primer Valves: ASSE 1018, water-supply-fed type, with the following characteristics:

1. 125-psig minimum working pressure.

2. Bronze body with atmospheric-vented drain chamber.

3. Inlet and Outlet Connections: 1/2-inch NPS threaded, union, or solder joint.

4. Gravity Drain Outlet Connection: 1/2-inch NPS threaded or solder joint.

5. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

B. Trap Seal Primer System: Factory-fabricated, automatic-operation assembly for wall mounting with the following:

1. Piping: 3/4-inch NPS, ASTM B 88, Type L; copper, water tubing inlet and manifold with number of 1/2-inch NPS outlets as indicated.

2. Cabinet: Steel box with stainless-steel cover.

3. Electric Controls: 24-hour timer, solenoid valve, and manual switch for 120-V, ac power.

4. Water Hammer Arrester: ASSE 1010.

5. Vacuum Breaker: ASSE 1001.

2.05 CLEANOUTS

A. General: Size cleanouts as indicated on drawings, or where not indicated, same size as connected drainage piping.

1. Provide wall cleanouts on each end of water closet ends and one over main drops in addition, provide all cleanouts required per code.

B. Cleanouts: ASME A1122.36.2M, cast-iron body with straight threads and gasket seal or tapered threads for plug, flashing flange, and clamping ring, and a brass closure plug. Cleanouts for installation in floors not having membrane waterproofing may be furnished without clamping ring.

1. Tiled Areas: Round cleanout top with tile recess top.

2. Quarry Tiled Areas: Square nickel-bronze cleanout cover.

3. Walls: Round cleanout cover with stainless steel finish.

4. All Other Areas: Round cleanout top with nickel-bronze finish.

2.06 DRAINS

A. General: Size outlets as indicated on drawings.

B. Floor Drains: ASME A112.21.1M, cast-iron body, with seepage flange and clamping device, and trap seal primer valve connection. Floor drains for installation in floors not having membrane waterproofing may have seepage flange with clamping device. Floor drains for use as area drains in exterior slab on grade may be furnished with anchor flange instead of seepage flange and clamping device. Provide the following options as indicated:

1. Trap primer connection.

2. Round or square strainer with integral funnel.

3. Polished nickel bronze top.

4. Slotted top.

C. Roof Drains: ASME A112.21.2M, cast-iron body, with combination flashing ring and gravel stop, cast-iron dome except where other dome material is specified, extension collars, underdeck clamp, and sump receiver. Roof drains for installation in cast-in-place concrete decks may be furnished without underdeck clamp and sump receiver.

2.07 MISCELLANEOUS PIPING SPECIALTIES

A. Water Hammer Arresters: ASME A112.26.1M, ASSE 1010, or PDI-WH 201, bellows or piston type with pressurized cushioning chamber. Sizes are based on water-supply fixture units, ASME A112.26.1M sizes A through F and PDI-WH 201 sizes A through F.

B. Hose Bibbs: Bronze body, with renewable composition disc, 1/2- or 3/4-inch NPS threaded or solder-joint inlet. Provide ASME B1.20.7 garden-hose threads on outlet and integral or field-installed, nonremovable, drainable, hose-connection vacuum breaker.

1. Finish: Rough brass.

2. Operation: Operating-key (handle) type. Include operation key.

C. Roof Flashing Assemblies: Manufactured assembly made of 4-lb/sq. ft., 0.0625-inch-thick, lead flashing collar and skirt extending at least 8 inches from pipe with galvanized steel boot reinforcement, and counterflashing fitting.

1. Vent Cap: Extended model with field-installed, vandal-proof vent cap.

D. Floor-Drain Inlet Fittings: Cast iron, with threaded inlet and threaded or spigot outlet, and trap seal primer valve connection.

E. Stack Flashing Fittings: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.

F. Vent Caps: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and set-screws to secure to vent pipe.

G. Hose-End Drain Valves: MSS SP-110, 3/4-inch NPS ball valve, rated for 400-psig minimum CWP. Include 2-piece, ASTM B 62 bronze body with standard port, chrome-plated brass ball, replaceable seats and seals, blowout-proof stem, and vinyl-covered steel handle.

1. Inlet: Threaded or solder joint.

2. Outlet: Short-threaded nipple with ASME B1.20.7 garden-hose thread and cap.

H. Stop-and-Waste Drain Valves: MSS SP-110, ball valve, rated for 200-psig minimum CWP or MSS SP-80, Class 125, gate valve, ASTM B 62 bronze body, with 1/8-inch NPS side drain outlet and cap.

I. Horizontal Backwater Valves: ASME A112.14.1, cast-iron body, with removable bronze swing-check valve and threaded or bolted cover.

1. Closed-Position Check Valve: Factory assembled or field modified to hang closed unless subject to backflow condition.

2. Open-Position Check Valve: Factory assembled or field modified to hang open unless subject to backflow condition.

3. Extension: ASTM A 74, Service class; full-size, cast-iron, soil-pipe extension to field-installed cleanout at floor, instead of cover.

J. Sand/Oil Interceptor and Sewage Pump Vault: Concrete compressive strength FC=5000 psi, ASTM C 857 minimum structural design loading for underground precast concrete utility structures. All baffles and weirs to be precast concrete. Galvanized diamond plate access and inspection covers.

2.08 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4 lb/sq. ft. or 0.0625-inch thickness.

2. Vent Pipe Flashing: 3 lb/sq. ft. or 0.0469-inch thickness.

3. Burning: 6 lb/sq. ft. or 0.0937-inch thickness.

B. Copper Sheet: ASTM B 152, of the following minimum weights and thicknesses, unless otherwise indicated:

1. General Applications: 12 oz./sq. ft.

2. Vent Pipe Flashing: 8 oz./sq. ft.

C. Zinc-Coated Steel Sheet: ASTM A 653, with 0.20 percent copper content and 0.04-inch minimum thickness, unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.

D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

E. Fasteners: Metal compatible with material and substrate being fastened.

F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

G. Solder: ASTM B 32, lead-free alloy.

H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 PLUMBING SPECIALTY INSTALLATION

A. General: Install plumbing specialty components, connections, and devices according to manufacturer's written instructions. All recessed and wall-mounted fixtures shall utilize specialty manufactured hanger assemblies suitable for the device being installed. Wood-blocking type supports are not acceptable.

B. Install backflow preventers of type, size, and capacity indicated, at each water-supply connection to mechanical equipment and systems, and to other equipment and water systems as indicated. Comply with authorities having jurisdiction. Locate backflow preventers in same room as connected equipment. Install air-gap fitting on units with atmospheric-vent connection and pipe relief outlet drain to nearest floor drain. Do not install bypass around backflow preventer. Assure proper clearances for maintenance and testing per state standards for backflow preventers.

C. Install pressure regulators with inlet and outlet shutoff valves and balance valve bypass. Install pressure gages on inlet and outlet.

D. Install strainers on supply side of each control valve, pressure regulator, and solenoid valve, and where indicated.

E. Install trap seal primer valves with valve outlet piping pitched down toward drain trap a minimum of one percent and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

F. Install backwater valves in building drain piping as indicated. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.

G. Install expansion joints on vertical risers, stacks, and conductors as indicated.

H. Install cleanouts in aboveground piping and building drain piping as indicated, and where not indicated, according to the following:

1. Size same as drainage piping up to 4-inch NPS. Use 4-inch NPS for larger drainage piping unless larger cleanout is indicated.

2. Locate at each change in direction of piping greater than 45 degrees.

3. Locate at minimum intervals of 50 feet for piping 4-inch NPS and smaller and 100 feet for larger piping.

4. Locate at base of each vertical soil and waste stack.

I. Install cleanout deck plates, of types indicated, with top flush with finished floor, for floor cleanouts for piping below floors.

J. Install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall, for cleanouts located in concealed piping.

K. Install flashing flange and clamping device with each stack and cleanout passing through floors with waterproof membrane.

L. Install vent flashing sleeves on stacks passing through roof. Secure over stack flashing according to manufacturer's written instructions.

M. Install floor drains according to manufacturer’s written instructions, in locations indicated.

N. Install floor drains at low points of surface areas to be drained as indicated. Set grates of drains flush with finished floor or as indicated. Size outlets as indicated.

O. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

P. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.

Q. Position floor drains for easy access and maintenance.

R. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions and size outlets as indicated.

S. Install roof-drain flashing collar or flange so no leakage occurs between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.

T. Position roof drains for easy access and maintenance.

U. Install interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.

   1. Flush with Floor Installation: Set unit and extension as required, with cover flush with finished floor.

   2. Install cleanout immediately downstream from interceptors not having integral cleanout on outlet.

V. Fasten wall-hanging plumbing specialties securely to supports attached to building substrate if supports are specified and to building wall construction if no support is indicated.

W. Fasten recessed, wall-mounting plumbing specialties to reinforcement built into walls.

X. Secure supplies to supports or substrate.

Y. Install individual stop valve in each water supply to plumbing specialties. Use ball, gate, or globe valve if specific valve is not indicated.

Z. Install water-supply stop valves in accessible locations.

AA. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

BB. Locate drainage piping as close as possible to bottom of floor slab supporting fixtures and drains.

CC. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

DD. All recessed and wall-mounting fixtures shall utilize specialty manufactured hangers, suitable for the device being installed. No wood blocking permitted.

EE. Include access for trap primers.

FF. Install hose bibbs with integral or field installed vacuum breaker.

3.02 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:

1. Install piping connections between plumbing specialties and piping specified in other Division 15 Sections.

2. Install piping connections indicated between appliances and equipment specified in other Sections; connect directly to plumbing piping systems.

3. Install piping connections indicated as indirect wastes from appliances and equipment specified in other Sections, to spill over receptors connected to plumbing piping systems.

B. Arrange for electric-power connections to plumbing specialties and devices that require power. Electric power is specified in Division 16 Sections.

C. Supply Runouts to Plumbing Specialties: Install hot- and cold-water-supply piping of sizes indicated, but not smaller than required by authorities having jurisdiction.

D. Drainage Runouts to Plumbing Specialties: Install drainage and vent piping, with approved trap, of sizes indicated, but not smaller than required by authorities having jurisdiction.

E. Ground electric-powered plumbing specialties.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

F. Arrange for electric-power connections to plumbing specialties and devices that require power. Electric power, wiring, and disconnect switches are specified in Division 16 Sections.

3.03 FLASHING INSTALLATION

A. Fabricate flashing manufactured from single piece unless large pans, sumps, or other drainage shapes are required.

B. Burn joints of lead sheets where required.

C. Solder joints of copper sheets where required.

D. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.

2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.

3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

E. Set flashing on floors and roofs in solid coating of bituminous cement.

F. Secure flashing into sleeve and specialty clamping ring or device.

G. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings.

H. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

I. Fabricate and install flashing and pans, sumps, and other drainage shapes as indicated. Install drain connection if indicated.

3.04 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Provide services of factory-authorized service representative to supervise the field assembly of components and installation of grease recovery units, including piping and electrical connections, and to report results in writing.

1. Test and adjust plumbing specialty controls and safeties. Replace damaged and malfunctioning controls and components.

3.05 START-UP PROCEDURES

A. Before startup, perform the following checks:

1. System tests are complete.

2. Damaged and defective specialties and accessories have been replaced or repaired.

3. Clear space is provided for servicing specialties.

B. Before operating systems, perform the following steps:

1. Close drain valves, hydrants, and hose bibbs.

2. Open general-duty valves to fully open position.

3. Remove and clean strainers.

4. Verify that drainage and vent piping are clear of obstructions. Flush with water until clear.

5. Fill grease interceptors with clean water.

C. Startup Procedures: Follow manufacturer's written instructions. If no procedures are prescribed by manufacturer, proceed as follows:

1. Energize circuits for electrically operated units. Start and run units through complete sequence of operations.

3.06 DEMONSTRATION

A. Startup Services: Engage a factory-authorized service representative to perform startup services and train Owner's maintenance personnel as specified below:

1. Train Owner's maintenance personnel on procedures and schedules related to startup of and servicing interceptors.

2. Train Owner's maintenance personnel on procedures and schedules related to startup of and servicing grease recovery units.

3. Review data in the maintenance manuals. Refer to Division 1.

4. Schedule training with Project Representative with at least 7 days' advance notice.

3.07 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

1. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 15738
SPLIT-SYSTEM AIR-CONDITIONING UNITS

PART 1 GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational mechanical installations on a Design-Build basis. It shall be the Mechanical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Terms and Conditions and Division 1 Specification Sections, apply to this Section.

1.03 SUMMARY

A. This Section includes split-system air-conditioning and heat pump units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for exposed or concealed mounting, and may be connected to ducts.

1.04 SUBMITTALS

A. General: See Section 15050 for general requirements of Product Data, Shop Drawings, Reports and Certificates, and Operation and Maintenance data submittals.

1. Include rated capacities, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Product Data: Provide submittals of the following:

1. Split-system air-conditioning units

2. Wall- or ceiling-mounted, evaporator-fan components

3. Air-cooled, compressor-condenser components

C. Shop Drawings: Diagram power, signal, and control wiring.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

F. Warranty: Special warranty specified in this Section.

1.05 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of split-system units and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

B. 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.

C. Energy-Efficiency Ratio: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

D. Coefficient of Performance: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."

E. Units shall be designed to operate with HCFC-free refrigerants. R-410A preferred.

1.06 COORDINATION

A. Coordinate size and location of concrete bases for units. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Division 3 Section "Cast-in-Place Concrete."

B. Coordinate size, location, and connection details with roof curbs, equipment supports, and roof penetrations specified in Division 7 Section "Roof Accessories."

1.07 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

1.08 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: One set of filters for each unit.

2. Fan Belts: One set of belts for each unit.

PART 2 PRODUCTS

2.01 CONCEALED EVAPORATOR-FAN COMPONENTS

A. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.

1. Drain Pans: Galvanized steel, with connection for drain; insulated.

B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

C. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.

D. Fan Motors: Comply with requirements in Division 15 Section "Motors."

1. Special Motor Features: Multitapped, multispeed with internal thermal protection and permanent lubrication.

E. Disposable Filters: 1 inch thick, in fiberboard frames.

F. Wiring Terminations: Connect motor to chassis wiring with plug connection.

2.02 WALL-MOUNTING, EVAPORATOR-FAN COMPONENTS

A. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.

B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

C. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements with refractory ceramic support bushings; automatic-reset thermal cutout; built-in magnetic contactors; manual-reset thermal cutout; airflow proving device; and one-time fuses in terminal box for overcurrent protection.

D. Fan: Direct drive, centrifugal fan.

E. Fan Motors: Comply with requirements in Division 15 Section "Motors."

1. Special Motor Features: Multitapped, multispeed with internal thermal protection and permanent lubrication.

F. Filters: Permanent, cleanable.

2.03 AIR-COOLED, COMPRESSOR-CONDENSER COMPONENTS

A. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.

B. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

1. Compressor Type Preferred: Rotary type preferred.

2. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.

3. Refrigerant Charge: R-410A.

C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid subcooler.

D. Heat Pump Components: Reversing valve and low-temperature air cut-off thermostat.

E. Fan: Aluminum-propeller type, directly connected to motor.

F. Motor: Permanently lubricated, with integral thermal-overload protection.

G. Low Ambient Kit: Permits operation down to 45 deg F.

H. Mounting Base: Polyethylene.

2.04 ACCESSORIES

A. Control equipment and sequence of operation are specified in Division 15 Sections "HVAC Instrumentation and Controls" and "Sequence of Operation."

B. Thermostat: Low voltage with subbase to control compressor and evaporator fan.

C. Thermostat: Wireless infrared functioning to remotely control compressor and evaporator fan, with the following features:

1. Compressor time delay.

2. 24-hour time control of system stop and start.

3. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.

4. Fan-speed selection, including auto setting.

D. Automatic-reset timer to prevent rapid cycling of compressor.

E. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

F. Additional Monitoring:

1. Monitor constant and variable motor loads.

2. Monitor variable frequency drive operation.

3. Monitor economizer cycle.

4. Monitor cooling load.

5. Monitor air distribution static pressure and ventilation air volumes.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install ground-mounting, compressor-condenser components on 4-inch- thick, reinforced concrete base; 4 inches larger on each side than unit. Concrete, reinforcement, and formwork are specified in Division 3 Section "Cast-in-Place Concrete." Coordinate anchor installation with concrete base.

D. Install ground-mounting, compressor-condenser components on polyethylene mounting base.

E. Install roof-mounting compressor-condenser components on equipment supports specified in Division 7 Section "Roof Accessories." Anchor units to supports with removable, cadmium-plated fasteners.

F. Install seismic restraints.

G. Install compressor-condenser components on restrained, spring isolators with a minimum static deflection of 1 inch. Refer to Division 15 Section "Mechanical Vibration Controls and Seismic Restraints."

H. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.02 CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

1. Water Coil Connections: Comply with requirements in Division 15 Section "Hydronic Piping." Connect to supply and return coil with shutoff-duty valve and union or flange on the supply connection and with throttling-duty valve and union or flange on the return connection.

2. Remote Water-Cooled Condenser Connections: Comply with requirements in Division 15 Section "Hydronic Piping." Connect to supply and return with shutoff-duty valve and union or flange on the supply connection and with throttling-duty valve and union or flange on the return connection.

3. Steam Coil Connections: Comply with requirements in Division 15 Section "Steam and Condensate Piping." Connect to steam piping with shutoff valve and union or flange; for condensate piping, starting from the coil connection, connect with union or flange, strainer, trap, and shutoff valve.

B. Install piping adjacent to unit to allow service and maintenance.

C. Duct Connections: Duct installation requirements are specified in Division 15 Section "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply and return ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Division 15 Section "Duct Accessories."

D. Ground equipment according to Division 16 Section "Grounding."

E. Electrical Connections: Comply with requirements in Division 16 Sections for power wiring, switches, and motor controls.

3.03 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

3.04 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.05 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units. Refer to Division 1 Section "Closeout Procedures."

END OF SECTION

SECTION 15815
METAL DUCTS

PART 1 GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational mechanical installations on a Design-Build basis. It shall be the Mechanical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the General Terms and Conditions and Division 1 Specification Sections, apply to this Section.

B. Related Sections include the following:

1. Division 7 for fire-resistant sealants for use around duct penetrations and fire-damper installations in fire-rated floors, partitions, and walls.

2. Division 10 for intake and relief louvers and vents connected to ducts and installed in exterior walls.

3. Division 15 Section "Mechanical Vibration Controls and Seismic Restraints" for seismic restraint criteria of equipment.

4. Division 15 Section "Duct Accessories" for dampers, sound-control devices, duct-mounted access doors and panels, turning vanes, and flexible ducts.

5. Division 15 Section "Diffusers and Grilles."

6. Division 15 Section "Testing, Adjusting, and Balancing" for air balancing and final adjusting of manual-volume dampers.

1.03 SUMMARY

A. This Section includes rectangular and round metal ducts, ventilating systems in pressure classes from minus 2- to plus 10-inch wg.

1.04 DEFINITIONS

A. Thermal Conductivity and Apparent Thermal Conductivity (k-Value): As defined in ASTM C 168. In this Section, these values are the result of the formula Btu x in./h x sq. ft. x deg F at the temperature differences specified. Values are expressed as Btu.

1.05 SYSTEM DESCRIPTION

A. Duct system design, as indicated, has been used to select and size air-moving and -distribution equipment and other components of air system. Changes to layout or configuration of duct system must be specifically approved in writing by Project Representative. Accompany requests for layout modifications with calculations showing

that proposed layout will provide original design results without increasing system total pressure.

1.06 SUBMITTALS

A. Product Data: For duct liner and sealing materials.

B. Shop Drawings: Show details of the following:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.

2. Duct layout indicating pressure classifications and sizes on plans.

C. Coordination Drawings: Refer to Division 15 "Basic Materials and Methods for Coordination Drawings requirements.

D. Welding Certificates: Copies of certificates indicating welding procedures and personnel comply with requirements in "Quality Assurance" Article.

E. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

F. Record Drawings: Indicate actual routing, fitting details, reinforcement, support, and installed accessories and devices.

1.07 QUALITY ASSURANCE

A. Welding Standards: Qualify welding procedures and welding personnel to perform welding processes for this Project according to AWS D1.1, "Structural Welding Code--Steel," for hangers and supports; AWS D1.2, "Structural Welding Code--Aluminum," for aluminum supporting members; and AWS D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," unless otherwise indicated.

C. Comply with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems," unless otherwise indicated.

D. Shop Drawings: Show details of the following:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.

2. Duct layout indicating pressure classifications and sizes on plans.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver sealant materials to site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle sealant materials according to manufacturer's written recommendations.

PART 2 PRODUCTS

2.01 SHEET METAL MATERIALS

A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A 653/A 653M, G90 coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.

B. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for 36-inch length or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.02 SEALANT MATERIALS

A. Joint and Seam Sealants, General: The term "sealant" is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.

1. Joint and Seam Tape: 2 inches wide; glass-fiber fabric reinforced.

2. Tape Sealing System: Woven-fiber tape impregnated with a gypsum mineral compound and a modified acrylic/silicone activator to react exothermically with tape to form a hard, durable, airtight seal.

3. Joint and Seam Sealant: One-part, nonsag, solvent-release-curing, polymerized butyl sealant, formulated with a minimum of 75 percent solids.

4. Flanged Joint Mastics: One-part, acid-curing, silicone, elastomeric joint sealants, complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.

2.03 HANGERS, SUPPORTS AND RESTRAINTS

A. Building Attachments: Concrete inserts, mechanical-anchor fasteners, or structural-steel fasteners appropriate for building materials. Powder actuated concrete fasteners are not allowed.

1. If concrete inserts cannot be used, install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer’s written instructions. Concrete inserts and mechanical-anchor fasteners shall be made of steel.

2. Expanding concrete anchors shall be made of steel.

B. Hanger Materials: Galvanized, sheet steel or round, threaded steel rod.

1. Hangers Installed in Corrosive Atmospheres: Electrogalvanized, all-thread rod or galvanized rods with threads painted after installation.

2. Straps and Rod Sizes: Comply with SMACNA "HVAC Duct Construction Standards--Metal and Flexible" for sheet steel width and thickness and for steel rod diameters.

C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

D. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.

1. Supports for Galvanized-Steel Ducts: Galvanized steel shapes and plates.

E. Duct Seismic Restraint: Comply with SMACNA "Seismic Restraint Manual Guidelines for Mechanical Systems".

2.04 DUCT PRESSURE CLASSIFICATIONS

A. Rectangular Duct Static-Pressure Classifications: Construct ducts to the following:

1. Exhaust Ducts: 2-inch wg, negative pressure.

2.05 RECTANGULAR DUCT FABRICATION

A. General: Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction with galvanized, sheet steel, according to SMACNA "HVAC Duct Construction Standards--Metal and Flexible," unless indicated otherwise. Comply with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.

1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification.

2. Materials: Free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.

3. Branch Connections:
   a. Rectangular Branch: Use 45º entry.

4. Material Thickness: For SMACNA "HVAC Duct Construction Standard – Metal and Flexible," but not less than 26 gauge.

B. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches and larger and 0.0359 inch thick or less, with more than 10 sq. ft. of unbraced panel area, unless ducts are lined.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 DUCT INSTALLATION, GENERAL

A. Duct installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of ducts, fittings, and accessories.

B. Construct and install each duct system for the specific duct pressure classification indicated.

C. Install ducts with fewest possible joints.

D. Install fabricated fittings for changes in directions, changes in size and shape, and connections.

E. Install couplings tight to duct wall surface with a minimum of projections into duct.

F. Install ducts, unless otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions, unless specifically indicated.

I. Electrical Equipment Spaces: Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures, unless ductwork is intended to serve these spaces.

J. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same metal thickness as duct. Overlap opening on four sides by at least 1-1/2 inches.

3.02 SEAM AND JOINT SEALING

A. General: Seal duct seams and joints according to the duct seal class described in SMACNA "HVAC Duct Construction Standards--Metal and Flexible" corresponding to the pressure class given below.

B. Pressure Classification:

1. Below 3-inch wg: Seal Class B; all transverse joints and longitudinal seams.

3.03 HANGING, RESTRAINING, AND SUPPORTING

A. Install rigid round, rectangular, and flat-oval metal duct with support systems indicated in SMACNA "HVAC Duct Construction Standards--Metal and Flexible."

B. Install duct seismic restraints as indicated in SMACNA "Seismic Restraint Manual Guidelines for Mechanical Systems."

C. Support horizontal ducts within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Support vertical ducts at a maximum interval of 16 feet and at each floor.

E. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.

F. Install concrete inserts before placing concrete.

G. Install mechanical-anchor fasteners after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

3.04 CONNECTIONS

A. Unless indicated otherwise, connect equipment with flexible connectors according to Division 15 Section "Duct Accessories."

B. For branch, outlet and inlet, comply with SMACNA "HVAC Duct Construction Standards-Metal and Flexible," unless indicated otherwise.

3.05 FIELD QUALITY CONTROL

A. Disassemble, reassemble, and seal segments of systems as required to accommodate leakage testing and as required for compliance with test requirements.

B. Determine leakage from entire system or section of system by relating leakage to surface area of test section.

C. Maximum Allowable Leakage: Comply with requirements for Leakage Classification 12 for rectangular ducts in pressure classifications less than and equal to 2-inch wg(both positive and negative pressures), and Leakage Classification 6 for pressure classifications from 2- to 10-inch wg.

D. Remake leaking joints and retest until leakage is less than maximum allowable.

E. Leakage Test: Perform tests according to SMACNA "HVAC Air Duct Leakage Test Manual."

3.06 ADJUSTING

A. Refer to Division 15 Section "Testing, Adjusting, and Balancing" for detailed procedures.

3.07 CLEANING

1. After completing system installation, including outlet fittings and devices, inspect the system. Vacuum ducts, and where possible, wipe ducts with moist cloth before final acceptance to remove dust and debris.

END OF SECTION

SECTION 15820
DUCT ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational mechanical installations on a Design-Build basis. It shall be the Mechanical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the General Terms and Conditions and Division 1 Specification Sections, apply to this Section.

B. Related Sections include the following:

1. Division 10 Section "Louvers and Vents" for intake and relief louvers and vents connected to ducts and installed in exterior walls.

2. Division 15 Section "Metal Ducts" for ductwork, duct liner and duct sealants.

3. Division 15 Section "Diffusers and Grilles."

4. Division 15 Section "Testing, Adjusting, and Balancing" for final positioning of manual-volume dampers.

1.03 SUMMARY

A. This Section includes the following:

1. Backdraft dampers.

2. Manual-volume dampers.

3. Turning vanes.

4. Flexible connectors.

5. Screened openings.

6. Duct accessory hardware.

1.04 SUBMITTALS

A. Product Data: For the following:

1. Backdraft dampers.

2. Manual-volume dampers.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loadings, required clearances, method of field assembly, components, location, and size of each field connection. Detail the following:

1. Special fittings and manual-volume-damper installations.

C. Product Certificates: Submit certified test data on dynamic insertion loss; self-noise power levels; and airflow performance data, static-pressure loss, dimensions, and weights.

1.05 QUALITY ASSURANCE

A. NFPA Compliance: Comply with the following NFPA standards:

1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."

2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

PART 2 PRODUCTS

2.01 SHEET METAL MATERIALS

A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A 653/A 653M, G90 coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.

B. Extruded Aluminum: ASTM B 221, Alloy 6063, Temper T6.

C. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for 36-inch length or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.02 BACKDRAFT DAMPERS

A. Description: Suitable for horizontal or vertical installations as indicated.

B. Counterbalance Type: Extruded aluminum with counterbalanced blades; blades begin to open at minimum 0.01 inches w.g. and be fully open at minimum 0.05 inches w.g. Designed for maximum 3500 feet per minute spot velocity and up to 4-inches w.g. back pressure.

1. Frame: Minimum 0.125 inches thick extruded aluminum, braced at corners.

2. Blades: Minimum 0.070 inches thick extruded aluminum. Blade seals extruded vinyl, mechanically attached.

3. Bearings: Corrosion resistant, long life synthetic.

4. Linkage: 1/2-inch diameter tie bar with stainless steel pivot pins; mounted on blades. Adjustable counterbalance.

C. Top-of-Blade Hinged Type: Extruded aluminum heavy duty backdraft dampers; blades begin to open at minimum 0.12 inches w.g. and be fully open at minimum of 0.20 inches w.g. Designed for maximum 3500 feet per minute spot velocity.

1. Frame: Minimum 0.125 inches thick extruded aluminum, braced at corners.

2. Blades: Minimum 0.70 inches thick extruded aluminum. Blade seals extruded vinyl, mechanical attached.

3. Bearings: Corrosion resistant, long life, synthetic.

4. Linkage: 1/2-inch diameter tie bar with stainless steel pivot pins; mounted on blades.

2.03 MANUAL-VOLUME DAMPERS

A. General: Factory fabricated with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

1. Pressure Classifications of 3-Inch wg or Higher: End bearings or other seals for ducts with axles full length of damper blades and bearings at both ends of operating shaft.

B. Steel Standard Volume Dampers: Multiple- or single-blade, opposed-blade design unless indicated otherwise, standard leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.

1. Steel Frames: Hat-shaped, galvanized, sheet steel channels, minimum of 16 gauge thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls; and flangeless frames where indicated for installing in ducts.

2. Roll-Formed Steel Blades: 16 gauge thick, galvanized, sheet steel.

3. Blade Axles: Galvanized steel.

4. Tie Bars and Brackets: Galvanized steel.

C. Jackshaft: 1-inch diameter, galvanized steel pipe rotating within a pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.

1. Length and Number of Mountings: Appropriate to connect linkage of each damper of a multiple-damper assembly.

D. Damper Regulators: Zinc-plated, die-cast core with dial and handle made of 3/32-inch-thick zinc-plated steel, and a 3/4-inch hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.04 TURNING VANES

A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Manufactured Turning Vanes: Fabricate of 1-1/2-inch-wide, curved blades set 3/4 inch o.c.; support with bars perpendicular to blades set 2 inches o.c.; and set into side strips suitable for mounting in ducts.

C. Acoustic Turning Vanes: Fabricate of airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

2.05 DUCT-MOUNTED ACCESS DOORS

A. General: Fabricate doors and panels airtight and suitable for duct pressure class. 14-inch by 14-inch, unless indicated otherwise.

B. Frame: Unless indicated differently, minimum 24-gauge thick galvanized, sheet steel, with bend-over tabs and foam gaskets.

C. Door: Double-wall, galvanized, sheet metal construction with insulation fill and thickness, and number of hinges and locks as indicated for duct pressure class. Include vision panel where indicated. Include piano hinge and cam latches. Multiple cam latches used on doors greater than 12-inches in height.

D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.

E. Insulation: 1-inch-thick, fibrous-glass.

2.06 FLEXIBLE CONNECTORS

A. General: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1. Fabricate designed to meet UL 214, NFPA 90A, airtight and waterproof.

B. Standard Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-inches wide attached to two strips of 3-inch-wide, minimum 24-gauge thick, galvanized, sheet steel or 0.032-inch aluminum sheets. Select metal compatible with connected ducts.

C. Extra-Wide Metal-Edged Connectors: Factory fabricated with a strip of fabric 5-3/4 inches wide attached to two strips of 3-inch-wide, minimum 24-gauge thick, galvanized, sheet steel or 0.032-inch aluminum sheets. Select metal compatible with connected ducts.

D. Transverse Flanged Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches wide attached to two strips of 4-3/8-inch-wide, 24-gauge thick, galvanized, sheet steel or 0.032-inch aluminum sheets formed for flanged type connection. Select metal compatible with connected ducts.

E. Conventional, Indoor System Flexible Connector Fabric: Woven nylon/polyester blend with vinyl coating.

1. Minimum Weight: 22 oz./sq. yd..

2. Tensile Strength: 240 lbf/inch in the warp, and 220 lbf/inch in the filling.

2.07 SCREENED OPENINGS

A. Screened Openings: 16-gauge steel angle frame enclosing 1/2-inch mesh, 14-gauge galvanized steel wire screen.

2.08 ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments, and length to suit duct insulation thickness.

B. Splitter Damper Accessories: Zinc-plated damper blade bracket; 1/4-inch, zinc-plated operating rod; and a duct-mounted, ball-joint bracket with flat rubber gasket and square-head set screw.

C. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 to 18 inches to suit duct size.

D. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

E. Concealed Damper Regulators: Gear operated linkage, minimum 3/8-inch diameter, steel rod, chrome plated ceiling cover, flush mount.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 INSTALLATION

A. Install duct accessories according to applicable details shown in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts.

B. Volume Dampers:

1. Install volume dampers at all diffuser and grille duct connections. Place as far upstream as layout and accessibility allow.

2. Install manual volume dampers in lined duct; avoid damage to and erosion of duct liner.

C. Provide instrument test holes where indicated.

D. Install duct access panels for access to both sides of duct coils and air measuring units. Install duct access panels downstream from branch volume dampers, turning vanes and equipment.

1. Install duct access panels to allow access to interior of ducts for cleaning, inspecting, adjusting, and maintaining accessories and terminal units.

2. Install access panels on side of duct where adequate clearance is available.

E. Label access doors according to Division 15 Section "Mechanical Identification."

3.02 ADJUSTING

A. Adjust duct accessories for proper settings.

B. Final positioning of manual-volume dampers is specified in Division 15 Section "Testing, Adjusting, and Balancing."

END OF SECTION

SECTION 15835
UNIT HEATERS AND CABINET HEATERS

PART 1 GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational mechanical installations on a Design-Build basis. It shall be the Mechanical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the General Terms and Conditions and Division 1 Specification Sections, apply to this Section.

B. Related sections include the following:

1. Division 15 Section "Motors" for fan motors.

2. Division 15 Section "Mechanical Vibration Controls and Seismic Restraints" for spring hangers and seismic restraints.

1.03 SUMMARY

A. This Section includes electric unit heaters and electric cabinet heaters.

1.04 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of product specified, including weights, dimensions, minimum clearances, metal gauges, and data on features and components.

C. Wiring diagrams detailing power and control wiring and differentiating clearly between manufacturer-installed wiring and field-installed wiring.

D. Samples of cabinet finish colors for approval.

E. Maintenance data to include in operation and maintenance manual specified in Division 1.

F. Field test reports from a qualified independent inspecting and testing agency indicating and interpreting test results relative to compliance with performance requirements of unit heaters.

1.05 QUALITY ASSURANCE

A. Comply with NFPA 70 for components and installation.

B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

1.06 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Developer under requirements of the Contract Documents.

PART 2 PRODUCTS

2.01 ELECTRICAL UNIT HEATERS

A. Heating Elements: Nickel-chromium heating wire element; free from expansion noise and 60-Hz hum; embedded in magnesium oxide, insulating refractory; and sealed in high-mass steel or corrosion-resistant metallic sheath with fins no closer than 0.16 inch. Element ends are enclosed in terminal box. Fin surface temperature does not exceed 550 deg F at any point during normal operation.

B. Heater Circuit Protection: One-time fuses in terminal box for overcurrent protection and automatic reset thermal overloads for overtemperature protection of heaters.

C. Fan and Motor: Direct-drive propeller fan and manufacturer's standard motor. Motors sized 1 hp and less include motor overload protection.

D. Wiring: Heaters designed for a single circuit, with elements, motor and control circuits subdivided with factory wired fuses to conform to the National Electric Code and Underwriter's Laboratory, Inc., Standard 1025. All three-phase heaters shall have balanced phases.

E. Unit Control: Contactors and control circuit transformers where required are factory installed and wired. Only direct line supply and thermostat connections in the field are required. Two-stage operation is required on all units 25 kW and larger with use of two-stage control. Built-in fan override is provided to purge unit casing of excess heat after unit shutdown. Provide wall-thermostat. Provide control range 45°F to 90°F.

F. Discharge Configuration: Discharge with horizontal, adjustable louvers, vertical discharge with radial louver diffuser as indicated.

G. Optional Accessories: Include the following:

1. Integral power disconnect switch.

2. Mercury contactors.

3. Stratification thermostat for summer fan only operation.

2.02 ELECTRICAL CABINET HEATERS

A. Arrangement: Provide following cabinet arrangement as indicated.

1. Recessed wall cabinet with front stamped louver.

B. Casing: In general, heavy gauge minimum.

C. Heating Elements: Guaranteed for 5 years. Non-glowing resistant wire enclosed in a steel sheath with steel plate fins attached.

D. Heater Circuit Protection: Automatic thermal shut-off when element overheats.

E. Fan and Motor: Blower, direct driven by a single-phase motor with impedance protection. Permanently lubed.

F. Wiring Terminations: Match conductor materials and sizes indicated.

G. Unit Controls: Bi-metallic snap action. Single pole integral thermostat.

H. Optional Accessories: Include the following:

1. Integral power disconnect switch.

I. Cabinet finish color as selected by Project Representative, applied to factory-assembled units prior to shipping.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 EXAMINATION

A. Examine areas to receive unit heaters and cabinet heaters for compliance with requirements for installation tolerances and other conditions affecting performance of units. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install unit heaters and cabinet heaters as indicated, according to manufacturer's written instructions and NFPA 90A.

3.03 CONNECTIONS

A. Electrical: Conform to applicable requirements of Division 16 Sections.

1. Install electrical devices furnished with heaters but not specified to be factory mounted.

B. Connect heaters and components to wiring systems and to ground as indicated and instructed by manufacturer. Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.04 ADJUSTING AND CLEANING

A. Adjust burner and other unit components for optimum heating performance and efficiency. Adjust heat distribution features, including louvers, vanes, shutters, dampers, and reflectors, to provide optimum heat distribution for objects, personnel, and spaces served.

B. After completing system installation, inspect heaters and associated components. Repair scratches and mars of finish to match original finish. Clean unit internally using methods and materials recommended by manufacturer.

3.05 START-UP PROCEDURES

A. Start-up Services: Provide start-up service, as specified below.

1. Start units and operate controls and safeties.

2. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.

3. Correct deficiencies identified by tests and observations and retest until specified requirements are met.

END OF SECTION

SECTION 15838
POWER VENTILATORS

PART 1 GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational mechanical installations on a Design-Build basis. It shall be the Mechanical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the General Terms and Conditions and Division 1 Specification Sections, apply to this Section.

1.03 SUMMARY

A. This Section includes the following:

1. Ceiling-mounting ventilators.

2. In-line centrifugal fans.

1.04 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base air ratings on actual site elevations.

B. Operating Limits: Classify according to AMCA 99.

1.05 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:

1. Certified fan performance curves with system operating conditions indicated.

2. Certified fan sound-power ratings.

3. Motor ratings and electrical characteristics, plus motor and electrical accessories.

4. Material gages and finishes, including color charts.

5. Dampers, including housings, linkages, and operators.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.

2. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.

C. Maintenance Data: For power ventilators to include in maintenance manuals specified in Division 1.

1.06 QUALITY ASSURANCE

A. 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.

B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

D. UL Standard: Power ventilators shall comply with UL 705.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.

B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

PART 2 PRODUCTS

2.01 CEILING-MOUNTING VENTILATORS

A. Description: Centrifugal fans designed for installing in wall or for concealed in-line applications.

B. Housing: Steel, lined with acoustical insulation.

C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

D. Grille: Stainless-steel, louvered grille with flange on intake and thumbscrew attachment to fan housing.

E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

F. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 percent to less than 50 percent.

2. Manual Starter Switch: Single-pole rocker switch assembly with cover and pilot light.

3. Time-Delay Switch: Assembly with single-pole rocker switch, timer, and cover plate.

4. Spark resistant construction.

5. Filter: Washable aluminum to fit between fan and grille.

6. Isolation: Rubber-in-shear vibration isolators.

7. Manufacturer's standard roof jack or wall cap, and transition fittings.

2.02 IN-LINE CENTRIFUGAL FANS

A. Description: In-line, belt-driven centrifugal fans consisting of housing, wheel, outlet guide vanes, fan shaft, bearings, motor and disconnect switch, drive assembly, mounting brackets, and accessories.

B. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

C. Direct-Driven Units: Motor encased in housing outside of airstream, factory wired to disconnect switch located on outside of fan housing.

D. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.

E. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.

F. Accessories:

1. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.

2. Companion Flanges: For inlet and outlet duct connections.

3. Fan Guards: 1/2- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.

4. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.

2.03 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 INSTALLATION

A. Install power ventilators level and plumb.

B. Support units using spring isolators having a static deflection of 1 inch. Vibration- and seismic-control devices are specified in Division 15 Section "Mechanical Vibration Controls and Seismic Restraints."

1. Secure vibration and seismic controls to concrete bases using anchor bolts cast in concrete base.

C. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

D. Support suspended units from structure using threaded steel rods and spring hangers. Vibration-control devices are specified in Division 15 Section "Mechanical Vibration Controls and Seismic Restraints."

1. In seismic zones, restrain support units.

E. Install units with clearances for service and maintenance.

F. Label units according to requirements specified in Division 15 Section "Mechanical Identification."

3.02 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 15 Section "Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment.

D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.03 FIELD QUALITY CONTROL

A. Equipment Startup Checks:

1. Verify that shipping, blocking, and bracing are removed.

2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.

3. Verify that cleaning and adjusting are complete.

4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.

5. Verify lubrication for bearings and other moving parts.

6. Verify that manual volume control dampers in connected ductwork systems are in fully open position.

7. Disable automatic temperature-control operators.

B. Starting Procedures:

1. Energize motor and adjust fan to indicated rpm.

2. Measure and record motor voltage and amperage.

C. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.

D. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Shut unit down and reconnect automatic temperature-control operators.

F. Refer to Division 15 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing procedures.

G. Replace fan and motor pulleys as required to achieve design airflow.

H. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.

3.04 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Lubricate bearings.

3.05 CLEANING

A. On completion of installation, internally clean fans according to manufacturer's written instructions. Remove foreign material and construction debris. Vacuum fan wheel and cabinet.

B. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.

3.06 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain power ventilators.

1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.

2. Review data in maintenance manuals. Refer to Division 1 Section 01700 "Contract Closeout."

3. Schedule training with Maintenance Personnel, through Project Representative, with at least seven days' advance notice.

END OF SECTION

SECTION 15858
DIFFUSERS AND GRILLES

PART 1 GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational mechanical installations on a Design-Build basis. It shall be the Mechanical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the General Terms and Conditions and Division 1 Specification Sections, apply to this Section.

B. Related Sections include the following:

1. Division 10 for fixed and adjustable louvers and wall vents, whether or not they are connected to ducts.

2. Division 15 Section "Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers and grilles.

3. Division 15 Section "Testing, Adjusting, and Balancing" for balancing diffusers and grilles.

1.03 SUMMARY

A. This Section includes ceiling-, floor-, sill- and wall-mounted diffusers and grilles.

1.04 DEFINITIONS

A. Diffuser: Circular, square, or rectangular air distribution outlet, generally located in the ceiling and comprised of deflecting members discharging supply air in various directions and planes and arranged to promote mixing of primary air with secondary room air.

B. Grille: A louvered or perforated covering for an opening in an air passage, which can be located in a sidewall, ceiling, sill, or floor.

1.05 SUBMITTALS

A. Product Data: For each model indicated, include the following:

1. Data Sheet: For each type of air outlet and inlet, and accessory furnished; indicate construction, finish, and mounting details.

2. Performance Data: Include throw and drop, static-pressure drop, and noise ratings for each type of air outlet and inlet.

3. Schedule of diffusers and grilles indicating drawing designation, room location, quantity, model number, size, and accessories furnished.

4. Assembly Drawing: For each type of air outlet and inlet; indicate materials and methods of assembly of components.

1.06 QUALITY ASSURANCE

A. NFPA Compliance: Install diffusers and grilles according to NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems."

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

A. Diffusers and grilles are scheduled on Drawings. Owner prefers Titus products.

2.02 SOURCE QUALITY CONTROL

A. Testing: Test performance according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

2.03 CEILING DIFFUSERS

A. Performance: Provide ceiling air diffusers that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device as listed in manufacturer's current data.

B. Ceiling Compatibility: Provide diffusers with border styles that are compatible with ceiling systems, and that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems, which will contain each type of ceiling air diffuser.

C. Types: Provide ceiling diffusers of type, construction, capacity, and with accessories and finishes as indicated on the drawings.

2.04 EXHAUST GRILLES

A. Performance: Provide exhaust and return grilles that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device and listed in manufacturer's current data.

B. Wall Compatibility: Provide grilles with border styles that are compatible with wall systems, and that are specifically manufactured to fit into wall construction with accurate fit and adequate support. Refer to general construction drawings and specifications for types of wall construction, which will contain each type of wall grille.

C. Types: Provide exhaust and return grilles of type, construction, capacity, and with accessories and finishes as indicated.

1. Exhaust Grille – Louvered

a. Materials: 22-gauge roll formed steel frame and blades or 0.040 minimum extruded aluminum frame and blades.

b. Grille Construction: 1-1/4-inch wide border, corners assembled with full penetration resistance welds. Screw holes countersunk. Blades at 35 degree deflection at 3/4-inch spacing. Blades fixed in place, parallel to the long dimension of the grille.

c. Finish: White, anodic acrylic paint or aluminum colored paint.

d. Accessories: Opposed blade damper, operable from the face of the grille (OBD).

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 EXAMINATION

A. Examine areas where diffusers and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install diffusers and grilles level and plumb, according to manufacturer's written instructions, Coordination Drawings, original design, and referenced standards.

B. Duct-Mounted Supply and Exhaust Grilles: Mount to duct branch with 16-gauge steel angle collar. Mounting screws to match grille frame. Screws shall not protrude more than 1/4-inch past angle collar.

C. Install diffusers and grilles with airtight connection to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

D. Install in-line multiple linear diffusers with alignment pins for a straight continuous appearance.

3.03 ADJUSTING

A. After installation, adjust diffusers and grilles to air patterns indicated, or as directed, before starting air balancing.

3.04 CLEANING

1. After installation of diffusers and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers and grilles that have damaged finishes.

END OF SECTION

SECTION 15990
TESTING, ADJUSTING, AND BALANCING

PART 1 GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational mechanical installations on a Design-Build basis. It shall be the Mechanical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the General Terms and Conditions and Division 1 Specification Sections, apply to this Section.

B. Related Sections include the following:

1. Testing and adjusting requirements unique to particular systems and equipment are included in the Sections that specify those systems and equipment.

2. Field quality-control testing to verify that workmanship quality for system and equipment installation is specified in system and equipment Sections.

1.03 SUMMARY

A. This Section includes testing, adjusting, and balancing HVAC systems to produce design objectives, including the following:

1. Balancing airflow within distribution systems, including submains and branches to indicated quantities according to specified tolerances.

2. Adjusting total HVAC systems to provide indicated quantities.

3. Setting quantitative performance of HVAC equipment.

4. Measuring sound and vibration.

5. Reporting results of the activities and procedures specified in this Section.

1.04 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to modify fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to design quantities.

C. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

D. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

E. Report Forms: Test data sheets for recording test data in logical order.

F. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.

G. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.

H. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

I. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

J. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

K. Test: A procedure to determine quantitative performance of a system or equipment.

L. Testing, Adjusting, and Balancing Agent: The entity responsible for performing and reporting the testing, adjusting, and balancing procedures.

M. AMCA: Air Movement and Control Association.

N. CTI: Cooling Tower Institute.

O. NEBB: National Environmental Balancing Bureau.

P. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

Q. TAB: Testing, Balancing, and Adjusting.

1.05 ACCEPTABLE DEVELOPERS

A. Neudorfer Engineers, Inc.

B. NAIAC.

C. Air Test.

D. Or approved.

1.06 SUBMITTALS

A. Quality-Assurance Submittals: Within 30 days from the Developer's Notice to Proceed, submit 2 copies of evidence that the testing, adjusting, and balancing Agent and this Project's testing, adjusting, and balancing team members meet the qualifications specified in the "Quality Assurance" Paragraph below.

B. Contract Documents Examination Report: Within 45 days from the Developer's Notice to Proceed, submit 2 copies of the Contract Documents Construction Phase review report as specified in Part 3 of this Section.

C. Strategies and Procedures Plan: Within 60 days from the Developer's Notice to Proceed, submit 2 copies of the testing, adjusting, and balancing strategies and step-by-step procedures as specified in Part 3 "Preparation" Paragraph below. Include a complete set of report forms intended for use on this Project.

D. Certified Testing, Adjusting, and Balancing Reports: Submit 2 copies of reports prepared, as specified in this Section, on approved forms certified by the testing, adjusting, and balancing Agent.

E. Warranty: Submit 2 copies of special warranty specified in the "Warranty" Article below.

F. Balancing Report:

1. Comply with Section 15050, paragraph "Submittals," subparagraph A, regarding format of TAB report, except title "Balancing Report."

2. Submit completed Balancing Report as indicated, including the following:

a. Fan Test Reports.

b. Rectangular Duct Traverse Reports.

c. Air Outlet Test Reports.

1.07 SEQUENCING/SCHEDULING

A. Phase in properly with Construction Schedule.

1.08 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with all applicable city, county, and state codes and ordinances. In case of conflict with drawings or specifications, the codes and ordinances govern.

2. Basis:

a. Uniform Building Code.

b. Uniform Plumbing Code.

c. Uniform Mechanical Code.

d. NFPA-90A.

e. NFPA 101.

B. Agent Qualifications: Engage a testing, adjusting, and balancing agent certified by NEBB, not affiliated with mechanical contractor. Certified agent shall be a full time employee of the TAB contractor.

C. Experience: Minimum 5 years on projects of similar scope and complexity.

D. Testing, Adjusting, and Balancing Conference: Meet with the Project Representative and the Architect's representatives on approval of the testing, adjusting, and balancing strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of testing, adjusting, and balancing team members, equipment manufacturers' authorized service representatives, HVAC controls installer, and other support personnel. Provide 7 days' advance notice of scheduled meeting time and location.

1. Agenda Items: Include at least the following:

a. Submittal distribution requirements.

b. Contract Documents examination report.

c. Testing, adjusting, and balancing plan.

d. Work schedule and Project site access requirements.

e. Coordination and cooperation of trades and subcontractors.

f. Coordination of documentation and communication flow.

E. Certification of Testing, Adjusting, and Balancing Reports: Certify the testing, adjusting, and balancing field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.

2. Certify that the testing, adjusting, and balancing team complied with the approved testing, adjusting, and balancing plan and the procedures specified and referenced in this Specification.

F. Testing, Adjusting, and Balancing Reports: Use standard forms from NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

G. Instrumentation Type, Quantity, and Accuracy: As described in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."

H. Instrumentation Calibration: Calibrate instruments as required by NEBB certification or more frequently if required by the instrument manufacturer.

1.09 PROJECT CONDITIONS

A. Partial Owner Occupancy: The Owner may occupy completed areas of the building before Substantial Completion. Cooperate with the Project Representative during

testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.

1.10 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist testing, adjusting, and balancing activities.

B. Notice: Provide 7 days' advance notice for each test. Include scheduled test dates and times.

C. Perform testing, adjusting, and balancing after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.11 WARRANTY

A. General Warranty: The special performance guarantee specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Developer under requirements of the Contract Documents.

B. Special Guarantee: Provide a guarantee on NEBB forms stating that NEBB will assist in completing the requirements of the Contract Documents if the testing, adjusting, and balancing Agent fails to comply with the Contract Documents. Guarantee includes the following provisions:

1. The certified Agent has tested and balanced systems according to the Contract Documents.

2. Systems are balanced to optimum performance capabilities within design and installation limits.

PART 2 PRODUCTS

2.01 GENERAL

A. Comply with "Quality Assurance" provisions, specifications, and manufacturer's data. Where these may be in conflict, the more stringent requirements govern.

2.02 TAB INSTRUMENTATION

A. Furnish materials and equipment necessary to properly measure system capacities, electrical voltage and current, fan speeds, static pressures, air velocities, water pressure drops, refrigeration pressures, and other readings necessary to evaluate system performance and adjust quantities to those indicated. TAB Contractor retains possession of materials and equipment after project is completed.

B. Instrumentation shall be accurate, with calibration histories available for examination upon request.

C. Instrumentation shall be used in accordance with manufacturer instructions.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 INSPECTION

A. Verify installation conditions as satisfactory to receive work of this Section. Do not begin work until any unsatisfactory conditions are corrected.

3.02 EXAMINATION

A. Examine Contract Documents to become familiar with project requirements and to discover conditions in systems' designs that may preclude proper testing, adjusting, and balancing of systems and equipment.

1. Contract Documents are defined in the General Terms and Conditions of the Contract.

2. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine project record documents described in Division 1 Section 01720 “Record Drawings."

C. Examine equipment performance data, including fan curves. Relate performance data to project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

D. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.

E. Examine system and equipment test reports.

F. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

G. Examine strainers for clean screens and proper perforations.

H. Examine equipment for installation and for properly operating safety interlocks and controls.

I. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures.

3.03 PREPARATION

A. Field verify locations of new and existing work prior to commencing work of this Section.

B. Protect surrounding areas and surfaces to preclude damage from work of this Section.

C. Prepare a testing, adjusting, and balancing plan that includes strategies and step-by-step procedures.

D. Complete system readiness checks and prepare system readiness reports. Verify the following:

1. Manual volume dampers, smoke, fire, and combination fire/smoke dampers are open.

2. Isolating and balancing valves are open and control valves are operational.

3. Windows and doors can be closed so design conditions for system operations can be met.

3.04 GENERAL TESTING AND BALANCING PROCEDURES

A. Perform testing and balancing procedures on each system according to the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.

C. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

D. Set automatic stops on metering balancing valves and butterfly valves with memory, and ensure volume damper locking mechanisms are tightened down in the balanced position.

3.05 FUNDAMENTAL AIR SYSTEMS' BALANCING PROCEDURES

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

D. Check the airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check for proper sealing of air-handling unit components.

3.06 TOLERANCES

A. Set HVAC system airflow rates within the following tolerances:

1. Exhaust Fans: Plus 5 to plus 10 percent.

2. Air Outlets and Inlets: 0 to minus 10 percent.

3.07 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article above, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.08 FINAL REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in 3-ring binder, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.

1. Include a list of the instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to the certified field report data, include the following:

1. Pump curves.

2. Fan curves.

3. Manufacturers' test data.

4. Field test reports prepared by system and equipment installers.

5. Other information relative to equipment performance, but do not include Shop Drawings and Product Data.

D. General Report Data: In addition to the form titles and entries, include the following data in the final report, as applicable:

1. Title page.

2. Name and address of testing, adjusting, and balancing Agent.

3. Project name.

4. Project location.

5. Architect's name and address.

6. Mechanical Consultant’s name and address.

7. Contractor's name and address.

8. Report date.

9. Signature of testing, adjusting, and balancing Agent who certifies the report.

10. Summary of contents, including the following:

a. Design versus final performance.

b. Notable characteristics of systems.

c. Description of system operation sequence if it varies from the Contract Documents.

11. Nomenclature sheets for each item of equipment.

12. Notes to explain why certain final data in the body of reports vary from design values.

13. Test conditions for fans performance forms, including the following:

a. Settings for outside and exhaust-air dampers.

b. Fan drive settings, including settings and percentage of maximum pitch diameter.

c. Other system operating conditions that affect performance.

3.09 ADDITIONAL TESTS

A. Within 90 days of completing testing, adjusting, and balancing, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

1. Seasonal Periods: If initial testing, adjusting, and balancing procedures were not performed during near-peak summer and winter conditions, perform additional inspections, testing, and adjusting during near-peak summer and winter conditions.

END OF SECTION

SECTION 15995
MECHANICAL COMMISSIONING: GENERAL REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational mechanical installations on a Design-Build basis. It shall be the Mechanical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

1.02 DESCRIPTION

A. Purpose:

1. The purpose of the commissioning process is to provide the Owner assurance that the systems have been installed in the prescribed manner and will operate within the performance guidelines. Commissioning is intended to enhance the quality of system start-up and aid in the orderly transfer of systems to beneficial use by the Owner.

2. The Developer verifies installation, provides scheduling and coordination of commissioning activities, performs training, starts up equipment, conducts functional performance testing, corrects deficiencies, performs retests, and provides documentation of the process. Developer provides the Owner an unbiased, objective view of the system's installation, documentation, operation, and performance.

3. Commissioning procedures and results will be reviewed and observed by the Commissioning Authority. The Developer is expected to verify the functional readiness of systems to be tested prior to performing the tests in the presence of the Commissioning Authority. A high rate of test failure will indicate that the Developer has not adequately verified the readiness of the systems.

B. General:

1. Furnish labor and material to accomplish building commissioning as specified herein.

2. Requirements of Commissioning Section shall be accomplished by a qualified Test Engineer, as specified in Division 1. The requirement for and responsibilities of the Test Engineer are indicated in Division 1 and Commissioning Section. The Test Engineer shall be hired by the Developer.

3. The Commissioning Authority is an independent contractor and will work under a separate contract. The responsibilities of the Commissioning Authority are indicated, for information only, in Division 1.

4. Unless noted otherwise, functional performance tests (FPTs) described under "Acceptance Criteria" in the various sections of this division, apply to all equipment and systems identified under "Systems / Equipment to be Tested."

1.03 COORDINATION

A. The Developer shall provide overall coordination and management of the commissioning program as specified herein. The commissioning process will require cooperation of the Developer, subcontractors, vendors, Architect, Mechanical Engineer, Electrical Engineer, Test Engineer, Commissioning Authority, and the Project Representative.

1.04 SUBMITTALS

A. General: The Test Engineer shall submit the following with input from the Contractors, Sub-Contractors, and Vendors:

B. Commissioning Plan: Submit (6) copies of a draft commissioning plan to the Project Representative for review and approval within 90 calendar days of Notice to Proceed. Submit (6) copies of the commissioning plan to the Project Representative after all review comments have been incorporated. Develop a commissioning plan to identify how commissioning activities will be integrated into general construction and trade activities. The plan is the key means to inform all parties as to how each system functions, independently and with respect to other systems. The plan shall be updated regularly and redistributed to the commissioning team for review and comment. The intent of this plan is to evoke questions, expose issues, and resolve them with input from the entire commissioning team early in construction. The commissioning plan shall identify how commissioning responsibilities are distributed.

1. Include an organizational chart showing lines of communication and authority relative to key Contractor positions and to key subcontractors.

2. Identify who will be responsible for producing the various procedures, reports, Owner notifications, and forms required in this division.

3. Include a summary of all commissioning tests to be performed.

4. Include the commissioning schedule.

5. Describe the test/acceptance procedure.

6. Identify which subcontractors will participate in each of the tests.

7. Identify instrumentation required for each test.

8. Identify who will provide instrumentation for each test.

C. Commissioning Schedule: Submit (6) copies of a draft commissioning schedule to the Project Representative for review and approval by the Project Representative within 90 calendar days of Notice to Proceed.

1. Integrate functional performance testing and commissioning requirements into the Critical Path Method (CPM) master construction schedule. Commissioning scheduling is the responsibility of the Developer. The schedule shall include dates for commissioning testing of each system and shall also include startup prerequisite activities shown linked to specific functional performance testing dates.

2. Commissioning of systems shall proceed per the criteria established in the specific sections that follow, with activities to be performed on a timely basis. Commissioning of systems may proceed prior to final completion of systems. The Test Engineer must be available to respond promptly to avoid delay to the CPM schedule.

3. The commissioning schedule shall incorporate the completion of all commissioning testing, with the exception of retesting resulting from deficiencies and seasonal testing, before the Final Certificate of Occupancy date.

4. Problems observed shall be addressed immediately, in terms of notification to responsible parties and actions to correct deficiencies.

D. Start-Up Plan: For each piece of equipment or system for which formal start-up is specified elsewhere in this division, submit a start-up plan to the Project Representative for review and approval within 90 days. Submit (6) copies of the draft startup plan. Submit (6) copies of the startup plan after all review comments have been incorporated from the Project Representative. Obtain approval of the plan prior to beginning startup activities. The plan shall include the following:

1. Start-up schedule.

2. Names of firms/individuals required to participate.

3. Detailed start-up procedures (may be manufacturer's startup checklist and procedures).

4. Start-up data forms.

E. Test Equipment Identification List: For each instrument, sorted according to intended use, submit (6) copies of a list containing the following information to the Project Representative for review and approval by the Architect and Commissioning Authority. Submit (6) copies of the list to the Project Representative after all comments have been incorporated:

1. Manufacturer.

2. Model number.

3. Serial number.

4. Calibration certification.

5. Range.

6. Accuracy.

7. Resolution.

8. Intended use.

F. Testing, Adjusting, and Balancing (TAB) Data Forms: In addition to the requirements for TAB submittals in other sections of this specification, submit (6) copies of the testing, adjusting, and balancing (TAB) data forms to the Project Representative for review and

approval by the Project Representative and Commissioning Authority. Submit (6) copies of the TAB forms after all comments have been incorporated. Forms shall be approved prior to the start of TAB activities.

G. Testing, Adjusting, and Balancing (TAB) Report: In addition to the requirements for TAB report submittals in other sections of this specification, submit (1) additional copy for review and approval by the Commissioning Authority. A preliminary TAB report shall be submitted first for approval. A final TAB report shall be submitted to incorporate review comments or, if additional TAB work is identified by the preliminary review comments, after the additional TAB work is completed.

H. Functional Performance Test Procedures: Refer to Section 15996 for additional requirements for functional performance test procedures. Submit functional performance test procedures for functional performance tests to the Project Representative for review and approval by the Project Representative and Commissioning Authority.

1. Each procedure shall have a unique alphanumeric designator.

2. The same procedure may be applied to multiple identical pieces of equipment or systems.

3. FPT procedures shall be detailed test instructions, written with sufficient step-by-step information to allow a test to be repeated under identical conditions with repeatable results.

I. Functional Performance Test Procedures: Submit (6) copies of the draft functional performance test procedures/data forms to the Project Representative for review and approval by the Project Representative and Commissioning Authority.

1. Identify each functional performance test data form by a unique designator, consisting of the applicable functional performance test procedure designator followed by a dash and digit suffix to distinguish multiple repetitions of the same procedure.

2. Include space to record the following:

a. Description of the procedure.

b. Whether the form is for a retest of a failed procedure.

c. Identification and location of the equipment being tested.

d. Observed conditions at each step of the procedure.

e. Date of the test.

f. Names and company of technicians performing the procedure.

g. Name and signature of the Test Engineer.

h. Name and signature of the Commissioning Authority or Project Representative witness. Signature of witness shall only indicate concurrence with reported

results and observations. Acceptance of the results will be reported separately by the Commissioning Authority after review of the FPT data forms.

3. Functional performance test procedures and functional performance test data sheets for each system shall be based upon actual system's configuration.

4. Test procedures shall fully describe system configuration and steps required for each test, appropriately documented so that another party can repeat the tests with virtually identical results.

5. Acceptance test procedures must confirm the performance of systems to the extent of the design intent and applicable code under which the project was permitted. When a system is accepted, the Commissioning Authority must be assured that the system is complete, works as intended, is correctly documented, and that the Project Representative's staff is trained in the operation and maintenance of the system.

6. The majority of mechanical equipment requires integral safety devices to stop/prevent equipment operation unless minimum safety standards or conditions are met. This could include adequate oil pressure, proof-of-flow, non-freezing conditions, maximum head pressure, etc. Functional performance test procedures shall demonstrate the actual performance of safety shutoffs in a real or closely simulated condition of failure.

7. Systems may include safety devices and components that control a variety of equipment operating as a system. Interlocks may be hard-wired or installed via software. Functional performance test procedures shall demonstrate these interlocks.

8. Inform appropriate subcontractor(s) and vendor(s) before commissioning is started as to what the test and expected results will be. Because some test results and interpretations may not become evident until the actual tests are performed, all participants should have a reasonable understanding of the requirements. The commissioning plan must address the requirements and be distributed to all participants involved with that particular system.

J. Functional Performance Test Deficiency Report Forms: Submit sample functional performance test deficiency report forms to the Project Representative for review and approval by the Project Representative and Commissioning Authority. Include space to record the following:

1. Associated functional performance test data form number.

2. Date of test.

3. Name of person reporting the deficiency.

4. Description of the observations associated with the failure of the test.

5. Cause of the failure if apparent at the time of the test.

6. Date and description of corrective action taken.

7. Name and signature of person taking corrective action.

8. Schedule for retest.

K. Owner Training Plan: Prepare and submit (6) copies of a training plan to the Project Representative for review and approval by the Project Representative and Commissioning Authority.

1. Training plan shall include for each training session the following:

a. Dates, start and finish times, and locations.

b. Outline of the information to be presented.

c. Names and qualifications of the presenters.

d. List of texts and other materials required to support training.

2. Obtain assistance from appropriate subcontractors and vendors to provide training for the Owner's operations staff.

3. Training will be in a classroom setting with the appropriate schematics, handouts, and audio/visual training aids.

4. Catalog training videotapes and deliver to the Project Representative with the O&M manuals.

5. Host each training session:

a. Provide program overview and curriculum guidance.

b. Obtain signatures of attendees on a sign-in list.

6. Equipment vendors provide training on the specifics of each system and philosophy, troubleshooting, and repair techniques as specified in the relevant sections of this specification.

7. Installation subcontractors provide training on peculiarities specific to this project and job specific experience as specified in the relevant sections of this specification.

8. Review record documents to verify accuracy.

1.05 COORDINATION WITH COMMISSIONING AUTHORITY

A. The Commissioning Authority will witness start-up and test activities specified in this division. The Project Representative will designate witnesses and alternates for each activity.

B. Notify the Project Representative in writing of the date, time, location, and anticipated duration of start-up and test activities as required in "Schedule" above.

C. Provide written timely notice to Project Representative of any changes in date, time, location, or anticipated duration of start-up and test activities. For the purpose of this

paragraph, written notice shall be received by Project Representative a minimum of 72 hours in advance to be considered timely notice.

D. Developer shall reimburse Owner for actual costs incurred by the Owner as the result of failure to provide timely notice, per preceding paragraph, of changes in date, time, location, or anticipated duration of start-up and test activities.

E. Obtain the signature of designated witness on all data forms. If the witness is unavailable at the scheduled time and location of the activity, so note, and proceed per schedule without the witness.

PART 2 PRODUCTS

2.01 TEST EQUIPMENT

A. Provide industry standard test equipment required for performing the tests specified herein. Instrumentation shall meet the following standards:

1. Be of sufficient quality and accuracy to test and measure system performance within the tolerances required to determine adequate performance.

2. Be calibrated on the manufacturer's recommended intervals with calibration tags permanently affixed to the instrument being used.

B. For all temperature measurements including air, liquids, and surfaces of pipes and components using appropriate probes:

1. Range: Minimum +15 ^{o} F to 230^{o} F

a. Type: Thermometer, Digital Electronic.

b. Minimum accuracy: +/- 0.5^{o} F.

c. Calibration Interval: Per manufacturer instruction, not to exceed every 12 months.

C. Air Pressure Measurement Instruments:

1. Range: 0 to 1 inch w.c., 0 to 4 inch w.c., 0 to 10 inch w.c.

a. Type: Use properly leveled and zeroed manometer, Magnehelic or electronic instrument meeting accuracy requirements.

b. Minimum accuracy for electronic devices: 2% of reading (Magnehelic or manometer), 1% of reading (electronic).

c. Calibration Interval for electronic devices: Per manufacturer's instructions, not to exceed every 12 months.

d. Note: Use lowest range instrument or scale.

2.02 REPORTS

A. Installation Verification Audit: Prior to start-up, submit to the Project Representative for review and approval by the Project Representative and Commissioning Authority a report of installation verification audit activities. Identify equipment and components verified, deficiencies noted, corrective action taken, and the dates and initials of the persons making the entries.

1. During construction, observe the work of the prime Developer and subcontractors to assure that all installations are being made in accordance with the intent of the contract documents.

2. Before system start-up begins, conduct a final installation verification audit. The Developer shall be responsible for completion of all work, including change orders and punch list items, to the satisfaction of the Project Representative. The audit shall include, but not be limited to, a check of the following:

a. Piping specialties, including balance, control, and isolation valves.

b. Ductwork specialty items, including turning devices; balance, fire, smoke and control dampers; and access doors.

c. Control sensor types and locations.

d. Identification of piping, valves, starters, gauges, thermometers, etc.

e. Documentation of prestart-up tests performed, including manufacturer's factory tests.

f. Accessibility to equipment in 1-3 above.

B. Start-Up Deficiency Report: Within five days following start-up of each system or equipment, submit to the Project Representative start-up deficiency report forms. Identify systems and/or equipment started up, deficiencies noted, corrective action taken, and the dates and initials of the persons making the entries.

C. Functional Performance Test Deficiency Reports: Submit weekly functional performance tests deficiency reports to the Project Representative.

1. Identify tests for which acceptable results were not obtained by test number and description, and equipment identification and location. Briefly describe observations about the performance which were associated with failure to achieve acceptable results. Identify the cause of failure if such is apparent.

2. When corrections have been completed, update the functional performance test deficiency report forms. Identify corrective action taken and the dates and initials of the persons making the entries.

3. Identify the schedule for retesting.

D. Final Commissioning Reports: Submit (6) copies of the draft final commissioning report to the Project Representative for review and approval by the Architect and the

Commissioning Authority. The draft final commissioning report shall be submitted a minimum of two weeks prior to the Final Certificate of Occupancy date. The draft final commissioning report shall include completed commissioning functional performance test procedures for all identified systems to be commissioned. For those systems that require re-testing due to deficiencies found during initial functional testing and those tests that require seasonal conditions to complete (i.e. – heating and cooling coil capacity tests), the initial completed functional test procedure shall be included in the preliminary final commissioning report. After all re-testing and seasonal testing has been completed, submit (6) copies of the final commissioning report to the Project Representative including the documentation for all re-testing and seasonal testing. The final commissioning report shall include the following items:

1. An executive summary including a brief description of the project, the commissioning process, and the results of the commissioning process.

2. A list of all outstanding items that were not resolved through the commissioning process.

3. Recommendations for system improvements that were not implemented through the commissioning process.

4. Log, list, or matrix of all deficiencies encountered during the course of functional performance testing.

5. All meeting notes.

6. All installation verification audits.

7. All startup deficiency reports.

8. All completed functional test procedures and data forms.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 COMMISSIONING PROCEDURE

A. Sequence of Testing: Commissioning shall proceed from lower to higher levels of complexity. For each discrete subsystem or system, testing at the lower level shall be completed prior to starting the next higher level of tests. In general, the order of testing, from lowest to highest is as follows:

1. System startup static tests (e.g. duct leakage tests, pipe static pressure tests).

2. Contractor equipment startup and vendor equipment startup including unitary controls checkout.

3. Testing, Adjusting, and Balancing (TAB).

4. System functional performance tests (FPT).

B. Retesting: Repeat, at no additional cost to the Owner, the complete functional test procedure for each test in which acceptable results are not achieved. Repeat tests until acceptable results are achieved. Compensate the Owner for direct costs incurred as the result of tests repeated to achieve acceptable results. Fill out a new functional performance test data form for each retest.

C. Correction of Deficiencies:

1. Correct functional performance test deficiencies promptly and schedule retest.

2. Corrections during functional performance tests are generally prohibited to avoid consuming the time of personnel waiting for the test, but not involved in making the correction. Exceptions will be allowed if the cause of the failure is obvious and corrective action can be completed in less than five minutes. If corrections are made under this exception, the failure shall be noted on the functional performance test data form. A new functional performance test data form, marked “retest,” shall be initiated after the correction has been made. The entire functional performance test procedure shall be repeated.

D. Owner witness: Commissioning Authority shall provide no labor or materials in the commissioning process. The only function of the Commissioning Authority shall be to observe and comment on the progress and results of commissioning.

1. Provide access to permit the Commissioning Agent to directly observe the performance of the equipment being tested.

2. Provide ladders, scaffolding, and staging as required to permit the Commissioning Agent to directly observe the performance of the equipment being tested.

3. Notify the Project Representative of commissioning schedule changes at least 48 hours in advance if a Commissioning Agent will be involved.

3.02 FUNCTIONAL COMPLETION

A. The Commissioning Authority will review Contractor’s records of completion of Commissioning requirements. Upon receiving evidence of satisfactory completion of Substantial Completion requirements listed in Section 00700, the Commissioning Authority will submit to the Project Representative a recommendation to accept Functional Completion.

3.03 EXCLUSIONS

A. The Project Representative and Commissioning Authority are not responsible for construction means, methods, job safety, or any management function related to commissioning on the job site.

1. The Contractor shall provide all technician services requiring tools or the use of tools, to test, adjust or otherwise bring equipment into a full operational state.

END OF SECTION

SECTION 15996
MECHANICAL COMMISSIONING: FUNCTIONAL PERFORMANCE TESTINGS

PART 1 GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational mechanical installations on a Design-Build basis. It shall be the Mechanical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

1.02 DESCRIPTION

A. The purpose of functional performance testing (FPT) is to assure the Owner that all work has been completed as specified and that systems are functioning in the manner intended, within the limits of the design and the contract documents. It will serve as a tool to minimize post-occupancy systems operational difficulty or failure. It will assist operations staff familiarization and training with new systems. It will also be used to develop test protocols and record associated test data in an effort to advance the building systems from a state of substantial completion to full dynamic operation. Functional performance testing will commence as systems startup and startup documentation is completed and reviewed and TAB work is completed. Functional performance testing will be done on a system-by-system basis. The results of these tests will be documented and handed over to the Commissioning Agent and Project Representative for final system acceptance.

B. Substantial Completion requires that:

1. All functional performance testing be complete and approved.

2. O&M manuals are complete (not in process).

3. All training is complete.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Division 15 Section "Mechanical Commissioning – General Requirements."

B. Division 15 Section "Mechanical Commissioning Support."

1.04 SYSTEMS TO BE TESTED

A. FPT will be performed on all energy-consuming systems and equipment and those mechanical systems that affect the performance of the dynamic functioning of the building. Those systems shall include the following:

1. HVAC

a. Exhaust Fans.

b. Unit Heaters.

c. Split-system Air-Conditioning Units.

PART 2 PRODUCTS

Not applicable to this section.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 GENERAL

A. The Contractor and subcontractors shall be responsible for performing all procedures presented in the specification and contract drawings, unless otherwise specified. The Test Engineer and Commissioning Agent will witness system start up and functional performance for all systems listed in this division.

3.02 FUNCTIONAL PERFORMANCE TESTING

A. Functional performance testing begins after the systems have been completed by the contractors, the system description and training sessions have been completed, and the O&M manuals have been completed.

B. The objective of functional performance testing is to advance the building systems from a state of installation and startup completion to full dynamic operation in accordance with the specified design requirements and design intent.

C. The Test Engineer shall attain this objective by developing individual system-testing protocols which, when implemented by the Contractor, will allow the Test Engineer to observe, evaluate, identify deficiencies, recommend modifications, tune, and document the systems and systems' equipment performance over a range of load and functional levels.

D. Functional performance testing shall be conducted with the systems in full automatic operation, except as noted in the test procedures. Unless otherwise noted in the testing procedures, motor starter HOA switches shall be in the AUTO position.

E. Equipment shall be tested for equipment under every operating mode.

F. All equipment safety devices shall be tested. Coordinate with equipment vendors for safe procedures to test safety devices.

END OF SECTION

SECTION 15997
MECHANICAL COMMISSIONING SUPPORT

PART 1 GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational mechanical installations on a Design-Build basis. It shall be the Mechanical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

1.02 SCOPE OF THE WORK

A. The purpose of this section is to specify Division 15 responsibilities and participation in the commissioning process.

B. Commissioning is the responsibility of the Developer (including subcontractors and vendors). The Developer is responsible for providing all scheduling, coordination and support required for start-up, testing, and commissioning (see Division 1). Commissioning Section is intended to provide an indication of the tests which must be performed by the Developer prior to and including verification by the Owner's Representative. The commissioning process requires Division 15 participation to ensure all portions of the work have been completed in a satisfactory and fully operational manner.

C. Work of Division 15 includes the following:

1. Attend commissioning scoping meetings. At a minimum, the Mechanical and TAB Contractors shall participate. Equipment vendor representatives shall also attend upon request of the Project Representative. These meetings shall further define the testing requirements and participation of each contractor and sub-contractors for each commissioning activity.

2. Attend other meetings as required to facilitate the commissioning process. This shall include bi-monthly meetings during the startup period and weekly meetings starting at the beginning of the Owner-witnessed Functional Testing period. Other meetings may be required as problems arise, apart from the regularly-scheduled commissioning meetings.

3. Provide Project Representative additional requested data, prior to normal O&M Manual submittal, in a timely manner for the development of the startup plan and the functional performance testing procedures.

4. During the normal submittal processes, provide an additional copy of all equipment submittals, startup forms, field static testing reports (duct static pressure test reports, pipe static pressure test reports, chemical treatment reports, etc.), and TAB reports to the Project Representative for review.

5. The Developer shall be responsible for development of a comprehensive startup plan, incorporating the controls contractor point-to-point startup plan. The startup plan shall be developed with the help of the Project Representative in order to integrate startup activities with the Test Engineer's commissioning plan. Mechanical

Sub-Contractors shall assist the Mechanical Prime Contractor in development of the startup plan.

6. The Developer shall provide detailed startup forms and clearly document all completed startup activities. The controls startup forms shall include detailed checkout forms with descriptions for each controlled device. All forms shall be submitted for review by the Project Representative prior to use.

7. Provide skilled technicians, including equipment vendor representatives, equipment, and materials to perform startup and execute functional performance tests. Controls contractor shall provide skilled technicians, familiar with the project, for both startup (Owner-witnessed point-to-point testing) and functional performance testing. Commissioning functional performance testing participation from the controls contractor shall be required in addition to the point-to-point testing.

8. Correct deficiencies found during startup and functional performance testing in a timely manner to facilitate retesting activities within the commissioning schedule.

9. Submit startup documentation to Developer and Project Representative to verify functional testing prerequisite requirements are fulfilled before functional testing for the associated equipment or system is scheduled to start. Refer to Section "Mechanical Commissioning: General Requirements," for commissioning procedure. Startup documentation (point-to-point testing) shall also be required from the controls contractor as a prerequisite to functional performance testing.

10. TAB Contractor shall report any deficiencies found in a timely manner to the Mechanical Contractor. The Mechanical Contractor shall correct these deficiencies in a timely manner to facilitate functional performance testing within the commissioning schedule.

11. Provide final O&M manuals that incorporate all system changes including controls sequence of operations.

12. Providing training, for equipment and systems specified under this section, with coordination by the Developer and Project Representative.

1.03 RELATED WORK

A. Division 15 Section "Mechanical Commissioning – General Requirements."

B. Division 15 Section "Mechanical Commissioning – Functional Performance Testing."

C. All start-up and testing procedures and documentation requirements specified within Division 15.

D. Cooperate with the Testing, Adjusting and Balancing (TAB) firm in the following manner:

1. Allow sufficient time before final commissioning dates so that testing, adjusting and balancing can be accomplished.

2. Put all heating and ventilating equipment and systems into full operation and continue the operation during each working day of testing, adjusting, balancing and commissioning.

3. Provide labor and material to make corrections when required, without undue delay.

4. Include the cost of exchange sheaves and belts as may be required by the TAB firm.

PART 2 PRODUCTS

2.01 TEST EQUIPMENT

A. Provide test equipment as necessary for start-up and commissioning of the mechanical equipment and systems. The TAB firm will provide the test equipment required to perform TAB services.

B. Proprietary test equipment required by the mechanical equipment manufacturer, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall demonstrate its use and assist the Contractor in the commissioning process.

PART 3 EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 WORK PRIOR TO COMMISSIONING

A. Complete all phases of work so each system can be started, tested, adjusted, balanced, and otherwise commissioned. Division 15 has primary start-up responsibilities with obligations to complete systems, including all sub-systems, so they are fully functional. This includes the complete installation of all equipment, materials, pipe, duct, wire, insulation, controls, etc., per the contract documents and related directives, clarifications, change orders, etc.

B. A commissioning plan will be developed by the Test Engineer and approved by the Project Representative.

1. Division 15 shall be obligated to assist the Test Engineer in preparing the commissioning plan by providing all necessary information pertaining to the actual equipment and installation, identification of parties responsible for startup activities, and schedule dates for equipment startup activities.

2. If system modifications/clarifications are called for in the contractual requirements of this and related sections of work, they will be made at no additional cost to the Owner.

3. If Contractor-initiated system changes have been made that alter the commissioning process, the Contractor will notify the Owner's Representative for approval.

3.02 PARTICIPATION IN COMMISSIONING

A. Provide skilled technicians to start up all systems within Division 15.

1. These same technicians shall be made available to assist the Contractor and Commissioning Authority in completing the commissioning program as it relates to each system and their technical specialty.

2. Work schedules, time required for testing, etc., will be requested and coordinated by the Contractor.

3. Division 15 will ensure that qualified technician(s) are available and present during the agreed-upon schedules and for sufficient duration to complete the necessary tests, adjustment, and problem resolutions.

B. System problems and discrepancies may require additional technician time which shall be made available for the subsequent commissioning periods until required system performance is obtained.

C. The Project Representative reserves the right to judge the appropriateness and qualifications of the technicians relative to each item of equipment or system. Such qualifications include expert knowledge relative to the specific equipment involved, adequate documentation and tools to service/commission the equipment, and an attitude/willingness to work with the Contractor to get the job done.

3.03 WORK TO RESOLVE DEFICIENCIES

A. In some systems, misadjustments, misapplied equipment and/or deficient performance under varying loads will result in additional work being required to commission the systems. This work will be completed under the direction of the Project Representative, with input from the Contractor and equipment supplier. Whereas all members will have input and the opportunity to discuss the work and resolve problems, the Project Representative will have final jurisdiction on the work needed to achieve performance.

B. Corrective work shall be completed in a timely fashion to permit timely completion of the commissioning process.

1. Experimentation to render system performance will be permitted.

a. If the Project Representative deems the experimentation work to be ineffective or untimely as it relates to the commissioning process, the Project Representative will notify the Owner indicating the nature of the problem, expected steps to be taken, and the deadline for completion of activities.

b. If deadlines pass without resolution of the problem, the Owner reserves the right to obtain supplementary services and/or equipment to resolve the problem.

c. Costs incurred to solve the problem in an expeditious manner will be the Contractor's responsibility.

3.04 SEASONAL COMMISSIONING AND OCCUPANCY VARIATIONS

A. Seasonal commissioning pertains to testing under full-load conditions during peak heating season, as well as part-load conditions in the spring and fall.

1. Initial commissioning will be done as soon as contract work is completed regardless of season.

2. Commissioning under conditions representing other than the current season may be undertaken at a later time by the Test Engineer and Commissioning Authority.

3. Discrepancies discovered with the Contractor’s equipment or workmanship will be handled as warranty items.

3.05 RETESTING AND RECOMMISSIONING

A. Any fault in material or in any part of the installation revealed by commissioning tests shall be investigated, replaced, or repaired by the Contractor, and the same test repeated at the Contractor’s expense until no fault appears.

3.06 TRAINING

A. Participate in the training of the Owner's engineering and maintenance staff, as required in Divisions 1 and 15, on each system and related components. Training, in part, will be conducted in a classroom setting, with system and component documentation, and suitable classroom training aids.

B. Training shall be conducted jointly by the Contractor and the equipment vendors. The Contractor will be responsible for highlighting system peculiarities specific to this project.

3.07 MISCELLANEOUS SUPPORT

A. Contractor and Project Representative shall remove and replace covers of mechanical equipment, open access panels, etc., to permit Contractor, Architect/Engineers and Project Representative to observe equipment and controllers provided. Furnish ladders and flashlights as necessary.

END OF SECTION

SECTION 16010
GENERAL ELECTRICAL PROVISIONS

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes general requirements for all Division 16 work and is supplemental and in addition to the requirements of Division 1.

1. It is the intention of this Division of the Specifications to establish minimum standards and guidelines for providing complete and operational electrical installations on a Design-Build performance basis. It shall be the Electrical Contractor's (EC's) responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment, materials, devices and necessary appurtenances specified in Division 16 work to provide a complete electrical system. Connect equipment and devices furnished and installed under other Divisions of this specification under this Division.

2. The EC shall provide all materials, appliances and apparatus not specifically mentioned herein, but which are necessary to make a complete, fully operational installation of all electrical systems described herein.

3. The EC shall provide all work to comply with the Electrical Design Criteria and these performance specifications.

B. Workmanship shall be of the best quality and none but competent and experienced electricians shall be employed and shall be under the supervision of a competent and experienced foreman.

C. See Division 0 for apprenticeship program requirements.

D. See Division 1 for sequence of work.

1.02 DESIGN-BUILD RESPONSIBILITY

A. The EC shall become the engineer of record as required by the Authorities Having Jurisdiction (AHJ's). It shall be the EC's responsibility to design and provide complete drawings, and load calculations as required to obtain all necessary approvals and permits, as well as to provide accurate and useful record documents. The EC shall confirm all special local code requirements, including requirements for engineered stamped documents (signed and dated PE stamp on drawings and specifications if required by the code authority), prior to permit application.

1.03 WORK IN OTHER DIVISIONS

A. See all other specification sections for other work which includes but is not limited to:

1. Temporary Power

2. Cutting and Patching

3. Door Hardware

4. Painting, Refinishing and Finishes

5. Equipment Wiring

6. Mechanical Equipment

7. Fire Protection

1.04 CODES, PERMITS, INSPECTION FEES

A. The following codes and standards are referenced in the Division 16 specifications. Perform all work and provide materials and equipment in accordance with the latest referenced codes and standards of the following organizations:

1. American National Standards Institute (ANSI)

2. National Electrical Manufacturer's Association (NEMA)

3. National Fire Protection Association (NFPA)

4. Underwriter's Laboratories (UL)

5. Washington Administrative Code (WAC)

B. Install the electrical systems based on the following:

NFPA 70	National Electrical Code as adopted and amended by the Local Jurisdiction.
IBC	International Building Code as adopted and amended by the Local Jurisdition.
BMC	Burien Municipal Code

C. The referenced codes establish a minimum level of requirements and are understood to be the minimum requirement only. Where provision of the various codes conflict with each other, the more stringent provision shall govern. If any conflict occurs between referenced codes and this specification, the codes are to govern.

D. Obtain and pay for all licenses, permits and inspections required by laws, ordinances and rules governing work specified herein.

1.05 DESIGN COORDINATION

A. The EC shall obtain and become familiar with all aspects of the Architectural construction drawings as well as the construction drawings of the other disciplines when they become available. The EC shall schedule and/or attend meetings with the Architect, Developer and other trades as required to determine and coordinate design requirements in a timely manner. Special coordination effort can be anticipated related to the following:

1. Elevator Equipment

2. Mechanical Equipment

3. Seattle City Light Power Service

4. Telephone Service

5. Fire Alarm System

6. Electric Power Generation Equipment

7. Battery Inverter Unit

8. Power Feeder Routing

9. Underground Power and Communication Routing

B. Coordinate work with that of the other Contractors and/or other trades doing work on the project. Examine all specifications of other trades for construction details and coordination. Make every reasonable effort to provide timely notice of work affecting other trades to prevent conflicts or interference as to space requirements, dimensions, openings, block-outs, sleeving or other matters which will cause delays or necessitate work-around methods.

1. Obtain submittals and shop drawings of all equipment with electrical connections furnished under other divisions of the specification. Provide all wiring in accordance with specific equipment requirements.

C. Furnish, install and place in satisfactory condition all raceways, boxes, conductors and connections and all other materials required for the electrical systems noted in the contract documents to be complete, fully operational and fully tested upon completion of the project.

D. Provide inserts or sleeves for outlet boxes, conductors, cables and/or raceways as required. Coordinate the installation thereof with other trades.

1.06 WARRANTY

A. Refer to General Terms and Conditions of the Contract.

B. All materials, equipment and systems furnished that include provisions for storing, displaying, reporting, interfacing, inputting, or functioning using date specified information shall be warranted to perform properly in all respects regardless of the century. Any interfaces to other new or existing materials, equipment or systems shall be warranted to function properly and shall be century compliant both in regards to information sent and received.

1.07 SUBMITTALS AND SHOP DRAWINGS

A. Submittals and Shop Drawings: Schedule so as not to delay construction schedule and no later than 60 days after Notice to Proceed, submit common brochure(s) with index and divider tabs by specification section (include paragraph numbers to indicate specification compliance), containing all required catalog cuts. Allow two weeks for review for each submittal and re-submittal by Owner. Incomplete submittals and shop drawings which do not comply with these requirements will be returned for correction, revision and re-submittal. See General Terms and Conditions for format, quantity, etc.

B. Submit in a three-ring binder with hardboard covers. Submittals shall show:

1. Indicate listing by UL or other approved testing agency.

2. Highlight with yellow or blue marker adequate information to demonstrate materials being submitted fully comply with contract documents.

3. Review and check all material prior to submittal and stamp "Reviewed and Approved".

4. Electrical Contractor will provide the following electrical drawings as a submittal:

   a. Electrical – Legend, Notes, and Drawing Index

   b. Electrical- Utility Site Plan

   c. Electrical – Pedestrian Light Pole Details

   d. Electrical – Embedded conduit plans (One drawing per floor)

   e. Electrical – Lighting Plan (One drawing per floor with other plan drawings as required)

   f. Electrical Power Plan (One drawing per floor with other plan drawings as required)

   g. Electrical – Surveillance and communication Plan (One drawing per floor with other plan drawings as required)

   h. Electrical – Surveillance and Communications Riser Diagram

   i. Electrical – Surveillance and Communications Systems Details

   j. Electrical – Enlarged Plan Details

   k. Electrical – One Line Power Riser Diagram and Feeder Circuit Schedule

   l. Electrical – Details (Number of drawings as required for project)

   m. Electrical Panel Schedules / Numbers of drawings as required for project with one schedule for each panel provided on project.

   n. All drawings will be sealed and signed by the responsible electrical engineer for the project.

C. Shop drawings shall show:

   1. Ratings of items and systems.

   2. How the components of an item or system are assembled, interconnected, function together and how they will be installed on the project.

   3. Coordinate with other division shop drawings and submittals. Identify interface points and indicate method of connection.

D. The Developer agrees:

1. Submittals and shop drawings processed by the King County Project Representative are not change orders.

2. The purpose of submittals and shop drawings by the Developer is to demonstrate to King County that the Developer understands the design concept.

3. Submittals demonstrate equipment and material Developer intends to furnish and install and indicate detailing fabrication and installation methods Developer intends to use.

4. To accept all responsibility for assuring that all materials furnished under this Division of the specifications meet, in full, all requirements of the contract documents.

5. Drawings provided will be sufficient for documenting design and as-built conditions.

6. Electrical Contractor acknowledges that electrical design intent is to embed all conduit for this project with exception being when entering into the main electrical or communication rooms.

7. Final electrical as-built drawings for project identified in Section 16010, Paragraph 1.07.B.4. will each be sealed and signed by the responsible electrical engineer for the project.

E. The King County review is only for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Corrections or comments made during this review do not relieve Developer from compliance with the requirements of the drawings and specifications. Developer is responsible for: Dimensions that shall be confirmed and correlated at the job site; fabrication process and techniques of construction; coordination of his work with that of all other trades; performing his work in a safe and satisfactory manner.

F. Submittals and shop drawings are required per the submittals schedule at the end of this Section.

1.08 ELECTRICAL EQUIPMENT OPERATION AND MAINTENANCE (O&M) MANUALS

A. Provide 6 sets of O&M manuals for all equipment furnished under Division 16 of the specifications. Deliver final bound corrected copies prior to scheduled instruction periods. Obtain a receipt for the manuals and forward a copy of the receipt to King County with the Job Completion Form.

B. The information included must be the exact equipment installed. Where sheets show the equipment installed and other equipment, the installed equipment shall be neatly and clearly identified on such sheets.

C. These O&M manuals shall contain all the information needed to operate and maintain all systems and equipment provided in the project. Present and arrange information in a logical manner for efficient use by the County's operating personnel. The information provided shall include but not be limited to the following:

1. Equipment manufacturer, make, model number, size, nameplate data, etc.

2. Description of system configuration and operation including component identification and interrelations. A master control schematic drawings(s) may be required for this purpose.

3. Dimensional and performance data for specific unit provided as appropriate.

4. Manufacturer's recommended operation instructions.

5. Manufacturer's recommended lubrication and servicing data including frequency.

6. Complete parts list including reordering information, recommended spares and anticipated useful life (if appropriate). Parts lists shall give full ordering information assigned by the original parts manufacturer. Relabeled and/or renumbered parts information as reassigned by equipment supplier not acceptable.

7. Shop drawings.

8. Wiring diagrams.

9. Signal equipment submittals shall contain step-by-step circuit description information designed to acquaint maintenance personnel with equipment operation in each mode of operation.

10. A complete list of local (nearest) manufacturer representative and distributor contacts for each type of equipment and manufacturer. Include name, company, address, phone, fax, e-mail address, and web site.

D. Furnish complete wiring diagrams for each system for the specific system installed under the contract. "Typical" line diagrams will not be acceptable unless revised to indicate the exact field installation.

E. Group the information contained in the manuals in an orderly arrangement by specification index. Provide a typewritten index and divider sheets between categories with identifying tabs. Bind the completed manuals with hard board covers not exceeding 5" thick. (Provide two or more volumes if required.) Signal and communication systems shall be in separate volumes. Imprint the covers with the name of the job, Owner, Architect, Electrical Engineer, Developer and year of completion. Imprint the back edge with the name of the job, Owner and year of completion. Hard board covers and literature contained may be held together with screw post binding.

1.09 INSTRUCTION PERIODS

A. After Substantial Completion of the work and after the O&M manuals have been delivered to King County and after all tests and final inspection of the work by the Authorities Having Jurisdiction, demonstrate the electrical systems and instruct the County's designated operating and maintenance personnel in the operation and maintenance of the various electrical systems. The Developer shall arrange scheduled instruction periods for King County personnel. The Developer's representatives shall be superintendents or foremen knowledgeable in each system and supplier’s representatives when so specified. When more than one training session is specified, the second session shall be as agreed to by King County’s maintenance supervisor.

B. Include in each instruction session an overview of the system, presentation of information in maintenance manuals with appropriate references to drawings. Conduct tours of the building areas with explanations of maintenance requirements, access methods, servicing and maintenance procedures, equipment cleaning procedures and adjustment locations.

C. Include the following scheduled instruction periods: First Session Second Session

1.	Power Distribution System	4 hours	4 hours
2.	Lighting Control System	4 hours	4 hours
3.	Power Generation Equipment	4 hours	4 hours

D. Factory trained suppliers representatives shall provide instruction for lighting control/dimming and power generation equipment.

E. Provide one professionally produced video of each training session in DVD format. Furnish two copies to the County.

1.10 RECORD DRAWINGS

A. Continually record the actual electrical system(s) installation on a set of prints kept readily available at the project during construction. These prints shall be used for this purpose alone.

1. Mark record prints with red erasable pencil. Mark the set to show the actual installation where the installation varies substantially from the work as originally shown.

2. Accurately locate with exact dimensions all underground and underslab raceways and stub-outs.

3. Note changes of directions and locations, by dimensions and elevations, as utilities are actually installed.

4. Include addenda items and revisions made during construction.

5. Erase conditions not constructed or "X-out" and annotate "not constructed" to clearly convey the actual "as constructed" condition.

6. Organize record drawings sheets in manageable sets, bind and print suitable titles, dates and other identification on the cover of each set.

7. Final electrical as-built drawings for project identified in Section 16010, 1.07.B.4 will each be sealed and signed by the responsible electrical engineer for the project.

B. Transmit the record drawing set to the King County Project Representative at the completion of the work. Final payment to the Developer will not be authorized until these prints have been submitted to and accepted by the King County Project Representative.

C. Transfer the changes marked up on the record prints into AutoCAD Release 2007 (or higher) at the completion of the work. Provide two (2) sets of prints, one set of fixed line reproducible drawings and one set of AutoCAD drawing files on CD ROM. Transmit drawings, CAD files and the record drawing mark-ups to the King County Project Representative. Final payment to the Developer will not be authorized until these documents have been submitted to and accepted by the King County Project Representative.

1.11 FINAL ACCEPTANCE REQUEST

A. Submit to King County a Job Completion Form (form attached in this section) properly filled out.

1.12 ABBREVIATIONS AND DEFINITIONS

A. When the following abbreviations and definitions are used in relation to the work for Division 16 they shall have the following meanings:

Item	**Meaning**
AHJ	Authority Having Jurisdiction.
Boxes	Outlet, Junction or Pull Boxes.
Code	All applicable codes currently enforced at project location.
Compression	Compressed using a leverage powered (hydraulic or equivalent crimping tool.
Connection	All materials and labor required for equipment to be fully operational.
Exterior Location	Outside of or penetrating the outer surfaces of the building weather protective membrane.
Fully Operational	Tested, approved, and operating to the satisfaction of the AHJ, manufacturer and contract documents.
Furnish	Deliver to the jobsite
Install	To enter permanently into the project and make fully operational.
kcmil	Thousand circular mils (formerly MCM).
Mfr.	Manufacturer.
NEC	National Electrical Code, NFPA #70.
Noted	Shown or specified in the contract documents.
Provide	Furnish and install.
Required	As required by code, AHJ, contract documents, or manufacturer for the particular installation to be fully operational.
Shown	As indicated on the drawings or details.
Wiring	Raceway, conductors and connections.

PART 2 - PRODUCTS

2.01 GENERAL

A. All materials and equipment installed shall have been tested and listed by Underwriters Laboratories or other approved testing organization.

B. All materials to be new, free from defects and not less than quality herein specified. Materials shall be designated to insure satisfactory operation and operational life in the environmental conditions that will prevail where they are being installed.

C. Each type of materials furnished shall be of the same make, be standard products of manufacturers regularly engaged in production of such materials and be the manufacturer's latest standard design.

D. All materials, equipment and systems furnished that include provisions for storing, displaying, reporting, interfacing, inputting, or functioning using date specific information shall perform properly in all respects regardless of the century.

2.02 NAMEPLATES

A. Nameplates shall conform to Section 16075.

PART 3 - EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft. Handle all equipment carefully to prevent damage, breakage, denting, and scoring of finishes. Do not install damaged equipment.

B. Store products subject to damage by the elements above ground, undercover in a weather tight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instruction.

3.02 CUTTING BUILDING CONSTRUCTION

A. Locate cuttings so they will not weaken structural components. Cut carefully and only the minimum amount necessary. Cut concrete with diamond core drills or concrete saws except where space limitations prevent the use of such tools.

B. All construction materials damaged or cut into during the installation of this work must be repaired or replaced with materials of like kind and quality as original materials by skilled labor experienced in that particular building trade.

3.03 PAINTING

A. Items furnished under this Division that are scratched or marred in shipment or installation shall be refinished with touchup paint selected to match installed equipment finish.

3.04 EQUIPMENT CONNECTION

A. For equipment furnished under this or other Divisions of the specifications, or by Owner, provide complete all electrical connections necessary to serve such equipment and provide required control connections to all equipment so that the equipment is fully operational upon completion of the project. Provide disconnect switches as required by code.

3.05 HOUSEKEEPING PADS

A. Provide steel reinforced concrete housekeeping pad under each floor-mounted switchboard, transformer, motor control center, generator and/or other free standing electrical equipment. Size 4" greater (horizontal minimum) than base of equipment mounted thereon. Minimum height 3-1/2". Use 3000-psi (20.7-Mpa), 28-day compressive strength concrete and reinforcement as specified in Division 3 Section 03300 "Cast-in-Place Concrete". Chamfer edges and finish smooth with all blockouts square and plumb.

B. When housekeeping pad is poured on previously poured concrete or is for engine or motor driven equipment, the pad shall be reinforced (4# rebar, 12" o.c., both ways) and the rebar shall be tied to the existing floor via #4 rebar epoxy grouted into the existing concrete on 12" centers or other acceptable means. The existing slab shall be thoroughly cleaned and prepared for the pad just before the pour.

3.06 TESTING AND DEMONSTRATION

A. Demonstrate that all electrical equipment operates as specified and in accordance with manufacturer's instructions. Provide all instruments, manufacturer's operating instructions and personnel required to conduct the tests. Repair or replace any electrical equipment that fails to operate as specified and or in accordance with manufacturer's requirements.

ELECTRICAL JOB COMPLETION FORM

PROJECT NAME: King County DOT Metro Transit Div – Burien Transit Center

PROJECT LOCATION: _____

DATE: _____

A. Electrical Inspectors Final Acceptance (Copy of certificate attached.)

_____
Name Agency Date

B. Fire Marshal's Final Acceptance of Fire Alarm System (Copy of certificate attached.)

_____
Name Agency Date

C. Record Drawings Attached Transmitted previously to _____
Date

D. O & M Manuals Attached Transmitted previously to _____

E. Test Reports Attached Transmitted previously to _____
Date

F. The work is complete in accordance with contract documents

_____ at _____ on _____
Supervisor of Electrical Work Time Date

_____ _____
Contractors Rep. Signature Date

SUBMITTAL LIST King County Burien Transit Center

SECTION	DESCRIPTION	SUBMIT RECEIVE DATE	STATUS
16010	GENERAL ELECTRICAL PROVISIONS		
16030	ELECTRICAL TESTING		
16075	ELECTRICAL IDENTIFICATION		
16105	ELECTRICAL SITE WORK		
16120	CONDUCTORS AND CABLES		
16130	RACEWAY AND BOXES		
16140	WIRING DEVICES		
16210	ELECTRIC SERVICE		
16230	ELECTRIC POWER GENERATION EQUIPMENT		
16390	TEMPORARY POWER		
16415	AUTOMATIC TRANSFER SWITCHES		
16420	TRANSIENT VOLTAGE SURGE SUPPRESSION (TVSS) SYSTEM		
16452	GROUNDING		
16460	DRY-TYPE TRANSFORMERS		
16470	PANELBOARDS		
16476	DISCONNECT SWITCHES AND ENCLOSED CIRCUIT BREAKERS		
16481	MOTOR CONTROLLERS		
16500	LIGHTING		
16620	BATTERY INVERTER UNIT		
16721	FIRE ALARM SYSTEM		
16745	VOICE CABLING		
16930	LIGHTING CONTROL EQUIPMENT		

END OF SECTION

SECTION 16030
ELECTRICAL TESTING

PART 1 - GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational electrical installations on a Design-Build performance basis. It shall be the Electrical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

B. Test and provide written certification that the entire electrical installation complies with contract documents, code and proper system operation. Perform acceptance tests in accordance with manufacturer's recommendations, NFPA 70B and the latest edition of the International Electrical Testing Association (NETA) testing specifications NETA ATS.

C. Testing company. The following testing shall be performed by an independent testing company:

1. Service Grounding Test

2. Ground Fault Protection Systems Test & Calibration

3. Transformers Dry-Type

4. Automatic Transfer Switch Test & Calibration

5. Molded-Case Circuit Breakers

6. Metering Test & Calibration

1.02 SCHEDULE

A. Perform all testing after installation.

1.03 RECEPTACLE AND DEVICE TEST

A. Receptacle Polarity Test: Test every receptacle installed under this contract with a receptacle circuit tester. Tester shall test for open ground, reverse polarity, open hot, open neutral, hot and ground reversed. Rewire receptacles with faults and retest. Submit test report signed by electrician that performed the test.

B. Ground-Fault Receptacle Circuit Interrupter Tests: Test each receptacle or branch circuit breaker having ground-fault circuit protection to assure that the ground-fault circuit interrupter will not operate when subjected to a ground-fault current of less than 4 milliamperes and will operate when subjected to a ground-fault current exceeding 6 milliamperes. Perform testing using an instrument specifically designed and manufactured for testing ground-fault circuit interrupters.

C. Operational Tests: Demonstrate the operation of each switch, circuit breaker and other items of electrical control with the systems fully energized and operating. Each shall be demonstrated three times.

1.04 600 VOLT WIRING

A. Scope: Test all electrical feeders whose operating voltage is 600 volts or less that are installed under this contract.

B. Test for continuity of each circuit.

C. Test for grounds in each circuit which shall consist of the physical examination of the installation to ensure that all required ground jumpers, devices, and appurtenances do exist and are mechanically firm.

D. Perform a 500 volt megohm meter test on each circuit between the conductor and ground. The insulation resistance shall not be less than 2 megohms for circuits under 115V, 6 megohms between conductor and ground on those circuits (115V-600V) with total single conductor length of 2,500 feet and over, nor less than 8 megohms for those circuits (115V-600V) with single conductor length of less than 2,500 feet. If conductor fails test replace wiring or correct defect and retest.

E. Perform torque test for every conductor tested and terminated in an overcurrent device or bolted type connection.

1.05 POWER SYSTEM TESTS

A. Scope. Inspect and test entire electrical systems provided by this contract to verify equipment and controls are correctly operating.

B. Load Balance Tests: Checks all panelboards for proper load balance between phase conductors and make adjustments as necessary to bring unbalanced phases to within 15% of average load.

C. Motor Tests: Check all motors for proper rotation and measure actual load current. Submit tabulation of motor currents for all motors 1 HP or more after the HVAC system has been balanced.

D. Phase Relationship Tests: Check connections to all equipment for proper phase relationship. During such check, disconnect all devices which could be damaged by the application of voltage or reversed phase sequence.

E. Transformer Taps: Connect all transformers at "Normal" tap. After facility is completely occupied for two weeks, measure secondary voltages at all new and existing transformers. Forward a list to engineer including service switchboard voltmeter reading at the time of the test for evaluation. Reconnect taps as subsequently directed.

1.06 SERVICE GROUNDING TEST

A. Perform fall-of-potential tests on main grounding electrode system provided by this contract per IEEE Standard No. 81. Maximum resistance to ground shall be less than 10 ohms.

B. Confirm that the neutral is grounded only at the service equipment by removing the service neutral grounding conductor and meggering the neutral bus.

1.07 GROUND FAULT PROTECTION SYSTEMS TESTS

A. Scope. Test all ground fault systems provided by this contract.

B. Prior to test:

1. Inspect neutral main bonding connection to assure:

a. Zero sequence system is grounded upstream of sensor.

b. Ground connection is made ahead of neutral disconnect link.

c. Ground strap systems are grounded through sensing device.

d. Verify ground electrode conductor(s) for proper size and connection.

2. Inspect control power transformer to insure adequate capacity for system.

3. Monitor panels (if present) shall be manually operated for:

a. Trip test.

b. No trip test.

c. Non-automatic reset.

d. Proper operation and test sequence shall be recorded.

4. Ground fault device circuit nameplate identification shall be verified by device operation.

5. Pickup and time delay settings.

1.08 TRANSFORMERS, DRY-TYPE

A. Test dry-type transformers rated 150 kVA and over provided by this contract.

B. Visual and Mechanical Inspection.

C. Electrical Tests. Perform insulation resistance tests winding-to-winding and winding-to-ground.

1.09 MOLDED-CASE CIRCUIT BREAKERS

A. Scope. Test all new circuit breakers 100 amps and over within new switchboards and panelboards.

B. Inspect each breaker, operate manually, and electrically. Test shunt trips and alarm devices manually and electrically.

C. Adjust breaker trips to settings furnished by the coordination study and verify settings of the manufacturer's rating by passing controlled current through the trip devices. Record values and report deficiencies.

D. Circuit Breaker Electrical Tests

1.10 AUTOMATIC TRANSFER SWITCHES

A. Scope. Test Automatic Transfer Switches provided by this contract.

B. Visual and Mechanical Inspection

1. Electrical Tests. Monitor and verify correct operation and timing.

C. Perform insulation resistance tests phase-to-phase and phase-to-ground with switch in both source positions.

D. Set and calibrate various relays and timers.

1.11 METERING TEST & CALIBRATION FOR METERS

A. Scope: Test all new meters provided by this contract.

B. Instrument Transformers

C. Metering and Instrumentation

PART 2 - PRODUCTS

2.01 TESTING COMPANY

A. Retain the services of an independent testing company that is qualified to test electrical equipment, and is an approved testing company by the Washington State Department of Labor and Industries. Approved companies: Eaton Engineering Services and Systems Division (ESS), Electro-Test, Apparatus Service and Engineering Technology, Inc. (ASET), Siemens Westinghouse Technical Services.

B. Testing company shall prepare test reports on the systems they test.

2.02 TEST EQUIPMENT

A. The Developer shall provide all apparatus and material required for testing. The Developer shall use installation tools and test equipment which are designed for the specific task and shall use this equipment per the manufacturer's instructions. All test equipment shall have current calibration certification by a third party calibration laboratory, and shall have a signed and dated calibration sticker affixed to the device. Calibration shall be traceable to the National Institute of Standards and Technology.

PART 3 - EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 PROJECT DOCUMENTS

A. Deliver the following project documents to testing company two weeks prior to testing:

1. Division 16 Specification.
2. Electrical Floor Plans showing equipment to be tested.
3. Electrical One-Line Diagrams.
4. Submittals of Manufacturers Data and Shop Drawings.
5. Coordination Study.

3.02 TEST REPORTS

A. The Contractor shall prepare test reports including description of project, description of equipment tested, description of test, test results, conclusions and recommendations, retesting results and list of test equipment used and calibration date.

B. Insert a copy of each test report in the operation and maintenance manuals.

3.03 LABELS

A. Upon completion of the tests a label shall be attached to all serviced devices with date serviced and the testing company.

END OF SECTION

SECTION 16075
ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational electrical installations on a Design-Build performance basis. It shall be the Electrical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

B. Section Includes:

1. Engraved Plastic Laminate Nameplates
2. Wire and Cable Markers
3. Posted Drawings and Operating Procedures
4. Safety Signs
5. Lighting Identification

1.02 REFERENCES

A. American National Standards Institute (ANSI):

ANSI A13.1	Operational and Warning signs.
ANSI C136-15-1986	High Intensity Discharge and Low Pressure Sodium Lamps in Luminaires - Field Identification.

B. Occupational Safety and Health Administration (OSHA). 29 CFR - Labor Chapter XVII Part 1910-145 "Occupational and Safety Health Standards" 2005.

1.03 SUBMITTALS

A. Make submittals in accordance with Section 16010 General Electrical Provisions.

B. Submit a complete nameplate schedule to indicate nameplate size, lettering size and color.

PART 2 - PRODUCTS

2.01 ENGRAVED PLASTIC LAMINATE NAMEPLATES

A. Materials: Three-layer laminated plastic nameplate. Lettering height for panel or equipment identifier is 1/2". Remaining lines are 3/8" high with 1/8" spacing between lines.

1. Normal System: White letters on black background.
2. Emergency System: White letters on orange background per WAC 296-46B-700.
3. Comply with ANSI 13.1.

B. Panelboard Nameplates

1. Provide engraved plastic nameplate for each new panelboard with panelboard name, and voltage, phase and wire.

   Example:

Panel E3 **208Y/120V,3PH 4W**

C. Transfer Switches

1. Provide phenolic nameplate for each new automatic and manual transfer switch with the following information:

   Line1: Transfer switch name (i.e. ATS…)

   Line 2: Branch of Emergency system (Emergency, Legally Required Standby, Optional Standby)

   Line 3: Normal source feed

   Line 4: Emergency source feed

D. Disconnects, Starters, Combination Starters and Other Devices

1. Provide phenolic nameplate for each device with the following information:

   Line 1: Load served
   Line 2: Panelboard and circuit number from which device is fed
   Line 3: Fuse size or breaker size as applicable

E. Main Service Project Nameplate

1. At Main Service Distribution Switchboard, provide engraved nameplate on switchgear front with the following information:

   a. Panel Name: 1/2" lettering label panel name PA as "MAIN PANEL" as well.

   b. Project Name: (1/2" lettering, all other 3/8").

   c. Electrical Consultant (CB Engineers).

   d. Electrical Contractor.

   e. Year of Manufacturer.

2.02 WIRE AND CABLE MARKERS

A. Every conductor and every cable shall be tagged.

B. Tags for conductors shall be as follows:

1. Sleeve-type, legible, permanently coded, yellow PVC or heat-shrink polyolefin tubing, appropriately sized for the wire to which it is being applied. Sleeves shall be by Floy Tag and Manufacturing, Seattle, T&B, or approved equal.

2. Labeling shall be machine-printed.

C. Tags for cable shall be embossed metal or machine-printed plastic type manufactured by T&B, Floy Tag and Manufacturing, Seattle or Project Representative-approved equal.

2.03 POSTED DRAWINGS AND OPERATING INSTRUCTIONS

A. Print electrical riser diagrams on 20 lb. bond paper. Blue print paper is not acceptable. Reduce drawings to approximately 1/2 size using Xerox reduction process. Contact Project Representative to obtain updated original plans for printing.

B. Mounting Frames: Extruded aluminum, 4 point screw mount with 1/8" clear plexiglass cover.

C. Operating Instructions: Printed in all capital letters of 12 pt. size minimum.

2.04 SAFETY SIGNS

A. Comply with 29 CFR, Chapter XVII, Part 1910.145.

B. Engraved Plastic Signs: Engraving stock, melamine plastic laminate, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. in. (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.

1. Engraved legend with black letters on white face.

2. Punched or drilled for mechanical fasteners.

C. Baked-Enamel Signs for Interior Use: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for the application. 1/4-inch (6.4-mm) grommets in corners for mounting.

D. Exterior, Metal-Backed, Butyrate Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1mm) galvanized-steel backing; and with colors, legend, and size required for the application. 1/4-inch (6.4-mm) grommets in corners for mounting.

E. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32, stainless-steel machine screws with nuts and flat and lock washers.

2.05 HID LIGHTING FIXTURES

A. All "HID" lighting fixtures shall be identified, as required by ANSI C136-15, no alternate method will be accepted. Per the ANSI standard, the Markers for HPS fixtures shall have 2-inch black letters on a 3-inch square gold-yellow background, and markers for Metal Halide fixtures shall be 2-inch black letters on a 3-inch square red background.

PART 3 - EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 ENGRAVED PLASTIC LAMINATE NAMEPLATES

A. Provide nameplates secured to the front outside surface of equipment for the following:

1. Equipment identification labels including, but not limited to: panelboards, disconnect switches, motor starters, transformers, fixed equipment, light fixtures, and transfer switches.

2. Special equipment outlet labels. (1/4" letters).

B. Secure nameplate to equipment front using screws. Adhesive is unacceptable.

3.02 WIRE AND CABLE IDENTIFICATION

A. Provide wire markers for control wiring as indicated on schematic and interconnection diagrams or equipment manufacturer's Shop Drawings.

B. Provide identification labels with the following information in accordance with NEC 210.4(d). Conductors of power systems in this building are identified as follows:

	208Y/120V	480Y/277V
A Phase (left bus in panel):	Black	Brown
B Phase (center bus in panel):	Red	Orange
C Phase (right bus in panel):	Blue	Yellow
Neutral:	White	Gray
Equipment Ground:	Green	Green

1. 2.0 Mil, White Polyester, Permanent Adhesive Material. Peel-off self sticking type.

2. Lettering: Black #10 font Arial on white opaque background.

3. In electrical rooms and closets, maintenance/storage rooms, and other similar areas, post decal on front of panel, MCC, and /or switchboard.

4. In finished areas, where panel may be painted at a later time, post decal behind circuit breaker doors or behind dead front door where decal can be easily seen when circuits are being added.

C. For all feeder circuit wiring identify to and from ends with from and to information. Example: Panel E3 circuit 1, 3, 5 serves heat pump HP-101. At panel E3 wires would be identified as HP101-1, HP101-3, and HP101-5. At heat pump HP-101 wires would be identified as E3-1, E3-3, and E3-5.

D. Each feeder conduit will be identified at each to and from end with the feeder circuit number. Example: Panel E3 serving heat pump HP-101 is identified on the Feeder circuit schedule drawing as “Circuit” “C15”, “Equipment Identification” “HP-101”,

"Voltage" "480V, 3 phase", and "Function" "heat pump for electrical room". Each to and from end of the conduit will have a metal tag "C15".

3.03 RACEWAY AND JUNCTION BOX COLOR CODING (IDENTIFICATION)

A. Conduit Identification:

1. In accessible ceiling spaces and exposed in unfinished areas, using an indelible marking pen, label all conduits 1" larger with panel and circuit numbers of conductors routed through the conduit. Label conduit at all wall penetrations and connections to all panels, junction boxes, and equipment served.

3.04 WARNING SIGNS

A. General: Provide warning signs where there is hazardous exposure or danger associated with access to or operation of electrical facilities. Provide text of sufficient clarity and lettering of sufficient size to convey adequate information at each location; mount permanently in an appropriate and effective location. Comply with ANSI A13.1 standard color and design.

B. Operational Tags: Where needed for proper and adequate information on operation and maintenance of electrical systems, provide tags of plasticized card stock, either pre-printed or hand printed to convey the message; example: "DO NOT OPEN THIS SWITCH WHEN BREAKER IS CLOSED."

3.05 POSTED DRAWINGS AND OPERATING INSTRUCTIONS

A. Mount drawings and operating procedures on the wall immediately adjacent to the main piece of equipment for which the instructions apply. If sufficient wall space is not available, mount directly to one of the sheet metal panels of the equipment.

END OF SECTION

SECTION 16105
ELECTRICAL SITE WORK

PART 1 - GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational electrical installations on a Design-Build performance basis. It shall be the Electrical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

B. Provide all excavation, trenching, backfill and surface restoration required for the electrical work.

C. Provide complete, the support structure, consisting of pullboxes, manholes and reinforced concrete encased duct bank, for power and communication cable systems. Provide innerduct for telecommunications conduits.

D. See Civil specification sections for excavation, patching and surface refinishing requirements.

E. See Section 16130 for various raceway materials not specified in this section.

PART 2 - PRODUCTS

2.01 CONCRETE

A. Concrete shall be Class 5, manufactured with 3/4 inch aggregate and Type 1 cement.

2.02 ASPHALT

A. Asphalt shall be Class B, manufactured with MC-250 asphalt.

2.03 CRUSHED ROCK

A. Crushed rock shall be 1 1/4" minus unless smaller is required for bedding material.

2.04 SAND

A. Sand shall be clean and washed building sand.

2.05 TOPSOIL

A. Topsoil shall be equal in quality to that removed.

2.06 SOD

A. New sod shall be mature, densely rooted grass free of weeds and objectionable grasses.

2.07 PLANTS

A. Plants shall be obtained from a commercial nursery and be similar to those replaced.

2.08 CONCRETE ENCASED DUCT BANK

A. Type EB or Schedule 40 rigid polyvinyl chloride (PVC) conduit for straight sections. Rigid Galvanized Steel (RGS) conduit for bends.

B. Concrete: Comply with other applicable specification sections, 3000 psi strength minimum. Concrete shall be dyed red.

C. Duct supports (racks to hold duct during concrete placement): Plastic materials designed to maintain spacing requirements shown.

2.09 STEEL REINFORCED CONCRETE ENCASED DUCT BANK

A. Match concrete encased duct bank with the addition of reinforcing. Reinforcing deformed steel bar shall comply with other applicable specification sections.

2.10 DIRECT BURIED DUCT

A. Schedule 40 rigid polyvinyl chloride (PVC) conduit.

2.11 MANHOLES AND PULLBOXES

A. Manholes and pullboxes shall be precast reinforced concrete structures with knockouts at walls for duct entries. Manufactured by Utility Vault Company or Pacific International Pipe and Engineering, Inc. (PIPE).

B. Furnish each handhole with pulling eyes and framing channels.

C. Furnish communication system manholes with support rack on the walls as follows:

1. On each side wall, four (4) vertical racking strips 30" long.

2. On each end wall, one (1) vertical racking strip 30" long.

3. Each racking strip shall be clamped at two locations and shall carry three (3) cable support bars.

D. Furnish pullboxes with two cable support bars on each side directly mounted to framing channels on each side.

E. All diamond plate doors shall have a design loading per AASHO-H20. Manhole covers in paved areas shall be raised to allow a finish paving coat on top of the manhole.

F. Each cover and door shall be marked with raised or depressed lettering at least 1" high as follows:

1. Electrical Systems: "ELECTRIC"

2. Communication Systems: "COMMUNICATION"

G. Handhole shall be sized per the following:

1. Pullbox 36"x36"x36"H inside dimensions. Utility Vault or PIPE. Provide diamond plate door nominally 30" by 30" minimum inside opening.

PART 3 - EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 EXISTING UTILITIES

A. The existing utilities shown on the contract drawings have been plotted from available records. No guarantee is made to the accuracy of the locations indicated, and is shown for whatever benefit the Contractor may derive therefrom.

B. Contact all serving utilities and have them locate their lines prior to commencing work. Forty-eight (48) hours prior to commencing work telephone "Call Before You Dig" at 1-800-424-5555.

3.02 TRENCHING

A. Trenching shall be to depths as required by code, the particular installation, or as shown on the drawings. Trench width and length as required by the installation or as shown.

B. Trench bottom shall be free of debris and graded smooth. Where trench bottom is rock, or rocky, or contains debris larger than 1", or material with sharp edges, Contractor shall over excavate 6" and fill with 6" of sand.

C. Provide 1'-0" minimum separation between new electrical utilities and other utilities, except gas lines shall be 1'-0" both vertical and horizontal and shall be 3'-0" (horizontal) for all water service lines.

3.03 EXCAVATIONS

A. Excavation bottom shall be free of debris and graded smooth. Where bottom is rock, or rocky, or contains debris larger than 1", or material with sharp edges, over excavate 6" and fill with 6" sand.

B. Conform to utility requirements for excavation and vault installation.

3.04 DEWATERING

A. Provide, operate and maintain all pumps or other dewatering equipment required for control of water in trenches and excavations for electrical site work during the entire construction period.

3.05 SHORING

A. Provide as required by trenching and excavating to secure site work.

3.06 BACKFILL, BEDDING AND COMPACTION

A. Backfill around raceways per 16130.

B. Backfill around vaults and handholes to be free of debris larger than 1 3/4" in all directions to 1'-0" from vault.

C. Provide 0'-6" of pea gravel or sand bedding for all vaults, and any handholes larger than 3'-0" x 3'-0". For handholes smaller than 3'-0" x 3'-0" provide 0'-3" pea gravel or sand.

D. All other backfill shall be free of debris larger than 6" in diameter.

E. Place all backfill material so as to obtain a minimum degree of compaction of 95 percent of the maximum density at optimum moisture content.

F. Broken pavement, concrete, sod, roots and debris shall not be used for backfill.

3.07 SURFACE REFINISHING

A. Refinish every disturbed surface to its' original condition.

3.08 DUCT BANK

A. Note backfill and surface restoration requirements in Section 02200, Earthwork.

B. Each end of each duct shall be belled at manholes and pullboxes.

C. All bends located between handholes shall be 10' radius minimum. All offsets in straight runs shall begin and end with a 10 degree maximum change in direction. All bends midway in service entrance runs shall meet the requirement for runs between handholes. Vertical bends at power pole feeds and at building service entrances (thru floor) shall be permitted to be an RGS or IMC factory ell with PVC jacket with radius bends conforming to the following table:

Duct Size	Power Systems	Communication Systems
2"	30"	48"
3"	36"	48"
4"	48"	60"
5"	60"	60"

Where long cable runs are involved, sidewall pressures may require larger radius bends. All duct exposed above grade or above finished floor shall be RGS or IMC.

D. All duct bank shall be buried 36" minimum below proposed finish grade.

E. After duct bank is complete, clean each duct at least twice with a brush. Pull brush the same direction each time. Pull downhill with slope of duct.

F. Leave a nylon cord, at least 300# test, in each unused duct.

G. Provide marker tape over all underground duct. See 16130 for materials. Marker tape shall be 18" above top of duct bank. Use a detectable tape: Magnatec By Thor Enterprises, Inc.

3.09 HANDHOLES

A. Provide one ground rod in each handhole.

B. Pack and smooth non-shrink grout at all rough edges around duct entrances.

C. Remove loose dirt and debris after installation.

3.10 COMMUNICATION SYSTEMS

A. All communication systems support structure shall be steel reinforced concrete encased duct bank. Provide #1 rebar in each corner of the duct bank and hoop ties every 24" along the length of the duct bank.

3.11 INNERDUCT

A. Place four 1" innerducts in each 4" conduit. Furnish a pull cord in each run of innerduct. Allow at least 3 feet extension beyond each vault entrance.

END OF SECTION

SECTION 16120
CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational electrical installations on a Design-Build performance basis. It shall be the Electrical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

B. Section Includes:

1. Building wire and cable.

2. Remote control and signal circuits.

3. Splices, connectors, and terminations.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM).

B. National Electrical Manufacturers Association (NEMA).

C. Underwriter's Laboratories, Inc. (UL).

PART 2 - PRODUCTS

2.01 WIRE AND CABLE

A. General

1. Copper conductor, single insulated wire for sizes #1 and smaller.

2. ASTM B1 solid conductors; ASTM B8 for stranded conductors.

3. 600 volt insulation class, 90°C maximum operating temperature for dry and wet locations.

B. Thermoplastic Insulated Wires and Cables

1. Type THHN/ THWN, UL 83 listed, comply with NEMA WC70.

C. Rubber Insulated Wires and Cables

1. Type XHHW-2, UL 44 listed, comply with NEMA WC70.

2. Type USE-2, UL 44 listed, comply with NEMA WC70.

2.02 REMOTE CONTROL AND SIGNAL CIRCUITS

A. Class 1

1. Copper conductor, single insulated wire.

2. Insulation type THHN/ THWN (90°C), 600 volt insulation class.

B. Classes 2 and 3

1. Copper conductor, multiple twisted conductors covered with an overall non-metallic jacket.

2. 300 volt XLPE insulation rated 105°C.

2.03 SPLICES, CONNECTORS, AND TERMINALS

A. Splices

1. Electrical Tape: 7 mil thick, PVC backing with flexibility and adhesion at 0°F.

2. Pre-Stretched Tubing: EPR pre-stretched tubular rubber sleeve suitable for insulation of voltages up to 600 volts. 3M PST series or equivalent.

3. Heat Shrink Tubing: Thermally stabilized cross-linked polyolefin with 3 to 1 expansion and internal adhesive sealant. Thomas & Betts Shrink-Kon or equivalent.

4. Resin Filled Insulators: Plastic mold body with pourable insulating and sealing compound. 3M Scotchcast 82 or 90 series or equivalent.

B. Connectors

1. No. 10 AWG and Smaller: Pre-insulated “twist-on” type with integral spring and insulated housing per UL 486C. Manufacturers: Ideal, Thomas & Betts, or 3M.

2. No 8 AWG and Larger: Bolt or compression set type per UL 486C. Provide two hole compression set connectors for ground bus applications. Manufacturers: Thomas & Betts or O.Z. Gedney.

C. Terminals

1. Stranded Conductors #10 and Smaller: Comply with UL 486A.

2. Heavy wall thickness copper, tin plated with nylon insulation.

3. Thomas & Betts Sta-Kon Terminals.

4. Cable ties - nylon locking type. Thomas & Betts Ty-Rap.

2.04 TERMINATIONS

A. Compression set, bolted, or screw type lug or direct to bolted or screw type terminal.

2.05 PLASTIC CABLE TIES

A. Nylon or approved locking type.

PART 3 - EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 WIRE AND CABLE

A. Sizing

1. Use stranded conductors for all wire sizes.

2. Minimum power and lighting branch circuit requirement of #12 AWG.

3. Oversize neutral conductors, for possible non-linear loads, for receptacle circuits using common neutrals.

B. Color Coding

1. Color code wire in accordance with the coding shown below:

	208Y/120V	480Y/277V
A Phase (Left bus in panel):	Black	Brown
B Phase (Center bus in panel)	Red	Orange
C Phase (Right bus in panel)	Blue	Yellow
Neutral	White	Gray
Equipment Ground	Green	Green
Control Circuits	All Yellow	

2. If #8 and larger conductors cannot be purchased with the correct insulation color, color code the conductors with wire and cable markers of the appropriate color. Completely encircle the conductor with color coding tape for a minimum length of 6 inches at all accessible locations.

3. In the event that separate neutrals are specified with each phase conductor, provide a white neutral conductor with a tracer of the same color as the corresponding phase conductor.

C. Installation

1. Utilize type THHN/THWN wire for all power, lighting circuits except where the ambient temperature is below 0°C, use Type XHHW installation.

2. Install all wiring in a raceway system.

3. Install wire only after building interior has been protected from the weather.

4. Use suitable wire pulling lubricant for building wire 4 AWG and larger.

5. Neatly train and lace wiring inside boxes, equipment and panelboards.

6. Provide conductor vertical supporting device as required by NEC 300-19.

7. Conductors from one system shall not be intermixed in the same raceway as another system unless shown otherwise. Examples of circuits not be to be intermixed are 480Y/277 with 208Y/120 volt circuits, emergency power, line voltage circuits with low voltage wiring, etc.

3.02 REMOTE CONTROL & SIGNAL CIRCUITS

A. Sizing - #16 AWG minimum.

B. Installation:

1. Install cables in conduit.

2. Use suitable cable fittings and connectors.

3.03 SPLICES, CONNECTORS & TERMINALS

A. Splices

1. Splice wires and cables only in accessible locations such as within junction boxes.

2. Make splices to carry full capacity of conductors with no perceptible temperature rise.

3. Make below-grade splices in manholes and handholes watertight with pre-stretched or heat shrinkable insulating tubing, or resin-filled insulator.

B. Connectors

1. Except where equipment is furnished with bolted or screw type lug, use compression set pressure connectors with insulating covers.

2. Use bolt or compression-set type with application of insulating tape, pre-stretched or heat shrinkable insulating tubing for splices and taps of #8 AWG copper conductors and larger.

3. Use pre-insulated “twist-on” connectors with integral spring for splices and taps of #10 AWG copper conductors and smaller.

C. Terminals

1. Insulate ends of spare conductors with electrical tape and identify spare circuit number where appropriate.

2. Eye type crimped terminal for removable screw type terminal. Forked torque terminal when screw terminal cannot be removed.

3. Cable ties: neatly bundle conductors and cables together for support. Size cable ties sufficiently to accommodate the multiple cables being supported.

END OF SECTION

SECTION 16130
RACEWAYS AND BOXES

PART 1 - GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational electrical installations on a Design-Build performance basis. It shall be the Electrical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

B. Section includes raceways, fittings, boxes, enclosures and cabinets for electrical and telephone wiring.

1.02 REFERENCE DOCUMENTS

A. American National Standards Institute (ANSI).

B. National Electrical Manufacturers Association (NEMA).

C. Underwriters Laboratories, Inc. (UL).

D. National Fire Protection Association (NFPA).

1.03 SUBMITTALS

A. Make submittals in accordance with Section 16010. Submit product data only for surface raceways and fittings, wireways, enclosures and cabinets.

PART 2 - PRODUCTS

2.01 RIGID METAL CONDUIT (RMC)

A. Rigid Steel Conduit: ANSI C80.1, UL 6.

B. Fittings: NEMA FB1, UL 514B, galvanized malleable iron or non-corrosive alloy threaded fittings. Erickson and watertight split couplings are permitted. Set screw and running thread fittings are not permitted.

C. Conduit Bodies and Fittings Manufacturers: American Electric; Bridgeport, Construction Materials Group, Crouse-Hinds; Div. of Cooper Industries, Emerson Electric Co.; Killark Electric Manufacturing Co.; Lamson & Sessions; Carlon Electrical Products; O-Z/Gedney; Unit of General Signal, Scott Fetzer Co.; Adalet-PLM; Spring City Electrical Manufacturing Co., Link Seal.

2.02 FLEXIBLE METAL CONDUIT (FMC)

A. Liquidtight Flexible Metal Conduit. UL 360, PVC weatherproof cover over flexible steel conduit. Fittings: galvanized or zinc coated.

2.03 RIGID NON-METALLIC CONDUIT (RNC)

A. Schedule 40 and 80: UL 651.

B. Fittings: NEMA TC3.

2.04 EXPANSION FITTINGS

A. Malleable iron, hot dip galvanized allowing 4”(100mm) (+/- 2” (50mm)) conduit movement. OZ/Gedney AX Series or equivalent by manufacturer listed in 2.1.D.

2.05 RACEWAY PENETRATION SEALS

A. Thruwall and Floor Seals: New construction - OZ/Gedney FSK Series.

2.06 RACEWAY SEAL FITTINGS

A. For one through four conductors: OZ/Gedney CSB Series.

B. For greater than four conductors: OZ/Gedney EYA Series with sealing compound.

C. Low temperature or hazardous locations: OZ/Gedney EYA Series with sealing compound.

2.07 METAL WIREWAYS

A. Material: Sheet metal, size and shape as indicated. Manufacturer’s standard finish. UL 870.

B. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

C. Manufacturer: Hoffman Engineering Co., Keystone/Rees, Inc., Square D Co., Circle AW or equivalent.

D. Wireway Covers: Hinged type.

2.08 ENCLOSURES AND CABINETS

A. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

B. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage, and include accessory feet where required for freestanding equipment.

2.09 OUTLET JUNCTION AND PULL BOXES

A. Interior Wiring:

1. Outlet and Pull Boxes. Pressed steel, zinc coated with plaster ring where applicable. NEMA OS1, UL 514A.

2. Large Junction and Pull Boxes. Fabricated sheet steel, zinc coated or baked enamel finish, with return flange and screw retained cover.

3. Concrete and Masonry. Specifically designed boxes for casting in concrete or mounting in masonry walls for that purpose.

4. Mounting. Provide boxes with fan side box support Caddy J1A series or Caddy quick mount H series.

5. Boxes in slabs on grade or top floor/roof: Cast or malleable iron or cast of corrosion resistant alloy, complete with conduit hubs, compatible with raceway to which it is connected. NEMA FB1.

B. Exterior Wiring:

1. Above Grade:

a. Outlet and junction boxes: Cast or malleable iron or cast of corrosion resistant alloy, complete with conduit hubs, compatible with raceway to which it is connected. NEMA FB1.

b. Pull boxes: Fabricated steel and hot dipped galvanized complete with malleable iron hubs.

c. All boxes labeled for damp (NEMA 3R) or wet (NEMA 4) locations as applicable. This includes boxes in the open parking garage areas.

2. Below Grade:

a. Where exposed to earth: Constructed of precast concrete with size, configuration, cover, grates and reinforcing as required by the particular installation. Manufacturer: Utility Vault or Renton Concrete Products or approved equivalent.

2.10 SOUND ISOLATION PADS

A. Polybutene putty sheet caulking with inert fillers. Lowry's outlet box pads (available from Harry A. Lowry & Associates, 11176 Penrose St., Sun Valley, CA 91352, phone (818) 768-4661), Kinetics Fire Rated outlet pad, or equivalent.

PART 3 - EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 WIRING METHODS

A. Interior: Use the following wiring methods:

1. Exposed: Rigid Steel Conduit (RGS) only.

2. Exposed Subject to Damage (i.e. from vehicles, carts and moving pallets including stubups in concrete): Rigid Steel Conduit (RGS).

3. Connection to Vibrating Equipment (including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): Liquidtight Flexible Metal Conduit with 90 degree loop, maximum 6 feet long.

4. Boxes in Exposed Areas (even if recessed in walls that are in exposed areas, including in columns or walls that are exposed to outdoor temperatures): Cast or malleable iron or cast of corrosion resistant alloy. No pressed metal boxes.

5. Minimum Size: 3/4" trade size minimum.

B. Exterior: Use the following wiring methods:

1. Exposed: Rigid Steel Conduit.

2. Concealed: Rigid Steel Conduit.

3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): Liquidtight Flexible Metal Conduit.

4. Boxes and Enclosures: NEMA 250, NEMA type 3R or type 4.

5. Minimum Size: 3/4" trade size minimum.

C. Raceway Embedded in Slabs

1. Install in middle third of slab thickness and leave at least 1-inch (25-mm) concrete cover. Coordinate with structural prior to bid.

2. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.

3. Protect stub-ups from damage where conduits rise through floor slabs. Transition from nonmetallic conduit to rigid steel conduit before rising above floor.

4. Minimum Size: 1" trade size minimum.

5. All embedded conduit to be Rigid Steel Conduit (RGS).

D. Raceways Underground

1. Rigid Nonmetallic Conduit, Schedule 80 except use plastic coated RGS in all paved areas.

2. Arrange and slope raceways entering building to drain away from building.

3. Provide marker tape over underground raceways. Marker tape to read "Caution - Electric Line Buried Below". Install 1'-0" below grade. Use a detectable tape: Magnetic By Thor Enterprises, Inc.

4. Install underground raceways a minimum of 24" below final grade (36" on public property).

5. Provide backfill around underground raceways. Use 3/4" minus material 6" above and below rigid steel conduit. Use clean sand 6" above and below PVC raceways. Backfill above 6" free of debris or rocks greater than 1" in diameter. Space raceways 7-1/2" minimum between centers and 3" minimum between raceways.

6. Anchor raceways encased in concrete to prevent floating during pour.

7. Minimum Size: 1" trade size minimum.

3.02 INSTALLATION

A. Provide raceways embedded in concrete except when entering main electrical and communication rooms.

B. Install raceways level and square and at proper elevations. Provide not less than 6'-6" headroom. Do not block access to light fixtures, junction boxes, valves, mechanical equipment or prevent removal of ceiling panels, etc.

C. Terminations: Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against the box.

D. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb (90-kg) tensile strength.

E. All raceways shall be a trade size of 3/4" minimum. Size raceways per NFPA 70 Appendix C, but with a 3/4" minimum. Size raceways for signal and communications systems per the shop drawings, but 3/4" minimum.

F. Maintain 12” minimum clearance to high temperature (greater than 90° C) surfaces.

3.03 RIGID METAL

A. All connections watertight. May be used as specified in 3.02 above.

B. Provide plastic coated rigid steel conduit for all exposed exterior raceways.

3.04 RIGID NONMETALLIC CONDUIT

A. May be used as specified in 3.02 above. Exception: Use rigid steel for elbows, penetrations through floors and walls and stub ups.

3.05 RACEWAY PENETRATION SEALS

A. Exterior wall surfaces above grade: Provide watertight seal around all raceways. For concrete construction above ground level, cast raceway in wall or core drill wall and hard pack with a mixture of equal parts of sand and cement.

B. Exterior surfaces below grade: Provide watertight seal around all raceways. Cast raceway into wall (or floor) or use manufactured seal assembly.

C. Fire rated construction: Seal penetrations to maintain fire rating of construction penetrated. Seal with UL Listed sealant.

3.06 RACEWAYS SEALING FITTINGS

A. Provide watertight seal in the interior of all raceways which pass through, ground floor slab or through outside walls of the building above or below grade. Seal on the end inside the building, using raceway sealing fittings manufactured for the purpose. Locate fittings at suitable accessible locations. For concealed raceways install each fitting in a flush steel box with a blank coverplate to match finish of adjacent plates or surfaces. Exception: Sealing fittings are not required on raceways through the floor slab when the raceway does not extend beyond the building footprint.

3.07 HANGERS FOR RACEWAYS

A. Raceways 1" and larger: Provide lay-in pipe hangers on 3/8" or larger all threaded rods attached to metal ceiling inserts or to structural members at not greater than 10'-0" on center and within 12" of each change in direction.

B. When more than two raceways will use the same routing, group together on a channel trapeze support system supported by 1/2" (minimum) threaded rods attached to metal ceiling inserts or structural members. Size supports for multiple raceways for 25% future capacity.

3.08 EXPANSION FITTINGS

A. Provide expansion fittings for raceways crossing expansion joints, building separation walls, and seismic joints. Provide bonding jumper.

3.09 CABLE SUPPORTS

A. Provide cable support for vertical cable runs as required by NFPA 70.

3.10 STUB-UP CONNECTIONS

A. Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with the finished floor. Extend conductors to equipment with rigid steel conduit; sealtite may be used 6 inches above the floor. For future equipment connections install threaded plugs flush with floor.

3.11 OUTLET AND JUNCTION BOXES

A. Firmly anchor boxes directly or with concealed bracing to building studs or joists. Boxes must be so attached that they will not "rock" or "shift" when devices are operated.

B. Flush Mounting: Install front edge (box or plaster ring) even with the finished surface of the wall or ceiling, except for those mounted above accessible ceilings or where drawings indicate surface mounting is permitted.

C. When boxes are installed in fire resistive walls and partitions provide 24” horizontal separation between boxes on opposite sides of a wall in accordance with UBC 709.7 Membrane Penetrations.

3.12 ELECTRICAL OUTLETS

A. General: Check and verify outlet locations indicated on Architectural drawings, door swings, installation details and layouts of suspended ceilings and locations of all plumbing, heating and ventilating equipment.

3.13 CONNECTION TO EQUIPMENT

A. Provide outlet boxes of sizes and at locations necessary to serve equipment furnished under this or other Divisions and provide final connections to all equipment.

3.14 BLANK COVERS

A. Provide blank covers or plates to match coverplates specified in section 16140 over all boxes that do not contain devices or are not covered by equipment.

3.15 DEVICE BOXES CONTAINING EMERGENCY AND NORMAL DEVICES

A. Permitted only with steel barrier manufactured especially for the purpose of dividing the box into two completely separate compartments.

3.16 DEVICE BOXES CONTAINING MULTIPLE DEVICES AND WIRING RATED OVER 150 VOLTS TO GROUND AND OVER 300 VOLTS BETWEEN CONDUCTORS

A. Permitted only with steel barrier manufactured especially for the purpose of dividing the box into separate compartments for each device having exposed live parts.

3.17 JUNCTION OR PULL BOXES

A. Pull and junction boxes: Install as necessary to facilitate pulling of wire and to limit the number of bends within code requirements.

B. Permanently accessible.

C. Do not intermix conductors from one system in same junction box or pull box as another system.

3.18 BOXES IN EARTH

A. Provide for all wire splices and as required to pull conductors. Set boxes (handholes) smaller than 3’ x 3’ in place on a 3" sand or pea gravel bed. Set larger boxes with a 6" bed.

B. Set boxes so that coverplates match the slope of, and are flush with the final surface grade.

3.19 COLOR CODING

A. Color Code all junction boxes installed in accessible ceiling spaces and exposed in unfinished areas using spray paint on the box and entire cover in the following manner:

480 Power	Brown	Telephone	Black
277V Lighting	Yellow		
120/208V	Unpainted		
Emergency Power	Orange		
Fire Alarm	Red		

B. Use black felt tip marker following painting to indicate the circuit numbers in 1" high letters contained within.

END OF SECTION

SECTION 16140
WIRING DEVICES

PART 1 - GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational electrical installations on a Design-Build performance basis. It shall be the Electrical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

B. This section includes switches, receptacles, dimmers, device plates and multi-outlet assemblies.

1.02 REFERENCES

A. National Electrical Manufacturers Association (NEMA).

B. Underwriters Laboratories (UL).

1.03 SUBMITTALS

A. Make submittals in accordance with Section 16010. Submit product data for each device utilized in the project.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Subject to compliance with requirements, provide products by one of the manufacturers listed in the following paragraphs. All devices utilized on the project shall be from the same manufacturer.

2.02 RECEPTACLES

A. Specification Grade: Federal Specification WC-596F, back and side wired, duplex NEMA 5-15R configuration (15 amp, 120V), nylon face, unless shown otherwise. Arrow Hart 52<u>6</u>2-GRY, Bryant 52<u>6</u>2-GRY, Eagle 52<u>6</u>2GY, Hubbell 52<u>6</u>2-GRY, Leviton 52<u>6</u>2-GY, or Pass & Seymour 52<u>6</u>2-GRY.

B. Ground Fault Circuit Interrupter (GFCI) Receptacle: Specification Grade, NEMA 5-15R configuration, duplex receptacle with 4-6 milliamps leakage current trip level. Feed through type to protect downstream receptacles on the same circuit. Arrow Hart GF-5242-GRY, Eagle GF15G, Hubbell GF-5252-GRY, Leviton 6599-GRY, or Pass & Seymour 1591-SGRY.

C. Provide 20 amp specification grade devices where indicated or where connected to dedicated 20 amp circuits. Device shall be of the same manufacturer of the 15 amp devices.

D. Provide 50 NEMA Type 5-30 receptacles with weatherproof covers (if required) for electric car battery charging system.

2.03 SWITCHES

A. Specification Grade, Federal Specification WS-896, back and side wired, rated 277 volt, 20 amp. Single pole, double pole, keyed, 3- way, pilot light, locking type as required or as noted. Arrow Hart 1221-GRY, Bryant 4901-GRY, Eagle 2221GRY, Hubbell 1221-GRY, Leviton 1221-GRY, or Pass & Seymour 20AC1-GRY.

B. Interchangeable type rated same as above.

C. Switches with integral occupancy sensors -- 180 degree coverage, 120/277 volt dual rating, isolated dual relays, digital time delay from 30 seconds to 30 minutes, adjustable sensitivity from 20% to 100%, built-in light level sensor from 10 to 150 foot-candles on secondary relay, Fresnel lens. Wattstopper, Leviton, Pass & Seymour, Hubbell.

2.04 DEVICE PLATES

A. Configuration: Single and combination type to match corresponding wiring devices.

B. Attachment Screws: Metal with head color to match plate finish.

C. Interior Recessed Boxes: Stainless steel Type 430 with satin finish.

D. Interior Surface Boxes: Pressed raised steel to match size of outlet box. Pressed raised steel boxes are not to be used for surface mounting. Use only when concealed. Use cast box for surface mounted applications.

E. Exterior: Weatherproof hinged cover, Bell RCV1-GFR, Pass & Seymour 4512, Hubbell WP26 for vertical GFCI. For other receptacles provide cover to match receptacle.

F. Identification: Device plates shall be provided with engraved laminated phenolic nameplates with 1/8 inch white characters on black background. Nameplates for switches shall identify panel and circuit number and area served. Nameplates for receptacles shall identify circuit and voltage if other than 120 volts, single phase.

2.05 CORD AND PLUG SETS

A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.

1. Cord: Rubber-insulated, stranded-copper conductors, with type SOW-A jacket. Green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.

2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

PART 3 - EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 MOUNTING

A. Rigidly fasten (without play) outlet boxes and devices at proper position with wall to bring receptacle flush with plate or switch handle the proper distance through plate. Align devices and plates plumb.

B. Mount electric car battery charging system outlets 36 inches above finished floor.

3.02 RECEPTACLES

A. Provide 15 amp receptacles in all locations except provide 20 amp receptacles on dedicated 20 amp circuits.

B. Provide weatherproof, GFCI receptacle for all outdoor receptacles and other locations shown on the drawings.

3.03 ORIENTATION

A. Set switches with handle operating vertically, up position "ON". Set receptacles vertically with ground pin up or when construction requires horizontal mounting ground pin left.

3.04 DEVICE PLATES

A. Provide for wiring devices, telephone and signal outlets. Plate to cover cutout for device outlet box.

END OF SECTION

SECTION 16210
ELECTRICAL SERVICE

PART 1 - GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational electrical installations on a Design-Build performance basis. It shall be the Electrical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

B. Provide permanent service entrance complete and fully operational.

C. Coordinate with Seattle City Light (SCL) and extend circuits from the interface point.

1.02 UTILITY CHARGES

A. Contact SCL and determine any utility charges. Developer performing the work of Division 16 shall pay for and include these charges.

PART 2 - PRODUCTS

2.01 SERVICE ENTRANCE EQUIPMENT

A. Provide complete as required. See Section 16470 "Panelboards".

2.02 RACEWAYS, CONDUCTORS, ETC.

A. Provide complete as required. Refer to applicable portions of this specification.

PART 3 - EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 Provide CT enclosure, current transformer space, meter bases and metering conductors per utility requirements. Determine SCL service requirements.

3.02 GROUNDING

A. Provide service grounding and bonding per code. See Section 16452.

3.03 WORK BY SCL

A. SCL will provide:

1. Utility Poles

2. Primary voltage conductors from existing SCL manhole to padmount transformer.

3. Padmount transformer.

4. Termination of service entrance conductors at padmount transformers.

5. Current transformers.

6. Meter.

3.04 WORK BY CONTRACTOR

A. Contractor shall provide:

1. All work not provided by SCL as required for a complete and fully operational electrical service.

2. Rebar-reinforced concrete-encased service entrance conduits and service entrance conductors from the SCL padmount transformer to the main switchboard.

3. Rebar-reinforced concrete-encased ductbank between the SCL point of connection to the padmount transformer.

4. Vault below the SCL padmount transformer sized per their requirements.

5. Grounding rods and service grounding per code.

6. All metering raceways and conductors per SCL requirements.

7. Current transformer enclosure per SCL requirements.

8. Meter base per SCL requirements.

9. Service entrance equipment.

B. Provide the service as required to totally conform with SCL requirements.

END OF SECTION

SECTION 16230
ELECTRIC POWER GENERATION EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational electrical installations on a Design-Build performance basis. It shall be the Electrical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

B. Provide an engine-generator set together with all required operating accessories properly assembled to give a complete and fully operational power generation system. The engine and alternator shall be the product of one manufacturer or a combination of two manufacturer's equipment regularly assembled by the supplier as a complete package in this size and configuration.

C. The equipment manufacturer(s) and the authorized supplier shall have complete responsibility for the performance of the engine-generator set and its accessories. Set shall be new, latest production model factory assembled and tested prior to delivery to job site.

D. Mount generator as a fully enclosed sound attenuated modular enclosure, designed for a maximum noise of 60dBA at 100 feet, to be skid mounted. Entire unit shall be self-contained to be dropped into the location indicated on the floor plan drawings.

E. Provide all necessary controls and accessories which, used with the engine-generator set, will make a complete operating package for installation up to 500 feet above sea level in an ambient temperature of 40 degrees C. maximum, -10 degrees C. minimum.

1.02 RELATED DOCUMENTS

A. Refer to Division 15 for natural gas service specifications.

1.03 TO QUALIFY AS AN ACCEPTABLE MANUFACTURER AND/OR SUPPLIER

A. Fulfill the following requirements:

1. Shall have been in the business of distributing and/or installing and maintaining the specific type of engine-generation equipment under the present firm name for at least five years.

2. Shall have the capability of dispatching a maintenance or repair truck with a qualified factory trained repairman and spare parts to the job site within four (4) hours of a request for service on the equipment.

3. Equipment shall be the product of a firm that has regularly assembled and/or manufactured such equipment for at least five years.

4. Bidders will not be considered unless there is a local office (within 100 miles of project site) with six or more factory-trained representatives who have been under their direct employment for a period of at least one year. All bidders shall maintain a stock of spare parts that would minimize system down time in case of a

component failure. Parts and service support shall not require crossing of international borders.

5. Shall be authorized engine distributor for the prime mover.

1.04 APPLICABLE CODES AND STANDARDS

A. The generator set and its installation and on-site testing shall conform to the requirements of the following codes and standards:

1. CSA C22.2, No. 14 – M91 Industrial Control Equipment.

2. CSA 282, 1989 Emergency Electrical Power Supply for Buildings.

3. IEC 8528 part 4. Control Systems for Generator Sets.

4. IEEE 446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.

5. NEMA ICS 10-1993 – AC Generator sets.

6. NFPA 70 – National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.

7. NFPA 110 – Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1 prototype tests required by this standard shall have been performed on a complete and functional unit, component level type tests will not substitute for this requirement.

8. UL 2200. The genset shall be listed to UL 2200 or submit to an independent third party certification process to verify compliance as installed.

B. The generator set manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

1.05 RATING

A. The engine-generator set rating shall be based on operation of the set when equipped with all the necessary operating accessories (radiator fan, exhaust silencer, air cleaners, lubricating oil pump, lubricating oil filters, fuel priming pump, fuel injection pump, jacket water pump, governor, alternating current generator and exciter regulator).

B. The engine-generator set shall be capable of producing not less than rated KW (with a 0.8 power factor load) continuously for standby power applications at the altitude and ambient temperature conditions as noted above.

C. On closing of the starting contact, engine generator shall be capable of accepting full rated load and stabilizing at rated voltage plus or minus (+/-) 5 percent of rated frequency, within 8 seconds.

1.06 SERVICE EQUIPMENT SIGN

A. Provide a sign at the service entrance main disconnect(s) to identify type and location of on-site emergency power source per NEC 700-8.

1.07 SHOP DRAWINGS & SUBMITTAL DATA

A. Prepare and submit for review prior to manufacture. Include the following information:

B. Dimensioned clearance drawings of the engine generator set including bolting template, earthquake restraints, and location of all stub ups for fuel and electrical connections.

C. Literature describing the engine-generator set including the following data in tabulated form:

1. Engine make and type
2. Number of cylinders
3. Make and type of generator
4. Generator electrical rating KVA, KW power factor and winding arrangement and voltage configuration.
5. Number and type of bearings (for generator and for engine)
6. Type of exciter and voltage regulator
7. Type and manufacturer of engine governor
8. Certification of factory vibration test report and torsional analysis
9. Certified engine horsepower curves
10. Engine generator control and monitoring panel

D. Drawings and/or literature describing the accessories including:

11. Batteries and rack
12. Battery charger and wiring diagrams
13. Jacket water heater
14. Silencer, exhaust adapter and other exhaust system components
15. Remote annunciator descriptions and wiring diagrams
16. Control wiring diagrams
17. Sound attenuated enclosure.

1.08 WARRANTY

A. The generator set and associated equipment shall be warranted for a period of not less than 5 years from the date of commissioning against defects in materials and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

C. The warranty shall be from the single source manufacturer of the complete generator covering engine, alternator, and controls. Multiple warranties are not allowed.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Acceptable manufacturers of Engine-generator set and accessories: Cummins Power Generation, Caterpillar, Kohler, and Pacific Power Products – MTU Detroit Diesel (aka MTU On-Site Energy).

2.02 GENERATOR SET

A. Ratings

1. The generator set shall operate at 1800 rpm and at a voltage of: 480Y/277 volts AC, three phase, four wire, 60 hertz.

2. The generator set shall be rated at designed KW rating at 0.8 PF, standby rating, based on the following site conditions: Altitude 500ft; ambient temperatures up to 40 degrees C.

3. The generator set rating shall be based on emergency/standby service.

4. Provide on-board main circuit breakers with ratings to match rated generator full load output at rated voltage. Circuit breakers shall be insulated case type and selectively coordinate with the downstream loads per Section 16470.

B. Performance

1. Voltage regulation shall be plus or minus 1.0 percent for any constant load between no load and rated load for both parallel and non-parallel applications. Random voltage variation with any steady load from no load to full load shall not exceed plus or minus 0.5 percent.

2. Frequency regulation shall be isochronous from steady state no load to steady state rated load. Random frequency variation with any steady load from no load to full load shall not exceed plus or minus 0.25%.

3. The natural gas engine generator set shall be capable of single step load pick up of 100% nameplate kW and power factor, <u>after</u> applicable de-rating factors, with the engine generator set at operating temperature.

4. The generator set shall be capable of sustaining a minimum of 90% of rated no load voltage with the specified kVA load at near zero power factor applied to the generator set.

5. The alternator shall produce a clean AC voltage waveform, with not more than 5% total harmonic distortion at full linear load, when measured from line to neutral, and with not more than 3% in any single harmonic. Telephone influence factor shall be less than 40.

C. Construction:

1. The engine generator set shall be mounted on a heavy-duty steel base to maintain alignment between components. The base shall incorporate a battery tray with hold-down clamps within the rails

D. Connections

1. The generator set load connections shall be composed of silver or tin plated copper bus bars, drilled to accept mechanical or compression terminations of the number and type as shown on the drawings. Sufficient lug space shall be provided for use with cables of the number and size as shown on the drawings.

2. Power connections to auxiliary devices shall be made at the devices, with required protection located at a wall-mounted common distribution panel.

3. Generator set control interfaces to other system components shall be made on a common, permanently labeled terminal block assembly.

2.03 ENGINE AND ENGINE EQUIPMENT

A. The engine shall be natural gas fueled as the primary fuel source, radiator and fan cooled. The horsepower rating of the engine at its minimum tolerance level shall be sufficient to drive the alternator and all connected accessories. Engine accessories and features shall include provisions (provide piping stubs and valves and space) for a future automatic changeover to liquid propane in the event of loss of natural gas fuel source.

B. The engine generator set shall be mounted on a heavy-duty steel base to maintain alignment between components. The base shall incorporate a battery tray with hold-down clamps within the rails. Vibration isolators shall be provided between the engine/alternator and the generator set base.

C. An electronic governor system shall provide automatic isochronous frequency regulation.

D. Skid mounted radiator and cooling system:

1. Rated for full load operation in 104 degrees F (40 degrees C) ambient as measured at the generator air inlet, based on 0.5 in H2O external static head.

2. Radiator shall be sized based on a core temperature that is 20F higher than the rated operation temperature, or prototype tested to verify cooling performance of the engine/radiator/fan operation in a controlled environment.

3. Radiator shall be provided with a duct adapter flange.

4. The equipment manufacturer shall fill the cooling system with a 50/50-ethylene glycol/water mixture.

5. Rotating parts shall be guarded against accidental contact.

E. Electric starter(s) capable of three complete cranking cycles without overheating.

F. Positive displacement, mechanical, full pressure, lubrication oil pump.

G. Full flow lubrication oil filters with replaceable spin on canister elements and dipstick oil level indicator.

H. Provide a complete engine fuel system, including all pressure regulators, strainers, and control valves. The fuel system shall be plumbed to the generator set skid for ease of site connections to the generator set.

I. Replaceable dry element air cleaner with restriction indicator.

J. Flexible supply fuel line.

K. Provide automatic fuel transfer valve that automatically switches the fuel source from natural gas to propane source.

L. Engine mounted battery charging alternator, 40-ampere minimum, and solid state voltage regulator.

M. Coolant heater

1. Engine mounted, thermostatically controlled, coolant heater(s) for engine. The coolant heater shall be UL499 listed and labeled.

2. The coolant heater shall be installed on the engine with silicone hose connections. Steel tubing shall be used for connections into the engine coolant system wherever the length of pipe run exceeds 12 inches. The coolant heater installation shall be specifically designed to provide proper venting of the system. The coolant heaters shall be installed using quick disconnect couplers to isolate the heater for replacement of the heater element. The quick disconnect/automatic sealing couplers shall allow the heater element to be replaced without draining the engine cooling system or significant coolant loss.

3. The coolant heater shall be provided with a 12VDC thermostat, installed at the engine thermostat housing. An AC power connection box shall be provided for a single AC power connection to the coolant heater system.

4. The coolant heater(s) shall be sized as recommended by the engine manufacturer to warm the engine to a minimum of 100F (40C) in a 40F ambient, in compliance with NFPA 110 requirements, or the temperature required for starting and load pickup requirements of this specification.

N. Provide vibration isolators, spring/pad type, quantity as recommended by the generator set manufacturer. Isolators shall include seismic restraints if required by site location.

O. Starting and Control Batteries shall be calcium/lead antimony type, 12 volt DC, sized as recommended by the engine manufacturer, complete with battery cables and connectors.

P. A UL listed/CSA certified 10 amp voltage regulated battery charger shall be provided for each engine generator set. Input AC voltage and DC output voltage shall be as required. Chargers shall be equipped with float, taper and equalize charge settings. Operational monitors shall provide visual output along with individual form C contacts rated at 4 amps, 120 VAC, 30VDC for remote indication of:

Loss of AC power red light
Low battery voltage red light
High battery voltage red light
Power ON green light (no relay contact)

Charger shall include an Analog DC voltmeter and ammeter, 12 hour equalize charge timer, and AC and DC fuses.

2.04 AC GENERATOR

A. The AC generator shall be; synchronous, four pole, 2/3 pitch, revolving field, drip-proof construction, single pre-lubricated sealed bearing, air cooled by a direct drive centrifugal blower fan, and directly connected to the engine with flexible drive disc. All insulation system components shall meet NEMA MG1 temperature limits for Class H insulation system. Actual temperature rise measured by resistance method at full load shall not exceed 105 degrees Centigrade.

1. The generator shall be capable of delivering rated output (kVA) at rated frequency and power factor, at any voltage not more than 5 percent above or below rated voltage.

2. A permanent magnet generator (PMG) shall be included to provide a reliable source of excitation power for optimum motor starting and short circuit performance. The PMG and controls shall be capable of sustaining and regulating current supplied to a single phase or three phase fault at approximately 300% of rated current for not more than 10 seconds.

2.05 ENGINE GENERATOR SET CONTROL:

A. A NEMA 1 enclosed control panel shall be mounted on the generator set with vibration isolators. The control shall be vibration isolated and prototype tested to verify the durability of all components under the vibration conditions encountered. The generator set mounted control shall include the following features and functions:

B. Three-position control switch labeled RUN/OFF/AUTO. In the RUN position the generator set shall start and accelerate to rated speed and voltage. In the OFF position the generator set shall immediately stop, bypassing all time delays. In the AUTO position the generator set shall be ready to accept a signal the automatic transfer switch to start and accelerate to rated speed and voltage.

C. RESET switch. The RESET switch shall be used to clear a fault and allow restarting the generator set after it has shut down for any fault condition.

D. PANEL LAMP switch. Depressing the panel lamp switch shall cause the entire panel to be lighted with DC control power.

E. Generator Set AC Output Metering: The generator set shall be provided with a metering set with the following features and functions:

1. Analog AC Voltmeter dual range, 90 degree scale, 2% accuracy, Analog AC Ammeter, dual range, 90 degree scale, 2% accuracy, Analog Frequency/RPM meter, 45 65 Hz, 1350 1950 RPM, 90 degree scale, +/- 0.6 Hz accuracy.

2. Seven-position phase selector switch with OFF position to allow meter display of current and voltage in each generator phase. When supplied with reconnectable generators, the meter panel shall be reconnectable for the voltage specified.

F. Generator Set Alarm and Status Display: The generator set shall be provided with alarm and status indicating lamps to indicate non automatic generator status, and existing alarm and shutdown conditions. The lamp condition shall be clearly apparent under bright room lighting conditions. The generator set control shall indicate the existence of the following alarm and shutdown conditions on the display panel:

1. low oil pressure (alarm)

2. low oil pressure (shutdown)

3. low coolant temperature (alarm)

4. high coolant temperature (alarm)

5. high coolant temperature (shutdown)

6. low coolant level (shutdown)

7. overcrank (shutdown)

8. overspeed (shutdown)

9. low fuel (alarm)

G. Engine Status Monitoring: The following devices shall be provided on the generator set control :

1. engine oil pressure gauge

2. engine coolant temperature gauge

3. engine operation hour gauge

4. battery voltage (DC volts)

H. Engine Control Functions. The control system provided shall include a cycle cranking system, which shall be for 3 cranking periods of 15 seconds each, with 15 second rest period between cranking periods. Fail to start shall be indicated by operation of the overcrank alarm indication lamp. The control system shall also include an engine

governor control, which functions to provide steady state frequency regulation as noted elsewhere in this specification.

I. Alternator Control Functions:

1. The generator set shall include an automatic voltage regulation system which is matched and prototype tested with the governing system provided. It shall be immune from misoperation due to load induced voltage waveform distortion and provide a pulse width modulated output to the alternator exciter. The system shall include a torque matching characteristic, which shall reduce output voltage in proportion to frequency below a threshold of 58 to 59 HZ.

2. Voltage adjusting rheostat, locking screwdriver type, to adjust voltage +/-5% from rated value;

J. The generator set shall be provided with a mounted main line circuit breaker, sized to carry the rated output current of the generator set on a continuous basis.

2.06 OUTDOOR WEATHER-PROTECTIVE SOUND ATTENUATING ENCLOSURE

A. The generator set shall be provided with a sound-attenuated housing which allows the generator set to operate at full rated load in the ambient conditions previously specified.

B. The enclosure shall reduce the sound level of the generator set while operating at full rated load to a maximum of 70 dBA at any location 7 meters from the generator set in a free field environment.

C. Housing configuration and materials used may be of any suitable design which meets application needs, except that acoustical materials used shall be oil and water resistant. No foam materials shall be used unless they can be demonstrated to have the same durability and life as fiberglass.

D. The enclosure shall include hinged doors for access to both sides of the engine and alternator, and the control equipment. Key-locking and padlock-able door latches shall be provided for all doors. Door hinges shall be stainless steel.

E. The enclosure shall be provided with an exhaust silencer that is mounted inside of the enclosure, and allows the generator set package to meet specified sound level requirements. Silencer and exhaust shall include a raincap and rainshield.

F. All sheet metal shall be primed for corrosion protection and finish painted with the manufacturer's standard color. All surfaces of all metal parts shall be primed and painted.

G. Painting of hoses, clamps, wiring harnesses, and other non-metallic service parts shall not be acceptable. Fasteners used shall be corrosion resistant, and designed to minimize marring of the painted surface when removed for normal installation or service work.

H. Engine-generator set and all associated components shall be contained within a custom made heavy-gauge steel, lockable, vandalproof, weatherproof enclosure with automatic opening intake and cooling air exhaust dampers. Other custom modifications include

those required to accommodate fuel tank, radiator guard, muffler guard, lockable fuel and radiator caps. Provide thermostatically controlled 500W, 120V heater in bottom of housing to keep the entire unit warm and prevent condensation. Prime paint enclosure all sides. Finish with two coats of exterior enamel.

2.07 FUEL, PIPING, EXHAUST AND VENTILATION

A. Refer to Division 15. The coordination of the mechanical and piping systems with the generator set installation shall be the responsibility of the generator set supplier.

PART 3 - EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 SEQUENCE OF OPERATION

A. Generator set shall start on receipt of a start signal from the automatic transfer switch (ATS).

B. The generator set control shall initiate the starting sequence for the generator set.

C. The starting sequence shall include the following functions:

1. The engine shall accelerate to rated speed and the alternator to rated voltage. Excitation shall be disabled until the engine has exceeded programmed idle speed, and regulated to prevent over voltage conditions and oscillation as the engine accelerates and the alternator builds to rated voltage.

2. When all start signals have been removed from the generator set, the generator set control shall switch off the excitation system and shall shut down.

3. Any start signal received after the time stop sequence has begun shall immediately terminate the stopping sequence and return the generator set to isochronous operation.

3.02 FACTORY TESTING

A. The generator set supplier shall perform a complete operational test on the generator set prior to shipping from the factory. A certified test report shall be provided. Equipment supplied shall be fully tested at the factory for function and performance.

B. Generator set factory tests on the equipment shall be performed at rated load and rated power factor. Generator sets that have not been factory tested at rated power factor will not be acceptable. Tests shall include: run at full load, maximum power, voltage regulation, transient and steady state governing, single step load pickup, and function of safety shutdowns.

3.03 INSTALLATION

A. Equipment shall be installed by the Contractor in accordance with final submittals and contract documents. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with

manufacturer's instructions and instructions included in the listing or labeling of UL listed products.

B. Installation of equipment shall include furnishing and installing all interconnecting wiring between all major equipment provided for the on-site power system. The contractor shall also perform interconnecting wiring between equipment sections (when required), under the supervision of the equipment supplier.

C. Equipment shall be installed on concrete housekeeping pads. Equipment shall be permanently fastened to the pad in accordance with manufacturer's instructions and seismic requirements of the site.

D. Equipment shall be initially started and operated by representatives of the manufacturer.

E. All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to final testing of the system.

F. Ground emergency generator as a separately derived system per NEC requirements. Provide ground rods, grounding electrode conductors, etc. Bond the neutral and ground at the generator together.

3.04 ON-SITE ACCEPTANCE TESTING:

A. The complete installation shall be tested for compliance with the specification following completion of all site work. Testing shall be conducted by representatives of the manufacturer, with required fuel supplied by Contractor.

B. Installation acceptance tests to be conducted on site shall include a "cold start" test, a two-hour full load test, and a one step rated load pickup test in accordance with NFPA 110. Provide a resistive load bank and make temporary connections for full load test, if necessary.

C. Perform a power failure test on the entire installed system. This test shall be conducted by opening the power supply from the utility service, and observing proper operation of the system for at least 2 hours. Coordinate timing and obtain approval for start of test with site personnel.

D. A certified copy of the test record shall be included in the O & M manual.

3.05 TRAINING

A. The equipment supplier shall provide training for the facility operating personnel covering operation and maintenance of the equipment provided. The training program shall be not less than 4 hours in duration and the class size shall be limited to 5 persons.

3.06 SERVICE AND SUPPORT

A. The manufacturer of the generator set shall maintain service parts inventory at a central location which is accessible to the service location 24 hours per day, 365 days per year.

B. The generator set shall be serviced by a local service organization that is trained and factory certified in generator set service. The supplier shall maintain an inventory of

critical replacement parts at the local service organization, and in service vehicles. The service organization shall be on call 24 hours per day, 365 days per year.

3.07 OPERATION AND MAINTENANCE MANUAL

A. Provide per Section 16010 with additional information as noted below.

B. Shall contain step by step instructions for startup and shutdown. The first page shall contain the name, address and phone number of the local representative to be called for service or parts. This shall be followed by a complete parts lists by actual ordering catalog numbers. Manual shall also contain four copies each of test record forms and service record forms for County use. These forms shall show the proper interval for test, servicing and replacement of all components, lubrication, filters, anti-freeze, etc., including recommended specifications for all lubricants.

C. A single copy of the service record forms, recommended operation and service practices for the unit shall be sealed in plastic and wall mounted in the generator room.

D. Instruction on maintenance procedures shall include proper interval for system tests and duration, replacement interval for fuel, oil and air filters; lube oil and coolant change; interval for fluid level checks (i.e. fuels, oil, lube oil, coolant and battery levels) as contained in the O & M manual test and service record forms.

E. Instructions shall be coordinated with those furnished under Section 16415, Automatic Transfer Switches.

END OF SECTION

SECTION 16390
TEMPORARY POWER

PART 1 - GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational electrical installations on a Design-Build performance basis. It shall be the Electrical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

B. The Developer is to provide temporary power service, see Divisions 0 & 1.

PART 2 - PRODUCTS

2.01 TEMPORARY LIGHTING

A. Temporary lighting per Washington Industrial Safety and Health Act (WISHA) requirements.

2.02 TEMPORARY DISTRIBUTION

A. Provide temporary transformers (both utility primary voltage to 480Y/277 volt and 480-208Y/120 volt), distribution panels, panelboards, power outlets, conduit, wire, cables, and boxes as required.

PART 3 - EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 MAINTAIN SERVICES

A. All services to be maintained for duration of the Contract.

3.02 UTILITY COORDINATION

A. Coordinate the availability of construction power with Seattle City LIght prior to bid, and provide vaults, and power distribution equipment, raceways, conduit/wire, cable, and "spider" power distribution boxes as required.

END OF SECTION

SECTION 16415
AUTOMATIC TRANSFER SWITCHES

PART 1 - GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational electrical installations on a Design-Build performance basis. It shall be the Electrical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

B. Provide all automatic transfer switches complete, fully operational and fully tested. Conform to UL Standard 1008.

PART 2 - PRODUCTS

2.01 TYPE

A. Transfer and retransfer to normal source shall be automatic. Automatic transfer switches shall be electrically operated, mechanically held and supplied with positive mechanical interlocking dual operator/switch mechanism. The main contacts shall be equipped with a safe manual override capability. UL 1008 listed meeting tables 21.1, 23.1, and 23.2.

B. Sensing and control logic may utilize solid state components mounted on printed circuit boards. Construction shall allow individual function replacement in the field without requiring replacement of the complete solid state package. The control panel shall meet or exceed the voltage surge withstand voltage test in accordance with IEEE/ANSI C37.90a-1974.

2.02 RATING

A. Shall have voltage, amperage and ampere withstand ratings per design.

B. Transfer switches used to transfer from normal to emergency power shall be approved for emergency service, full continuous ampere rated (no derating) with make rating at 20 times and break rating at 6 times full load current rating.

2.03 ACCESSORIES

A. The following accessories shall be provided as a minimum in addition to those normally required for proper operation.

1. Full three phase voltage failure with adjustable drop out and pick up. Set at 80% dropout, 90% pick up.

2. Signals. Two pilot lights for indicating transfer position. Green - normal, red - emergency at transfer switch. Auxiliary contacts for remote pilot lights.

3. Test switch. For simulating power failure.

4. Time Delay Before Engine Starting: Adjustable ride through feature of approximately 0-10 seconds for start of engine generator and transfer on

momentary loss of normal source. Set at 1 second. Include two auxiliary contacts, 1 N.O. and 1 N.C. for use for engine start signal.

5. Retransfer. Adjustable time delay (with emergency failure by-pass) of 0 to 30 minutes for retransfer to normal. Set at 15 minutes.

6. Generator Condition. Voltage and frequency sensitive lockout relay. Prevents transfer until voltage and frequency of generator have reached preset rating. Set at 95%.

7. Time Delay Neutral - Provide time delay with transfer switch in neutral position and load disconnected from either source, adjustable .2 to 50 seconds, to prevent transfer between sources when sources are significantly out of phase for transfer switches. Set at 5 seconds.

8. Block Transfer and Load Shed Relays - Provide relays in transfer switches and to prevent automatic transfer until a signal is received from the emergency generator control switchboard, and to initiate load shedding by driving the transfer switch to the neutral position.

9. Phase Reversal Relay. Sensing relay to prevent transfer to new source when phases are reversed from designed phasing.

10. Exerciser Clock. Shall set the day, time and duration of the generator exercise period and shall include a selector switch for choosing exercise with load transfer, without load transfer, or for bypassing the exercise period.

11. Elevator Signal Contacts: Provide two time delay contacts that open 1-120 seconds (adjustable) before transfer in either direction and reset after transfer.

12. Lighting controls -- Provide two NO/NC auxiliary contacts for emergency lighting override.

2.04 ENCLOSURE

A. Each transfer switch shall be enclosed in an enclosure suitable for the environment in which it is located, with front opening lockable door. Provide enclosure suitable for front and side access only.

2.05 SHOP DRAWINGS

A. Prepare and submit detailed shop drawings for review prior to manufacture. Include the following information: wiring diagrams, dimensions, front view and catalog information indicating complete electrical and mechanical characteristics.

2.06 NAMEPLATES

A. Provide engraved phenolic nameplates per 16075.

2.07 MANUFACTURER

A. All transfer switches shall be of the same manufacturer. Acceptable manufacturers are: Automatic Switch Company, Caterpillar, Onan, Kohler, Russelectric, and MTU On-Site Energy.

PART 3 - EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 MOUNTING

A. Wall mounted or free standing assembly with housekeeping pad. Bolt to wall and/or floor in a manner similar to that for switchboards and/or panelboards. Verify space available with equipment sizes and code required working clearances prior to submittal of shop drawings.

3.02 OPERATION TEST

A. Provide testing of transfer system coordinated with generator set and start control panel to ensure proper operation of transfer devices under actual operating conditions. Monitor and verify correct operation and timing of the following applicable items:

1. Normal voltage sensing relays.
2. Emergency voltage sensing relays.
3. Test switch.
4. Time delay neutral.
5. Engine start sequence.
6. Time delay upon transfer.
7. Interlocks and limit switch function.
8. Timing delay and re-transfer upon normal power restoration.
9. Engine cool-down time delay and shutdown.
10. Lighting controls override.

3.03 SEQUENCE

A. Any automatic transfer switch sensing loss of power shall start the emergency generator set and the set shall continue to run until after all transfer switches have returned to normal power (engine cool-down timer part of emergency generator set).

3.04 OPERATION AND MAINTENANCE MANUALS

A. Provide per Section 16010. Manuals shall in addition contain the following information:

1. Recommended testing and service intervals and routine maintenance.

2. Test and service record forms showing proper intervals for tests.

3. The first page of the manual shall contain the name, address and phone number of the local representative to be called for service and parts.

3.05 INSTRUCTION

A. The Contractor shall conduct an instruction session during which all maintenance and operational aspects of the system will be described and demonstrated to personnel selected by the County in conjunction with instruction period for Generator System Equipment, Section 16230. The session shall be conducted by a Contractor's representative thoroughly familiar with the characteristics of the system. O & M manual information regarding the system shall be turned over to King County prior to scheduling the instruction session.

3.06 WARRANTY

A. The manufacturer shall warranty the transfer switches against failures which result, under normal use and service, from defects in workmanship and materials. Warranty shall be for parts and labor for two years from date of "Substantial Completion" and for parts for an additional three years after the expiration of the first two-year period.

END OF SECTION

SECTION 16420
TRANSIENT VOLTAGE SURGE SUPPRESSION (TVSS) SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. This specification establishes minimum standards and guidelines for providing complete and operational electrical installations on a Design-Build performance basis. It shall be the Electrical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

B. Provide all TVSS equipment complete, fully operational and fully tested. Work includes complete installation, electrical testing and commissioning.

1.02 QUALITY ASSURANCE

A. Comply with the National Electrical Code (NEC), NEMA and IEEE Standards as applicable to wiring methods, construction and installation of TVSS devices. Comply with applicable requirements of ANSI/IEEE C62.41, C62.45; NFPA 20, 70, 75 and 78, and UL 1449. Provide complete packaged units, which have been UL listed and labeled by Underwriters Laboratory. UL surge ratings (UL 1449, February 2007 Edition (2.5) must be permanently affixed to the TVSS device.

B. The short circuit rating shall be indicated on the device.

1.03 WARRANTY

A. Manufacturer shall provide a product warranty for a period of not less than five years from date of installation. Warranty shall cover unlimited replacement of TVSS modules during the warranty period.

1.04 SUBMITTALS

A. Drawings: Electrical and mechanical drawings shall be provided by the manufacturer which show unit dimensions, weights, component and connection locations, mounting provisions, connection details and requirements, including breaker size, and wiring diagram.

B. Equipment Manual: The manufacturer shall furnish an installation manual with installation, start-up and operating instructions for the specified system.

C. Installation instructions shall clearly state if the system requires an external overcurrent device to maintain the system's UL 1449 listing.

D. A UL 1449 stipulation, signed by the manufacturer's authorized representative, is required for all submittals. The stipulation shall:

1. Certify that the TVSS system is UL 1449 listed.

2. Indicate what internal or external fusing is incorporated in the TVSS system and what impact the fusing has on the performance of the device. (I.e. surge capacity and clamping levels).

E. Provide minimum single-pulse surge current testing documentation on each model proposed for locations per specification.

F. Documentation of filter performance for stand-alone and system requirements per the specification.

G. Documentation showing operational test set which can verify the clamping voltage of unit. Factory trained representative shall include start-up and testing as part of the requirements of this specification.

H. Breaker and wire size requirements shall be indicated.

PART 2 - PRODUCTS

2.01 GENERAL

A. Provide high-energy transient voltage surge suppression electronic filter devices, suitable for application in Category A, B and C environments as indicated. Provide types, sizes, ratings and electrical characteristics indicated which comply with manufacturer's standard materials, design and construction in accordance with published information and as required for a complete installation.

B. SPD stands for "surge protective device" where used herein.

2.02 TVSS SYSTEM DESCRPTION

A. Provide TVSS devices, which comply with the following:

1. Have operating temperature of -40 to + 122 degrees F and operate reliably in environments with 0 to 95% humidity (non-condensing).

2. Emit no audible noise and capable of operation of up to 12,000 feet above sea level and emit no appreciable magnetic field.

3. Have a maximum continuous operating voltage not less than 125% of the nominal system operating voltage for 120/208 volt systems, 125% for 277/480 volt systems, and a frequency operating range of 47 to 63 Hertz.

4. Provide protection modes for line-to-neutral, line-to-line, line-to-ground, and neutral-to-ground for three-phase, 4-wire wye systems.

B. The system protection modules shall contain a linear array of balanced metal oxide varistors (MOV). Each MOV will be individually fused. Silicon avalanche diodes and gas tubes are not to be used or other components, which may short or "crowbar" the AC line and lead to possible disruption of the normal AC power flow.

C. All primary transient path wiring shall be of #8 AWG copper minimum or via bus bar of equivalent capacity to provide equal impedance interconnection between phases. No plug-in modules, components or printed circuit boards shall be used in surge carrying paths.

D. Each protection module shall have a visual indicator that signifies the protection circuitry is on line. A redundant status indicator shall be mounted on the front of the panel.

E. Each protection module shall have a capacitive filtering system connected in each Line to Neutral (L→N)(Wye) mode or Line to Line (L→L)(Delta) mode to provide sine wave tracking and better performance of the protection modules.

F. The fusing elements must be capable of allowing the suppressor's minimum rated transient current to pass through suppressor, at a minimum 1,000 times, without fuse operation.

G. Manufacturers shall submit independent test data from a nationally recognized testing laboratory verifying that the TVSS unit can withstand its rated single impulse surge current.

H. Protection modes: The TVSS shall provide Line to Neutral (L→N)(Wye), Line-to-Ground (L→G) (Wye or Delta), Line-to-Line (L→L)(Delta) and Neutral-to-Ground (N→G)(Wye) protection.

I. Each unit shall include a UL 1283 listed filter, which shall reduce low-level fast rise-time electrical line noise as follows per NEMA LS-1 guidelines:

J.	Frequency	K.	Insertion Loss	L.	Frequency	M.	Insertion Loss
N.	100 kHz	O.	34 dB	P.	1 MHz	Q.	51 dB
R.	10 kHz	S.	54 dB	T.	100 MHz	U.	48 dB

V. Provide each unit with status indicators.

W. The SPD shall be rated for the available fault current of 65,000 amps, and shall be labeled with its rating.

2.03 UNITS INSTALLED AT MAIN SERVICE PANEL

A. Acceptable Manufacturers and Models:

LEA International Inc. - Gb200s
Current Technology - TG150
Liebert - S1032
Eaton - CPS200

No other Manufacturers will be accepted.

B. Device shall meet all specification requirements in Section 2.2, except as follows:

Equipment shall be a multi-stage parallel protector rated for VAC, 480Y/277 3-phase, 4-wire, plus ground. The equipment's minimum surge current capacity shall be 300,000 per phase (L-N plus L-G).

C. The system protection modules shall contain a linear array of balanced metal oxide varistors (MOV). Each MOV will be individually fused. Each protection module shall have a minimum surge current rating of 150,000 per mode. Each protection module shall be capable of withstanding over 1,000 sequential 10,000 Amp ANSI/IEEE C62.41 Category C3 impulses without degradation or failure.

D. TVSS units shall be provided as an integral component of the switchboard. Provide overcurrent protection for TVSS units in sizes and types as recommended by the manufacturer for a UL-listed assembly. Options should be mounted on a remote panel that can be installed on the out side of the switchboard or switchgear equipment.. Refer to Section 16425 - Switchboards.

2.04 UNITS INSTALLED AT DISTRIBUTION PANELS DOWNSTREAM OF THE SERVICE ENTRANCE

A. Acceptable Manufacturers and Models:

LEA International Inc. - GB100
Current Technology - TG100
Liebert - LM100
Eaton - CPS200

No other Manufacturers will be accepted.

B. Device shall meet all specification requirements in Section 2.02 in this specification section, except as follows:

Equipment shall be a multi-stage parallel protector rated for VAC, 208Y/120 3-phase, 4-wire, plus ground. The equipment's minimum surge current capacity shall be 200,000 per phase (L-N plus L-G).

C. The system protection modules shall contain a linear array of balanced metal oxide varistors (MOV). Each MOV will be individually fused. Each protection module shall have a minimum surge current rating of 100,000 per mode. Each protection module shall be capable of withstanding over 1,000 sequential 10,000 Amp ANSI/IEEE C62.41 Category C3 impulses without degradation or failure.

2.05 UNITS INSTALLED AT PANELBOARDS

A. Acceptable Manufacturers and Models:

LEA International Inc. – PBS
Current Technology – EGP 80
Liebert – LPG
Eaton - CPS160

No other Manufacturers will be accepted.

B. Device shall meet all specification requirements in Section 2 except as follows:

Equipment shall be a multi-stage parallel protector rated for 208Y/120 volts, 3 phase, 4 wire, plus ground. The equipment's minimum surge current capacity shall be 160,000 per phase (L-N plus L-G).

C. The system protection modules shall contain a linear array of balanced metal oxide varistors (MOV). Each MOV will be individually fused. Each protection module shall have a minimum surge current rating of 80,000 per mode. Each protection module shall be capable of withstanding over 1,000 sequential 10,000 Amp ANSI/IEEE C62.41 Category C3 impulses without degradation or failure

D. TVSS units shall be provided as an integral component of the panel board. Provide overcurrent protection for TVSS units in sizes and types as recommended by the manufacturer for a UL-listed assembly.

PART 3 - INSTALLATION

3.01 Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.02 GENERAL

A. The specified TVSS system shall be installed no further than eighteen (18) electrical inches from the power conductor(s) it is protecting, and must have a grounding resistance of 25 Ohms or less.

B. Install devices in accordance with manufacturer's written installation and operation manuals. Have factory trained representative provide factory start-up and initial clamp voltage testing to show each unit is clamping within tolerance, installed properly and functioning correctly.

C. The installing contractor shall install service entrance SPD with short and straight conductors as practically possible. The contractor shall twist the SPD input conductors together to reduce input conductor inductance.

D. When mounted internally to the power distribution equipment, the SPD shall be close-nippled to the panel and be supplied by a breaker sized per the SPD manufacturer's recommendation, and with the appropriate number of poles.

E. Factory trained ISO 9001 certified service division employees shall be required to perform a site inspection. Site inspection shall include verification of proper SPD installation, correct SPD voltage application, and startup procedures.

F. Contractor to provide CB or molded case switch sized per manufacturer's recommendations for units not provided with internal disconnects.

G. Contractor to provide wiring from panel to TVSS device per manufacturers recommendations.

END OF SECTION

SECTION 16452
GROUNDING

PART 1 - GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational electrical installations on a Design-Build performance basis. It shall be the Electrical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

B. Grounding systems shall be provided for service neutral 60-hertz ground and for equipment grounds and bonding as required by code.

PART 2 - PRODUCTS

2.01 GROUNDING CONDUCTORS AND CONNECTORS

A. Copper only, sized per code. Bare or green insulated in sizes #10 AWG or larger. Green insulated for size #12 AWG.

2.02 GROUND RODS

A. 3/4" x 10'-0"-copper clad steel.

PART 3 - EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 GROUNDING, GENERAL

A. Provide all grounding for electrical systems and equipment as required by Codes and as specified herein.

B. Provide concrete-encased grounding electrode (UFER) sized per Code.

C. Bond to building steel per NEC requirements.

3.02 GROUND RODS

A. Provide as shown and/or required. Connect the grounding conductor to each rod.

3.03 SIZE OF GROUND WIRE

A. As required by National Electrical Code.

3.04 GROUND CONNECTION OF WATER PIPING

A. Metal internal piping shall be grounded, as a part of this Contract.

3.05 CONNECTION TO THE POWER GROUND BUS

A. Provide connections in accordance with the codes, including:

1. Raceway system

2. Switchboard

3. Service neutral

4. "Separately derived service" (transformers and emergency generator)

5. Electrically operated equipment and devices

6. Ground automatic transfer switches as separately derived systems, bonding the neutral to the ground, since the transfer switches are 4-pole.

B. No device or equipment shall be connected for electrical service which has a neutral conductor connected to a grounding conductor or to the frame within the device or equipment.

C. Method of Connection

1. Make all ground connections and ground cable splice by thermal welding or copper compression set type connectors U.L. listed for grounding purposes. Grounding lugs, where provided as standard manufacturer's items on equipment furnished, may be used.

2. The contractor shall provide a ground rod in each handhole. When associated with light poles, connect this ground to the ground lug in the light pole. The light pole foundation shall also be connected to the ground system; a #4 bare copper ground conductor shall be exothermically connected to the rebar in the pole foundation with enough conductor extending up the center of the foundation to provide connection to the grounding lug in the pole handhole. The ground rod shall extend 3 inches above the bottom of the handhole, connection at the ground rod shall be made with a bolted connector.

3. A ground wire sized per code shall be placed in each conduit installed under this contract.

4. All handholes with metal lids associated with this contract shall be provided with grounding straps for the lid and rim of handholes with metal covers. This ground strap shall be connected to the ground rod or ground system within the handholes.

3.06 EXPANSION FITTINGS

A. In conduit runs requiring an expansion fitting, a bonding jumper shall be installed around the fitting to maintain continuous ground continuity.

3.07 TESTING

A. Conform to Section 16030.

3.08 GROUND CABLE CROSSING EXPANSION JOINTS

A. Ground cables crossing expansion joints or similar separations in structures or paved areas shall be protected from damage by means of suitable approved devices or

methods of installation which will provide the necessary slack in the cable across the joint to permit movement. Stranded or other approved flexible copper run or jumper shall be used.

3.09 RACEWAY BUSHINGS

A. Provide insulated grounding bushing on service and feeder raceways at panelboards and switchboards. Provide ground conductor sized per code to ground bus.

END OF SECTION

SECTION 16460
DRY-TYPE TRANSFORMERS

PART 1 - GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational electrical installations on a Design-Build performance basis. It shall be the Electrical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

B. Provide dry-type transformers complete and fully operational. Transformers shall be UL listed and comply with NEMA Standard ST-20 and NEMA TP-1.

1.02 SHOP DRAWINGS

A. Prepare and submit for review prior to manufacture. Include dimensioned front plan and section views, wiring and connection diagrams and bolting template. Developer shall indicate mounting methods and connection lugs required on the drawings.

B. Submit transformer efficiencies showing compliance with minimum values set forth in NEMA TP-1-1996.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Specially constructed units with core and coil assembly mounted on rubber vibration and sound isolation pads as manufactured by Tierney, Square D, Acme, Eaton, Hevi-Duty, General Electric, or Hammond.

2.02 ENCLOSURE

A. Steel panel enclosure over core, coil and terminal chamber with louvered openings for convection cooling. Cooling and terminal access shall be possible with both sides and rear of enclosure obstructed. Maximum surface temperature: 35 degrees centigrade.

B. Weatherproof enclosure when located outdoors.

2.03 WINDINGS

A. Separate primary and secondary. Windings shall have Class H insulation and shall be rated for continuous operation at rated KVA with temperature rise of not over 150 degrees C above a 40 degree C ambient, with a maximum hot spot temperature of 220 degrees C. Windings and core and coil assembly shall be treated and built to resist the effects of dirt and moisture.

B. Core and coil mounted on rubber isolation mounting pads.

C. Isolating type with grounded electrostatic shield where noted and when serving computer systems. Where noted include primary surge suppression and secondary filters similar to Square D Class 7450-FIL.

2.04 PRIMARY TAPS

A. Full capacity taps, minimum of two 2-1/2 percent above and four 2-1/2 percent below normal (rated) primary voltage.

2.05 CAPACITY

A. Continuous rating.

B. Provide K-factor rated transformers, if required.

2.06 CONNECTIONS

A. Three-phase transformers shall have a 480 volt delta connected primary and 208Y/120 volt, three phase, four wire secondary. Provisions for external connections shall be made by means of a terminal board employing lugs conforming with Section 16120 which are compatible with the external conductors installed. All connections shall be accessible from front and top of cabinet.

2.07 NOISE LEVEL

A. Noise level shall not exceed 45 db for sizes less than 51 KVA, 50 db for 51-150 KVA, 55 db for 151-300 and 60 db for greater than 300 as measured in accordance with NEMA ST20 requirements.

2.08 VIBRATION ISOLATORS

A. McDougal Control Co.

1. Rubber pad isolator: Model WMNK.

2.09 NAMEPLATES

A. Provide permanently attached engraved nameplates per Section 16075 for each transformer. For each transformer include name (3/8" letters), voltage, phase and kVA rating, source of power, and output service.

Example: T1-30 kVA
480V - 208Y/120V, 3ø, 4W
Source: PANEL DP
Serves: PANEL P3

B. Nameplate color shall be: Normal System - white on blue; Emergency System - white on orange per WAC 296-46B-700.

2.10 EFFICIENCY

A. Transformers shall comply with minimum efficiencies as set forth in NEMA TP-1-2007.

PART 3 - EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 MOUNTING

A. Attach to the building structure via vibration isolators to prevent overturning or sway on ceiling hanger in compliance with the IBC. All attachment nuts to have split and flat washer. Mount on floor, wall or suspended from ceiling as required.

1. Enclosures designed for floor mounting, where suspended from ceiling, shall be suspended via trapeze constructed of two (minimum) horizontal structural channels hung via 1/2" steel threaded rods attached to structural members or inserts in structural slab. Each rod to contain rubber isolator ceiling hanger. Channel, rod, ceiling hanger and inserts shall be sized for not less than 400% load safety factor. Locking type nuts shall be used in assembly.

2. Secure wall mounted types via rubber-in-shear isolators sized to give 400% safety factor.

3. Secure floor mounted types via rubber pad isolators sized to give 400% safety factor.

3.02 CONNECTIONS

A. 208Y/120 volt three-phase secondary transformers shall be considered "grounded neutral separately derived systems" and neutral shall be grounded per code accordingly.

B. Transformer raceway connections shall be waterproof flexible metal conduit (sealtite or liquid tight flexible metal conduit) as specified in Section 16130.

C. Voltage Tap Connections: Connect all transformers at "normal" tap. After facility is completely energized, measure secondary voltages at all transformers and service switchboard. Include copy in O&M Manual.

END OF SECTION

SECTION 16470
PANELBOARDS

PART 1 - GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational electrical installations on a Design-Build performance basis. It shall be the Electrical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

B. Provide both service entrance distribution class panelboards with separate current transformer cabinet and utility metering enclosure as well as branch circuit panelboards.

1.02 RELATED DOCUMENTS

Dead front type, conforming to U.L. 67 and NEMA PB 1.1.

1.03 SHOP DRAWINGS

A. Submit for review prior to manufacture. Include complete description, front view, dimensions, device sizes and layout, and ground bus(ses). Panel breaker configuration shall exactly match that given on panel schedules that are included with the contract drawing and specification set.

1.04 COORDINATION STUDY

A. Manufacturer to perform a short circuit study. Rate all equipment provided for available short circuit current. Fault current levels at the supply side of the source shall be gotten from the utility and are the designer's responsibility.

B. Manufacturer to prepare coordination study, which includes an analysis of the breakers on the emergency generator. Study to indicate components of all equipment provided are selectively coordinated for all levels of short circuit current. Submit settings and trip curves of all components to King County and include in O & M manual.

C. The manufacturer shall include in the bid a 100% selectively coordinated systems as required by the NEC, to include:

1. Emergency Systems per NEC 700.27

2. Legally Standby Systems per NEC 701.18

3. Elevator overcurrent protective devices per NEC 620.62

1.05 ARC FLASH STUDY

A. Manufacturer to prepare arc flash study for new equipment that is being provided in this contract using IEEE 1584 calculation method for all switchboards and panelboards being provided in this contract. Study and label to indicate incident energy, flash hazard boundary, equipment name, study date, and recommended category of personnel protective equipment (PPE). This information shall be provided on a pre-printed label on each panel and switchboard.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Square D or GE.

2.02 PANELBOARD TYPE

A. Rated at proper voltage and current, bus bars of copper 3-phase, 4-wire, 100 percent neutral. Provide 200 percent neutral bars in all panels on the secondary of K-13 rated transformers. Multiple lugs where conductors in parallel or "feed through" or double lugs are shown.

B. Bolted busbar to busbar connections. Conductor connectors to conform with Section 16120, bolted to busbars using Grade 5 bolts, belleville and flat washers.

C. Separate ground bus bonded to panelboard cabinet.

D. Isolated ground bus insulated from cabinet when noted.

E. Service entrance label for service entrance equipment.

2.03 CIRCUIT BREAKERS AND FUSED SWITCHES

A. U.L. interrupting rating labeled. Minimum rating as follows:

208Y/120V Panelboards	10,000 AIC symmetrical
480Y/277V Panelboards	30,000 AIC symmetrical

B. Circuit breakers: Conform with UL 489, labeled for 75ºC conductors. Mount per panel schedules. Pre-threaded, bolt on type. Common trip on multiple pole breakers. Labeled `SWD' when utilized for switching loads.

C. Spares and spaces: Complete for future circuits. Where "Space" is indicated, provide space, bussing, device mounting hardware and steel knockouts in dead front.

2.04 SERVICE DISTRIBUTION EQUIPMENT

A. Main Distribution Panel

1. Ampere rating as designed at 480Y/277V. 3 Ph, 4 W and Braced for 65 kA. Fully Rate Panel, no series ratings.

2. Distribution Class Panelboard with Service entrance rating. Lighting and Branch Circuit Panel class equipment is not acceptable. Provide neutral-ground bond only in this panel at 480V.

3. Equip with Main Circuit Breaker that has residual ground fault protection. Set per coordination study requirements.

4. Wall Mount.

5. Door in Door construction with lock sets keyed alike on both. Doors to be contained by a single operating handle with no additional tie down screws or similar forms of retainers being acceptable.

6. Provide integral CT compartment per Seattle City Light requirements.

B. Revenue Meter Cabinet:

1. Remote SCL meter -- Provide meter base per Seattle City Light requirements as stated in Customer Service Requirements publication. Mount meter base outside as shown on the drawings.

2. Power Monitor

a. In a self contained enclosure, mount a digital power monitor for voltage, amperage, power factor, kW demand, kVAR demand by phase. Square D Series 650 or equal. Provide associated donut current transformers to be mounted around incoming service entrance conductors.

2.05 CABINET AND FRONTS

A. Flush or surface, as noted. Tight closing doors without play, when latched. Where two cabinets are located adjacent to each other in finished areas, provide matching trim, same height. Where remote controlled switch or contactor is mounted in panelboard, mount on same frame as panelboard interior, with dedicated access door and key lock

B. Fronts: Door-in-door type such that breaker handles can be accessed by opening the inner door and panel wiring can be accessed by opening the outer door, hinged at right side. Panels shall be lockable with two identical keys provided for each panel. All panel shall be keyed alike.

C. Finish: Factory prime coat for cabinets located in finished areas. When located in unfinished areas, factory standard lacquer or enamel finish, gray or blue-gray color, over prime coat.

2.06 NAMEPLATES

A. Engraved nameplates per Section 16075 permanently attached to panelboard front. Include panel name in ½ inch sized letters; fed from; area served, voltage, phase and wire in 3/8 inch sized letters.

B. Nameplate color:

1. Normal system - white letters on blue.

2. Emergency system - white letters on orange per WAC 296-46B-700.

2.07 SYSTEM OF NUMBERING AND BUS ARRANGEMENT

A. Panelboards rated for 400 or 600 amps shall accept 225 amp frame circuit breakers.

PART 3 - EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 MOUNTING

A. Firmly anchor cabinets directly or with concealed bracing to building structure, level, 6'-6" above finished floor unless otherwise required. When not located directly on wall, provide support frame of formed steel channel anchored to floor and ceiling structure.

3.02 WIRING

A. Conform to applicable sections of these specifications and NEMA PB 1.1. Conductors and terminations per 16120. Coverplates in open knockouts.

3.03 CIRCUIT INDEX AND LABELS

A. Typed circuit index with odd circuits on left, even circuits on right, listing each circuit by number with complete load designation, (i.e. Receptacle room ___, lights room ___, etc.). Room names/numbers per actual room identification assigned by owner at project completion. Mount inside door with transparent protective cover. Provide number labels on circuit breakers to match index.

3.04 WORK CLEARANCE

A. Verify space available with equipment sizes and code required working clearances prior to submitting shop drawings.

3.05 GROUNDING

A. Provide per 16452.

3.06 CABINET PAINTING

A. Cabinets furnished prime painted: Field paint to match wall color. (See Division 9 Painting).

3.07 DEDICATED SPACE

A. Locate in dedicated spaces. Coordinate project construction so piping, ducts, etc. are routed around dedicated spaces above and in front of panelboards per code.

END OF SECTION

SECTION 16476
DISCONNECT SWITCHES AND ENCLOSED CIRCUIT BREAKERS

PART 1 - GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational electrical installations on a Design-Build performance basis. It shall be the Electrical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

B. This section includes separately mounted switches and circuit breakers.

C. Provide all disconnects required by code for equipment furnished under this and other Divisions of these specifications unless disconnects are integral with equipment and acceptable to the authority having jurisdiction.

1.02 RELATED DOCUMENTS

A. See Section 16470 for Arc Flash study requirements.

1.03 REFERENCES

A. National Electrical Manufacturers Association (NEMA)

B. Underwriters Laboratories (UL)

1.04 SUBMITTALS

A. Make submittals in accordance with Section 16010. Submit product data for disconnect switches, fused disconnect switches, enclosed circuit breakers and accessories specified in this section.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following (same manufacturer for all products):

1. GE

2. Square D

2.02 DISCONNECT SWITCHES

A. NON-FUSED: Heavy duty, quick make, quick break, single throw, horsepower rated with poles to open all ungrounded conductors. AIC rating same as upstream protective device with 10,000 AIC minimum. NEMA KS1. Toggle switches that are Heavy Duty motor rated toggle switches with padlocking provisions are acceptable for circuits rated 20 amps or less.

B. FUSED: As specified above with addition of fuse clips to accept only Class R fuses. Service entrance labeled for service disconnect switches.

C. OPERATING HANDLE: Lockable in off position. Interlocked with cover to prevent opening when switch is closed. (Interlock to include defeating mechanism).

2.03 ENCLOSED CIRCUIT BREAKERS

A. Enclosed, Molded-Case Circuit Breaker: NEMA AB 1, with lockable handle.

B. Characteristics: Frame size, trip rating, number of poles, and auxiliary devices as indicated and interrupting rating to meet available fault current.

C. Application Listing: Appropriate for application, including switching fluorescent lighting loads or heating, air-conditioning, and refrigerating equipment.

D. Manufacture same as Panelboards Section 16470.

E. Current-Limiting Trips: Let-through ratings less than NEMA FU 1, Class RK-5.

F. Molded Case Switch: Provide molded case circuit breaker without trip units where required.

G. Accessories: Provide shunt trip, under voltage and other accessories where required.

2.04 ENCLOSURE

A. NEMA AB 1, Type 1, unless otherwise required to meet environmental conditions of installed location.

B. Outdoor Locations: NEMA Type 3R.

C. Other Wet or Damp Indoor Locations: NEMA Type 4.

D. Provide flush mounted enclosures for circuit breakers where indicated on the drawings.

2.05 NAMEPLATES

A. Provide nameplates per Section 16075 Identification.

B. Provide permanently attached nameplates (with mechanical fasteners) constructed of plastic laminated material engraved through surface material to white sublayer. Normal power white letters on blue background and emergency distribution system is white letters on orange background per WAC 296-46B-700.

C. Include the following information: Load name, voltage and phase and fuse size and type (when applicable).

PART 3 - EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 INSTALLATION

A. Install disconnect switches and enclosed circuit breakers level and plumb.

B. Securely mount adjacent to equipment on wall or acceptable mounting frame.

C. Wiring space within Disconnects, Fused Switches or Enclosed Circuit Breakers shall not be used for splices.

D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.02 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish including chips, scratches, and abrasions.

END OF SECTION

SECTION 16481
MOTOR CONTROLLERS

PART 1 - GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational electrical installations on a Design-Build performance basis. It shall be the Electrical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

B. Scope of work under this Section includes all requirements for motor controllers (starters) to be provided and/or installed under this contract.

C. The Developer performing the Division 16 work shall furnish motor controllers for all motors shown unless the controllers are included with the equipment furnished under other divisions of these specifications. The Developer performing the Division 16 work shall install all motor controllers including all controllers not factory assembled into equipment furnished under other divisions of these specifications. All motors and motor controllers shall be complete and fully operational upon completion of the project.

1.02 RELATED DOCUMENTS

A. See Section 16470 for Arc Flash Study requirements.

B. Motor controls shall conform to NEMA standards for each specific purpose and be U.L. listed.

1.03 MOTOR VOLTAGE INFORMATION

A. Voltages available are 208 and 480 volt three-phase; or 120, 208 and 277-volt single-phase. Circuits are designed (in general) for motors with voltage ratings as follows:

1. Smaller than 1/2 HP - 115 volts, single-phase.

2. 1/2 HP and larger - 208 or 460 volts, three-phase.

B. Obtain submittals and shop drawings and verify motor sizes and voltages provided under other Divisions prior to commencing work.

PART 2 - PRODUCTS

2.01 MOTOR STARTERS

A. Magnetic motor starters: Shall conform to or contain items called for below and unless noted otherwise, shall be full voltage non-reversing for NEMA size 3 and under. Starters larger than NEMA size 3 shall be closed transition, autotransformer or wye-delta type. No starters smaller than NEMA size 0 and no half size starters are permitted. Wye-delta type must have motor designed for this use.

B. Overload devices: Shall be melting alloy or bimetallic type. One overload shall be provided for each phase. Provisions shall be made for resetting the overload devices from outside the starter enclosure. Provide ambient compensated overload devices only

when the motor is at a constant temperature and the controller is subject to a separate, varying temperature. Automatic reset overload devices are not permitted.

C. Accessories: Each magnetic motor controller shall include phase loss protector, "HAND-OFF-AUTO" selector switch, 120 volt coil (unless noted otherwise), red running pilot light, green off pilot light, 100VA (minimum) control transformer (except for 115 volt motors), surge suppression kit, with fused primary and secondary, two spare auxiliary interlock contacts and all other accessories required or noted.

D. Enclosures: All motor controllers shall be contained in an enclosure suitable for the environment in which the controller is mounted. Shall be NEMA 3R when exposed to weather.

E. Combination motor controller: Shall be fused switch type (Class RK5), or motor circuit protector type rated for 22,000 RMS A.I.C. minimum and containing all accessories as listed above. If externally powered control circuits are used, provide an auxiliary switch on the disconnect switch or protector and fuse in lieu of the control transformer. Switch or protector shall be capable of being padlocked in the off position.

F. Manual Starters: Shall be toggle switch type, lockable in the "off" position, with overload relays, pilot light and enclosure per above.

2.02 MANUFACTURER

A. Allen Bradley or Square D.

2.03 NAMEPLATES

A. Provide engraved phenolic nameplates per Section 16075. Permanently attach (with mechanical fasteners) on each controller, nameplates with the following information: load and area served, voltage, phase and (when applicable) fuse size and type.

2.04 FAN SHUTDOWN RELAYS

A. Developer shall provide relay(s) with sufficient contacts to shutdown all fans over 2000 cfm upon receipt of fire alarm. See Section 16721. Coordinate relay coil voltage with fire alarm system supplier.

PART 3 - EXECUTION

Sections under Part 3 are provided as recommendations to the Developer in order to achieve the desired results specified in the Design Criteria and Performance Specifications.

3.01 WIRING

A. Provide wiring from branch circuit overcurrent device to motor controller to motor terminals, including installation of starter and all connections. Motor controllers provided under Division 16 shall be combination type. Where starters furnished under other Divisions of the specification do not include an integral disconnect switch, a separately mounted disconnect switch shall be provided. Coordinate other control wiring with Division 15 of the Specifications. Provide overload elements in controllers sized to match motor nameplate full load amperes. Space within controllers shall not be used as a junction box.

3.02 SUPPORTS

A. Securely mount to equipment, wall or acceptable mounting frame suitable to withstand earthquake forces.

3.03 FAN SHUTDOWN WIRING

A. Provide 3/4" raceway with 2 #14 AWG conductors from each fan motor controller to the fire alarm shutdown relay(s). Provide wiring of interlock connections for all (over 2000 CFM) fan starter control circuits via Division 16 furnished fan shutdown relay to shutdown fans upon receipt of fire alarm.

END OF SECTION

SECTION 16500
LIGHTING

PART 1 - GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational electrical installations on a Design-Build performance basis. It shall be the Electrical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

B. Provide lighting system complete and fully operational.

1.02 REFERENCES

A. National Electrical Manufacturer's Association (NEMA) LE5-1993:

1. Procedure for determining Luminaire efficiency ratings.

B. Underwriters Laboratories, Inc. (UL):

UL 496:	Edison Base Lampholders
UL 542:	Lampholders, Starter Holders for Fluorescent Lamps
UL 924:	Emergency Lighting and Power Equipment
UL 935:	Fluorescent Lamp Ballasts
UL 1029:	HID Lamp Ballasts
UL 1570:	Fluorescent Lighting Fixtures
UL 1572:	High Intensity Discharge Lighting Fixtures

C. American National Standards Institute:

ANSI C136-15-1986	American National Standards Institute, "High-Intensity-Discharge and Low-Pressure Sodium lamps in luminaires - Field Identification."

1.03 SUBMITTALS

A. For standard catalog items, provide original product sheets, -neatly and clearly marked- to indicate that light fixture, ballasts and lamps fully comply with contract documents. Include photometric report by an independent certified testing laboratory when required in fixture schedule. Manufacturer's test report is not acceptable.

B. Submittals shall have fixture types and project name clearly indicated and shall be prepared by the authorized manufacturer's representative serving the project area. A list of manufacturer's representatives (including address, telephone and fax numbers) identifying which light fixture types they represent shall be included with submittals.

C. Product Samples, complete with housing, trim with 8' cord, plug, and specified lamp shall be submitted if requested.

1.04 QUALITY ASSURANCE

A. All fixtures and components shall be new and listed by Underwriters Laboratories (UL) or other testing lab acceptable to local jurisdiction.

1.05 WARRANTY

A. Ballasts: Provide manufacturer's warranty for a period of not less than five years. Warranty shall include parts and labor to replace defective ballasts.

B. Exit Signs Utilizing LED Lamp Technology: Provide manufacturer's warranty for a period of not less than five years including parts and labor for full replacement of defective product.

1.06 EXTRA MATERIALS

A. Ballasts: Provide one case or 10% (whichever is less) of each type used on the project. Turn over to King County.

B. Lamps: Provide one case or 10% (whichever is less) of each type used on the project. Turn over to King County.

C. Fuses: Provide one case or 10% (whichever is less) of each type used on the project. Turn over to King County.

PART 2 - PRODUCTS

2.01 GENERAL MATERIAL REQUIREMENTS

A. Interior Light Fixtures: Finish ferrous mounting hardware and accessories to prevent corrosion and discoloration to adjacent materials.

B. For weatherproof or vaportight installations, painted finishes of fixtures and accessories shall be weather resistant enamel using proper primers or galvanized and bonderized epoxy, so that the entire assembly is completely corrosion resistant for the service intended. Where aluminum parts come into contact with bronze or steel parts, apply a coating material to both surfaces to prevent corrosion.

C. Fixtures shall be free of light leaks and designed to provide sufficient ventilation of lamps to provide the photometric performance required. Ballasts and transformers shall be adequately vented.

D. All sheet metal work shall be free from tool marks and dents and shall have accurate angles bent as sharp as compatible with the gauges of the required metal. Intersections and joints shall be formed true and of adequate strength and structural rigidity to prevent any distortion after assembly. Finish exposed edges so no sharp or ragged edges are exposed. All miters shall be in accurate alignment with abutting intersecting members.

E. Lampholders shall hold lamps securely against normal vibrations and maintenance handling.

F. Light fixtures containing lamps which require protective shielding shall have tempered glass lenses.

G. For adjustable fixtures, provide positive locking devices to fix aiming angle. Fixture shall be capable of being relamped without adjusting aiming angle.

H. Safety: Provide safety devices for removable fixture elements (cones, reflectors, lenses, etc.) to support removable elements when not in normal operating position. Safety devices shall be detachable if necessary and shall not interfere with fixture performance, maintenance or the seating of any fixture element, and not be visible during normal fixture operation.

I. Exterior Fixtures

1. Painted surfaces shall have an outdoor life expectancy of not less than 20 years without any visible rust or corrosion.

2. All diffusing materials shall be UV stabilized.

2.02 FLUORESCENT FIXTURES

A. Housing: Minimum code gauge steel or rigid aluminum construction painted after fabrication with high reflectance white paint (min. 89%).

B. Frames:

1. Supply with concealed hinges and latching. Provide mitered corners with no gaps or light leaks.

C. Lamp Mounting:

1. Mount lamps used in programmed start circuits 430ma and below within 1/2" of grounded metal as long as the lamp.

2. For programmed start circuits using single lamp ballasts, provide one grounding lamp holder per lamp.

2.03 HIGH INTENSITY DISCHARGE (HID) FIXTURES:

1. Housing: Minimum code gauge steel, bonderized or equal rust protected or rigid aluminum construction.

2. Finish: Visible surfaces. Powder coated paint unless otherwise specified. Color as specified on drawings. Concealed parts, (lamp holders, yokes, brackets, etc.) matte black.

3. Lamp Holder Housing: Cast aluminum with integral heat radiating fins to assure cool lamp base operation.

2.04 WIRING

A. All wiring shall be as required by code for fixture wiring.

B. All flexible cord wiring between fixture components or to electrical receptacle and not in wireways shall have a minimum temperature rating of 105°C.

C. Cords shall be fitted with proper strain reliefs and watertight entries where required by application.

D. No internal wiring shall be visible at normal viewing angles, i.e. above 45° from vertical.

2.05 BALLASTS:

A. Fluorescent General Requirements:

1. All T5 or T8 lamps shall be operated on programmed start ballasts only. Ballasts shall provide normal rated lamp life as stated by lamp manufacturers.

2. Ballasts shall be HPF (greater than 90%), UL listed, and ETL certified. Magnetic ballasts shall be CBM certified. For projects applying for utility funding, ballasts shall meet utility requirements. Provide ballasts with thermal protection unless otherwise specified. Ballasts shall be Class P. Ballast shall have less than 10 percent Total Harmonic Distortion (THD).

3. Confirm voltage requirements with Electrical Drawings. Ballasts shall operate lamps correctly within +/-10% voltage variation without damaging ballasts.

4. Ratings:

a. "A" sound rating for 430 ma and 265 ma

5. Low temperature, unconditioned, and/or outdoor application: Provide ballasts suitable for low starting temperature where light fixture is located outdoors, in any unconditioned space where subject to ambient air temperature will be below 50 degrees F. Do not use T5 lamps in unheated spaces.

B. Magnetic Fluorescent Ballasts: In addition to the general requirements, provide magnetic ballasts as required and as follows:

1. Energy saving type with a ballast factor not less than 95%.

2. Each ballast individually protected by an in-line GMF fuse in a Bussman type HLR fuseholder.

3. Manufacturers: Advance, GE/Magnatek, Robertson, as specifically noted in the Light Fixture Schedule, or approved equal.

C. Electronic Fluorescent Ballasts: In addition to the general requirements, provide electronic ballasts where required in the Light Fixture Schedule as follows:

1. Ballasts in conformance with the following regulatory requirements:

a. EMI and RFI limits set by the FCC (CFR47, Part 18 and FCC Part 18,15j), IEEE Publication 587, Category A (transients).

b. Minimum efficiency standards of Public Law 100-357.

c. Starting sequence consistent with ANSI Standard C82.1-1993.

2. Reduced light output ballasts (ballast factors below 87%) are not acceptable except as noted otherwise in the Light Fixture Schedule.

3. Total harmonic distortion shall be less than 10% of the input current. Current crest factor shall be less than 1.7. Operating frequency shall be between 25 and 60 kHz with no visible flicker.

4. Ballasts shall operate in ambient temperatures up to 105°F (40°C).

5. Ballasts for single ended lamps shall be program start, with end of life protection.

6. Manufacturers: Advance, GE/Magnatek, Universal/ESI, Osram/Sylvania or approved equivalent.

D. High Intensity Discharge:

1. HPF type (minimum power factor 90%).

2. Sound Rating: "low noise" or "extra quiet".

3. Each ballast shall be individually protected by an in-line fuse in a Bussman fuseholder type HLR for 120 and 277 volt, type HEX for 208, 240 and 480 volt.

4. Metal Halide: Constant Wattage Autotransformer (CWA) except for lamps below 175 watts without igniters where high resistance auto transformer type will be acceptable. Use Advance Transformer "Smart Cap" ballast where required by lamp selection. Provide pulse-start lamps and ballasts on all metal halide fixtures.

5. Manufacturers Magnetic Ballasts: SLI, Osram Sylvania, Holophane, Jefferson, Advance, or Universal.

6. Where ceramic metal halide lamps (Philips Master Color) are utilized, use electronic ballasts.

7. Manufactured, Electronic Ballasts: 39 watt lamps, Aromat; 50 & 70 watt lamps, Aromat and Advance; 100 & 150 watt lamps, Aromat.

2.06 LAMPS

A. Each lamp type in the Project shall be manufactured by the same manufacturer.

B. Fluorescent:

1. Medium Bi-pin, T8 rapid start, compact TT and DTT; 3500K color temperature and 80+ Color Rendering Index (CRI).

2. Manufacturers: General Electric, Philips, Osram or Sylvania.

C. High Intensity Discharge Type

1. Refer to fixture schedule for specific metal halide lamps required.

2. Acceptable manufacturers: General Electric, Osram Sylvania, Philips, or Venture.

2.07 SOCKETS

A. Fluorescent: Suitable for lamp and ballast type employed.

B. H.I.D.: Porcelain for mogul or medium base lamps, pulse rated as required. Keyed for all position oriented lamps. For other lamp types, as required by base type.

2.08 OUTDOOR LIGHTING STANDARDS

A. Pole/Luminaire Assemblies and Bollards: Supply luminares, davit arms, brackets, poles, handhole covers, base components and all other accessories for a complete assembly. Manufacturer shall be responsible for proper fitting of all elements and the structural integrity of the unit. Provide assembly to withstand 100 mph steady wind rated poles with 1.3 gust factor.

B. Provide watertight insulating fuse and holder in the base of each lighting standard to individually protect each lighting fixture. Fuse holder similar to Buss style "HEX" (HEB permitted for 120V or 277V), with Buss fuse of appropriate ampacity and voltage. Provide fuse for each hot circuit wire; do not fuse neutral.

2.09 IDENTIFICATION

A. All "HID" lighting fixtures shall be identified, as required by ANSI C136-15, no alternate method will be accepted. Per the ANSI standard the Markers for Metal Halide fixtures shall be 2-inch black letters on a 3-inch square red background.

PART 3 - EXECUTION

Sections under PART 3 are provided as recommendations to the developer in order to achieve the desired results specified in the design criteria and performance specifications.

3.01 LIGHTING FIXTURES, GENERAL

A. Provide mounting accessories and trims as required for wall and ceiling construction types.

B. Fixture mounting assemblies shall comply with all local seismic codes and regulations.

C. Install fixtures with vent holes free of air blocking obstacles.

D. Lighting fixtures located in recessed ceilings with a fire resistive rating of 1-hour or more shall be enclosed in an approved fire-resistive rated box equal to that of the ceiling.

E. Contractor shall be responsible for adjusting aperture rings on all recessed fixtures to be flush with the finished ceiling.

F. Adjust variable position lampholders for proper lamp position prior to fixture installation.

G. All finishes shall be unmarred upon project completion.

H. Replace all burned out or inoperative lamps at the end of the construction prior to County occupancy.

3.02 DIFFUSERS AND ENCLOSURES

A. Remove all dirty lamps, reflectors and diffusers; clean and reinstall. When cleaning "Alzak" reflectors, use a manufacturer recommended cleaning solution.

3.03 ADJUSTMENT OF LIGHT FIXTURES

A. Focus all adjustable light fixtures prior to the completion of the project, after normal business hours if required.

3.04 OUTDOOR LIGHTING STANDARDS

A. Provide rebar reinforced concrete base. For bolted poles, provide galvanized anchor bolts and nuts and plumb to true vertical using a nut above and below the base plate on the anchor bolts. Pack grout between base plate and concrete base and provide drain hole below base plate to prevent accumulation of moisture inside pole base. Provide two piece or individual covers for nuts exposed above the baseplate of the same color as the pole. Ground pole and light fixture.

3.05 EXIT SIGNS

A. Locate exit signs such that they are to the side or ends of drive aisles, between parking lines, so that the risk of collision with vehicles is minimized. Submit shop drawings that show all exit signs in plan and cross section in. Fully coordinate with the structure.

END OF SECTION

SECTION 16620
BATTERY INVERTER UNIT

PART 1 - GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational electrical installations on a Design-Build performance basis. It shall be the Electrical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

1.02 DESCRIPTION

A. Provide uninterruptible battery inverter unit and emergency lighting and power system complete and fully operational. It shall be suitable for HID lighting.

B. Under normal mode the connected load shall be on. Under emergency mode the unit shall provide rated output power for a minimum period of 90 minutes. In the event of power failure, the batteries shall supply the load. Upon restoration of line power, the unit shall recharge its battery system and maintain it at full charge. Transfer between the normal and emergency mode shall be fully automatic and without interruption of power to the load. Output shall be 277V, single phase (normally on).

1.03 WARRANTY

A. The unit shall be guaranteed against defective workmanship and material for a period of one year after final acceptance. Lead calcium batteries shall be warranted for 10 years, 5 years full replacement and 5 years prorated. Warranty shall be confirmed by warranty registration card supplied with each unit.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Chloride, Lithonia, Holophane, or Exide.

2.02 BATTERIES

A. Shall be sealed lead calcium type. The batteries shall be specifically designed for long life "stand-by" applications. Batteries shall have sufficient capacity to power the inverter at the rated load for a minimum of 90 minutes. The batteries must operate in an ambient temperature of 104 degrees F (40 degrees C).

2.03 BATTERY CHARGER

A. Shall be completely automatic, solid state, dual rate and shall be capable of providing 90% battery charge in twelve (12) hours or less. The charger may be a constant voltage type (with temperature compensation) self-protected from short-circuit in its output. The charger shall provide a float rate charge to maintain the batteries at their full charge with minimum water use. Charger shall include a DC voltmeter and ammeter.

2.04 INVERTER

A. Volt-ampere and voltage ratings as per design. The output frequency shall be 60 Hertz +/-2%. The voltage regulation shall be better than 7% for 10-100% load and high to low battery. The output waveform shall be sinusoidal with less than 5% THD at full load. The maximum transfer time shall be less than 20ms. The inverter shall be capable of powering any combination of incandescent and fluorescent loads to 100% of its volt-ampere rating. A DC input voltmeter and AC output voltmeter and ammeter shall be provided integral to the inverter and mounted on the enclosure. Shall be capable of powering switched loads to its full volt-ampere rating.

2.05 ENVIRONMENTAL CONDITIONS

A. The battery inverter unit shall operate at full ratings in temperatures from 68 to 86 degrees F in a dry location, without the use of supply fans or other mechanical cooling.

2.06 CONTROL AND SUPERVISION

A. The battery inverter unit shall contain high/low battery voltage alarm, battery voltmeter, electrolyte level monitor/alarm, AC load voltmeter, test switch, automatic low voltage battery disconnect and Utility On pilot light. The electrolyte level monitor shall use an intrinsically safe battery probe or an optical system for level detection. The control system shall contain automatic battery loading controls to load the batteries. The system shall be set to use the batteries each three or six months to greater than 50% discharge by powering normally connected emergency lighting for at least one hour.

B. System metering and controls shall consist of an alpha-numeric front panel display, normal, caution and alarm indicating alarms, fused battery disconnect switch, input and output disconnects, audible failure alarms with silence switch, dry contact for remote failure alarm, "D" type 9-pin AS/400 compatible computer interface connector, and battery monitor with alarm.

2.07 LOAD CENTER

A. The battery inverter unit shall be equipped with internal load center with six 20 amp bolt-on circuit breakers. Circuit breakers shall be as specified in Section 16470 Panelboards of this specification.

2.08 ENCLOSURE

A. All components of the battery inverter unit shall be contained within a steel enclosure with hinged doors. Provide lock and six keys. The enclosure shall have separate compartments for electronics and batteries. Provide with floor stand at bottom and wall bracket at top.

2.09 SOFTWARE

A. Provide PC format diagnostic software.

PART 3 - EXECUTION

Sections under PART 3 are provided as recommendations to the developer in order to achieve the desired results specified in the design criteria and performance specifications.

3.01 WIRING

A. Install all emergency system wiring separate from normal system wiring as required by NEC Article 700.

3.02 TESTS

A. Test completed systems operation and verify that emergency lighting is provided for the required 1-1/2 hour period.

3.03 HOUSEKEEPING PAD

A. Provide housekeeping pad as specified in Section 16010.

END OF SECTION

SECTION 16721
FIRE ALARM SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational electrical installations on a Design-Build performance basis. It shall be the Electrical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

B. This Section includes fire alarm systems with fire alarm control panel, manual stations, detectors, signal equipment, controls, elevator recall, off-site reporting, sprinkler system monitoring, and devices.

C. The Contractor shall design and provide a complete fire alarm system per Authorities Having Jurisdiction (AHJ's) requirements. The AHJ's include, but are not limited to: the local fire marshal, the local elevator inspector, and the local building department. System shall include a fire alarm control panel, audible and visual notification, sprinkler system monitoring, door hardware and security system interface, off-site notification via phone lines, and all other components and functions required to provide a system that complies with the AHJ's requirements. All required functionality, i.e. alarm initiation and indication, elevator recall, and sprinkler system monitoring, shall be accomplished with the components specified herein.

1.02 RELATED SECTIONS

1. Division 8 Section "Finish Hardware" for door closures/holders, electric door locks, and release devices that interface with fire alarm system.

2. Division 15 Section 15300 "Fire Sprinkler and Standpipe Systems" for waterflow, valve tamper switches and post indicator valves that interface with fire alarm system.

3. Division 14 for" Hydraulic Elevators."

1.03 REFERENCES

A. American National Standards Institute (ANSI)

B. National Electrical Manufacturers Association (NEMA)

C. Underwriter's Laboratories, Inc. (UL)

D. National Fire Protection Association (NFPA)

1.04 APPLICABLE CODES AND STANDARDS

A. Provide the system in compliance with the following:

1. NFPA Codes, Standards and Manuals (latest issue enforced)

a. 70 - National Electrical Code

b. 72 - National Fire Alarm Code

c. 90A- Standard for the Installation of Air Conditioning and Ventilating Systems

2. International Fire Code (IFC)

3. International Building Code (IBC)

4. Washington Administrative Codes (WAC)

a. WAC296-46 Safety Standards – Installing Electric Wires and Equipment

b. WAC51-40-1101 Chapter 11, Accessibility

c. WAC 51-44 State Building Code Adoption of the Uniform Fire Code

5. Factory Mutual

a. FM Global Data Sheet 5-40 Fire Alarm Systems

b. FM Global Data Sheet 5-48 Automatic Fire Detection

6. Other Codes

a. Local fire code, building code, mechanical code, elevator code, sprinkler code, electrical code, rules and interpretations required by the AHJ.

1.05 QUALITY ASSURANCE

A. Each and all items of the Fire Alarm System shall be listed as a product of a fire alarm system manufacturer under the appropriate category by Underwriters' Laboratories, Inc. (UL) and Factory Mutual (FM), and shall bear the UL and FM labels. All control equipment shall be listed under UL Category UOJZ as a single control unit. Partial listing is NOT acceptable.

B. In addition to UL-UOJZ requirement mentioned above, the system controls shall be UL listed for Power Limited Applications per NEC 760. All circuits must be marked in accordance with NEC article 760.

C. All control equipment shall have transient protection devices to comply with UL 864 requirements.

1.06 CONTRACTOR DESIGN

A. The Contractor shall design and provide a complete fire alarm system. Design shall be performed by a NICET Level 3 designer and shall be marked with the designer's certification number under the direct supervision of a professional engineer. The system shall include a fire alarm control panel, alarm initiation devices, alarm indication devices, sprinkler system monitoring, sprinkler alarm bell initiation, elevator recall, notification of the remote monitoring station, and all other functions specified herein and on the drawings. These functions shall be accomplished with the fire alarm control panel specified, as well as all other devices specified in this section. It shall be the

responsibility of the fire alarm system supplier to design raceway routing and wiring and to show the same on shop drawings.

B. The Contractor shall contact all AHJ's prior to bid to determine the requirements for the system. All functionality shall be provided with the fire alarm control panel specified as well as other components specified herein.

C. Evacuation alarm sound level: The number of fire alarm notification devices shall be increased if required by the AHJ.

1.07 SUBMITTALS

A. General: Make submittals in accordance with Section 16010.

B. The fire alarm contractor shall solicit and incorporate room and device names directly from King County Power Distribution personnel, via the Project Representative.

C. Product Data: Submittals shall include a compilation of manufacturer's catalog or specification sheets of all system components. Items being provided shall be clearly indicated. Any variations of the submittal from the specifications shall be clearly indicated. Include the following additional information:

1. Point Schedule

2. Complete schedule of customized English message formats of alarms and troubles for system.

3. Battery systems and standby battery load calculations showing capacity for 50% additional devices of each device type for future growth. Provide additional loop controllers or networked panels as required.

4. Fire Alarm zone and address schedule including alphanumeric description for each monitor and control point.

5. Outputs zone schedule for off-premise UL Central Station Monitoring.

6. Complete sequence of operations for all fire alarm system functions.

7. Recommended spare parts list. The list shall include recommended quantities for each item.

8. Acceptance Test Procedure: The ATP shall include step-by-step procedures for performance testing every fire alarm device and system output to demonstrate full functionality in accordance with the Specification requirements.

D. Shop Drawings

1. Riser Diagrams. Fire alarm supplier and/or subcontractor shall develop CAD based (AutoCad 2005 or more recent) original fire alarm riser diagram to show main geographical fire alarm zones and point to point wiring requirements.

2. Floor Plans. CADD based floor plans shall be drafted to show conduit routing, device locations, end of line resistors, wire count and color coded wiring between

device locations on each plan. Show room names and numbers for each room where a fire alarm device is located. Plans shall be on 22 inches by 36 inch sheets of heavy bond media. Submitted drawing shall have AHJ approval marked thereon.

E. Submissions to Authorities Having Jurisdiction: In addition to distribution requirements for Submittals specified in Division 1 Section "Submittals", make an identical submission to authorities having jurisdiction. Resubmit if required to make clarifications or revisions to obtain approval.

F. Installer Certificates: Signed by manufacturer certifying that installers comply with requirements.

G. Field Test Reports: Indicate and interpret test results for compliance with performance requirements. Comply with NFPA 72.

H. Certificate of Completion: Comply with NFPA 72.

I. Operation and Maintenance Manual: Per Section 16010. Include record drawings, Certificate of Completion, and test results. Nominal 8-1/2"x11 size. Provide complete operating instructions, preventative maintenance instructions, catalog sheets on all devices and equipment, manufacturer's operation and maintenance instructions, reduced 11x17 copies of all system drawings, and complete system software on permanent media.

J. Record Drawings: All review drawings shall be revised to reflect the accurate as-built condition. Working plan shall show accurate locations of devices, and actual routing of conduit and location of end-of-line devices.

1.08 TO QUALIFY AS AN ACCEPTABLE SUPPLIER AND/OR SUBCONTRACTOR

A. Have the ability to provide the fire alarm system indicated in the contract documents from the criteria contained in the specification.

B. Provide AHJ approved shop drawings which show complete system plan views indicating equipment layout, device layout, raceway routing and sizing, point to point wiring, termination and connection diagrams and wire numbers for all conductors and terminations.

C. To have been in the business of installing and maintaining the specific type of system equipment under the present firm name for at least five years.

D. To have distributing and/or installing the specific brand and model line of system equipment for at least three years prior to the date of these criteria.

E. To have the capability of dispatching a maintenance or repair truck with a qualified repairman to the job site within four hours of a request for service on the equipment.

1.09 ADDITIONAL REQUIREMENTS

A. Fire Alarm System Supplier and/or Subcontractor Requirements:

B. Coordination the installation of the fire alarm system including the preparation of shop drawings in conformance with 16721 Paragraph 1.07.C.

C. Furnish and load all software required to implement a complete monitoring and control system.

D. Submit shop drawings to the "Authority Having Jurisdiction" (AHJ) as defined in NFPA 72. One copy of the above shop drawings with this approval evidenced shall be included with the submittal required by Section 16010.

E. Provide raceway, back boxes, wiring, and power circuits for the fire alarm system, and install the devices ready for final termination at the Fire Alarm Panel by the Fire Alarm System Subcontractor.

F. Provide all 120V power circuits to fire alarm control equipment and remote power supplies. Remote power supplies are not shown.

G. In addition, the contractor shall schedule periodic inspections by the AHJ during the course of the installation and shall make any minor corrections, deletions, relocations or additions to the system as required for acceptance of the completed system by the AHJ. Contractor shall obtain and pay for all required permits.

H. Coordinate the interface requirements between mechanical control systems and the fire alarm system.

I. Performance Test: The fire alarm system shall have a successful performance test, accomplished by the installer and witnessed by the Fire Marshal.

1.10 DESCRIPTION

A. General: Non-coded, addressable-analog fire alarm system with manual and automatic alarm initiation; automatic sensitivity control of certain smoke detectors; and multiplexed signal transmission dedicated to fire alarm service. Provide a complete and fully operational fire detection and alarm system, sprinkler monitoring and alarm, and elevator recall system which fully complies with the local fire, sprinkler, and elevator codes currently enforced at the project location. All functionality shall be provided with the fire alarm control panel and other components specified. If any conflict occurs between government adopted code rules and these contract documents, the codes are to govern. All wiring shall be within conduit.

1.11 GENERAL OPERATION

A. The system shall be solid state, microprocessor based, using a true digital format between the Central Processing Unit (CPU) and each addressable device. Systems which do not transmit digital data between CPU and devices over a one-pair cable are not acceptable. System shall be able to communicate with a minimum of 100 addressable devices per pair of wires.

B. Adding points within the system, up to its maximum point capacity shall not require memory additions.

C. The control panel shall be initially configured to monitor a minimum of 380 addressable points. Control panels, transponders and remote power supplies shall be sized to accommodate 20% future growth beyond the scope of the initial project. All secondary power supply batteries shall be sized for future system growth. Spare battery capacity required by NFPA 72 and local codes shall be in addition to future system growth capacity of 50% for each device type.

D. Under normal condition the fire alarm control panel shall display a "SYSTEM NORMAL" message and the current time and date.

E. Should an abnormal condition be detected the appropriate LED (Alarm, Supervisory, or Trouble) shall flash. The panel audible signal shall pulse for alarm conditions and sound steadily for trouble and supervisory conditions.

F. The panel shall display the following information relative to the abnormal condition of a point in the system. These three characteristics relative to an abnormal condition of a point shall be displayed simultaneously:

1. Custom location label (80 characters minimum)

2. Type of device (i.e. smoke, manual station, waterflow)

3. Point status (i.e. alarm, trouble)

G. All information displayed by the fire alarm control panel shall also be capable of being transmitted and displayed on any system CRT and printer or graphic terminal.

1.12 OPERATION OF FIRE ALARM SYSTEM

A. Operation of any initiation device shall immediately cause all of the following:

1. All fire alarm speakers to sound a three pulse temporial tone pattern (per ANSI S3.41) throughout the facility until silenced by a switch at the Fire Alarm Control Panel (FACP) or until the system is reset. Visual alarm lights throughout shall flash repetitively until the system is reset.

2. Elevator recall per AHJ requirements.

3. Auxiliary controlled devices shall operate until the alarm condition is corrected and the system reset.

4. Full English language annunciation of the alarm condition, type and location at the FACP display. An audible signal shall sound and the alarm condition shall flash on the FACP display and CRT until acknowledged. Emergency instructions shall be displayed in English for the operator.

5. Printout in full English language of the alarm condition, type and location plus time and date. All fire alarm initiated event commands shall be recorded automatically.

6. Automatically transmit a general alarm and common trouble alarm to the local Fire Department via an outside vendor via an autodialer.

7. Send a signal to the mechanical control system to identify when the building is in alarm.

B. History Logging: The system shall log and store 300 events in an alarm log and 300 events in a trouble log. These events shall be stored in random access memory with battery protection. Each event shall include the time and date of the events occurrence.

C. A drill switch is to be provided at the Fire Alarm Control Panel to sound an evacuation alarm signal but not send an alarm to the Fire Department.

D. The system, including annunciation, and remote annunciation shall be completely supervised to sound an audible and visual trouble signal upon the occurrence of any open or grounded circuits except that auxiliary control circuits (door holders, and fan shutdown) and smoke detector remote indicator lights need not be supervised. An open or grounded zone circuit or annunciator circuit shall illuminate the trouble lamp and sound the trouble alarm at the control panel.

E. Sprinkler System Monitoring

1. Coordinate the Fire Alarm System with the Sprinkler System to provide circuits for detection and annunciation as required by the AHJ to supervise PIV, OSY and gate valve positions. Provide circuits from the fire alarm control panel for detection and annunciation of water flow. Each waterflow device and its associated valve position switch shall have their own address. In the event of water flow, a fire alarm bell/strobe shall be initiated. Locate the bell per AHJ requirements.

2. Activation of any tamper switch shall activate the system supervisory trouble light. Differentiation between valve tamper switch and open/or grounds in the initiation circuit wiring shall be provided. Water flow shall initiate a bell/strobe on the building exterior.

F. Elevator Capture. Provide circuitry to the elevator controllers from the fire alarm control panel to indicate when an alarm has been initiated by the associated elevator lobby smoke detectors to initiate recall. Coordinate exact circuitry required with elevator subcontractor. Provide circuits from FACP to corresponding elevator controller. Elevator capture shall be accomplished with equipment specified in this specification.

G. Bypass Switches: Provide the following bypass switches for testing purposes:

1. Elevator Bypass - to prevent recalling the elevators.

2. Door Release Bypass - to prevent releasing the smoke doors.

3. Fan Control Bypass - to prevent shutdown of fans or starting of elevator and stairwell pressurization fans.

4. Remote Alarm Bypass - to prevent the transmission of all fire alarm signals to the King Country Metro Tunnel Control Center.

5. Horns, strobes, and speakers Bypass - for testing purposes.

1.13 DEFINITIONS

A. FACP: Fire Alarm Control Panel.

B. LED: Light-emitting diode.

C. Definitions in NFPA apply to fire alarm terms used in this section.

1.14 INTERFACE REQUIREMENTS

The contractor is responsible for coordinating the system with other contractor furnished systems and equipment. The work consists of but is not limited to the following:

A. Elevators:

1. Fire Emergency. Two control modules with dry contacts and wiring to the elevator controllers to signal a fire emergency mode for automatic elevator recall. One shall be for primary recall and the second for alternative recall.

2. Elevator Lobby Smoke Detectors. To signal smoke in an elevator lobby to the FACP.

3. Elevator power shutdown control circuit shall be monitored for presence of operating voltage. Loss of voltage shall cause a supervisory signal at the control panel and remote annunciators.

4. Fire Signal Speakers. Provide speakers for all elevators.

1.15 RECORD DRAWINGS

A. Provide per 16010. Record drawings shall clearly indicate:

1. Actual routing of all raceways and location of all junction boxes.

2. Actual cable types, numbers and routing.

3. Actual system wiring diagrams, connection diagrams and interface of all components in the system.

1.16 UNIT PRICES

A. Provide unit prices to add/delete the following:

1. Manual Pull Station

2. Smoke Detector

3. Duct Smoke Detector

4. Heat Detector

5. Fire Alarm Speaker

6. Visual Alarm Light

7. Monitoring Module

8. Control Module (control relay)

9. Remote Indicating Light

10. Input/Output Modules (including back planes)

11. Printer

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. All equipment shall be the product of a single manufacturer except that certain individual components which are regularly used as part of the system may be the product of a different manufacturer. Approved manufacturer:

1. Edwards Systems Technology EST-3, NO SUBSTITUTIONS ALLOWED.

2.02 FACP ALPHANUMERIC DISPLAY

A. Plain-English-language descriptions of alarm, supervisory, and trouble events; and addresses and locations of alarm-initiating or supervisory devices originating the report. Display monitoring actions, system and component status, system commands, programming information, and data from the system's historical memory.

2.03 AUTOMATIC REPORTING

A. Provide two dedicated phone lines to King County's outside vendor for receiving calls from the autodialer. The outside vendor at this time is Protection One. Coordinate with Archie Alexander at King County's Power Distribution department one month prior to building opening. System shall report both alarm and trouble signals for each major geographic zone. Conform with applicable requirements of NFPA 72 "Installation, Maintenance and use of Protective Signalling Systems". System shall report via an Edwards Systems Technology 3-MODCOMM DACT via a Radionics 8112 autodialer. Final connection to phone lines shall be made by King County Personnel. The signal of the Radionics system shall be replicated by he 3-MODCOMM DACT.

2.04 CENTRAL FACP

A. Cabinet: Lockable steel enclosure. Arrange interior components so operations required for testing or for normal maintenance of the system are performed from the front of the enclosure. If more than one unit is required to form a complete control panel, fabricate with matching modular unit enclosure to accommodate components and to allow ample gutter space for field wiring and interconnecting panels.

1. Identify each enclosure with an engraved, red, laminated, phenolic-resin nameplate with lettering not less than 1/2 inch high. Identify individual components and modules within cabinets with permanent labels.

2. Mounting: Surface.

B. Alarm and Supervisory Systems: Separate and independent in the FACP. Alarm-initiating zone boards consist of plug-in cards. Construction requiring removal of field wiring for module replacement is unacceptable.

C. Control Modules: Include types and capacities required to perform all functions of fire alarm systems.

D. Indications: Local, visible, and audible signals announce alarm, supervisory, and trouble conditions. Provide each type of audible alarm with a different sound.

E. Resetting Controls: Prevent the resetting of alarm, supervisory, or trouble signals while the alarm or trouble condition still exists. Provide manual reset feature at the FACP for smoke and heat detectors. Duct detectors shall be resettable from the FACP.

F. Keyed Disable Switch: At the FACP, provide an outboard disable switch panel. Operation of the panel shall be enabled by turning a key in the main switch. The key switch shall be Allen-Bradley 8080T-H31A or IDEC ASD2K11N-RL. Once enabled, individual pushbutton switches shall bypass system functions.

G. Alphanumeric Display and System Controls: Arranged for interface between human operator at the FACP and addressable system components, including annunciation, supervision, and control.

1. Display: A minimum of 80 characters; alarm, supervisory, and component status messages; and indicate control commands to be entered into the system for control of smoke detector sensitivity and other parameters.

2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.

2.05 TRANSIENT PROTECTION DEVICES

A. All control equipment shall have transient protection devices to comply with UL 864 requirements:

1. Provide an Isolated Loop Circuit Protector (ILCP) device on all fire alarm initiating circuits, alarm indicating appliance circuits, signaling line circuits which extend beyond the main building by either aerial, underground or other methods, walkways, bridges or other above ground connectors.

2. The ILCP shall be located as close as practicable to the point at which the circuits leave or enter the building.

3. The ILCP grounding conductor is to be a No. 12 AWG wire having a maximum length of 28 feet to be run in as straight a line as practicable and connected to a building ground electrode system (unified ground) per Article 800 of the National Electrical Code.

4. The ILCP is to have a line to line response time of less than one nanosecond capable of accepting greater than 2000 amps (9 joules each line) to earth. Shield to earth current is to be 5000 amps maximum.

5. The ILCP shall be protected by a high dielectric insulating material and of small enough size to mount in a standard 4" square 2 -1/8" deep electrical box.

6. Spark gap devices or devices incorporated in or installed within the fire alarm control panel in lieu of the specified ILCP are not acceptable.

7. All ILCP's shall comply with UL 497B requirements.

2.06 SECONDARY POWER SUPPLY

A. General: Components include gel cell sealed batteries, charger, and an automatic transfer switch.

1. Battery Nominal Life Expectancy: 2 years, minimum.

B. Battery Capacity: Comply with NFPA 72.

C. Battery Charger: Solid-state, fully automatic, variable-charging-rate type. Provide capacity for 150 percent of the connected system load while maintaining batteries at full charge. If batteries are fully discharged, the charger shall recharge them completely within four hours. Supervise charger output as part of system power supply supervision.

D. Integral Automatic Transfer Switch: Transfers the load to the battery without loss of signals or status indications when normal power fails.

E. Size battery capacity for an increase of the total number of each type of device by 50 percent.

2.07 MANUAL PULL STATIONS

A. Description: Fabricated of metal or plastic, and finished in red with molded, raised-letter operating instructions of contrasting color. EST model SIGA-278.

1. Double-action mechanism requiring two actions, such as a push and a pull, to initiate an alarm.

2. Station Reset: Manual reset key operated.

3. Weatherproof Protective Shield: Factory-fabricated clear plastic enclosure, hinged at the top to permit lifting for access to initiate an alarm.

4. Integral Addressable Module: Arranged to communicate manual-station status (normal, alarm, or trouble) to the FACP.

2.08 SMOKE DETECTORS

A. General: Include the following features:

1. Operating Voltage: 24-V dc, nominal.

2. Self-Restoring: Detectors shall not require resetting or readjustment after actuation to restore them to normal operation except resetting the control panel.

3. Plug-in Arrangement: Detector and associated electronic components are mounted in a module that connects in a tamper-resistant manner to a fixed base with a twist-locking plug connection. Terminals in the fixed base accept building wiring.

4. Integral Visual-Indicating Light: LED type to indicate when detector has operated.

5. Sensitivity: Can be tested and adjusted in-place after installation.

6. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

7. Remote Controllability: Unless otherwise indicated, detectors are analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.

8. All smoke detectors located adjacent to roll down smoke doors or motorized smoke doors shall be provided with a relay base.

B. Photoelectric Smoke Detectors: Include the following features:

1. Sensor: LED or infrared light source with matching silicon-cell receiver.

2. Detector Sensitivity: Between 2.5 and 3.5 percent/foot smoke obscuration when tested according to UL 268A.

3. EST SIGA-PS or SIGA-IS with base.

C. Ionization Detector: Include the following features:

1. Responsive to both visible and invisible products of combustion.

2. Self-compensating for changes in environmental conditions.

2.09 OTHER DETECTORS

A. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F or rate of rise of temperature that exceeds 15 deg F per minute, unless otherwise indicated. EST SIGA-HRS or SIGA-HFS with based.

1. Mounting: Plug-in base, interchangeable with smoke detector bases.

2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

B. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F. Heat detectors in unprotected areas should be rate compensated detectors.

1. Mounting: Plug-in base, interchangeable with smoke detector bases.

2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

2.10 NOTIFICATION APPLIANCES

A. Description: Equip for mounting and have screw terminals for system connections.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly and enclosure. Suitable for 0 degrees F and weatherproof..

B. Bells: Electric-vibrating, 24-V dc, under-dome type; with provision for housing the operating mechanism behind the bell. When operating, bells provide a sound-pressure level of 94 dB, measured 10 feet from the bell. 10-inch size, unless otherwise indicated. Bells shall be weatherproof.

C. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Horns produce a sound-pressure level of 98 dB, measured 10 feet from the horn. Horns in garage area shall be weatherproof. Suitable for 0 degrees F.

D. Visible Alarm Devices: Xenon strobe lights listed under UL 1971 with clear lens. The word "FIRE" is engraved in minimum 1-inch-high letters. Flash rate shall not exceed two flashes per second nor be less than one flash per second. Maximum pulse duration shall be 0.2 seconds with a maximum duty cycle of 40 percent. Shall be suitable for installation in a single-gang outlet box. Color of housing shall be white in finished areas, red housing in unfinished areas such as garage and mechanical areas. All devices in garage area shall be weatherproof and suitable for operation down to 0 degrees F. 75cd at 10 feet minimum.

1. Strobe Leads: Factory connected to screw terminals.

2. Combination visual/audible notification devices are allowed.

E. Voice/Tone Speakers:

1. High-Range Units: Rated 2 to 15 W.

2. Low-Range Units: Rated 1/4 to 2 W.

3. Mounting: Flush.

4. Matching Transformers: Tap range matched to the acoustical environment of the speaker location.

5. Speakers shall be UL listed for emergency alarm systems.

2.11 REMOTE DEVICE LOCATION-INDICATING LIGHTS AND IDENTIFICATION PLATES

A. Description: LED indicating light near each smoke detector that may not be readily visible when standing in the room. Light is connected to flash when the associated device is an alarm or trouble mode. The lamp is flush mounted in a single-gang plate. A red, laminated, phenolic-resin identification plate as the indicating light identifies, in engraved white letters, device initiating the signal and room where the smoke detector is.

2.12 MONITOR MODULE

A. Description: Microelectronic monitor module listed for use in providing a multiplex system address for listed fire and sprinkler alarm-initiating devices with normally open contacts and for heat detectors located in high ambient temperature areas. All modules shall be single-input.

2.13 CONTROL RELAY MODULE

A. Description: Microelectronic control module listed for use in controlling smoke/fire dampers, door release service and other control functions.

2.14 FIRE ALARM TERMINAL CABINETS

A. NEMA Type 1 enclosure, hinged door front with flush hinge, latch and lock. Provide terminal blocks in all cabinets with 25% spare capacity. Box and front shall be steel, painted red with label "Fire Alarm". Flush mounted.

2.15 GUARDS FOR PHYSICAL PROTECTION

A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, notification appliance, or other device requiring protection.

1. Factory fabricated and furnished by the manufacturer of the device.

2. Finish: Paint of color to match the protected device.

2.16 WIRE

A. Wiring shall be UL-Listed limited energy cable for fire protection signaling. Non-Power-Limited Circuits. Conductors shall be minimum size #14 AWG for all non-addressable circuits and West-Penn or Allied two twisted pair #18 shielded cable on all addressable-loop circuits. Wiring insulation shall be color-coded and cable shall have an overall red-colored jacket. The cable shall be plenum rated. Conductors shall be solid copper and shall be of the type and AWG size as required. Stranded wire shall not be used for detector circuits.

B. Power-Limited Circuits: NFPA 70, Types FPL, FPLR, or FPLP, as recommended by manufacturer.

2.17 RACEWAYS, OUTLETS AND JUNCTION BOXES

A. Shall conform to specification sections "Raceways and Boxes". All fire alarm cabling and wire shall be within conduit. 3/4"' minimum.

2.18 PRINTER

A. The printer shall be free-standing and have a minimum 96-character standard ASCII character set in accordance with ANSI X3.64 and X4.14, The printer shall have adjustable sprockets for print width up to at least 100 columns per line with a minimum speed of 160 characters per second. The character spacing shall be 10 characters per inch and the line spacing shall be between three and eight lines per inch. The printer shall utilize standard form size sprocket-fed fanfold paper, and have multiple copy capability. The unit shall have programmable control of top-of-form and variable (multiple) line-skip capability. Provide 2000 pages of fanfold paper in addition to paper

used for testing and training. (Get signed receipt from County) EST Model PT-1S dot-matrix printer at the FACP.

PART 3 - EXECUTION

Sections under PART 3 are provided as recommendations to the developer in order to achieve the desired results specified in the design criteria and performance specifications.

3.01 SYSTEM SUPPLIER AND/OR SUBCONTRACTOR REQUIREMENTS

A. Provide and/or supervise all wiring, wiring terminations and connections.

B. Provide and/or supervise all equipment installation.

C. Perform and/or supervise all testing during and after installation.

D. Certify in writing at completion stating that system has been inspected, tested and is complete and fully operational in accordance with Contract Documents.

E. Instruct and/or assist the contractor in instructing King County personnel in the operation and maintenance of the system.

F. Device names, control sequences, security parameters, and other software configurable items shall all be outlined and documented.

3.02 EQUIPMENT INSTALLATION

A. Manual Pull Stations: Mount semiflush in recessed back boxes.

B. Water-Flow Detectors and Valve Supervisory Switches: Connect for each sprinkler valve station required to be supervised.

C. Ceiling-Mounted Smoke Detectors: Not less than 4 inches from a side wall to the near edge. For exposed solid-joist construction, mount detectors on the bottom of joists. On smooth ceilings, install not more than 30 feet apart in any direction.

D. Wall-Mounted Smoke Detectors: At least 4 inches, but not more than 12 inches, below the ceiling.

E. Smoke Detectors near Air Registers: Install no closer than 60 inches.

F. Heat Detectors in Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location.

G. Heat Detectors in Elevator Machine Room: Provide heat detector within 24" of each sprinkler head for shunt trip control of power to the elevator machinery.

H. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed.

I. Visible Alarm-Indicating Devices: Install wall mounted devices such that the lens is not less than 80 inches and not greater than 96 inches above the finished floor. Ceiling mount devices allowed for ceiling application. More than two visible notification devices in the same room or adjacent space within the field of view shall flash in synchronization. Synchronization of devices not in the same field of view is allowed. In corridors where there are more than two devices in any field of view, they shall be spaced a minimum of 55' apart or they shall flash in synchronization.

J. Device Location-Indicating Lights: Locate in public space near the device they monitor when the device is not visible when standing in the room.

K. FACP: Surface mount with tops of cabinets not more than 72 inches above finished floor.

L. Annunciator: Install with the top of the panel not more than 72 inches above finished floor.

M. Shunt Trip Voltage Sensor -- Provide and monitor voltage sensor for shunt trip power circuit for the elevator controller per NFPA 72 requirements.

N. Input Modules: Install input modules in NEMA 4 cabinets when located in sprinkler riser rooms.

3.03 WIRING INSTALLATION

A. Provide all wiring complete per system requirements. All wiring shall be contained in steel raceways and red color junction boxes. Seal raceways to prevent air passage at each smoke detector. Permanent wire markers shall be affixed to all conductors at terminations and splices. Numbering system shall be consistent with shop drawings. All terminations shall be T&B "Sta-Kon" (or equivalent) self insulated, flanged or forked tongue lugs where connected at screw type terminals.

B. Wiring within Enclosures: Wiring in main control cabinet shall be neatly arranged and bundled with tie wraps. Separate power-limited and non-power-limited conductors as recommended by the manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

C. Cable Taps: Use numbered terminal strips in junction, pull and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

D. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

E. Provide 3/4" raceway and wiring from the control panel to the main telephone terminal board as required for alarm transmission to the monitoring company.

F. Provide 3/4" raceway, 3 #12 wire from control panel to 20 amp circuit breakers with lock-on device in a 120-volt panelboard. Panelboard on emergency distribution system when applicable.

3.04 IDENTIFICATION

A. Paint power-supply disconnect switch red and label "FIRE ALARM." When the fire alarm system primary power is served from a branch circuit panelboard the panel cover shall be labeled "FIRE ALARM PRIMARY SOURCE" and the branch circuit breakers serving the fire alarm system provided with "lock-on" devices.

3.05 GROUNDING

A. Ground cable shields and equipment according to system manufacturer's written Instructions to eliminate shock hazard and to minimize, to the greatest extent possible, ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

B. Signal Ground Terminal: Locate at main equipment rack or cabinet. Isolate from power system and equipment grounding.

C. Install grounding electrodes of type, size, location, and quantity as required.

D. Ground equipment and conductor and cable shields. For audio circuits, minimize, to the greatest extent possible, ground loops, common-mode returns, noise pickup, crosstalk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.

3.06 ACCESS DOORS

A. Provide where required for access to system components.

B. Provide door, mounting frame and trim for access openings in ceiling. Door shall have fire rating equivalent to that of the ceiling it is installed in. Nominal door opening shall be 24" x 24" with hinge fully concealed. Latches shall be flush screwdriver operated type. In latched position, door shall seat firmly against frame at all points and there shall be no warps, sags or open gaps.

3.07 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and connections and to supervise pretesting, testing, and adjustment of the system. Report results in writing.

B. Testing of duct smoke detectors shall be performed using artificial smoke and with the detector in place.

C. All wiring shall be tested for proper connections, continuity, and resistance to ground.

D. The entire system shall be tested in accordance with a written Acceptance Test Procedure (ATP) to demonstrate and certify proper system operation. As a minimum, the ATP shall provide a detailed method of testing the following to demonstrate to King County that the system functions as intended by the design. An official Record of Completion shall accompany the request for final inspection to the AHJ.

1. All alarm and control functions.

2. All trouble and supervisory functions.

E. Pretesting: After installation, align, adjust, and balance the system and perform complete pretesting. Determine, through pretesting, the compliance of the system with requirements of Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new ones, and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.

F. Report of Pretesting: After pretesting is complete, provide a letter certifying the installation is complete and fully operable, including the names and titles of witnesses to preliminary tests.

G. Minimum System Tests: Test the system according to procedures outlined in NFPA 72. Minimum required tests are as follows:

1. Verify the absence of unwanted voltages between circuit conductors and ground.

2. Test all conductors for short circuits using an insulation-testing device.

3. With each circuit pair, short circuit at the far end of the circuit and measure the circuit resistance with an ohmmeter. Record the circuit resistance of each circuit on record drawings.

4. Verify that the control unit is in the normal condition as detailed in the manufacturer's operation and maintenance manual.

5. Test initiating and indicating circuits for proper signal transmission under open circuit conditions. One connection each should be opened at not less than 10 percent of initiating and indicating devices. Observe proper signal transmission according to class of wiring used.

6. Test each initiating and indicating device for alarm operation and proper response at the control unit. Test smoke detectors with actual products of combustion.

7. Test the system for all specified functions according to the approved operation and maintenance manual. Systematically initiate specified functional performance items at each station, including making all possible alarm and monitoring initiations and using all communications options. For each item, observe related performance at all devices required to be affected by the item under all system sequences. Observe indicating lights, displays, signal tones, and annunciator indications.

8. Test Both Primary and Secondary Power: Verify by test that the secondary power system is capable of operating the system for the period and in the manner specified.

9. A Final Acceptance Test shall be conducted by the contractor for approval by the AHJ. The fire alarm system shall be pre-tested and free of all defects, including

H. Retesting: Verify by the system test that the total system meets Specifications and complies with applicable standards.

I. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log. Submit log on the satisfactory completion of tests.

J. Tag all equipment, stations, and other components at which tests have been satisfactorily completed.

K. Manufacturer's representative shall submit a letter stating that it has tested the system and found it acceptable in all respects. The signed NFPA 72 checklist from the final acceptance test shall be provided to King County for inclusion in the system's records.

3.08 CLEANING AND ADJUSTING

A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Touch up scratches and marred finish to match original finish. Clean unit internally using methods and materials recommended by manufacturer.

3.09 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:

1. Train King County's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, adjusting, and maintaining equipment and schedules.

2. Training Aid: Use the approved final version of the operation and maintenance manual as a training aid.

3. The Contractor shall provide classroom training for King County personnel. The training shall be organized in two separate sessions to cover shift workers and shall emphasize the necessary adjustments, maintenance, parts replacement, servicing, theory of operation, and trouble shooting of the installed system. One session shall be four hours in length and shall cover the overall system layout, functions, operation and use. The second session shall be eight hours in length and shall cover specific system repair, restoration, changes, and updating.

3.10 OPERATION AND MAINTENANCE MANUALS

A. Provide all information as required by Section 16010.

B. Include record drawings, letter of certification and record drawings.

END OF SECTION

SECTION 16745
VOICE AND DATA CABLING

PART 1 - GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational electrical installations on a Design-Build performance basis. It shall be the Electrical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

B. This Section includes voice and data station cabling and terminations.

1.02 DESCRIPTION

A. Definition: "Telecommunications Cabling" as used in this Section refers to a unified cable plant primarily designed for carrying signals associated with telephone within the building.

B. Station Cable: Provide a complete cable system tested for continuity and performance to each outlet, including:

1. Four each Category 5E station cables for voice and data interconnections per station.

2. Quad outlet plates.

C. Telecommunications Closets (TC's): Provide terminating hardware.

D. Identification and Labeling: Labeling is to be functional and permanent, in strict accordance with plans and TIA/ EIA 606.

E. Detailed Documentation: Provide as-built system design and documentation services as required to complete shop drawings for telephone system administration, and detailed documentation of as-built conditions. Jack numbers connected at each outlet location must be those shown in "as-built" documentation.

F. Work Furnished by Others: Telephone switching equipment and telephone instruments will be furnished or relocated by others."

1.03 REFERENCES:

A. Design, manufacture, test, and install telecommunications cabling networks per manufacturer's requirements and in accordance with NFPA-70 (National Electrical Code), Uniform Building Code, FCC Part 68, FCC 76.611. State codes, local codes, requirements of authorities having jurisdiction, and particularly the following standards:

B. ANSI/TIA/EIA Standards

1. ANSI/TIA/EIA-568-A -- Commercial Building Telecommunications Cabling.

2. ANSI/TIA/EIA-568-A-1 -- Propagation Delay and Delay Skew Specifications for 100 ohm 4-pair Cable

3. ANSI/TIA/EIA-568-A-2 -- Commercial Building Standards Updates

4. ANSI/TIA/EIA-569-A -- Commercial Building Standard for Telecommunications Pathways and Spaces

5. ANSI/TIA/EIA-606 -- The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings

6. ANSI/TIA/EIA-607 -- Commercial Building Grounding and Bonding Requirements for Telecommunications

7. ANSI/TIA/EIA TSB-67 -- Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling Systems

C. American Society for Testing and Materials (ASTM)

D. National Electrical Manufactures Association (NEMA)

E. Underwriter's Laboratories, Inc. (UL)

F. Install cabling in accordance with the most recent edition of BICSI® publications:

1. BICSI -- Telecommunications Distribution Methods Manual

2. BICSI -- Cabling Installation Manual

1.04 SUBMITTALS

A. Make submittals in accordance with Section 16010.

1.05 PRE-CONSTRUCTION CONFERENCE

A. Early in the construction time line, and before any shop drawings are produced, a representative of the low voltage communications installer, who shall serve as supervisor to the installation crew throughout construction, shall attend a pre-construction meeting where installation details, including labeling and wire management will be discussed.

1.06 SYSTEM DESIGN OBJECTIVES

A. System Description:

1. The cabling system is designed to support telephone distribution to all equipment rooms and dedicated spaces of the facility. Most information outlets will consist of outlet boxes with uniform Category 5E jacks for voice. The size of outlet boxes and conduit at each location are indicated in the specifications.

B. Telecommunications Closet (TC) Support Fixtures:

1. All required equipment room fixtures must be installed.

1.07 INSTALLER QUALIFICATIONS AND QUALITY ASSURANCE

A. The Low Voltage cable system installer shall at a minimum be a firm normally employed in the low voltage cabling industry with a reference list of five projects and contact names to confirm successful Category 5/5E UTP cable plant projects within the twelve months prior to the bid opening date in this project.

B. The County reserves the right to exercise it's discretion to require the contractor to remove from the project any such employee of the contractor deemed by the County to be incompetent, careless, or insubordinate.

C. Personnel whom the cabling contractor intends to use as supervisors or testers shall have been employed by the cabling contractor for at least six months as of the date of the bid opening and have been trained on the contractor's company policies with respect to personnel safety, telecommunications industry cabling quality and neatness standards, and use of CSI-standard specifications.

D. A fifteen year installation warranty shall be provided by the selected Low Voltage installer. This warranty shall include defects in workmanship and/or material. The warranty period shall begin at the date of the County's acceptance of the project.

E. The selected low voltage installer must be licensed and bonded in the State of Washington for the work performed under this Specification.

1.08 SUBMITTALS

A. Project Initiation: Within fourteen calendar days following the pre-construction conference, the low voltage contractor shall furnish the following in a single consolidated submittal:

1. The name of the person who will act as the low voltage cabling Contractor's official contact.

2. The name of every certified Category 5/5E installation technician who may be used in the conduct of the project, and evidence of certification of each. For each separate certification program cited, provide the course outline or description and indicate the date and place of attendance for each technician

3. To qualify under paragraph two, courses attended must include hands-on access to cable and terminating tools and materials, and test equipment required to perform installation functions required in the work of this contract.

4. Complete manufacturer's product literature for all products to be used in the installation. Product submittals must be keyed to the specification.

5. Shop Drawings. The Contractor shall submit scaled drawings of all proposed changes in equipment room installation detail.

6. Proposed Contractor Category 5E UTP cable test result forms. Backbone UTP shall be tested as provided herein. Contractor shall provide test documentation.

7. Examples of the jack labeling materials and arrangement proposed. Submittal must include actual samples of each type of connecting fixture proposed, with realistic labels attached.

B. Project Completion: As a condition for project acceptance, the Contractor shall submit the following for review and approval.

1. Complete manufacturer's product literature.

2. An Exceptions List of deviations (in materials, construction, and workmanship) from that specified in this section.

3. Field Drawings. Throughout the course of the project, details concerning the exact physical layout or arrangement of the backboards shall be marked on a field set (with dimensions in inches) reserved for this purpose. The Field Drawings shall be available throughout the project for inspection, and shall be submitted to the King County at Project turnover.

4. Inspection and Test Reports: During the course of the Project the Contractor shall maintain an adequate inspection system and shall perform such inspections to insure that the materials supplied and the work performed conform to Contract requirements. The Contractor shall provide written documentation indicating materials acceptance testing was conducted as outlined in Part 3 below. The Contractor shall also provide documentation indicating that all cable termination testing was completed and that all irregularities were corrected prior to job completion.

1.09 CABLE LABELING, JACKET COLORS, AND PLACEMENT

A. All cable terminations shall be labeled.

B. Most cables will be assigned specific termination locations and identification numbers.

PART 2 - PRODUCTS

2.01 GENERAL

A. All material required for a complete installation, shall be furnished by the Contractor.

B. All materials must be new, free from defects and not less than the quality herein specified. They shall be designed to insure satisfactory operation and operation life in the environmental conditions which will prevail where they are being installed.

C. Each type of materials bid and furnished shall be of the same make and shall be of the standard products or manufacturers regularly engaged in the production of such materials and shall be the manufacturer's latest standard design.

D. Materials shall be as listed or shall be equivalent products of other manufacturers meeting the intent and quality level of the specifications.

2.02 WIRE PLANT MATERIALS

A. Materials shall be as listed or shall be equivalent products of other manufacturers meeting the intent and quality level of the EIA/TIA 568A specifications.

B. All products shall be new, and brought to the job site in original manufacturer's packaging. Electrical components (including innerduct) shall bear the Underwriter's

Laboratories label. All communications cable shall bear flammability testing ratings as follows:

- ♦ CM Communications Cable

C. All voice station cables specified herein shall be CM rated.

D. Initial Cable Inspection: The Contractor shall inspect all cable prior to installation to verify that it is identified properly on the reel identification label, that it is of proper gauge, containing correct number of pairs, etc. Note any buckling of the jacket which would indicate possible problems. Damaged cable, or any other components failing to meet specifications shall not be used in the installation.

2.03 STATION CABLING

A. Voice Station Cable: Provide Enhanced (Cat 5E) cable as identified by TIA/EIA for both voice and data station cables: Each cable reel shall be tested for Category 5E performance at the factory. Voice cables shall have a green jacket.

Acceptable Products:	Lucent Technologies 2061
	CommScope Ultra II 5504M
	Berktek LanMark 350

2.04 STATION HARDWARE

A. Outlets: Flush mount voice jacks shall be high quality tested Category 5E (plus) 8-pin (RJ45) modular jacks with IDC style terminations. All jacks shall use the T568B pin configuration. Jacks shall exceed the proposed TIA/EIA 568A recommendations for Category 5E connecting hardware. Jack color shall match faceplate.

Acceptable Products:	Siemon CT-5-A4-A4-(XX) or equal

B. Icons and Labels: Icons shall have voice or data symbols as appropriate.

Recommended product:	Siemon or equal.

C. Faceplates:

1. Shall be stainless steel.

Recommended product:	Siemon or equal

D. Cable labels.

1. All cables shall be labeled at the TC termination and at the user terminal connection with the same identifying code.

2. TC-end labels shall be mechanically printed on strips designed for use with the prescribed terminating hardware.

3. Jack-end labels must be mechanically created, have letters that are at least 3/16 inches high, and have a high contrast with the label background.

4. Label adhesive must be shown to be permanent and not removable without use of heat or solvents, when applied to each of the types of outlet cover plates to be used in the project.

2.05 VOICE TERMINATION HARDWARE

A. TC termination frames.

1. 300-pair type 110 frames, including four 4-pair connecting blocks and one 5-pair connecting block per row.

Recommended product:	Ortronics OR-30200007, OR-302000109, and OR-30200110 and OR-30200140 or equal

B. Termination clips:

Recommended product:	AT&T 110C-4 Clips (Com Code 103-801-247); Nordx - AX100707 or equal

C. Termination Block Label Strips: Standard colored designation label strips that match the colors for application shall be affixed to each row of the 110-type wiring termination. For PBX-feed cables, labels shall be white.

PART 3 - EXECUTION

Sections under PART 3 are provided as recommendations to the developer in order to achieve the desired results specified in the design criteria and performance specifications.

3.01 TC INSTALLATION

A. Ground conductor. Provide a #6 (minimum) copper stranded cable in a green jacket from the ground bar in the TC to a local electrical panelboard serving the room. Provide a ground wire connection to each rack and piece of overhead tray. Bridge gaps between tray sections with short lug-ended straps.

B. Any penetration through fire rated walls, and both ends of all vertical conduit chases (including those in sleeves) will be resealed with an Underwriter Laboratories (U.L.) approved sealant. Typical of this type of product is Flameseal. Contractor shall also seal all floor, ceiling, and wall penetrations in fire or smoke barriers and in the TC's.

3.02 CABLE HANDLING

A. All cable is subject to subtle damage that may degrade future performance, if abused during installation. In all cable installation, set reels and use sufficient pulleys and manpower so that cables are not pulled around blunt corners or against material that might cause chafing. For the purpose of this paragraph, any edge with a radius of less than 5 inches is considered "blunt".

B. Allowable Cable Bend Radius and Pull Tension: In general, communications cable cannot tolerate sharp bends or excessive pull tension during installation. The following tables provide minimum bend radius and maximum pull tension for twisted-pair cables in conduit. Also refer to manufacturer's recommendations.

MINIMUM BEND RADIUS AND MAXIMUM PULL TENSION
OF TWISTED-PAIR CABLE

PAIRS	MINIMUM BEND RADIUS	MAXIMUM PULL TENSION
4	3 inches	50 lbs
25	4 inches	200 lbs
100	7 inches	500 lbs
150	8 inches	750 lbs
200	10 inches	1000 lbs
300	11inches	1500 lbs

MINIMUM BEND RADIUS AND MAXIMUM PULL TENSION
OF OPTICAL FIBER CABLE

SERVICE	MINIMUM BEND RADIUS	MAXIMUM PULL TENSION
Riser	12 inches	150 lbs

C. Cable Lubricants: Lubricants specifically designed for installing communications cable may be used to reduce pulling tension as necessary when pulling cable into conduit. After installation, exposed cable and other surfaces must be cleaned free of lubricant residue.

Recommended product:	
Twisted Pair Cable	Dyna -blue; American Polywater

D. Pull Strings: Provide pull tapes in all sections of conduit. Tapes shall be marked in feet. Greenlee recommended.

E. Replace or rework cables showing evidence of improper handling including stretches, kinks, short radius bends, over tightened bindings, loosely twisted and over twisted pairs at terminals, and re-terminate cables with sheath removed over 2".

3.03 LABELS

A. The Contractor will label all outlets, using permanent, legible typed or machine engraved labels. Submit proposed labels.

B. Terminals in the TC’s shall be labeled by the contractor using designation strips designed for 110 hardware or as applicable to terminal hardware.

3.04 STATION WIRING INSTALLATION

A. Certified Installers. The low voltage Contractor shall supervise the installation of all communications cable. All Category 5E cable shall be installed by individuals trained (and certified) in low voltage data cable system installation. All Category 5E 4-pair UTP cable must be handled with care during installation so as not to change performance specifications. The Contractor shall not over tighten wraps or over bend cables. No plastic tie-wrap may be used. All cable bundling is to be done using "velcro" style wraps.

B. Wiring. Station wire shall be installed in 1" minimum size conduit.

C. Each Station shall have Four CAT 5E cables installed and terminated in a Quad outlet Plate/Box loaded with Four CAT 5E RJ-45 jacks.

D. Coordination. All wiring and associated hardware shall be placed so as to make efficient use of available space in coordination with other uses. All wiring, and associated structures and hardware shall be placed so as to not impair the use or capacity of other building systems, equipment or hardware placed by others, or to not impair the efficient use of their full capacity.

3.05 TELECOMMUNICATIONS CLOSET (TC) DETAILS

A. Mount termination equipment as required. Leave clear routes for service entrance equipment.

B. Coordinate with the Electrical Contractor to assure installation of power outlets in each location. Keep telecommunications cabling clear of spaces designated for power outlets. Telecom cable jackets shall not come in contact with electrical outlet boxes or conduit at any point in the system.

3.06 STATION CABLES

A. Installation: Pull all cables carefully, adhering to standards of care and manufacturer's recommendations for installation of cabling. Assure that when cables are left on the floor before pulling, signs or other procedures are used to assure that no one steps on the cables.

B. Labeling: All cables shall be identified by a four-digit numerical designator preceded by the TC designation. This "Jack Number" shall be determined by the position at which the cable terminates. Gaps shall be provided in the sequence of numbers, as shown on termination rack details, for possible installation of additional cables between initial termination fields.

C. NOTE: An identification number for Category 5E jacks represents four pair.

3.07 STATION HARDWARE

A. UTP cables shall be terminated in high-quality Category-5E "RJ-45" jacks meeting EIA/TIA-568A specifications, using wiring format T568B (TIA), which is both 100baseT and ATM compatible.

3.08 BACKBOARD CABLING/EQUIPMENT RACK CONFIGURATION

A. Cable installation in the equipment rooms shall be per design. Cabling shall be routed so as to avoid interference with any other service or system, operation, or maintenance purposes. Avoid crossing areas horizontally just above or below any conduit opening. Lay and dress cables to allow other cables to enter the conduit without difficulty at a later time by maintaining a working distance from these openings.

B. Cable shall be routed as close as possible, and parallel to, the ceiling, floor, or corners to ensure that adequate wall or backboard space is available for current and future

equipment and for cable terminations. Cables shall not come in contact with, electrical conduit or other equipment.

C. Cable bundles passing from a wall to a rack or other free-standing object shall not bridge a gap of greater than four inches without the use of a uni-strut or other bridging structural piece. All cables to a rack shall be cabled out to the top. Cable bundles running vertically along the back of a rack shall be held out by supporting bars a distance of at least four inches away from the back side of the rack rail. No cables will be run inside the vertical rack rail channels.

D. On backboards, lay cables via the shortest route directly to the nearest edge of the backboard from the mounted equipment or block. Lace or bundle all similarly routed cables together, and attach by means of d-rings screwed to the outside edge(s) of the backboard vertically and/or horizontally, then route via "square" corners over a path that will offer minimum obstruction to future installations of equipment, backboards, or other cables.

E. Do not allow binding on cable. Do not use tie-wraps. Velcro-style straps are recommended for cable bundling, where required.

F. Labeling: Backbone high-count UTP cables shall be numbered and labeled.

3.09 INSTALLATION TESTING

A. The Contractor shall perform a series of end-to-end installation performance tests. The Contractor shall submit a proposal describing the test procedures, test result forms, and timetable for all copper plant wiring.

B. Acceptance of the simple test procedures discussed below is predicated on the Contractor's use of the recommended products (including but not limited to twisted-pair cable, cross-connect blocks, and outlet devices specified in the Products paragraph), and adherence to the inspection requirements and practices set forth. Acceptance of the completed installation will be evaluated in the context of each of these factors.

C. At a minimum, the Contractor shall test:

1. All station drop cable pairs from EQUIPMENT ROOM terminations to outlet device RJ45 jacks.

D. Each Category 5E wire/pair shall be tested for the following:

1. termination order

2. polarity (pair reversals)

3. continuity

4. shorts

5. grounds

6. NEXT (near end cross talk)

7. cable length (record all lengths)

8. ACR (attenuation: crosstalk ratio)

9. ELFEXT (equal level far end crosstalk ratio)

10. Return Loss

E. These test procedures shall be based on EIA/TIA 568A utilizing a commercial UTP cable tester that will test up to EIA/TIA 568 Category 5E specifications and UL Category 5E parameters. Acceptable test equipment includes Scope 155 Version 5.1, Fluke DSP-4000. Testers shall have the latest software update. Testers shall be set to 100 MHz setting for Category 5E cable tests. Each tester shall be certified within 3 months of its use on the project.

F. UTP Category 5E cables shall be tested from Equipment Room to RJ45 outlets in small groups. After a small group of station cables are installed, they must be tested. Test groups shall consist of no more than forty cables.

G. The 100 MHz testing will show numerous problems which go undetected with lower frequency testing including the following:

1. Stretched cables.

2. Kinked cables.

3. Short bend radius.

4. Tight bindings.

5. Loose twists and tight twists at terminals.

6. Cable sheath removed too far.

H. When errors are found, the source of each error shall be determined, corrected, and the cable re-tested. All defective components shall be replaced and retested.

I. Test records shall be maintained using the test equipment manufacturer's electronic form. The form shall record cable identification ("jack") number, outcome of test, indication of errors found (e.g., a, b, c, d, or e), cable length, re-test results after problem resolution, and signature of the technician completing the tests. Test results shall be submitted in spreadsheet format (Excel or Word compatible) on disk - with a printed copy. Test results for each test group shall be sent to King County.

END OF SECTION

SECTION 16930
LIGHTING CONTROL EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. This specification establishes minimum standards and guidelines for providing complete and operational electrical installations on a Design-Build performance basis. It shall be the Electrical Contractor's responsibility to design and provide for furnishing, installing, testing and placing in successful operation all equipment and materials specified.

B. Provide U.L. listed lighting control equipment.

PART 2 - PRODUCTS

2.01 PHOTOELECTRIC CONTROL

A. Provide as required.

2.02 TIME CLOCK

A. Provide Intermatic ET70815CR time clock.

2.03 LIGHTING CONTACTORS AND CONTROL RELAYS

A. Contactors: Multipole, mechanically or electrically held as shown, rated for 480V operation. Contact rating 20A minimum or as required, with coil clearing contacts. Square D Class 8903.

B. Control relays: Rated 600V, 20A contacts. Square D Class 8501 XMO series.

C. NEMA 1 enclosures and 120V coils.

PART 3 - EXECUTION

Sections under PART 3 are provided as recommendations to the developer in order to achieve the desired results specified in the design criteria and performance specifications.

3.01 PHOTO CONTROL

A. Provide roof mounted (unless required otherwise) support stand. Orient light sensor in northerly direction.

3.02 LIGHTING CONTROLS

A. Install control equipment with required wiring to achieve lighting control needed. Outdoor lights off during daylight hours.

B. Interior lighting zones shall be programmed per the King County's requirements. Meet with King County to determine interior lighting scheduling requirements prior to programming.

END OF SECTION

SECTION 280800
CONFIGURATION AND COMMISSIONING OF SECURITY SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. Configure, activate, and commission the site security system integrated to the central security monitoring station.

B. The work includes (in general sequence of activities):

1. Configure System – Furnish and install system control software, and configure the software, devices, and overall integrated system to achieve the specified functionality and SMS integration requirements. Review King County IT standard operating system and firewall configurations necessary to plan and conduct the work.

2. Inspect and Test System (additional requirements specified elsewhere in document) – Inspect and test the equipment and software prior to in-service activation, to demonstrate conformance with specifications. Also, provide support during King County's inspection and testing of the system.

3. Support King County Network Installation (additional requirements specified elsewhere in document) – Provide support for King County's network installation, testing, and activation.

4. Activate System – Activate and conduct operational demonstration and system validation testing of the end-to-end system at the site interconnected to the SMS. Demonstrate system functionality, and provide technical support for inspection and testing of the activated system by King County. Closely monitor system operations for two (2) days, and troubleshoot and repair any non-performing equipment or configuration work to achieve specified performance requirements. Repeat the activation step until the system achieves specified performance. System will remain in service after this task is successfully completed.

5. Commission System – Routinely monitor system during the initial thirty (30) days of in-service operation by King County, and troubleshoot and repair any user-indentified equipment or configuration issues to achieve specified performance and functionality requirements.

C. Warranty – Warranty period begins at acceptance of testing and commissioning approvals by King County representative. Warranty period shall cover a minimum of 1 year from acceptance by King County.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.01 SYSTEM CONFIGURATION

A. Configure the system to achieve specified performance and functionality requirements. The work includes (in general sequence of activities):

B. Submit Implementation Plan – Prepare an implementation plan that documents the requirements, work plan, and testing requirements necessary to conduct this scope of work. Work includes: a) conduct system review; b) establish project requirements, c) plan the work, and d) submit implementation plan for proposed activities. Review the configuration and functionality of Metro's existing SMS, access control, and INET systems as necessary to establish project requirements necessary for a complete and fully functional system interconnection. Identify the required software and hardware settings and configurations and establish configuration requirements necessary to achieve system functionality. Submit an implementation plan that addresses the requirements of each task scope herein and includes, at a minimum, these elements: narrative description of the overall process; proposed software and hardware settings and configuration requirements; work breakdown and schedule for the work with key milestones (including any SMS or access control system operational interruptions); contact information and communication plan; system protection plan; test plan (including at a minimum the testing requirements identified herein and pass/fail criteria); activation plan (including rollback plan); and commissioning plan. Identify information needed from Metro to complete the work. Attend one meeting to review the proposed plan and respond to comments from Metro staff prior to implementation.

C. Configure System – Furnish and install system control software, and configure system to enable specified local and remote control and monitoring functionality. Work includes: a) conduct the system configuration and integration work, b) attend one coordination meeting with Metro staff regarding the configuration work, and c) provide follow-up technical support to Metro staff as requested for the implemented configurations. Metro will provide a work station for contractor use that is configured for remote access to Metro's security and access control systems, this work station is located at King Street Center 201 S Jackson St Seattle, WA.. The work under this task includes, but is not limited to, these activities:

1. Windows OS & Firewall Installation – Metro will install its standard Windows Operating System and firewall on system devices (Digital Video Recorder, network switch, etc.). Review the software configurations as necessary to plan and execute the work. Conform to Metro network standards without exception.

2. IP Addressing – Metro will provide IP addresses for the DVRs. Review the addresses as necessary for project implementation, and implement the addressing consistently throughout the work.

3. Device Naming – Metro will provide the baseline naming conventions for all field devices (alarms, access controlled doors, cameras, help-phones and any other installed device). Submit a detailed naming plan including information required for full functionality (aliases, graphical user interface information, alarm naming, etc.) for Metro review, consistent with Metro's conventions. Implement the approved naming convention consistently throughout the configuration work

4. Call Station and VOIP Configuration – Metro will assign VOIP phone numbers to call stations. Configure the site VOIP systems to communicate with the central VOIP system at SMS to achieve instantaneous two-way communication between the two sites. Implement the phone numbering consistently throughout the work.

5. Access Control System Configuration (Doors, Break-In Alarms, and NetController System) - The access control system is used for both door access and break-in detection. Metro will provide the baseline naming convention for the site doors, and will also configure the access rights for the doors within Metro's existing access control database (administered by Metro's Facilities Section). Configure the access control system to integrate with and function with the existing Metro access control system and access control database. Implement the approved naming convention consistently throughout the configuration work. Provide technical support to Metro during access rights configuration and testing.

6. Video Surveillance System Configuration (DVRs, cameras) – Metro will provide baseline security functionality requirements to be applied to the video surveillance system. Submit a detailed configuration plan (camera preset positions; activation, recording, and monitoring requirements; and emergency call alarm and break-in alarm conditions) for Metro review, consistent with the baseline functionality requirements. Implement the approved video surveillance system plan to achieve the required security control, monitoring and recording functionality consistently throughout the configuration work.

7. Graphical User Interface (GUI) Configuration - Metro will provide a baseline graphics/control layout. Prepare graphical representation and control functionality to be applied to the monitoring and control systems at the site and SMS. Submit a detailed GUI configuration plan (camera views, device graphics, alarm activation and acknowledgement, etc.) for Metro review, consistent with the existing SMS system conventions. Implement the approved GUI plan consistently throughout the configuration work.

D. Inspect and Test System (additional requirements specified elsewhere in document) – Test the configured system interconnection to meet the specified technical and functional requirements, prior to activation at the SMS. Conduct discrete unit, system, and performance testing activities, and demonstrate the specified performance and functionality of the installed equipment. Conduct initial readiness testing as described herein in preparation for Metro's readiness review, and make the system ready for inspection by Metro. Metro will conduct inspection testing and establish system readiness for activation. Metro's readiness review will include testing and acceptance of these items (at a minimum): unit and system functionality testing; hardware, software, application and data specification conformance; SMS systems status (ready for activation); equipment connection; back-up and recovery documentation; training documentation; approved contractor staffing plan and schedule for subsequent work tasks.

E. Activate and Test System – Submit test documentation for review and approval by King County before system acceptance. Following successful testing, activate the system and conduct testing under simulated normal operating conditions. Demonstrate successful interactions and interconnection functionality of the new system with the existing SMS system. Confirm and demonstrate that the system operates as a complete entity between the site and the SMS, including the system user interface, data conversion requirements, and specified applications and functions. Monitor the system continuously for a period of two (2) days, during which time Metro SMS staff will use and evaluate the complete interconnected system. Provide hands-on instruction to Metro staff to facilitate system use and testing during the activation period. Adjust the system

as required by Metro during this activation period. Roll back the system interconnection if operational impacts are identified by either Contractor or Metro.

F. Commission System – Following successful activation, provide commissioning services for the system interconnection for a period of thirty (30) days of normal operation, to run consecutively with the successful activation period. Troubleshoot and adjust the system as identified by Contractor or required by Metro during this commissioning period. Submit a documentation package including the pre- and post-expansion configuration, naming/addressing, equipment interconnection diagrams, software settings, operations and maintenance information (including troubleshooting guide). Work includes: prepare and submit documentation package; and attend review meeting.

END OF SECTION

EXHIBIT C-1

Legal Description of Land

Certain real property situated in King County, Washington and more particularly described as follows:

LOT A OF BLA NO. PLA 07-1600, RECORDED NOVEMBER 28, 2007 UNDER RECORDING NO. 20071128900020, IN KING COUNTY, WASHINGTON.

EXHIBIT C-2

Map of Land

(showing approximate location of Garage Land and Housing Land)

EXHIBIT D

Legal Description of Garage Land

[To be attached to this Lease upon completion of
short plat of Land pursuant to Section 1.4 of Ground Lease]

EXHIBIT E

Legal Description of Housing Land

[to be attached to this Lease upon completion of short plat of Land pursuant to Section 1.4 of the Ground Lease

EXHIBIT F

[Intentionally Deleted]

EXHIBIT G

Project Schedule

EXHIBIT H

Confirmation of Commencement Date and Expiration Date

In accordance with the provisions of Section 3 of the Lease as of this _____ day of _____, 20___, Landlord and Tenant acknowledge, agree and confirm the following:

The Commencement Date of the Lease is: _____.

The Expiration Date of the Lease is: _____.

The foregoing agreement and confirmation shall be binding upon Landlord and Tenant and shall supersede and control over any other provision in the Lease regarding the Commencement Date and Expiration Date which might be construed other than as set forth in this Confirmation.

AGREED the day and year first above written.

LANDLORD:

ALLIANCE WASATCH I, LLC, a California limited liability company

By _____
Name _____
Title _____

Date _____, 20__

TENANT:

APPROVED AS TO FORM:

KING COUNTY, a political subdivision of the State of Washington

By _____
Senior Deputy Prosecuting Attorney

Date _____, 20__

By _____
Name _____
Title _____

Date _____, 20__

EXHIBIT I

DISPUTE RESOLUTION PROCEDURE

Landlord and Tenant shall act in good faith and deal fairly in performing their respective duties under the Lease in order to accomplish their mutual objectives and avoid disputes. If a dispute arises with respect to design or construction of the Project including, without limitation, the calculation of Additional Rent, the parties agree to utilize the dispute resolution process contained herein, which will be non-binding but a condition precedent to having such dispute decided in court by a judge or jury.

1. Mediation. In the event a dispute arises between Tenant and Landlord with respect to (i) design or construction of the Project or (ii) the calculation of Additional Rent, the parties shall proceed in good faith to resolve such dispute as expeditiously as possible. In particular, the parties shall cooperate so that the progress of the design and construction of the Project is not delayed. If, however, the parties are unable to resolve the dispute within three (3) Business Days, either party may refer the dispute to the Mediator named below.

1.1 Mediator. For any dispute arising during construction of the Project which cannot be resolved by the parties, the mediator hereunder ("Mediator") shall be a mediator designated by Tenant from the JAMS panel of neutrals located in Seattle, Washington, a mediation panel which Landlord and Tenant have mutually designated to resolve such dispute, or, if at the time the dispute exists, JAMS or the JAMS panel of neutrals in Seattle, Washington no longer exists or is not available, Tenant shall designate a reputable independent mediator with at least seven (7) years of experience in the Pacific Northwest in design and construction of parking garages comparable to the Project. The Mediator is to act impartially and independently in the consideration of facts and conditions surrounding any dispute presented by Tenant and Landlord; however, the Mediator's recommendations concerning any such dispute are advisory only. The Mediator's recommendations shall be based on the pertinent Lease provisions, and the facts and circumstances involved in the dispute. The Mediator's recommendations shall be furnished in writing to the parties.

1.2 Tenant Responsibility. Tenant shall furnish the Mediator one copy of all documents it might have, other than those furnished by Landlord, which are pertinent to the performance of the Mediator's duties hereunder.

1.3 Landlord Responsibility. Landlord shall furnish the Mediator one copy of all Contract Documents, including but not limited to the Preliminary Plans and Outline Specifications, applicable contracts, interpretative reports, progress schedule and updates, monthly progress reports, and other documents pertinent to the performance of the Lease and necessary to the performance of the Mediator's duties hereunder.

1.4 Term. Following execution of the Lease, the Mediator shall have authority to act hereunder upon written request from either Landlord or Tenant and such authority shall terminate upon notice to the Mediator by the parties.

1.5 Payment. The fees charged by the Mediator shall be shared equally by the parties. The Mediator's compensation shall include compensation for all materials, supplies,

travel, office assistance and support and incidentals necessary to provide the services described herein. Payment for services rendered by the Mediator will be at the Mediator's standard hourly rate as approved by Landlord and Tenant prior to commencement of the dispute resolution proceeding.

1.6 Legal Relationship. The Mediator, in the performance of the duties described herein, is acting in the capacity of an independent agent and not as an employee of either Tenant or Landlord. The Mediator is absolved of any personal or professional liability arising from the recommendations made hereunder, unless due to gross negligence or willful malfeasance.

EXHIBIT J

FORM OF NOTICE OF EXERCISE OF OPTION TO PURCHASE

[date]

To: Landlord

You are hereby notified that King County, a political subdivision of the State of Washington has elected to exercise on [date of payment] its option to purchase the Garage ("Premises") currently leased by Tenant, pursuant to the Lease Agreement (with Option to Purchase) ("Lease") by and between Landlord and Tenant dated as of April 1, 2010. This purchase option is being exercised pursuant to Section 21 of the Lease. The purchase price of the Premises shall be an amount equal to the Option Price (as defined in the Lease) less the amount of all Monthly Rent paid under the Lease to the date of Closing, plus an option exercise fee of one dollar ($1.00).

TENANT:

APPROVED AS TO FORM:

KING COUNTY, a political subdivision of the State of Washington

By _____
Senior Deputy Prosecuting Attorney

By _____
Name _____
Title _____

Date _____

EXHIBIT K

After Recording Return To:
King County
Property Service Division
500 King County Administration Building
500 Fourth Avenue
Seattle, Washington 98104

SUBORDINATION, NONDISTURBANCE AND ATTORNMENT AGREEMENT
Lease (with Option to Purchase)

GRANTORS: 1. ALLIANCE WASATCH I, LLC, a California limited liability company (Landlord)

2. KING COUNTY, a political subdivision of the State of Washington (Tenant)

GRANTEE: [LENDER] (Beneficiary)

Legal Description:
Abbreviated form:
Additional legal on page _____ of document

Assessor's Property Tax Parcel Account Number(s):

Reference number(s) of Related Document(s):

(Additional on page ____ of document)

SUBORDINATION, NONDISTURBANCE AND ATTORNMENT AGREEMENT

NOTICE: THIS AGREEMENT RESULTS IN THE LEASE BECOMING SUBJECT TO AND OF LOWER PRIORITY THAN THE LIEN OF SOME OTHER OR LATER SECURITY INSTRUMENT.

THIS AGREEMENT is made as of April 1, 2010, by and among Landlord, Tenant and Beneficiary and affects the Property described in Exhibit A attached hereto. The terms "Tenant," "Landlord," "Beneficiary," "Premises," "Ground Lease," "Lease," "Property," "Loan" and "Mortgage" are defined in the Schedule of Definitions attached hereto as Exhibit B. This Agreement is entered into with reference to the following facts:

RECITALS

A. Landlord and Tenant have entered into the Lease with respect to the Premises.

B. Beneficiary has made the Loan to Landlord secured by the Mortgage on the Premises.

C. It is a condition precedent to the effectiveness of the Lease that Tenant is assured of continued occupancy of the Premises and its rights under the Lease (including its option to purchase the Premises) under the terms of the Lease.

D. Beneficiary is willing to assure Tenant of continued occupancy of the Premises and its rights under the Lease (including its option to purchase the Premises) pursuant to the terms of the Lease as stated in this Agreement.

NOW, THEREFORE, in consideration of the mutual benefits accruing to the parties and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, it is agreed:

AGREEMENT

1. Beneficiary hereby consents to and approves the Lease including Tenant's option to purchase the Premises on the terms and conditions contained therein.

2. Tenant's interest in the Lease and all rights of Tenant thereunder shall be subject and subordinate to the Mortgage encumbering the Premises (provided that all condemnation awards and insurance proceeds paid or payable with respect to the Premises and received by Beneficiary shall be applied to the repair and restoration of the Premises or disbursed to Tenant as and to the extent provided in the Lease, subject however to such reasonable protective measures as may be required by Beneficiary for disbursement of such funds and as are described in the Mortgage). Nothing contained in this Agreement is

intended to constitute a subordination of the Tenant's interest as the fee owner of the Property demised to Landlord under the terms of the Ground Lease.

3. If Beneficiary causes a foreclosure of the Mortgage, Beneficiary will not name or join Tenant as a party to any foreclosure action except as required by law, nor will Beneficiary name or join Tenant as a party in any suit, action or proceeding to enforce any rights under the Mortgage.

4. Tenant's possession of the Premises and Tenant's rights in the Premises (including its option to purchase the Premises) shall not be interrupted, disturbed, affected or impaired by, nor will the Lease or the term of the Lease or Tenant's option to purchase the Premises on the terms and conditions set forth in the Lease be terminated or otherwise affected by, any default by Landlord under the Mortgage or any suit, action or proceeding upon the Mortgage or for the foreclosure of the Mortgage by Beneficiary or the enforcement of any rights under the Mortgage or any other documents held by the Beneficiary, or by any judicial sale or execution or other sale of the Premises, or by any deed given in lieu of foreclosure, or by the exercise of any other rights given to the Beneficiary by any other documents or as a matter of law. This nondisturbance provision shall apply with respect to Tenant's continued occupancy of the Premises pursuant to an exercise of its rights under Bankruptcy Code Section 365(h).

5. So long as Tenant is not in default under any of the terms, covenants or conditions of the Lease after the expiration of all cure, notice or grace periods provided in the Lease for Tenant's defaults: The Lease shall continue in full force and effect, the Lease shall not be terminated, and Tenant's use, possession and enjoyment of the Premises (including its option to purchase the Premises) shall be recognized and shall not be interfered with. If the Beneficiary takes possession of the Premises or starts collecting rent or becomes the owner of the Premises by reason of foreclosure of the Mortgage or otherwise, or if the Premises shall be sold as a result of any action or proceeding to foreclose the Mortgage or by a deed given in lieu of foreclosure, the Lease shall continue in full force and effect, without necessity for executing any new Lease, as a direct lease between Tenant and the Beneficiary or the then owner of the Premises as landlord upon all of the same terms, covenants and provisions contained in the Lease, (including, but not limited to Tenant's option to purchase the Premises), and in that event the Beneficiary or such new owner shall be bound to Tenant under all of the terms, covenants and provisions of the Lease (including, but not limited to Tenant's option to purchase the Premises) for the remainder of the term of the Lease which terms, covenants and provisions the Beneficiary or new owner agrees to assume and perform. Tenant agrees, after receipt by Tenant of notice from Beneficiary of any foreclosure of the Mortgage or any conveyance in lieu of foreclosure, to attorn to Beneficiary or its successor and accept the Beneficiary or any such successor owner as landlord under the Lease, and to be bound by and perform all of the obligations imposed upon Tenant by the Lease. Beneficiary or any such successor owner of the Property shall be bound by, assume and agree to perform all of the obligations imposed by the Lease upon Landlord (including but not limited to the

obligation to complete construction of the Garage on the terms and conditions set forth in the Lease) and Tenant shall have the same remedies against Beneficiary or a successor owner for breach of the Lease that Tenant may have had under the Lease against Landlord.

6. Insurance and condemnation proceeds shall be disposed of in accordance with the Ground Lease and the Lease, respectively, and not in accordance with the Mortgage.

7. Landlord and Beneficiary each acknowledges and agrees that all trade fixtures, equipment and other property owned by Tenant located or installed in or on the Premises, if any, regardless of the manner of attachment, shall be and remain the property of Tenant and may be removed by Tenant at any time. In no event (including a default under the Lease or Mortgage) shall either Landlord or Beneficiary have any liens, rights or claims in Tenant's property, and Beneficiary expressly waives all rights of lien, levy, distraint or execution with respect to Tenant's property.

8. Beneficiary and Tenant agree that so long as the Lease is in full force and effect, no exercise by Tenant of its rights under the Lease shall constitute a default under the Mortgage or require Beneficiary's consent, and that except for the rights, privileges and benefits of Landlord and Tenant expressly set forth herein, any conflict between the terms of the Lease and the terms of the Mortgage shall be resolved in favor of the Lease. In furtherance of and not as a limitation on the foregoing, Tenant may, without causing a default to occur under the Mortgage and without Beneficiary's consent, to the extent expressly permitted by the Lease: (a) make alterations and improvements to the Premises; (b) contest legal requirements claimed to be applicable to the Premises and defer compliance with such legal requirements pending the determination of any such contest; (c) exercise its right to issue certificates of participation in rent payments to be made under the Lease; (d) exercise its option to purchase the Premises; and (e) remove fixtures, improvements and/or personal property that it owns from the Premises.

9. All notices hereunder shall be deemed to have been duly given if mailed by United States registered or certified mail, with return receipt requested, postage prepaid, or by United States express mail or other comparable overnight courier service or by facsimile transmission to the parties at the following address or addresses (or at such other address or addresses, written notice of which have been given as herein provided) and shall be deemed given when so delivered, two (2) business days after being deposited in the United States mail postage prepaid or delivered to the overnight courier service or on the date when faxed (provided the fax machine has issued a printed confirmation of receipt):

Landlord: Alliance Wasatch I, LLC
617 West 7th Street, Suite 401
Los Angeles, CA 90017

Beneficiary: _____
_____
_____

Tenant: King County
Property Services Division
500 King County Administration Building
500 Fourth Avenue
Seattle, WA 98104

These addresses may be changed from time to time by a party serving notice of the changes as provided above. Notices shall be deemed given upon receipt or attempted delivery where delivery is not accepted.

10. This Agreement, and each of the provisions hereof, shall inure to the benefit of or bind as the case may require, and be enforceable by the parties hereto and their respective heirs, personal representatives, successors and assigns, including without limitation, any purchaser at any foreclosure sale of the Mortgage or any transferee of a deed in lieu of foreclosure; provided, however, that the interest of any party under this Agreement may not be assigned or transferred except together with an assignment or transfer of such party's interest under the Ground Lease and the Lease, or the Mortgage, as applicable.

11. Landlord, as landlord under the Lease and grantor under the Mortgage, acknowledges and agrees for itself and its successors and assigns that: (a) this Agreement does not constitute a waiver by Beneficiary of any of its rights against Landlord under the Mortgage and/or in any way release Landlord from its obligation to comply with all of the terms, provisions, conditions, covenants, and agreements set forth in the Mortgage; and (b) this Agreement does not constitute a waiver by Tenant of any of its rights under the Ground Lease or the Lease and/or in any way release Landlord from its obligation to comply with all of the terms, provisions, conditions, covenants and agreements set forth in the Ground Lease and the Lease.

12. This Agreement may not be modified other than by an agreement in writing signed by the parties hereto or by their respective successors in interest. This Agreement shall be governed by and construed and enforced in accordance with the laws of the State of Washington.

13. Landlord and Beneficiary acknowledge that the Tenant is the fee owner of the real property legally described in the Ground Lease which is has leased to Landlord pursuant to the terms of the Ground Lease. Nothing contained in this Agreement is intended to modify the rights, duties and obligations of the Tenant in its capacity as landlord under the Ground Lease or the Landlord as tenant under the Ground Lease. This Agreement does not subordinate the Ground Lease to the lien of the Mortgage. This

Agreement does not subordinate the fee interest of the Tenant in the real property demised to Landlord under the Ground Lease. This Agreement is intended only to subordinate the interest of the Tenant as the tenant under the Lease. Nothing contained in this Agreement is intended to constitute a consent to a merger of the fee title to the Property and the leasehold estate of the Landlord as the tenant therein created under the Ground Lease with the leasehold interest of the Tenant created under the Lease.

14. In the event any term or provision of this Agreement or the application thereof to any person or circumstance shall, for any reason and to any extent be invalid or unenforceable, the remaining terms and provisions of this Agreement shall not be affected thereby, but rather shall be enforceable to the fullest extent permitted by law.

15. This document may be executed in counterparts, each of which shall constitute an original and all of which shall together constitute one original.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement the date and year first above written.

BENEFICIARY:

By _____
Name _____
Title _____

TENANT:

KING COUNTY, a political subdivision of the State of Washington

By _____
Name _____
Title _____

LANDLORD:

ALLIANCE WASATCH I, LLC, a California limited liability company

By _____
Name _____
Title _____

Approved as to Form:

By _____
Senior Deputy Prosecuting Attorney

Date: _____

STATE OF WASHINGTON)
) ss.
COUNTY OF KING)

I certify that I know or have satisfactory evidence that _____ is the person who appeared before me, and said person acknowledged that s/he signed this instrument, on oath stated that s/he was authorized to execute the instrument and acknowledged it as the _____ of KING COUNTY, a political subdivision of the State of Washington, and acknowledged it to be the free and voluntary act and deed of said entity for the uses and purposes mentioned in the instrument.

DATED _____.

_____
Notary Public
Print Name _____
My commission expires _____

(Use this space for notarial stamp/seal)

STATE OF WASHINGTON)
) ss.
COUNTY OF KING)

I certify that I know or have satisfactory evidence that _____ is the person who appeared before me, and said person acknowledged that s/he signed this instrument, on oath stated that s/he was authorized to execute the instrument and acknowledged it as the _____ of ALLIANCE WASATCH I, LLC, a California limited liability company, and acknowledged it to be the free and voluntary act and deed of said entity for the uses and purposes mentioned in the instrument.

DATED _____.

_____
Notary Public
Print Name _____
My commission expires _____

(Use this space for notarial stamp/seal)

STATE OF WASHINGTON)
) ss.
COUNTY OF KING)

I certify that I know or have satisfactory evidence that _____ is the person who appeared before me, and said person acknowledged that s/he signed this instrument, on oath stated that s/he was authorized to execute the instrument and acknowledged it as a _____ of _____, and acknowledged it to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

DATED _____.

_____
Notary Public
Print Name _____
My commission expires _____

(Use this space for notarial stamp/seal)

Exhibit A

Legal description of the Property

(after short plat)

Exhibit B

Definitions

"Beneficiary" shall mean [name of Lender] having an address at [address of Lender].

"Ground Lease" shall mean that certain Ground Lease with an Effective Date of [*], executed by King County, in its capacity as fee owner of the Property, as ground lessor, and Landlord, as ground lessee, as such Ground Lease is now or hereafter amended.

"Landlord" shall mean Alliance Wasatch I, LLC, a California limited liability company, having an address at 617 West 7th Street, Suite 405, Los Angeles, California 90017.

"Lease" shall mean that certain Lease Agreement (with Option to Purchase) with an Effective Date of [*], by and between Landlord and Tenant, as such Lease is now or hereafter amended.

"Loan" shall mean that certain loan in the amount of $20,518,000.00 made by Beneficiary to Landlord to finance construction of the Garage to be constructed on the Property pursuant to the Lease.

"Mortgage" shall mean a first lien Construction Leasehold Deed of Trust, Security Agreement, Assignment of Leases and Rents and Fixture Filing dated as of [•], 2010, encumbering the Premises, executed by Landlord, as grantor, in favor of Beneficiary, securing repayment of the Loan to be recorded in the county in which the Property is located.

"Premises" shall mean the Landlord's leasehold interest in the Property created under the Ground Lease together with all improvements now or hereafter located on the Property.

"Property" shall mean the real property described in Exhibit A hereto.

"Tenant" shall mean King County, a political subdivision of the State of Washington having an address at King County Property Services Division, 500 King County Administration Building, 500 Fourth Avenue, Seattle, WA 98104.

EXHIBIT L

After Recording Return To:
King County
Property Service Division
500 King County Administration Building
500 Fourth Avenue
Seattle, Washington 98104

MEMORANDUM OF LEASE AGREEMENT
(With Option to Purchase)

GRANTOR: ALLIANCE WASATCH I, LLC, a California limited liability company (Landlord)

GRANTEE: KING COUNTY, a political subdivision of the State of Washington (Tenant)

Legal Description:
Abbreviated form:
Additional legal on page Exhibit A of document

Assessor's Property Tax Parcel Account Number(s):

THIS MEMORANDUM OF LEASE (the "Memorandum") is dated for reference purposes as of April 1, 2010 between ALLIANCE WASATCH I, LLC, a California limited liability company ("Landlord"), and KING COUNTY, a political subdivision of the state of Washington ("Tenant").

1. Lease. Landlord has leased to Tenant the Premises described in Exhibit A attached hereto and by this reference incorporated herein (the "Premises") at a rent and on the terms and conditions set forth in that certain Lease Agreement (With Option to Purchase) dated April 1, 2010 by and between Landlord and Tenant (the "Lease"). The Lease is for a term expiring on the earlier of: (i) the date which is twenty-five (25) years after the Commencement Date or (ii) the date the Ground Lease is terminated as a result of payment or defeasance in full of all Monthly Rent as set forth on Exhibit A to the Lease, unless sooner terminated pursuant to the terms of the Lease; provided, however, that Tenant's duty to pay Monthly Rent shall not commence until the Commencement Date.

2. Definition of Terms. All capitalized terms not otherwise defined herein shall have the same meaning as set forth in the Lease.

3. Tax Exemption. In accordance with RCW 36.34.205 and RCW 35.42.090, the Lease shall be exempt from any taxes imposed under the authority of RCW Ch. 82.45, RCW 82.04.040 or RCW 82.08.090.

4. Lien Notice. Notice is hereby given that Tenant will not be liable for any labor, services, materials or equipment furnished or to be furnished to Landlord, General Contractor or anyone holding an interest in the Premises (or any part thereof) through or under Landlord or General Contractor, and that no construction or other liens for any such labor, services, materials or equipment shall attach to or affect the interest of Tenant in the Premises.

5. Option to Purchase. Landlord has granted Tenant an option to purchase the Premises at a price and on the terms and conditions set forth in the Lease.

6. Purpose of Memorandum. This Memorandum is prepared for purposes of recordation only and does not set forth all of the terms and conditions set forth in the Lease. In the event there is any conflict between the terms and conditions of the Lease and this Memorandum, the Lease shall control.

DATED the date first above written.

LANDLORD:

ALLIANCE WASATCH I, LLC,
a California limited liability company

By _____
Name _____
Title _____

Date _____, 2010

TENANT:

APPROVED AS TO FORM:

KING COUNTY, a political subdivision of the State of Washington

By _____
Senior Deputy Prosecuting Attorney

By _____
Name _____
Title _____

Date _____, 2010

Date _____, 2010

STATE OF WASHINGTON)
) ss.
COUNTY OF KING)

I certify that I know or have satisfactory evidence that _____ is the person who appeared before me, and said person acknowledged that s/he signed this instrument, on oath stated that s/he was authorized to execute the instrument and acknowledged it as the _____ of ALLIANCE WASATCH I, LLC, a California limited liability company, and acknowledged it to be the free and voluntary act and deed of said entity for the uses and purposes mentioned in the instrument.

Given Under My Hand And Official Seal this _____ day of _____, 2010.

_____
Notary Public
Print Name _____
My commission expires _____

(Use this space for notarial stamp/seal)

STATE OF WASHINGTON)
) ss.
COUNTY OF KING)

I certify that I know or have satisfactory evidence that _____ is the person who appeared before me, and said person acknowledged that s/he signed this instrument, on oath stated that s/he was authorized to execute the instrument and acknowledged it as the _____ of KING COUNTY, a political subdivision of the State of Washington, and acknowledged it to be the free and voluntary act and deed of said entity for the uses and purposes mentioned in the instrument.

Given Under My Hand And Official Seal this _____ day of _____, 2010.

_____
Notary Public
Print Name _____
My commission expires _____

(Use this space for notarial stamp/seal)

EXHIBIT A

LAND

EXHIBIT M

FEDERAL TRANSIT ADMINISTRATION (FTA) REQUIREMENTS

1-1 Disadvantaged Business Enterprise (DBE) Participation

A. Nondiscrimination 49 CFR part 26. The Contractor 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 and administration of United States Department of Transportation assisted contracts. Failure by the Contractor to carry out these requirements is a material breach of this Contract, which may result in the termination of this Contract or such other remedy, as the County deems appropriate. Each subcontract the contractor signs with a subcontractor must include the assurance in this paragraph (see 49 CFR 26.13(b)).

B. DBE Program. The DBE requirements of 49 CFR Part 26 apply to this Contract. King County has determined that no DBE goal will be established for this Contract. However, the County requires that the Contractor report any actual DBE participation on this Contract to enable the County to accurately monitor DBE program compliance.

C. Efforts to Increase DBE Participation. Even though this Contract has no DBE goal, the County still encourages Contractors to pursue opportunities for DBE participation. To that end, Contractors are encouraged to:

1. Advertise opportunities for subcontractors and suppliers ("subcontractors") in a manner reasonably designed to provide DBEs capable of performing the work with timely notice of such opportunities. All advertisements should include a provision encouraging participation by DBE firms and may be done through general advertisements (e.g., newspapers, journals, etc.) or by soliciting proposals directly from DBEs.

2. Utilize the services of available minority community organizations, minority consultant groups, local minority assistance offices and organizations that provide assistance in the recruitment and placement of DBEs and other small businesses.

3. Establish delivery schedules, where requirements of the contract allow and encourage participation by DBEs and other small businesses.

4. Achieve DBE attainment through joint ventures.

D. DBE Listing. A current list of DBE firms accepted as certified by the Washington State Office of Minority and Women's Business Enterprises (OMWBE) is available from that office at (360) 753-9693. For purposes of this Contract, a DBE firm must be certified by OMWBE as of the date of contract award.

E. Procedure Applicable when DBEs Are Utilized. Concurrent with the use of any DBE subcontractor or supplier the Contractor shall provide notice of such use in writing to the King County Office of Business Development and Contract Compliance (BDCC). Upon receipt of said notice, BDCC shall provide the Contractor with the applicable procedures for counting DBE participation. Assistance with this Section is available from BDCC at (206) 684-1330. Notice referenced herein should be delivered to the following address:

King County Department of Finance
Office of Business Relations and Economic Development
701 Fifth Avenue, Suite 2000
Bank of America Tower
Seattle, WA 98104-7097
Phone: (206) 205-0711
Fax: (206) 205-0719

1-2 Federal Changes

Contractor shall at all times comply with all applicable FTA regulations, policies, procedures and directives, including without limitation those listed directly or by reference in the Master Agreement between the County and FTA, as they may be amended or promulgated from time to time during the term of this contract. Contractor's failure to so comply shall constitute a material breach of this contract.

1-3 No Federal Government Obligations to Third Parties

The Contractor acknowledges and agrees that, notwithstanding any concurrence by the Federal Government in or approval of the solicitation or award of this Contract, absent the express written consent by the Federal Government, the Federal Government is not a party to this Contract and shall not be subject to any obligations or liabilities to the Contractor or any other party (whether or not a party to this Contract) pertaining to any matter resulting from this Contract.

The Contractor agrees to include the above clause in each subcontract financed in whole or in part with Federal assistance provided by FTA. It is further agreed that the clause shall not be modified, except to identify the subcontractor who will be subject to its provisions.

1-4 Civil Rights

The following requirements apply to the underlying contract:

(A) Nondiscrimination - In accordance with Title VI of the Civil Rights Act, as amended, 42 U.S.C. § 2000d, section 303 of the Age Discrimination Act of 1975, as amended, 42 U.S.C. § 6102, section 202 of the Americans with Disabilities Act of 1990, 42 U.S.C. § 12132, and Federal transit law at 49 U.S.C. § 5332, the Contractor agrees that it will not discriminate against any employee or applicant for employment because of race, color, creed, national origin, sex, age, or disability. In addition, the Contractor agrees to comply with applicable Federal implementing regulations and other implementing requirements FTA may issue.

(B) Equal Employment Opportunity - The following equal employment opportunity requirements apply to the underlying contract:

(1) Race, Color, Creed, National Origin, Sex - In accordance with Title VI of the Civil Rights Act, as amended, 42 U.S.C. § 2000e, and Federal transit laws at 49 U.S.C. § 5332, the Contractor agrees to comply with all applicable equal employment opportunity requirements of U.S. Department of Labor (U.S. DOL) regulations, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor," 41 C.F.R. Parts 60 et seq., (which implement Executive Order No. 11246, "Equal Employment Opportunity," as amended by Executive Order No. 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," 42 U.S.C. § 2000e note), and with any applicable Federal statutes, executive orders, regulations, and Federal policies that may in the future affect construction activities undertaken in the course of the Project. The Contractor agrees to take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, creed, national origin, sex, or age. Such action shall include, but not be limited to, the following: 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. In addition, the Contractor agrees to comply with any implementing requirements FTA may issue.

(2) Age - In accordance with section 4 of the Age Discrimination in Employment Act of 1967, as amended, 29 U.S.C. §§ 623 and Federal transit law at 49 U.S.C. § 5332, the Contractor agrees to refrain from discrimination against present and prospective employees for reason of age. In addition, the Contractor agrees to comply with any implementing requirements FTA may issue.

(3) Disabilities - In accordance with section 102 of the Americans with Disabilities Act, as amended, 42 U.S.C. § 12112, the Contractor agrees that it will comply with the requirements of U.S. Equal Employment Opportunity Commission, "Regulations to Implement the Equal Employment Provisions of the Americans with Disabilities Act," 29 C.F.R. Part 1630, pertaining to employment of persons with disabilities. In addition, the Contractor agrees to comply with any implementing requirements FTA may issue.

1. (C) Information and Reports - The Contractor shall provide all information and reports required by the regulations or directives issued pursuant thereto and shall permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the County or the Federal Transit Administration (FTA) to be pertinent to ascertain compliance with such regulations, orders and instructions. The Contractor shall maintain all required records for a least three (3) years after the County makes final payment and all other pending matters are closed. Where any information is required and it is in the exclusive possession of another who fails or refuses to furnish this information, the Contractor shall so certify to the County or the Federal Transit Administration, as appropriate, and shall set forth efforts made to obtain the information.

2. (D) Sanctions for Noncompliance - In the event of the Contractor's noncompliance with the nondiscrimination provisions of this Contract, the County shall impose such contract sanctions as it or the FTA may determine to be appropriate, including, but not limited to:

3. Withholding of payments to the Contractor under the Contract until the Contractor complies, and/or,

4. Cancellation, termination or suspension of the Contract, in whole or in part.

(E) Incorporation of Provisions - The Contractor shall include the provisions of paragraphs A through E of this section in every subcontract, including procurements of materials and leases of equipment, unless exempt by the regulations or directives issued pursuant thereto. The Contractor shall take such action with respect to any subcontract or procurement as the County or the FTA may direct as a means of enforcing such provisions, including sanctions for noncompliance. Provided, however, that, in the event the Contractor becomes involved in or is threatened with litigation with a subcontractor or supplier as a result of such direction, the Contractor may request the County to enter into such litigation to protect the interests of the County, and in addition, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

1-5 Labor Provisions - Non-Construction Contracts

The Contractor agrees to comply, and assures the compliance by each subcontractor or subconsultant at any tier with any applicable employee protection requirements for non-construction employees of Section 102 of the Contract Work Hours and Safety Standards Act, as amended, 40 U.S.C. Sections 327 - 332, and U.S. DOL regulations, "Labor Standards Provisions Applicable to Contracts Governing Federally Financed and Assisted Construction (also Labor Standards Provisions Applicable to Nonconstruction Contracts Subject to the Contract Work Hours and Safety Standards Act)," 29 C.F.R. Part 5. These include but are not limited to the following:

5. A. Overtime Requirements

No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any work week in which he or she is employed on such work to work in excess of forty (40) hours in such work week unless such laborer or mechanic receives compensation at a rate not less than one and one-half (1.5) times the basic rate of pay for all hours worked in excess of forty (40) hours in such work week. (29 CFR § 5.5(b)(1)).

6. B. Violation: Liability for Unpaid Wages: Liquidated Damages

In the event of any violation of the clause set forth in paragraph A of this section, the Contractor and any subcontractor responsible therefor shall be liable for the 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 or mechanic, including watchmen and guards, employed in violation of paragraph A of this section in the sum of ten ($10) dollars for each calendar day on which such individual was required or permitted to work in excess of the standard work week of forty (40) hours without payment of the overtime wages required by paragraph A of this section. (29 CFR § 5.5(b)(2)).

7. C. Withholding for Unpaid Wages and Liquidated Damages

The Department of Transportation or the County shall upon its own action or upon written request of an authorized representative of the Department of Labor 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 paragraph B of this section. (29 CFR § 5.5(b)(3)).

8. D. Payrolls and Basic Records

The Contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three (3) years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made and actual wages paid. Further, the records to be maintained under this paragraph shall be made available by the Contractor or subcontractor for inspection, copying or transcription by authorized representatives of the Department of Transportation and the Department of Labor, and the Contractor or subcontractor will permit such representatives to interview employees during working hours on the job. (29 CFR § 5.5(c)).

9. E. Subcontracts

The Contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraphs A through E of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime Contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs A through E of this section. (29 CFR § 5.5(b)(4)).

1-6 Davis Bacon Act and Copeland Anti-Kickback Act Requirements

A. **Minimum Wages**

1. All laborers and mechanics employed or working upon the site of the work (or under the U. S. Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project) 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 issued by the Secretary of Labor under the Copeland Act, 29 CFR Part 3), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor as set forth in Section 00130 of the Contract Documents and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers and mechanics, subject to subparagraph A(4) below of this provision 10.12, Davis-Bacon Act also, 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 29 CFR 5.5(a)(4). 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. The wage determination and the Davis-Bacon poster (WH-1321) 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.

2. 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 shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

3. If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as 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. Classifications and disputes determined as follows:

   a. The County shall require that any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the Contract shall be classified in conformance with the wage determination. King County shall approve an additional classification and wage rate and fringe benefits therefor only when the following criteria have been met:

      (i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(ii) The classification is utilized in the area by the construction industry; and

(iii) except with respect to helpers as defined as 29 CFR 5.2(n)(4), the work to be performed by the classification requested is not performed by a classification in the wage determination, and

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

b. If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and King County 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 King County to the Administrator of the Wage and Hour Division, Employment Standards Administration, U. S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise King County or will notify King County within the 30-day period that additional time is necessary.

c. In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and King County do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), King County shall refer the questions, including the views of all interested parties and the recommendation of King County, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise King County or will notify King County within the 30 day period that additional time is necessary.

d. The wage rate, (including fringe benefits where appropriate) determined pursuant to subparagraphs A(4)(b) or A(4)(c) of this provision, shall be paid to all workers performing work in the classification under this Contract from the first day on which work is performed in the classification.

B. **Withholding**

The County shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the Contractor under this Contract or any other Federal contract with the same Contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same Contractor, so 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 (or under the U. S. Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the FTA assisted project), all or part of the wages required by the Contract, the County may, after written notice to the Contractor, sponsor, applicant, or owner, 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.

C. **Payrolls and Basic Records**

1. Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the U. S. Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project). Such records shall contain the name, address and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of 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. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) 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 shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual costs incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

2. The Contractor shall comply with the following requirements for submission of payrolls:

   a. The Contractor shall submit weekly, for each week in which any Contract Work is performed, a copy of all payrolls to the County for transmittal to the FTA. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR Part 5. 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 029-005-00014-1), U. S. Government Printing Office, Washington, D.C. 20402 The Contractor is responsible for the submission of copies of payrolls by all subcontractors.

   b. Each payroll submitted shall be accompanied by a "Statement of Compliance" signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the Contract and shall certify the following:

      (i) that the payroll for the payroll period contains the information required to be maintained under 29 CFR Part 5, and that such information is correct and complete;

      (ii) that each 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 wages earned, other than permissible deductions as set forth in 29 CFR Part 3; and

      (iii) that each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the Contract.

c. 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 subparagraph C(2)(b) of this provision.

d. The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

3. The Contractor or subcontractor shall make the records required under subparagraph C(1) of this provision available for inspection, copying, or transcription by authorized representatives of King County, the FTA or the federal Department of Labor, 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, King County or the FTA may, after written notice to the Contractor, sponsor, applicant, or owner, take such action 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.

D. **Apprentices and Trainees**

1. Apprentices. 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 U. S. Department of Labor, 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 or 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. The allowable ratio of apprentices to journeymen 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 worker 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 on 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 wage determination for the work actually performed. Where a Contractor 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's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. 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 journeymen 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 determines that a different practice prevails for the applicable apprentice classification, fringe benefits shall be paid in accordance with that determination. 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 will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

2. Trainees. 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 U. S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman 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 wage rate on the wage determination which provides for less than full fringe benefits for apprentices. 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 work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor 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.

3. Equal Employment Opportunity. The utilization of apprentices, trainees and journeymen shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

E. **Compliance with Copeland Act Requirements**

The Contractor shall comply with the requirements of 29 CFR Part 3, which are incorporated by reference in this Contract.

F. **Subcontracts**

The Contractor or subcontractor shall insert in any subcontracts the clauses set forth in subparagraphs A through E above and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The Contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in 29 CFR 5.5(a)(1) through (10) and such other clauses as the FTA may by appropriate instructions require, and also a clause requiring subcontractors to include these clauses in any lower tier subcontracts. The Contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

G. **Contract Termination – Debarment**

A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the Contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

H. **Compliance with Davis-Bacon and Related Acts Requirements**

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3 and 5 are incorporated herein by reference in this Contract.

I. **Disputes Concerning Labor Standards**

Disputes arising out of the labor standards provisions of this Contract shall not be subject to the general disputes clause of this Contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6 and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the County, the FTA, the U.S. Department of Labor, or the employees or their representatives.

J. **Certification of Eligibility**

1. By entering into this Contract, the Contractor certifies that neither it (nor he or she) nor any person or firm which has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).
2. No part of this Contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

3. The penalty for making false statements is prescribed in the U. S. Criminal Code, 18 U.S.C. 1001.

1-7 Bonding

A. **Bond Requirements (Construction)**

1. Bid Security

A Bid Bond must be issued by a fully qualified surety company acceptable to the and listed as a company currently authorized under 31 CFR, Part 223 as possessing a Certificate of Authority as described thereunder.

2. Rights Reserved

In submitting this Bid, it is understood and agreed by bidder that the right is reserved by the **County** to reject any and all bids, or part of any bid, and it is agreed that the Bid may not be withdrawn for a period of **ninety (90)** days subsequent to the opening of bids, without the written consent of the **County**.

It is also understood and agreed that if the undersigned bidder should withdraw any part or all of his bid within **ninety (90)** days after the bid opening without the written consent of the **County**, shall refuse or be unable to enter into this Contract, as provided above, or refuse or be unable to furnish adequate and acceptable Performance Bonds and Labor and Material Payments Bonds, as provided above, or refuse or be unable to furnish adequate and acceptable insurance, as provided above, he shall forfeit his bid security to the extent of the **County** damages occasioned by such withdrawal, or refusal, or inability to enter into an agreement, or provide adequate security therefor.

It is further understood and agreed that to the extent the defaulting bidder's Bid Bond, Certified Check, Cashier's Check, Treasurer's Check, and/or Official Bank Check (excluding any income generated thereby which has been retained by the **County** as provided in (**Item x "Bid Security" of the Instructions to Bidders**) shall prove inadequate to fully recompense the **County** for the damages occasioned by default, then the undersigned bidder agrees to indemnify the **County** and pay over to the **County** the difference between the bid security and the **County's** total damages, so as to make the **County** whole.

The undersigned understands that any material alteration of any of the above or any of the material contained on this form, other than that requested, will render the bid unresponsive.

B. **Performance and Payment Bonding Requirements (Construction)**

The Contractor shall be required to obtain performance and payment bonds as follows:

1. Performance bonds

   a. The penal amount of performance bonds shall be 100 percent of the original contract price, unless the **County** determines that a lesser amount would be adequate for the protection of the **County**.

   b. The **County** may require additional performance bond protection when a contract price is increased. The increase in protection shall generally equal 100 percent of the increase in contract price. The **County** may secure additional protection by directing the Contractor to increase the penal amount of the existing bond or to obtain an additional bond.

2. Payment bonds

   a. The penal amount of the payment bonds shall equal:

      (i) Fifty percent of the contract price if the contract price is not more than $1 million.

      (ii) Forty percent of the contract price if the contract price is more than $1 million but not more than $5 million; or

      (iii) Two and one half million if the contract price is more than $5 million.

   b. If the original contract price is $5 million or less, the **County** may require additional protection as required by subparagraph 1 if the contract price is increased.

C. **Performance and Payment Bonding Requirements (Non-Construction)**

The Contractor may be required to obtain performance and payment bonds when necessary to protect the **County's** interest.

1. The following situations may warrant a performance bond:

   a. The **County's** property or funds are to be provided to the contractor for use in performing the contract or as partial compensation (as in retention of salvaged material).

   b. A contractor sells assets to or merges with another concern, and the **County**, after recognizing the latter concern as the successor in interest, desires assurance that it is financially capable.

   c. Substantial progress payments are made before delivery of end items starts.

   d. Contracts are for dismantling, demolition, or removal of improvements.

2. When it is determined that a performance bond is required, the Contractor shall be required to obtain performance bonds as follows:

   a. The penal amount of performance bonds shall be 100 percent of the original contract price, unless the **County** determines that a lesser amount would be adequate for the protection of the **County**.

   b. The **County** may require additional performance bond protection when a contract price is increased. The increase in protection shall generally equal 100 percent of the increase in contract price. The **County** may secure additional protection by directing the Contractor to increase the penal amount of the existing bond or to obtain an additional bond.

3. A payment bond is required only when a performance bond is required, and if the use of payment bond is in the **County**'s interest.

4. When it is determined that a payment bond is required, the Contractor shall be required to obtain payment bonds as follows:

   a. The penal amount of payment bonds shall equal:

      (i) Fifty percent of the contract price if the contract price is not more than $1 million;

      (ii) Forty percent of the contract price if the contract price is more than $1 million but not more than $5 million; or

      (iii) Two and one half million if the contract price is increased.

D. **Advance Payment Bonding Requirements**

The Contractor may be required to obtain an advance payment bond if the contract contains an advance payment provision and a performance bond is not furnished. The **County** shall determine the amount of the advance payment bond necessary to protect the **County**.

E. **Patent Infringement Bonding Requirements (Patent Indemnity)**

The Contractor may be required to obtain a patent indemnity bond if a performance bond is not furnished and the financial responsibility of the Contractor is unknown or doubtful. The **County** shall determine the amount of the patent indemnity to protect the **County**.

F. **Warranty of the Work and Maintenance Bonds**

1. The Contractor warrants to the **County**, the Architect and/or Engineer that all materials and equipment furnished under this Contract will be of highest quality and new unless otherwise specified by the **County**, free from faults and defects and in conformance with the Contract Documents. All work not so conforming to these standards shall be considered defective. If required by the **[Project Manager]**, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

2. The Work furnished must be of first quality and the workmanship must be the best obtainable in the various trades. The Work must be of safe, substantial and durable construction in all respects. The Contractor hereby guarantees the Work against defective materials or faulty workmanship for a minimum period of one (1) year after Final Payment by the **County** and shall replace or repair any defective materials or

equipment or faulty workmanship during the period of the guarantee at no cost to the **County**. As additional security for these guarantees, the Contractor shall, prior to the release of Final Payment **[as provided in Item X below]**, furnish separate Maintenance (or Guarantee) Bonds in form acceptable to the **County** written by the same corporate surety that provides the Performance Bond and Labor and Material Payment Bond for this Contract. These bonds shall secure the Contractor's obligation to replace or repair defective materials and faulty workmanship for a minimum period of one (1) year after Final Payment and shall be written in an amount equal to ONE HUNDRED PERCENT (100%) of the CONTRACT SUM, as adjusted (if at all).

1-8 Seismic Safety

The Contractor agrees that any new building or addition to an existing building will be designed and constructed in accordance with the standards for Seismic Safety required in Department of Transportation Seismic Safety Regulations 49 CFR Part 41, now or as hereinafter amended, and will certify to compliance to the extent required by the regulation. The Contractor also agrees to ensure that all work performed under this Agreement including work performed by a subcontractor is in compliance with the standards required by the Seismic Safety Regulations and the certification of compliance issued on the Project.

1-9 Conformance with ITS Architecture

The Contractor agrees to conform, to the extent applicable, to the National Intelligent Transportation Systems (ITS) Architecture and Standards as required by section 5206(e) of TEA-21, 23 U.S.C. § 502 note, and comply with FTA Notice, "FTA National ITS Architecture Policy on Transit Projects" 66 Fed. Reg. 1455 et seq., January 8, 2001, and other Federal requirements that may be issued. The Contractor agrees to include the above language in any sub-contractors or sub-agreements entered into in the performance of this agreement.

1-10 Cargo Preference - Use of U.S. Flag Vessels

The contractor agrees:

a. to use privately owned United States-Flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant to the underlying contract to the extent such vessels are available at fair and reasonable rates for United States-Flag commercial vessels;

b. to furnish within 20 working days following the date of loading for shipments originating within the United States or within 30 working days following the date of leading for shipments originating outside the United States, a legible copy of a rated, "on-board" commercial ocean bill-of -lading in English for each shipment of cargo described in the preceding paragraph to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590 and to the FTA recipient (through the contractor in the case of a subcontractor's bill-of-lading.)

c. to include these requirements in all subcontracts issued pursuant to this contract when the subcontract may involve the transport of equipment, material, or commodities by ocean vessel.

1-11 Fly America Requirements

The Contractor agrees to comply with 49 U.S.C. 40118 (the "Fly America" Act) in accordance with the General Services Administration's regulations at 41 CFR Part 301-10, which provide that recipients and subrecipients of Federal funds and their contractors are required to use U.S. Flag air carriers for U.S. Government-financed international air travel and transportation of their personal effects or property, to the

extent such service is available, unless travel by foreign air carrier is a matter of necessity, as defined by the Fly America Act. The Contractor shall submit, if a foreign air carrier was used, an appropriate certification or memorandum adequately explaining why service by a U.S. flag air carrier was not available or why it was necessary to use a foreign air carrier and shall, in any event, provide a certificate of compliance with the Fly America requirements. The Contractor agrees to include the requirements of this section in all subcontracts that may involve international air transportation.

1-12 Audit and Inspection of Records

Access to Records - The following access to records requirements apply to this Contract:

A. Where the Purchaser is not a State but a local government and is the FTA Recipient or a subgrantee of the FTA Recipient in accordance with 49 C.F.R. 18.36(i), the Contractor agrees to provide the Purchaser, the FTA Administrator, the Comptroller General of the United States or any of their authorized representatives access to any books, documents, papers and records of the Contractor which are directly pertinent to this contract for the purposes of making audits, examinations, excerpts and transcriptions. Contractor also agrees, pursuant to 49 C.F.R. 633.17 to provide the FTA Administrator or his authorized representatives including any PMO Contractor access to Contractor's records and construction sites pertaining to a major capital project, defined at 49 U.S.C. 5302(a)1, which is receiving federal financial assistance through the programs described at 49 U.S.C. 5307, 5309 or 5311.

B. Where the Purchaser is a State and is the FTA Recipient or a subgrantee of the FTA Recipient in accordance with 49 C.F.R. 633.17, Contractor agrees to provide the Purchaser, the FTA Administrator or his authorized representatives, including any PMO Contractor, access to the Contractor's records and construction sites pertaining to a major capital project, defined at 49 U.S.C. 5302(a)1, which is receiving federal financial assistance through the programs described at 49 U.S.C. 5307, 5309 or 5311. By definition, a major capital project excludes contracts of less than the simplified acquisition threshold currently set at $100,000.

C. Where the Purchaser enters into a negotiated contract for other than a small purchase or under the simplified acquisition threshold and is an institution of higher education, a hospital or other non-profit organization and is the FTA Recipient or a subgrantee of the FTA Recipient in accordance with 49 C.F.R. 19.48, Contractor agrees to provide the Purchaser, FTA Administrator, the Comptroller General of the United States or any of their duly authorized representatives with access to any books, documents, papers and record of the Contractor which are directly pertinent to this contract for the purposes of making audits, examinations, excerpts and transcriptions.

D. Where any Purchaser which is the FTA Recipient or a subgrantee of the FTA Recipient in accordance with 49 U.S.C. 5325(a) enters into a contract for a capital project or improvement (defined at 49 U.S.C. 5302(a)1) through other than competitive bidding, the Contractor shall make available records related to the contract to the Purchaser, the Secretary of Transportation and the Comptroller General or any authorized officer or employee of any of them for the purposes of conducting an audit and inspection.

E. The Contractor agrees to permit any of the foregoing parties to reproduce by any means whatsoever or to copy excerpts and transcriptions as reasonably needed.

F. The Contractor agrees to maintain all books, records, accounts and reports required under this contract for a period of not less than three years after the date of termination or expiration of this contract, except in the event of litigation or settlement of claims arising from the performance of this contract, in which case Contractor agrees to maintain same until the Purchaser, the FTA Administrator, the Comptroller General, or any of their duly authorized representatives, have

disposed of all such litigation, appeals, claims or exceptions related thereto. Reference 49 CFR 18.39(i)(11).

G. FTA does not require the inclusion of these requirements in subcontracts.

1-13 Buy America

The contractor agrees to comply with 49 U.S.C. 5323(j) and 49 C.F.R. Part 661, which provide that Federal funds may not be obligated unless steel, iron, and manufactured products used in FTA-funded projects are produced in the United States, unless a waiver has been granted by FTA or the product is subject to a general waiver. General waivers are listed in 49 C.F.R. 661.7, and include final assembly in the United States for 15 passenger vans and 15 passenger wagons produced by Chrysler Corporation, and microcomputer equipment and software. Separate requirements for rolling stock are set out at 49 U.S.C. 5323(j)(2)(C) and 49 C.F.R. 661.11. Rolling stock must be assembled in the United States and have a 60 percent domestic content.

A bidder or offeror must submit to the FTA recipient the appropriate Buy America certification in Attachment H with all bids or offers on FTA-funded contracts, except those subject to a general waiver. Bids or offers that are not accompanied by a completed Buy America certification must be rejected as nonresponsive. This requirement does not apply to lower tier subcontractors.

1-14 FTA Protest Procedures

Bidders are hereby notified that if this Contract is funded in whole or in part by the Federal Department of Transportation, the Federal Transit Administration (FTA) may entertain a protest that alleges that the County failed to have or follow written protest procedures. Bidders must file a protest with the FTA not later than 5 working days after the County renders a final decision or 5 working days after the Bidder knows or has reason to know that the County has failed to render a final decision. The protesting party must notify the County if it has filed a protest with the FTA. After 5 days, the County will confirm with FTA that FTA has not received a protest. Protests to the FTA must be filed in accordance with FTA Circular 4220.1F (as periodically updated).

The County will not award a contract for 5 working days following its decision on a Bid protest or while a protest to the FTA is pending unless the County determines that: (1) the items to be procured are urgently required; (2) delivery of performance will be unduly delayed by failure to make the award promptly; or (3) failure to make prompt award will otherwise cause undue harm to the County or the Federal Government.

1-15 Privacy

Should the Contractor, or any of its subcontractors, or their employees administer any system of records on behalf of the Federal Government, the Privacy Act of 1974, 5 USC § 552a, imposes information restrictions on the party administering the system of records.

For purposes of the Privacy Act, when the Agreement involves the operation of a system of records on individuals to accomplish a government function, the recipient and any contractors, third party contractors, subcontractors and their employees involved therein are considered to be government employees with respect to the government function. The requirements of the Act, including the civil and criminal penalties for violations of the Act, apply to those individuals involved. Failure to comply with the terms of the Act or this provision of this contract will make this contract subject to termination.

The Contractor agrees to include this clause in all subcontracts awarded under this Contract, which involve the design, development, operation, or maintenance of any system of records on individuals subject to the Act.

1-16 Certification Regarding Debarment, Suspension and Other Responsibility Matters

Pursuant to Executive Order 12549 and 12689, "Debarment and Suspension," 31 USC § 6101 note and federal regulations in 49 CFR 29, entities and individuals who are debarred or suspended by the federal government are excluded from obtaining federal assistance funds under this contract. To assure that such entities and individuals are not involved as participants on this FTA-financed contract, if the contract exceeds $25,000, each Bidder shall complete and submit, as part of its Bid, the certification contained in Attachment K for itself, its principals and its subcontractor(s) for any subcontract in excess of $25,000. The inability of a Bidder to provide a certification in Attachment K will not necessarily result in denial of consideration for contract award. A Bidder that is unable to provide a certification must submit a complete explanation attached to the certification form. Failure to submit a certification or explanation shall disqualify the Bidder from participation under this Bid. The County, in conjunction with FTA, will consider the certification or explanation in determining contract award. No contract will be awarded to a potential third-party contractor submitting a conditioned debarment or suspension certification, unless approved by the FTA.

The certification is a material representation of fact upon which reliance is placed in determination of award of contract. If at any time the Bidder or Contractor learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances, it shall immediately provide written notice to the County. If it is later determined that the Bidder knowingly rendered an erroneous certification, or failed to notify the County immediately of circumstances that made the original certification no longer valid, the County may disqualify the Bidder. If it is later determined that the Contractor knowingly rendered an erroneous certification, or failed to notify the County immediately of circumstances which made the original certification no longer valid, the County may terminate the contract, in addition to other remedies available including FTA suspension and/or debarment.

1-17 Subcontractors' Certification Regarding Debarment, Suspension or Ineligibility

By submitting a Bid for this Contract, the Bidder agrees that should it be awarded the Contract, it shall not knowingly enter into any subcontract exceeding $25,000 with an entity or person who is debarred, suspended, or who has been declared ineligible from obtaining federal assistance funds; and shall require each subcontractor to complete the certification provided in Attachment L.

Each subcontract, regardless of tier, shall contain a provision that the subcontractor shall not knowingly enter into any lower tier subcontract with a person or entity who is debarred, suspended or declared ineligible from obtaining federal assistance funds, and a provision requiring each lower-tiered subcontractor to provide the certification set forth in Attachment L.

The Contractor shall require each subcontractor, regardless of tier, to immediately provide written notice to the Contractor if at any time the subcontractor learns that its, or a lower-tier certification was erroneous when submitted or has become erroneous by reason of changed circumstances. The Contractor may rely upon the certifications of the subcontractors unless it knows that a certification is erroneous. The Contractor's knowledge and information regarding any subcontractor is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business.

1-18 Disclosure of Lobbying Activities

Bids in excess of $100,000 require Attachment I, "Certification Regarding Lobbying," and Attachment J, "Disclosure of Lobbying Activities" (if appropriate), be completed and submitted to the County with the proposal, as required by 49 CFR Part 20, "New Restrictions on Lobbying."

The Contractor certifies that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by the Byrd Anti-Lobbying Amendment,

31 USC § 1352. The Contractor shall disclose the name of any registrant under the Lobbying Disclosure Act of 1995, codified at 2 USC § 1601 et seq., who has made lobbying contacts on its behalf with non-Federal funds with respect to that Federal contract, grant or award covered by 31 USC § 1352. Such disclosures are to be forwarded to the County.

The Contractor will include the language of this certification in all subcontract awards at any tier and require that all recipients of subcontract awards in excess of $100,000 shall certify and disclose accordingly.

1-19 Anti-Kickback

The County and contractors are required to comply with the Anti-Kickback Act of 1986, 41 USC §§ 51 et seq. Under state and federal law, it is a violation for County employees, bidders, contractors or subcontractors to accept or offer any money or benefit as a reward for favorable treatment in connection with the award of a contract or the purchase of goods or services.

"Kickback" as defined by Federal Acquisition Regulation (FAR) 52.203-7, and 41 USC § 52(2), means any money, fee, commission, credit, gift, gratuity, thing of value, or compensation of any kind that is provided directly or indirectly to any prime Contractor, prime Contractor employee, subcontractor or subcontractor employee for the purpose of improperly obtaining or rewarding favorable treatment in connection with a prime contract or in connection with a subcontract relating to a prime contract.

1-20 False or Fraudulent Statements or Claims

(A) The Contractor acknowledges that the provisions of the Program Fraud Civil Remedies Act of 1986, as amended, 31 U.S.C. § 3801 et seq. and U.S. DOT regulations, "Program Fraud Civil Remedies," 49 C.F.R. Part 31, apply to its actions pertaining to this Project. Upon execution of the underlying contract, the Contractor certifies or affirms the truthfulness and accuracy of any statement it has made, it makes, it may make, or causes to be made, pertaining to the underlying contract or the FTA assisted project for which this contract work is being performed. In addition to other penalties that may be applicable, the Contractor further acknowledges that if it makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submission, or certification, the Federal Government reserves the right to impose the penalties of the Program Fraud Civil Remedies Act of 1986 on the Contractor to the extent the Federal Government deems appropriate.

(B) The Contractor also acknowledges that if it makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submission, or certification to the Federal Government under a contract connected with a project that is financed in whole or in part with Federal assistance originally awarded by FTA under the authority of 49 U.S.C. § 5307, the Government reserves the right to impose the penalties of 18 U.S.C. § 1001 and 49 U.S.C. § 5307(n)(1) on the Contractor, to the extent the Federal Government deems appropriate.

(C) The Contractor agrees to include the above two clauses in each subcontract financed in whole or in part with Federal assistance provided by FTA. It is further agreed that the clauses shall not be modified, except to identify the subcontractor who will be subject to the provisions.

1-21 Conservation

The Contractor agrees to comply with mandatory standards and policies relating to energy efficiency that are contained in the State Energy Conservation plan issued in compliance with the Energy Policy and Conservation Act, 42 USC §§ 6321 et seq.

The Contractor agrees to include this clause in all subcontracts awarded under this Contract.

1-22 Environmental Requirements

The Contractor agrees to comply with all applicable standards, orders or requirements as follows:

10. A. Environmental Protection

The Contractor agrees to comply with the applicable requirements of the National Environmental Policy Act of 1969, as amended, 42 USC §§ 4321, et seq., consistent with Executive Order No. 11514, as amended, "Protection and Enhancement of Environmental Quality," 42 USC § 4321 note. FTA statutory requirements on environmental matters at 49 USC § 5324(b); Council on Environmental Quality regulations on compliance with the National Environmental Policy Act of 1969, as amended, 42 USC § 4321 et seq. and 40 CFR Part 1500 et seq.; and joint FHWA/FTA regulations, "Environmental Impact and Related Procedures," 23 CFR Part 771 and 49 CFR Part 622.

11. B. Air Quality

The Contractor agrees to comply with all applicable standards, orders, or regulations issued pursuant to the Clean Air Act, as amended, 42 USC §§ 7401, et seq. The Contractor agrees to report each violation to the County and understands and agrees that the County will, in turn, report each violation as required to assure notification to FTA and the appropriate U.S. Environmental Protection Agency (EPA) Regional Office.

The Contractor agrees to include this clause in each subcontract exceeding $100,000 financed in whole or in part with Federal assistance provided by FTA.

12. C. Clean Water

The Contractor agrees to comply with all applicable standards, orders, or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 USC §§ 1251 et seq. The Contractor agrees to report each violation to the County and understands and agrees that the County will, in turn, report each violation as required to assure notification to FTA and the appropriate Environmental Protection Agency (EPA) Regional Office.

The Contractor agrees to protect underground sources of drinking water consistent with the provisions of the Safe Drinking Water Act of 1974, as amended, 42 USC §§ 300h et seq. The Contractor agrees to include these requirements in each subcontract exceeding $100,000 financed in whole or in part with Federal assistance provided by FTA.

13. D. Use of Public Lands

The Contractor agrees that no publicly owned land from a park, recreation area, or wildlife or waterfowl refuge of national, state, or local significance as determined by the federal, state or local officials having jurisdiction thereof, or any land from a historic site of national, state, or local significance may be used for the Project unless the FTA makes the specific findings required by 49 USC § 303.

14. E. Historic Preservation

The Contractor agrees to assist the Federal Government in complying with section 106 of the National Historic Preservation Act, as amended, 16 USC § 470f, Executive Order No. 11593, "Protection and Enhancement of the Cultural Environment," 16 USC § 470 note, and the Archaeological and Historic Preservation Act of 1974, as amended, 16 USC §§ 469a-1 et seq. involving historic and archaeological preservation as follows:

1. The Contractor agrees to consult with the State Historic Preservation Officer about investigations to identify properties and resources listed in or eligible for inclusion in the National Register of Historic Places that may be affected by the Project, in accordance with Advisory Council on Historic Preservation regulations, "Protection of Historic and Cultural Properties," 36 CFR Part 800, and notifying FTA of those properties so affected.

2. The Contractor agrees to comply with all federal requirements to avoid or mitigate adverse effects on those historic properties.

15. F. Mitigation of Adverse Environmental Effects

The Contractor agrees that if the Project should cause adverse environmental effects, the Contractor will take all reasonable steps to minimize those effects in accordance with 49 USC § 5324(b), and all other applicable federal laws and regulations, specifically, the procedures of 23 CFR Part 771 and 49 CFR Part 622.

1-23 Preference for Recycled Products

Recovered Materials - The contractor agrees to comply with all the requirements of Section 6002 of the Resource Conservation and Recovery Act (RCRA), as amended (42 U.S.C. 6962), including but not limited to the regulatory provisions of 40 CFR Part 247, and Executive Order 12873, as they apply to the procurement of the items designated in Subpart B of 40 CFR Part 247.

1-24 Termination Provisions Required

All contracts and subcontracts in excess of $10,000 shall contain contractual provisions or conditions that allow for termination for cause and convenience by the County including the manner by which it will be effected and the basis for settlement.

(Required by FTA Circular 4220.1F, Page IV-12).

1-25 Breach Provisions Required

All contracts in excess of $100,000 shall contain contractual provisions or conditions that will allow for administrative, contractual, or legal remedies in instances where the Contractor violates or breaches the terms of this Contract, including sanctions and penalties as may be appropriate. The Contractor agrees to include this provisional requirement in all subcontracts in excess of $100,000 awarded under this Contract.

(Required by FTA Circular 4220.1F, Page IV-12).

1-26 Incorporation of FTA Terms

The preceding provisions include, in part, certain Standard Terms and Conditions required by the U.S. Department of Transportation, whether or not expressly set forth in the preceding contract provisions. All contractual provisions required by the U.S. Department of Transportation, as set forth in FTA Circular 4220.1F, dated November 1, 2008, are hereby incorporated by reference. Anything to the contrary herein notwithstanding, all FTA mandated terms shall be deemed to control in the event of a conflict with other provisions contained in this Contract. The Contractor agrees not to perform any act, fail to perform any act, or refuse to comply with any County requests that would cause the County to be in violation of the FTA terms and conditions.

ATTACHMENT A

Personnel Inventory Report

Legal name of business_____ Telephone No: _____

dba (if applicable)_____

Street address_____City_____State_____Zip Code_____

16. Submitted by:_____Title_____Date_____

17. IRS Employer Identification Number: _____

18. Do you have any employees? No ___Yes___

If yes, list on the Employment Data Chart below the total number of employees for all businesses located in (1) King County. If none, list the total number of employees for all businesses located in (2) Washington State. If none, list the total number of employees for all businesses located in the (3) United States. Indicate which locale (1,2,3) report covers _____. This report covers Business Location(s) in (circle one): [King County, Washington State, Other States] for the Payroll Period ending (Month/Day/Year):_____.

Do any of your employees belong to a union and/or do you use an employee referral agency? No_____Yes____

If yes, list the unions and/or employee referral agencies with whom you have agreements:

_____. If you expect to do more than $10,000 worth of public Work (construction) or, more than $25,000 worth of business with King County, the unions or employee referral agencies must submit a statement of compliance with King County Code Chapter 12.16.

Job Categories	Whites		African Americans		Asians		Native Americans		Hispanics		Disabled		Minority Subtotal		Disabled Subtotal	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Managerial																
Professional																
Technical																
Clerical																
Sales																
Service																
Labor																
On-Job Trainees																
Apprentice																
Skilled Craft*																
Subtotal																

* Journey worker: List by classification on reverse, e.g., carpenter, plumber, etc.

Total number of employees reported above: _____ If no employees, write "0."

Personnel Inventory Report

SUPPLEMENTAL FORM
Use this form as necessary to report the total Work force.

Legal name of business_____Telephone_____
Submitted by: Title Date

Job Categories	Whites		African Americans		Asians		Native Americans		Hispanics		Disabled		Minority Subtotal		Disabled Subtotal	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Managerial																
Professional																
Technical																
Clerical																
Sales																
Service																
Labor																
On-Job Trainees																
Apprentice																
Skilled Craft*																
Subtotal																

Contact the King County Procurement and Contract Services Section at (206) 684-1681 or the King County Department of Finance, Business Development and Contract Compliance Division (206) 684-1330 if you have any questions concerning completion of this form.

ATTACHMENT B

Affidavit and Certificate of Compliance

with King County Code Chapter 12.16, Discrimination and Affirmative Action in Employment by Contractors, Subcontractors and Vendors

The undersigned, being first duly sworn, on oath states, s/he is authorized by the Contractor, and on the Contractor's behalf, affirms and certifies as follows:

Definitions: "Contractor" Shall mean any Contractor, vendor or Contractor who supplies goods and/or services. "Contract" Shall mean any Contract, purchase order or agreement with King County Government, hereinafter called the COUNTY.

A. Contractor recognizes that discrimination in employment is prohibited by federal, state and local laws. Contractor recognizes that in addition to refraining from discrimination, affirmative action is required to Provide equal employment opportunity. Contractor further recognizes that this Affidavit establishes minimum requirements for affirmative action and fair employment practices and implements the basic nondiscrimination provisions of the general Contract Specifications as applied to service, Contractor, and vendor Contracts exceeding $25,000, or public Work Contracts exceeding $10,000. Contractor herein agrees that this Affidavit is incorporated as an addendum to its general Contract, and recognizes that failure to comply with these requirements may constitute grounds for application of sanctions as set forth in the general Specifications, King County Code Chapter 12.16 ("Chapter") and this Affidavit. PROVIDED FURTHER, that in lieu of this Affidavit, the Executive may accept a statement pledging adherence to an existing Contractor affirmative action plan where the provisions of the plan are found by the Executive to substantially fulfill the requirements of the Chapter.

B. Contractor Shall give notice to their supervisors and employees of the requirements for affirmative action to be undertaken prior to the commencement of Work.

C. This Person has been designated to represent the Contractor and to be responsible for securing compliance with and for reporting on the affirmative actions taken:

D. Contractor Will cooperate fully the M/WBE and Contract Compliance Division and appropriate County agents while making every reasonable "good faith" effort to comply with the affirmative action and nondiscrimination requirements set forth in this Affidavit and in King County Code Chapter 12.16.

E. **Reports:** The Contractor agrees to complete and submit as required such additional reports and records that may be necessary to determine compliance with the Affidavit and to confer with the County Compliance Officer at such times as the County Shall deem necessary. The information required by the Chapter includes but is not limited to the following reports and records:

1. **Personnel Inventory Report:** This report Shall include a breakdown of the employer workforce showing race, sex and handicapped and other minority data.
2. **Monthly Utilization Report:** This report Shall apply to construction Contractors and Subcontractors and Shall Provide the number of hours of employment for all employees, including minority, women and disabled employees by craft and category.
3. **Statement from Union or Worker Referral Agency:** This statement affirms that the signee's organization has no practices and policies which discriminate on the basis of race, color, creed, religion, sex, age, marital status, sexual orientation, nationality or the presence of sensory, mental or physical disability.

The information required in this section Shall be submitted on forms provided by the County unless otherwise specified.

F. **Subcontractors:** For public works projects and Contracts of ten thousand dollars ($10,000) or more, and for all other Contracts and agreements of twenty-five thousand ($25,000) dollars or more, the prime Contractor Shall be required to submit to the County, along with its qualifying documents under the Chapter, employment profiles, Affidavits and Certificates of Compliance, Reports and Union Statements from its Subcontractors in the same manner as these are required of the prime Contractor. Reporting requirements of the prime Contractor during the Contract period Will apply equally to all Subcontractors.

G. **Employment Goals for Minorities, Women and Persons with Disabilities:** No specific levels of utilization of minorities and women in the workforce of the Contractor Shall be required, and the Contractor is not required to grant any preferential treatment on the basis of race, sex, color, ethnicity or national origin in its employment practices. Notwithstanding the foregoing, any affirmative action requirements set forth in any federal regulations, statutes or rules included or referenced in the Contract documents Shall continue to apply.

H. **Affirmative Action Measures:** Contractor agrees to implement and/or maintain reasonable good faith efforts to comply with King County Code Chapter 12.16. The evaluation of a Contractor's compliance with the Chapter shall be based upon the Contractor's effort to achieve maximum results from its affirmative action measures. The Contractor shall document these efforts and shall implement affirmative action steps at least as extensive as the following:

1. **Policy Dissemination:** Internal and external dissemination of the Contractor's equal employment opportunity policy; posting of nondiscrimination policies and of the requirement of the Chapter on bulletin boards clearly visible to all employees; notification to each subcontractor, labor union or representative of workers with which there is a collective bargaining agreement or other Contract, Subcontract, or understanding of the Contractor's commitments under the Chapter. Inclusion of the equal opportunity policy in advertising in the news media and elsewhere.
2. **Recruiting:** Adopt and implement recruitment procedures designed to increase the representation of women, minorities and persons with disabilities in the pool of applicants for employment: including, but not limited to establishing and maintaining a current list of minority, women and disabled recruitment sources, providing these sources written notification of employment opportunities and advertising vacant positions in newspapers and

periodicals which have minority, women and/or disabled readership.

3. **Self-Assessment and Test Validation:** Review of all employment policies and procedures, including tests, recruitment, hiring and training practices and policies, performance evaluations, seniority policies and practices, job classifications and job assignments to assure that they do not discriminate against, or have a discriminatory impact on, minorities, women and persons with disabilities and validate all tests and other selection requirements where there is an obligation to do so under state or federal law.
4. **Record Referrals:** Maintain a current file of applications of each minority, women and persons with disabilities who are applicants or referrals for employment indicating what action was taken with respect to each such individual and the reasons therefor. Contact these people when an opening exists for which they may be qualified. Names may be removed from the file after twelve months have elapsed from their last application or referral.
5. **Notice to Unions:** Provide notice to labor unions of the Contractor's nondiscrimination and affirmative action obligations pursuant to King County Code Chapter 12.16. Contractors Shall also notify the M/WBE and Contract Compliance Division if labor unions fail to comply with the nondiscrimination or affirmative provisions.
6. **Supervisors:** Ensure that all supervisory personnel understand and are directed to adhere to and implement the nondiscrimination and affirmative action obligations of the Contractor under King County Code Chapter 12.16. Such direction Shall include, but not be limited to, adherence to, and achievement of, affirmative action policies in performance appraisals of supervisory personnel.
7. **Employee Training:** When reasonable, develop on-the-job training opportunities which expressly include minorities, women, and persons with disabilities and sponsor and/or utilize, training/educational opportunities for the advancement of women, minorities and persons with disabilities employed by the Contractor, subject to Acceptance by the County.
8. **Responsible Person:** Designate an employee who Shall have the responsibility for implementation of the Contractor's affirmative action measures.
9. **Progress Reporting:** Prepare as part of the affirmative action plan an analysis and report on the progress made toward eliminating the underrepresentation of minorities, women, and persons with disabilities in the Contractor's workforce on an annual basis.

I. During the performance of this Contract, neither the Contractor nor any party Subcontracting under the authority of this Contract Shall discriminate nor tolerate harassment on the basis of race, color, sex, religion, nationality, creed, marital status, sexual orientation, age, or the presence of any sensory, mental or physical disability in the employment or application for employment or in the administration or delivery of services or any other benefits under this Contract.

J. Contractor agrees to Provide reasonable access upon request to the premises of all places of business and employment, relative to Work undertaken in this Contract, and to records, files, information and employees in connection therewith, to the M/WBE and Contract Compliance Division or agent for purposes of reviewing compliance with the provisions of this Affidavit and agrees to cooperate in any compliance review.

K. Should the M/WBE and Contract Compliance Division find, upon complaint investigation or review, the Contractor not to be in good faith compliance with the provisions contained in this Affidavit, it Shall notify the County and Contractor in writing of the finding fully describing the basis of non-compliance. Contractor may request withdrawal of such notice of noncompliance at such time as the compliance office has notified in writing the Contractor and the County that the noncompliance has been resolved.

L. The Contractor agrees that any violation of any term of this Affidavit, including reporting requirements, Shall be deemed a violation of King County Code Chapter 12.16. Any such violation Shall be further deemed a breach of a material provision of the Contract between the County and the Contractor. Such breach may be grounds for implementation of any sanctions provided for in the Chapter, including but not limited to, cancellation, termination or suspension, in whole or part, of the Contractor by the County; liquidated damages; or disqualification of the Contractor PROVIDED, that the implementation of any sanctions is subject to the notice and hearing provisions of King County Code Chapter 12.16.110.

Contractor: _____
Company Name Street Address City State Zip

I have read and understood the foregoing; and am authorized on behalf of the Contractor to agree to the terms and conditions of this and Affidavit and Certificate of Compliance and therefore, execute the same.

Authorized Signer: _____
Name (type or print) Title Phone Signature

VALID ONLY IF NOTARIZED

SUBSCRIBED AND SWORN TO BEFORE ME THIS _____DAY OF _____, 2002.

_____
(Signature of notary public)

_____
(Printed name of notary public)

Notary Public in and of the state of _____

My appointment expires:

_____

ATTACHMENT C

BUY AMERICA CERTIFICATE

CONTRACT NO. _____

Certificate Of Compliance With Section 165(a)

The vendor hereby certifies that it will comply with the requirements of Section 165(a) of the Surface Transportation Assistance Act of 1982, as amended, and the regulations in 49 CFR Part 661.

Date: _____

Company Name: _____

Signature: _____

Title: _____

OR

Certificate Of Noncompliance With Section 165(a)

The vendor hereby certifies that it cannot comply with the requirements of Section 165(a) of the Surface Transportation Assistance Act of 1982, as amended, but it may qualify for an exception to the requirement pursuant to Section 165(b)(2) or (b)(4) of the Surface Transportation Assistance Act of 1982 and regulations in 49 CFR Part 661.7.

Date: _____

Company Name: _____

Signature: _____

Title: _____

It is important to remember that this Bid is funded in part by the FEDERAL TRANSIT ADMINISTRATION (FTA). In accordance with FTA requirements, each vendor shall complete this Attachment H and submit it to the County with and as a part of their Bid.

Par. 661.5 GENERAL REQUIREMENTS FOR STEEL AND MANUFACTURED PRODUCTS.

[a] Except as provided in Part 661 no funds may be obligated by FTA for a grantee project unless all steel and manufactured products used in the project are produced in the United States.

[b] All steel manufacturing processes must take place in United States, except metallurgical processes involving refine of steel additives.

[c] The steel requirements apply to all steel items including, but not limited to, structural steel, running rail and contact rail.

[d] For a manufactured product to be considered produced in the United States:

[1] All of the manufacturing processes for the product must take place in the United States; and

[2] All items or material used in the product must be of United States origin.

ATTACHMENT D

CERTIFICATE OF LOBBYING ACTIVITIES

CONTRACT NO. _____

The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No federally 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 agency, a Member of Congress, or 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.

(2) If any funds other than federally appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress or an employee or 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," to the contract administrator.

(3) The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including sub-contracts, sub-grants and contracts under grants, loans and cooperative agreements) and that all recipients of subcontract awards in excess of $100,000 shall certify and disclose accordingly.

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 § 1352, Title 31, U.S. Code. 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.

Name of Firm: _____

Authorized Signature: _____

Printed Name: _____

Title: _____

Date: _____

ATTACHMENT E
DISCLOSURE FORM TO REPORT LOBBYING
DISCLOSURE OF LOBBYING ACTIVITIES

Complete this form to disclose lobbying activities pursuant to 31 U.S. C. 1352
(See reverse for public burden disclosure.)

1. Type of Federal Action: ☐ a. contract ☐ b. grant ☐ c. cooperative agreement ☐ d. loan ☐ e. loan guarantee ☐ f. loan insurance	2. Status of Federal Action: ☐ a. bid/offer/application ☐ b. initial award ☐ c. post-award	3. Report Type: ☐ a. initial filing ☐ b. material change For material change only: year_____ quarter_____ Date of last report:_____

4. Name and Address of Reporting Entity: ☐ Prime ☐ Subawardee Tier_____, if known: Congressional District, if known:	5. If Reporting Entity in No. 4 is Subawardee, Enter Name and Address of Prime: Congressional District, if known:
6. Federal Department/Agency:	7. Federal Program Name/Description: CFDA Number, if applicable: _____
8. Federal Action Number, if known:	9. Award Amount, if known: $
10. a. Name and Address of Lobbying Entity (If individual, last name, first name, MI):	b. Individuals Performing Services (including address if different from No. 10a) (Last name, First name, MI):
11. Amount of Payment (check all that apply):	13. Type of Payment (check all that apply): ☐ a. retainer ☐ b. one-time fee ☐ c. commission ☐ d. contingent fee ☐ e. deferred ☐ f. other; specify: _____
12. Form of Payment (check all that apply): ☐ a. cash ☐ b. in kind; specify: nature _____ value _____	

14. Brief Description of Services Performed or to be Performed and date(s) of service, including officer(s), employee(s), or member(s) contacted, for payment indicated in Item 11:
(Attach Continuation Sheet(s) SF-LLL-A, if necessary)

15. Continuation Sheet(s) SF-LLL-A attached): ☐ Yes ☐ No

16. Information requested through this form is authorized by title 31 USC § 1352. This disclosure of lobbying activities is a material representation of fact upon which reliance was placed by the tier above when this transaction was made or entered into. This disclosure is required pursuant to 31 USC § 1352. This information will be reported to the Congress semi-annually and will be available for public inspection. Any person who fails to file the required disclosure shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.	Signature:_____ Print Name:_____ Title: _____ Telephone No: _____ Date: _____

ATTACHMENT F

INSTRUCTIONS FOR COMPLETION OF SF-LLL, DISCLOSURE OF LOBBYING ACTIVITIES

This disclosure form shall be completed by the reporting entity, whether subawardee or prime federal recipient, at the initiation or receipt of a covered federal action, or a material change to a previous filing to title 31 USC § 1352. The filing of a form is required for each payment to any lobbying entity for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of congress, or an employee of a Member of Congress in connection with a covered federal action. Use the SF-LLL-A Continuation Sheet for additional information if the space on the form is inadequate. Complete all items that apply for both the initial filing and material change report. Refer to the implementing guidance published by the Office of Management and Budget for additional information.

1. Identify the type of covered federal action for which lobbying activity is and/or has been secured to influence the outcome of a covered Federal action.

2. Identify the status of the covered federal action.

3. Identify the appropriate classification of this report. If this is a follow-up report caused by a material change to the information previously reported, enter the year and quarter in which the change occurred. Enter the date of the last previously submitted report by this reporting entity for this covered federal action.

4. Enter the full name, address, city, state and zip code of the reporting entity. Include Congressional District, if known. Check the appropriate classification of the reporting entity that designates if it is, or expects to be, a prime or subaward recipient. Identify the tier of the subawardee, e.g., the first subaward of the prime is the 1st tier. Subawards include but are not limited to subcontracts, subgrants and contract awards under grants.

5. If the organization filing the report in item 4 checks "Subawardee," then enter the full name, address, city, state and zip code of the prime federal recipient. Include Congressional District, if known.

6. Enter the name of the federal agency making the award or loan commitment. Include at lease one organizational level below agency name, if known. For example, Department of Transportation, United States Coast Guard.

7. Enter the federal program name or description for the covered federal action (item 1). If known, enter the full Catalog of Federal Domestic Assistance (CFDA) number for grants, cooperative agreements, loans, and loan commitments.

8. Enter the most appropriate federal identifying number available for the federal action identified in item 1 - (e.g., Request for Proposal (RFP) number, Invitation for Bid (IFB) number, grant announcement number, the contract, grant, or loan award number, the application/proposal control number assigned by the federal agency). Include prefixes, e.g., "RFP-DE-90-001."

9. For a covered federal action where there has been an award or loan commitment by the federal agency, enter the federal amount of the award/loan commitment for the prime entity identified in item 4 or 5.

10. (a) Enter the full name, address, city, state and zip code of the lobbying entity engaged by the reporting entity identified in item 4 to influence the covered federal action.

    (b) Enter the full name, of the individual(s) performing services, and include full address if different from 10(a). Enter Last Name, First Name, and Middle Initial (MI).

11. Enter the amount of compensation paid or reasonably expected to be paid by the reporting entity (item 4) to the lobbying entity (item 10). Indicate whether the payment has been made (actual) or will be made (planned). Check all boxes that apply. If this is a material change report, enter the cumulative amount of payment made or planned to be made.

12. Check the amount of box(es). Check all boxes that apply. If payment is made through in-kind contribution, specify the nature and value of the in-kind payment.

13. Check the appropriate box(es). Check all boxes that apply. If other, specify nature.

14. Provide a specific and detailed description of the services that the lobbyist has performed, or will be expected to perform, and the date(s) of any services rendered. Include all preparatory and related activity, not just time spent in actual contact with federal officials. Identify the federal official(s) or employee(s) contacted or the officer(s), employee(s), or Member(s) of Congress that were contacted.

15. Check whether or not an SF-LLL-A Continuation Sheet(s) is attached.

16. The certifying official shall sign and date the form, print his/her name, title, and telephone number.

Public reporting burden for this collection of information is estimated to average 30 minutes per response, including time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0046), Washington, D.C. 20503.

ATTACHMENT G

CERTIFICATION REGARDING DEBARMENT, SUSPENSION AND OTHER RESPONSIBILITY MATTERS - PRIMARY COVERED TRANSACTIONS

Federal Transit Administration (FTA)

The prospective Primary Participant (potential contractor for a major third-party contract), _____ _____certifies to the best of its knowledge and belief, that it and its principals:

1. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any federal department or agency;

2. Have not within a three (3) year period preceding this Bid 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 or records, making false statements or receiving stolen property;

3. 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 2 of this certification; and

4. Have not within a three (3) year period preceding this Bid had one or more public transactions (federal, state or local) terminated for cause or default.

[If the primary participant (applicant for an FTA grant, or cooperative agreement or potential third-party contractor) is unable to certify to any of the statements in this certification, the participant shall attach an explanation to this certification.]

THE PRIMARY PARTICIPANT (POTENTIAL CONTRACTOR FOR A MAJOR THIRD-PARTY CONTRACT) CERTIFIES OR AFFIRMS THE TRUTHFULNESS AND ACCURACY OF THE CONTENTS OF THE STATEMENTS SUBMITTED ON OR WITH THIS CERTIFICATION AND UNDERSTANDS THAT THE PROVISIONS OF 31 USC SECTIONS 3801, *ET SEQ.*, ARE APPLICABLE THERETO.

Name of Firm: _____

Authorized Signature: _____

Printed Name: _____

Title: _____

Date: _____

ATTACHMENT H

CONTRACT NO: _____

CERTIFICATION REGARDING DEBARMENT, SUSPENSION, AND OTHER INELIGIBILITY AND VOLUNTARY EXCLUSION – LOWER-TIER COVERED TRANSACTIONS

(This Attachment may be completed and submitted to the Buyer after award of Contract.)

The Lower-Tier Participant (potential sub-grantee or sub-recipient under a Federal Transit Administration (FTA) project, potential third-party contractor, or potential subcontractor under a major third-party contract), _____ certifies, by submission of this Bid, that neither it nor its principals are presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any federal department or agency.

The Lower-Tier Participant will not knowingly enter into any lower-tier covered transaction with a person who is proposed for debarment under 48 CFR part 9, subpart 9.4, 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.

The prospective Lower-Tier Participant agrees by submitting this proposal that it will include this requirement in all lower-tier covered transactions and in all solicitations for lower-tier covered transactions.

If the Lower-Tier Participant (potential sub-grantee or sub-recipient under an FTA project, potential third-party contractor, or potential subcontractor under a major third party contract) is unable to certify to any of the statements in this certification, such participant shall attach an explanation to this Bid.

THE LOWER-TIER PARTICIPANT (POTENTIAL SUB-GRANTEE OR SUB-AGREEMENT UNDER AN FTA PROJECT, POTENTIAL THIRD-PARTY CONTRACTOR, OR POTENTIAL SUBCONTRACTOR UNDER A MAJOR THIRD-PARTY CONTRACT) CERTIFIES OR AFFIRMS THE TRUTHFULNESS AND ACCURACY OF THE CONTENTS OF THE STATEMENTS SUBMITTED ON OR WITH THIS CERTIFICATION AND UNDERSTAND THAT THE PROVISIONS OF 31 USC §§ 3801, *ET SEQ.*, ARE APPLICABLE THERETO.

Name of Firm: _____

Authorized Signature: _____

Printed Name: _____

Title: _____

Date: _____