

DIVISION 26 05 05

ELECTRICAL SYSTEMS NARRATIVE

PART 1 - GENERAL

1.01 INTRODUCTION

- A. The purpose of this section is to define the design approach upon which the contractor is to base a budget/estimate and establish the design criteria, and design submittals, which will be required in the preparation and execution of the design.
- B. All work under this section shall comply with the requirements of General Conditions, Supplemental Conditions, Special Conditions, and Division 01 – General Requirements, and shall include all mechanical sections specified herein.
- C. This section includes a general narrative description of Division 26 systems with specific equipment and component criteria that are to be included in the project. Reference all other specification sections, floor plans, drawing notes, drawing equipment schedules, and drawing matrices for additional equipment and project criteria.

1.02 APPLICABLE CODES AND STANDARDS

- A. Design and construction shall comply with the following Codes:

APPLICABLE WASHINGTON STATE BUILDING CODES			
ENERGY CODE	2021 WASHINGTON STATE ENERGY CODE (SEC) FOR COMMERCIAL BUILDINGS	WAC 51-11C	EFFECTIVE MARCH 15, 2021
BUILDING CODE	2021 INTERNATIONAL BUILDING CODE WITH WASHINGTON STATE AMENDMENTS	WAC 51-50	EFFECTIVE MARCH 15, 2021
ACCESSIBILITY CODE	2021 INTERNATIONAL BUILDING CODE WITH WASHINGTON STATE AMENDMENTS CHAPTER 11 AND ICC A117.1-2009	WAC 51-50	EFFECTIVE MARCH 15, 2021
SEISMIC CODE	ASCE 7-2016 AS REFERENCED BY 2018 INTERNATIONAL BUILDING CODE	WAC 51-50	EFFECTIVE MARCH 15, 2021
FIRE CODE	2021 INTERNATIONAL FIRE CODE WITH WASHINGTON STATE AMENDMENTS	WAC 51-54A	EFFECTIVE MARCH 15, 2021
MECHANICAL CODE	2021 INTERNATIONAL MECHANICAL CODE WITH WASHINGTON STATE AMENDMENTS	WAC 51-52	EFFECTIVE MARCH 15, 2021
PLUMBING CODE	2021 UNIFORM PLUMBING CODE WITH WASHINGTON STATE AMENDMENTS	WAC 51-56	EFFECTIVE MARCH 15, 2021
BOILER CODE	WASHINGTON STATE BOILER CODE	WAC 296-104	
ELECTRICAL CODE	2020 NATIONAL ELECTRICAL CODE WITH 2020 WASHINGTON AMENDMENTS (NFPA 70)	WAC 296-46B	EFFECTIVE NOVEMBER 1, 2020
ELECTRICAL	ELECTRICIANS AND ELECTRICAL INSTALLATIONS	RCW CHAPTER 19.28	
NFPA STANDARDS	NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) STANDARDS AS REFERENCED BY THE CODES ABOVE OR AS SPECIFICALLY LISTED BELOW		

1.03 RELATED DOCUMENTS

- A. Architectural, Civil, Structural, and MEP Drawings and Narratives

1.04 ORDER-OF-PRECEDENCE PROVISIONS

- A. In the case of inconsistency or ambiguities in design documents (all specifications and drawings), compliance with the strictest design requirement among conflicting criteria is required.
- B. If provided, alternate pricing for compliance with less strict criteria will be evaluated in addition to the mandatory baseline strictest criteria.
- C. Provide notice upon discovering potential design conflicts prior to bid where possible.

1.05 GENERAL ELECTRICAL PROVISIONS

- A. Definitions:
 - 1. Electrical Contractor – This term as used in the Contract Documents shall be considered as synonymous with Electrical Contractor, or the Contractor where in reference to providing, furnishing, and/or installing electrical equipment or systems.
 - 2. Low Voltage Contractor- This term may be used in the Contract documents to refer to the low voltage systems integrator for telecommunications, security systems or Fire Alarm.
 - 3. Complete System: The Contract Documents do not attempt to address all materials, devices, equipment, and work that shall be required for completion of the electrical systems. All materials, devices, equipment, and work not addressed in the Contract Documents shall be provided by the Contractor to provide complete and functional systems, shall meet the applicable industry standards, and shall be equal or better than that normally provided for similar buildings in the same geographical area.
 - 4. The Electrical/ Low Voltage Contractor is responsible for providing the finished electrical work, tested, and ready for normal operation.
 - 5. Unless otherwise noted, all materials shall be new. Electrical Contractor shall properly store all materials and equipment in order to protect materials from physical damage or damage due to the elements or corrosion.

6. Materials shall be provided, installed, and/or used in conformance with the manufacturer's recommendations. If manufacturer's recommendations are not in conformance with the intent of the Contract Documents, obtain clarification from the Architect and Engineer prior to proceeding.
7. Coordination: Check drawings of other trades to verify spaces in which work shall be installed. Establish exact locations of piping and ducts in such a manner as to conform to structure, avoid obstructions, and keep openings and passageways clear. Lines that must pitch or that must have a constant elevation, shall have the right-of-way over lines not so restricted. Maintain maximum headroom. If space conditions appear inadequate, notify the Architect before proceeding with the work. Make reasonable modifications in the work without extra cost as needed to prevent conflict with work of other trades and for proper execution of the work.
8. For installation of equipment furnished by Others, that requires electrical connection, Electrical Contractor shall obtain rough-in dimensions from approved shop drawings, by measurement from the actual equipment to be installed, or as otherwise directed by the Architect. Provide all electrical services to and within equipment in a manner that maintains accessibility, operation, as well as maintenance and repair options.
9. Contractor shall ensure adequate equipment space and required clearances based on actual equipment selected for installation. Any modifications required to accommodate electrical equipment selected shall be at the Contractor's expense.
10. Drawings and Narratives shall be considered as a single entity, identified as the Contract Documents. Consider work indicated in one as required by both.

B. Codes, Permits, Inspections, and Fees:

1. The Electrical / Low Voltage Contractor shall obtain all permits and inspections and pay all fees required by State and Local authorities, except as noted.
2. All work and materials shall be in accordance with requirements of all applicable local and state codes, statutes, standards and other regulations. Date of regulations shall be as adopted by local authorities at the time of permit intake, unless indicated otherwise.
3. The codes shall be construed as establishing a minimum or base level of requirements. Contract Documents shall not be construed to permit or direct work not in conformance with codes, statutes, standards and other regulations. Where provisions of the various regulations conflict with each other, or with the Contract Documents, the more stringent provisions shall be included in contract pricing. Conflict shall be

resolved with the Architect and Authorities Having Jurisdiction (AHJ) prior to completing the design.

4. Where the Contract Documents call for material or construction of a better quality or higher capacity than required by the codes, statutes, standards, and other regulations, the provisions of the Contract Documents shall take precedence over the requirements of the codes and standards.
5. Material and equipment within the scope of the UL Testing Laboratory Service shall be listed by the Underwriters Laboratories for the purpose for which they are used and shall bear their listing mark. ETL or CSA shall be allowed if acceptable to the Authorities Having Jurisdiction (AHJs).

C. Construction Coordination Drawings

1. It shall be the Contractor's responsibility to work out and coordinate all conflicts and to provide all transitions and offsets required to facilitate installation of work. Provide construction coordination drawings for congested areas requiring close coordination with other trades and the general construction. Electrical work that is fully coordinated and that can be installed generally per the contract documents will not require coordination drawings. Failure to provide coordination drawings, when needed, shall be considered nonperformance, and progress payments will be suspended until the drawings are reviewed and accepted by the Architect/Owner.
2. The construction coordination drawings shall show all related trades, structure, and ceiling, walls, and partitions. Provide cross sections of all congested areas.
3. The final as-built drawings shall be submitted at the completion of the project for record purposes in hard copy as well as AutoCAD electronic files.

D. Submittals and Trade Coordination

1. The Contractor shall coordinate their shop drawings with other trades prior to shop drawing approval and construction.
2. No cutting or drilling of joists or beams will occur without Structural Engineer approval.
3. Architectural drawings shall be checked for ceiling heights, walls, and cabinets that are intended to conceal work of this section. Where conflicts occur, the Architect shall be notified prior to rough-in or installation of the work. Location of exposed work such as diffusers, grilles, and piping outlets shall take precedence over concealed work.

4. Submittals: Mark submittal literature and show drawings clearly, and include all equipment and material shown on drawings and specified. Indicate the following:
 - a. Index, followed by specification reference and/or drawing reference for which literature is submitted for review.
 - b. Manufacturer's name and address, and supplier's name, address and phone number.
 - c. Catalog designation or model number.
 - d. Rough-in data and dimensions and cut sheets clearly identifying the specific model and options.
 - e. Installation as well as operation and maintenance manuals with specific model and features applicable to this installation identified.
 - f. Warranties.
 - g. Spare parts lists as recommended by manufacturer for equipment.
 - h. Factory certifications.
 - i. Troubleshooting guides.
 - j. Complete customized listing of characteristics, equipment, accessories, etc., specified.
 - k. Indicate whether item is "As Specified" or "Proposed Substitution". Indicate any deviations on submittal. Indicate any deviations on submittal. Mark out all non-applicable items and/or clearly identify applicable items. The terminology "As Specified" used without clearly identifying applicable items is not acceptable. Show exactly what will be provided and include options or deletions.
 - l. Contractor agrees that Shop Drawings Submittals processed by the architect are not Change Orders, that the purpose of Shop Drawing Submittals by the Contractor is to demonstrate to the Architect that the Contractor understands the design concept and demonstrate its understanding by indicating which equipment and material it intends to furnish and install and by detailing the fabrication and installation methods it intends to use.
 - m. Contractor further agrees that if deviations, discrepancies, or conflicts between Shop Drawings and Specifications are discovered either prior to or after Shop Drawing Submittals are processed by the Architect, the Design Drawings and Specifications shall control and shall be followed.
 - n. Shop drawings shall be provided for all voice/data and power work, including detailed layout drawings of all devices and raceways.

- o. Warranty period to extend for one year from date the project is occupied by the Owner, not from the date of completion of the work. Warranty not applicable to defective items due to faulty work of subsequent trades.
- p. As-builts: Contractor shall maintain up to date as-built drawings showing all construction installation with any/all design changes. Drawings shall be maintained in the project office for inspection by the Architect/Owner at any time. Provide Owner with reproducible and electronic (AutoCAD and PDF files) as-built drawings within 4 weeks of substantial completion.
- q. Provide manufacturers product, installation and warranty information for all products supplied with signed contract documents per an agreed upon schedule at the time of contract award. This is of particular importance for GC to forward appropriate information to Subcontractors to facilitate coordinated installation of his products.

PART 2 - SYSTEMS

2.01 GENERAL ELECTRICAL DESIGN CRITERIA

A. Load Calculations:

- 1. The load calculation assumes a VRF mechanical system for residential unit heating/cooling, as well as a gas cooktop/electric oven for cooking in all units and a central hot water system. A dummy load for heat (4w/sf) and for gas cooking (8kw) is included so the optional NEC calculation may be utilized per 2023 NEC 220.80.
- 2. If furnished, Sizing for residential stepdown transformers is based on the same unit calculation as described above.

B. Electrical Service:

- 1. The building is in City of Port Angeles and will be served via a secondary electrical service that comprises a pad mounted transformer furnished and installed by the Clallam Co PUD.
- 2. The Electrical Contractor shall provide the secondary connections between the pad mounted service transformer and the main electrical room. The contractor shall furnish and install all conduit, conductors, trenching, and backfilling associated with all secondary conductors. Contractor shall include coordination with local power

2

utility company to determine responsibility matrix for electrical service and adjust bid accordingly.

3. 600A switchboard will be utilized to serve the house loads.
4. Residential loads will be powered one (1) 600A service feeding the meter center.
5. Provide grounding and bonding as required by NEC Article 250.

C. The service voltage to the building will be 120/208V, 3 Phase, 4 Wire

2.02 SECONDARY ELECTRICAL DISTRIBUTION SYSTEM:

- A. Load calculations will be continued through the design process to ensure service sizes are sufficient. All final electrical room layouts to be detailed by EC and confirmed with selected gear manufacturer.
- B. Provide a circuit breaker in the house switchboard to serve the required future electric vehicle charging capacity per City code.
- C. Provide fully rated electrical distribution equipment. Contractor to obtain available fault from utility company prior to order of switchgear, distribution, and panels and adjust AIC ratings accordingly prior to bid. No exceptions. Series rated meter stacks for the residential units are allowed.
- D. 208Y/120V-3Ph panelboards shall be provided to serve house power, lighting loads and other loads. House power panels shall be 3-phase, four wire, sized to accommodate the designed systems, with minimum 25% spare panel circuit breakers and load capacity.
 1. Neutral Bus: Provide 100% rated neutral for 208Y/120V branch panels.
 2. Ground Bus: Provide code sized ground bus.
 3. Bus Bars: Panels shall have copper bus bars or copper clad Aluminum.
- E. Load center panels shall be provided at 100 or 125 amp 1-phase with MLO (AIC rating TBD based upon AFC from utility, but not less than 10,000A) to serve residential units. All branch circuits for residential spaces must be equipped with Arc Fault Circuit Interrupters (AFCI) circuit breakers installed in accordance with NEC. Size of panel varies with square foot size of unit and quantity of electrical connections. Provide pre-finished white in lieu of standard finish for unit load centers.

2.03 GROUNDING:

- A. Provide a complete National Electrical Code (NEC) grounding system, including UFER ground. Ground conductors shall be sized in accordance with the (NEC).
- B. Ground conductors shall be provided for all feeders and branch circuits, except for lighting branch circuits. Conduit or raceway shall not be sole means for equipment grounding.

2.04 EQUIPMENT CONNECTIONS:

- A. Provide the following equipment connections as listed, but not limited to:
 - 1. HVAC equipment.
 - 2. Plumbing equipment.
 - 3. 120V power connections for irrigation control system.
 - 4. Empty raceway for irrigation control system.
 - 5. 120V smoke and CO alarms in residential units.
 - 6. Owner furnished equipment.
 - 7. Circuit Loading: Each 20 amp circuit shall not be loaded to more than 80% or 16A for a 120V circuit, unless circuit feeds a single piece of equipment. Circuit load shall be calculated in compliance with the following:
 - a. Lighting: The volt-ampere rating of each fixture connected, in accordance with the NEC.
 - b. Convenience Receptacles: 180 VA per duplex receptacle.
 - c. Dedicated Receptacle: Nameplate rating of equipment connected.
 - d. Motors and all hard wired equipment: Nameplate rating of equipment connected.
 - 8. Provide all interconnect wiring between controls, equipment, and major mechanical and electrical equipment, except where identified "By Owner".
 - 9. Provide all disconnects for mechanical, plumbing, and electrical equipment in accordance with the NEC.
 - 10. Label all receptacles, equipment hard wire connections, and power junction boxes with the appropriate panel name and circuit number.

2.05 EMERGENCY POWER SYSTEM:

- A. Emergency power system shall consist of individual battery/inverter units installed in selected light fixtures for egress lighting to maintain average of 1.0-fc and a minimum of 0.1-fc light level along egress path as per NFPA 101. Refer to architectural drawings for final path of egress.

2.06 RESIDENCE HVAC SYSTEMS

- A. Refer to mechanical narrative for residential HVAC systems and required connections.

2.07 RESIDENCE EXHAUST SYSTEMS

- A. Refer to mechanical narrative for residential HVAC systems and required connections.

2.08 MECHANICAL & PLUMBING EQUIPMENT CONNECTIONS:

- A. Provide wiring, starters (except where available integral to the equipment), disconnects and OCP devices. See mechanical drawings/ narratives for equipment.
- B. Refer to mechanical and plumbing plans for exact locations.
- C. Coordinate with mechanical criteria and Mechanical Contractor to provide complete power wiring and connections for all required mechanical equipment. Provide control power for mechanical system control.
- D. Electrical Contractor to provide Emergency Power Off (EPO) button to shunt trip boilers at each entrance to boiler room as required by State and local codes, (WAC 296-104-303 and 2005 Seattle Boiler and Pressure Vessel Code Section 170). Shut down is to comply with the requirements of AMSE CSD-1 Code Part CE.
- E. Provide GFCI connections to all heat trace equipment. Refer to plumbing narrative for heat trace requirements. Outdoor heat trace for hot water heating system will need to be on the optional standby branch of emergency power.
- F. Provide motor controls for mechanical equipment in accordance with the Trade Coordination Schedule requirements.

- G. Provide all disconnect switches, fused or non-fused, in accordance with the requirements of the NEC.
- H. Electrical contractor to provide 120V circuits for control panels provided by Mechanical for controls contractor.
- I. Refer to Div 22 and 23 narratives for electrical requirements and equipment schedules.

2.09 ENERGY METERING AND ENERGY CONSUMPTION MANAGEMENT

- A. Each house panel shall be provided with energy metering system to separately meter house lighting, receptacles and HVAC loads.

2.10 ENERGY CODE C411 RENEWABLE ENERGY AND SOLAR READINESS

- A. New PV system will be required per WSEC C411.1, On-site renewable energy systems requirements for new buildings and additions larger than 10,000 ft² of gross conditioned floor area.
- B. PV system sizing criteria is 0.5 watts rated peak PV energy production per square foot of conditioned space at minimum, which will require installing 7.5KW PV system based on 15,000-SF gross conditioned area.
- C. Contractor shall provide PV system, rough-in, power cabling and NEC 705 load-side source connection system via CB installed inside the service switchboard.
- D. In addition, and per Energy Code C411.3 - Option 1., 40% of facility roof space shall be designated for solar readiness zone. PV system can be installed inside of this zone.
- E. Contractor to provide additional space within the main switchboard at the end of the bus for future PV in compliance with C411.3.7 interconnection.

2.11 MISCELLANEOUS

- A. Doors
 - 1. Provide electrical connections to all ADA doors.
 - 2. Coordinate all electrical requirements with the Architect

B. Security/ Access Control

1. Provide electrical connections to Access Control and CCTV systems. Coordinate power requirements to the CCTV and access control systems with equipment provider. Coordinate head-end equipment location with Client.

2.12 UNIT POWER AND LOW VOLTAGE FEEDER ROUTING

- A. Unit power feeders shall not be routed through another unit.

2.13 WIRING DEVICES:

- A. Provide wiring devices, in types, characteristics, grades, colors, and electrical ratings for given applications which are UL listed and which comply with NEMA WD 1 and other applicable UL and NEMA standards.
1. In residential units, provide 20A rated receptacles in the Kitchens and baths; 15A elsewhere.
- B. Receptacles: Comply with UL 498 and NEMA WD 1, 20A, 125 Volt, Duplex - NEMA 5-20R, Heavy Duty in commercial and common areas; Residential grade in units.
- C. Dedicated Receptacles: Comply with NEMA and voltage recommendations from manufacturer of equipment to be installed. Provide dedicated circuits and dedicated, 20A receptacles for Owner furnished equipment with a load 1200W or greater.
- D. Ground-Fault Circuit Interrupter (GFCI) Receptacles: Provide "feed-thru" type ground-fault circuit interrupter, with integral heavy-duty NEMA 5-20R duplex receptacles arranged to protect connected downstream receptacles on same circuit. Provide GFCI protection for all receptacles located where within six feet of the outside edge of a sink or in wet areas. In residences provide GFCI circuit breakers in lieu of receptacles, so that all devices are accessible and consistent throughout the space.
- E. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
1. Code requires all receptacles in the units to be Tamper resistant.

- F. Equipment Disconnect Toggle Switches: NEMA WD 1, totally enclosed with rectangular bodies of thermosetting plastic and a mounting strap. Handles shall be white. Wiring terminals shall be of the screw type, side wired. Switches shall be rated quiet-type, 120/277 volts, with number of poles indicated and shall be fully rated for the ampere rating of the installed equipment. Not more than one switch shall be installed in a single gang position. Toggle switches for motor disconnecting means shall be motor rated snap switches, heavy duty, specification grade.
- G. Provide maximum of eight (8) general convenience receptacles per 20 amp, 120 volt circuit along with AFCI circuit breaker for residential units only as required by the NEC 2017.
- H. Provide dedicated circuit for the smart box panel provided with AFCI breaker.
- I. Receptacles shall be installed 18" above finished floor (AFF) to center of receptacle, unless noted otherwise.
- J. Residential Unit Receptacles – Baseline approach: Provide receptacles in residential units as required by NEC section 210.50. Receptacles shall be provided at the following areas, but are not limited to:
 - 1. Every 12' on center and no more than 6' from wall breaks in all bedroom and living areas,
 - 2. (1) receptacle in every hallway longer than 10',
 - 3. (1) receptacle in foyers at walls 3' or greater in width and at 12' on center in foyer,
 - 4. (1) dedicated laundry receptacle,
 - 5. (1) Receptacle at all kitchen islands and peninsular countertops 24" or greater. Receptacle shall be located no more than 12" below the countertop with no more than a 6" overhang
 - 6. Within 3' of every restroom water basin
 - 7. Every 4' on center at kitchen counters for all counters that are 12" or wider
 - 8. Electrical contractor shall refer and coordinate with interior, architectural, and other discipline drawings when developing final device layouts per NEC 210.50. All device locations should be coordinated with other equipment, pocket doors, window and column locations, and construction details prior to rough in.
 - 9. Provide (1) USB outlet in every bedroom at bedside table outlet location, at the kitchen counter and at each desk location.
 - 10. Provide switched outlet in bedrooms instead of overhead lighting.

K. Additional Unit Requirements:

1. EC to provide and install air button switch for all garbage disposals located on kitchen islands. Kitchens without islands will receive regular on/off switch.
2. Unit panels are assumed to be located behind the bedroom door where possible.
3. Refer to architectural drawings for assumed kitchen appliance connections required.

L. Receptacles shall be installed 18" above finished floor (AFF) to center of receptacle, unless noted otherwise.

M. Coordinate the location of all electrical items with architectural and mechanical layout to avoid interference etc. Any items installed that will not allow the installation of the designed features shall be connected at no additional cost.

N. Label all receptacles, equipment hard wire connections, and power junction boxes with the appropriate panel name and circuit number in all building areas, except residential units.

O. Refer to section 261400 for additional details.

2.14 LIGHTING SYSTEMS:

A. Scope of New Work:

1. Provide new lighting and controls that comply with the City codes referenced below.
2. Provide 100% LED lighting package for an energy efficient design.
3. Electrical engineer of record shall be responsible for lighting summary permit forms, emergency egress lighting layouts and photometrics, exit sign layouts, circuiting, code required control specifications and wiring diagrams.

B. Lighting Allowance:

1. GC/Owner to provide lighting allowance for interior and exterior lighting and controls.

A. Applicable Codes & Guidelines for New Lighting:

1. 2021 Washington State Energy Code – Interior Lighting:
 - a. The 2021 Washington State Energy Code (WSEC) shall be applicable for all interior lighting.

- b. Provide an energy efficient lighting design with a lighting power density that is less than the WSEC Table C405.4.2(2) Interior Lighting Power Allowances: Space-By-Space Method
- c. Table C405.4.2(2) Interior Lighting Power Allowances: Applicable Spaces
- d. Interior common area hardwired lamps (retrofit) must have a minimum efficacy of 60 lumens per watt per WSEC section C405.4.1.

Primary Interior Function	Allowed Watts/SF Option 2 C406.2.3.2 Targets: 20% LPD Reduction	Allowed Watts/SF Option 1 C406.2.3.1 Targets: 10% LPD Reduction	Allowed Watts/SF Code Baseline
Corridors	0.32	0.36	0.41
Electrical / Mechanical Rooms	0.34	0.38	0.43
Laundry/Wash Room	0.42	0.48	0.53
Stairwell	0.39	0.44	0.49
Storage Rooms			
< 50 SF	0.41	0.46	0.51
50+ SF	0.30	0.34	0.38
Dwelling/ Sleeping Units	Code Baseline requirement: No less than 90% of the installed lamps must have a minimum efficacy of 65 lumens per watt or luminaires with a minimum efficacy of 45 lumens per watt per WSEC section C405.1.1.		

	C406 requirement: No less than 95% of the installed luminaires must have a minimum efficacy of 90 lumens per watt per SEC section C406.2.3.3.
--	---

2. 2021 Washington State Energy Code – Exterior Lighting

- a. The 2021 Washington State Energy Code (WSEC) shall be applicable for all exterior lighting which includes all building mounted exterior lighting and site lighting.
- b. Project is classified under Zone 2 of Table C405.5.3(1) in the Washington State Energy Code. Zone 2 best describes this project's location in a predominantly residential area with limited nighttime use.
- c. Provide an energy efficient lighting design that complies with WSEC Table C405.5.3(2) Lighting Power Allowances for Building Exteriors.

<u>Primary Exterior Function</u>	<u>Zone 2</u>	<u>Zone 3</u>
Walkways less than 10ft wide	0.07 Watts/ Linear Foot	0.10 Watts/ Linear Foot
Uncovered Parking Areas and Drives	0.026 Watts/SF	0.037 Watts/SF
Entry/ Exit Doors	9.8 Watts/ linear foot of opening	14.0 Watts/ linear foot of opening
Entry Canopies	0.126 Watts/SF	0.180 Watts/SF
Building Facades	0.075 Watts/SF of gross above grade wall area.	0.113 Watts/SF of gross above grade wall area.

3. IESNA Illumination Recommendations

- a. Target illumination values for all interior and exterior spaces are recommended in the IESNA Handbook.
- b. IESNA Lighting Handbook (2020 Edition) Recommended Foot Candles:
- c. ANSI/IES RP-28-20 Recommended Practice

Primary Function	Recommended Foot-Candles
-------------------------	---------------------------------

Corridors	5 average at the floor
Entry Vestibule	15 average at the floor (Day) 4 average at the floor (Night)
Laundry	30 average at 42" AFF
Stairwells	10 minimum at treads
Storage Spaces / Janitor Closet	5-10 average at the floor
Mechanical Rooms	20 average at the floor
Electrical Rooms	30 average at 30" AFF
Exterior Walkways	3-5 average at the floor
Entrance Canopy	3-4 average at the floor
Exterior Exits/Entrances	3-4 average at the floor
Exterior Parking	0.2 average at the floor

4. IBC Illumination for Egress Requirements

- a. Engineer of record shall provide photometric calculations to ensure that under normal power, illumination levels are not less than 1 foot-candle at designated paths of egress. Under emergency power, illumination levels shall be an average of 1 foot-candle and a minimum of 0.1 foot-candle at all designated paths of egress. Refer to IBC section 1008.1-1008.3.5 for additional information.
- b. Per IBC reference to ASME 17.1, all elevator lobby thresholds shall have 10FC of emergency illumination when the elevator is in service.
- c. Electrical contractor to provide UL-924 devices as required for all emergency egress illumination.
- d. Refer to Section 2.05 for emergency lighting power requirements.

5. Lighting Controls – 2021 **Washington** Energy Code Requirements: Interior and Exterior Lighting Controls:

- a. Provide code compliant lighting controls in accordance with the IMEG Control Sequence of Operations.
6. Provide one of the following lighting control systems for common area interior lighting and exterior lighting.
 - a. nLight by Acuity
 - b. Athena by Lutron
 - c. Wattstopper DLM by Legrand
 - d. Or Equal control system.
7. Provide Claro style wall switches for any interior lighting areas with standalone controls.
8. See IMEG Basis of Design luminaire schedule and luminaire cutsheet package for dimming protocol designation per luminaire
9. See IMEG electrical drawing set for control sequence of operations
- B. Lighting Concepts Space by Space
 1. See IMEG electrical drawing set for lighting layouts and luminaire specifications
- C. Extra Materials
 1. Furnish extra materials described below that match lighting products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - a. Lamps: 10% of each type and size used.
 - b. Diffusers and Lenses: Furnish at least one of each type.
 - c. Drivers: Furnish one of each type.
 - d. Globes and Guards: Furnish one of each type.

PART 3 - EXECUTION

3.01 PREPARATION & INSTALLATION

- A. All work contracted for must be accepted by all applicable inspectors including site superintendent, GC quality control personnel, owner's representative (IMEG) or their assigns.
- B. As-builts: provide owner with electronic as-built drawings within two weeks of substantial completion. As-builts will reflect all changes from the construction drawing set and will comply with 2021 Washington Energy Code project completion requirements.
- C. O&Ms: provide hard copy and electronic copies of O&Ms for all systems within two weeks of substantial completion.

3.02 TESTING & INSPECTION

- A. A third party will act in the role of Project Commissioning Authority (CxA) and will participate with the EC in final execution of functional testing for the electrical systems in accordance with 2021 Washington State Energy Code section 1416 commissioning. These requirements apply to all residential and non-residential systems.
- B. Test the entire electrical installation to ensure compliance with the Contract Documents.
- C. All inspections and tests shall be in accordance with the following applicable codes and standards except as provided otherwise herein.
 - 1. American Society for Testing and Materials – ASTM
 - 2. International Electrical Testing Association – NETA
 - 3. National Fire Protection Association – NFPA
 - 4. 2021 Washington State Energy Code (including but not limited to Section 1513.8 and 1416.)
 - 5. State and *Local* Codes and Ordinances.
- D. The EC is responsible for all test, balance, and startup of electrical systems.
- E. The EC is responsible for coordination study and arc-flash studies.
- F. The EC will create functional witness tests for the electrical systems for review by the CxA. The contractor will incorporate the review comments. The EC will execute all pre-functional testing to assure system readiness for final functional testing.
- G. Installing contractors will document deficiencies and provide equipment, materials, and labor necessary to correct deficiencies found during the commissioning process to fulfill contract and warranty requirements.
- H. The Contractor shall be responsible for implementing all final settings and adjustments of protective devices and electrical equipment in accordance with Manufacturer recommended or Engineer's specified values.
- I. Any system material or workmanship which is found defective on the basis of electrical tests shall be reported directly to the Engineer and shall be corrected by the Contractor at no additional cost to the Owner.
- J. The Contractor shall maintain a written record of all tests and upon completion of the project. Assemble and certify a final test report. The test report shall include:
 - 1. Summary of the Project
 - 2. Description of the equipment tested
 - 3. Description of tests performed on each equipment or system
 - 4. Test results
 - 5. All conclusions and recommendations

- 6. An appendix including appropriate test forms
- 7. List of *test* equipment used and calibration date

- K. Owner training will be provided by the EC.

- L. The contractor will be expected to fully comply with the observation process and no change orders will be accepted for the contractor's participation.

- M. The contractor will provide Section 1416 mandated documentation at the appropriate stages of planning, testing, and project closeout.

- N. The EC will provide mandated life safety system testing as needed.

- O. Owner training will be provided by the installing contractor.

END OF SECTION