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1.0 EXHIBIT INFORMATION

1.1 Purpose

1.1.1 Without limiting the information summarized herein, the purpose of this document is to summarize the *minimum* performance specifications, quality standards, scope of work and other criteria required for the engineering, procurement, and construction of the Project.

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(1) The engineering, procurement, and construction of the balance-of-plant infrastructure for the Project, including all civil works, structural works, and electrical works;

(2) The supply and delivery of WTGs to the Project Site;

(3) The offloading and installation of all WTGs for the Project, and all tasks necessary to achieve mechanical completion of the WTGs;

(4) All tasks necessary to achieve commissioning completion of the WTGs; and

(5) The furnishing and installation of the O&M Building and the meteorological towers.

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1.2 Project Description

1.2.1 PacifiCorp (Owner) is soliciting proposals from qualified bidders (Sellers) for cost-effective renewable resources that are located in or can be delivered to PacifiCorp's west balancing authority area ("**PACW**"). Any wind energy project to be owned and operated by PacifiCorp shall meet the PacifiCorp requirements set forth herein. The performance requirement is that the Project must be capable of producing safely, reliably and continuously at rated at all ranges power output and ambient conditions.

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1.3 References

1.3.1 Appendix "A-7" contains the following Owner standards that apply to this Technical Specification:

- RFP Appendix A-7.01: Attachment 1A Project Document Formatting and Requirements.
- RFP Appendix A-7.02: Attachment 1B – Project Document Deliverables
- RFP Appendix A-7.03: Computer Aided Design (PacifiCorp Energy) General AutoCAD/Drafting Standards (Specification DCAP876).

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- RFP Appendix A-7.04.1: EBU PX-S01/S01A Substation Equipment—Power Transformer, All Ratings and Substation Equipment—Transformer-Specific Requirements
- RFP Appendix A-7.04.2: EBU PX-S02 Substation Equipment—Collector Substation Main Power Transformer
- RFP Appendix A-7.04.3: ZS-102 Two-Winding Distribution Transformer Inverter Step-Up Liquid-Immersed (Pad Mounted, Compartmental Type)
- RFP Appendix A-7.05: EBU SI-S04 Electrical Equipment—Insulating Oil
- RFP Appendix A-7.06: EBU SI-S02 Wind, Ice, and Seismic Withstand

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- RFP Appendix A-7.07: EBU SI-S03 Contaminated Environment Protection
- RFP Appendix A-7.08: SP-TRF-INST Transformer, Oil-Filled Reactor and 3phase Regulator Installation Procedure
- RFP Appendix A-7.09: TD 051 Sign, Danger
- RFP Appendix A-7.10.1: 6B.5—Fence Application and Construction
- RFP Appendix A-7.10.2: Section 02810 Chain Link Fencing and Gates
- RFP Appendix A-7.10.3: Section 02815 Cantilever Slide Gate

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- RFP Appendix A-7.11: 6B.6—Substation Grounding
- RFP Appendix A-7.12: GEN-ENG-RELAY-0001 Protective Relaying Standard
- RFP Appendix A-7.13: GEN-ENG-RELAY-0002 Arc Flash Hazard Standard
- RFP Appendix A-7.14: GEN-ENG-RELAY-0003 Relay Current Transformer (CT) and Potential Transformer (PT) Insulation Integrity Test
- RFP Appendix A-7.15: GEN-ENG-RELAY-1003 Thermal Plant Protective Relay Maintenance and Testing – PRC-005
- RFP Appendix A-7.16: Relay Testing and Commissioning Checklist

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- RFP Appendix A-7.17: GPCP-EQPMNT-INST Generation Protection and Control Equipment Installation Procedure
- RFP Appendix A-7.18: GPCP-CT-INST Current Transformer Installation Procedure
- RFP Appendix A-7.19: PCF-CT-INST Current Transformer Installation Form
- RFP Appendix A-7.20: SG-001 Substation High-Voltage Warning Signs
- RFP Appendix A-7.21: EXHIBIT X Specification for Substation Equipment Installation, Testing and Commissioning
- RFP Appendix A-7.22.1: SV 251 Bird and Animal Protection for Miscellaneous Equipment

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- RFP Appendix A-7.22.2: SV 001 Bird and Animal Protection – General Information
- RFP Appendix A-7.22.3: SV 002 Bird and Animal Protection – General Installation Instructions
- RFP Appendix A-7.23: Volume 8 Consultant Drafting Procedures and Standards (For Engineering Drawings)

1.4 Definitions

The following words shall have the respective meanings set forth below when used in this specification:

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1.4.1 "**Access Roads**" means all the complete, fully-functional roads to be constructed by Seller under the Agreement.

1.4.2 "**Agreement**" means the written agreement between Owner and Seller covering the furnishing of Work and other services in connection therewith. Other documents and deliverables are attached to the Agreement and made a part thereof as provided therein.

1.4.3 "**Applicable Standards**" has the meaning set forth in this specification.

1.4.4 "**As-Built Drawings**" means a complete set of drawings prepared by Seller or a Subcontractor which accurately and completely represent the Work as constructed and installed.

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1.4.5 "**BOP**" means balance-of-plant.

1.4.6 "**Collection System**" means the permanent electrical and communications infrastructure required to transmit energy and performance and operating data between each Wind Turbine and the Project Substation, or to the Turbine SCADA System control panel as appropriate.

1.4.7 "**Communications System**" means the supervisory, control, and data acquisition system for the Project Substation equipment (including all breakers, switches, transformers, relays, and meters) and permanent meteorological towers; all fiber optic cabling and supporting devices within the Collection System Circuits; and the Turbine SCADA System.

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1.4.8 "**Seller**" means the person, firm, or corporation with whom Owner has entered into the Agreement.

1.4.9 "**Seller Deliverables**" means all drawings, plans, studies, reports, calculations, specifications, pictures, videos, test results, manuals, completion certificates, completion procedures, checklists, documents, and other similar items necessary for the successful completion of the Work.

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1.4.10 "**Equipment**" means all of the parts, components, equipment, materials, apparatus, structures, tools, supplies, consumables, goods, and other items required or appropriate for a complete, fully-functional Project or that otherwise form or are intended to form part of the Work or the Project, including all equipment, materials, apparatus, structures, tools, supplies and other goods provided and used by Seller and the Subcontractors for performance of the Work, but that are not incorporated into the Project, and excluding all Owner-Supplied Equipment.

1.4.11 "**Foundation**" means each Wind Turbine foundation.

1.4.12 "**Job Book**" means a manual to be prepared by Seller and approved by Owner, which will include all Seller engineering, design, purchasing, and other information relating to the Work.

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1.4.13 "**Interconnection Line**" means the [TBD]-kV high-voltage transmission line connecting the Project Substation with the Point of Interconnection. "TBD" is a Project-specific voltage to be specified in the Proposal, but generally expected to be 115 kV or greater.

1.4.14 "**O&M Building**" means the operations and maintenance building for the Project.

1.4.15 "**Owner**" means PacifiCorp.

1.4.16 "**Point of Interconnection**" means the point where the Interconnection Line connects to the interconnection facilities constructed and owned by the interconnecting utility to which electrical power produced by the Project will be delivered.

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1.4.17 “**Project**” means the generating facility described in the Proposal.

1.4.18 “**Project Schedule**” means the schedule of key dates, milestones, and other activities for timely completion of the Work, reflecting the project execution plan and anticipated sequence of site operations.

1.4.19 “**Project Site**” or “**Site**” means the location, or proposed location, of the Project.

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1.4.20 "**Project Substation**" means the 34.5/[TBD]-kV substation to be located at the Project Site, with all necessary equipment to connect the Project to the interconnecting utility's grid. "TBD" is a Project-specific voltage to be specified in the Proposal, but generally expected to be 115 kV or greater.

1.4.21 "**Proposal**" means the formal offer of Seller together with all information submitted that pertains to this RFP.

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1.4.22 "**Prudent Wind Industry Practices**" means (a) those practices, methods, equipment, specifications and standards of safety, performance, dependability, efficiency and economy as are acceptable for construction and professional engineering firms performing design, engineering, procurement and construction services in North America on facilities of the type and size similar to the Project, which in the exercise of reasonable judgment and in the light of the facts known at the time the decision was made, are considered good, safe and prudent practice in connection with the design, construction and use of electrical and other equipment, facilities and improvements, with commensurate standards of safety, performance, dependability, efficiency and economy, are in accordance with generally accepted national standards of professional care, skill, diligence and competence applicable to design, engineering, construction and project management practices, and are consistent with Applicable Laws; and (b) those practices, methods, standards and acts that at a

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particular time in the exercise of reasonable judgment would have been acceptable to those engaged in, or approved by a significant portion of, the wind power industry for similar facilities in similar geographic areas as a reasonable effort to accomplish the desired result in a manner consistent with Applicable Laws, Applicable Standards, safety, environmental protection, economy and expedition.

1.4.23 "**Quality Plan**" means quality assurance and quality control plan to be prepared by Seller in compliance with the requirements in this specification.

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1.4.24 "**Requirements**" means the Work Specifications, Prudent Wind Industry Practices, applicable laws, applicable permits, Applicable Standards, the Project Schedule, the Project's interconnection Agreement, the Project design documents, and the other requirements of the Agreement.

1.4.25 "**RFP**" means request for proposals.

1.4.26 "**Safety Plan**" means safety plan to be prepared by Seller in compliance with the requirements in <u>this specification.</u>

1.4.27 "**SCADA**" means supervisory control and data acquisition.

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1.4.28 "**Security Plan**" means security plan to be prepared by Seller in compliance with the requirements in this specification.

1.4.29 "**Turbine Supplier**" means a Project-specific Wind Turbine supplier to be specified in the Proposal.

1.4.30 "**Wind Turbine Generator**" means each of the complete, fully-functional wind turbine generators to be part of the Project.

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1.4.31 "**Wind Turbine Pad**" means both the crane pads and hardstands, where (i) "**crane pads**" refer to a hardstand area in connection with the erection or service of a Wind Turbine and (ii) "**hardstands**" refer to any area where Wind Turbine components, Wind Turbine equipment, transport equipment, or storage equipment are stored, placed, or parked, and including parking areas, laydown areas, and other such working areas.

1.4.32 "**Work**" means all actions, capital, contracts, labor, equipment, and materials necessary to construct the proposed Project and furnish wind energy and environmental attributes (including operating the Project) to Owner at the specified delivery point.

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1.4.33 "**Work Specifications**" means the minimum performance specifications, quality standards, and other criteria required for the performance of the Work by Seller, each as described in more detail in <u>this specification.</u>

1.4.34 References to "**roads**" and "**roadways**" herein shall be understood to consist of all access roads, Wind Turbine Generator string and spur roads, substation roads, transmission line service roads, meteorological tower roads, maintenance building roads, and temporary construction roads to be constructed for the Project.

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1.4.35 As used herein, "**raceway**" shall be understood to include conduit (rigid and flexible), underground duct, wireway, cabinets and boxes, and all materials and devices required to install, support, secure, and provide a complete system for support and protection of electrical conductors.

1.5 Interpretation

1.5.1 References herein to requirements to perform and/or provide work, services, equipment, or other similar items shall be understood to be the responsibility of Seller, unless explicitly noted as being a responsibility of Owner.

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1.5.2 The headings of sections and subsections herein are for convenience only and shall be ignored in construing this exhibit.

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2.0 STANDARDS OF PRACTICE

2.1 General Provisions

2.1.1 Seller shall be responsible for the interpretation of the data provided herein and validation of the proposed design.

2.1.2 Any proposed materials, structures, and/or assemblies shall be maintainable in the simplest and most cost-effective manner possible.

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2.1.3 All materials shall be new, unused, of the highest quality, free of defects and irregularities, and consistent for use in wind generation facilities.

2.1.4 Equipment shall be installed, assembled, and tested in strict compliance with the manufacturer's drawings, code markings, and instructions.

2.1.5 The Seller shall ensure the final drawings, models, and associated documents meet the needs of the Project requirements and adhere to all applicable codes and standards. The Seller shall have the overall responsibility for the design and engineering provided by their Engineer of Record (EOR).

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2.1.6 Physical and cyber security shall adhere to NERC Critical Infrastructure Protection (CIP) protocol. This compliance shall be demonstrated within the design and using additional reporting and documentation when necessary.

2.2 Supervision and Engineer of Record

2.2.1 All engineering shall be performed under the supervision of and stamped by the engineer(s) of record, who shall be a registered professional engineer with a current license in the Project jurisdiction. Such professional engineer(s) shall be registered in the applicable discipline for the drawings being signed and sealed.

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2.2.2 Seller shall provide all engineering, technical expertise, management, and supervision, to design, engineer, specify and complete all aspects of the Project, including but not limited to: land use, access, interconnection, equipment, structures, devices, materials, construction, testing, and commissioning, (unless otherwise noted).

2.2.3 Seller shall be responsible for complying with all technical requirements contained in the Power Purchase Agreement and Generation Interconnection Agreement, including all Utility and ISO requirements.

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2.2.4 Seller shall be aware of all local requirements and shall be incorporated into the design and construction of the Project. All Work concerning the geotechnical services shall be supervised and directed by a qualified, competent, practicing geotechnical engineer. A geotechnical engineer or engineering geologist shall observe, log borings, obtain soil samples, and record blow counts of the samples, drill rates, rock quality, depth to ground water, and other pertinent data under the direction of a licensed geotechnical engineer.

2.2.5 All Project submittals shall be subject to review and/or approval by Owner, as applicable, and shall meet the minimum requirements for submittals set forth in Section 3.2 (*Submittal Requirements*) herein.

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2.3 Applicable Standards

2.3.1 The Applicable Standards shall include (i) the minimum standards and industry codes and any other criteria required for the performance of the Work by Seller, (ii) each of the standards and industry codes listed below, and (iii) each of the relevant standards and codes issued by the organizations listed below (collectively, the "**Applicable Standards**").

(1) Aluminum Association ("AA")

(2) American Association of State Highway and Transportation Officials ("AASHTO")

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(3) American Concrete Institute ("ACI")

(4) American Institute of Steel Construction ("AISC")

(5) Association of Iron and Steel Engineers ("AISE")

(6) American National Standards Institute ("ANSI")

(7) American Society of Civil Engineers ("ASCE")

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(8) American Society of Heating, Refrigeration, and Air Conditioning Engineers (“ASHRAE”)

(9) American Society of Mechanical Engineers (“ASME”)

(10) American Society of Nondestructive Testing (“ASNT”)

(11) American Society of Testing and Materials (“ASTM”)

(12) American Water Works Association (“AWWA”)

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(13) American Welding Society (“AWS”)

(14) Avian Power Line Interaction Committee (“APLIC”)

(15) Code of Federal Regulations (“CFR”)

(16) Concrete Reinforcing Steel Institute (“CRSI”)

(17) Crane Manufacturer Association of America (“CMAA”)

(18) United States Environmental Protection Agency (“EPA”)

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(19) Federal Aviation Agency, Department of Transportation ("FAA")

(20) Federal Energy Regulatory Commission ("FERC").

(21) Federal Highway Administration ("FHWA")

(22) IAPMO Uniform Plumbing Code

(23) Illuminating Engineering Society ("IES")

(24) Institute of Electrical and Electronic Engineers ("IEEE")

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(25) Instrumentation Society of America ("ISA")

(26) Insulated Cable Engineering Association ("ICEA")

(27) International Building Code ("IBC")

(28) International Code Council ("ICC")

(29) International Electrotechnical Commission ("IEC")

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(30) Applicable state requirements, including State Department of Transportation and Environmental Protection

(31) National Electric Code ("NEC")

(32) National Electrical Contractors Association ("NECA")

(33) National Electric Safety Code ("NESC")

(34) National Electrical Manufacturers Association ("NEMA")

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(35) National Electrical Testing Association ("NETA")

(36) National Fire Protection Association ("NFPA")

(37) National Safety Council ("NSC")

(38) North American Electric Reliability Corporation (NERC)

(39) Occupational Safety and Health Administration ("OSHA")

(40) Post-Tensioning Institute ("PTI")

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(41) Scientific Apparatus Makers Association ("SAMA")

(42) Sheet Metal and Air Conditioning Contractors National Association ("SMACNA")

(43) Society for Protective Coatings ("SPC")

(44) Telecommunications Industry Association/Electronic Industries Association ("TIA/EIA")

(45) Underwriter's Laboratories ("UL")

(46) Uniform Building Code ("UBC")

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(47) DNVGL-ST-C502, Offshore Concrete Structures.

2.3.2 Unless otherwise specified, all engineering, procurement, and construction associated with the Project shall comply with the latest revision of all applicable codes and standards including, but not limited to, those listed herein. Any departure from the referenced codes and standards must be fully explained in writing and submitted for Owner's review and approval prior to implementation.

2.3.3 All specific standards applicable to pieces of equipment, structures, and/or buildings may not be listed herein. Specifications may describe the specific standards that may apply.

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2.3.4 Any general standard or organization listed above shall be understood to include all relevant codes, standards, and/or guidelines under that standard or organization. For example, ACI shall include ACI 301, ACI 305, ACI 306, ACI 318, etc.

2.3.5 Unless otherwise specified herein, in the case of conflict between any Applicable Standards, the more stringent requirement shall apply.

2.3.6 It is the Seller's responsibility to be knowledgeable to include designs and practices that incorporate the latest revisions of all applicable codes, standards and regulations.

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2.4 Approved Suppliers

2.4.1 This Section 2.4 contains a list of approved materials, equipment suppliers, and subcontractors. If Seller is considering the selection of a material, equipment supplier, or subcontractor that is not listed herein, Seller shall request approval from Owner prior to executing any contract for the procurement of such material or with such equipment supplier or subcontractor. Equipment catalog cut sheets shall be submitted for Owner review and approval prior to procurement.

2.4.2 Collection system:

(1) Approved cable suppliers:

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(a) Prysmian.

(b) Southwire

(2) Approved junction box suppliers:

(a) Hubbell (Trinetics).

(b) SolarBos

(3) Approved pad-mount transformer suppliers:

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(a) Cooper-Eaton.

(b) General Electric.

(c) Howard.

(d) Virginia Transformer

(4) Approved 34.5-kV disconnect and grounding switch suppliers:

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(a) Cleveland / Price.

(b) Morpac.

(c) Royal.

(d) Southern States.

(e) USCO.

(f) SPS

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(5) Approved 34.5-kV circuit breaker suppliers:

(a) ABB (with spring/hydraulic mechanism).

(b) Siemens.

(c) EMA

(6) Approved grounding rod suppliers:

(a) Blackburn.

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(b) Weaver.

(7) Approved cable splice suppliers:

(a) 3M.

(b) Kanusa.

(8) Approved fault indicator suppliers:

(a) Cooper.

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(b) Power Delivery Products.

(c) Schweitzer.

(9) Approved compression connection suppliers:

(a) Burndy.

(b) CMC.

(c) Polaris Connectors.

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2.4.3 Meteorological towers:

(1) Approved meteorological tower suppliers:

(a) Nello Corporation.

(b) Renewable NRG Systems.

(c) SABRE Industries Inc.

(d) World Tower Company Inc.

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(e) Ariel Erectors

(2) Approved MET Tower installation contractors:

(a) VIKOR.

(b) Anetech, LLC.

(c) PowerShare Cooperative

(d) Rinehart Tower Service, Inc.

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(3) Approved anemometer suppliers:

(a) Vaisala.

(b) Thies (First Class Advanced).

(c) RISØ / WindSensor (Class 1).

(d) RM Young (vertical anemometers).

(4) Approved wind direction sensor suppliers:

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(a) Vaisala.

(b) Thies.

(5) Approved data logger suppliers:

(a) Campbell Scientific.

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2.4.4 Wind Turbine Generators:

(1) Approved Turbine Suppliers:

(a) General Electric.

(b) Siemens Gamesa.

(c) Vestas.

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3.0 GENERAL SPECIFICATIONS

3.1 General Provisions

3.1.1 All Work, including construction, materials storage, grading, landscaping, cut/fill, erosion control, and other similar or related activities, shall not extend beyond the designated disturbance areas. Unnecessary disturbance of the existing Project Site conditions shall be minimized, and under no circumstance may Seller perform any Work or cause any disturbance beyond these corridors without explicit written confirmation from Owner.

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3.1.2 Existing access to the Project Site, including along public roads, shall remain open throughout construction.

3.1.3 All existing infrastructure, including communications towers, pipelines, telephone lines, and electrical lines, shall be maintained in their current condition throughout the construction of the Project.

3.1.4 Temporary power and utilities must be included by Seller including easements and access need for construction.

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3.1.5 Seller shall maintain an office on or close to the site of the Project. These construction office trailers shall be delivered, set-up, furnished and ready to use including power, phone service, internet service, HVAC systems, sewer and restroom facilities and decking by Seller's mobilization date and shall be demobilized after substantial completion has been achieved.

3.1.6 Seller shall provide sufficient space and electrical service in the office complex area for one office trailer for the turbine supplier. Site grading shall include parking space for turbine supplier's personnel.

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3.1.7 Seller shall maintain two-way radio communication till substantial completion. Each crew shall have a radio for communications, at all times, effective communication for compliance with the Seller's emergency action plan.

3.2 Submittal Requirements

3.2.1 This Section 3.2 sets forth the *minimum* requirements for all Seller-provided submittals, including Seller Deliverables.

3.2.2 General requirements:

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(1) Seller is required to submit a Master Drawing List showing all drawings and documents estimated to be provided for the project within ten (10) Business Days after Notice to Proceed.

(2) Seller shall name and label all submittals using an Owner-approved naming convention. Such naming convention shall be used consistently for all submittals, and the only filename modification for revised submittals shall be a change in revision number. Unidentifiable submittals will be returned for proper identification.

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(3) Submittals shall be accompanied by copies of native, electronic design files (e.g., AutoCAD .dwg file, PLS-CADD .bak file, etc.), including for interim design transmittals (e.g., 30%, 90%, etc. as applicable) and As-Built Drawings.

(4) All design submittals shall be provided in a common and consistent coordinate system. Such coordinate system shall be subject to Owner approval.

(5) All drawings shall be clearly marked with: Revision numbers, dates, clouds around any change and appropriate explanations for the design changes.

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(6) Seller shall maintain current set of IFC drawings on-site at all times, updated to the latest revisions.

3.2.3 Quality requirements:

(1) Scanned submittals are not acceptable. All submittal text shall be electronically recognizable and searchable.

(2) Submittals to Owner shall be of suitable quality for legibility and reproduction purposes. Every line, character, and letter shall be clearly legible. Drawings shall be useable for further reproduction to yield legible hard copies.

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(3) Documents submitted to Owner that do not conform to specified requirements shall be subject to rejection by Owner, and upon request, Seller shall resubmit conforming documents. If conforming submittals cannot be obtained, such documents shall be retraced, redrawn, or photographically restored as may be necessary to meet such requirements. Seller's (or its subcontractor's) failure to initially satisfy the legibility quality requirements will not relieve Seller (or its subcontractors) from meeting the required schedule for submittals.

3.2.4 Quantity requirements:

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(1) Seller shall electronically transmit one (1) copy of all submittals to Owner, including modifications to submittals, except as otherwise specified elsewhere in the Agreement.

(2) Seller shall provide four (4) complete, full-size (size D), color sets *and* four (4) complete, 11-inch by 17-inch, color sets of As-Built Drawings in hard copy format, as well as one (1) complete, full-size (size D) set of As-Built Drawings in electronic format on external hard drive.

3.2.5 Languages and dimensions:

(1) All words shall be in the English language.

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(2) All dimensional units shall be in English units. When both metric and English units of measurement are presented, English dimensional units shall prevail.

(3) All drawings and dimensions shall be to scale; not-to-scale ("**NTS**") dimensions will not be permitted on scalable drawings. A scale bar shall be included to permit use following photo-reduction.

3.2.6 Submittal completeness:

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(1) Submittals shall be complete with respect to dimensions, design criteria, materials of construction, and other information specified to enable Owner to review the information effectively.

(2) Where standard drawings are furnished which cover a number of variations of the general class of equipment, each drawing shall be annotated to indicate exactly which parts of the drawing apply to the equipment being furnished. Use hatch marks to indicate variations which do not apply to the submittal. The use of "highlighting markers" will not be an acceptable means of annotating submittals. Such annotation shall also include proper identification of the submittal permanently attached to the drawing.

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3.2.7 Transmittal of submittals:

(1) Submittals and Project documents shall be transmitted in (i) nonproprietary, native electronic format, incorporating any necessary reference files; and/or (ii) Adobe (*.pdf) files created directly from native electronic format.

(2) All electronic submittals shall be uploaded to Owner's web-based document management site. Selected submittals may also be required to be provided on CD, DVD, or flash drive.

(3) All electronic submittals shall be clearly named and versioned (e.g., revision number, date appended to file name).

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(4) Each submittal shall be accompanied by a completed transmittal letter. Submittals that are not accompanied by a completed transmittal letter will not be accepted and will be returned to Seller. All Seller transmittal letters submitted to Owner shall contain the following information, at a minimum:

(a) Transmittal number.

(b) Date of transmittal.

(c) Seller's name.

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(d) Project name.

(e) Owner's project number.

(f) Filename and revision number.

(g) Description of the information contained in the specific transmittal.

(h) Purpose of transmitting to Owner (i.e., issued for information, issued for review, etc.), including applicable Agreement references.

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(5) Seller shall check and approve submittals of subcontractors and manufacturers prior to transmitting them to Owner. Seller's submission shall constitute a representation to Owner that Seller approves such submittal(s) and has determined and verified all information contained therein, and Seller assumes full responsibility for doing so; and Seller has coordinated each submittal with requirements of the Work and the Agreement.

(6) Seller shall, at the time of each submission, call to the attention of Owner in the letter of transmittal any and all deviations from the Requirements.

3.2.8 Owner's review:

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(1) Owner's review and approval of submittals will not relieve Seller of responsibility for any deviation from the Requirements unless Seller has in writing called Owner's attention to such deviation at the time of submission, and Owner has given written concurrence in and approval of the specific deviation. Approval by Owner shall not relieve Seller from responsibility for errors or omissions in submittals.

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(2) Seller shall make all modifications noted or indicated by Owner and return the required number of revised submittals until approved. Direct specific attention in writing, or on revised submittals, to changes other than the modifications called for by Owner on previous submittals. After submittals have been approved, submit copies thereof for final distribution. Previously approved submittals transmitted for final distribution will not be further reviewed and are not to be revised. If errors are discovered during manufacture or fabrication, correct the submittal and resubmit for review.

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(3) Seller shall not construct any portion of the Work until issued-for-construction drawings have been approved by Owner. Wind Turbine Generator Foundations shall not be constructed until the Wind Turbine Generator Foundation drawings and calculations have been approved by Owner, including its independent engineer.

(4) Seller shall submit equipment catalog cut sheets for Owner review and approval prior to procurement.

(5) Review of drawings by Owner does not relieve Seller of responsibility for errors, correctness of details or conformance with these specifications.

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3.2.9 Design submittals:

(1) The civil works design documents shall include a plan view of all access roads, crane paths, Wind Turbine Generator Pads, Wind Turbine Generator locations, staging / laydown areas, and limits of disturbance; profile views for all vertical curves; Wind Turbine Generator delivery flow plan; grading and drainage plans; erosion control details; fencing and gate details; public road improvement details; compaction details; backfill / fill properties; road materials properties; road cross-sections; drawing index; bill of materials; construction sequencing; and inspection, testing, and quality control requirements, at a minimum.

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(2) The Turbine Foundation design documents shall include reinforcing steel details; rebar shop drawings; conduit details; grouting details; civil requirements (e.g., backfill, compaction, drainage, etc.); structural calculations; tensioning sequencing and parameters; drawing index; bill of materials; construction sequencing; and inspection, testing, and quality control requirements, at a minimum.

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(3) The Collection System Circuit design documents shall include a plan view of the overall system; one-line electrical diagram; cable installation details, including cable specifications, trench details, splice details, and cable marker details; cable crossing details, including road crossings, utility crossings, pipeline crossings, and directional boring; grounding details, including trench grounds and Wind Turbine Generator grounding; termination details, including junction boxes and Wind Turbine Generator switchgear; junction box details; meteorological tower power details; conduit and cable schedules; the Project Electrical Studies, as defined in this specification; drawing index; bill of materials; construction sequencing; and inspection, testing, and quality control requirements, at a minimum.

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(4) The Communications System design documents shall include a plan view of the fiber optic cable layout; fiber optic loop diagram, including communication loop and connection details for all Wind Turbine Generators, permanent meteorological towers, and the O&M Building; communications block diagram, including all Communications System equipment, Owner-Supplied Equipment (including Wind Turbine Generators and the Turbine SCADA System), and utility equipment; logic descriptions; points lists; rack layout diagrams; HMI screen development; fiber termination diagrams; drawing index; bill of materials; construction sequencing; and inspection, testing, and quality control requirements, at a minimum.

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(5) The O&M Building design documents shall include electrical works, including grounding and lighting plans, one-line diagrams, electrical load list, power distribution board, communications, and construction specifications; civil works, including site plan, subgrade preparation, grading/drainage, paving plan/design, and laydown area; structural works, including structural steel drawings, foundation and equipment pads (locations and details), rebar, design calculations, and construction specifications; mechanical works, including equipment arrangements/locations, equipment list, HVAC layout, fire protection and monitoring, piping and plumbing, vendor drawings (as applicable), and construction specifications; architectural works, including building layout/plans/elevations, finishes, schedules for windows and doors, and hardware; drawing index; bill of materials; construction sequencing; and inspection, testing, and quality control requirements, at a

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minimum.

(6) The meteorological tower design documents shall include foundation plans and details, including all structural calculations, pier details, and footing details; tower details, including boom elevations, boom directions, equipment mounting, guying details, and hardware details; instrument details, wiring schematics; H-frame diagrams; grounding details; power supply details; drawing index; bill of materials; construction sequencing; and inspection, testing, and quality control requirements, at a minimum.

(7) Issued-for-construction drawings shall not be changed or substantially deviated from without Owner approval.

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(8) As-Built Drawings: As-Built Drawings shall be issued as the next sequential revision from previous releases. The revision block shall state "As Built". All clouds, revision diamonds, and other interim control markings shall be removed, and all information listed as "later" or "hold" shall be completed. The As-Built Drawings shall include a final bill of materials. As-Built Drawings shall be created in the latest version of AutoCAD, or in the version of AutoCAD utilized by Owner, as applicable.

(9) All design submittals shall bear the Project name and the status of the submittal (e.g., Preliminary, Issued for Bid, Issued for Construction, As Built).

(10) Each drawing and submittal shall be sequentially numbered with a unique identifier.

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(11) All materials shall be fully identified by Seller, and each engineering package shall include a bill of materials, including all equipment and materials to be procured. Every item in the bill of materials shall have a unique identifier (typically numerical). Each bill of materials shall list product name, manufacturer, unique product / part number, and quantity.

3.3 Project Construction Documentation

3.3.1 Seller shall prepare and submit all Seller Deliverables required to be delivered to Owner. All such Seller Deliverables shall be subject to review; shall be coordinated and discussed with all pertinent parties prior to and during the construction phase of the Project; and shall comply with the Technical Specifications.

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3.3.2 Seller shall perform the Work in accordance with the safety plan set forth in Exhibit Q-1 ("**Safety Plan**").

3.3.3 Seller shall perform the Work in accordance with the requirements of the Quality Control Manual.

3.3.4 Seller shall provide four (4) complete copies of Job Books in hard copy format and four (4) complete copies of Job Books in electronic format on external hard drive. Job Books shall comply with the requirements as set forth in the Technical Specifications.

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3.3.5 Seller shall prepare, implement, and manage a detailed project execution plan that is specific to the Project and Project Site. The project execution plan shall be sufficient in scope and detail to convey the means and methods that will be employed by Seller to perform all aspects of the Work. Key elements of the project execution plan shall include, but not be limited to, project management structure and key personnel; roles and responsibilities; staffing plans; communications protocol; engineering execution plans; and construction management plans, including, but not limited to, cost controls, schedule controls, mobilization, document management, materials management, details for receipt and transport of equipment, construction sequencing, movement of cranes during construction, and other similar items.

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3.3.6 Seller shall prepare, implement, and manage a detailed traffic management plan that is specific to the Project and Project Site. The traffic management plan shall clearly identify all haul routes from the nearest highway; proposed traffic flow within the Project Site, including public and non-public roads; plans for managing construction, delivery, public, and other traffic at the Project Site during construction; daily concrete truck delivery flow plans; and mitigation measures to reduce risk and impact to non-construction vehicles due to construction activities.]

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3.3.7 Seller shall prepare, implement, and manage critical lift plans that are specific to the Project and Project Site. The critical lift plan shall clearly identify precautions for all critical lifts; coordination plans, including pre-lift meetings, with all participating personnel; and sample documentation/checklists for all critical lifts. Prior to performing any critical lift, Seller shall perform a practice lift with a similar crane configuration and load configuration; practice lifts shall always be performed with the same crew and using the same lifting equipment as those used for the critical lift. Any lift exceeding ninety percent (90%) of a crane's load chart is prohibited. For purposes of this exhibit, a "critical lift" shall include any lift that exceeds seventy-five percent (75%) of the rated capacity of the crane, per the respective crane's load chart; any lift that exceeds 50,000 pounds; any lift that requires the use of more than one crane; any lift requiring blind picks; any man-basket lifting operation; any load that is lifted/transported over or near energized electrical

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equipment, such as power lines, transformers, or switchgear; any lift in a confined space or restricted area (including an operating facility) where the load, or any part of the crane or equipment structure, could come within one (1) meter of any existing structure; or any lift where the equipment is set up near manholes, catch basins, sewers, sinkholes or other known surface or sub-surface interferences.

3.3.8 Seller shall prepare a storm water pollution prevention plan (the "**SWPPP**") for the Project.

3.3.9 Seller shall prepare and submit all required geotechnical documentation and submittals, as more particularly described in Section **Error! Reference source not found.** of this Exhibit A.

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3.3.10 Seller shall prepare blasting plans and procedures for all blasting work to be performed at the Project Site. Such plans and procedures shall include, a description of safety buffer zones, parameters for blasting times during the day, and approved certification as required from the authority having jurisdiction.

3.3.11 Seller shall prepare and submit concrete and grout mix designs; concrete and grout placement procedures; and grout specification sheets as Seller Deliverables. Each mix design submitted by Seller shall be accompanied by documentation of achieving Project-specific compressive strength requirements according to ACI procedures.

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3.3.12 Seller shall prepare energization plans and procedures for each collection system circuit, the Substation, and the transmission interconnection line. Energization plans shall be submitted to Owner *prior* to use. Energization plans shall include both electrical and communications infrastructure as well as backfeed plans, soaking plans, testing plans, and lock out tag out procedures.

3.3.13 Seller shall provide a foundation inspection report for each Turbine Foundation excavation and every drilled pier constructed (if any) (each, a "**Foundation Inspection Report**"). A Foundation Inspection Report, including all accompanying documentation, shall be provided to Owner as a condition of each Turbine Foundation completion and shall include the minimum information set forth in the Technical Specifications.

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3.3.14 Seller shall provide a bolt tensioning plan, including procedures for tightening / re-tightening, with recommendations covering the design life of the Project.

3.3.15 Seller shall prepare the design documents, including civil works, WTG foundations, collection system circuits, communications system, Substation, transmission interconnection line, O&M Building, and meteorological towers. All design documents shall meet the minimum requirements set forth in the Technical Specifications.

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3.4 Project Schedule Requirements

3.4.1 This <u>Section 3.4</u> provides an outline for the *minimum* contents and requirements of the Project Schedule to be prepared by Seller. Seller shall provide Initial Level 3 Schedule, twenty-one (21) days after Notice to Proceed and at a level of engineering deliverable that supports construction detailed activity breakdowns for task duration and estimates of the work to be detailed/performed for the schedule. Final Level 3 Baseline Project Schedule to be provided within 1 week after approval of Initial Level 3 Schedule.

3.4.2 For purposes of only this <u>Section 3.4</u>, the following words shall have the respective meanings set forth below.

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(1) "**Activity**" means a discrete part of a contract that can be identified for planning, scheduling, monitoring, and controlling the construction Work. Activities included in a construction schedule consume time and resources but shall not include planned work stoppages. Activities shall not normally reflect the Work of more than one trade.

(2) "**Baseline**" schedule means the initial Project Schedule, as approved by Owner.

(3) "**Critical path**" means the longest sequence of activities in a project plan which must be completed on time for that project to complete by the stated due date.

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(4) "**Critical path method**" or "**CPM**" means a method of planning and scheduling a construction contract where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Agreement.

(5) "**Float**" means the measure of leeway in starting and completing an activity. Float time (including total float) is not for the exclusive use or benefit of either Owner or Seller, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Agreement completion date.

(6) "**Predecessor activity**" means an activity that precedes another activity in the network.

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(7) "**Resource loading**" means the allocation of manpower, equipment, or material necessary for the completion of an activity as scheduled.

(8) "**Successor activity**" means an activity that follows another activity in the network.

(9) "**Total float**" is the measure of leeway in starting or completing an activity without adversely affecting an intermediate deadline or the planned Agreement completion date.

3.4.3 General requirements:

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(1) Seller's accepted Baseline schedule will be set forth in Appendix B (*Critical Path Schedule Requirements*).

(2) Seller shall utilize Primavera Professional Project Management Software from Oracle for preparation of the Project Schedule. At a minimum, this shall be version Primavera P6.7 or newer.

(3) Activities in the Project Schedule shall be defined so that no single construction activity is longer than 20 calendar days and no single other activity is longer than 30 calendar days, respectively, unless specifically allowed by Owner.

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(4) Each activity shall be assigned a number. Numbering shall be such that predecessor activity numbers are smaller numerically than successor activity numbers in the Baseline Project Schedule. Seller shall use even-numbered activities for base Agreement Work, and odd-numbered activities for change order work. No activity number shall change after approval of the Baseline Project Schedule.

(5) The Project Schedule shall include a clear and logical work breakdown structure, wherein all items are assigned a sensible activity number based upon the type of work being performed. Such work breakdown structure shall be subject to approval by Owner.

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(6) Procurement process activities shall be included for all long-lead and major items (as defined by Owner) as separate activities in the Project Schedule. Procurement cycle activities shall include, but not be limited to, submittals, approvals, purchasing, fabrication, and delivery.

(7) The Project Schedule shall indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

(a) Preparation and processing of submittals.

(b) Mobilization and demobilization.

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(c) Acquisition of key permits.

(d) Completion of interconnection studies and interconnection agreement, respectively.

(e) Purchase of major equipment.

(f) Delivery.

(g) Fabrication.

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(h) Utility interruptions.

(i) Installation.

(j) Work by Owner that may affect or be affected by Seller's activities.

(k) Startup and initial operations.

(l) Tests and inspections.

(m) Training.

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(8) The Project Schedule shall include Milestones indicated in the Agreement, including, but not limited to, guaranteed Milestone completion dates and any critical milestones in Appendix M (*Critical Milestones*). All major milestones shall be presented at the top of the Project Schedule.

(9) The Project Schedule shall show the Work in Gantt chart format, on a sheet size of 11-inch by 17-inch, the scale and spacing shall allow room for notation and revisions, and the font shall be sized such that it is easily legible when printed.

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(10) Each revised or updated Project Schedule shall show actual progress compared to the originally accepted Baseline schedule and any proposed changes in the schedule of remaining Work.

(11) The Project Schedule shall clearly identify all critical path activities. Scheduled start and completion dates shall be consistent with Agreement milestone dates.

(12) Seller shall not use artificial activity durations, preferential logic, or other devices for sequestering Float. Owner retains the right to reject any schedule submittal in which Seller has sequestered Float. Any activity with lag greater than two (2) days shall be identified in the activity description.

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(13) Constraint dates shall be kept to a minimum, and all constraints shall be identified with descriptive text in the activity description.

(14) All activities shall have a predecessor activity and successor activity except for the first and last activities in the Project Schedule.

(15) Each Project Schedule shall meet the minimum requirements for submittals set forth in Section 3.2 (*Submittal Requirements*) herein.

(16) The Project Schedule shall include allowances for delays that may be encountered for reasonably expected weather conditions, non-working holidays, and other similar items.

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(17) Recovery Schedule - A detailed breakdown of the detailed schedule may be requested by Owner as a mitigation plan for a Critical Milestone activity that becomes delayed.

3.4.4 Concurrent with each Project Schedule submittal, Seller shall submit the following reports:

(1) General: electronic copies of the complete Project Schedule file in P6 executable (*.xer) format (including the Project-specific *.plf layout filters) and Adobe (*.pdf) format, respectively.

(2) Critical path report: list of all activities on critical path, sorted in ascending order by activity number.

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(3) Activity report: list of all activities sorted by activity number and then start date, or actual start date if known. Within each activity, Seller shall indicate estimated completion percentage in no greater than 10 percent (10%) increments.

(4) Logic report: list of preceding and succeeding activities for all activities, sorted in ascending order by activity number.

(5) Total float report: list of all activities sorted in ascending order by activity number and showing total float by activity.

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(6) Three-week look ahead: list of all planned Work activities during the current week and the subsequent two-week interval, sorted in ascending order by activity number.

(7) Tabulated reports and/or schedule layouts showing the following:

(a) Identification of activities that have been added, deleted, or changed.

(b) Changes in activity durations in workdays.

(c) Changes in total float.

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(d) Detailed schedule layout showing start and finish date variances.

(e) Critical path and near critical path (1 to 15 days float) layout with variances.

(f) Major milestone report with variances.

(g) Activity constraints, including type.

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(8) Format for each activity in all reports described above shall contain, at a minimum, activity number, activity description, resource loading, original duration, remaining duration, early finish date, late start date, late finish date (or actual start date and/or actual finish date, as applicable), and total float in calendar days.

3.5 Job Book Requirements

3.5.1 This Section 3.5 sets forth an outline for the *minimum* contents of the Job Books to be prepared by Seller.

3.5.2 Job Book outline:

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(1) **General:**

(a) Index:

1. Job Book index

2. Project Directory

3. Drawing index, including all categories listed under Section 3.5.2(2)(b) below

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(b) Schedule:

1. Final Project Schedule

2. Actual delivery schedule of Owner-Supplied Equipment

(c) Seller plans:

1. Safety Plan

2. Security Plan

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3. Environmental Plan

4. Project execution plan

(d) Health and safety statistics:

1. Project construction Work hours and statistical information

2. Incident reports, including accidents, thefts, injuries, and near misses

(e) Changes:

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1. Project Change Orders
2. Seller correspondence concerning Change Orders

(f) Permits:

1. Owner permits
2. Seller permits
3. Certification of compliance to permit requirements

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(g) Training:

1. Project construction training records

2. Copies of training manuals

(h) Reporting:

1. Plan of the day reports

2. Weekly progress reports

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3. Monthly progress reports

(i) <u>Contracting:</u>

1. List of Subcontractors used on the Project
2. Summary of all work performed by Subcontractors
3. Copies of all subcontracts for construction services (non-priced)
4. Copies of purchase orders for major equipment

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(2) **Drawings and manuals:**

(a) Design documentation:

1. Project Site plan
2. As-built Wind Turbine Generator coordinates
3. Design basis and Project Site data
4. Engineering calculations and design studies

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5. Final geotechnical engineering report

(b) Issued for construction drawings:

1. Civil works
2. Collection System Circuits
3. Turbine Foundations
4. Project Substation (including civil, structural, and electrical)

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5. Interconnection Line
6. SCADA System
7. O&M Building
8. Meteorological towers
9. As-Built Drawings, including all items listed under Section 3.5.2(b) above
10. Project bill of materials

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11. Correspondence between Owner and Seller, including RFIs

    (c) Manuals and data sheets for all major equipment within or a part of the following:

1. Collection System Circuits
2. Project Substation
3. Interconnection Line

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4. SCADA System

5. O&M Building

(d) <u>Other equipment documentation:</u>

1. Instruction manuals where appropriate for building systems

2. Equipment factory acceptance test reports

3. Spare parts list

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4. Warranty agreements (including contact information) for all Equipment

(e) Material safety data sheets

(3) **Quality assurance documentation:**

(a) Construction photographs:

1. Photographs of construction activities

2. Photographs of Project Site restoration

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(b) Civil / structural works:

1. Road base aggregate proctor testing results
2. Road base density testing results
3. Access Road inspection documentation
4. Drainage structure inspection documentation
5. Soil testing results

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6. Compaction testing results road subgrade and aggregate base

7. Moisture and density analysis

8. Drainage works (including culverts) inspection reports

9. Concrete mix design(s) and placement procedures

10. Grout mix design(s) and placement procedures, including specification sheets

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11. Concrete and grout testing results / reports

12. Concrete batch tickets

13. Trial Batch Testing Report

14. Site Water Analysis Report

15. Batch Plant Scale Certification

16. Crane Pad compaction test results

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17. Non-conformance and corrective action reports

(c) Turbine Foundations:

1. Wind Turbine Generator pad inspection and testing results

2. Turbine Foundation subgrade inspection and testing results

3. Wind Turbine Generator Foundation subgrade improvement inspection (if any)

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4. Wind Turbine Generator Foundation coordinate survey and top of concrete level check

5. Foundation Inspection Report

6. Batch Plant Inspection report

7. Reinforcing steel placement inspection

8. Concrete mix design(s) and placement procedures

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9. Grout mix design(s) and placement procedures, including specification sheets

10. Electrical conduit and ground grid installation inspection report

11. Concrete and grout testing results (Sampling, Compressive Strength, Temp, Density, Slump, and Air Content)

12. Concrete batch tickets

13. Concrete pour logs

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14. Foundation Concrete Compressive Strength Test Documentation

15. Grout placement inspection

16. Foundation Grout Compressive Strength Test Documentation

17. Pre-backfill Turbine Foundation inspection

18. Turbine Foundation backfill testing

19. Reinforcing steel, embedment ring, and anchor bolt mill certificates

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20. Anchor Bolt Embedment Plate Placement inspection

21. Anchor Bolt tensioning reports

22. Non-conformance and corrective action reports

(d) Collection System Circuits:

1. Check of delivered cables and other materials

2. Trenching and cable installation inspection

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3. Electrical cable and fiber optic cable splice inspections, including coordinates of splice locations

4. Trench backfilling inspection

5. Marker ball placement and inspection, including coordinates of the marker ball locations.

6. Termination inspections (ground level, T-body and riser pole terminations)

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7. Junction box inspection, including coordinates of cabinet locations

8. Directional boring inspection

9. Tile repair reports

10. Pad-mount / medium-voltage transformer installation inspection

11. Energization and testing procedures

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12. Electrical testing and commissioning results, including commissioning checklists (VLF testing, PD testing and Meggar testing)

13. Splice locations with marker balls and GPC coordinates

14. Junction box locations and GPS coordinates

15. Fiber OTDR testing

16. Installation of above ground cable markers inspection

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17. Non-conformance and corrective action reports

(e) Project Substation:

1. Construction inspection documentation
2. Control building/switchgear inspection
3. Main Power transformer factory acceptance test
4. Control Building factory acceptance test

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5. Main power transformer foundation installation inspection

6. Equipment foundation excavation, reinforcement, concrete placement, earthing installation, foundation backfilling inspection

7. Concrete cable trenches installation inspection

8. Fences and gates installation inspection

9. Substation yard earthing system installation inspection

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10. Final grade level and backfilling inspection of substation yard

11. Relay functionality check

12. Energization and testing procedures

13. Electrical testing and commissioning results, including commissioning checklists

14. Communications validation and IT integration

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15. Non-conformance and corrective action reports

16. Switching Procedures

(f) Interconnection Line:

1. Check of the delivered material

2. Check of pole coordinates and orientation

3. Pole drilling, reinforcement placement, concrete placement inspection

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4. Pole, insulators and conductor's installation inspection

5. Construction inspection documentation

6. Energization and testing procedures

7. Electrical testing and commissioning results, including commissioning checklists

8. Non-conformance and corrective action reports

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(g) Agreement certificates (e.g., Certificate of Access Road Completion).

(h) Other certifications:

1. Reinforcing steel mill certificates

2. Flange bolt certifications

3. Tooling calibration records and testing certificates

4. Rigging inspection reports

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5. Welding certifications

6. Equipment receipt, inspection, and inventory reports

(4) **Wind Turbine Generator binders (One per Wind Turbine Generator):**

(a) Wind Turbine Generator Equipment receipt and visual inspection forms

(b) Certificate of Wind Turbine Generator Mechanical Completion

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(c) Wind Turbine Generator punch lists

(d) Turbine Supplier assembly and erection checklists

(e) Anchor bolt tensioning logs, including 10% inspection

(f) Torque logs, including tower, nacelle, rotor, and rotor blades

(g) Wind Turbine Generator wiring testing results

(h) Wind Turbine Generator grounding testing results

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(i) Service lift installation checklist (if applicable)

(j) Mechanical walk down inspections

(k) Wind Turbine Generator functional tests

(l) Wind Turbine Generator SCADA tests on completion

(5) **MET tower:**

(a) Check of the delivered material

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(b) Foundation inspection report

(c) Instrumentation installation inspection

(d) Torque and bolt inspection

(e) Electrical connection inspection

(f) Grounding inspection

(g) MET tower commissioning report

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(h) MET tower communication check

(6) **O&M Building:**

(a) Check of the delivered material

(b) Foundation excavation inspection including checks for foundation base level

(c) Reinforcement inspection

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(d) Conduit and earthing installation inspection

(e) Concrete placement inspection

(f) Steel building installation inspection

(g) Brickwork inspection (if any)

(h) LV installation, including HVAC inspection

(i) Plumbing works inspection

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(j) Fire suppression system inspection

(k) Emergency lighting system inspection (if any)

(l) Doors and windows installation inspection

(m) Plastering and painting inspection

(n) Roof works installation inspection

(o) Electrical equipment installation inspection

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(p) Security system installation inspection

(q) Sanitary works installation inspection

(r) Outdoor perimeter works inspection

(7) **Handover Documents:**

(a) Roads completion certificates

(b) Wind Turbine Generator Foundation completion certificates

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(c) Collection Circuit Completion Certificates

(d) Wind Turbine Generator Mechanical Completion Certificates

(e) Substation Completion Certificate

(f) Transmission Line Completion Certificate

(g) O&M Building Completion Certificate

(h) MET tower Completion Certificate

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(i) MET tower Commissioning Certificate

(j) Wind Turbine Generator Commissioning Certificate

(k) Project Substantial Completion Certificate

(l) Project Final Completion Certificate

(m) All the associated punch lists

(n) All certificates of insurance

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(o) Any third-party inspection reports

(p) All approved permits and utility permissions

(q) Partial and Final Lien Release Certificates

(r) Set of Project Record drawings

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3.6 Quality Plan Requirements

3.6.1 This Section 3.6 sets forth an outline for the *minimum* contents and requirements of the Quality Plan to be prepared by Seller.

3.6.2 Quality Plan outline:

(1) **Overview:**

(a) Purpose and scope of quality assurance program

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(b) Description of quality system procedures

(2) **Personnel:**

(a) Roles and responsibilities:

1. Project director(s)
2. Project manager
3. Quality manager

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4. Construction manager / site manager

5. Project engineer(s)

6. Superintendents and foremen

7. Testers / inspectors (including third parties)

(b) Organization chart (including all personnel listed in Section 3.6.2(2)(a) above)

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(c) Reporting responsibilities:

1. Lines of authority

2. Communication procedures

3. Authority to stop work

(3) **Administration:**

(a) Document control:

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1. Document control plan / procedure

2. Transmittal process, including naming convention

3. Document revision process / change management

4. Redlines and as-built documents

(b) Routine documentation procedures:

1. Daily, weekly, and monthly reporting

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2. Incident reporting
3. Non-conformance reports
4. Technical clarifications / requests for information
5. Notice of design change process
6. Field design change process
7. Request for Information (RFI)

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(c) Personnel training:

1. Requirements (competency / certification)

2. Records

(d) Quality meetings

(4) **Inspections, testing, and non-conformance:**

(a) Audits:

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1. Schedule of audits

2. Audit personnel

3. Non-conformance reports

(b) Inspections (including frequency, duration, procedures, and documentation for each):

1. Tools and equipment

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2. Materials

3. Field work (e.g., civil works, electrical works, structural works)

4. Field tests and laboratory qualifications

5. Checklists and installation procedures

   (c) Non-conformance reporting

   (d) Issues / conflict resolution process

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(5) **Sample forms:**

(a) Non-conformance report

(b) Request for information

(c) Transmittal

(d) Inspections

3.6.3 Other Quality Plan requirements:

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(1) The Quality Plan shall be specific to the Project and the Project Site.

(2) The Quality Plan shall be sufficient in scope and detail to convey the means and methods that will be employed by Seller to perform all aspects of the Work.

(3) The Quality Plan shall clearly communicate the anticipated actions of Seller in the event of defects or non-conformance of the Work, including corrective action.

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3.7 Safety Plan Requirements

3.7.1 This Section 3.7 sets forth an outline for the *minimum* contents and requirements of the Safety Plan to be prepared by Seller.

3.7.2 Safety Plan outline:

(1) **General:**

(a) Purpose and scope of safety program

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(b) Project Site description

(c) Project Site map

(d) Roles and responsibilities / key personnel / contact information

(2) **Project Site rules:**

(a) Project Site / employee orientation

(b) Project Site- and task-specific training

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(c) Stretching program

(d) Firearms / weapons

(e) Motor vehicle operation qualifications and requirements

(f) Heavy equipment operation qualifications and requirements

(g) Substance abuse program

(h) Removal of employees

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(i) Subcontractor management

(j) Badging requirements

(k) Tours / third-party visits

(l) Disruption avoidance plan

(m) Incident notification procedures

(3) **Emergency procedures:**

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(a) Safety stand-down procedures

(b) Explosion procedures

(c) Severe weather procedures

(d) Bomb threat procedures

(e) Utility emergency procedures

(f) Civil disturbance procedures

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(g) Tower rescue procedures

(h) Snake / insect bite and dangerous animals

(i) Spill control and prevention plan

(j) Evacuation procedures

(k) Emergency route map

(l) Emergency contacts and first responder list

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(4) **Health and safety programs:**

(a) Job safety and environmental analysis ("**JSEA**") program / pre-task planning

(b) Toolbox talks

(c) Personal protective equipment ("**PPE**") requirements

(d) Fire prevention and suppress procedures

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(e) Fall protection program

(f) Material Handling and Storage

(g) Welding and Cutting

(h) Walking / working surfaces

(i) Stairways and Ladders

(j) Scaffold standards

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(k) Tower climbing program

(l) Crane and erection safety program

(m) Crane walking procedures

(n) Excavation and trenching program

(o) Hazard communication / hazardous materials program

(p) Electrical safety

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(q) Lockout / tagout ("**LOTO**") program

(r) Motor vehicle and traffic safety program

(s) Respiratory protection program

(t) Concrete safety program

(u) Confined space entry program

(v) Inspection / audit program

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(w) Incident / injury reporting and investigation program

(x) Hand and power tool safety program

(y) First aid / CPR / medical response program

(z) Bloodborne pathogens

(aa) Permitted work requirements

(bb) Blasting requirements

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(cc) Competency requirements

(dd) Hunting safety

(ee) Environmental program

(ff) Working on or near exposed energized parts

(gg) Deenergizing lines and equipment for employee protection

(5) **Required checklists and forms:**

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(a) Accident / injury / incident report forms

(b) Site orientation training verification form – employee

(c) Site orientation training verification form – visitor

(d) Stretch and bend sign-in form

(e) Safety audit checklist

(f) Site inspection forms

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(g) Critical lift planning forms and checklists

(h) Excavation inspection form

(i) Competency evaluation forms

(j) JSEA form

(k) Toolbox talk form

(l) Rigging inspection forms

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(m) Hazardous materials inventory form

(n) Heavy equipment inspection forms (daily, monthly)

(o) Heavy equipment operator certification form

(p) Respirator compliance checklist

(q) Respirator fit test certification form

(r) Form of LOTO permit and extraction form

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(s) Form of hot work permit

(t) Form of dig permit

(u) Form of blasting permit

(v) Form of confined space entry permit

3.7.3 Other Safety Plan requirements:

(1) The Safety Plan shall be specific to the Project and the Project Site.

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(2) Seller is responsible for creating an energization and de-energization plan for safe operation. The Seller shall coordinate with all applicable parties to coordinate the energization plan. Site safety plans shall detail the process, roles, and responsibilities related to the energization procedure.

(3) Energization and de-energization plans shall be submitted to the Owner for review no less than 30 Business Days before the energization date. The Seller shall hold a meeting with all applicable parties before energization to walk through the energization/de-energization plans.

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(4) The Safety Plan shall be sufficient in scope and detail to convey the means and methods that will be employed by Seller to perform all aspects of the Work.

(5) Seller shall be responsible to establish coordination with locally available hospitals and medical facilities to ensure that they will be supporting the project site for nay emergency needs. These details should be part of the site safety plan.

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(6) All rigging shall be rated; inspected daily and monthly; and load tested in accordance with the Applicable Standards or other more rigorous requirements set forth in the Safety Plan. The manufacturer-rated capacities shall be legible and permanently affixed. Inspection reports shall be maintained at the Project Site and available for review by Owner. Copies of testing certificates and calibration records for all tooling shall be maintained at the Project Site and available for review by Owner.

(7) Seller shall conduct daily job hazard analysis meetings for each task to be performed in order to identify and mitigate potential hazards prior to beginning Work. Each such meeting shall be specific to the task and shall be conducted at the respective work area. A job hazard analysis form shall be completed daily for each such meeting.

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(8) Seller shall conduct site safety orientation (approximately 2-3 hours) for all personnel working on the Project Site, including, but not limited to, Owner, Turbine Supplier, subcontractors, office personnel, and visitors, prior to their being released to work on the Project Site. In addition, there shall be a delivery driver orientation given to all delivery drivers that will visit the site. Personnel who have not attended the site safety orientation and environmental awareness training shall have escorted access around the project site.

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(9) Seller shall provide two (2) full-time safety representatives at all times till the final completion of the project. In periods of low activity, these two HSE representatives will be on site on a standby basis. Seller will provide additional safety staff based on the number of employees on site. Seller shall, in all cases where the Seller, or Subcontractor(s) perform any Work during extended or weekend hours, have an HSE representative on-Site till such Work is completed.

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(10) HSE representative should have a degree in Health and Safety or equivalent safety experience. Shall be fully dedicated to health and safety with at least half of their time being in the field to ensure adherence with the site safety plan is maintained. Shall have working knowledge of OSHA regulations as well as other applicable agencies related to safe work practices.

(11) Seller shall provide the Owner the weekly hours, number of orientations and incidents for the week on a weekly reporting schedule.

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(12) Seller shall conduct daily safety plan of the day meeting at the beginning of each shift including a stretch program, which will occur at the office compound prior to dispatching to site work locations. This meeting can be completed in break-out groups by trade at the respective hob sites. Seller shall conduct a weekly all hands site safety meeting that includes all employees of each Seller for the entire site.

(13) Seller shall document weekly site health and safety inspections with all the corrective actions. Seller shall implement a documented audit program per quarter.

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(14) Seller shall establish a Health and Safety Committee consisting of the EPC/BOP Seller and Subcontractor's employees other than management personnel. The committee shall meet at least once per week and document meeting minutes and actions.

(15) Seller shall establish a weekly Site Safety Managers Meeting with published meeting minutes and actions. This meeting shall include the health and safety representatives from each Seller on site.

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(16) Seller shall report incidents to Owner's Site Safety Representative as soon as practically possible either verbally or electronically. Seller shall perform follow-up written incident investigations that will include recommended corrective actions within forty-eight (48) hours from incident occurrence and submit the investigation report to the Owner. Final reports are due to the Owner no later than ten (10) days after the incident.

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(17) Seller shall liaise and coordinate with local emergency services, including coordination with local "life flight" to identify landing sites available for helicopter emergency evacuation of personnel. Seller will develop a written Emergency Management Plan (EMP) which shall include at a minimum injury response, environmental and weather risks. Two safety evacuation drills shall be conducted, one during early works and another prior to the completion of five (5) wind turbines. A report of these drills shall be submitted to Owner which shall include, at a minimum, a timeline of events and any areas that may need improvement.

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(18) Seller shall perform all necessary emergency response drills, to be performed at least quarterly, including coordination with local emergency response officials and hospitals and incorporating the dispatch of ambulance and life flight to the Project Site.

(19) Seller shall immediately report all near misses, accidents, thefts, injuries (including first aid), and safety incidents to Owner's site manager and health and safety representative(s). A written incident report shall be submitted to Owner within 48 hours of each incident.

(20) Seller shall provide all necessary safeguards to ensure safety and security of, at a minimum, the Project Site, equipment, and personnel at the Project Site.

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(21) Seller shall ensure medical and first aid. Review all Federal and State regulations for first aid kit and AED inspection and/or registrations. All sites shall have AEDs and personnel trained in their operation.

(22) Seller shall provide drug and alcohol testing for all injuries requiring more than first aid; if drug or alcohol use is reasonably suspected; in the event of equipment damage that causes a loss of more than 10 hours of operable work; or in the event of equipment damage that exceeds $5,000 in estimated damage to the equipment or related work. Drug and alcohol testing shall be performed as soon after the event as reasonably possible.

(23) Training records shall be retained by the Seller for the duration of construction.

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(24) Seller shall provide training for the following but not limited to, site evacuation and emergency awareness training, fall prevention awareness training, mobile equipment training, energy isolation training, confined space training, forklift training and reporting requirements.

(25) Seller shall conduct environmental Orientation shall be of an appropriate length (approximately 1 hour). This orientation shall include at the minimum, overview of the environmental regulatory obligations, including relevant site permits, review of the flora, fauna and archaeological restrictions and housekeeping and recycling requirements.

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3.8 Security Plan Requirements

3.8.1 This Section 3.8 sets forth an outline for the *minimum* contents and requirements of the Security Plan to be prepared by Seller.

3.8.2 Security Plan outline:

(1) General:

(a) Purpose and scope of security program

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(b) Project Site description

(c) Project Site map

(d) Roles and responsibilities / key personnel / contact information

(2) Project Site security procedures:

(a) Controlled entry procedures

(b) Badging requirements

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(c) Site / employee orientation

(d) Suspicious activity and unauthorized visitor procedures

(e) Security threats / emergency procedures

(f) Firearms / weapons

(g) Site security procedures

(h) Equipment security procedures

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(i) Security guards and patrols

(j) Incident notification procedures

3.8.3 Other Security Plan requirements:

(1) The Security Plan shall be specific to the Project and the Project Site.

(2) The Security Plan shall be sufficient in scope and detail to convey the means and methods that will be employed by Seller to perform all aspects of the Work.

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(3) Seller shall provide site passports to all project personnel for identification and daily site population tracking purposes. Site personnel shall keep their passports on their person at all times while onsite.

(4) All visitors shall check in with and receive a visitor pass from Security prior to entering the compound area. All visitor passes shall be returned to Security at the end of each day.

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(5) A security office shall be located at the compound entrance and supplied with electricity and appropriate toilet facilities as required. The location of the security office shall allow for the security officer to view all persons entering and exiting vehicles without impeding traffic flow. Seller shall ensure that the Security Officer shall be provided a radio, cell phone and a vehicle.

(6) Seller, and Subcontractors shall ensure that their vehicles except for rentals on site temporarily, have placards or company insignias.

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3.9 Foundation Inspection Reports

3.9.1 A Foundation Inspection Report shall be provided for each Turbine Foundation excavation and every drilled pier constructed (if any). Each report shall include the following minimum information:

(1) Information on the foundation excavation, including, but not limited to, date, ambient air temperature, line name, structure number, location, structure type, foundation type, size and condition (e.g., dry excavation, casing, slurry) of excavation, soil conditions, depth to rock, depth to water, and method of disposal of excavated/displaced material.

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(2) Concrete and concrete placement information, including, but not limited to, concrete supplier, concrete mix number, batch tickets (including batch time), number of cubic meters placed (including time of placement for each truck), concrete temperature, results of concrete testing, name of person performing concrete testing, number of test cylinders cast, placement and compaction method (e.g., free fall, tremie, slurry displacement, pumped), curing measures, and protection against freezing or heat.

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(3) A delivery ticket shall be prepared for each load of concrete delivered, including, but not limited to, the number of cubic meters delivered, the quantities of each material in the batch, the ambient temperature at the time of delivery, the time at which the cement was added, the amount of water able to be added at the pour site, and the numerical sequence of the delivery. The delivery ticket shall be handed to the authorized representative of Seller by the truck operator at the time of delivery, and a copy of each delivery ticket shall be included in the Foundation Inspection Report.

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3.10 Rigging and Tooling

3.10.1 All rigging shall be rated; inspected daily and monthly; and load tested in accordance with the Applicable Standards or other more rigorous requirements set forth in the HSSE Plan (as defined in this specification). The manufacturer-rated capacities shall be legible and permanently affixed. Inspection reports shall be maintained at the Project Site and available for review by Owner.

3.10.2 Copies of testing certificates and calibration records for all tooling shall be maintained at the Project Site and available for review by Owner.

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3.11 Fencing, Walls, and Gates

3.11.1 All permanent fencing and gate materials, including for the Project Substation, O&M Building, and meteorological towers, shall be galvanized in accordance with ASTM A392.

3.11.2 Unless stated otherwise, fencing shall be 8-foot-high (7-foot fence plus 1-foot barbed wire), anti-climb, chain link, grounded, perimeter fencing. Fencing fabric shall be woven into a 2-inch diamond mesh.

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3.11.3 Barbed wire shall be a minimum of 2-strand, #12-1/2 steel wire gauge with 4 half-round barbs of #14 steel wire gauge at 5-inch spacing. After weaving, the wire shall be galvanized per ASTM A121. Barbed wire fencing posts shall be galvanized, standard-weight steel pipe. At least three (3) lines of barbed wire shall be provided when used.

3.11.4 Unless stated otherwise, or as necessary to complete the Work, gate widths shall be consistent with road widths, wherein all gate posts shall be set outside of the road width area.

3.11.5 Sufficient space and graded area shall be provided near each gate to allow truck turning.

3.11.6 All corner posts and gate posts shall be set (embedded) in concrete.

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3.11.7 All gates shall be designed to adequately contain livestock without being pushed open, bending, or otherwise failing. Further, all gates shall be designed to adequately prevent opening due to wind conditions expected at the Project Site.

3.11.8 A gate shall be installed at every location where a roadway penetrates an existing fence line at the Project Site. Each such gate shall be a double-hung, prefabricated, finished metal gate. Each such gate shall be a minimum 40-feet-wide manual swing gate with a pipe frame and manufacturer's standard coating finish; complete with hinges and latching hardware; complete with a metal hinge post and removable center post; lockable; and each gate post shall be set in concrete.

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3.11.9 Cattle guards shall cover the full road width and be installed level and provided with a stable base capable of sustaining heavy loads without shifting or settling.

3.12 Signage

3.12.1 The Seller shall erect directional and access signage on each access road intersection in accordance with the Seller's traffic management plan

3.12.2 Temporary signage shall be legible and of sufficient durability to last the duration of construction activities.

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3.12.3 Temporary signage shall be approved by Owner prior to installation.

3.12.4 All signage and equipment marking (including numbering and labeling) are subject to approval by Owner.

3.13 Dust Control

3.13.1 Water used for dust control shall be treated to ensure no negative impacts to human health and ecology, including downstream environments.

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3.14 Temporary Facilities

3.14.1 Seller shall furnish and install one (1) 24-foot by 60-foot double-wide office trailer for Owner's exclusive use. Each trailer shall be located at the laydown yard and shall be installed and ready-to-use no later than the Seller mobilization date.

(1) Each trailer shall include at least four (4) offices, and Seller shall furnish each such office in Owner's trailers with two (2) desks, two (2) two-drawer file cabinets, two (2) rolling arm chairs, two (2) visitor chairs, and one (1) 2-foot by 3-foot white board.

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(2) Each trailer shall include at least one (1) conference area, and Seller shall furnish each such conference area in Owner's trailers with six (6) 8-foot-long tables, 16 chairs, and one (1) 4-foot by 6-foot white board.

(3) Each trailer shall include at least one (1) unisex restroom, each complete with running water, one (1) flushable toilet, and one (1) flushable urinal.

(4) Each trailer shall include at least one (1) full-size drawing table, one (1) full-size drawing rack, and two (2) 4-foot by 6-foot bookshelves, respectively.

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(5) Each trailer shall include one (1) full-size refrigerator with freezer and one (1) full-size microwave. All appliances shall be new and unused.

(6) Each trailer shall be furnished with central HVAC.

(7) Each trailer shall be furnished with at least one (1) first aid kit and one (1) fully-charged fire extinguisher, respectively. Seller shall maintain and recharge such fire extinguishers throughout the duration of the construction activities, as required.

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(8) Seller shall provide and install phone service, broadband internet service, electric service, and running water for each Owner trailer, including connection of all communications (phone and internet) to the jobsite. Phone service shall include at least one (1) four-line phone system up to the wall jacks in each trailer. Internet service shall include high-speed internet infrastructure wiring up to the wall jacks in each trailer and high-speed wireless internet service (wifi) throughout the trailer compound, respectively. All utility services shall include use and service charges to Seller's account, including for Owner's trailers.

(9) Seller shall furnish bottled water and ice in each Owner trailer and for Owner's exclusive use throughout the duration of the construction activities.

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(10) Seller shall provide daily cleaning services within each Owner trailer throughout the duration of the Work. This shall include cleaning restrooms and trash collection, pickup, and removal, respectively.

3.14.2 Reserved.

3.14.3 Seller shall provide separate office trailers for his own use (including for Turbine Vendor). Seller shall be solely responsible for furnishing his trailer(s), including any utility services.

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3.14.4 Seller shall furnish, install, and maintain portable chemical toilets for use by site construction personnel, including Owner, Turbine Vendor, and subcontractors. This shall include cleaning (at least weekly), emptying, and disposal of such toilets through substantial completion of the Project or Seller demobilization, whichever occurs last. Following such date, Seller shall remove all such toilets from the Project Site.

3.14.5 Seller shall design, permit, furnish, construct, and maintain, as required, any temporary fuel containment facilities required to support ongoing construction activities. This shall include removal of all such facilities following substantial completion of the Project or Seller demobilization, whichever occurs last.

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3.14.6 Seller shall design, permit, furnish, construct, and maintain (including disposal), as required, any hazardous materials/waste facilities required to support ongoing construction activities. This shall include removal of all such facilities following substantial completion of the Project or Seller demobilization, whichever occurs last. Seller shall provide Owner with a copy of all hazardous material manifests.

3.14.7 As required to perform the Work, Seller shall procure, permit, install, construct, and maintain batch plant(s) at the Project Site, including all necessary labor and materials related to the operation of the batch plant, and removal of the batch plant at the conclusion of the Work. The batch plant shall be removed from the Project Site by Seller within 30 days of the Project Substantial Completion date. Power to operate the batch plant shall be the sole responsibility of Seller.

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3.14.8 As required to perform the Work, Seller shall procure, permit, install, construct, and maintain fixed and/or mobile rock crusher(s) at the Project Site, including all necessary labor and materials related to the operation of the rock crusher(s), and removal of the rock crusher(s) at the conclusion of the Work. The location of any fixed rock crusher(s) shall be at the temporary facility areas, and the location of any mobile rock crusher(s) shall remain within the designated disturbance areas. Power to operate the rock crusher(s) shall be the sole responsibility of Seller.

3.14.9 Seller shall design, furnish, construct, install, and maintain one (1) temporary laydown yard.

(1) Seller shall incorporate into the design and construction of the laydown yard any space required by Turbine Vendor for storage or other purposes.

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(2) Seller shall furnish and maintain a system of temporary lighting for use in the Project laydown yard and other construction areas where required. All temporary lighting shall be removed at the completion of construction.

(3) Fencing and gates are not required for the laydown yard.

3.15 Debris

Seller's obligations under this Section 2.9 of this Exhibit is subject to Section 2.15 of the Agreement.

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3.15.1 Seller shall assume ownership of all construction-related debris and unsuitable materials, and each shall be removed from the Project Site and be properly disposed of by Seller.

3.15.2 Seller shall maintain a continuous and regular clean-up program to avoid accumulation of debris, waste, wreckage, and/or rubbish within the Project Site resulting from the Work and shall maintain the Project Site in a neat and orderly condition throughout the performance of the Work.

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3.15.3 Seller shall provide all trash collection, pickup, and removal related to the Work, including within Owner's office trailers and other temporary facilities, and including disposal of cable reels. Dumpsters and trash receptacles shall be provided in sufficient quantities and with sufficient volume to support timely trash removal from the Project Site and preclude windblown trash generated during construction activities. Dumpsters and trash receptacles shall be emptied at a reasonable frequency to prevent overflowing or accumulation of trash around the dumpster or receptacle.

3.15.4 Seller shall cause its subcontractors, employees, and other representatives to refrain from littering at or within the Project Site, or within other areas (including along public roadways) used in conjunction with the Work.

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3.15.5 Seller shall use lined washout pits, washout dumpsters, or other suitable means to contain the excess concrete and runoff from the cleaning of concrete trucks. All washout waste shall be properly disposed of off-Project Site by Seller in accordance with the Technical Specifications.

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3.16 Project Site Closeout and Restitution

3.16.1 Seller shall remove all tools, equipment, surplus materials (including unused or useless materials), waste materials, temporary work (including temporary erosion control features), temporary buildings, temporary facilities (including batch plants, rock crushers, and office trailers), and rubbish from the Project Site prior to final completion, and shall cause any facilities used by Seller during the performance of the Work to be restored to the same or better condition that such facilities and the Project Site were in on the date the Seller commenced work at the Project Site, ordinary wear and tear excepted.

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3.16.2 Seller shall perform restitution, restoration, and/or reclamation of Work areas to include, but not limited to, the following. Notwithstanding anything that follows, all Work areas at the Project Site shall be restored in accordance with the requirements set forth in the Applicable Permits, the SWPPP, and the other Technical Specifications, as appropriate.

(1) Clean all drains and ditches at completion of the construction Work and leave the Project Site in a neat and presentable condition wherever construction operations have disturbed the conditions existing at the time of starting the Work.

(2) Preserve and/or restore to their pre-construction condition all land and water resources adjacent to construction areas.

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(3) Notwithstanding the following paragraph (a), WTG Pads, laydown areas, roadway shoulders, and roadway turning radii shall be decompacted and reclaimed, including proper grading, aggregate touchup, and seeding with an approved mixture.

(a) Crane pads shall be preserved in a suitable manner to support the use of cranes in ongoing WTG maintenance activities following construction (e.g., cranes required for gearbox removal and / or installation).

(4) Re-dress all road surfaces within the Project Site.

(5) Seed all cut / fill slopes utilizing an approved seed mixture.

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(6) Fill all depressions and water pockets caused by construction operations and remove all obstructions within waterways.

(7) Spread surplus fill on-Project Site.

(8) Spread recovered aggregate from laydown yard within approved disturbance limits.

(9) Collect large rocks or boulders unearthed during excavation as part of the Work but not utilized in the construction of the Project and store at the Project Site.

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4.0 LOGISTICS SERVICES

4.1 Transportation and Delivery

4.1.1 Seller shall furnish and deliver all Equipment to the Project Site.

4.1.2 Seller shall perform all Job Site clearing necessary for the transportation of Equipment to the Project Site, including, but not limited to, tree trimming / removal and clearing of overhead obstructions.

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4.1.3 Seller shall, as required by Applicable Permits, upgrade and maintain public roads, bridges, and culverts as required for the transportation of Equipment to the Project Site and including obtaining any necessary permits.

4.1.4 Seller shall furnish and operate assist vehicles (i.e., prime movers) as necessary for delivery and movement of Equipment at and within the Project Site and as needed to traverse steep grades.

4.1.5 Seller shall inspect all delivery trucks upon arrival to the Project Site to ensure they are free of debris, mud, and vegetation, and to ensure they are in good mechanical condition. Seller shall also regularly inspect trucks and other equipment for oil leaks. Any vehicles that fail to pass this inspection shall be turned away.

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4.1.6 Seller shall complete a haul route review for WTG deliveries at the Project Site to demonstrate that road dimensions will be appropriate for successfully delivering components from the Project Site entrance to the WTG Pads in the most critical points in terms of access. The review shall be completed prior to commencing deliveries of WTG equipment to the Project Site, and shall be coordinated between the Turbine Vendor, Owner, and Other Owner Sellers.

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4.2 Offloading

4.2.1 Seller shall receive, visually inspect, and inventory all equipment and material deliveries to the Project Site. Seller shall submit reports to Owner within 24 hours of delivery for all Major Equipment or Service regarding receipt, inspection, and inventorying of all such deliveries, including any damage identified.

4.2.2 Seller shall furnish all rigging, tooling, hoisting equipment, lifting devices, and other similar items necessary to offload the equipment.

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4.2.3 Seller shall offload all equipment at the Project Site. Seller shall offload and stage all WTG deliveries at the WTG Pad location nearest each WTG.

4.2.4 Seller shall furnish and maintain protective tarps to eliminate unwanted materials from entering WTG equipment after removal of shrink wrapping.

4.2.5 Seller shall furnish and install adequate measures to prevent WTG equipment from being blown over or otherwise damaged while stored at the Project Site. This shall include tie down of blades and other similar measures.

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4.3 Coordination

4.3.1 Seller shall actively coordinate the sequence of Work with Owner and Other Owner Sellers to support the Project Schedule.

4.3.2 Seller shall coordinate with all transportation Sellers to mitigate congestion within the Project Site. Seller shall provide directions to the Project laydown yard to all heavy load transportation vehicles upon arrival to the Project Site and, if required by the transportation plan, Seller shall provide an on-Project Site vehicle escort for all such deliveries to the respective delivery location(s).

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4.3.3 Seller shall coordinate with local utilities, railroad, and pipeline companies to facilitate crossings and interconnections necessary to perform the Work.

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5.0 GEOTECHNICAL WORK SPECIFICATIONS

5.1 General Provisions

5.1.1 All geotechnical, geophysical, and other similar subsurface investigations and testing described herein shall be completed before commencing the applicable Work.

5.1.2 The geotechnical engineering report shall be utilized for the design and construction of all Project structures, including Turbine Foundations. All foundations shall be designed with consultation of a licensed geotechnical engineer.

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5.1.3 The maximum loads (including load factors) applied to the foundations and used for design shall be determined from the structure design of the supported structure considering load cases and Applicable Standards associated with the structure type.

5.1.4 Foundation designs shall neglect or degrade soil strength properties at the top of the foundation as a result of frost or disturbance during drilling per recommendations of the geotechnical engineer.

5.1.5 The Project Site premises shall at all times remain free from accumulations of waste materials or rubbish resulting from the subsurface investigations.

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5.1.6 All field investigations and all laboratory testing shall comply with the Applicable Standards, including the most current, applicable ASTM standards.

5.2 Field Investigations

5.2.1 Geotechnical borings and material sampling shall be provided at the following minimum frequencies:

(1) Wind Turbine Generators: each Wind Turbine Generator location.

(2) Project Substation: minimum of five (5) locations at the Project Substation.

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(3) Interconnection Line: each angled and dead-end structure, respectively, as well as any additional borings and samplings necessary to ensure that adjacent borings are no more than one (1) mile apart.

(4) O&M Building: minimum of one (1) location at the O&M Building.

(5) Meteorological towers: each free-standing meteorological tower location.

5.2.2 Geotechnical borings and material sampling shall be provided at the following minimum depths:

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(1) All borings: minimum depth of 35 feet below base of foundation, or greater if specified below.

(2) Wind Turbine Generators: minimum depth of at least one (1) foundation diameter for spread footer foundations, or minimum depth of at least 10 feet beyond the anticipated depth of the foundation at such location (including anchors, if applicable) for rock anchor foundations.

(3) Project Substation: to a minimum depth necessary to provide sufficient information for the data and recommendations required in the geotechnical engineering report.

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(4) Interconnection Line: to a minimum depth necessary to provide sufficient information for the data and recommendations required in the geotechnical engineering report.

(5) O&M Building: to a minimum depth necessary to provide sufficient information for the data and recommendations required in the geotechnical engineering report.

(6) Meteorological towers: to a minimum depth necessary to provide sufficient information for the data and recommendations required in the geotechnical engineering report.

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5.2.3 Sufficient rock core samples shall be obtained from each boring to adequately characterize and test the material, including coring from the point at which competent rock is encountered and until the appropriate boring depth is achieved (at a minimum). All core samples shall be delineated and digitally photographed in color. Unaltered rock core samples shall be placed in a core box and taken to a laboratory for analysis.

5.2.4 Additional geotechnical and geophysical investigations shall be performed as necessary to adequately describe and characterize the Project Site materials and provide the data and recommendations required in the geotechnical engineering report. These shall include, but not be limited to, standard penetration tests, and Shelby tube samples, additional borings, test pits, seismic refractions, cone penetrometer soundings, *in situ* testing, and other similar or related methods.

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5.2.5 If using rock anchor foundations, a rock analysis shall be performed to identify the presence of fissures, rock joints, or other discontinuities that will control the overall strength of the rock mass, including, but not limited to, rock mass rating, rock classifications, depth of overburden, rock quality designation, joint spacing and orientation, stratifications, rock material strength, and water pressure in joints.

5.2.6 Soil resistivity testing shall be completed using the Wenner Four-Electrode method.

5.2.7 Existing utilities in the vicinity of borings or other subsurface test locations shall be identified and protected.

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5.2.8 Borings shall be backfilled with cement-bentonite grout and in a manner and with materials required under the applicable laws of the location of the Project Site. Excess cuttings shall be disposed of by Seller in accordance with the applicable Requirements and subject to Owner approval.

5.2.9 Borings shall be drilled using methods that minimize the potential for disturbance, sloughing or mixing of materials within samples. When water is encountered in a hole in cohesionless materials, rotary wash drilling methods with bentonite or polymer slurry shall be used, maintaining a positive head in the borehole at all times.

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5.2.10 Unless explicitly stated otherwise, all rock core sampling shall be complete, full-boring-length samples. Such coring shall span from the point at which competent rock is encountered and until the appropriate boring depth is achieved (at a minimum).

5.2.11 All core samples shall be delineated and digitally photographed in color. Unaltered rock core samples shall be placed in a core box and taken to a laboratory for analysis.

5.2.12 Seller shall obtain 24-hour water level readings in boreholes or install piezometers for long-term water level readings as required to determine prevailing groundwater levels.

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5.2.13 A geologic review should consist of a review of the geologic data along the Project alignment. This review should identify and document areas of landslides, potential landslides, potential geologic hazards, past (historical) earth movements, and transitions between geologic units. Special consideration should be given to identify active and potential landslide zones.

5.3 Lab Testing

5.3.1 All testing described herein shall be performed by an independent, experienced third party.

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5.3.2 Laboratory testing shall be sufficient to provide the data and recommendations required in the geotechnical engineering report, at a minimum. Laboratory testing shall include chemical testing to evaluate corrosion potential and to determine the required cement type for concrete.

5.3.3 At a minimum, laboratory testing shall include the following:

(1) Moisture content (ASTM D2216).

(2) Grain size analysis (per ASTM D422).

(3) Atterberg limits (per ASTM D4318).

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(4) Maximum soil density (per ASTM D4253).

(5) Specific gravity (per ASTM D854).

(6) Compaction characteristics of the soil (per ASTM D698 or ASTM D1557 A).

(7) Unit weight determination (per ASTM D653).

(8) Core recovery percentage and rock quality designation when rock is encountered.

(9) Perform multi-channel analysis of surface wave tests.

(10) Soil resistivity testing (per ASTM-G57-95a). Results to be submitted in Ω-cm.

(11) Direct shear angle.

(12) Cohesion constant.

(13) Unconfined compressive strength (per ASTM D2166).

(14) Unconsolidated undrained (UU) triaxial compression (per ASTM D2850).

(15) Consolidation test parameters (per ASTM D2435).

(16) Soil corrosiveness (chloride, sulfate, and pH).

(17) California bearing ratio.

(18) Dry and wet densities.

5.4 Submittals

5.4.1 The geotechnical engineering report shall contain the following, at a minimum:

(1) Boring location drawings and coordinates.

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(2) Field photographs.

(3) Description of the drilling and sampling program.

(4) Final boring logs.

(5) Description of the geology.

(6) Subsurface and groundwater conditions encountered.

(7) Summary of results of field and laboratory tests performed.

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(8) Foundation recommendations (as further described in Section 5.4.2 below).

(9) Specific design criteria for the Project (as further described in Section 5.4.2 below).

5.4.2 Seller's design criteria shall address the following items, as a minimum:

(1) Impacts of new construction on existing facilities.

(2) Factors of safety used in determining allowable foundation loads.

(3) Recommended foundation types for all structures.

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(4) Discussion of the dynamic soil properties at the Project Site, including dynamic shear modulus, Poisson's ratio, Young's Modulus, and shear wave velocity.

(5) Recommendations for designing for seismic issues, including liquefaction potential. Identify the building code site coefficient/site classification for seismic design.

(6) Recommendations for site dewatering and construction practices, including design water level.

(7) For shallow foundations:

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(a) Allowable soil bearing values and minimum bearing depths.

(b) Anticipated total and differential settlements.

(c) Uplift resistance.

(d) Lateral resistance.

(e) Subgrade modulus.

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(f) Dynamic spring constants for foundations supporting vibrating machines, if applicable.

(8) For deep foundations:

(a) Type of deep foundation (e.g., drilled shaft, rock anchor).

(b) Diameter (or dimensions) and depth of foundation members.

(c) Minimum spacing and group reduction factors.

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(d) Allowable compressive, uplift, and lateral capacities, including allowable skin friction and end bearing capacities.

(e) Anticipated settlements and lateral deflections.

(f) Static and dynamic spring constants.

(9) For retaining structures:

(a) Active, passive and at-rest earth pressures for both drained and undrained conditions and requirements for type of backfill.

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(b) Required rotation or translation to mobilize active and passive pressures.

(c) Recommendations of methods to insure drained conditions.

(10) Recommendations for slopes:

(a) Temporary excavation slopes and OSHA soil types.

(b) Permanent slopes.

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(11) Temporary and permanent excavation support requirements.

(12) Corrosion potential and chemical attack to construction materials.

(13) Recommended cement type in concrete and corrosion protection for buried steel, based on chemical test results. Recommended cement type shall be based on soluble sulfate content in the soil and ACI recommendations.

(14) An evaluation of the expansive, dispersive, and collapsing nature of the on-Site soil materials and discussion of design features to resist these tendencies.

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(15) Recommendations for earthwork requirements including acceptable fill materials, moisture contents, compactive effort, lift thickness, proofrolling, equipment, and compaction testing.

(16) Recommended aggregate gradations for general fill, load bearing fill, granular road base, and granular surfacing.

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6.0 CIVIL WORKS SPECIFICATIONS

6.1 General Provisions

6.1.1 All civil works design shall conform to Turbine Supplier's requirements for roads, crane pads, and hardstands (the "**Turbine Supplier Project Site Requirements**").

6.1.2 Seller is responsible for all surveying, layout and control work, including establishing and maintaining survey control points for the duration of the Work and conforming to Owner provided ALTA survey.

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6.1.3 Seller shall be using the excavated topsoil and excavated material for final dressing of the site. Any additional topsoil, vegetation, organic material, rock, earth, sand and debris shall be removed and disposed by the Seller as per approved procedures and permit requirements. Soils shall not be relocated throughout the project site, unless approved by Owner.

6.1.4 Seller is responsible for restoring all temporarily disturbed areas prior to the completion of the Work. This shall include all crane paths, crane pads, lay down areas, storage areas, road shoulders, collection system trenches, temporary access roads, etc. which should be fully remediated including decompaction as necessary.

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6.1.5 Seller is responsible for ensuring, in agricultural areas (wheat, hay, and other actively farmed fields), that all backfill areas impacted by the Work are free of rock to a minimum depth per landowner and environmental agreements.

6.2 Design Working Life

6.2.1 The design working life of the civil works shall be a minimum of 30 years.

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6.2.2 The design of the civil works shall be consistent with the following storm events:

(1) Roadways (including all drainage facilities, such as swales and culverts) shall be designed for a 25-year, 24 hours storm event, while being able to safely convey a 100-year, 24 hours storm event.

(2) Wind Turbine Generator Pads shall be designed to withstand a 100-year, 24-hour storm event.

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6.3 Project Site Preparation

6.3.1 Project design shall consider existing Project Site conditions with respect to, at a minimum, soil characteristics, permit conditions, site clearing, grading, and drainage including existing floodplains and floodways.

6.3.2 Clearing and grubbing requirements:

(1) Clearing, grubbing, removing and disposing of all vegetation and debris shall be understood to include felling and disposal of trees, brush, and other vegetation within the project limits as shown on the design drawings or as designated by the Owner

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(2) Verify limits of clearing and features designated to remain, are clearly labeled and tagged prior to start of work; resolve any areas of confusion prior to start of work.

(3) Stripping shall be understood to consist of excavation and removal of all topsoil and organic matter.

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(4) Topsoil shall be stockpiled for later use during landscape reclamation activities. Topsoil shall be stockpiled only in areas designated where it will not interfere with construction operations or existing facilities. Stockpiled topsoil shall be reasonably free of subsoil, stumps, roots, debris, and stones larger than two (2) inches in diameter. Topsoil shall not be used as structural fill. Appropriate erosion control measures shall be utilized on stockpiled topsoil. If the topsoil strata are such that there are more than 2 distinct layers impacted, then each layer shall be stockpiled separately and returned in reverse order, unless agreed upon in writing with Owner.

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(5) Debris, rubbish, shrubs, organic matter, and vegetation from developed areas shall be grubbed and removed from the Project Site in accordance with applicable permit instructions and other pertinent Requirements. Burning or burying of materials on site shall not be permitted unless otherwise specified. No fill shall be placed in wetlands, environmentally or culturally sensitive areas unless a permit/approval has been received to do so.

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(6) Root mats and stumps shall be completely removed from the Project Site construction areas, holes refilled with select material and compacted adequately for the ultimate expected loading for the material used and graded to drain. Any pockets of organic laden soils, and/or deleterious materials should be excavated to competent soils before proof rolling and placing structural fill.

(7) Except in areas to be excavated, backfill stump holes and other holes from which obstructions are removed, with suitable materials, and compact in accordance with contract documents.

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6.3.3 Removal of or damage to trees without written approval of Owner is prohibited outside the designated disturbance areas. Trees shall be adequately protected, including protecting tops, trunks, and roots of existing trees at the Project Site which are to remain, as follows:

(1) Box, fence around, or otherwise protect trees before any construction Work is started.

(2) Do not permit heavy equipment or stockpiles within branch spread (dripline) of trees.

(3) Trim or prune to obtain working space in lieu of complete removal when possible. Conduct operation as follows:

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(a) With experienced personnel.

(b) Conform to good horticultural practice.

(c) Preserve natural shape and character.

(d) Protect cuts with Owner-approved tree paint.

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(4) Grade around trees as follows:

(a) Trenching: where trenching is required around trees which are to remain, avoid cutting the tree roots by careful hand tunneling under or around the roots. Avoid injury to or prolonged exposure of roots.

(b) Raising grades: where existing grade at a tree is below the new finished grade and fill not exceeding 15 inches is required, place 1 to 2 inches of clean, washed gravel directly around the tree trunk. Extend gravel out from trunk on all sides at least 20 inches and finish 2 inches above

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finished grade at tree. Install gravel before earth fill is placed. Do not leave new earth fill in contact with any tree trunks.

(c) Lowering grades: re-grade by hand to elevation required around existing trees in areas where new finished grade is to be lower. As required, cut the roots cleanly 3 inches below finished grade, and cover scars with tree paint.

(5) Remove when damage occurs and survival is doubtful, following approval by Owner.

(6) Replace with similar item when damaged through carelessness and so requested by Owner.

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6.3.4 All underground utilities, pipelines, and other buried facilities shall be located and marked before construction activities, and such items shall be appropriately considered in the Project design.

6.4 Blasting

6.4.1 Blasted material shall be crushed and screened for use as fill on access roads and in other areas of the Project Site assuming the aggregate meets the appropriate geotechnical specifications for this application. Seller shall be responsible for verifying that the quantity and quality of such rock is suitable for use as aggregate at the Project Site.

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6.4.2 Controlled blasting will be used to create a precise rock profile without significant final surface irregularities.

6.4.3 Owner shall be notified prior to the use of explosives at the Project Site, and such blasting shall be completed, at a minimum, in accordance with the applicable permits and Seller-furnished blasting plan.

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6.4.4 Seller shall prepare blasting plans and procedures for all blasting work to be performed at the Project Site, as required. Such plans and procedures shall include, at a minimum, a description of safety buffer zones, parameters for blasting times during the day and approved certification as required from the authority having jurisdiction, technical report to define detailed parameters, define blast hole alignment, locations, diameters, quantity required, drilling slope and depth, type of explosive, quantity of explosive, blasting sequence, features of fuses, detonators, delayers, triggers and any other special devices.

6.4.5 When the use of explosives is necessary for the Work, Seller shall use the utmost care not to endanger life or property and shall comply with all applicable laws and other Requirements and conduct the necessary advance notifications.

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6.4.6 Under no circumstance shall caps or other exploders or fuses be stored, transported, or kept together with powder.

6.4.7 All explosives shall be handled in a secure manner, and all such storage places (if permitted) shall be marked clearly “DANGER - EXPLOSIVES” or as otherwise required by law.

6.4.8 All permits and licenses required for blasting shall be obtained, paid for, and maintained by Seller.

6.4.9 Blasting shall be performed only by persons who are qualified, competent, and thoroughly experienced in the use of explosives for rock excavation.

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6.4.10 Charge holes shall be located properly and drilled to correct depths for charges used.

6.4.11 Charges shall be limited in size to the minimum required for reasonable removal of material by excavating equipment.

6.4.12 Excessive overbreak or damage to adjacent structures, exposed cut slopes, equipment, utilities, or buried pipeline and conduit shall be avoided as follows:

(1) With properly designed pattern.

(2) By use of Owner-approved explosion mats.

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6.4.13 Blasting near utilities, pipelines, or facilities (buried or above-ground) shall be subject to approval of owning agency and Owner.

6.4.14 Before delivery of any explosives to the Project Site, Seller shall have obtained a blasting endorsement on their public liability and property damage insurance policy.

6.4.15 Seller shall control debris resulting from blasting, including minimizing, to the extent practicable, the size of said debris. Seller shall use the utmost care not to endanger life or property, and to comply with all applicable laws and conduct the necessary advanced notifications.

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6.4.16 Blast mats shall be utilized as required in sensitive areas, including, but not limited to, archeologically sensitive areas, environmentally sensitive areas, existing Project Site facilities, and other Project infrastructure.

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6.5 Excavation, Filling, and Backfilling

6.5.1 Different types of excavations based on the type and consistency of soil and rock are provided by the design and/or as requested by Owner. The Seller shall provide his own excavation plan for any excavation activity and shall submit it to Owner for approval before commencing any work. The excavation plan shall contain all the relevant information detailing the means, procedures and scheduling to implement the excavation activities, any environmental conditions and geotechnical characteristics. The Seller shall update the excavation plan as the work progresses.

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6.5.2 The excavation plan for all working locations shall include the excavation procedure, type and transport of all the earthmoving equipment, any type of shoring or reinforcement that may be needed for supporting the excavation walls, drainage measures and procedures, blasting procedures, stockpiling and storage procedures for reusable excavated material, detailed work schedule.

6.5.3 Stability of excavation sides shall comply with local codes, ordinances and requirements of agencies having jurisdiction. Shore and bracing are permitted in case of space restrictions or depending on stability of the excavated material. Remove shoring carefully to prevent caving or collapse of excavation. The sides and slopes of the excavation shall be maintained in safe condition until backfilling is complete.

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6.5.4 Materials suitable for use as fill at the Project Site shall include only materials that are free of debris, roots, organic matter, frozen matter, coal, ashes or cinders, and as recommended by the geotechnical engineering report.

6.5.5 All excavations shall be maintained in a safe, clean, and sound condition up to the time of concrete placement. The stability of all excavations shall be maintained by providing adequate sheeting, shoring, and bracing to support any lateral earth pressure. Stability considerations shall include the surrounding land surfaces that may impact the Project or nearby improvements. Sheeting, shoring, and bracing shall be removed as backfilling proceeds.

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6.5.6 Permanent slope and rock stability measures shall be part of the Project design and shall incorporate the recommendations and requirements set forth in the geotechnical engineering report. Safe stabilization for all slopes, regardless of the type of rock or soil conditions, shall be guaranteed including protection of all personnel and structures against any damage from cave-ins, heaving, or other earth movements.

6.5.7 All structure foundations shall be surveyed and staked prior to excavation. The methods of staking and final alignment of the concrete caisson, anchor bolts, reinforcing steel, stub angles, and embedment sections shall be designed such that the finished condition of the Work meets the requirements for alignment, position, elevation, and rotation.

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6.5.8 Seller shall be responsible for locating buried utilities and other underground obstructions prior to any excavation. For underground gas and oil pipelines, it may be required, that the pipeline owner be on site always while the work is occurring within the pipeline easement. Seller shall coordinate such activities with pipeline owners prior to starting work so that the project schedule is not impacted. Excavation by hand tools without any mechanical means shall occur when it is not possible to proceed with earthmoving machines, or a special precision and/or care is needed to avoid any damage to existent underground cables, pipes, sewers, equipment's, objects and manufactured items in general, or other special situations. The Seller shall bear the full cost associated with repairing any damage done to underground utility lines caused by work performed by the Seller. Should uncharted, or incorrectly charted, utilities be encountered during excavation, stop work and contact the Owner immediately.

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6.5.9 When excavation reaches the required subgrade elevations, notify the Owner and geotechnical engineer and they will make the inspection of conditions. If the project geotechnical engineer determines that the bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are reached. This shall be after approval from the Owner and geotechnical engineer is received.

6.5.10 Correct unauthorized excavation, including areas over excavated by error, at Sellers' expense.

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6.5.11 Stockpile of excavated materials shall be protected from erosion. Do not permit topsoil to be mixed with subsoil. As a guideline, topsoil (from topsoil excavation) shall be deposited, loosely, in heaps with a maximum height of 15 feet and excavated soil (excluding the topsoil from excavation) shall be deposited in subsequent layers, with a slope angle equal to the natural friction angle of the soil. If stockpiles left undisturbed for more than 30 days, then they need to be stabilized. Direct surface water away from the stockpile to prevent erosion, runoff and deterioration of materials.

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6.5.12 Prevent surface water and groundwater from flowing into excavations and accumulate. Remove water to prevent softening of foundation bottoms, undercutting foundations which may cause the soil changes that that can impact the structural stability of the foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines and other dewatering systems necessary to convey the water away from excavations. Establish temporary drainage ditches or other diversions outside the excavation limits to convey rainwater or water removed from excavations. Do not use any trenches or other excavations for permanent structures as temporary drainage ditches.

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6.5.13 Dispose water from the work in a suitable manner that causes no damage to adjacent property and does not interfere with the traffic flow or other construction activities. Water shall be disposed of in such a manner as not to be a menace to public health and in accordance with Environmental Protection Agency, Corps of Engineers, state water quality control division standards and permits and project storm water pollution prevention plan or environmental plan.

6.5.14 Seller shall be responsible for maintaining a temporary, highly visible fencing around excavations that exceed 4 feet in depth. Such temporary fencing will be used for protecting against fall hazards for site personnel, other people on site, ranch livestock etc. Setback for any temporary fencing shall be a minimum of 6 feet from the edge of the excavation. Carry out daily checks on the conditions and completeness of temporary fencing and carry out repairs if necessary.

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6.5.15 All excavations shall have at least two (2) means of ingress and egress.

6.5.16 All foundations shall bear on undisturbed soils or structural fill. Conform to all design elevations and dimensions within acceptable tolerances for placing and removing of concrete formwork, conducting inspections and other construction activities.

6.5.17 Protect excavation bottoms against freezing when atmospheric temperature is less than 35°F or as per design requirements.

6.5.18 The main access to all Wind Turbine Generator excavations shall have safe and functional access and walking surface.

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6.5.19 Proof roll subgrade with loaded rubber-tired equipment for a total equipment weight greater than 25 tons to determine soft areas or as per design requirements. After passing proof roll test, road base material, foundation mud mat will be placed on the subgrade. Additional tests for subgrade compaction shall be completed as per design requirements, which may include but not limited to checking the moisture content, in-situ density and degree of compaction. The Seller may be asked by the Owner to implement remedial measures and repeat these tests if the compaction requirements are not met.

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6.5.20 Structural fill lifts shall not exceed a thickness of 8 inches. Other fill lifts shall not exceed a thickness of 12 inches.

6.5.21 Embankments (fill and cut) shall have a slope of 3H:1V or flatter. All embankment fill material shall comply with the design requirements. The material shall be uniformly spread in layers and the required degree of compaction should be achieved. The compaction is 95% of standard proctor density or as per the design documents. The embankment construction shall be done with minimal slope to avoid rainwater stagnation and soil softening and to prevent soil washout.

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6.5.22 Earthwork activities shall be sub-divided in smaller sections/areas to reduce the time lapse between completion of the layers and placement of new layers above. The Seller shall follow the design guidelines for new embankment constructed on an existing embankment. Embankments to support roads and service yards shall have slopes as per the design/project documents. Areas no longer being actively grades shall be temporarily or permanently stabilized per permit conditions.

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6.5.23 The excavated materials may require crushing and screening prior to backfilling of foundations if they do not meet the design specifications of backfill material. The tests that need to be performed as per a minimum shall be particle size distribution, Atterberg limits and abrasion resistance. This is applicable to the material available for backfilling after blasting activities. The Seller shall provide crushing and screening plant in compliance with applicable standards/codes and shall obtain the required approvals from the local authorities. Seller shall submit the crushing and screening plant report to the Owner for review and approval prior to commencing work. The report shall include, but not limited to size of the plant, location of the plant, schedule of crushing activities, permits, compliance with emission standards including pollution, dust and noise.

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6.5.24 The material produced from crushing and screening shall be tested as per the frequency mentioned in the design documents. The crushing and screening plant shall be capable of supplying high quality materials in the quantity required. The crushed material should be capable of being handled by earthmoving machines.

6.5.25 The backfill material shall meet the design requirements as this will be spreading the structural loads to the subgrade. To check the material properties, the Seller shall perform tests as per the frequency mentioned in the design documents. For special situations, as per the Owner's request or as per the design, the Seller may be asked to perform these tests with greater frequency under additional compensation or to perform additional test.

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6.5.26 Fill activity includes filling soils with compaction into road excavations, trenches, general grading applications and backfilling for foundation excavations. The material for backfilling can be the same as the material excavated if it meets the design requirements as per the design/project documentation.

6.5.27 Soil proposed for fill and backfill shall be approved by geotechnical engineer prior to use. The backfill or fill layers shall be tested during placement and compaction operations. The number of tests shall be made in a quantity to ensure that uniform compaction for each lift is suitably achieved.

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6.5.28 Ensure areas to be backfilled are free of debris, snow, ice and water and that ground surface es are not in frozen conditions. Do not use muddy or frozen fill materials. Moisture condition of the fill material shall be as required to achieve design compaction. Compact backfill material in layers not exceeding a thickness of 8”.

6.5.29 Use hand tampers or vibrating compactors at foundations or similar locations inaccessible to large equipment and rollers. Rolling equipment shall not be used immediately to the foundations.

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6.6 Laydown Yard

6.6.1 The laydown yard shall be sufficient in size to allow for simultaneous (i) storage of equipment, including any Owner-Supplied Equipment, that will not be stored at the Wind Turbine Generator Pads; (ii) storage of office trailers and other temporary facilities; (iii) parking for approximately 20 Owner vehicles; and (iv) regular construction traffic.

6.6.2 The laydown yard shall be covered throughout with crushed rock surfacing. All crushed rock surfacing at the laydown yard shall conform, at a minimum, to the specifications prescribed in Section 6.10 (*Crushed Rock Surfacing*) herein.

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6.6.3 The laydown area shall remain suitable for use in all weather conditions.

6.6.4 The laydown yard shall have a two percent (2%) grade, or less if required, for the safe storage of equipment, or to meet manufacturer's requirements for storage of equipment. The surface of the yard shall be free from potholes and ruts and shall allow for free drainage of surface water.

6.6.5 The laydown yard shall comply with the Turbine Supplier Project Site Requirements.

6.6.6 Fencing shall be installed around the perimeter of the laydown yard, and vehicle gates shall be installed at all entrances to the laydown yard. All fencing and gates shall comply with the minimum specifications in Section 3.11 (*Fencing, Walls, and Gates*) herein.

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6.6.7 The laydown yard shall have at a minimum two points of ingress/egress which shall always be accessible.

6.7 Roads

6.7.1 Seller is responsible for Construction of the project access roads in accordance with the IFC drawings and specifications, including the ability to withstand both the individual and sustained loading requirements of construction traffic associated with the foundation material deliveries, component deliveries, and erection crane travel.

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6.7.2 Seller is responsible for conducting a survey to document the existing conditions of the roads to be utilized, prior to the start of and after the completion of the construction activities. This survey shall include video of the roads and Seller will be submitted to the Owner.

6.7.3 All roads shall be constructed within the permitted corridors. This will include wind turbine generator access roads, string roads, crane pads, public road improvements, MET tower access roads, delivery road improvements, substation access roads including accommodations for MPT delivery, O&M building access road, access roads to the laydown yard and parking lot, turbine staging areas access roads.

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6.7.4 Roads shall be designed, constructed, and maintained adequately to support all anticipated construction loads, equipment delivery (including Owner-Supplied Equipment), crane crawling, construction traffic usage, and weather conditions to be expected.

6.7.5 Roads shall comply with the Turbine Supplier Project Site Requirements.

6.7.6 Road entries, intersections, and turns that will be used by heavy equipment shall be designed to accommodate the longest vehicle anticipated to utilize the road so that it will be able to maneuver through the entire Project Site without leaving the graveled road area. Consideration of cantilevered loads (e.g., Wind Turbine Generator blade ends) shall be considered to ensure obstructions adjacent to the roadway are cleared and will not endanger the equipment delivery.

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6.7.7 Roads shall be designed with turnarounds to assist in truck and trailer flow throughout the Project Site. Backup motions for tractor trailers shall be kept to a minimum and are subject to Owner approval.

6.7.8 Dead-end roads shall be designed with adequate turnaround space for a tractor/trailer to turn around without leaving the graveled road area. If backup motions for tractor trailers are necessary, the backup path shall be as straight and short as possible. All turnarounds shall be constructed using the same gravel design as the roads.

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6.7.9 Roads shall be designed to have a graveled roadway surface with sub-grade cleared and compacted to at least ninety-five percent (95%) of the maximum density within the moisture content of two percent (2%) below optimum to two percent (2%) above optimum, as determined by ASTM Standard D698, unless a higher level of compaction is required by the geotechnical engineering report.

6.7.10 Roads shall be rocked with crushed rock material over a stabilized subgrade. All such crushed rock surfacing shall conform, at a minimum, to the specifications prescribed in Section 6.10 (*Crushed Rock Surfacing*) herein.

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6.7.11 Roads shall be constructed within permitted boundaries and shall be subject to grading permit review and approval, if required, from the agency(ies) having jurisdiction.

6.7.12 Roads shall be cleared of overhead obstructions (e.g., power lines). Mark all overhead obstructions with signs and goal posts.

6.7.13 Roads shall be able to accommodate two-way traffic during normal conditions but may be converted to one-way traffic when wide vehicles are entering the Project Site and delivering equipment and/or materials.

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6.7.14 Seller is responsible for ongoing regular maintenance of all project and public roads as needed throughout the Work, to include grading, dust control, and snow removal as needed.

6.7.15 Seller is responsible for all surveying and staking out needed to construct the roads in accordance with design plans. The levels and control points and final grade of the roads shall follow the design drawings.

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6.7.16 Seller shall be responsible for locating buried utilities and other underground obstructions prior to any excavation. For underground gas and oil pipelines, it may be required, that the pipeline owner be on site always while the work is occurring within the pipeline easement. Seller shall coordinate such activities with pipeline owners prior to starting work so that the project schedule is not impacted. Excavation by hand tools without any mechanical means shall occur when it is not possible to proceed with earthmoving machines, or a special precision and/or care is needed to avoid any damage to existent underground cables, pipes, sewers, equipment's, objects and manufactured items in general, or other special situations. The Seller shall bear the full cost associated with repairing any damage done to underground utility lines caused by work performed by the Seller. Should uncharted, or incorrectly charted, utilities are encountered during excavation, stop work and contact the Owner immediately.

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6.7.17 Roads shall be a *minimum* of 20 feet wide. Where crane walks are to be utilized, roads shall have a minimum 10-foot temporary compacted earthen shoulder on each side.

6.7.18 Roads shall have a minimum turning radius on curves of no less than is required for Wind Turbine Generator and other equipment deliveries. Roads shall be widened through turns and curves, as necessary. Seller shall provide documentation for required widenings to demonstrate the ability for required vehicles to accommodate turns safely.

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6.7.19 Roads shall be designed and constructed with a maximum grade of ten percent (10%) grade, or less if required by the Turbine Supplier Project Site Requirements. Approaches to Wind Turbine Generator Pads from access roads shall be designed and constructed sufficiently level to allow transport vehicles, including Wind Turbine Generator transport vehicles, to park on a flat surface during offloading.

6.7.20 Roads shall have no more than two percent (2%) crown, unless such roads will be utilized as crane paths, in which case the maximum crown shall be one percent (1%). All roadways, including shoulders, shall be graded to self-drain, and must not allow water to puddle.

6.7.21 Maximum allowable rutting is two (2) inches.

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6.7.22 Roads shall meet all required design elements at substantial completion.

6.7.23 Maximum vertical crest and dip on roads is six (6) inches vertical to 50 feet horizontal, or less if required by the Turbine Supplier Project Site Requirements.

6.7.24 The longitudinal radii (convex or concave) of roads shall not be less than 750 feet.

6.7.25 The surface of the road shall be free from potholes and ruts and shall allow for free drainage of surface water.

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6.7.26 All non-Wind Turbine Generator roadways shall be able to accommodate light traffic consisting of general-purpose pickup trucks, SUVs, and bucket trucks, or as required during construction to perform the Work. During construction, equipment delivery trucks shall also be able to safely travel these roadways.

6.7.27 All site entrances/exits shall have a system in place to prevent tracking of mud and other debris onto the public way.

6.7.28 Seller shall procure and install cattle guards, when required. Cattle guards shall be installed level and provided with a stable base capable of sustaining heavy loads without shifting or settling.

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6.7.29 Seller shall inventory, analyze and verify all existing bridges and culvert crossings on the Project Site are sufficient for the intended Project use. If any improvements are needed to existing culverts and bridges, Seller shall make these improvements as per planned schedule to not delay any major component deliveries or construction traffic.

6.7.30 The Seller shall modify existing public roads, as required, at the access road intersections and other locations as needed to allow the delivery of the turbine components to the respective foundation locations. Modifications to the existing public road should meet all applicable State DOT and local jurisdictional requirements and follow any road use agreements.

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6.7.31 Construction and maintenance of project site roads shall follow all storm water pollution prevention and spill prevention plans.

6.7.32 During winter conditions, carry out snow plowing to provide vehicle access to all turbine locations throughout the construction life of the project. This shall be completed by the Seller as soon as safely practical after a storm event. Seller is responsible for applying sand/salt mixture or all sand mixture in the event of icy conditions on access roads and construction areas.

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6.7.33 Seller shall prepare, implement, and manage a detailed traffic management plan that is specific to the Project. The traffic management plan shall clearly identify all haul routes from the nearest highway; proposed traffic flow within the Project Site, including public roads; plans for managing construction, delivery, public, and other traffic at the Project Site during construction; daily concrete truck delivery flow plans; and mitigation measures to reduce risk and impact to non-construction vehicles due to construction activities. The Seller is responsible for all signage, spotters or other requirements to meet state traffic requirements. The Seller is responsible for any agency approval needed prior to any road work.

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6.7.34 Seller shall provide temporary signs at public and site access road intersections to provide direction to turbine locations; and at the appropriate locations on public roads to indicate that no wind project traffic is allowed along these roads. These signs shall remain in place throughout the construction period.

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6.7.35 Lime treatment of road subgrade to modify the physical and mechanical properties of the soil through chemical reactions is acceptable for road subgrade improvement. Seller shall be responsible for submitting to the Owner the procedure for lime stabilization for review and approval before lime application. The lime treatment procedure shall include but not limited to the following: suitable climatic condition for lime treatment, suitable subgrade soil conditions, measures to mitigate frost conditions and dewatering methods, types of lime, storage and delivery of lime material, material dosage requirements, lime application methods and testing methods. The procedure shall follow the latest editions of all applicable standards. Lime stabilization is preferred for cohesive soils.

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6.7.36 For granular soils, cement stabilization methods can be used for road subgrade improvement. It is important to remember that in situations where there is time constraint due to fast pace of construction activity, cement stabilization can be considered as an alternative as the cement treated soils can gain strength much quickly compared to lime treated soils. Seller shall be responsible for submitting to the Owner the procedure for lime stabilization for review and approval before cement application. The cement stabilization procedure shall include but not limited to the following: suitable climatic condition for lime treatment, suitable subgrade soil conditions, measures to mitigate frost conditions and dewatering methods, types of lime, storage and delivery of material, optimum dosage of cement, cement application methods and testing methods, placement and compaction methods. The procedure shall follow the latest editions of all applicable standards. For cement stabilization, Type I Portland Cement conforming to ASTM C150 shall be used. Other

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equivalent products shall be submitted for review and approval.

6.7.37 Geosynthetics may be required as per design requirements to filter, drain, separate, protect and reinforce the ground during and after construction. Materials must be delivered to the construction site in their original packaging with labels along with the manufacturer's technical sheets indicating the main specifications and instructions for proper installation. The Owner may request certificates issued by authorized testing laboratories to confirm the physical, mechanical, hydraulic and durability properties stated in the technical sheets. Materials must be stored on the construction site in their original packaging and be protected from weather and exposure to direct sunlight must be avoided.

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6.7.38 Joint types between geotextile sheets can be overlapping, sewn or, with adhesive strips, staples, adhesives (gluing) or hot melt and tying. Geotextiles for filtering can be installed outdoors or underground on horizontal, sloped and vertical surfaces. They can be used around perforated pipes or in trenches. Geotextiles must be installed in a stable position during construction of drains and during burial. If installed in drainage trenches to be filled by gravel, geotextile tarps must be positioned and adhered to the trench bottom and to the walls to avoid tension stress when the drain is filled. The Seller shall ensure that the geotextile material shall not be in contact with rock or any sharp objects.

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6.7.39 Geogrid is a geosynthetic formed by a network of integrally connected elements to allow interlocking with surrounding soil, rock, earth and other surrounding materials to function primarily as reinforcement. Geogrids shall not decompose and must be non-toxic, rodent and micro-organism proof, chemically inert and ultraviolet (UV) ray stable. Geogrids must be installed as per the design requirements and manufacture's specifications. Construction site equipment (such as excavators and cranes) should not be allowed to travel directly on geogrids.

6.8 Turbine Foundations

6.8.1 Turbine Foundations shall be constructed at each Wind Turbine Generator location.

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6.8.2 Turbine Foundations shall be conventional spread footing / gravity-type foundations. No alternate Turbine Foundation type, including P&H or rock anchor, shall be utilized without Owner approval.

6.8.3 Turbine Foundations shall be reinforced concrete designed in accordance with Turbine Supplier Project Site Requirements; ASCE/AWEA RP2011 "*Recommended Practice for Compliance of Large Land-based Wind Turbine Support Structures*"; ACI 318; and other relevant Applicable Standards and Requirements.

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6.8.4 Turbine Foundations shall, at a minimum, be designed using the final geotechnical engineering report, including allowable soil bearing pressure values determined by geotechnical investigation from soil borings at each specific Wind Turbine Generator site and equipment loads provided by the Turbine Supplier. No portion of Turbine Foundations shall be constructed on fill material or within ten (10) feet of a fill slope without Owner approval.

6.8.5 Turbine Foundations shall include a grounding grid. The design and construction of the grounding system in such foundations shall meet or include the following requirements, at a minimum:

(1) Turbine Supplier Project Site Requirements.

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(2) Incorporate the recommendations and minimum requirements set forth in the geotechnical engineering report.

(3) Proper grounding of equipment and structures.

(4) Installation of adequate ground for personnel safety, including touch and step potentials (to be demonstrated by Seller via calculations in the grounding study).

(5) Proper grounding for lightning and surge protection.

(6) Incorporate local resistivity measurements.

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(7) A ground resistance <= 2 Ω.

6.8.6 All local requirements and the NESC shall be adhered to in the grounding design and construction.

6.8.7 Turbine Foundations shall be designed to have adequate stiffness to maximize the system natural frequency within practical limits.

6.8.8 Turbine Foundation anchor bolts shall have a minimum projection of two (2) anchor bolt diameters beyond the tightened anchor nuts. Anchor bolts not meeting this requirement may be rejected by Owner.

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6.8.9 Turbine Foundation materials, including rebar, anchor bolts, forms, concrete, and grout, shall comply with the applicable structural requirements in Section 7.0 (*Structural Works Specifications*) herein.

6.9 Wind Turbine Generator Pads

6.9.1 A Wind Turbine Generator Pad shall be constructed at every Turbine Foundation location.

6.9.2 Wind Turbine Generator Pads shall be sufficient in size to allow for simultaneous offloading, storage, and assembly of all Wind Turbine Generator components, including, but not limited to, rotor, nacelle, and tower sections.

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6.9.3 Wind Turbine Generator Pads shall comply with the Turbine Supplier Project Site Requirements and provide minimum bearing capacity requirements for turbine supplier transportation requirements and requirements for the erection crane to install the heaviest turbine component.

6.9.4 Wind Turbine Generator Pads shall be cleared of brush, boulders, and other debris around each Turbine Foundation, up to the pad limits, and shall be continually maintained to ensure a safe working environment.

6.9.5 Wind Turbine Generator Pads shall not exceed two percent (2%) grade, or less if required for the safe execution of Work, including Wind Turbine Generator assembly, storage, or erection.

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6.9.6 Wind Turbine Generator Pads shall have a graveled surface with sub-grade cleared and compacted to at least ninety-five percent (95%) of the maximum density within the moisture content of two percent (2%) below optimum to two percent (2%) above optimum, as determined by ASTM Standard D698, unless a higher level of compaction is required by the geotechnical engineering report.

6.9.7 Following Wind Turbine Generator installation, a gravel ring (i.e., "beauty ring") shall be installed around the perimeter of each Wind Turbine Generator location, at a minimum distance of twenty (20) feet beyond the Wind Turbine Generator tower wall in all directions. All crushed rock surfacing around the perimeter of each Wind Turbine Generator location shall conform, at a minimum, to the specifications prescribed in Section 6.10 (*Crushed Rock Surfacing*) herein.

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6.9.8 Crane pads shall be designed and constructed to allow for use of cranes in ongoing Wind Turbine Generator maintenance activities following construction (e.g., cranes required for gearbox removal and / or installation).

6.10 Crushed Rock Surfacing

6.10.1 Verify gradients and elevation of the subgrade are correct as per design drawings. Proof roll road subgrade using loaded rubber-tired equipment weighing more than 25 tons to detect soft areas prior to any aggregate placement. If unsuitable/soft subgrade is encountered, Seller shall undercut unstable material and stabilize subgrade using structural fill prior to aggregate placement.

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6.10.2 The maximum aggregate size for surface fill (i.e., crushed rock surfacing) shall not exceed three (3) inches, including, but not limited to, that used for roadways, Wind Turbine Generator Pads, Project Substation, laydown yard, and the O&M Building.

6.10.3 Spread and compact aggregate base material in lifts of thickness no greater than 6 inches.

6.10.4 Unless explicitly stated otherwise, all crushed rock surfacing shall be of thickness required by Project Site loading requirements, including those set forth in (i) the Turbine Supplier Project Site Requirements and (ii) the geotechnical engineering report.

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6.10.5 Unless explicitly stated otherwise, all aggregate shall conform to local department of transportation requirements.

6.10.6 An aggregate job mix formula shall be established prior to the start of fill operation based on recommendations from the final geotechnical engineering report. This mix shall not be changed without prior approval of Owner. Testing data, including sieve analysis, shall be submitted for all aggregate sources.

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6.10.7 Road aggregate characteristics shall be tested as per frequency of testing mentioned in the design requirements. For construction of crane pads/roads, the material must be placed in lifts not exceeding 6 inches or as per the design and should be properly compacted while providing adequate drainage of runoff water away from the pavement surface. The characteristics of the material shall be tested for of grain size analysis, compaction, Atterberg limits, soundness of aggregate, LA abrasion and CBR tests.

6.10.8 Restore all the permanent access roads to meet the road surfacing design conditions at the end of the project.

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6.10.9 Finish surfaces by rolling with smooth steel wheel roller. Repair soft and yielding areas that develop in the final rolling.

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6.11 Drainage and Erosion Control

6.11.1 The working areas of the Project Site shall be well drained during and after construction, respectively. All drainage shall be away from buildings and foundations.

6.11.2 Seller shall be responsible for submitting Stormwater Pollution Prevention Plan to Pacific Corp for review and approval prior to any site disturbance. Implementing and maintaining a comprehensive storm water pollution prevention plan (SWPPP) during construction. This shall include all required permit submittals. The SWPPP shall be a live document, subject to review and adaptation throughout construction – a final SWPPP will be provided as part of the turnover documentation robustly capturing any residual maintenance requirements.

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6.11.3 Roadway cross sections shall be shaped to move water away from the road, such as crowning or cross-slopes, and roads shall be designed and constructed to prevent water ponding. Storm water shall not channel flow across constructed roads.

6.11.4 Controls shall be provided to protect the water quality and shall be in accordance with all Requirements, including applicable laws, applicable permits, and the Seller-provided SWPPP.

6.11.5 Seller shall provide all excavation, embankment preparation, drainage contours and culverts necessary to prevent excessive erosion and degradation of site due to water runoff.

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6.11.6 Culvert pipe ends, swales, and ditches shall be designed to control concentrated flow velocities and minimize erosion and siltation. Corrugated metal pipes are most widely used for drainage applications including storm sewers, culverts, and storm water detention and infiltration systems in the wind projects. These pipes can be made of steel or aluminum. Corrugated coupling bands, galvanized steel or aluminum to match pipe, minimum 10-inches (250-mm) wide; connected with two neoprene O-ring gaskets per and two galvanized steel bolts.

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6.11.7 Verify is trench cut to the dimensions, and elevations are as indicated on the Construction Drawings. Remove large stones which could damage piping or impede backfilling or compaction. Dewater excavations to maintain dry conditions and preserve final grades at bottom of excavation. Place bedding material at trench bottom, level continuous layer not exceeding 8-inch compacted depth; compact to 95 percent of the modified proctor maximum dry density. Install pipe as per manufacturer's instructions. Seal joints watertight. Keep pipe and fittings clean until work is completed. Lay pipe to alignment and slope gradient noted on the design. Protect pipe and bedding from damage or displacement until backfill operation is in progress.

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6.11.8 Riprap shall be placed primarily for culvert outlet protection and embankment slope protection. Riprap shall be tested as per frequency of testing mentioned in design documents. LA abrasion test and soundness test shall be completed for testing the riprap. Riprap shall be irregular shaped rock; 2-inch minimum size, 12-inch maximum size; solid and non-friable. Do not place riprap over frozen subgrade surfaces. Installation thickness of riprap shall be of minimum 6 inches.

6.11.9 Wetlands impacts shall be avoided to the maximum extent practicable and are subject to regulatory approval or other applicable Requirements.

6.11.10 All storm water flows shall be returned to their original drainage patterns and the Project shall not increase flow rates from their historic levels.

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6.11.11 Sheet flows shall be collected in roadside drainage swales and conveyed to culverts or channels to safely pass storm water flows.

6.11.12 Culverts or low-water crossings shall be placed under roads where required to pass existing storm water concentrated flows.

6.11.13 Erosion and sediment control, both during and after construction, shall be provided as required by the Requirements to retain sediment onsite and to control the erosion of embankments, temporary and final exposed slopes, and temporary stockpile(s).

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6.11.14 All practicable erosion control devices shall be installed and maintained in good working order throughout construction to prevent the unauthorized discharge of material into a wetland or tributary. These controls shall be maintained until permanent erosion controls are in place.

6.11.15 Silt fences, check dams, drainage ditches or swales, straw mulch, and pre-manufactured geotextiles, geotubes, geogrids, cellular geoweb, and other similar items (collectively, the "**Best Management Practices**") shall be utilized as appropriate. Use impervious materials to cover stockpiles when unattended or during rain event. Erosion control measures shall be inspected and maintained daily to ensure their continued effectiveness. No heavy machinery in a wetland or other waterway. Seller shall prepare maps showing location and type of BMPs installed and used for Project Site.

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6.11.16 Synthetic, toxic, or otherwise harmful erosion-control materials shall be made inaccessible to livestock on or adjacent to the Project Site during the construction period.

6.11.17 Construction operations shall be continuously monitored by Seller to avoid creating conditions that could lead to excessive erosion of soil with surface runoff from Work areas. Site drainage shall be provided to ensure that water does not "pond" on or near the project facilities constructed by the Seller. Special attention shall be paid to wind turbine foundation areas, substation areas, O&M facilities, and access roads.

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6.11.18 Run off from all site roads, parking areas and any areas liable to be contaminated by oil shall be managed in accordance with the Spill Prevention Control and Countermeasure Plan or Storm Water Pollution Prevention Plan.

6.11.19 Seller shall provide construction dust control at the project throughout the duration of the Work, including furnishing of all labor, equipment, and materials, including water and/or equivalent duct control products, necessary for dust control and as necessary to reduce the risk of dust becoming a nuisance. Dust control methods to be reviewed by the Owner prior to implementation.

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6.11.20 Local agencies may enforce requirements that limit certain construction activities during a portion of the year (e.g., due to storm events). These requirements shall be incorporated into the proposed SWPPP, erosion control plan, and Project Schedule.

6.11.21 Seller is responsible for maintaining a log of all storm events, the impacts and corrections as required under the SWPPP.

6.11.22 Seller shall document, record and maintain all documentation relating to SWPPP. The SWPPP package shall be submitted to the Owner upon final completion of the project.

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6.11.23 Seller shall be responsible for repairing drainage tile systems damaged during the installation of the foundations, collection system, crane walks, or any other activity with the potential to damage drain tiles. Seller shall recognize locations of drain tile by GPS and flagging/staking. All repair made to drain tiles shall fully comply with local Codes and standards and Landowner requirements. Seller shall include the GPS coordinates, photo documentation and field report and submit to the Owner as per the quality job book.

6.12 Site Restoration

6.12.1 Seeding shall occur during a time / season when the probability of successful seed germination is maximized. Hydro-seeding is acceptable for slopes.

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6.12.2 Prior to re-seeding, Seller to obtain approval from Owner and landowners on reseeding and the desired seed mix. Active agricultural fields should not be reseeded.

6.12.3 Seller shall restore the erection areas to pre-construction conditions at the completion of the project.

6.12.4 All temporary structures, buildings, temporary concrete footings and slabs, and scaffolding furnished by the Seller during the construction shall be removed, and the involved areas shall be left in their intended or original condition.

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6.13 Testing and Quality Control

6.13.1 All testing described herein shall be performed by an independent, experienced third party. Seller shall notify Owner of all testing schedules at least 30 days in advance of testing activities.

6.13.2 All roadways, compacted areas, Wind Turbine Generator Pads, and Turbine Foundations shall be tested to demonstrate they meet stated design criteria and are fit for purpose.

6.13.3 Roadway testing shall include the following, at a minimum:

(1) Maximum dry density and optimum moisture content: per ASTM D698 or ASTM D1557

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(2) In-place density by nuclear methods (shallow): per ASTM D2922

(3) Aggregate sampling: per ASTM D75

(4) Sieve analysis of fine and coarse aggregates: per ASTM C136

(5) California Bearing Ratio of laboratory-compacted soils: per ASTM D1883

(6) Sand equivalent value: per ASTM D2419

(7) Liquid limit, plastic limit, and plasticity index: per ASTM D4318

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(8) Roadway subgrade and surfacing compaction shall be verified at a minimum of every 1,000 feet. Roadway subgrades shall be proof-rolled over the entire length.

(9) Aggregate base shall be analyzed with a sieve at a minimum of every 2,500 cubic yards.

6.13.4 Turbine Foundation testing shall include the following, at a minimum:

(1) Third-party certification of integrity of Turbine Foundation sub-base.

(2) Concrete and grout strength.

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(3) Compaction of backfill around Wind Turbine Generators / Turbine Foundations.

(4) Compaction of Wind Turbine Generator Pads.

(5) Turbine Foundations and Wind Turbine Generator Pads shall be tested in accordance with the recommendations set forth in the geotechnical engineering report. Such areas shall be fully proof-rolled.

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6.13.5 Copies of testing reports shall be submitted to Owner within 10 days of completing such test. Testing reports shall include a summary of testing procedures and acceptance criteria. Notwithstanding the preceding requirements, a copy of test results for each Turbine Foundation shall be provided to Owner *prior* to erection of the applicable Wind Turbine Generator.

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7.0 STRUCTURAL WORKS SPECIFICATIONS

7.1 General Provisions

7.1.1 All buildings, support structures, foundations (including Turbine Foundations), and equipment pads shall be constructed on competent material. All loose materials shall be removed from excavation bottoms. Unsatisfactory foundation subgrade material shall be removed and replaced with compacted structural fill material or with suitable concrete.

7.1.2 All buildings, foundations, meteorological towers, equipment supports, and other structures shall be designed in accordance with the latest edition of the Applicable Standards.

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7.1.3 As further described in Section 3.0 (*Geotechnical Specifications*), the geotechnical engineering report shall be utilized for the design and construction of all Project structures, including Turbine Foundations. All foundations shall be designed with consultation of a licensed geotechnical engineer.

7.1.4 The foundation designer shall perform and detail all appropriate design verifications in a calculation report. The following information shall be included at a minimum:

a. List of all design standards utilized with revisions/edition.

a. List of design load cases based on wind turbine loading information

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b. List of all safety factors, load factors, materials factors, etc. and correlation to the design standard they are taken from.

c. Justification for foundation type and shape based on the Geotechnical Assessment and site conditions.

d. Coordination with Civil Engineer to ensure alignment of final proposed grades with civil site plans.

e. Intended soil improvement justification, improvement type, and locations, as needed.

f. Concrete Exposure Class.

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g. Environmental Analysis (seismic)

h. Stability Checks:

   i. Differential Settlement

   ii. Foundation Stiffness

   iii. Soil Bearing Capacity

   iv. Gapping Requirements

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v. Overturning & Sliding

i. Structural Analysis Checks:

i. Concrete Design (Raft, Pedestal, etc.)

ii. Anchorage Design (Bolt length, embedment plates, etc.)

iii. Tower Connection Design (grout/concrete crushing at flange)

iv. Fatigue Assessment.

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7.1.5 The wind turbine manufacturer shall be responsible for providing all the necessary information for foundation design, such as the following:

a. Load Combinations

i. Ultimate Limit State, ULS (normal and abnormal cases)

ii. Serviceability Limit State, SLS (operational cases)

iii. Fatigue Limit State, FLS

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iv. Seismic Load Combinations

b. Interface Geometry & Properties

c. Anchor Bolt Post Tensioning Forces

d. Wind Turbine Requirements for Serviceability (consideration of differential settlement)

e. Allowable Foundation Gap Between Grade (extreme and operational load cases)

f. Location, Geometry, Size of Inserts (conduit)

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7.1.6 Wind turbine foundation designer shall be responsible for performing the following geotechnical checks:

a. Differential Settlement

i. Short term & long-term consolidation shall be accurately investigated and reported. With cohesive soils, long term consolidation analyses must be checked for the design life of the wind turbine using the design loads.

b. Rotational and Translational Stiffness

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i. The foundation designer shall ensure that the rotational and translational stiffness of the foundation satisfies the requirements as outlined by the wind turbine manufacturer. Foundation designer shall account for translational, rocking, and torsional stiffness of the foundation with respect to dynamic behavior.

c. Sliding

i. Foundation sliding with respect to the horizontal actions transmitted from the wind turbine shall be considered for both undrained and drain conditions of nearby soils.

d. Overturning

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i. Foundation overturning with respect to the horizontal actions transmitted from the wind turbine shall be considered utilizing the factored stabilizing moment due to self-weights, concrete, and backfilling deadloads. Favorable effects of backfill shall be limited to a profile based on the original topography. Passive earth pressures shall not be used in calculating the stabilizing moment.

e. Soil Bearing Capacity Check

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i. Soil pressure below foundation shall be evaluated for short term and long-term loading considering external actions and taking into consideration the water table. Foundation designer shall evaluate soil pressure considering the effective loaded area of varying load cases, foundation geometry, and soil properties.

f. Foundation Gapping

i. Foundation designer shall ensure that the pressures developed at the foundation-soil interface satisfy the limitations set by the wind turbine manufacturer. At a minimum, the foundation designer shall ensure that gapping is limited to 50% for extreme load cases and 0% for operational load cases.

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g. Piles

i. If piles are utilized by the foundation designer, it is their responsibility to define the forces acting on the piles. The foundation designer shall additionally be responsible for performing all pile checks, such as axial, transverse, and tensile. Foundation designer shall not be permitted to allow uplift forces on piles for operational load cases. Only in extreme load cases shall tensile uplift forces in piles be allowed.

7.1.7 Foundation designer may specify ground improvements as needed if the soil below the foundation does not comply with required strength and compressibility properties.

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a. Soil Substitution

i. Existing soil below the foundation shall be removed and replaced with more suitable soils. Foundation designer shall ensure that backfill has sufficient bearing capacity and soil compressibility to dissipate pressure to deeper native soils. Soil substitution area shall be wider than the foundation footprint.

b. Stone Column & Rigid Inclusion

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i. Foundation designer shall be permitted to utilize stone column techniques as needed to supplement existing soils. If used, the design should follow international design guidelines and recommendations as provided by DNV or IEC to determine adequacy of design. Owner may request the use of a finite element analysis model to conform design approach.

c. Foundation Subsurface Void Grouting

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i. If other techniques are not found suitable for the project, foundation designer may recommend void grout filling within the foundation influence zone to supplement soil strength.

7.1.8 The maximum loads (including load factors) applied to the foundations and used for design shall be determined from the structure design of the supported structure considering load cases and Applicable Standards associated with the structure type.

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7.1.9 All relevant site parameters shall be identified to ensure that load effects transmitted from wind turbine are sufficiently captured in foundation design. The primary contributor is typically the wind load, however consideration shall be given, where necessary, to other factors such as snow loads, seismic loads, ground water buoyancy, etc.

7.1.10 The average wind speed may be determined using various methods as outlined in the applicable design codes. In IEC-EN 61400, which the wind turbine is typically designed to, the maximum wind speed at hub height is averaged over 10 minutes for a recurrence period of 50 years. This method may vary from other structural codes, such as ASCE 7 or IBC which rely upon wind speed gusts averaged over 3 seconds.

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7.1.11 Wind turbine design is based on different classes as defined in IEC EN 61400 latest edition, which considers both average wind speed and turbulence:

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Wind turbine class			I	II	III	S
V_{ave}		(m/s)	10	8,5	7,5	Values specified by the designer
V_{ref}	(m/s)		50	42,5	37,5	
	Tropical (m/s) $V_{ref,T}$		57	57	57	
A+		I_{ref} (-)	0,18			
A		I_{ref} (-)	0,16			
B		I_{ref} (-)	0,14			
C		I_{ref} (-)	0,12			

The parameter values apply at hub height and

V_{ave} is the annual average wind speed;

V_{ref} is the reference wind speed average over 10 min;

$V_{ref,T}$ is the reference wind speed average over 10 min applicable for areas subject to tropical cyclones;

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7.1.12 The wind turbine foundation shall be designed for load combinations which account for various design situations such as "Normal" events which are frequently expected to occur and "Abnormal" events which usually pertain to the activation of protection systems. See below for IEC EN 61400's table of design load cases. The following load cases shall be used or more recent version, if applicable:

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Design situation	DLC	Wind condition	Other conditions	Type of analysis	Partial safety factors
1) Power production	1.1	NTM $V_{in} < V_{hub} < V_{out}$	For extrapolation of extreme events	U	N
	1.2	NTM $V_{in} < V_{hub} < V_{out}$		F	*
	1.3	ETM $V_{in} < V_{hub} < V_{out}$		U	N
	1.4	ECD $V_{hub} = V_r - 2$ m/s, V_r, $V_r + 2$ m/s		U	N
	1.5	EWS $V_{in} < V_{hub} < V_{out}$		U	N
2) Power production plus occurrence of fault	2.1	NTM $V_{in} < V_{hub} < V_{out}$	Normal control system fault or loss of electrical network or primary layer control function fault (see 7.4.3)	U	N
	2.2	NTM $V_{in} < V_{hub} < V_{out}$	Abnormal control system fault or secondary layer protection function related fault (see 7.4.3)	U	A
	2.3	EOG $V_{hub} = V_r \pm 2$ m/s and V_{out}	External or internal electrical fault	U	A

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7.1.13 Wind turbine foundation design shall include considerations of manufacturer's loads which shall be located in manufacturer's calculation report. Loads are to be provided for each relevant design load case as determined by the manufacturer and shall be provided with and without applicable safety factors.

7.1.14 At a minimum, seismic design loads shall be considered according to IEC-EN 61400, which specifies that the ground accelerations shall be considered for a 475-year return period. If necessitated by local relevant codes, more severe parameters should be applied.

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7.1.15 Partial safety factors to be used in load combinations are defined in IEC-EN 61400 and are shown below:

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Unfavourable loads		Favourable loads[15]
Type of design situation (see Table 2)		All design situations
Normal (N)	Abnormal (A)	
1,35[a]	1,1	0,9

[a] For design load case DLC 1.1, the partial load factor shall be γ_f = 1,25.

If for normal design situations the characteristic value of the load response $F_{gravity}$ due to gravity can be calculated for the design situation in question, and gravity is an unfavourable load, the partial load factor for combined loading from gravity and other sources may have the value

$$\gamma_f = 1{,}1 + \varphi\zeta^2 \text{ and } \varphi = \begin{cases} 0{,}15 \text{ for DLC 1.1} \\ 0{,}25 \text{ otherwise} \end{cases}$$

$$\zeta = \begin{cases} 1 - \left| \dfrac{F_{gravity}}{F_k} \right|; & \left| F_{gravity} \right| \le \left| F_k \right| \\ 0; & \left| F_{gravity} \right| > \left| F_k \right| \end{cases}$$

For design load case DLC 2.1, the partial load factor may be calculated from the following expression if the mean time between failures (MTBF), in years, for the considered failure mode has been evaluated (see 7.4.3.2):

$$\gamma_f = \begin{cases} 1{,}35 & \text{MTBF} \le 10 \\ 1{,}71 - 0{,}155 \ln(\text{MTBF}) & 10 < \text{MTBF} \le 50 \end{cases}$$

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The guidance provided in IEC-EN 61400 shall be considered as a minimum standard for design. It is the designer's responsibility to ensure that local governing design codes do not present more severe parameters for design. The designer should refer to AWEA-ASCE – Recommended Practice for Compliance of Large Land-based Wind Turbine Support Structures for additional guidance on reconciling IEC 61400 with local design codes.

7.1.16 Seismic load combinations shall be performed as outlined in IEC-EN 61400. In general, seismic loads shall be combined with operational wind loads and the highest of the following shall control:

a. mean loads during normal power production determined at rated wind speed

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b. loads during emergency stop at rated wind speed

c. loads during idling or parked condition at no wind and rated wind speed

Note that IEC-EN 614000 states that a partial safety factor of 1 for seismic load evaluation.

7.1.17 Operational and fatigue loads, as provided by the wind turbine manufacturer, shall be utilized by the designer for the serviceability limit state check.

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7.1.18 The foundation designer shall be responsible for performing the following checks in addition to other conventional checks that are typically performed in reinforced concrete design. This list is not intended to be all-encompassing, but rather to convey the owner's expectations for the calculation package.

a. Raft Check

i. Foundation designer shall ensure that foundation has sufficient capacity to prevent punching failures where the pedestal connects to the raft.

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ii. Foundation designer shall ensure that foundation has sufficient capacity to prevent shear and flexural failure at critical cross sections along the raft.

iii. Foundation designer shall ensure that minimum reinforcement requirements, as outlined in ACI 318 and possibly local governing codes, are satisfied by the design.

iv. Foundation designer shall ensure that the maximum characteristic shear resistance is determined based on the ratio between the reinforcing radial bars in tension and the concrete section is lower than 1% using Paulay & Priestley formulas.

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v. Foundation designer shall ensure that steel shear reinforcement is sufficient for resisting the entirety of the external shear where concrete shear resistance is exceeded.

b. Tower Connection Check

i. The turbine manufacturer will provide loading, layout, and size of anchor bolts. It is the foundation designers' responsibility to identify the length of anchor bolt needed to resist the loads.

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ii. Foundation designer shall ensure that the concrete and grout in the vicinity of the tower connection is sufficient to resist the compressive forces of the tower to prevent compression crushing failure (failure of region in contact with tower), spalling failure (failure of region adjacent to region in contact with tower), and splitting failure (delamination in deeper layers due to tensile forces).

c. Fatigue Checks

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i. Foundation designer shall verify that the grout below the tower flange, concrete below the grout, concrete in vicinity of embedded plates, reinforcement bars, and concrete at critical raft cross sections are sufficient for the fatigue loading expected due to the dynamic loading of the tower.

7.1.19 It is the owner's preference that the shape of the foundation be circular. Other geometries must be approved by owner prior to design phase.

7.1.20 For shallow foundations, the thickness of the raft along the perimeter shall not be less than 12 inches in granular soil and 20 inches in granular soil. If foundation designer can provide sufficient evidence that a thinner section is acceptable, owner may permit thinner sections at foundation edge.

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7.1.21 If piles are utilized, the minimum center to center distance of piles shall be three times the diameter. The minimum pile center to foundation edge distance shall be 20 inches.

7.1.22 For deep foundations, the thickness of the raft along the perimeter shall not be less than "20 inches + pile radius" or 1 meter, whichever is more restrictive.

7.1.23 Concrete cover, rebar lapping, and bar bundling shall be performed according to applicable codes.

7.1.24 Foundation designer shall clearly locate and callout the position of all conduits to avoid clashes during installation.

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7.1.25 Foundation designer shall propose method of routing conduits for owner approval prior to design.

7.1.26 At a minimum, anchorage bolts shall have an embedment length into the foundation of at least 5.25 ft.

7.1.27 Foundation designs shall neglect or degrade soil strength properties at the top of the foundation as a result of frost or disturbance during drilling per recommendations of the geotechnical engineer.

7.1.28 All exposed foundation edges shall have a 0.75-inch chamfer.

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7.1.29 All foundations and slabs-on-grade shall have a minimum projection of 6 inches above ground level, except that concrete pier-type foundations shall have a minimum projection of 12 inches of concrete above ground level.

7.1.30 All foundation design shall be performed in accordance with the recommendations outlined in the project specific geotechnical report.

7.1.31 Foundation designer shall utilize provisions in project specific geotechnical report related to prevention of frost heave.

7.1.32 Substation foundation designs shall be compliant with all applicable OSHA requirements.

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7.1.33 Substation foundation designs shall be compliant with ACI 318, ACI 336, AISC Manual of Steel Construction, and ASCE Manual No. 113.

7.1.34 Substation foundations for control houses, step-up transformers, firewalls, etc. shall comprise of drilled piers, cast in place mat foundations, etc.

7.1.35 Foundation designer shall consider oil spill retention as needed. Oil retention basins shall extend a minimum of 5 ft. beyond the perimeter of oil-bearing parts. The oil retention basin shall be sized for the full volume of oil within equipment, plus 10 minutes of flow from a firehose (500 gpm) and 6 inches of additional freeboard and shall comply with all EPA and state requirements.

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7.1.36 Substation foundation stability checks shall be performed with unfactored loads. The minimum permissible safety factors for resisting forces shall be as follows:

- Overturning & Sliding, FS = 1.5
- Soil Bearing Capacity, FS = 3.0

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7.1.37 Structure foundations shall be surveyed and staked prior to excavation.

7.1.38 When performing backfill load calculation, designer shall consider minimum load factors of 0.90 and 1.35 when load is considered favorable and unfavorable, respectively. Designer shall not be permitted to rely upon additional backfill higher than the original topography without prior approval from the owner.

7.1.39 Foundation designer shall specify minimum backfill material properties such as grading, plasticity, lift thickness, compaction, etc. Backfill material at a minimum should comply with conventional backfill soil expectations, such as the following:

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a. absence of organic materials

b. approximate density of 120 lbs./ft.

c. soil compaction of at least 95% of maximum density as outlined in ASTM D1557

7.2 Design Working Life

7.2.1 The design working life of the structural works (including Turbine Foundations) shall be a minimum of 30years.

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7.3 Concrete

7.3.1 Concrete materials shall be in accordance with the requirements set forth in Table 1 (*Summary of Requirements for Concrete Materials*) herein, at a minimum.

7.3.2 A nominal slump at the point of delivery shall be as shown in Table 2 (*Slump Requirements*) herein, as tested in accordance with ASTM C143.

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Table 1: Summary of Requirements for Concrete Materials

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Material	Material Requirements
Cement	ASTM C150, Type I, II, or V (as required)
Water	Clean, potable, and free from injurious amount of oil, acid, alkali, organic matter or other deleterious substances.
Coarse aggregate	Crushed stone, washed gravel, or other acceptable inert granular material conforming to ASTM C33, ACI 318
Fine aggregate	Clean natural sand, ASTM C33, ACI 318
Fly ash	ASTM C618; determined by Seller and approved by Owner

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Material	Material Requirements
Air-entraining agent	ASTM C260
Chemical admixture	ASTM C494; determined by Seller and approved by Owner
Plasticizer	ASTM C494 / ASTM C1017; determined by Seller and approved by Owner
Form oil	Light colored paraffin oil or other acceptable non-staining material
Curing agent	ASTM C309; determined by Seller and approved by Owner

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Material	Material Requirements
Floor sealer	ASTM C1315; determined by Seller and approved by Owner
Concrete repair	Determined by Seller and approved by Owner
Compound	Determined by Seller and approved by Owner
Joint sealant	ASTM C1193; determined by Seller and approved by Owner
Non-shrink grout	Determined by Seller and approved by Owner
Pre-formed joint filler	Determined by Seller and approved by Owner

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Material	Material Requirements
Concrete	Minimum concrete compressive strength to be determined by Seller and subject to Owner review and approval.
Grout	Minimum grout compressive strength to be determined by Seller and subject to Owner review and approval.

Table 2: Slump Requirements

Description	Minimum	Maximum

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	(inches)	**(inches)**
Turbine Foundations	2.0	5.0
Reinforced walls and footings	2.0	5.0
Slabs on-grade	2.0	4.0
Drilled piers (dry, uncased, or permanent casing drill method)	4.0	6.0
Drilled piers (temporary casing drill method, wet and dry)	6.0	8.0
Drilled piers (slurry displacement drill method)	7.0	9.0

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7.3.3 Cast-in-place concrete shall be in accordance with the latest applicable requirements of the ACI, ASTM, and CRSI, at a minimum.

7.3.4 Ready-mixed concrete manufacturing and delivery shall conform to ASTM C94.

7.3.5 Concrete for foundations shall have a specified compressive strength of not less than 5,000 psi.

7.3.6 Concrete mix designs and concrete placement procedures shall be approved by Owner prior to use.

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7.3.7 Aggregates shall be tested per ASTM C33 for potentially reactive materials. If such test results indicate that aggregates are reactive, an alkali-silica reaction ("**ASR**") mitigation plan shall be provided.

7.3.8 Concrete admixtures may be used to improve the performance of the concrete however shall be approved by the owner prior to use. Utilization of admixtures shall conform to ASTM C494 guidelines.

7.3.9 Concrete shall be placed only in the presence of a duly-authorized representative of Seller.

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7.3.10 Concrete placement shall not be permitted when weather conditions or other pertinent factors prevent proper placement and consolidation.

7.3.11 Concrete shall be placed at a sufficient rate to ensure that lifts below have not taken initial set before fresh concrete is deposited. In any event, concrete shall be placed within 45 minutes after mixing. This period may be extended to 90 minutes provided that the combined air temperature, relative humidity, and wind velocity are such that the plasticity of the fresh concrete is satisfactory for placement and consolidation, and that the specified mixing water is not exceeded. Concrete which has partially set shall not be re-tempered but shall be discarded.

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7.3.12 Concrete requirements shall be adjusted for hot weather:

(1) Hot weather concreting shall be in accordance with ACI 305R.

(2) When hot weather conditions exist that would materially impair the quality or strength of concrete, the concrete shall be placed in compliance with ACI 305R and as herein specified.

(3) Ingredients shall be cooled before mixing to maintain concrete temperature at time of placement below 90°F.

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(4) Mixing water may be chilled or chopped ice may be used to control the concrete temperature, provided the water equivalent of the ice is calculated to the total amount of mixing water.

(5) Reinforcing steel shall be covered with water-soaked-burlap if it becomes too hot, so that the steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

(6) Retarding admixtures shall not be used unless otherwise accepted in mix designs.

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7.3.13 Concrete requirements shall be adjusted for cold weather:

(1) Cold weather concreting shall be in accordance with ACI 306R.

(2) After the first frost and until the mean daily temperature in the vicinity of the Work falls below 40°F for more than 24 hours, the concrete shall be protected against freezing for not less than 48 hours after it is placed.

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(3) Whenever the mean daily temperature in the vicinity of the Work falls below 40°F for more than 24 hours, the concrete shall be maintained at a temperature not lower than 50°F for at least 72 hours after it is placed and shall be protected against freezing for five (5) days immediately following the 72 hours of protection at 50°F. This continuance of protection against freezing shall be such that the drop-in temperature of any portion of the concrete will be gradual and will not be lower than 40°F in 24 hours.

(4) When artificial heat is employed, special care shall be taken to prevent the concrete from drying.

(5) The use of calcium chloride will not be permitted.

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(6) A non-corrosive, non-chloride set accelerating admixture may be used when approved by Owner.

(7) Concrete damaged by freezing shall be removed and replaced at Seller's expense.

(8) Concrete shall not be permitted to freeze for at least seven (7) consecutive days following placement.

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7.3.14 The maximum aggregate size for concrete shall not exceed 1.5 inches. However, it is the designers' responsibility to ensure that the maximum aggregate size is compatible with the design and layout of rebar or other inserts. The designer shall evaluate the concentration of rebar and inserts to ensure that aggregate size does not affect the free flow of wet concrete, creating issues such as concrete segregation which should be avoided.

(1) Smaller maximum aggregate size, such as 0.75 inches, may be necessary for pumped or tremie concrete.

(2) Rounded aggregates may be necessary to produce desired workability.

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7.3.15 All exterior exposed concrete shall have an air content of 4.5 percent (4.5%) to 7.5 percent (7.5%).

7.3.16 Designer shall at a minimum evaluate exposure categories C1 and C2 as outlined in ACI 318 (latest edition) when performing concrete design. Designer shall evaluate more rigorous exposure categories if necessitated by local conditions.

7.3.17 Concrete shall be conveyed from mixer to forms as rapidly as practicable without segregation or loss of ingredients. Concrete shall be placed in forms nearly as practicable in final position to avoid re-handling.

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7.3.18 Chutes, if used, shall slope sufficiently to ensure flow of properly proportioned concrete and must be kept free of hardened or partially set concrete.

7.3.19 Concrete shall be carried in at such a rate that the concrete is at all times plastic and flows readily into the spaces between the bars. No concrete that has partially hardened or been contaminated by poor material shall be used nor shall re-tempered concrete be used.

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7.3.20 Immediately after depositing, concrete shall be compacted by agitating thoroughly in an approved manner to force out air pockets. The mixture shall be worked into corners around reinforcement and inserts to prevent formation of voids. Tapping or other external vibration of forms will not be permitted. Care shall be used in use of vibrators to prevent segregation of sand pockets or bleeding. Vibrators shall be moved continuously in and out of concrete, keeping stationary only a few seconds in any position. Vibrators shall not be used to transport concrete within forms.

7.3.21 For concrete poured within forms and not involving drilled pier construction, concrete shall not drop freely over five (5) feet in unexposed work or over three (3) feet in exposed work. Where greater drops are required, tremies, concrete pump, or other approved methods shall be used.

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7.3.22 Concrete may be dropped into drilled piers installed using the dry method under the conditions that concrete shall not hit any reinforcing bars or sidewalls and that concrete with all aggregates shall be able to flow freely into the spaces between the reinforcing bars. Vibration of concrete falling more than 20 feet is not required. The concrete shall be placed in the pier in one continuous operation unless agreed otherwise by Owner.

7.3.23 For concrete involving massive structures, including Turbine Foundations, concrete mix or construction procedure shall be modified such that excessive heat produced by hydration shall be prevented.

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7.3.24 Cast-in-place concrete, at Seller's option, may be placed by pumping in accordance with ACI 304; however, it shall use a specifically designed mix for pumping concrete, as fine aggregate gradation and water and cement content are more critical and different from the regular concrete mix. The mortar used for lubricating the pumping equipment shall be discarded.

7.3.25 Concrete shall not be conveyed through aluminum or aluminum alloy pipes.

7.3.26 Maximum water/cement ratio: 0.45.

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7.3.27 Joints:

(1) A good bond and watertight joint are required at construction joints.

(2) Joints shall be obtained by adequately preparing and protecting the surface of the first pour or lower part of the construction joint.

(3) Joint surface shall be level and reasonably rough, clean, moist and some aggregate particles should be exposed. Any laitance or soft layers shall be removed from the top surface of the hardened concrete.

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(4) Turbine Foundations shall not have joints, unless approved by Owner and only for the base and pedestal interface in a spread footer foundation.

7.3.28 All fins and other surface projections shall be removed from all formed surfaces.

7.3.29 All surfaces are to be at the specified elevation and left true and level.

7.3.30 Surfaces that will be exposed shall be cleaned and rubbed to produce a smooth, uniform surface that is free of marks, voids, surface glaze, and discoloration. Slab foundations shall receive a light broom finish. Care shall be taken to see that all excess water is removed before making any finish.

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7.3.31 The unformed surfaces of concrete shall be screened and given an initial float finish followed by additional floating and troweling as required. Precaution shall be taken by Seller to protect the finished surface from stains and abrasions.

7.3.32 The removable ends of all form ties shall be removed and the recesses resulting from such removal shall be filled with dry patching mortar.

7.3.33 "Cure & Seal 1315 UV" curing compound, manufactured by Symons Corporation, or an approved equal, shall be applied to all outside foundations to a depth of 12 inches below final ground grade.

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7.3.34 Concrete shall be protected from loss of moisture for at least seven (7) consecutive days by membrane curing compound and the curing medium shall be maintained to prevent detrimental loss of water from the concrete for the duration of the entire curing period.

7.3.35 Unhardened concrete shall be protected from heavy rains, flowing water, excessive heat, or mechanical damage. Finished surfaces shall be protected from stains, abrasions, or physical damage.

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7.3.36 Defects:

(1) Defects in formed concrete surfaces shall be repaired within 24 hours, and defective concrete shall be replaced within 48 hours, after the adjacent forms have been removed.

(2) All concrete which is porous, honeycombed, or otherwise defective shall be repaired.

(3) Defective concrete shall be repaired by chipping out the unsatisfactory material to a minimum depth of 0.5 inches and placing new concrete, which shall be formed with keys, dovetails, or anchors to attach it securely in place with Owner approval.

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(4) Concrete surfaces, including structural concrete, that contain defects which adversely affect durability, strength, and/or appearance shall be repaired by a method approved by Owner or replaced.

7.3.37 Concrete testing:

(1) Prepare concrete test cylinders conforming to ASTM C31 and ASTM C192 prior to the first pour of each day, and at a rate of not less than one set of cylinders for each 50 cubic yards or fraction thereof and not less than one set for each foundation or structure. Strength assessment of concrete test cylinders shall conform to the procedures as outlined in ASTM C39.

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(2) Field slump tests in accordance with ASTM C143 shall be performed prior to the pour from each truck. Designer shall clearly indicate slump range and requirements on the construction drawings. Adjustment or fixing of concrete *in situ* shall not be allowed.

(3) Air content, concrete temperature, and air temperature tests shall be performed prior to the pour from each truck. All testing shall be done in accordance with the requirements of ASTM C231 (air) and ASTM C1064 (temperature).

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(4) Electronic copies of concrete test reports shall be provided to Owner within 72 hours of testing but not less than 24 hours in advance of commencing Wind Turbine Generator erection activities at the relevant Wind Turbine Generator location. In the event of failure of any concrete test, Owner shall be immediately notified, and a repair/remediation plan shall be provided.

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7.4 Grout

7.4.1 Nonmetallic, shrinkage-resistant grout shall conform to ASTM C1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time. Grout shall be selected such as to have high fatigue resistance as is needed due to the inherent dynamic loading involved with a wind turbine. Grout shall also be selected to be suitable for the expected temperature fluctuations during both construction and design life of structure.

7.4.2 Designer shall calculate the necessary grout compressive strength and indicate on the design drawings the minimum grout resistance needed prior to tensioning the anchor bolts.

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7.4.3 Grout mix designs, grout specification sheets, grouting plans, and grouting procedures shall be approved by Owner prior to use.

7.4.4 Grout testing shall be performed in accordance with ASTM C579 to ensure adequate strength. Additional testing shall be performed in accordance with ASTM C881 to ensure adequate bonding to concrete. Sufficient grout cubes shall be taken to allow for, at a minimum, 1-day, 2-day, 3-day, 7-day, and 28-day testing, plus two (2) additional cubes per sample for accelerated or delayed testing.

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7.4.5 Grout test reports shall be provided to Owner within 72 hours of testing, and for Turbine Foundations, at least at least 24 hours in advance of commencing or continuing (as is the case with grouting of tower base sections) Wind Turbine Generator erection activities at the relevant Wind Turbine Generator location. In the event of failure of any grout test, Owner shall be immediately notified, and a repair/remediation plan shall be provided.

7.4.6 Grouted surfaces that contain defects which adversely affect durability, strength, and/or appearance shall be repaired by a method approved by Owner or they shall be replaced.

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7.5 Forms

7.5.1 Forms shall be designed to produce hardened concrete having the shape, lines, and dimensions indicated on the drawings.

7.5.2 Forms shall be substantial and sufficiently tight to prevent leakage and shall be properly supported and braced to maintain position and shape. Forms for all exposed surfaces shall produce smooth, dense, and true finishes free of fins, imperfections, or other defects.

7.5.3 Forms shall be cleaned and oiled before concrete is placed. Oil is to be applied before reinforcement is placed.

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7.5.4 Formwork for walls, columns, sides of beams, gravity structures, slabs-on-ground, and other vertical-type formwork not supporting the weight of concrete shall remain in place for at least 24 hours after concrete placement is completed.

7.5.5 Formwork supporting weight of concrete and shoring shall not be removed until structural members have acquired sufficient strength to safely support their own weight and any construction or other superimposed loads to which the supported concrete may be subjected.

7.5.6 Forms may be of wood, plywood, concrete-form-grade hardboard, metal or other acceptable material, which will produce smooth, true surfaces.

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7.5.7 Metal forms shall have smooth surfaces free from any pattern, irregularities, dents, or sags.

7.5.8 Commercial formulation form-coating compounds shall be used that will not bond with, stain, nor adversely affect concrete surfaces, nor impair subsequent treatments of concrete surfaces requiring bond or adhesion, nor impede wetting of surfaces to be cured with water or curing compound.

7.5.9 Form ties shall be factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal. For concrete that will be exposed, provide ties so portion remaining within concrete after removal is at least 1.5 inches inside concrete. Form ties shall not leave holes larger than one (1.0) inch in diameter in concrete surfaces.

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7.5.10 Remove forms in a manner to avoid damage to the structure, with particular care for corners and edges.

7.6 Drilled Piers

7.6.1 All drilled piers shall be designed consistent with the primary load application, either as laterally loaded piers or as compression/uplift piers.

7.6.2 Circular shafts shall be dug by means of a power-driven rotary bucket or auger type drilling rig.

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7.6.3 Diameter and depth of drilled piers shall be as needed to resist overturning moments and designed to ensure compliance with foundation performance criteria such as pier rotation and deflection.

7.6.4 Drilled pier performance criteria shall be limited by 1 degree of total rotation, 0.5 degrees of non-recoverable rotation, 1 inch of total deflection, and 0.5 inches of non-recoverable deflection.

7.6.5 Unfactored loads shall be used for determination of foundation performance.

7.6.6 A minimum safety factor of 1.25 shall be utilized during comparison of ultimate strength for overturning/pull out with factored design loads.

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7.6.7 Drilled piers shall have a nominal projection of 12" and shall be crowned to prevent ponding.

7.6.8 A steel lining shall be used for soil conditions that make it necessary to protect personnel, prevent cave-ins, or hold out ground water. Linings shall be withdrawn concurrent with placement of concrete in such a manner as to prevent formation of rock pockets or ground water mixing with concrete. Concrete shall have sufficient head above bottom of lining being withdrawn to hold out water and maintain shaft diameter.

7.6.9 Concrete reinforcement shall be placed in dry pier excavation, unless otherwise approved by Owner, clear of all loose earth, gravel, and rock.

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7.6.10 Concrete shall be placed in continuous operation to top of pier elevation, using an elephant trunk, concrete pump, or other approved method. Time delays between shaft drilling and concrete placement shall be minimized particularly in unstable and/or granular type soils prone to sloughing or caving.

7.6.11 When it is necessary to place concrete under water, a tremie pipe or concrete pump shall be used. The lower end of the tremie pipe shall be kept submerged in the concrete throughout concrete placement.

7.6.12 All methods used to design, and construct drilled piers shall be in accordance with ACI 336.1.

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7.6.13 Permanent casings shall not be used without prior approval by Owner.

7.6.14 The volume of concrete required for each drilled shaft shall be plotted on a graph of concrete volume versus depth.

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7.6.15 In locations where drilled pier foundations are impractical or cannot be constructed due to cost, soil, environmental, access or permitting considerations, alternate foundation types will be allowed with the approval of Owner. Alternate foundation types may include spread or block footings, direct embedded, vibratory caissons, socketed, rock anchors, grouted, grouped piles with pile cap (e.g., concrete filled pipe piles, auger cast-in-place piles, H-piles), micro-pile, and other similar items. The selection of the foundation type and construction methods should consider site disturbances, access and long-term drainage and erosion control.

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7.7 Reinforcing Bar

7.7.1 All reinforcing steel, including welded wire mesh, shall be accurately located and held in position using proper reinforcing steel supports, spacers, and accessories in accordance with ACI SP-66 "*Detailing Manual*" and CRSI's "*Manual of Standard Practice*".

7.7.2 At time of placing concrete, all reinforcing shall be free of loose rust, scale, oil, paint, mud or other coatings which may destroy or reduce the concrete bond.

7.7.3 All reinforcing bars shall conform to ASTM A615 and have a minimum yield strength of 60 ksi.

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7.7.4 Where not otherwise specified or shown by the written dimension, the minimum coverage of the concrete over the steel shall be as follows:

(1) Concrete cast against and permanently exposed to earth: 3 inches.

(2) Formed concrete exposed to earth or weather: 2 inches.

(3) Concrete in beams and columns not exposed to ground or weather: 1.5 inches.

(4) Concrete slabs and walls not exposed to weather: 1.5 inches.

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7.8 Anchor Bolts

7.8.1 The threads on the upper end of each anchor bolt shall protrude sufficiently to satisfy the Requirements and adequately complete tensioning activities.

7.8.2 Prior to setting anchor bolts, the threads on the upper end of each anchor bolt shall be given a light coat of oil or grease to prevent adherence of concrete.

7.8.3 When installed, anchor bolts shall be cleaned and the portions to be embedded in concrete shall be cleaned and free of oil or other deleterious substances which would adversely affect the bond between the bolt and concrete, unless otherwise specified by the Turbine Supplier.

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7.8.4 During the concrete finish and clean-up, concrete adhering to the portions of the anchor bolt extending above finished concrete grade shall be removed giving attention to concrete at the finish grade line which would prevent base plates from seating fully on the finished concrete elevation.

7.8.5 Anchor bolts shall be properly located, accurately positioned, and maintained securely in place before placing of concrete.

7.8.6 Unless otherwise required by the Turbine Supplier, anchor bolts, nuts, and washers shall comply with the following:

(1) Anchor bolts: ASTM A615 or A722, Grade 150.

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(2) Nuts: ASTM A563, heavy hex carbon steel.

(3) Washers: ASTM F436, hardened carbon steel.

(4) Finish: Not used.

7.8.7 Anchor bolt ring-plates shall be fabricated by Seller as needed following the templates provided by the Turbine Supplier. Embedment rings shall be new material.

(1) Embedment ring shall be minimum 1.5-inches thick, ASTM A36 Grade 36 or ASTM A572 Grade 50, and new material (not reused).

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(2) Template rings shall be minimum 1.5-inches thick, ASTM A36 Grade 36 or ASTM A572 Grade 50.

7.9 Tolerances

7.9.1 Anchor bolts, concrete piers, and flat slabs shall be set carefully and maintained at the lines and elevations within the following tolerances, unless otherwise specified by the Turbine Supplier:

(1) Location of concrete piers with respect to foundation center: ±1/4 inch.

(2) Distances between bolt centers in the same foundation: ±1/8 inch.

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(3) Elevation at top of anchor bolts and flat slabs: -0 to +1/4 inch.

(4) Angular deviation from vertical (i.e., out of plumb): 1/16 inch in 1 foot.

(5) Distance between anchor bolt centers between adjacent foundations for a structure: ±1/4 inch.

(6) Horizontal angular alignment (i.e., rotation) of anchor bolt group: ±1°.

(7) Flat slab deviation from level: 1/16 inch in 4 feet.

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7.10 Structural Steel Fabrication and Connections

7.10.1 Structural steel shall be fabricated and assembled in shop to greatest extent possible.

7.10.2 Specific structural steel materials shall comply with the following, at a minimum:

(1) W-shapes: ASTM A992/A992M (50 ksi yield strength).

(2) Channels, angles-shapes: ASTM A36/A36M.

(3) Plate and bar: ASTM A36/A36M.

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(4) Cold-formed hollow structural sections: ASTM A500, Grade B structural tubing.

(5) Steel pipe: ASTM A53/A53M, Type E or S, Grade B.

(6) Weight class: standard.

(7) Finish: galvanized.

(8) Welding electrodes: comply with AWS requirements.

7.10.3 Galvanizing repair paint shall be SSPC-Paint 20 ASTM A780.

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7.10.4 Design and fabrication shall be according to AISC's "*Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design*".

7.10.5 High-strength structural steel shall be identified according to ASTM A6/A6M and maintain markings until structural steel has been erected.

7.10.6 Materials shall be marked and match-marked for field assembly.

7.10.7 Structural-steel assemblies shall be completed, including welding of units, before starting galvanizing operations.

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7.10.8 High-strength bolts shall be shop installed according to the RCSC's "*Specification for Structural Joints Using ASTM A325 or A490 Bolts*" for type of bolt and type of joint specified.

7.10.9 Weld connections shall comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding Work.

7.10.10 Backing bars or runoff tabs shall be removed, back gouged, and ground steel smooth.

7.10.11 Built-up sections shall be assembled and welded by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "*Code of Standard Practice for Steel Buildings and Bridges*" for mill material.

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7.10.12 Weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel shall be verified that they will limit distortions to allowable tolerances.

(1) Butt welds shall be ground flush.

(2) Exposed fillet welds shall be ground or filled to smooth profile.

(3) Exposed welds shall be dressed.

7.10.13 Zinc coating shall be applied by the hot-dip process to structural steel according to ASTM A123/A123M.

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7.10.14 Vent holes shall be filled and ground smooth after galvanizing.

7.11 Testing and Quality Control

7.11.1 All testing described herein shall be performed by an independent, experienced third party. Seller shall notify Owner of all testing schedules at least 30 days in advance of testing activities.

7.11.2 All structural works shall be tested to demonstrate they meet stated design criteria and are fit for purpose.

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7.11.3 Structural works testing shall include the following, at a minimum (for the avoidance of doubt, additional Turbine Foundation testing requirements are specified in Section 6.13 herein):

(1) Concrete and grout properties (strength, slump, air content, temperature).

(2) Compaction.

7.11.4 Copies of testing reports shall be submitted to Owner within 10 days of completing such test. Testing reports shall include a summary of testing procedures and acceptance criteria.

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8.0 COLLECTION SYSTEM SPECIFICATIONS

8.1 General Provisions

8.1.1 The Collection System Circuits shall be installed only within parcels that are leased by the Project and clearly defined by ALTA survey

8.1.2 The Collection System Circuits shall be designed and constructed to a high level of reliability and shall meet or exceed the requirements set forth by the interconnection utility.

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8.1.3 The Collection System Circuits shall be designed and constructed in accordance with the Project Electrical Studies, as defined below:

(1) Load Flow Study: load flow study with power flow analysis for the collection system circuits. Final report shall include a table showing cable ampacity and percent loading per cable section corresponding to the Project one-line diagram. Cable ampacity shall not exceed 90 percent of the rated value, based on Project Site-specific thermal resistivity. All external heat sources shall be considered, including parallel circuits. Thermal design shall account for actual field soil samples and backfill requirements (native or engineered).

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(2) Short Circuit Study: short circuit analysis of collection system circuits, Substation, and transmission interconnection line, including secondary values on WTGs. The short circuit analysis and study shall be utilized in Seller's electrical designs to support relay coordination study and equipment specification.

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(3) Annual Energy Loss Report: electrical losses evaluation, including estimate of annual energy losses for Project design based upon fully-loaded conditions and Project Site-specific wind distribution data, respectively. Such analysis shall be sufficient to demonstrate that the Electrical Loss Limit (see Section **Error! Reference source not found.** of this Exhibit A) is not being exceeded, and shall be based upon Project-specific cabling and transformer specifications, Project Site-specific soil conditions, Project Site-specific wind data, and other similar considerations.

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(4) Reactive Compensation Study: reactive power flow report, including power factor study at Point of Interconnection. The study shall identify reactive compensation required to meet the Technical Specifications, including the requirements of interconnection for power factor and voltage regulation, and including any capacitor bank and/or reactor requirements. The study shall include varying combinations of active power (no load, partial load, full load) and voltage (min. 0.95 to 1.05 pu) at the Point of Interconnection.

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(5) Harmonic Analysis Report: power quality analysis or harmonic monitoring at the Point of Interconnection and Substation shall be used to determine the harmonic resonance and flicker conditions within the Project, and demonstration that the Project design meets the harmonics distortion requirements in the Technical Specifications (including IEEE 519), including any necessary filtering or mitigation to be provided by Seller. If the Transmission system is found to be source of the harmonics, the Transmission Operator shall be responsible for the required mitigating actions.

(6) Concentric Induced Voltage Report: analysis to calculate the maximum induced voltage on the collection system circuit shield wires.

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(7) Insulation Coordination Report: study to ensure the insulation coordination requirements of IEEE C62.22-2009 have been satisfied within the Project electrical design, including proper application of surge arresters to safeguard electric power equipment within the collection system circuits against hazards of abnormally-high voltage surges of various origins.

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(8) Transient Overvoltage Report: study to confirm any system modifications required to adequately limit transient overvoltage on the collection system circuits, including determination of the transient overvoltage levels on the collection system circuits after feeders have been isolated from the Substation due to a line-to-ground fault, and determination of the maximum energy required to be absorbed by each surge arrester on the collection system circuit feeders.

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(9) WTG Ground Grid Report: analysis of WTG grounding design to verify the adequacy of the proposed design and the safety of personnel working in or around the WTG. The study shall confirm that the grounding system maintains touch and step voltages within tolerable limits, and shall be prepared in accordance with the procedures, data, and recommendations given in IEEE 80). The study shall determine the ground potential rise with respect to remote earth, and Turbine Foundations shall be modeled as they are constructed (i.e., if not solidly bonded (e.g., using wire ties), they should be modeled accordingly).

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(10) Arc Flash Study: arc flash hazard analysis of the Equipment, including all energized equipment in the WTGs, collection system circuits, and O&M Building. This analysis shall be performed in accordance with the latest version of NFPA-70E and IEEE 1584. Study shall inform incident energies for labels and PPE requirements. Arc flash stickers shall be prepared by Seller based on these results. Seller shall provide the stickers and detailed location guidance on where stickers are to be applied.

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(11) Protection Coordination Study: relay and protection equipment coordination study, including detailed calculations, one-line and three-line diagrams, fuse curves, coordination curves, protected equipment data, and relay set points. This study shall include the WTG equipment (including switchgear) and collection system circuits. A narrative philosophy statement shall be submitted for comment before completing the coordination study. The relay settings shall be coordinated with that of the WTG's switchgear. The applicable trip curves and settings will be sent to the Turbine Vendor for review.

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8.1.4 Each individual collector circuit shall be limited in generation capacity by the ampacity at nominal collection voltage in local soil conditions of a single 1250 kcmil conductor per phase from the substation to the first turbine in the circuit. This fixed, project specific voltage and ampacity will determine the maximum power and thus the maximum number of turbines allowable on each circuit. Owner does not permit parallel conductor runs in this case.

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8.1.5 Access to the Collection System Circuits shall be from existing roads or new access roads within the permitted area. Exact Collection System Circuit routing shall be determined, however, the preferred routing shall be to parallel the access roads and crane paths as much as possible, so long as such routing does not increase the required number of crane breakdowns. When not practical or efficient to parallel the access roads, the Collection System Circuit shall be routed in a straight line, shortest distance as much as possible within the lease requirements of all parcels.

8.1.6 All manufacturer installation instructions for the installation of all Collection System Circuit components shall be obtained and followed.

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8.2 Design Working Life

8.2.1 The design working life of the Collection System Circuits shall be a minimum of 30 years.

8.3 Civil Works Requirements

8.3.1 All civil works for the Collection System Circuits shall comply with the applicable specifications in Section 6.0 *(Civil Works Specifications)*.

8.3.2 Excavation by blasting for the Collection System Circuits is prohibited.

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8.3.3 Trench widths shall be kept to a minimum to allow sufficient space for equipment installation.

8.3.4 The trench bottom shall be firm for the entire length and width.

8.3.5 Trenches shall be kept free from water.

8.3.6 Conduit and cable shall not be placed on frozen ground.

8.3.7 All splice pits (if used) and backfill shall be compacted to a minimum of 85 percent (85%) of standard proctor density, unless otherwise noted on the design drawings.

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8.4 Power Cabling

8.4.1 All Collection System Circuit power cabling shall be 34.5-kV, three (3)-phase, 60 Hertz.

8.4.2 Cables should adhere to AEIC CS8-13 and the latest versions of ANSI/ICEA S-94-649 “Standard for Concentric Neutral Cables Rate 5 through 46kV” and S-97-682 “Standard for Utility Shielded Power Cables Rated 5Through 46kV.

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8.4.3 Jacketed, single-conductor, appropriately sized concentric neutral, insulated medium-voltage underground distribution power cable insulated with EPR shall be used. All underground Collection System Circuit power cabling shall be supplied with a minimum of 100 percent (100%) insulation that meets or exceeds all requirements of applicable AEIC, IEEE, ICEA, NEMA, and UL standards.

8.4.4 Notwithstanding the following sentence, all underground Collection System Circuit cabling shall be direct buried at a depth of at least 42 inches below grade. All crossings, including road and utility crossings, shall be installed in conduit and buried at a depth of at least 48 inches below grade.

8.4.5 All Collection System Circuit cables shall be UL listed.

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8.4.6 Collection system Circuit cable shall be of a discharge-free design and suitable for direct burial, installation in duct and exposure to sunlight on an alternating current, three-phase, 34.5-kV nominal, 60-Hertz power system.

8.4.7 Allowable conductor sizes are 1/0 AWG through 1250 kcmil. Sites should be limited to two or three sizes of cable for ease of installation.

8.4.8 All central conductors shall be Class B stranded. No more than one (1) conductor per cable shall be allowed. Conductor material shall be aluminum or copper.

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8.4.9 A sufficient amount of cable slack shall be provided to allow installation of elbows and termination of the cables to the appropriate junction box and/or Wind Turbine Generator switchgear terminal and permit ready disconnection of the elbows and mounting on the parking stands. Such slack shall allow for the installation / service disconnection of connectors, dead breaks, and other similar devices.

8.4.10 Excess slack shall be provided to allow re-termination in the event of failure. The excess slack at each Wind Turbine Generator location shall be in the form of a maintenance loop. Sufficient cable length shall be provided such that the cables may be re-terminated at least two (2) times after installation.

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8.4.11 All Collection System Circuit power cabling shall be provided with terminators and labels. Labels shall be permanently attached at both ends. Labels shall be sequentially numbered.

8.4.12 If underground splices are permitted by Owner, underground splices shall be identified using a domed post installed on the surface at the point of the splice (the domed post shall be offset ten (10) feet from the plane of the collector line on a plane that is perpendicular to the plane of the collector line), splices shall only be performed by a skilled, qualified craft worker, and all underground splice work shall be videotaped; the coordinates of each splice shall be recorded and noted within the As-Built Drawings.

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8.4.13 Bedding material shall be installed around all buried Collection System Circuits to provide physical and/or thermal protection for buried cable. All trench bedding and/or backfill materials shall be screened and visually inspected for materials in excess of two (2) inches. All bedding and/or backfill material shall be composed of materials that are native to the Project Site. Such materials shall be free of debris, roots, organic matter, frozen matter, coal, ashes or cinders.

8.4.14 Cable marking tape shall be furnished and installed in all trenches. Such tape shall be metallic and detectable. Marking table shall be placed 12 to 18 inches above cable.

8.4.15 Excessive bending of cabling shall be avoided, and the manufacturer recommended bending radius shall not be exceeded.

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8.4.16 All crossings, including road and utility crossings, shall be marked on each side using a cable marker.

8.4.17 Domed posts shall be placed along the underground cable trench at the following locations:

(1) All crossings (road, pipeline);

(2) Every underground splice location (see <u>Section 8.4.12</u> above)

(3) When the path of the collector line deviates from the path of a parallel road (when a road uses an "S" turn on the side of a hill, but the collector line takes a shortcut over steep grade).

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8.4.18 BIL voltage rating: 200 kV or as approved by Owner on a case-by-case basis.

8.4.19 Maximum short-circuit conductor temperature: 250°C.

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8.4.20 Reel management plan for all cable sizes and fiber optic cables must be created and adhered to by Seller to minimize splices. The reel management plan shall be available to owner upon request. The reel management plan shall be updated as necessary during the installation to reflect any changes or corrections to line lengths. Planned splice locations shall be reviewed and approved by owner. To minimize splices, it may be preferable to pull cable some distance through a bore provided pulling tension does not exceed manufacturer's specifications. Any anticipated cable shortages shall be brought to owner's attention immediately. Provide trenching plan ten (10) days prior to trenching activities.

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8.5 Fiber Optic Cabling

8.5.1 Fiber optic cable may be installed in the same trench as the Collection System Circuit power cabling.

8.5.2 Refer to Section 9.0 (*Communications System Specifications*) for additional requirements.

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8.6 Pad-Mount Transformers

8.6.1 If not supplied internal to the Wind Turbine Generator, each Wind Turbine Generator location shall include a medium-voltage, pad-mount transformer. Such transformer shall be sufficiently sized to allow the full Wind Turbine Generator capacity to be delivered.

8.6.2 Pad-mount transformers shall be in accordance with the requirements set forth in Table 3 (*Summary of General Requirements for Pad-Mount Transformers*) herein, at a minimum.

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Table 3: Summary of General Requirements for Pad-Mount Transformers

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Description	Value
Quantity	1 per Wind Turbine Generator
Type	Oil filled, hermetically sealed, outdoor installation
Voltage ratio	MV/LV ratio varies by connection voltage and Wind Turbine Generator
Phases	3
Windings	2 (MV, LV)
Ambient Temp Conditions	-25°C to 50°C

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Description	Value
Steady state temperature rise	65°C above ambient
Frequency	60 Hz
Impulse levels	150 kV (General), 200 kV (Windings)
Vector group	Grounded wye/delta (unless required otherwise for interconnection or WTG operation)
Harmonics	Core and laminations shall tolerate harmonic content according to THD distribution from turbine/inverter vendor

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Description	Value
Cooling	ONAN
Tapping range	±5%, 2.5% steps, manual control
Paint finish	Munsell Green
Guaranteed losses	Not used
Temperature gauge with alarm	Required (analog or digital alarm acceptable)
Pressure level indicator with alarm	Required (analog or digital alarm acceptable)

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Description	Value
Pressure relief device with alarm	Required (analog or digital alarm acceptable)
Oil sampling valve	Required (to be located on the end of the drain valve inside the LV compartment)
Filling orifice	Required
Tank ground tag	Required
Oil level indicator	Required

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Description	Value
Grounding	Solid (MV source) Un-grounded delta (LV) (Actual grounding configuration is project specific and should be coordinated between the utility requirements and the turbine vendor requirements)

8.6.3 Pad-mount transformers shall be fitted with LV breakers and in-line, medium-voltage rated, current-limiting fuse protection per phase utilizing suitably rated, oil-immersed, current-limiting fuses. The selection of these fuses shall be such as to ensure:

(1) Compliance with the requirements of C37.47, or IEC equivalent.

(2) Short circuit protection of the MV transformer winding.

(3) That degradation of the fuses or mechanical support failure does not occur as a result of the flow of repeated transformer magnetizing in-rush currents.

(4) Ease of replacement following an in-service operation.

8.6.4 Enclosure:

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(1) The pad-mount transformer shall include a fully enclosed, transformer mounted, MV and LV termination, steel cabinet, suitable for outdoor installation, as per ANSI C57.12.28. The cabinet must be so designed as to fully enclose all cable tails, cable terminations, grounding tags and transformer fittings within a tamper and rodent resistant, secure enclosure.

(2) The cabinet shall extend to floor level, fully shrouding all cable tails, having the facility for being directly bolted to the supporting concrete plinth. The cabinet depth shall be 24 inches.

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(3) The MV and LV compartments shall be partitioned such that access to each compartment is via a separate door. External access shall be available through the LV compartment door only, with access to the MV compartment door lock being available within the LV compartment. The doors shall be fitted with an all steel, robust, tamper proof, three point (i.e., top, mid, and bottom) integral locking system. Each door shall have the facility of being securely locked shut via the application of a dedicated pad lock.

(4) The transformer name plate and all transformer indication fittings (e.g., oil level indicator, oil temperature indicator) shall be located within the LV compartment, while all transformer operational fittings (e.g., tap changer switch, isolation switch etc.) shall be located within the MV compartment.

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(5) The cabinet doors shall be fitted with anti-close stays designed such that both doors can be held open at right angles. The anti-close stay design shall be sufficiently strong enough to withstand the prevailing wind conditions.

8.6.5 Foundations / vaults:

(1) Pad-mount transformers shall be installed with a fiberglass box pad.

(2) Box pads shall be installed level and plumb, and set on concrete with a rock base. Excavations shall be filled with a minimum 2,000 psi slurry mix.

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8.7 Junction Boxes

8.7.1 Junction boxes shall be stainless steel or fiberglass.

8.7.2 Junctions boxes shall be installed level and plumb, and set on concrete with a rock base, with excavations filled with a minimum 2,000 psi slurry.

8.7.3 Junction boxes shall be clearly marked with an appropriate high-voltage sign identifying the junction box number and Collection System Circuit number.

8.7.4 Junction boxes shall meet the requirements of ANSI C57.12.28, including water resistance.

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8.7.5 The coordinates of each junction box shall be recorded and noted within the As-Built Drawings.

8.7.6 Junction boxes shall be lockable with a padlock.

8.7.7 No medium-voltage cable run shall exceed 10,000 feet without a sectionalizing junction box.

8.7.8 Junction boxes are to be installed in proximity to existing roads, service roads, and project equipment easements for ease of access when servicing is required.

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8.8 Overhead Installation

8.8.1 All Collection System Circuits shall be installed underground.

8.9 Surge Arrestors

8.9.1 Surge arrestors shall be provided at the end of each string of Wind Turbine Generators. Surge arrestors shall be 35-kV class, 600A, 30kV/24.4MCOV equipment meeting the requirements of ANSI C62.11 for Station Class installation in a 60-Hertz outdoor installation.

8.9.2 Surge arrestors shall be provided in pre-molded rubber elbows.

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8.9.3 Surge arrestors shall provide overvoltage system protection in an insulated, fully shielded, submersible, dead-front device.

8.10 Grounding

8.10.1 Grounding connections at junction boxes and pad-mount transformers (if any) shall be bolted to facilitate separation of grounds for continuity testing and ground mat testing.

8.10.2 Ground rods shall be incorporated into the grounding system. Ground rods shall be copper-clad, 5/8-inch diameter, 10-foot-long rods at a minimum.

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8.10.3 Turbine Foundations shall include a grounding grid. The design and construction of the grounding system in such foundations shall meet or include the following requirements, at a minimum:

(1) Requirements set forth by Turbine Supplier.

(2) Incorporate the recommendations and minimum requirements set forth in the geotechnical engineering report.

(3) Proper grounding of equipment and structures.

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(4) Installation of adequate ground for personnel safety, including touch and step potentials (to be demonstrated by Seller via calculations in the grounding study).

(5) Proper grounding for lightning and surge protection.

(6) Incorporate local resistivity measurements.

(7) A ground resistance <= 2 Ω.

8.10.4 All local requirements and the NESC shall be adhered to in the grounding design and construction.

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8.10.5 Meteorological towers shall be independently grounded; meteorological tower grounding shall not be interconnected to the Wind Turbine Generator grounding system.

8.11 Bollards

8.11.1 Bollards shall be installed around every junction box and pad-mount transformer (if any), respectively. Bollards shall be installed no closer than four (4) feet from the junction box or pad-mount transformer (if any).

8.11.2 Bollards shall be a minimum three (3)-inch diameter steel pipe, concrete filled for equipment protection, painted safety yellow, and extend five (5) feet above grade.

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8.11.3 Bollards shall include two (2) embedded galvanized steel eye bolts in each bollard at an elevation of forty-two (42) inches above grade that is sufficient to allow for the connection of lengths of chain.

8.12 Conduit

8.12.1 Conduit size shall be in accordance with ANSI / NFPA 70, at a minimum.

8.12.2 The location of all conduit shall be surveyed and recorded within the As-Built Drawings.

8.12.3 Non-metallic conduit shall be protected from sunlight.

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8.12.4 The interior surface of all conduits shall be smooth to prevent damage to the cables. When cable is pulled into a duct, a suitable pulling lubricant shall be used.

8.12.5 HDPE conduit shall be SDR13.5 or heavier if needed to avoid damage when pulling into the bored hole. HDPE shall be one continuous length or connected with fused joints.

8.12.6 Use suitable temporary plugs or caps to protect installed conduit against entrance of dirt, moisture, and debris.

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8.12.7 All above-ground power and communications cabling shall be installed in conduit. All below grade crossings, including road and utility crossings, shall be installed in conduit. Conduit shall be installed from each Wind Turbine Generator to each pad-mount transformer (if any).

8.12.8 All conduit materials required shall be furnished new and undamaged in accordance with the following requirements, at a minimum:

(1) Duct: polyvinyl chloride, Schedule 40 PVC in accordance with NEMA TC-2.

(2) Couplings: plastic, for use with duct previously specified and “Duct-to-steel” adapters as required, including joint cement.

(3) Spacers: plastic high impact, interlocking, base and intermediate type

(4) Factory bends and sweeps: Schedule 40 PVC, 3-foot minimum radius (or greater if required to not violate the minimum bending radius of the cable being installed in it).

(5) End bells: plastic.

(6) Plugs: plastic, high impact, tapered to fit end bell provided.

(7) Duct binder: hemp or sisal twine coupling.

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8.13 Connectors and Fittings

8.13.1 Connectors and fittings shall be of the proper size and design to assure permanent, secure, and low-resistance connections.

8.13.2 Connectors and fittings shall be all welded or swaged type for aluminum tubing connections and shear bolt or puddle-welded type for aluminum cable connections.

8.13.3 Tubular aluminum welded or swaged splicing sleeves shall be used for necessary splices in aluminum tubing.

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8.13.4 For connections between aluminum tubing and cable, use a welded or swaged tubing-to-terminal pad connector and a compression-type cable-to-terminal pad connector on the end of the cable.

8.13.5 Flexible terminal types shall be furnished where tubing connections are made to bushing studs of transformers, breakers, and other equipment. Expansion-type connectors shall be used with internal ball-type alignment guides.

8.13.6 For electrical pad connections, stainless steel hex-bolts, hex-nuts, flat washers, and Belleville washers shall be provided. Belleville washers shall have a minimum compression rating of 4,000 pounds. Bolt lengths shall be sized to provide minimal projection beyond hex nut to prevent excessive noise due to corona, but entire hex nut must be engaged.

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8.13.7 For copper to aluminum connections, stainless steel bolts shall be used for copper to aluminum bar or rod connections and faced or sleeved aluminum connectors shall be used for cable connections.

8.13.8 All connections between stranded aluminum or ACSR-type conductors and equipment stud terminals shall be made with a stud-to-pad type stud connector and a compression-type cable-to-pad type conductor termination.

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8.13.9 All dead-end fittings, terminals, splices, and other similar items for ACSR and other types of stranded aluminum conductor shall be tubular compression type fittings. In no case shall any type of stranded aluminum conductors be used with bolted or clamp-type fittings, except for through-type connections to surge arresters on transformers. At least five percent (5%) extra dead-end body filler plugs for each type used shall be provided.

8.13.10 Stranded and tubular copper bus work, where used, shall have connectors and fittings with a minimum of four (4) bolts or two (2) "U"-bolts on each side of each joint.

8.13.11 Fittings shall develop the full strength of the conductor and shall be capable of carrying the full current capacity of the conductor.

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8.13.12 Fittings for shield wire dead ends, splices, and taps shall conform to the following:

(1) Shield wire dead-end fittings shall be compression type with bolted jumper connection. Shield wire insulators shall be located as indicated.

(2) Compression sleeves for shield wire tension splices shall be used which will develop at least ninety percent (90%) of shield wire strength.

8.13.13 “Alcoa Filler Compound” shall be furnished for application in conductor dead-end bodies and Alcoa No. 3 Electrical Joint Compound (Alnox) or approved equal for aluminum connections. At least five percent (5%) overage shall be furnished for all filler compounds furnished.

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8.13.14 Bus support clamps for rigid bus shall be fixed or slip type as required to firmly support the bus but allow for temperature expansion and contraction.

8.13.15 Bolted ground connectors and flexible type grounding jumpers shall be provided for operating handles of disconnect switches.

8.13.16 All transformer and oil circuit breaker stud connectors shall be tinned bronze material.

8.13.17 All grounding connectors in contact with galvanized structures shall be tinned bronze material.

8.13.18 All compression tees are to be open type compression run and 4-hole NEMA pad tap.

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8.13.19 Bundled jumpers from power circuit breakers to disconnect switches shall be furnished.

8.13.20 For disconnect switch connections, NEMA-type terminal pad connectors shall be provided with at least four (4) bolts.

8.13.21 All materials furnished shall have mechanical and electrical ratings, types, sizes, and other similar items coordinated with adjacent hardware and fittings.

8.13.22 All hardware furnished shall be static-free type.

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8.13.23 Ground jumpers shall be provided direct from switch-operator ground pad to ground connector on operating handle or mechanism of switch. No other ground connection is to be made to pad. Ground mat(s) shall be furnished at each switch-operator.

8.13.24 Bus grounding stud, welded or swaged, shall be furnished as indicated.

8.13.25 Wire guides and bundle conductor spacers shall be provided as required and indicated to maintain adequate clearance and support on cable jumpers, connections, and overhead lines.

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8.14 Miscellaneous Material

8.14.1 Cable accessories, terminators, dead front, load break and/or dead break elbows shall be designed and manufactured for the cable to be utilized and rated 600-amp for outdoor 34.5-kV use.

8.14.2 Dead front, load break, and/or dead break elbows shall be supplied with test ports.

8.14.3 Cable fault indicators shall be installed. The remote head shall be mounted in the cabinet wall to allow viewing from outside the cabinet. Fault indicators shall be installed at no more than every third Wind Turbine Generator location.

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8.14.4 Miscellaneous wire material such as armor rod, line guard, spacers, dampers, tension splices, compression sleeves, and jumper terminals shall be provided.

8.15 Testing and Quality Control

8.15.1 All testing described herein shall be performed by an independent, experienced third party. Seller shall notify Owner of all testing schedules at least 30 days in advance of testing activities.

8.15.2 All Collection System Circuits shall be tested to demonstrate they meet stated design criteria and are fit for purpose.

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8.15.3 Collection System Circuit testing shall include the following, at a minimum:

(1) All testing specified in the Applicable Standards, including NETA.

(2) All testing reasonably recommended or required by the applicable equipment suppliers.

(3) All exposed cable sections shall be visually inspected for physical damage or manufacturing defects. Such inspections shall be performed prior to and during installation.

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(4) Resistance testing on grounding grid at each Wind Turbine Generator location and junction box.

(5) Megger test of all 34.5-kV Wind Turbine Generator cables.

(6) Very low frequency ("**VLF**") test of all 34.5-kV power cabling.

(7) Final continuity tests after completion of all system connections. Acceptable continuity tests shall include a Megger test or VLF test at 100 percent of rated voltage.

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(8) Partial discharge testing on each splice. All partial discharge testing shall be performed at a minimum of 200 percent of the rated voltage of the cable and at 60 Hertz. All partial discharge testing shall be performed following installation of the cabling, but prior to energization.

(9) Compaction testing shall be verified at a minimum of every 1,000 feet and at every splice pit location.

(10) Communications system testing according to Section 9.0 (*Communications System Specifications*).

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(11) Pad-mount transformer minimum testing:

(a) Transformer turns ratio ("**TTR**") on all tap positions.

(b) Insulation resistance test (i.e., Megger), including winding-to-winding and winding-to-ground measurements.

(c) Winding resistance test.

(d) Insulation power factor test.

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(e) Oil testing prior to energization and at least 30 days following energization, respectively.

(f) No-load and load loss test.

(g) Temperature rise test, to be performed on one (1) randomly selected unit.

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(h) Dissolved gas analysis, to be performed on every purchased unit, plus one (1) additional DGA test before the temperature rise test listed above. Any costs incurred by removing or replacing transformers due to abnormal DGA results or any delay due to removing or replacing transformers will be the responsibility of the Seller.

8.15.4 Copies of testing reports shall be submitted to Owner within 10 days of completing such test. Testing reports shall include a summary of testing procedures and acceptance criteria.

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9.0 COMMUNICATIONS SYSTEM SPECIFICATIONS

9.1 General Provisions

9.1.1 The Communications System shall be designed with data continuity and reliability as priority.

9.1.2 All monitoring and control devices and systems shall be suitably zone protected against lightning electromagnetic impulses in accordance with IEEE C37.90.1.

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9.1.3 The Communications System shall be compliant with all Applicable Standards, including NERC Functional Model Registered Entity function, NERC Reliability Standards, Regional Entity Standards, approved regional variances, and/or FERC Orders as defined by NERC/FERC orders and Owner interpretation. Further, the Communications System shall comply and be designed to work in accordance with applicable system operator approved protocols, operating guides, standards, business practice manuals, and/or approved rules. In so far as either a state utility commission or provincial authority has instituted additional regulations, the communications system should be designed to accommodate where no conflict exists with NERC or FERC. Design should include parameters for operating under conditions specified by rules stated hereto as well as capability to function on an evidentiary basis.

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9.1.4 The design deliverables shall include but not limited to, integrated control and monitoring systems and communication networks schedule, description and technical specifications of monitoring and control systems, SCADA architecture, fiber optic design, SCADA points list, bill of materials, fiber patch panel drawings, logic diagrams and functional control diagrams.

9.1.5 All Communications System design and construction shall conform to the Turbine Supplier's requirements.

9.2 Design Working Life

9.2.1 The design working life of the Communications System equipment shall be a minimum of 30 years.

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9.3 Civil Works Requirements

9.3.1 All civil works for the Communications System shall comply with the applicable specifications in Section 6.0 *(Civil Works Specifications)*.

9.3.2 Excavation by blasting for the Communications System is prohibited.

9.3.3 Trench widths shall be kept to a minimum to allow sufficient space for equipment installation.

9.3.4 The trench bottom shall be firm for the entire length and width.

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9.3.5 Trenches shall be kept free from water.

9.3.6 Conduit and cable shall not be placed on frozen ground.

9.3.7 All splice pits (if used) and backfill shall be compacted to a minimum of 85 percent (85%) of standard proctor density, unless otherwise noted on the design drawings.

9.3.8 Backfill shall be free of debris and sharp objects.

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9.4 System Functionality

9.4.1 The Control and Monitoring systems shall be designed to meet the Turbine Vendor's drawings and specifications, Interconnection Agreement requirements, PPA requirements and Owner's design guidelines and standards.

9.4.2 The Communications System shall be capable of centrally and remotely monitoring, controlling, and recording the performance of the permanent meteorological towers, Wind Turbine Generators, wind turbine supplier SCADA and other critical sensors.

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9.4.3 The Communications System design shall include configuration files and a comprehensive data points list and protocol specification for communications between all Project components requiring communications, data transfer, and control monitoring using the fiber network integrated into the Communications System. Such configuration files shall have the ability to be configured by Owner, and Seller shall furnish development application software for each configurable device.

9.4.4 The Communications System shall include the necessary equipment (hardware and software) for the exchange of signals with Project Substation equipment to support grid monitoring. Seller is responsible to provide design and drawings, supply, install and test all necessary Ethernet and fiber optic cable networks to maintain all communications.

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9.4.5 The Communications System shall include the necessary equipment (hardware and software) for the exchange of signals with the permanent meteorological towers to support data monitoring.

9.4.6 The Communications System shall include the necessary equipment (hardware and software) for the exchange of signals and integration of any required reactive compensation devices (e.g., capacitor banks, reactors).

9.4.7 Remote monitoring, control, and reporting of the Communications System equipment shall be available through a web-based configuration accessible from a standard internet browser. The system shall be connected to the internet at all times and shall remain behind an Owner-managed firewall.

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(1) Owner shall have unlimited access to Project data through the web-based system.

(2) Owner shall have no limitation on number of users through web-based system.

(3) Varying levels of access to the web-based system shall be permitted through secure login and user permissions.

9.4.8 Upon loss of utility power interconnection or failure of utility power, restart of the instrumentation and control system to a fully functioning condition should require no local manual operations. Synchronization shall be performed automatically.

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9.4.9 The equipment IP addresses networking security shall be aligned to Owner standards and recommendations

9.5 Fiber Network

9.5.1 Fiber optic cable shall be installed in the same trench as the Collection System Circuit power cabling and will be used for all turbine-to-turbine runs, turbine to meteorological tower runs and for all homeruns to the site substation

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9.5.2 When fiber cables are installed in a trench, the fiber cable shall be placed in conduit or continuous innerduct; the fiber cable shall be rated for underground use; and there shall be a suitable locating cable installed in the innerduct/conduit. Innerduct shall have a minimum diameter of 1.25 inches.

9.5.3 Fiber optic shall be separated from any power cables when co-located in a trench.

9.5.4 All fiber cables shall consist of a minimum of 12-strand multi/single mode fiber. All fiber runs greater than one (1) mile in length shall be single-mode fiber, or as otherwise required to maintain a minimum of at least one (1) gigabyte bandwidth throughout the backbone of the system.

9.5.5 If metallic armored fiber optic cable is used, protection from induced voltage shall be installed.

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9.5.6 All fiber cables shall be designed with a minimum of fifty percent (50%) spare fiber, and at least an additional six (6) feet of fiber cable supplied at each end.

9.5.7 All communications cables, including fiber cables, shall be appropriately labeled with a permanently attached label at both ends. Labels shall be sequentially numbered.

9.5.8 The fiber system shall be designed for a minimum of five (5) dB system margin.

9.5.9 The fiber system design shall be a fiber ring topology or a “daisy-chained” system.

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9.5.10 Conduits for fiber entry into the Wind Turbine Generator areas shall include a pull string for pulling the cable.

9.5.11 All splices shall be fusion splices.

9.5.12 Maximum attenuation:

(1) 0.36 dB/km at 1310 nm.

(2) 0.22 dB/km at 1550 nm.

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9.5.13 Terminations shall be completed with either an approved fiber optic pigtail kit or with approved mechanical connectors and an approved fanout kit.

9.5.14 Data collection loops shall be designed so that a loss of a power circuit does not cause a loss of data collection from the Turbines during the power outage.

9.6 Monitoring and Control Requirements

9.6.1 Design and installation of the Communications System shall be provided with all hardware, telemetry, communication and other requirements as required by the interconnection utility.

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9.6.2 The Wind Turbine Communications System shall be provided with the following supervisory screens, at a minimum.

(1) Wind Turbine Generator status, including the following:

(a) Wind Turbine Generator status (e.g., online, offline for maintenance, curtailed) for each unit.

(b) Wind Turbine Generator generation level for each unit.

(c) Total Project power.

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(d) Atmospheric conditions.

(2) Permanent Meteorological Tower Data:

(a) Wind Speed

(b) Wind Direction

(c) Turbulence

(d) Temperature

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(e) Pressure

9.6.3 The Wind Turbine Supplier Power Plant Controller shall include control functionality for the following, at a minimum:

(1) Active power.

(2) Reactive power.

(3) Frequency.

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(4) Voltage.

(5) Power factor.

(6) Noise-related operations.

9.6.4 Fault notification shall be provided through real-time text messaging or e-mail alerts, as determined by Owner. Fault notification messages and recipients shall be specified by Owner.

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9.7 Reporting and Storage Requirements

9.7.1 All reporting shall be in Generation Availability Data System ("**GADS**"), wind format.

9.7.2 SCADA system reporting shall include, at a minimum, the following for the permanent meteorological towers and Wind Turbine Generators:

(1) Performance parameters, availability, operation counters, faults, and alarms.

(2) Browsing and filtering of historical data.

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(3) Creation of pre-defined and custom reports.

(4) Interface and operational procedure for interaction with existing Owner assets as defined by Owner

9.7.3 All stored data and generated reports shall be exportable as ASCII and Microsoft Excel formats.

9.7.4 The system shall not permit unwarranted tampering with or changing of raw data or functionality.

9.7.5 Seller shall design and provide connectivity and data sharing form/to the Interconnection utility.

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9.8 Data Storage Requirements

9.8.1 All data monitored by the Communications System shall be recorded and stored. Local controllers shall have sufficient buffer for at least 30 days of data storage in the event of power loss.

9.8.2 Historical data shall be stored in an SQL database or Owner-approved equivalent for the life of the Project. Data shall be stored in the database as no higher than 1-minute averages, with accompanying statistical values including, but not limited to, minima, maxima, and standard deviation. All data shall be retrievable.

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9.9 Data Integration

9.9.1 Seller shall include the design with the standardization and synchronization required by the Owner's control center or Plant SCADA to integrate the new wind site including naming convention, alarms configuration, point definitions, HMI screens, ISO, PPA requirements, WTG models, Substation model, etc.

9.9.2 Provide all hardware and software necessary to interface and transmit all required monitoring and control data from/to substation Owner's SCADA system (RTAC), WF SCADA and the other communication devices of Owner's Control Center.

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9.9.3 Testing and commissioning of the integration shall be included as a milestone on the plan schedule.

9.10 Testing and Quality Control

9.10.1 All testing described herein shall be performed by an independent, experienced third party. Seller shall notify Owner of all testing schedules at least 30 days in advance of testing activities.

9.10.2 All communications system equipment shall be tested to demonstrate it meets stated design criteria and is fit for purpose.

9.10.3 Communications system testing shall include the following, at a minimum:

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(1) All testing specified in the Applicable Standards, including NETA.

(2) All testing reasonably recommended or required by the applicable equipment suppliers.

(3) All exposed cable sections shall be visually inspected for physical damage or manufacturing defects. Such inspections shall be performed prior to and during installation.

(4) Verify all alarms, indications and analog quantities are communicated and received properly by the RTU and displayed correctly on the HMI.

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(5) Verify all communication channels (intra- and inter-Project Substation), including Project Substation LAN, operate as expected.

(6) Verify fiber optic system performance (power losses, splice or connector losses, etc.) using optical domain reflectometer ("**OTDR**"). All such testing shall be done with an OTDR in both directions of the strands. For single-mode fiber, test both directions at 1310 nm and 1550 nm.

(7) All fiber optic cable shall be visually inspected and OTDR-tested prior to installation. OTDR testing shall be coordinated with the Substation Communication System testing.

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(8) Provide system functionality and compatibility at the control room / O&M Building.

(9) Test each cable and strand on every fiber run from termination to termination.

(10) Provide entire Project Site testing to ensure proper operation of all data points into the component gateways and testing of all data points provided to third parties with that party.

9.10.4 Copies of testing reports shall be submitted to Owner within 10 days of completing such test. Testing reports shall include a summary of testing procedures and acceptance criteria.

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10.0 ERROR! REFERENCE SOURCE NOT FOUND.**WIND TURBINE GENERATOR**

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OFFLOADING AND ERECTION SPECIFICATIONS

10.1 General Provisions

10.1.1 Wind Turbine Generator erection shall follow a "reference" approach, wherein complete erection of the first Wind Turbine Generator shall occur prior to erecting any subsequent Wind Turbine Generators. Such initial Wind Turbine Generator erection shall be reviewed and approved by Owner and the Turbine Supplier before continuing Wind Turbine Generator erection activities, and such approval shall not be unreasonably withheld or delayed. The "reference" Wind Turbine Generator, once accepted, shall serve as a model finished product for all subsequent Wind Turbine Generator erections.

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10.1.2 Wind days shall be actively minimized by scheduling Wind Turbine Generator erection activities at times of day when wind speeds are projected to be lowest.

10.1.3 Wind Turbine Generators shall be erected such that the tower door orientation is downwind of the of the prevailing wind direction.

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10.1.4 Each crane, including the main erection crane(s) and any base/mid crane(s), shall be equipped with redundant anemometers at Wind Turbine Generator hub height for measurement of wind speeds. Wind speeds shall be recorded from these instruments prior to the start of all lifting activities, and measurements shall be recorded on a Seller-furnished data logger. Handheld anemometers shall also be furnished to determine safe wind speeds for all other operations. All such wind data shall be shared with Owner upon request.

10.1.5 Wind Turbine Generator cleaning:

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(1) All exterior Wind Turbine Generator surfaces shall be cleaned via pressure washing; light brushing with mild, biodegradable detergent shall be performed as necessary. Following cleaning, all surfaces shall appear clean at a minimum distance of 50 feet.

(2) All washing, including runoff, shall be in accordance with the applicable permits and other Requirements.

(3) Seller shall maintain cleanliness in the erected towers during performance of the Work. Final cleaning shall be performed prior to the Mechanical Completion walk down.

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10.2 Procedures

10.2.1 Transportation, offloading, storage, and erection of Wind Turbine Generators shall be performed in accordance with the applicable instructions provided by the Turbine Supplier and the specifications provided herein, including critical lift plans.

10.2.2 Seller is responsible for supplying all straw bales, anchors, tie downs and other general supplies for staging Turbine components at Turbine foundation sites.

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10.2.3 Seller is responsible to provide support to Turbine Vendor’s component delivery trucks, assist with breakdown of shipping fixtures and trailers, and assist with loading of component shipping fixtures and hardware onto such trucks for removal from the Project.

10.2.4 Cooperating with the Owner and Supplier to mitigate demurrage to the maximum extent practical. In the event, the Seller is directly responsible for the demurrage the Owner shall cooperate to mitigate the demurrage to match the delivery cadence of the WTG Supplier to the maximum extent practical for the Seller to minimize additional demurrage.

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10.2.5 Seller is responsible unwrapping or removing protective coverings on Turbine Equipment as a part of the inspection and rewrapping and replacing any protective coverings on Turbine Equipment after the inspection.

10.2.6 If electrical or other components are sealed prior to arrival and the seal must be broken to meet inspection and installation requirements, Seller will re-cover such components. Seller will reseal using methods other than shrink wrap.

10.2.7 All rigging shall be stamped, load tested and inspected regularly in accordance with OSHA requirements, including any rigging supplied by Turbine Vendor.

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10.2.8 The Seller shall assist trucking company with breakdown and preparation for return to port of the shipping trailers including providing support with breakdown of shipping fixtures, loading the specialty supports, cradles and shipping fixtures for return to vendor.

10.2.9 Seller shall inspect all Turbine components for damage upon arrival at the Site and report such damage to Owner within twenty-four (24) hours of arrival on the Project Site.

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10.2.10 Seller shall maintain a detailed inventory of all Turbine components received, inspected, unloaded and installed at all times. Seller is responsible for collecting, organizing by final placement, and electronically scanning all Material Receiving Reports, Bills of Material, and/or packing lists in the job books as appropriate. Seller shall note the date and time of receipt, condition, and quantity of all materials received.

10.2.11 Seller shall use inspection reports supplied by the Turbine Vendor and Owner for reporting on the condition of all components received.

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10.2.12 Seller shall track times and dates of component arrival, assist in determining component damage upon receipt, and assist in coordination of repairs prior to components being installed.

10.2.13 Mechanical completion of each Wind Turbine Generator, including documentation of progress on Turbine Supplier-furnished forms, shall be successfully achieved in accordance with the instructions set forth in the installation manual and mechanical completion checklists provided by the Turbine Supplier.

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10.2.14 All rigging utilized for the transportation, offloading, or erection of Wind Turbine Generators shall be rated; inspected daily and monthly; and load tested in accordance with Applicable Standards or other more rigorous requirements set forth in the HSSE Plan, as defined in this specification. Inspection reports shall be maintained at the Project Site and available for review by Owner.

10.2.15 Primary delivery point is the Turbine Pad adjacent to the WTG foundation.

10.2.16 Create lift plans for all crane lifts. A copy of the lift plans shall be kept in the crane at all times. At a minimum, the lift plan shall be consulted before the first pick of its type for the crane for that day.

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10.2.17 Seller shall install stairs, tower ladders, steel tubular towers, safety wires, platforms (and cut switchgear service penetrations in basement platforms), platform extensions, lights, switchgear, meteorological and support equipment and all tower and appurtenances. Seller shall install locks on access doors once tower installation has commenced.

10.2.18 Seller is responsible for supplying grease and bolt caps for exterior foundation anchor bolts. Owner or Turbine Vendor shall install grease and bolt caps as per the Turbine Vendor specifications.

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10.2.19 Seller is responsible for all installation tooling. This includes, but is not limited to, Skidmore testing equipment, hydraulic torque wrenches, hand tools, etc. Testing certificates and calibration records for these tools shall be maintained on site and made available for inspection by Owner and Turbine Vendor.

10.2.20 Seller shall supply labor and equipment to perform touch up painting as required and in accordance with Turbine Vendor's instructions.

10.2.21 Seller shall supply and install permanent FAA lights at designated locations including wiring and field testing. FAA lights are to be installed per the FAA approved lighting plan.

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10.2.22 Seller shall procure and install temporary FAA lights on Owner supplied mounting brackets. Temporary FAA lights shall be installed on those Turbines required to have permanent FAA lights and shall remain operational until the Turbines are energized.

10.2.23 Supply and install concrete footings at exterior WTG stairs, including grounding for stairs.

10.2.24 Providing all temporary surfaces (mats, hard standing, etc.) for safe and efficient offload, storage and erection, in accordance with crane manufacturer and WTG Supplier requirements.

10.2.25 Coordinating all crane crossing of temporary overhead and underground utilities. This includes all necessary crane break downs that may be needed.

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10.2.26 All offloading and installation of wind turbine components shall be completed during safe working wind speeds.

10.2.27 Seller shall provide standstill maintenance (i.e., freewheeling) of WTGs during construction, if necessary.

10.2.28 Seller shall provide (via Turbine Vendor) technical advisors at the Project Site to provide advice, consultation (including answering questions), and clarification regarding the Turbine Vendor manuals, specifications, and other WTG-related technical documents. Such technical advisors shall be available during the loading, offloading, assembly, erection, installation, storage, and achievement of mechanical completion of the Turbine Equipment.

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10.2.29

10.3 Testing and Quality Control

10.3.1 All testing described herein shall be performed by an independent, experienced third party. Seller shall notify Owner of all testing schedules at least 30 days in advance of testing activities.

10.3.2 Structural bolting will be installed in accordance with the applicable specification, design drawing, and ASTM/AISC standards.

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10.3.3 Flange bolt torque requirements will be specified by the foundation structural design engineer. All flange bolts may be electronic or hydraulic torque wrench. All torque tools are to be inspected daily.

10.3.4 Bolts, washers and nuts required a visual check prior to final tightening to ensure all have been properly installed. After each bolt has been tightened, a torque mark must be made on bolt to ensure bolt has been torqued to specified value.

10.3.5 After final torque has been completed, a 10% check of flange bolts must be done. If a single bolt moves more than 20% (1/2 Flat Movement) during the check, a 100% re-torque is required. Upon completion bolts must be remarked for torque.

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10.3.6 After verifying proper installation of blades, bolts, and washers' blades must be tensioned to specified value. The blade studs will be tensioned in accordance with the WTG manufacturer's specified procedure

10.3.7 All Wind Turbine Generator electrical wiring shall be tested to demonstrate it meets stated design criteria and is fit for purpose.

10.3.8 Wind Turbine Generator testing shall include the following, at a minimum:

(1) All testing specified in the Applicable Standards, including NETA.

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(2) All testing reasonably recommended or required by the applicable equipment suppliers.

(3) Structural works testing for grout properties, in accordance with Section 7.0 (*Structural Works Specifications*) herein.

(4) All exposed cable sections shall be visually inspected for physical damage or manufacturing defects. Such inspections shall be performed prior to and during installation.

(5) Megger test of all 34.5-kV Wind Turbine Generator cables.

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(6) Final continuity tests after completion of all system connections. Acceptable continuity tests shall include a Megger test or VLF test at 100 percent of rated voltage.

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11.0 METEOROLOGICAL TOWER SPECIFICATIONS

11.1 General Provisions

11.1.1 References to “meteorological towers” herein shall be understood to include both permanent and temporary meteorological towers, unless explicitly stated otherwise.

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11.1.2 Meteorological towers shall be sized and constructed appropriately to allow instrumentation to be placed at Wind Turbine Generator hub height. A side-by-side (i.e., goalpost) anemometer orientation, as shown in IEC 61400-12-1, shall be utilized; such side-by-side anemometers will be mounted at Wind Turbine Generator hub height on each permanent meteorological tower. Similarly, any height provided by a foundation for the temporary meteorological tower shall be taken into consideration relative to the final constructed hub height of the Wind Turbine Generator.

11.1.3 Meteorological towers shall be designed and fabricated to the latest EIA/TIA-222-FS Structural Standards for Steel Antenna Towers and Antenna Supporting Structures and according to other Applicable Standards.

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11.1.4 Meteorological towers shall be painted / marked in accordance with the Applicable Standards and applicable permits.

11.1.5 All meteorological tower designs, including foundation design, shall be approved by Owner prior to procurement of such equipment or materials.

11.1.6 All meteorological towers shall incorporate a safety climb cable.

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11.1.7 Sufficient grounding and lightning protection per IEC 61400-12 shall be installed on all meteorological towers, including lightning finials. Meteorological towers shall be independently grounded; meteorological tower grounding shall not be interconnected to the Wind Turbine Generator grounding system.

11.1.8 All anemometers shall be type “first class”, heated sensors. All anemometers shall be calibrated in accordance with MEASNET’s Anemometer Calibration Procedure and performed by a MEASNET-certified organization.

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11.2 Design Working Life

11.2.1 The design working life of the permanent meteorological tower equipment shall be a minimum of 30 years.

11.3 Civil Works Requirements

11.3.1 All civil works for the meteorological towers shall comply with the applicable specifications in Section 6.0 (*Civil Works Specifications*).

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11.4 Structural Works Requirements

11.4.1 All meteorological tower foundations shall be designed and constructed in accordance with the applicable structural works specifications in Section 7.0 (*Structural Works Specifications*).

11.5 Temporary Meteorological Towers

11.5.1 Temporary meteorological towers shall be either self-supported (non-guyed) or guy-wire-supported, galvanized lattice structures, each designed and certified for maximum wind and ice loading for the Project Site conditions.

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11.5.2 Temporary meteorological towers shall be installed at a location at the Project Site to be specified by Owner. Care shall be taken by Seller to ensure that the constructed elevation of the temporary meteorological towers and the hub height anemometers is identical to the final hub height elevation of the respective Wind Turbine Generator at that location.

11.5.3 Temporary meteorological towers shall not be fenced.

11.5.4 All guy wires shall include avian protection, including bird diverters.

11.5.5 Each temporary meteorological tower shall include the following minimum instruments:

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(1) Two (2) cup anemometers at Wind Turbine Generator hub height in a goal-post configuration.

(2) One (1) cup anemometer at mid-blade height.

(3) One (1) cup anemometer at lower-blade height.

11.5.6 Each temporary meteorological tower shall include the following auxiliary equipment:

(1) One (1) NEMA 4X fiberglass enclosure for data logger and auxiliary equipment.

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(2) One (1) data logger. Each shall be Campbell Scientific, model CR1000.

(3) One (1) radio. Each shall be Campbell Scientific, model 401A.

(4) Signal surge protection terminals. Each shall be Phoenix Contact, type Termitrab 24V.

11.5.7 Each temporary meteorological tower shall include the following other equipment:

(1) One (1) obstruction light, including mounting bracket. The light shall be mounted below the goal post

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(2) Grounding and lightning protection, including lightning finial.

(3) Instrumentation booms.

(4) Cabling.

(5) H-frame equipment rack.

(6) Safety climb cable.

(7) Temporary power supply for data logger and aviation lights.

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11.6 Permanent Meteorological Towers

11.6.1 Permanent meteorological towers shall be self-supported (non-guyed), galvanized lattice structures, each designed and certified for maximum wind and ice loading for the particular Project Site conditions.

11.6.2 Permanent meteorological towers shall be installed at a location at the Project Site to be specified by Owner.

11.6.3 Seller shall design, furnish, construct, and install permanent meteorological towers according to the following schedule and based on the number of WTGs installed.

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No. of WTGs Installed	No. of Permanent Met Towers
Less than 50	2
51 to 100	4
101 to 150	6
151 to 200	8
201 to 250	10
251 to 300	12

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11.6.4 All permanent meteorological tower locations shall be fenced.

(1) Fencing shall be placed to allow a minimum of ten (10) feet of free space around the tower base.

(2) At least one (1) walk gate shall be installed at each permanent meteorological tower. The walk gate shall be a lockable, single-hung, 4-foot-wide, swing-gate for personnel access.

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(3) All fencing and gates shall comply with the minimum specifications in Section 3.11 (*Fencing, Walls, and Gates*) herein.

11.6.5 Each permanent meteorological tower shall include the following instruments:

(1) Two (2) cup anemometers at Wind Turbine Generator hub height in a goal-post configuration.

(2) One (1) cup anemometer at mid-blade height.

(3) One (1) cup anemometer at lower-blade height.

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(4) One (1) vertical anemometer near Wind Turbine Generator hub height (below goal post).

(5) Two (2) wind direction sensors near Wind Turbine Generator hub height (below goal post).

(6) One (1) temperature / relative humidity sensor with radiation shields near Wind Turbine Generator hub height (below goal post).

(7) One (1) barometric pressure sensor near Wind Turbine Generator hub height (below goal post).

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(8) One (1) temperature / relative humidity sensor with radiation shields at 10 meters above ground level.

(9) One (1) precipitation sensor.

11.6.6 Each permanent meteorological tower shall include the following auxiliary equipment:

(1) One (1) NEMA4X fiberglass enclosure for data logger and auxiliary equipment.

(2) One (1) data logger. Each shall be Campbell Scientific

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(3) Signal surge protection terminals. Each shall be Phoenix Contact, type Termitrab 24V.

11.6.7 Each permanent meteorological tower shall include the following other equipment:

(1) Two (2) obstruction lights, including top- and mid-level, and including mounting brackets. The top-level light shall be mounted below the goal post.

(2) Grounding and lightning protection, including lightning finial.

(3) Instrumentation booms.

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(4) Cabling.

(5) H-frame equipment rack.

(6) Fiber patch panel.

(7) Safety climb cable.

(8) Temporary power supply for data logger and aviation lights (if a power performance test (i.e., power curve test) is performed.)

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11.7 Power Performance Testing Requirements

11.7.1 Proposals shall include an option price for a power performance test (i.e., power curve test).

11.7.2 Owner can request a power performance test be performed in the time period between the commissioning of the first Wind Turbine Generator and one year after the Project's commercial operation date. If a power performance test is performed, installation of the meteorological towers shall be installed in a commercially reasonable time after the owner has made the request and the test shall meet all requirements of the Wind Turbine Generator OEM. At least three (3) months of data collection shall be assumed to be required from the time that each meteorological tower is installed until the time it is removed.

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11.7.3 If a power performance test (i.e., power curve test) is performed, meteorological towers shall be constructed in sets of two, or one permanent meteorological tower and one temporary meteorological tower, in order to maximize data collection time for Owner's site calibration (see Section **Error! Reference source not found.** herein).

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11.7.4 If a power performance test (i.e., power curve test) is performed, upon completion of data collection for the power performance test site calibration and at the request of Owner, temporary meteorological towers shall be decommissioned and removed, including any temporary foundations and fencing. All equipment and instrumentation from the decommissioned towers shall be returned to Owner at a location requested by Owner. For the avoidance of doubt, and unless explicitly approved by Owner, Wind Turbine Generators may only be installed (including earthwork and construction of Foundations) *after* the temporary meteorological tower at the respective Wind Turbine Generator location has been removed.

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11.8 Meteorological Tower Obstruction Lighting

11.8.1 All meteorological towers shall be provided with aviation obstruction lights, including top- and mid-level as required, and including all mounting assemblies, GPS controller, and photocell as required by the Federal Aviation Administration and all other Applicable Standards, including US DOT-FAA Advisory Circular No. AC 70/7460-1K: *Obstruction Marking and Lighting*.

11.8.2 Meteorological tower aviation obstruction lights shall be programmed to blink in unison, including with those aviation obstruction lights that are installed on the Wind Turbine Generators.

11.8.3 Aviation obstruction lighting equipment shall be designed for continuous operation.

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11.8.4 Aviation obstruction lights shall be FAA Type L-864 (single, red, flashing configuration).

11.8.5 Obstruction lighting shall incorporate an uninterruptible power supply capable of supplying back-up power for at least one (1) hour.

11.8.6 Obstruction lighting for all permanent met towers shall be integrated with the lighting for the Wind Turbine Generators in the FAA lighting plan for the Project.

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11.9 Communications

11.9.1 All permanent meteorological towers shall be connected to, and communicate with, the Communications System and allow data recording and storage through the data archival features of the Communications System.

11.9.2 Communication from each permanent meteorological tower to the Communications System shall be via fiber optic circuit. Such communication path shall follow the same route as the Collection System Circuits in order to minimize disturbed area.

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11.10 Power

11.10.1 Permanent power supply for each permanent meteorological tower shall be taken from the nearest Wind Turbine Generator or Collection System Circuit. Such permanent power supply path shall follow the same route as the Collection System Circuits in order to minimize disturbed area and shall be marked on the as built drawings and be protected with direct burial tape.

11.11 Testing and Quality Control

11.11.1 All testing described herein shall be performed by an independent, experienced third party.

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11.11.2 All meteorological tower equipment shall be tested to demonstrate it meets stated design criteria and is fit for purpose.

11.11.3 Meteorological tower testing shall include the following, at a minimum:

(1) All testing specified in the Applicable Standards.

(2) All testing reasonably recommended or required by the applicable equipment suppliers.

(3) All meteorological tower foundations shall be tested in accordance with Section 7.11 (*Testing and Quality Control*) herein.

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(4) All exposed cable sections shall be visually inspected for physical damage or manufacturing defects. Such inspections shall be performed prior to and during installation.

(5) Resistance testing on grounding grid at each tower location.

(6) Final continuity tests after completion of all system connections. Acceptable continuity tests shall include a Megger test or VLF test at 100 percent of rated voltage.

(7) Verify all alarms, indications and analog quantities are communicated and received properly by the RTU and displayed correctly on the HMI.

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(8) Verify all communication channels operate as expected.

11.11.4 Copies of testing reports shall be submitted to Owner within 10 days of completing such test. Testing reports shall include a summary of testing procedures and acceptance criteria.

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12.0 O&M BUILDING REQUIREMENTS

12.1 General Provisions

12.1.1 The O&M Building shall be constructed at a location at the Project Site to be approved by Owner.

12.1.2 The O&M Building shall be designed and constructed such that it is ADA compliant, including parking, doorways, bathrooms, and other building features.

12.1.3 The O&M Building shall comply with all Turbine Supplier requirements for the building, including office quantity, furnishings, warehouse requirements, and other similar items.

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12.1.4 All manufacturer installation instructions for the installation of all O&M Building equipment and components shall be obtained and followed.

12.1.5 Seller shall be responsible for obtaining all the permits for a fully functional O&M building. This may include but not limited to building permit, certificate of occupancy, water permit, leach field permit etc.

12.2 Design Working Life

12.2.1 The design working life of the O&M Building shall be a minimum of 30 years.

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12.3 General Building Requirements

12.3.1 General:

(1) The operations and maintenance building shall have the outer dimensions and indicative layout shown in Figure 1 (9,600 square feet).. It is expressly noted that a washer and dryer (as shown in these figures) are not required.

(2) Material and color (interior/exterior) samples shall be compiled for Owner's review.

12.3.2 Metal building:

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(1) The main frames shall be clear span.

(2) The sidewall columns shall be tapered with inset girts.

(3) The bay spacings shall be 20 feet on center.

(4) Primer color shall be standard red.

(5) Arkema's KYNAR 500 26-gauge architectural wall panels, or Owner-approved equal, shall be applied to all exterior walls. Architectural panels shall have semi-concealed fasteners. The Premium 70 finish coating system shall have a superior high-build primer application that is then coated with premium fluorocarbon coating that contains seventy percent (70%) KYNAR 500 resin.

(6) Closure strips, sealing tape, and joint sealants shall be furnished and utilized as needed to complete the metal building erection per industry standard.

(7) To ensure weather tightness and rodent control, a finished base angle at the bottom of each wall sheet shall be included.

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(8) Provision for thermal expansion movement of the standing seam panels shall be accomplished by the use of clips with a movable tab.

12.3.3 Roof:

(1) The roof pitch shall be 1½:12.

(2) The roof covering shall be American's 24-gauge Aluminum Coated Steel 360º Seamless Roof System or Owner-approved equal. The panels shall be 20-feet wide with 3-inch-high crown. The high crown shall include factory-applied, all-weather mastic. The panel overlaps shall be seamed mechanically to ensure weather tightness of the roof system.

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(3) Deluxe eaves which match the rake of the building shall be included.

(4) Dektite boot flashings at 4-inch to 12-inch pipe penetrations shall be provided.

(5) Gutters and downspouts shall be furnished and installed. Splash blocks shall be included at all downspouts. Downspouts shall not drain onto sidewalks or aprons, and rain water shall not cross sidewalks.

12.3.4 Doors:

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(1) Doors for the O&M Building shall be furnished according to the schedule set forth in Table 4 (*O&M Building Door Schedule*) herein, at a minimum.

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Table 4: O&M Building Door Schedule

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Room	Type	Qty	Size [ft]	Door Type	Frame Type	Lock Function	Panic Hardware	Closer	Fire Rated	Lite Size	Kick Plates
Offices	Interior	TBD	3 x 7	Wood	Metal	Keyed	No	No	No	8”x24”	No
Meeting Rm	Interior	TBD	3 x 7	Wood	Metal	None	No	No	No	8”x24”	No
Break Room	Interior	TBD	3 x 7	Wood	Metal	Push/Pull	No	Yes	No	8”x24”	Yes
Bathrooms	Interior	TBD	3 x 7	Wood	Metal	Push/Pull	No	Yes	No	None	Yes
Comm	Interior	TBD	3 x 7	Metal	Metal	Keyed	No	Yes	60 min.	8”x24”	Yes
Shop	Interior	TBD	3 x 7	Metal	Metal	Keyed	No	Yes	60 min.	8”x24”	Yes
Shop	Exterior	TBD	3 x 7	Metal	Metal	Key Card	Yes	Yes	No	8”x24”	Yes
Front Entry	Exterior	TBD	3 x 7	Metal	Metal	Key Card	Yes	Yes	No	8”x24”	Yes

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Room	Type	Qty	Size [ft]	Door Type	Frame Type	Lock Function	Panic Hardware	Closer	Fire Rated	Lite Size	Kick Plates
Overhead	Roll-Up	TBD	12 x 16	Metal	Metal	Yes	No	No	No	None	No

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(2) Exterior doors:

(a) Overhead doors shall be 12-foot by 16-foot doors, with vinyl seal on both sides of track, hood baffle, reversing "Feather Edge", and take-up reel. Each door shall be motor operated, and openers shall come with one (1) three-stage (open/stop/close) push button. Bollards shall be installed on each side of the overhead door(s) and shall meet the specifications included in Section 12.3.1 herein.

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(b) Exterior doors shall be 3-foot by 7-foot commercial-grade, insulated-steel service doors with ball-bearing hinges, hydraulic closer, latch guard, weather-stripping, self-sealing sweep, ADA-compliant aluminum threshold, and keyed lockset.

(c) All door jambs shall be completely flashed to give door opening a finished appearance.

(d) All exterior doors shall be equipped with key card readers, as further described in Section 12.3.19 herein.

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(e) All exterior doors shall be equipped with a SCADA-integrated intrusion alarm. Such alarms shall be programmed to provide immediate silent notifications in the event of after-hours and/or non-card-reader access.

(f) Panic hardware shall be provided on any door, including those listed as "No" in the applicable column of Table 15, where local fire codes require they be installed.

(g) All exterior steel doors shall be painted.

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(h) Ramps shall be suitable to provide a smooth, gradual transition from grade elevation to the shop floor. Max 3%. Ramps shall be constructed with materials compatible with the shop floor loadings. All exterior leading into the shop areas shall have housekeeping pads. Pads shall be 6' x 4' with no more than a 1% rise entering the building.

(3) Interior doors:

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(a) Interior doors shall be 3-foot by 7-foot by 1.75-inch-thick flush solid-core birch doors. All interior doors shall be installed in primed hollow metal frames with three (3) 4.5-inch by 4.5-inch commercial hinges. The frames shall be painted, and the doors shall be stained and varnished.

(b) All doors with push/pull hardware shall include kick-plates installed on push sides.

(c) All wood doors shall be commercial grade.

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(d) All interior doors shall have medium-duty commercial lever locksets.

(e) All interior doors and woodwork shall be stained and varnished. All interior hollow metal doors and door frames shall be painted.

(f) Doors shall be fire rated as per design requirements and applicable standards

(4) Door hardware:

(a) Door bumpers shall be provided on every door.

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(b) Door keying shall be provided on every door. Bathroom doors shall include dead bolt.

(c) Windows shall be installed in all doors, except restrooms.

12.3.5 Windows:

(1) 4-foot by 5-foot aluminum horizontal slider windows, equal to Plyco Model M3025, shall be provided in the following quantities:

(a) Offices: 1 per interior office, 2 per corner office.

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(b) Meeting room: 2.

(c) Break room: 1.

(d) Warehouse: 2.

(2) Window frames shall be thermally broken with standard color.

(3) Operable units shall include screens.

(4) Exterior windows shall be glazed with tinted insulated glass and argon gas filled.

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12.3.6 Room schedule:

(1) The building shall include all rooms set forth in the schedule in Table 5 (*O&M Building Room Schedule*) herein, at a minimum, including the requirements set forth therein.

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Table 5: O&M Building Room Schedule

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Room	Floor	Base	Walls	Nominal Ceiling Height	Ceiling Type
Common area Offices Break room Meeting room	Vinyl composition tile	4-inch vinyl	Painted drywall	8’0”	2x4 acoustical tiles
Comm	Anti-static vinyl composition tile	4-inch vinyl	Painted drywall	8’0”	2x4 acoustical tiles

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Bathrooms	Glazed ceramic/ porcelain tile, with floor drain	4-inch glazed ceramic/ porcelain tile	Ceramic tile/ painted drywall	8’0”	2x4 vinyl covered sheetrock
Shop	Sealed concrete, with floor drain	Not applicable	29 ga. white liner (steel)	17’0”	Exposed structure

12.3.7 Flooring:

(1) All tile shall be waxed.

(2) All tile and grout shall be sealed.

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(3) Vinyl composition floor tile shall be 12-inch by 12-inch by 1/8-inch tile adhesive applied to concrete floors. Base shall be 4-inch high, vinyl base adhesive applied to walls with covered profile.

(4) Ceramic/porcelain tile shall be set by the thin-set method. Anti-fracture membrane at control joints in floors for bathroom areas shall be provided.

(5) Ceramic/porcelain wall tile in bathrooms shall be 5-foot high on all sides, with painted drywall above.

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12.3.8 Casework, countertops, and windowsills:

(1) Cabinets shall be installed in the break room. Wall cabinets and hardware shall be wood veneer MDF-type, Owner approved. Cabinets shall be both counter height and overhead.

(2) Countertops shall be installed in the breakroom. Countertops shall be Corian, or Owner-approved equal.

(3) Wall Length counter in the computer room at suitable height for computer keyboard applications (approximately 28” high)

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12.3.9 Walls:

(1) All drywall shall be 5/8-inch, taped, sanded, and textured.

(2) All bathroom walls shall have 5/8-inch moisture-resistant drywall with at least two (2) coats of semi-gloss latex applied.

(3) Three (3)-foot wainscot shall be applied along all exterior walls.

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(4) A 29-gauge steel liner panel to approximately 8-feet high shall be used along the exposed shop wall. A 2-inch by 2-inch galvanized base angle to attach liner panel at the concrete floor shall be provided.

(5) Walls shall be fire rated as per design requirements and applicable standards

(6) Vapor retarder: not required for walls.

(7) Retractable wall requirements: not used.

12.3.10 Ceilings:

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(1) All ceiling tile shall be Armstrong Cortega or Owner-approved equal.

(2) The ceiling over the electrical storage, storage, and shared workshop shall be covered with 2-inch by 8-foot beams at 16 feet on center with one (1) layer of 7/16-inch OSB over the top. This shall be designed as a dust cover and not a mezzanine.

12.3.11 Signage:

(1) A 6-inch plastic vinyl building address and numbers on the front of the building shall be furnished and installed.

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(2) Men's and women's restroom signs shall be furnished and installed.

(3) Handicap (ADA compliant) and visitor parking sign(s) on steel posts in front of the handicap stalls shall be furnished and installed.

(4) Interior signage, as required by the Applicable Standards and other requirements, shall be furnished and installed.

12.3.12 Bathroom accessories:

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(1) Toilet partitions shall be installed between each toilet. Partitions shall be wall- and ceiling-mounted with baked enamel finish complete with door, latch, rubber stop, and coat hook at each stall.

(2) Standard mirrors in toilet rooms shall be approximately 36 inches by 40 inches in size. Such mirrors shall be furnished and installed in each bathroom.

(3) Paper towel dispensers and toilet paper holders shall be furnished and installed.

(4) Handicap grab-bar hardware shall be furnished and installed.

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(5) Liquid soap dispensers shall be furnished and installed.

(6) Hot and cold running water to the bathrooms and kitchen

(7) At least eight (8) lockers shall be furnished and installed in the men's bathroom. At least four (4) lockers shall be furnished and installed in the women's bathroom. Each locker shall measure at least 8 feet by 12 inches by 12 inches and each in standard manufacturer's colors. One (1) movable hardwood bench shall be furnished and installed in front of each set of lockers.

12.3.13 Appliances:

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(1) The following appliances shall be installed in the kitchen / break room:

(a) Microwave.

(b) Refrigerator with ice maker.

(c) Oven.

(d) Dishwasher.

(2) All appliances shall be new, unused, white, and Maytag (or Owner-approved equal).

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(3) A temperature and humidity-controlled kitchen area with, electric oven, microwave oven, 25 Cu. Ft side by side refrigerator, counter and double sink. Cupboards and drawers to be provided beneath the counter and wall-mounted cupboards above the sink.

12.3.14 Bollards:

(1) Bollards shall be a minimum 3-inch-diameter steel pipe, concrete filled for equipment protection, painted safety yellow, and extend five (5) feet above grade.

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12.3.15 Aprons and sidewalks:

(1) HVAC pads shall have minimum dimensions of 4 feet by 4 feet by 4 inches.

(2) A concrete slab shall be installed along the length of the O&M Building near the exterior shop door and roll-up doors. Such slab shall be designed to accommodate AASHTO HS44-20 loading.

(3) All aprons and sidewalks shall be reinforced concrete with a broom finish. Minimum thickness shall be 4 inches.

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(4) Sidewalk and curb at handicap stall shall be sloped per ADA requirements for handicap access.

(5) Sidewalks and aprons shall have 4-inch ABS sleeve under the structure every 15 feet, at a minimum.

12.3.16 Parking and driveways:

(1) The parking area shall be sufficient to simultaneously accommodate parking for at least 10 vehicles and allow deliveries to the O&M Building front entry and warehouse.

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(2) All car parking areas shall be shaped and graded for drainage.

(3) Wheel stops and lighting shall be provided for the parking area.

(4) A concrete slab shall be poured in the parking lot to accommodate ADA parking requirements. Parking lot striping and handicap symbol shall be painted on the concrete paving.

12.3.17 Freight loading and unloading area:

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(1) A 300-foot by 300-foot asphalt area shall be installed to accommodate loading and unloading of freight from delivery trucks.

(2) The loading and unloading area should allow access to the overhead doors of the maintenance shop.

12.3.18 Fencing and gates:

(1) The O&M Building perimeter shall be fenced.

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(2) At least one (1) vehicle gate shall be installed at the O&M Building. The vehicle gate shall be a double-hung, 8-feet high, 20-foot-wide (minimum), motorized, rolling gate. At least 10 remote-entry devices shall be supplied and programmed by Seller for Owner's use.

(3) At least one (1) walk gate shall be installed at the O&M Building. The walk gate shall be a lockable, single-hung, 4-foot-wide, swing-gate for personnel access.

(4) All fencing and gates shall comply with the minimum specifications in Section 3.11 (*Fencing, Walls, and Gates*) herein.

12.3.19 Electronic security system:

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(1) For all access control components, the subcontractor must be "Software House" certified.

(2) Vehicle access control system: not used.

(3) Personnel access control system:

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(a) This system shall be installed for all man doors and vehicular gates. The system shall consist of stand-alone distributed smart panels that make the access decision and must have a stand-alone storage database capability that is downloaded routinely to the central computer database. The master computer or any other computer unit that has the proper password must be able to query it. The unit must have different levels of password control to access the data or program the unit.

(b) The card system must use a proximity or RFID card.

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(c) This system must have anti-passback capabilities to prevent multiple use of the card in a short time frame. This can be accomplished through read-in and read-out card readers with a timeout feature that prevents multiple uses at the same reader with in a user-defined time frame.

(d) This system must be able to work in a local area network and/or wide area network environment and allow access from other computers on the network.

(e) The software must be capable of providing an audit trail of all who have accessed the database and all changes made by an individual.

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(4) Security CCTV system:

(a) For purposes of the Proposal, a CCTV system will not be installed, although Seller shall install conduits and gang boxes (including covers for gang boxes) and leave appropriate space for future installation.

12.3.20 Garbage enclosure:

(1) The O&M Building shall include a separate, detached garbage enclosure. The enclosure shall be installed at an Owner-approved location.

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(2) The enclosure shall be constructed of treated wood.

(3) The enclosure shall be 10-feet high on all sides and shall include at least 12 inches of clear space between the dumpster and enclosure in all directions.

(4) The front of the enclosure shall include a solid screening gate on a metal frame with hinges and a center latch. Such gate shall swing out to an angle greater than 90 degrees and create an opening wide enough to allow a truck to easily access the dumpster. Pins shall not be required to hold gates open while the dumpster is being accessed.

12.3.21 Oil storage building:

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(1) The O&M Building shall include a separate, detached building for oil storage. The building shall be installed at an Owner-approved location.

(2) The oil storage building shall have dimensions of at least 12-feet by 32-feet, with a minimum interior area sufficient for the storage and convenient access of up to ten (10) 55-gallon drums of oil.

(3) The oil storage building shall have a wood frame.

(4) The oil storage building shall include solid walls on three (3) sides, with one (1) roll-up door on the final side.

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(a) The door shall be sliding type or roll-up type.

(b) The door shall be furnished with a keyed lockset.

(c) The door shall be wide enough to permit the safe and comfortable entry by a standard, loaded forklift.

(5) The oil storage building shall have a ramped entry on the door side, sufficient to allow forklift access and with a minimum 5-foot concrete slab extension.

(6) A concrete floor shall be installed throughout the interior of the oil storage building.

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(a) The floor shall include concrete curbs on all sides, each at least 6-inches high. The floor shall be concrete with an oil containment cast into the building foundation with 2% slope draining to single low point which is accessible for future pumping.

(b) A non-skid composite grate shall be furnished and installed above the concrete floor.

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(c) The concrete floor shall be safely sloped towards a Seller-installed sump pit in the rear corner of the building, which shall include a Seller-furnished and Seller-installed sump pump. The pump shall be used to manually remove effluent as needed; automatic discharge is not expected.

(d) The concrete floor (including the floating grate) shall be designed with sufficient structural capacity to simultaneously support the load of a standard, loaded forklift and other stored materials. At least 15,000 pounds of floor load capacity shall be provided. Shape building site, pad and surrounding area to match site drainage plan.

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(7) The oil storage building shall have a metal roof which shall be slanted away from the door side and which shall be designed with similar loading criteria as was used for the O&M Building. The roof pitch for the oil storage building shall match the roof pitch utilized on the O&M Building.

(8) The oil storage building shall have power, heating, and lighting installed and operable.

(9) The oil storage building shall include ventilation for chemical storage.

(10) The interior of the building shall have at least 10 feet of clearance from floor to ceiling, or more if necessary, to permit safe forklift access and use.

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(11) One (1) eye wash station shall be furnished and installed in the oil storage building. Eye wash bottles may be substituted where they satisfy local regulations.

(12) Portable CO_2 and dry chemical fire extinguishers shall be furnished and installed in the oil storage building, in a quantity and type sufficient to ensure compliance with the Applicable Standards and other requirements. At a minimum, one (1) 10-pound ABC-type fire extinguisher (including mounting device / cabinet) shall be installed in the building.

(13) Bollards shall be installed on each side of the outside of the overhead door(s) in the oil storage building.

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(14) Minimum signage, exterior of oil storage building:

- (a) No smoking.
- (b) No open flames.
- (c) Maximum floor capacity (including loaded forklift).
- (d) Personal protective equipment requirements.
- (e) Authorized personnel only.

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(15) Minimum signage, interior of oil storage building:

(a) Eye wash station.

(b) Fire extinguisher location.

12.3.22 Storm shelter:

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(1) Shelter shall be a hardened room located within the O&M building. Walls shall be filled core cement block construction with reinforcement. Ceiling shall be concrete panels or reinforced structural components capable of sustaining tornado force winds. Tornado Shelter shall be designed in accordance with tornado shelter standards. The shelter shall be integral to the building and shall be easily accessed by employees in the event of a tornado.

12.4 Civil / Structural Requirements

12.4.1 All civil works for the O&M Building shall comply with the applicable specifications in Section 6.0 *(Civil Works Specifications)*.

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12.4.2 All O&M Building foundations shall be designed and constructed in accordance with the applicable structural works specifications in Section 7.0 (*Structural Works Specifications*).

12.4.3 Excavated material shall be backfilled and compacted on the outside of the foundation walls adjacent to green areas and graded around building to provide proper drainage. The outside foundation walls adjacent to hard surfaces and future additions shall be filled with compacted granular fill.

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12.4.4 Fill shall be compacted to at least 95 percent (95%) of the maximum density within the moisture content of two percent (2%) below optimum to two percent (2%) above optimum, as determined by ASTM Standard D698, unless a higher level of compaction is required by the geotechnical studies. Seller shall furnish compaction-testing results to Owner.

12.4.5 The O&M Building perimeter (including parking and all fenced area) shall be rocked throughout with crushed rock material over a compacted subgrade. Such crushed rock material shall include at least six (6) inches of aggregate and shall conform to the requirements in Section 6.10 (*Crushed Rock Surfacing*) herein.

12.4.6 The O&M Building shall have a reinforced-concrete foundation covering the building footprint.

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(1) Minimum concrete strength shall be 3,000 psi for footings and walls, respectively, and 3,500 psi for floors in place in 28 days.

(2) Rebar shall conform to ASTM A615. Placement shall be in accordance with ACI 318.

(3) Welded wire fabric shall conform to ASTM A185. Plain wire shall conform to ASTM A82. Placement shall be in accordance with Chapters 7 and 12 of ACI 318 and the CRSI's "*Manual of Standard Practice*".

(4) The O&M Building floor shall be at least six (6) inches thick.

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(5) All foundations shall extend a minimum of six (6) inches above the adjacent finished grade.

(6) Concrete for equipment pads and containment areas shall be sealed with petroleum resistant sealant. All exposed concrete slabs, interior or exterior, shall have a combination sealer/curing compound, ASTM C309 or equivalent applied.

(7) Footing, wall, and floor heights shall be set with a laser transit to improve accuracy of determining heights for construction.

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(8) Design of structural and miscellaneous steel shall be in accordance with the AISC's "*Manual of Steel Construction*". Design of structural and miscellaneous steel shall also be in accordance with NEMA Standard SG6, NEMA Standard TT1, and the International Code Council's "*International Building Code*", respectively.

(9) High strength bolts, nuts, and washers shall be galvanized in accordance with ASTM F2329. Bolts, nuts, and washers under 0.5 inches in diameter shall conform to ASTM A307, Grade B, ASTM A563 and ASTM F844 respectively, and shall be galvanized in accordance with ASTM F2329.

(10) Anchor bolts, anchor bolt assemblies, and concrete embedments shall be galvanized.

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(11) Anchor bolts shall conform to ASTM A449, ASTM F1554, Grade 36 or A307. Anchor bolt sleeves shall conform to ASTM A501.

(12) All structural welding shall conform to the requirements of AWS Standard D1.1.

(13) Galvanizing as specified herein, shall conform to the requirements of ASTM A123, ASTM A153 or ASTM A2329 as applicable.

(14) Stainless steel shall conform to ASTM A167.

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(15) Design of structural and miscellaneous aluminum shall be in accordance with the latest version of the Aluminum Association's "Aluminum Design Manual" and "Aluminum Standards and Data".

(16) Materials for structural and miscellaneous aluminum including structural shapes and plates shall conform to ASTM B209 and ASTM B308 and shall be aluminum alloy 6061-T6.

(17) Bolts and nuts shall conform to ASTM F468 and ASTM F467, respectively, and shall be aluminum alloy 6061-T6. Washers shall be aluminum-clad steel Alclad 2024-T4 or approved equal.

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(18) Vapor retarder: 10 mil polyethylene placed under office floor and anywhere floor finish or coating shall be used to help reduce any moisture migration through the slab. All joints shall be taped, and all penetrations shall be repaired and taped.

12.5 Mechanical Requirements

12.5.1 The following plumbing-related items shall be provided in the quantities shown:

(1) Men's bathroom:

(a) Wall-mounted toilet (2).

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(b) Urinal (1).

(c) Floating sink (1).

(d) Shower (2).

(2) Women's bathroom:

(a) Wall-mounted toilet (1).

(b) Floating sink (1).

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(c) Shower (1).

(3) Kitchen:

(a) Sink with faucet (1).

(b) Ice maker connection (1).

(4) Warehouse area:

(a) Floor sink (1).

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(b) Wash sink (1).

(c) Eye wash station (1).

(d) Propane or natural gas hot water heater (1), of sufficient size to satisfy the facility's needs.

12.5.2 Fire protection system:

(1) The fire protection system shall receive the approval of Owner's insurance carrier.

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(2) Portable CO_2 and dry chemical fire extinguishers shall be furnished and installed in the building, in a quantity and type sufficient to ensure compliance with the Applicable Standards and other requirements. At a minimum, one (1) 10-pound ABC-type fire extinguisher (including mounting device / cabinet) shall be installed at every exit door, break room, and utility room, respectively.

(3) All local alarm, detection, and suppression panels shall report status to the main fire alarm panel located in the control room.

(4) All areas of the building shall be provided with smoke and heat detectors as the form of fire detection.

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(5) The following walls and door shall be fire rated for the minimum times shown, or as required by the authority having jurisdiction, whichever is greater:

(a) Interior wall between warehouse and office areas: 60 minutes.

(b) Interior doors between warehouse and office area: 60 minutes.

(c) Interior SCADA / communications room walls: 60 minutes

(d) Interior door to SCADA / communications room: 60 minutes

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12.5.3 Potable water system:

(1) The potable water system shall be designed to provide potable water, both hot and cold, at the proper pressure, temperature, and flow rate to all plumbing fixtures and equipment.

(2) This shall be by service from an existing water main (if such a main exists in the area) and, if so, shall be a potable supply. If no mains supply is available, then water service shall be via a water well. Seller shall Engineer, Procure, & Construct a complete water supply solution.

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(3) The potable water system shall include chlorination, charcoal filters, or other treatment as required.

(4) Incoming water line shall have sand filters with provisions to prevent fixtures from clogging with sand. System shall be engineered for pressure & water quality to meet the industry standards.

(5) All internal water piping shall be copper.

(6) Potable water piping shall be insulated as required.

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(7) Potable water piping shall be sterilized in accordance with AWWA standards for disinfecting purposes prior to filling.

(8) At least two (2) insulated exterior hose bibs shall be installed.

(9) All water supply and installations shall conform with all applicable local and/or state regulations, including fire water storage for fire suppressant system.

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12.5.4 Sanitary wastewater:

(1) Above and below grade water and sewer lines shall be furnished and installed per applicable building codes.

(2) Sanitary wastewater shall be collected from the various points of origin in the facility and diverted to a septic tank, and discharge from the septic tank shall be routed to a leach field.

(3) Septic tank and leach field shall be placed to minimize impact to the yard area and shall be clearly marked to prevent traffic from encroaching or driving over septic tank. Leach field to be placed outside the fenced area.

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(4) A pumped sanitary wastewater system shall only be used if a gravity system is impractical.

(5) Floor drains shall be installed in the break room, shop area, and each bathroom.

12.5.5 Heating, ventilating, and air conditioning system:

(1) Heating elements shall be propane or natural gas fired. Cooling elements shall be electric.

(2) The heating, ventilating, and air conditioning systems shall satisfy the workspace environmental requirements for personnel occupancy and equipment operation.

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(3) Minimum ventilation rates shall be provided in normally occupied areas in accordance with the Applicable Standards and other requirements. In the absence of local codes, ASHRAE Standard 62 requirements shall be met. A minimum of five (5) air changes per hour of ventilation or recirculation air shall be provided for effective mixing during heat removal ventilation or air conditioning of normally occupied spaces.

(4) The air conditioning for control and electrical equipment shall be designed to meet the filtration levels as defined by ASHRAE Standard 52.

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(5) Interior cooling loads for the SCADA room shall be based upon actual equipment to be installed and ASHRAE Standard requirements. This air conditioning unit shall be ceiling mounted. The A/C to the SCADA room shall be balanced (external filtered inlet and outlet), and the SCADA room door shall be sealed, to prevent ingress of dust into the SCADA room. The SCADA room shall be temperature and humidity controlled.

(6) HVAC systems shall be designed to maintain the indoor conditions listed in Table 6 (*HVAC Design Requirements*) herein.

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(a) Where redundancy is indicated in this table, only the major active components require backup equipment; static components such as ductwork do not require duplication.

(b) Noise criteria are indicated as NC levels or decibels. Noise criteria values are as indicated in the ASHRAE Handbook series for acoustical design criteria. Decibels are sound pressure levels, A-weighted, to a reference of 0.0002 microbar at 5 feet from the equipment as measured in a free field with a single reflecting plane.

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(c) Maximum design temperatures represent the average building temperature. Cooler temperatures may occur near the ventilation inlets and higher temperatures may occur at relief and exhaust points.

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Table 6: HVAC Design Requirements

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Area	Outdoor Ambient Design	Indoor							
		Design Temp.		Humidity Control (%RH)	Particulate Filtration Efficiency (%)	Pressuri-zation	Redundancy (Note 3)	Noise Criteria	System Configuration
		Winter (°F)	Summer (°F)						
Communications Room	Note 1	65	65	30-65	High	Positive	2 x 100%	NC 45	AC for personnel comfort and equipment requirements

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Area	Outdoor Ambient Design	Indoor							
		Design Temp.							
		Winter (°F)	Summer (°F)	Humidity Control (%RH)	Particulate Filtration Efficiency (%)	Pressuri-zation	Redundancy (Note 3)	Noise Criteria	System Configuration
Offices Break Room Bathrooms Meeting Room	Note 1	70	72	30-65	ASHRAE STD-62	Positive	None	NC 45	AC for personnel comfort and equipment requirements

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Area	Outdoor Ambient Design	Indoor							
		Design Temp.							
		Winter (°F)	Summer (°F)	Humidity Control (%RH)	Particulate Filtration Efficiency (%)	Pressuri-zation	Redundancy (Note 3)	Noise Criteria	System Configuration
Workshop	Note 1	60	90	N/A	30	Positive	None	NC-55	Evaporative cooler for personnel comfort (Note 2)

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Area	Outdoor Ambient Design	Indoor							
		Design Temp.							
		Winter (°F)	Summer (°F)	Humidity Control (%RH)	Particulate Filtration Efficiency (%)	Pressuri-zation	Redundancy (Note 3)	Noise Criteria	System Configuration

Note 1: Site design temperatures.

Note 2: Evaporative cooler shall be designed for a minimum of 85% effectiveness. Air handler shall include a heating element.

Note 3: Redundancy is included to specify the amount of redundancy required (e.g., 2x100% requires a primary system with a 100% backup system), and None requires only a primary system.

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(7) Air velocities in ducts and from louvers and grills shall be sufficiently low to maintain acceptable noise levels in areas where personnel are normally located.

(8) Thermal insulation with vapor barrier shall be provided on ductwork surfaces with a temperature below the dew point of the surrounding atmosphere to prevent vapor condensation. All ductwork used for air conditioning purposes shall be insulated; ductwork used for ventilation purposes shall not require insulation.

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(9) Exhaust fans for bathrooms and locker room shall be furnished and installed. Exhaust systems shall be provided above the roof for toilet, shower and locker room areas and shall be controlled by occupancy sensors. Outdoor ventilation air shall be based on normal room occupancy or local codes, whichever is more stringent.

(10) Functional louvers at building workshop area shall be provided. Adequate overhead heaters in the workshop area

(11) Restrooms to be equipped with ceiling mounted exhaust fans vented to the exterior.

12.5.6 Insulation systems / thermal and moisture protection:

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(1) Caulking and backer board, as recommended by the manufacturer and to seal exterior and interior joints at expansion joints, frames of doors, windows, and other wall openings, shall be furnished and installed.

(2) Roof insulation shall be such that an *R* value of at least 30 is achieved. Thermal blocks shall be included within the roof system.

(3) All building walls shall be insulated. Wall insulation shall be such that an *R* value of at least 19 is achieved. All interior office walls shall be insulated with 3.5-inch fiberglass batt insulation for sound control.

(4) Miscellaneous insulation for filling voids at roof eave, roof peak, door frames, window frames, and other similar areas shall be furnished and installed.

12.6 Electrical Requirements

12.6.1 General requirements:

(1) O&M Building power shall be 240-Volt, single-phase (or Owner-approved equal)

(2) All convenience outlets shall be on 20A circuits.

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(3) All equipment and materials shall bear UL label.

(4) Underground conduit shall be PVC and shall conform to the specifications for conduit set forth herein.

(5) All transformers shall be installed exterior to the building.

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(6) Furnish and install a fully functional emergency backup generator capable of supplying all SCADA loads and minimal lighting within the O&M Building. Backup generator system shall be supplied complete with subpanels, wiring and an automatic transfer switch. Generator shall be propane fueled with a tank operating capacity of 72 hours. Generator sizing shall be submitted to Pacific Corp for approval. Generator shall include a properly rated outdoor Arc Flash Rated disconnect switch.

12.6.2 Communication cabling:

(1) A complete telephone and data network system shall be provided including all distribution jacks, cable, and wireless systems.

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(2) Internet service shall include (i) high-speed internet service (Wi-Fi) throughout the building and (ii) broadband internet service up to the wall jacks. T1 service shall be provided (or the fastest available speed from the local service provider).

(3) Phone service shall include at least one (1) four-line phone system up to the wall jacks.

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(4) Within the building the installation shall comprise one telephone jack in each office, the computer room and the SCADA room, all wired back to the SCADA room for connection to the incoming telephone service. The installation shall also comprise CAT5 jacks in the same quantities and locations, together with CAT5 cabling back to the SCADA room, such that all computers can be networked. One spare conduit from the SCADA room to each office and the computer room, CAT5 cable for security mounted cameras from the top of each roller door area back to the SCADA room.

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12.6.3 Interior grounding:

(1) Grounding shall be in accordance with NFPA 70/NEC. All feeder and branch circuits shall have a green-colored insulated equipment ground conductor in addition to any metallic conduit being bonded to the equipment grounding system.

(2) Ground fault protection shall be installed in receptacles in warehouse and workshop where power tools are used, and in restrooms and other locations as required by NFPA 70/NEC.

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12.6.4 Exterior grounding:

(1) The facility shall have a #4/0 AWG bare copper ground counterpoise with 0.75-inch by 10-foot copper-clad steel ground rods. The counterpoise will be connected to service entrance equipment, derived source transformer secondary neutrals, telecommunications main ground bus bar, and all building columns.

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12.6.5 Lightning protection:

(1) The building shall have an array of air terminals, roof conductors, and down conductors. The lightning protection system shall be interconnected to the ground counterpoise system. Requirements for the building's lightning protection system shall be as determined and recommended by NFPA 780.

12.6.6 Exterior lighting:

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(1) Exterior lighting shall be provided by building-mounted, metal-halide light fixtures at facility personnel and overhead doors. Additional building-mounted lights shall be provided to illuminate walkway and parking area. LED lights are preferred if minimum required illumination levels can be met. In lieu of LED lights, metal halide lights shall be used. Lighting levels shall meet the intensities indicated in the IES handbook and NFPA 70/NEC.

(2) Exterior lighting shall be controlled by lighting contactors with hands-off auto selector switches and photocells and should be equipped with vandal-resistant lenses.

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(3) Lighting shall be provided to cover the building faces evenly and shall be directed inward from the property line.

(4) Area lighting shall supplement existing street lighting (if any) to provide a maximum level of illumination from a minimum number of fixtures. The system shall be designed to illuminate the entire area evenly, including doorways, structures, and all opening into the structures.

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(5) Pedestrian and vehicle entrances that are actively used are to be provided with sufficient illumination to permit recognition of individuals and examination of credentials. All vehicle entrances must be lit so that the entire vehicle, occupants, and contents can be adequately viewed. Doorways and other recesses must be lit to eliminate shadows.

(6) Alternate circuitry must be used in the power circuits so that the failure of any one lamp does not leave a large portion of either (i) the site perimeter or (ii) critical or vulnerable areas in darkness.

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12.6.7 Emergency egress lighting:

(1) The facility shall use fluorescent fixtures with internal battery backup ballast for emergency egress locations such as corridors, hallways, and fire exits.

(2) Exit signs shall be illuminated LED type located at fire exits and required locations.

12.6.8 Interior lighting and receptacles:

(1) Lighting levels shall meet the intensities indicated in the IES handbook and NFPA 70/NEC. The facility shall use the following types of fixtures:

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(a) 1-inch by 4-inch industrial fluorescent fixtures with guards with at least two (2) lamps in storage areas and SCADA room, respectively.

(b) 2-inch by 4-inch fluorescent fixtures with parabolic louvers with at least three (3) lamps with dual level switching in office areas, break room, and conference room, respectively.

(c) 2-inch by 4-inch high bay I-beam fluorescent fixtures with four (4) T5 high-output linear fluorescent lamps in workshop area.

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(2) Fluorescent fixtures shall be equipped with high-efficiency electronic ballasts. Classified area lighting fixtures shall be designed to meet requirements of NFPA 70/NEC, Article 500.

(3) A lighting control system shall be used to control fixtures in office areas. The lighting control system will have local low voltage switches for local control. Offices will be locally switched and have motion sensors to shut off the circuit automatically when the room is unoccupied.

(4) Install receptacle outlets as specified in accordance with NFPA 70/NEC.

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(5) Office lighting to be flush-mount fluorescent lighting panels (with specular reflectors) fitted in the suspended ceiling. Workshop lighting to be fluorescent tube strip-lighting units. Workshop lighting to be 400W metal halide units or similar

12.6.9 Power distribution system:

(1) Service entrance conductors shall be installed to tie into the main distribution panel and terminated and tested by Seller. The MDP in the building shall be service entrance rated.

(2) Feeders shall extend from the MDP to serve general power panel boards

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(3) Panel boards and associated feeders shall be sized for 20 percent (20%) spare capacity. Panel boards shall contain space for 20 percent (20%) additional spare circuit breakers.

(4) Building electrical service shall include a manual transfer switch and pad-mounted generator. The backup service shall be sized equal to the utility service and provided with sufficient fuel to operate for a minimum of five (5) days without refueling. A propane generator is preferred over diesel.

(5) Exterior building shall have exterior 120VAC GFCI outlets; one on each exterior wall.

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12.6.10 Wiring and conduit:

(1) Each length of PVC conduit furnished with coupling on one end and metal or plastic thread protector on the other end. Sizes of conduit, fittings and accessories as indicated, specified or as required by Applicable Standards or in accordance with NFPA 70/NEC requirements.

(2) Terminate all conduit runs with insulated bushings.

(3) Provide all fittings necessary for a complete installation.

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(4) Lighting branch circuits, telephone circuits, fiber optic cables and intercommunications circuits shall be routed in separate conduit systems.

(a) Lighting circuits shall be routed in electrical metallic tubing for indoor concealed areas, rigid conduit for outdoor areas, and PVC tubing or Schedule 40 PVC conduit for underground.

(5) Threaded, galvanized, rigid steel conduit or intermediate metal conduit shall be PVC tape wrapped or coated for underground use and will be used in all exposed, outdoor and hazardous locations.

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(6) All conductors shall be copper.

(7) All conductors #10 AWG and smaller shall be solid conductor. All conductors #8 AWG and larger shall be stranded conductor.

(8) All feeder and branch circuit wire shall be single conductor and have THWN/THHN insulation.

(9) All electrical enclosures mounted outdoors shall be NEMA 3R (minimum).

(10) Isolate emergency lighting circuit conductors from all other wiring.

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Figure 1: Indicative Operations and Maintenance Building Layout

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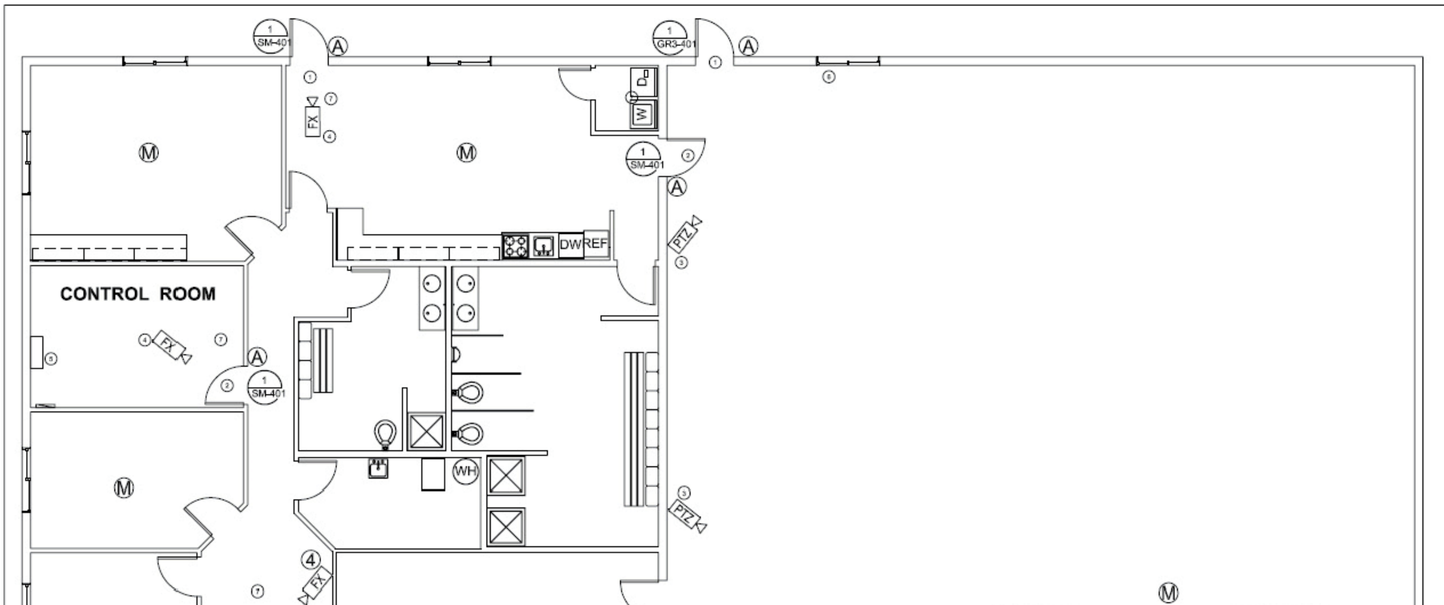

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13.0 WIND TURBINE GENERATOR SPECIFICATIONS

13.1 General Provisions

13.1.1 The Wind Turbine Generator, including all components, shall be capable of operating at rated capacity in a safe, reliable, and continuous manner and without undue maintenance under the meteorological conditions (e.g., temperature, air density, wind speed, salinity) of the Project and Project Site.

13.1.2 All exterior surfaces of the Wind Turbine Generator shall be white or light gray in color.

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(1) RAL 9010 (pure white) or RAL 7035 (light gray) are acceptable colors.

(2) A non-glare finish shall be used.

(3) Touch-up paint shall be provided as reasonably necessary to repair any damage to Wind Turbine Generator equipment that occurs during the transportation, offloading, erection, and/or commissioning of the Wind Turbine Generators.

13.1.3 The Wind Turbine Generator (including the tower and nacelle) shall have no external markings unless explicitly listed herein.

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13.1.4 Wind Turbine Generators shall be supplied with the first fill of all grease, oil, and other lubricants and consumables in the Wind Turbine Generator equipment (and confirmed, filled or topped off at the Project Site following delivery).

(1) Gearbox oil shall be AMSOIL or Owner-approved equal.

13.1.5 Turbine Supplier shall validate the Wind Turbine Generator equipment incorporated into the Work is new, unused, of good quality, consistent for use in wind generation facilities, and complies with the Requirements.

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13.1.6 All Functional Groups shall be interchangeable, regardless of the suppliers or manufacturers of the Functional Group, including if such Functional Groups are furnished by different suppliers or manufacturers. For purposes this exhibit, a "**Functional Group**" shall mean a rotor blade set; hub; pitch system; main shaft; main bearing; generator; gearbox; mechanical brake; high-speed shaft coupling; internal crane; power converter; medium-voltage transformer; service lift (if elected by Owner); internal tower wiring and cabling; controller; auxiliary system; wind vane; anemometer; yaw system; cooling system; hydraulic system; tower section; switchgear; ground controller; or uninterruptible power supply, respectively.

13.2 Design Working Life

13.2.1 The design working life of the Wind Turbine Generator equipment shall be a minimum of 20 years.

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13.3 Type Certificate

13.3.1 The Wind Turbine Generator shall hold current certification of compliance with IEC WT 01 / IEC 61400-1 / IEC 61400-22, either in the form of a Type Certificate or an A-Design statement of compliance (collectively, the "**Certificate**").

13.3.2 The Certificate shall be from an approved certifying entity:

(1) Germanischer Lloyd.

(2) Det Norske Veritas.

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(3) TÜV NORD Group.

(4) Owner-approved equal.

13.4 Site Suitability

13.4.1 Proposals shall include an assessment of suitability of the proposed Wind Turbine Generator at the Project Site. This assessment shall include a representation from Seller confirming the suitability of the Wind Turbine Generator for the Project Site and its ability to withstand the Project Site conditions for a period of at least 20 years. Seller's impacts due to wake sector management, elevation and temperature (if any) shall be included in the suitability assessment.

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13.5 Component Suppliers

13.5.1 Quality control and assurance programs, both the Turbine Supplier and their component suppliers, shall meet ISO 9001 requirements.

13.5.2 Proposals shall include a listing of all potential component suppliers that will furnish the following components for the Project. This list shall include the names of the proposed component suppliers and the country of origin for each.

(1) Rotor blades.

(2) Gearbox (if applicable).

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(3) Generator.

(4) Main shaft (if applicable).

(5) Main bearings

(6) Hub.

(7) Controller.

(8) Power converter.

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(9) Tower.

(10) Pitch system, including actuators and accumulators (as applicable).

(11) Yaw system, including motors.

(12) Mechanical brake.

(13) Transformer (if applicable).

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13.6 Rotor and Blades

13.6.1 The rotor shall be of three-bladed cantilevered construction.

13.6.2 The rotor shall be mounted upwind of the tower.

13.6.3 The rotor shall have a horizontal-axis orientation.

13.6.4 Reserved.

13.6.5 Blades shall have an integrated lightning protection system, in accordance with IEC 61400-24

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13.6.6 Rotor blades shall be manufactured by an experienced component supplier in an ISO 9001 certified facility.

13.7 Hub

13.7.1 The hub shall allow access to any internal components or operating mechanisms, such as pitch bearings and blade roots.

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13.8 Generator

13.8.1 Owner reserves the right to review available generator types (e.g., induction, permanent magnet generator) offered by Seller for the purpose of specifying the type to be installed in the Wind Turbine Generator.

13.8.2 The generator shall be a three-phase, variable speed, alternating current generator.

13.8.3 The generator shall have a rated frequency of 60 Hertz.

13.8.4 The generator shall operate at the manufacturer's standard voltage level.

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13.8.5 The generator shall have a rated power of no less than 1,500 kilowatts and no greater than 6,000 kilowatts at the Project Site air density.

13.8.6 The generator shall be of minimum protection class IP54.

13.8.7 The generator and its internal components shall be manufactured to NEMA Class H insulation.

13.8.8 The generator shall be enclosed in a weatherproof nacelle.

13.8.9 The generator windings shall be of copper or all-welded aluminum.

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13.8.10 The generator shall operate with a step-up transformer with a high-side voltage of 34.5 kilovolts. The step-up transformer can be integrated in the nacelle or located outside the base of the tower.

13.8.11 The generator nameplate shall contain the applicable information according to IEEE C50.12.

13.8.12 Generators shall be manufactured by an experienced component supplier in an ISO 9001 certified facility.

13.9 Gearbox

13.9.1 No more than one (1) gearbox shall be used in a single Wind Turbine Generator.

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13.9.2 Gearboxes shall be designed in accordance with IEC 61400-4 “Design Requirements for Wind Turbine Gearboxes”

13.9.3 Production testing of the gearbox shall have been performed prior to final acceptance.

13.9.4 The gearbox shall be manufactured by an experienced component supplier in an ISO 9001 certified facility.

13.9.5 Note: if the Wind Turbine Generator does not include a gearbox (e.g., direct drive topology), this Section 13.9 in its entirety is non-applicable.

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13.10 Pitch System

13.10.1 The Wind Turbine Generator shall include a pitch system for controlling the movement of rotor blades.

13.10.2 The pitch system should be capable of pitching blades independently.

13.10.3 The pitch system shall be capable of feathering the blades a full 90 degrees.

13.10.4 The pitch system shall include either hydraulic or electric actuation for pitch drives.

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(1) Pitch systems employing hydraulic actuation shall include adequate spill containment or an absorption system.

(2) Pitch systems employing hydraulic actuation shall incorporate an appropriate filtration system.

(3) Pitch systems employing hydraulic actuation shall include accumulators for failsafe operation. Accumulators shall be charged with nitrogen in the factory prior to delivery onsite. Accumulator pressures shall be confirmed onsite prior to commissioning completion. Any necessary actions for proper operation of the pitch system shall be taken by the Seller or Turbine Supplier to meet safe operation.

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(4) Pitch systems employing electric actuation shall include back-up power for failsafe operation. Pitch system safe operating parameters must be confirmed prior to commissioning completion.

13.10.5 Rotor blades shall be automatically pitched on a regular basis during non-operational periods to ensure a consistent distribution of lubricants.

13.11 Braking System

13.11.1 The braking system shall include both mechanical and aerodynamic brakes.

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13.11.2 The braking system shall be capable of bringing the rotor to a complete stop from any operational condition and for parking the Wind Turbine Generator.

13.11.3 The braking system shall be capable of preventing rotor rotation at wind speeds up to at least the rated survival speed.

13.11.4 The braking system shall include the necessary failsafe redundancy and be designed to function even if its external power supply fails.

13.11.5 The braking system shall include a manual emergency stop function.

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13.12 Yaw System

13.12.1 The yaw system shall be self-orienting.

13.12.2 The yaw system shall be capable of allowing 360 degrees of nacelle rotation.

13.12.3 The yaw system shall be capable of slewing at a rate of at least 0.5 degrees per second.

13.12.4 Owner requests the necessary failsafe system to address the following condition: external power supply failure, loss of back-up pitch system and increasing wind speeds perpendicular to the rotor plane. This condition will cause the rotor speed to increase to an uncontrollable situation.

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13.12.5 The yaw system shall include an appropriately-sized torque limiter.

13.13 Nacelle

13.13.1 The nacelle shall provide adequate working space for service and maintenance activities.

13.13.2 The nacelle interior shall be sufficiently lit to provide adequate visibility for service at any hour.

(1) Nacelle lighting shall meet OSHA requirements for working environments.

(2) Lighting shall incorporate an uninterruptible power supply capable of supplying back-up power for at least one (1) hour.

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13.13.3 The nacelle shall incorporate natural ventilation.

13.13.4 The nacelle shall include spill containment suitable to contain 110 percent of all grease, gear oil, coolant, and other liquids or lubricants stored in nacelle components.

13.13.5 A hatch shall be positioned in the floor or rear of the nacelle for raising or lowering equipment.

13.13.6 The nacelle floor shall have anti-slip surfaces.

13.13.7 Nacelles shall be assembled by an experienced component supplier in an ISO 9001 certified facility.

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13.14 Tower

13.14.1 The Wind Turbine Generator shall be mounted on a tapered, tubular, watertight, tower. No supporting (e.g., guy) wires shall be used.

13.14.2 The tower shall be constructed of steel or concrete.

13.14.3 Reserved.

13.14.4 The tower shall be accessible through a lockable door at the base of the tower.

(1) Doors shall be protected by an intrusion alarm integrated into the SCADA System.

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(2) Permanent metal stairs, including concrete pads for the stair support columns and stair landing for each Wind Turbine Generator, shall be provided if the access door is above grade level.

13.14.5 The tower interior shall be sufficiently lit to provide adequate visibility for service at any hour.

(1) Tower lighting shall meet OSHA requirements for working environments.

(2) Lighting shall be installed at the base of the tower, at all platforms within the tower, and at the top of the tower below the nacelle.

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(3) Lighting shall incorporate an uninterruptible power supply capable of supplying back-up power for at least one (1) hour.

13.14.6 Welded service platforms, or other means to allow access to all components, shall be included within the tower.

(1) Duplex, interior, 120-volt alternating current, 20-amp GFI power receptacles shall be installed at the base of the tower, at all platforms within the tower, and at the top of the tower below the nacelle.

(2) Floors of all platforms shall have anti-slip surfaces.

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13.14.7 A ladder shall be included in the tower for internal ascent.

(1) The tower ladder shall reach from the base of the tower to the nacelle.

(2) The tower ladder shall be made of aluminum or steel.

(3) The tower ladder shall meet all OSHA standard requirements for safety and construction.

(4) Lights shall be mounted along the ladder route inside the tower to provide adequate lighting of the tower interior.

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(5) An OSHA-compliant fall arrest system shall be included that is compatible with the tower ladder. The fall arrest system shall be designed and manufactured according to the latest versions of the following standards, at a minimum: EN 353-1, EN 362, EN 363, CAN/CSA Z259 and ANSI Z359.1. The ladder fall arrest system shall include a rail or steel cable that integrates with a personnel runner.

13.14.8 Tower drawings and specifications shall clearly show maximum foundation loading, shall specify bolt torque requirements for connections and provide all bolt details including size, material and certification

13.14.9 The tower shall incorporate natural ventilation, either through louvers in the tower door or other suitable means.

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13.14.10 Tower sections shall be connected using flange connections.

13.14.11 The tower shall be manufactured by an experienced component supplier in an ISO 9001 certified facility.

13.15 Climb Assist

13.15.1 A climb assist system shall be included in the Proposal as optional equipment; if a climb assist is standard equipment in the proposed Wind Turbine Generator model, the Proposal shall indicate as much. The following specifications shall apply to any climb assist that may be provided.

13.15.2 The climb assist shall be compatible with the standard tower ladder.

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13.15.3 The climb assist shall provide a reduced carrying weight of at least 75 pounds (34 kg).

13.15.4 The climb assist shall meet all OSHA standard requirements for safety and construction.

13.16 Service Lift

13.16.1 A service lift system shall be included in the Proposal as optional equipment; if a service lift is standard equipment in the proposed Wind Turbine Generator model, the Proposal shall indicate as much. The following specifications shall apply to any service lift that may be provided.

13.16.2 The service lift shall be an electrically-driven man-lift capable of lifting two workers and light parts from the base of the tower to the nacelle.

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13.16.3 The service lift shall have a minimum lift capacity of 500 pounds (227 kg).

13.16.4 The service lift shall meet, at a minimum, the requirements of ASME A17.1, ASME A120.1, and OSHA standard requirements for safety and construction.

13.16.5 The service lift shall have interior lights.

13.16.6 The service lift shall have an access door that can be secured from within the lift.

13.16.7 The service lift shall include external controls at the base of the tower to enable movement of the lift without an operator inside.

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13.16.8 The service lift shall have controlled descent capability to enable descent at a controlled rate during power interruption.

13.16.9 The tower ladder shall be accessible from the service lift in the event of power interruption during tower ascent or descent.

13.17 Service Hoist

13.17.1 An electrically-powered service hoist shall be included in the nacelle, capable of lifting parts from ground level to the nacelle.

13.17.2 The service hoist shall have a minimum lifting capacity of 1,000 pounds (453 kg).

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13.18 Power Converter

13.18.1 The Wind Turbine Generator shall include a partial- to full-power convertor capable of supplying power at constant frequency and voltage from the generator to the step-up transformer.

13.19 Thermal Conditioning System

13.19.1 A cooling system (active or passive, as appropriate) suitable for Project Site elevations and temperatures shall be included for the following, at a minimum:

(1) Generator.

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(2) Power converter.

(3) Hydraulics.

(4) Gearbox (as applicable).

(5) Medium-voltage transformer (as applicable).

(6) Nacelle.

13.19.2 Liquid cooling systems shall be self-contained.

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13.20 Lubrication System

13.20.1 Oil shall be maintained at a cleanliness level of at least ISO 4406 15/12.

13.20.2 The gearbox shall be lubricated with oil regularly and automatically.

13.20.3 A backup lubrication system shall be included for failsafe operation.

13.20.4 The following, at a minimum, shall be regularly lubricated with grease from an automatic lubrication unit:

(1) Blade bearings.

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(2) Main bearing.

(3) Generator bearings.

(4) Yaw gear teeth

13.21 Condition Monitoring System

13.21.1 Critical Wind Turbine Generator components shall be monitored by a condition monitoring system for the purpose of targeting predictive maintenance and proactively monitoring failures.

13.21.2 On-line vibration diagnostics shall be carried out, at a minimum, on the following:

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(1) Main bearing.

(2) Gearbox.

(3) Generator.

(4) Drive Train (if applicable)

13.21.3 A baseline for vibration data shall be established on every Wind Turbine Generator using no less than three (3) months of data at the beginning of life on every Wind Turbine Generator.

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(1) Limits shall be set in the SCADA monitoring system for warnings and alarms using these baseline vibration characteristics. These limits shall be actively monitored.

(2) In the event that vibration limits are exceeded, the Wind Turbine Generator shall be automatically shut down in a safe and reliable manner and left in a safe configuration so inspection may be performed.

(3) Vibration data and statistics of the Wind Turbine Generator shall be retrievable from the SCADA System interface.

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13.22 Meteorological Equipment

13.22.1 Each nacelle shall be supplied with primary and secondary anemometers capable of measuring wind speeds.

(1) Anemometers shall be redundant and the Wind Turbine Generator capable of operating with only one anemometer available.

(2) Reserved.

(3) Ultrasonic or three-cup anemometers are acceptable.

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(4) Heaters should be included for anemometers.

13.22.2 Each nacelle shall be supplied with primary and secondary wind vanes capable of measuring wind direction. The vanes shall be redundant and the Wind Turbine Generator capable of operating with only one vane available.

13.22.3 The supplied anemometers and wind vanes shall provide control and display data for the system.

(1) The anemometers shall provide information for system shutdown in the event of excessive wind speeds.

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(2) The anemometers shall provide information for system start or restart when wind speeds are within an acceptable range.

(3) The wind vanes shall provide information for yawing of Wind Turbine Generators.

13.23 Switchgear

13.23.1 A medium voltage switchgear is required at the base of each wind turbine tower when a 34.5 kV step-up transformer is located in the nacelle.

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13.23.2 The Wind Turbine Generator shall include all relaying and switchgear required to assure safe and proper connection and disconnection with the Collection System Circuits, including uninterruptible power supply for safe shutdown upon loss of grid power. The switchgear shall include all enclosures, fittings, disconnect switches, fuses, breakers, and other similar or related items as necessary to adequately protect and isolate the Wind Turbine Generator equipment.

13.23.3 The switchgear shall consist primarily of a main circuit breaker, along with associated equipment.

13.23.4 All equipment and its installation shall meet, at a minimum, applicable NEMA, ANSI, and IEC standards. In the case of conflict between standards, the more stringent shall apply.

13.23.5 The medium voltage switchgear shall be gas-insulated using SF6.

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13.23.6 The switchgear shall be provided in a dedicated steel enclosure and be readily accessible for inspection and maintenance.

13.23.7 The circuit breaker compartment shall have a hinged door and dead front construction.

13.23.8 No exposed buswork or cable connection shall be present with the breaker door open.

13.24 Tower Wiring and Cabling

13.24.1 The internal tower wiring and cabling shall be provided in a sufficient quantity to transfer electrical power between the Wind Turbine Generator nacelle and the down-tower switchgear, including all necessary slack and splicing quantities.

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13.25 Wind Turbine Generator Obstruction Lighting

13.25.1 The Wind Turbine Generator shall be provided with aviation obstruction lights, including mounting assemblies, GPS controller, and photocell as required by the Federal Aviation Administration and all other Applicable Standards, including US DOT-FAA Advisory Circular No. AC 70/7460-1K: *Obstruction Marking and Lighting*.

13.25.2 Wind Turbine Generator aviation obstruction lights shall be programmed to blink in unison, including with those aviation obstruction lights that are installed on the meteorological towers.

13.25.3 Aviation obstruction lighting equipment shall be designed for continuous operation.

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13.25.4 Aviation obstruction lights shall be FAA Type L-864 (single, red, flashing configuration).

13.25.5 Obstruction lighting shall incorporate an uninterruptible power supply capable of supplying back-up power for at least one (1) hour.

13.25.6 A radar activated obstruction lighting system shall be included in the Proposal as optional equipment.

13.26 Lightning Protection

13.26.1 The Wind Turbine Generator shall be furnished with lightning protection designed in compliance with, at a minimum, the requirements of IEC 61400-24 and IEC 62305.

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13.26.2 Lightning protection equipment should include, at a minimum, the following on every Wind Turbine Generator:

(1) Franklin rods on nacelle.

(2) Lightning receptors on hub, nacelle, and each rotor blade.

(3) Internal steel mesh in nacelle to act as Faraday cage.

(4) Fire-retardant materials within nacelle composition.

(5) Earthing system, including down-conducting system with clear electrical path to ground.

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13.26.3 All metallic components within the Wind Turbine Generator shall be bonded to the Wind Turbine Generator.

13.26.4 Rotor blades shall be designed to Lightning Protection Level ("LPL") I, in accordance with IEC 61400-24.

13.26.5 Unless demonstrated by a risk analysis that a lower level is adequate, the remaining components (other than rotor blades) shall be designed to at least LPL-II, in accordance with IEC 61400-24.

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13.27 Corrosion Protection

13.27.1 All ferrous materials shall be supplied with coating systems adequate to protect it from corrosion for the design life (minimum 20 years) of the Wind Turbine Generators at the Project Site location.

13.28 Extreme Weather Packages

13.28.1 The design temperature ranges for each Wind Turbine Generator shall be in accordance with, at a minimum, the most recent edition of IEC 61400-1. The Wind Turbine Generator shall employ hot weather and/or cold weather packages as necessary to maximize production opportunities.

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13.29 Emergency Protection Systems

13.29.1 During power outages of any nature, the Wind Turbine Generator shall have the ability to power down, feather blades properly, and orient the Wind Turbine Generator appropriately to prevent damage by high winds.

13.29.2 Tower, nacelle, and obstruction lighting back-up power shall be provided for personnel and equipment safety during power outages.

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13.30 Fire Protection

13.30.1 Fire protection should be designed to the NFPA 850 (Recommended Practice for Fire Protection for Electric Generating Plants and High Voltage Direct Current Converter Stations) standard.

13.30.2 Permanently-mounted fire extinguishers shall be included, at a minimum, in the nacelle and at the base of every tower.

13.30.3 Fire suppression equipment for the Wind Turbine Generator should be included as an option in the Proposal. Owner reserves the right to install third-party fire suppression equipment at a later date.

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13.31 Grid Compliance

13.31.1 The Wind Turbine Generator shall provide a controlled and predictable power response from variations in wind and grid frequency.

13.31.2 The Wind Turbine Generator shall be compliant with the following power quality and grid interconnection standards, at a minimum:

(1) Federal Energy Regulation Commission Order 661a Appendix G, “Interconnection Requirements for a Wind Generating Plant”.

(2) NERC standards including but not limited to PRC-019, PRC-024, and PRC-025.

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(3) IEEE Standard 519, “Harmonic Limits”.

(4) ANSI C84.1, “American National Standard for Electric Power Systems and Equipment - Voltage Ratings”.

13.31.3 Voltage and Frequency ride through: The Wind Turbine Generator shall be capable of remaining in service for frequency and voltage regulations as determined by NERC ride-through for WECC region.

13.31.4 The Wind Turbine Generator shall operate within a frequency range of 60 Hertz ± 2 Hz.

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13.31.5 The Wind Turbine Generator shall be capable of providing active power control through the following, at a minimum:

(1) Ramp rate control, permitting active power response up to ten percent (10%) of rated power per second.

(2) Delta control, permitting Wind Turbine Generator to be operated at specified output level (delta) below available output level.

13.31.6 Reactive power control shall be provided by the Wind Turbine Generator to assist with regulating grid voltages. The Project (inclusive of all Wind Turbine Generators) shall maintain a power factor within the range of 0.95 leading to 0.95 lagging, as measured at the point of interconnection.

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13.31.7 Total harmonic distortion shall be no greater than five percent (5%).

13.31.8 Test results for IEC 61400-21 shall be provided by the Turbine Supplier.

13.32 Testing and Quality Control

13.32.1 All testing described herein shall be performed by an independent, experienced third party.

13.32.2 All Wind Turbine Generator equipment shall be tested to demonstrate it meets stated design criteria and is fit for purpose.

13.32.3 Wind Turbine Generator testing shall include the following, at a minimum:

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(1) All testing specified in the Applicable Standards.

(2) All testing reasonably recommended or required by the applicable equipment suppliers.

(3) Results of all design testing / factory acceptance testing performed by the OEM shall be provided to the Owner for review. Any testing for non-Project Specific units shall be performed on components of an identical design and construction as those to be installed in Project Specific Wind Turbine Generators. As used herein, "**Project Specific**" means those items that have been specifically manufactured or furnished for the Project.

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(4) All exposed cable sections shall be visually inspected for physical damage or manufacturing defects. Such inspections shall be performed prior to and during installation.

(5) Start-up, test, commission, and successfully achieve commissioning completion and substantial completion of all Wind Turbine Generators and other Wind Turbine Generator equipment, including the SCADA System and service lifts (if elected by Owner).

(6) Reliability test following commissioning completion:

(a) Minimum duration: 72 hours.

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(b) Each individual Wind Turbine Generator shall maintain a minimum availability level of at least 80 percent (80%), as calculated at the end of the test, and as determined using the availability calculation in the Project availability agreement.

(c) The Wind Turbine Generators (considered in the aggregate) shall maintain a minimum availability level of at least 90 percent (90%), as calculated at the end of the test, and as determined using the availability calculation in the Project availability agreement.

(d) Each Wind Turbine Generator shall remain in continuous operation throughout the test and be available to produce.

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(e) Each Wind Turbine Generator shall generate at least five times the nameplate rating in MWh by the end of the test.

(f) No major mechanical or electrical issues shall occur on any Wind Turbine Generator during the test.

13.32.4 Copies of testing reports shall be submitted to Owner within 10 days of completing such test. Testing reports shall include a summary of testing procedures and acceptance criteria.