PILLAR MOUNTAIN WIND PROJECT

KODIAK ISLAND, ALASKA

PHASE II

SUMMER, 2012

DRAWING NUMBER	DESCRIPTION	REV	DATE
S101	COVER SHEET AND DRAWING INDEX	0	03/09/12
S102	PLAN, SECTIONS AND DETAILS	0	03/09/12
S103	BILL OF MATERIALS	0	03/09/12
S104	TECHNICAL SPECIFICATIONS AND SUBMITTALS	0	03/09/12
S105	TECHNICAL SPECIFICATIONS AND SUBMITTALS	0	03/09/12

DATED: MARCH 9, 2012

FINAL DESIGN

MICHAEL J. SHANNON
STATE OF WASHINGTON
42223
REGISTERED PROFESSIONAL ENGINEER
03-09-2012
MICHAEL J. SHANNON, P.E.
No. 42223
LIC. EXP. DATE 5-16-2012

STATE OF ALASKA
49 TH
MICHAEL J SHANNON
Date: 03-09-2012
No. CE 11940
REGISTERED PROFESSIONAL ENGINEER
MICHAEL J. SHANNON, P.E.
No. CE 11940
LIC. EXP. DATE 12-31-2013

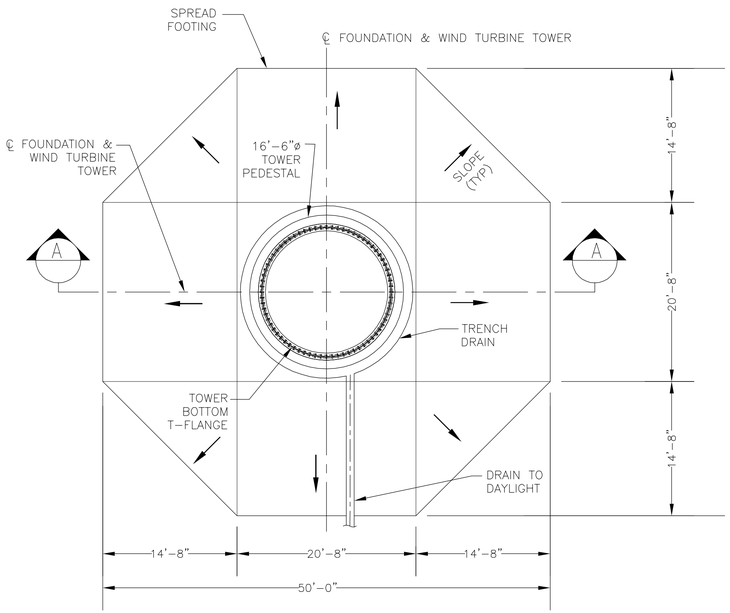
PROJ# 106-4493	
W/O# N/A	
DATE MARCH 9, 2012	
ENG MJS	DES SAE
DR DL	CH VP
APPROVAL	
REDRAWN FROM	

PILLAR MOUNTAIN WIND PROJECT
KODIAK ISLAND, ALASKA
PHASE 2
WTG FOUNDATION
COVER SHEET AND DRAWING INDEX
KODIAK ELECTRIC ASSOCIATION, INC

SCALE: NTS | TETRA TECH EC, INC. | SHEET S101 | REV. 0

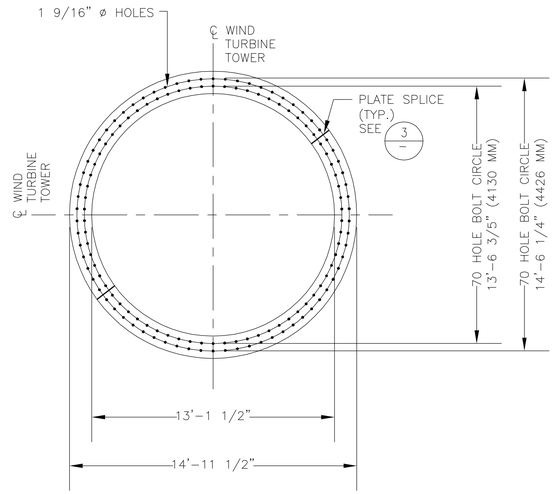
PLOT SCALE: 1=1 ELECTRONIC FILE NAME: D3642-PHASE2_S-101_REV 0.DWG

REFERENCE DESCRIPTION/TYPE | DRAWING No. | REFERENCE DESCRIPTION/TYPE | DRAWING No. | CHK APP | BY | W/O No. | REVISION | DATE | No. | REVISION | DATE | CHK APP | BY | W/O No. | REVISION | DATE | No.



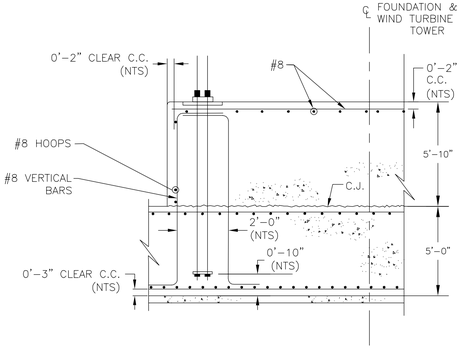
WIND TURBINE TOWER FOUNDATION PLAN

1/8" = 1'-0"



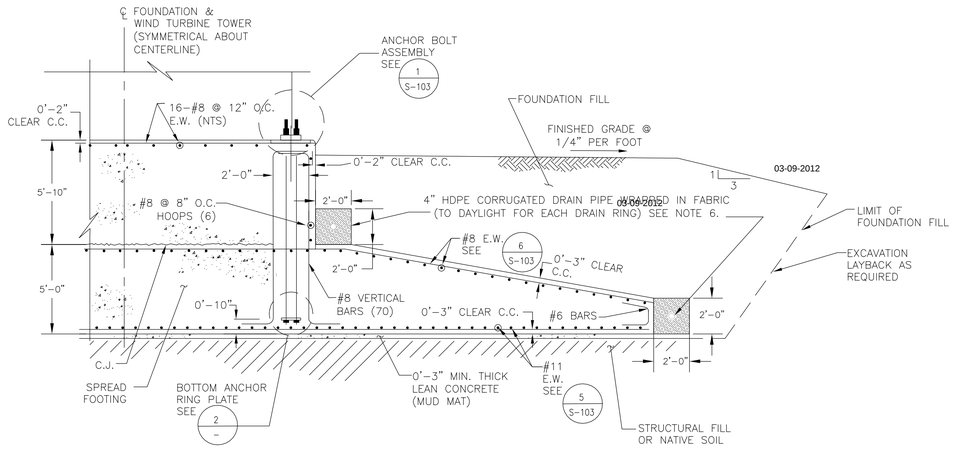
2 / - BOTTOM ANCHOR RING PLATE DETAIL

NTS (EMBEDMENT RING)



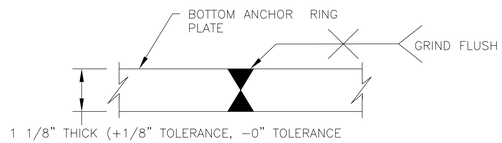
4 / - LOCATION OF VERTICAL BARS IN RELATION TO ADJACENT REBARS

NTS



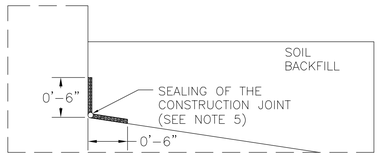
WIND TURBINE TOWER FOUNDATION REINFORCEMENT

1/4" = 1'-0" (UNLESS NOTED)



3 / - BOTTOM ANCHOR RING PLATE SPLICE DETAIL

NTS



7 / - CONSTRUCTION JOINT BETWEEN FOUNDATION AND PEDESTAL

NTS

DATED: MARCH 9, 2012

FINAL DESIGN

GENERAL NOTES:

1. THE FOUNDATION SUPPORT AND SOIL PROPERTIES FOR THIS DESIGN ARE BASED ON RECOMMENDATIONS FOR ALL WIND TURBINES INCLUDED IN THE GEOTECHNICAL ENGINEERING REPORT FOR KEA WIND FARM PREPARED BY TETRA TECH ON MARCH 2008. THIS DESIGN IS APPLICABLE ONLY TO FOUNDATIONS AT TURBINE SITES 1, 2 AND 3.
2. ALL CONCRETE WORK SHALL CONFORM TO ACI-318.
3. FOR TECHNICAL SPECIFICATIONS, SEE DRAWING S-104
4. SEE ELECTRICAL DRAWINGS FOR GROUNDING SYSTEM AND ELECTRICAL CONDUIT LAYOUT.
5. THE CONSTRUCTION JOINT SHALL BE SEALED TO PREVENT WATER INTRUSION. SEAL THE JOINT WITH SILICON RATED FOR OUTDOOR USE. AFTER THE SILICON HAS SET, APPLY A LIQUID ROOFING TAR OR LIQUID RUBBER PRODUCT BRUSHING ALONG THE JOINT AND UP TO 6" ON EACH SIDE OF THE JOINT. ONCE THE TAR OR RUBBER PRODUCT HAS SET, INSTALL THE DRAIN SYSTEM. THE GEOTEXTILE USED IN THE DRAIN SHALL BE ADEQUATE TO PROTECT THE SEALED JOINT FROM BEING DAMAGED BY THE ROCKS IN THE DRAIN (SEE DETAIL 7).
6. BACKFILL AROUND THE HDPE DRAINS SHALL BE FREE DRAINING MATERIAL AND SHALL BE PLACED AROUND THE DRAIN WITHOUT ANY COMPACTION EFFORT.

ABBREVIATIONS:

C.C.	CONCRETE COVER
O.D.	OUTSIDE DIAMETER
I.D.	INSIDE DIAMETER
E.W.	EACH WAY
TYP	TYPICAL
T.O.C.	TOP OF CONCRETE
O.C.	ON CENTER
T&B	TOP AND BOTTOM
NTS	NOT TO SCALE
C.J.	CONSTRUCTION JOINT
HH	HUB HEIGHT
MW	MEGA WATT
WTG	WIND TURBINE GENERATOR
BFS	BELOW FINISHED SURFACE

BUILDING AND DESIGN CODES:

INTERNATIONAL BUILDING CODE 2006, INTERNATIONAL CODE COUNCIL

BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE, ACI 318, 2008, AMERICAN CONCRETE INSTITUTE.

AISC MANUAL OF STEEL CONSTRUCTION, ASD, 13TH EDITION

WIND TURBINE AND TOWER:

MANUFACTURER: GE ENERGY
MODEL: G.E. 1.5-77, rNAMTS
POWER OUTPUT: 1.5 MW
TOWER HEIGHT: 79.7 m HH

DESIGN DATA:

CRITICAL FOUNDATION LOADS (UN-FACTORED)@ 0.83 FT ABOVE GROUND LEVEL (LOAD DLC6.2-4)

OVERTURNING MOMENT, M0 = 35,455.93 FT-KIPS
HORIZONTAL BASE SHEAR, Fr = 163.07 KIPS
VERTICAL TOWER REACTION, F = -499.80 KIPS (DOWNWARD)

MIN. 28-DAY CONCRETE COMPRESSIVE STRENGTH FOR SPREAD FOOTING: 4000 PSI

MIN. 28-DAY CONCRETE COMPRESSIVE STRENGTH FOR PEDESTAL: 4000 PSI

MIN. COMPRESSIVE STRENGTH OF GROUT:
3 DAYS = 6500 PSI 28 DAYS = 8000 PSI

MIN. YIELD STRENGTH OF REINFORCING BAR: 60 KSI

MIN. YIELD STRENGTH OF BOTTOM ANCHOR RING PLATE: 36 KSI

DESIGN ALLOWABLE SOIL BEARING PRESSURE = 10,000 PSF

GROUNDWATER ELEVATION MATCHES EXISTING GRADE

MIN. ROTATIONAL STIFFNESS OF FOUNDATION = 62.1 E+7 FT-KIPS/RAD

MIN. HORIZONTAL STIFFNESS OF FOUNDATION = 1.03 E+6 K/FT

MIN. COMPACTED UNIT WEIGHT OF FOUNDATION FILL = 115 PCF (MOIST)

MIN. REQUIRED SOIL DYNAMIC SHEAR MODULUS: 7914 KSF

MIN. FOUNDATION BEARING DEPTH = 10.83 FT BFS

ANCHOR BOLTS:

TENSION FORCE = 76 KIPS
MIN. YIELD STRENGTH = 75 KSI
MIN. TENSILE STRENGTH = 100 KSI
ANCHOR BOLT DIAMETER (THREAD MAJOR DIAMETER) = 1 1/2 INCHES

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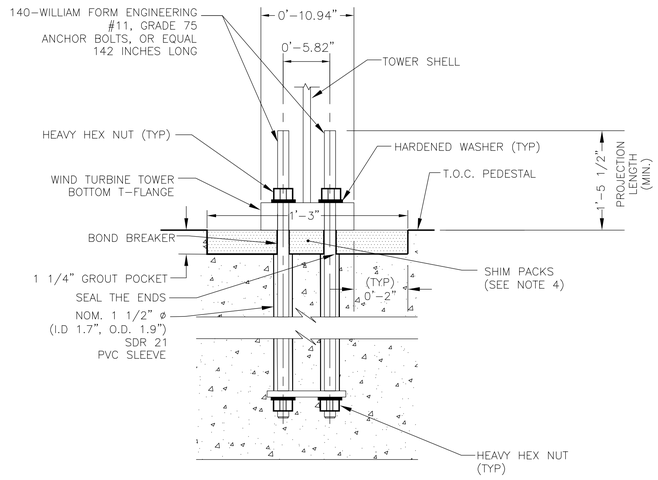
PILLAR MOUNTAIN WIND PROJECT
KODIAK ISLAND, ALASKA
PHASE II
WTG FOUNDATION
PLAN, SECTIONS AND DETAILS

KODIAK ELECTRIC ASSOCIATION, INC

SCALE: AS SHOWN | TETRA TECH EC, INC. | SHEET S102 | REV. 0

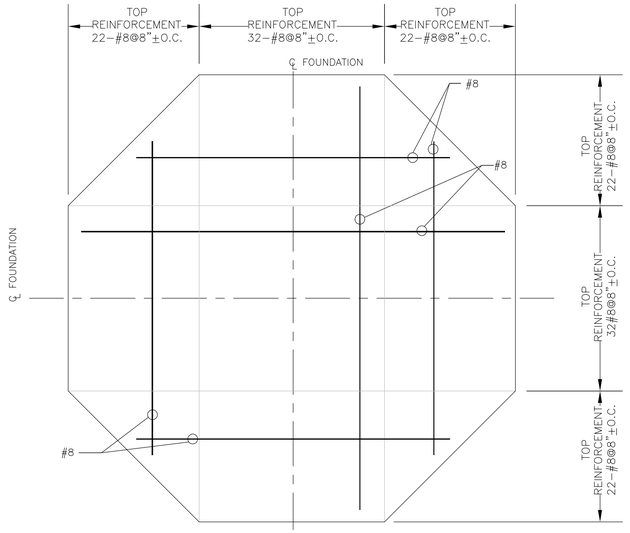
No.	DATE	REVISION
A		REFERENCE DESCRIPTION/TYPE
		DRAWING No.
B		REFERENCE DESCRIPTION/TYPE
		DRAWING No.
		CHK APP
		BY
C		W/O No.
		REVISION
D		DATE
		No.

ELECTRONIC FILE NAME: D3642-003_01_S-102_REV 0.dwg
PLOT SCALE: 1=1



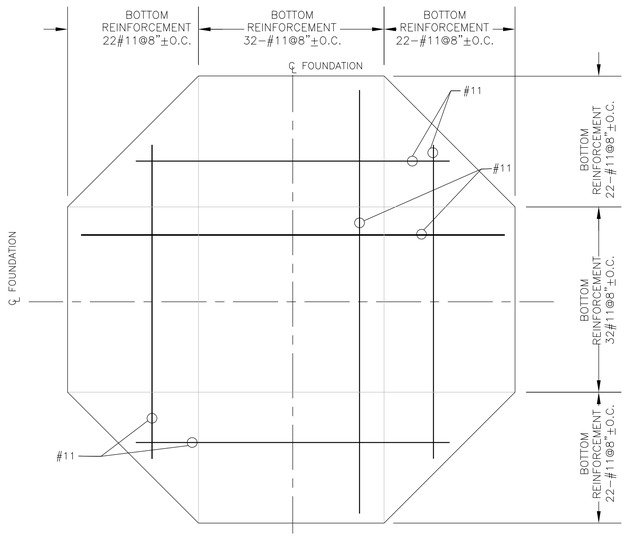
1
S-102

ANCHOR BOLT ASSEMBLY DETAIL
NTS



6
S-102

TOP SPREAD FOOTING
REINFORCEMENT DETAIL
(VERTICAL REBARS ARE NOT SHOWN FOR CLARITY)
1/8" = 1'



5
S-102

BOTTOM SPREAD FOOTING
REINFORCEMENT DETAIL
(VERTICAL REBARS ARE NOT SHOWN FOR CLARITY)
1/8" = 1'

NOTES:

1. FOR GENERAL NOTES, SEE DRAWING S-102.
2. MINIMUM EMBEDMENT LENGTH FOR ANCHOR BOLT SHALL BE 50 INCHES, MEASURED FROM T.O.C. OF SPREAD FOOTING @ CENTER (SEE DRAWING S-102).
3. FOR LOCATION OF VERTICAL BARS, SEE DETAIL 4 ON DRAWING S-102.
4. PROVIDE SHIM PACKS AT A MINIMUM OF FOUR PLACES EVENLY SPACED.
5. FOR CONDUITS AND GROUNDING SEE ELECTRICAL DRAWINGS.

BILL OF MATERIALS PER WTG FOUNDATION

ITEM NO.	DESCRIPTION	QUANTITY	UNIT
1	CONCRETE	331	CY
2	TOTAL REINFORCING STEEL	29.898	TONS
2a	#11 HORIZONTAL BARS	16.617	TONS
2b	#8 HORIZONTAL BARS	8.356	TONS
2c	#8 HOOP BARS	0.50	TONS
2d	#8 VERTICAL BARS	2.445	TONS
2e	#8 STRAIGHT BARS	0.610	TONS
2f	#6 EDGE BARS	1.370	TONS
3	ANCHOR BOLTS	140	EA
4	HARDENED WASHERS	280	EA
5	SHIM PACKS	4	EA
6	HEAVY HEX NUTS	280	EA
7	BOTTOM ANCHOR RING PLATE	1	EA
8	GROUT	5.8	CF
9	JAM NUTS	AS REQUIRED	EA

DATED: MARCH 9, 2012

FINAL DESIGN

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PILLAR MOUNTAIN WIND PROJECT
KODIAK ISLAND, ALASKA
PHASE 2
WTG FOUNDATION
BILL OF MATERIALS

KODIAK ELECTRIC ASSOCIATION, INC

SCALE:		SHEET	REV.
NONE	TETRA TECH EC, INC.	S103	0

No.	DATE	REVISION

No.	DATE	REFERENCE DESCRIPTION/TYPE	DRAWING No.

No.	DATE	REVISION	W/O No.	BY	CHK	APP

ELECTRONIC FILE NAME: D3642-003_01_S-103_REV 0.dwg
PLOT SCALE: 1=1

SECTION 02300 EXCAVATION, BACKFILL AND COMPACTION
PART 1 GENERAL

1.1 THIS SECTION SPECIFIES THE TECHNICAL AND CONSTRUCTION REQUIREMENTS FOR EXCAVATION, BACKFILL, COMPACTION AND GRADING FOR WIND TURBINE GENERATOR (WTG) FOUNDATIONS.

1.2 SUBMITTALS
A. LEAN CONCRETE MIX DESIGN: SUBMIT 14 DAYS PRIOR TO PLACEMENT OF LEAN CONCRETE.
B. BACKFILL: WHEN IMPORTED STRUCTURAL FILL IS USED FOR FOUNDATIONS, SUBMIT LABORATORY SOIL TEST RESULTS DOCUMENTING FILL PROPERTIES. THIS TEST DATA SHALL INCLUDE MOISTURE-DENSITY RELATIONSHIP AND PARTICLE SIZE ANALYSIS.
C. EXCAVATION PROTECTION PLAN: DESCRIBE SHEETING, AND BRACING MATERIALS AND INSTALLATION IF REQUIRED TO PROTECT EXCAVATIONS AND ADJACENT STRUCTURES AND PROPERTY INCLUDING STRUCTURAL CALCULATIONS TO SUPPORT PLAN FOR EXCAVATIONS GREATER THAN 4.0 FEET DEPTH. EXCAVATION PROTECTION PLAN SHALL COMPLY TO 29 CFR PART 1926, OSHA STANDARD AND BE SIGNED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF ALASKA.
D. FIELD COMPACTION TEST REPORTS FOR STRUCTURAL FILL PLACED BELOW THE FOUNDATION AND FOUNDATION FILL PLACED ABOVE THE SPREAD FOOTING. NO COMPRESSION TESTING IS REQUIRED FOR LEAN CONCRETE.
E. SUBGRADE INSPECTION REPORT FOR EACH WTG FOUNDATION. A QUALIFIED THIRD PARTY REPRESENTATIVE SHALL INSPECT THE BASE OF EACH FOUNDATION EXCAVATION PRIOR TO PLACING ANY STRUCTURAL FILL OR THE MUD MAT. THE QUALIFIED THIRD PARTY REPRESENTATIVE SHALL DOCUMENT WITH PHOTOS AND WRITTEN NARRATIVE THE TYPE AND CHARACTER OF THE EXPOSED ROCK. THE DESIGN IS BASED ON FINDING COMPETENT ARGILLITE SHALE ROCK AT EACH WTG FOUNDATION EXCAVATION AS WAS THE CASE FOR THE THREE EXISTING WTG'S. EACH INSPECTION REPORT SHALL BE SIGNED BY THE QUALIFIED THIRD PARTY REPRESENTATIVE AND MASTEC REPRESENTATIVE AND FORWARDED TO THE PROFESSIONAL ENGINEER FOR REVIEW PRIOR TO PLACING STRUCTURAL BACKFILL OR MUD MAT OVER NATURAL SHALE BEDROCK.

PART 2 PRODUCTS

2.1 LEAN CONCRETE
A. CEMENT SHALL CONFORM TO ASTM C150, TYPE I.
B. COARSE AGGREGATES SHALL CONFORM TO ASTM C33. COARSE AGGREGATE SHALL CONSIST OF GRAVEL, CRUSHED GRAVEL OR STONE, AIR-COOLED BLAST FURNACE SLAG OR COMBINATION THEREOF.
C. FINE AGGREGATE SHALL CONFORM TO ASTM C33 OR GRADATION APPROVED BY THE MASTEC REPRESENTATIVE. FINE AGGREGATE SHALL CONSIST OF NATURAL SAND, MANUFACTURED SAND, OR A COMBINATION THEREOF.
D. A TYPICAL LEAN CONCRETE MIX DESIGN SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 2000 PSI (28 DAYS).

2.2 EXCAVATED SUITABLE MATERIALS
A. AT MINIMUM, EXCAVATED SUITABLE MATERIAL SHALL BE:
   1. FREE OF ORGANIC MATERIAL, DEBRIS, SNOW, ICE, FROZEN SOIL OR MUD.
   2. FREE OF VISIBLE OR KNOWN CONTAMINATION.
   3. FREE OF LUMPS AND ROCKS LARGER THAN 3 INCHES.

2.3 FOUNDATION FILL
A. FOUNDATION FILL CONSISTS OF EXCAVATED SUITABLE MATERIALS (EXCLUDING TUNDRA) OR IMPORTED FOUNDATION FILL SOILS. THE FOUNDATION FILL MATERIAL SHALL BE COMPACTED TO AT LEAST 95% OF THE MAXIMUM DRY DENSITY IN ACCORDANCE WITH ASTM D1557 OR 70% RELATIVE DENSITY PER ASTM D4253/D4254 WITH A COMPACTED TOTAL MOIST UNIT WEIGHT OF 115 PCF OR GREATER.
B. THE FOUNDATION FILL MATERIAL SHALL BE USED IN AREAS ABOVE THE SPREAD FOOTING.

2.4 IMPORTED STRUCTURAL FILL
A. THE IMPORTED STRUCTURAL FILL MATERIAL SHALL BE CLEAN DENSE GRADED AGGREGATE FREE OF CONTAMINANTS MEETING THE REQUIREMENTS OF ALASKA DEPTARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS SECTION 703 FOR CLASS B MATERIAL.
B. USE OF IMPORTED STRUCTURAL FILL IS SUBJECTED TO THIRD PARTY QUALIFIED REPRESENTATIVE'S APPROVAL.

2.5 TOPSOIL MATERIALS
A. STRIPPED SOIL DURING EXCAVATION SHALL BE SALVAGED AND REUSED.

PART 3 EXECUTION

3.1 PREPARATION
A. CONTACT LOCAL UTILITY LINE LOCATION SERVICE, IF AVAILABLE, BEFORE PERFORMING WORK.
B. IDENTIFY REQUIRED LINES, LEVELS, CONTOURS, AND DATUM.

3.2 CLEARING
A. REMOVE ALL VEGETATION INCLUDING TREES, STUMPS, ROOTS AND SHRUBS AS NECESSARY WITHIN WTG FOUNDATION CONSTRUCTION AREAS.
B. STRIP EXISTING TOPSOIL TO A DEPTH SPECIFIED BY THE MASTEC REPRESENTATIVE. STOCKPILE FOR REUSE.

3.3 EXCAVATION
A. PROVIDE DEWATERING AS REQUIRED TO MAINTAIN GROUNDWATER LEVEL AT LEAST 1 FOOT BELOW THE BOTTOM OF EXCAVATION. NO SUMPS OR OTHER PUMPING WILL BE PERMITTED WITHIN THE FOUNDATION FOOTPRINT.
B. EXCAVATE SUBGRADE MATERIAL FROM THE REQUIRED AREAS TO THE LINES AND GRADES SHOWN IN THE DESIGN DRAWINGS.
C. SEE REQUIREMENTS IN SECTION 02300, PART 1 GENERAL, PARAGRAPH 1.2 E.
D. REMOVE UNSUITABLE EXCAVATED MATERIALS FROM THE FOUNDATION FOOTPRINT AS DIRECTED BY THE MASTEC REPRESENTATIVE.
E. EXCAVATION SHOULD BE CARRIED OUT IN SUCH A MANNER THAT THE GRADE THROUGHOUT THE WORK AREA IS KEPT DRAINED AT ALL TIMES.

3.4 STOCKPILING
A. STOCKPILE MATERIALS ON SITE AT LOCATIONS INDICATED BY THE OWNER.

3.5 CLEANUP AND RESTORATION
B. REMOVE STOCKPILE; LEAVE AREA IN CLEAN AND NEAT CONDITION, GRADE WTG FOUNDATION AREA SURFACE IN ACCORDANCE WITH DESIGN DRAWINGS.

3.6 BACKFILLING
A. DO NOT BACKFILL OVER POROUS, WET, FROZEN, OR SPONGY SUBGRADE SURFACES.
B. MAINTAIN MOISTURE CONTENT OF BACKFILL MATERIALS WITHIN 2 PERCENTAGE POINTS OF OPTIMUM TO ATTAIN REQUIRED COMPACTED DRY DENSITY.
C. PLACE STRUCTURAL FILL IN LOOSE LIFTS TO ACHIEVE MAXIMUM 6 INCHES COMPACTED LIFT. THE COMPACTED LIFT SHALL HAVE A MINIMUM 100 PERCENT OF MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D698 OR 70% RELATIVE DENSITY PER ASTM D4253/D4254.
D. PLACE LEAN CONCRETE FROM ONE END OF THE BACKFILL AREA TO THE OTHER.
E. THE SURFACE OF THE LEAN CONCRETE SHALL BE LEVELED TO PROVIDE UNIFORM AREA AND TO FACILITATE THE PLACEMENT OF REINFORCING STEEL.
F. PLACE FOUNDATION FILL IN MAXIMUM 8" LOOSE LIFTS AND COMPACT TO AN IN-PLACE TOTAL UNIT WEIGHT OF 115 PCF OR GREATER. PLACE FOUNDATION FILL FROM THE TOP OF THE FOOTING TO THE FINISHED GROUND SURFACE ELEVATION AS SHOWN ON THE DESIGN DRAWINGS.

3.7 TOLERANCE
A. SUBGRADE ELEVATION UPON EXCAVATION: PLUS 0 INCHES OR MINUS 2 INCHES FROM REQUIRED ELEVATION.

3.8 TESTING
A. ONE IN-PLACE DENSITY AND ONE MOISTURE TEST SHALL BE PERFORMED FOR EACH LIFT FOR WTG FOUNDATION.
B. IN-PLACE DENSITY TEST: ASTM D698, ASTM D2167, ASTM D6938
C. IN-PLACE MOISTURE TEST: ASTM D6938
D. MOISTURE DENSITY RELATIONSHIP: ASTM D698, ASTM D1557
E. PARTICLE SIZE ANALYSIS: ASTM D422
F. RELATIVE DENSITY: ASTM D 4286, ASTM D4287

SECTION 03300 CAST-IN-PLACE STRUCTURAL CONCRETE

PART 1 GENERAL

1.1 THIS SECTION SPECIFIES TECHNICAL AND CONSTRUCTION REQUIREMENTS FOR FORM WORK, CAST-IN-PLACE CONCRETE, REINFORCING STEEL AND NON-SHRINK GROUT.

1.2 QUALIFICATIONS
A. MANUFACTURER: COMPANY SPECIALIZING IN MANUFACTURING PRODUCTS SPECIFIED IN THIS SECTION WITH MINIMUM THREE YEARS DOCUMENTED EXPERIENCE.

1.3 SUBMITTALS
A. CONCRETE MIX DESIGN: SUBMIT 14 DAYS PRIOR TO PLACEMENT OF CONCRETE. THE SUBMITTALS FOR LEAN CONCRETE ARE COVERED IN SECTION 02300. SUBMIT SEPARATE MIX DESIGNS WHENEVER SPECIAL ADMIXTURES ARE REQUIRED.
B. BATCH TICKETS: SUBMIT DAILY COPY OF THE BATCH TICKET FOR EACH LOAD OF CONCRETE.
C. CONCRETE FIELD TEST RESULTS: SUBMIT SLUMP, AIR CONTENT, AND TEMPERATURE TEST RESULTS FOR CONCRETE USED FOR THE FOUNDATIONS.
D. CONCRETE COMPRESSION TEST RESULTS: SUBMIT COMPRESSION TEST RESULTS FOR CONCRETE USED FOR THE FOUNDATION.
E. PRODUCT DATA FOR ADMIXTURE, POZZOLAN, AND CURING MEMBRANE USED ON THE PROJECT.
F. COLD AND HOT WEATHER CONCRETE PLACEMENT AND PROTECTION PLAN.
G. REINFORCING STEEL FABRICATION AND PLACEMENT DRAWINGS.
H. CERTIFIED MILL REPORTS OF REINFORCING STEEL, CONFIRMING THE GRADE AND STRENGTH OF REINFORCING STEEL PROVIDED ON THE PROJECT.
I. PRODUCT DATA FOR NON-SHRINK GROUT.
J. MANUFACTURER'S INSTRUCTION FOR MIXING, PLACING AND CURING OF THE GROUT TO BE USED ON THE PROJECT.
K. GROUT CUBE STRENGTH TEST RESULTS, SIGNED BY A TESTING LABORATORY QC REPRESENTATIVE.

1.4 QUALITY ASSURANCE
A. PERFORM CONCRETE WORK IN ACCORDANCE WITH ACI 318 AND ACI 301.
B. REVIEW CONCRETE SUPPLIER BATCH PLANT TO ASSURE CAPABILITY OF BATCH PLANT TO PRODUCE CONCRETE MEETING THE REQUIREMENTS STATED IN THE SPECIFICATION.
C. INSPECT THE TRUCK MIXERS AND OTHER EQUIPMENT TO BE USED IN THE MIXING AND TRANSPORTING CONCRETE.

PART 2 PRODUCTS

2.1 FORM MATERIALS
A. FORMS FOR EXPOSED FINISH CONCRETE: PROVIDE CONTINUOUS, STRAIGHT, SMOOTH EXPOSED SURFACES. FURNISH IN LARGEST PRACTICAL SIZES TO MINIMIZE NUMBER OF JOINTS. PROVIDE FORM MATERIAL WITH SUFFICIENT THICKNESS TO WITHSTAND PRESSURE OF NEWLY PLACED CONCRETE WITHOUT VISIBLE BOW OR DEFLECTION.
B. FORM COATINGS: PROVIDE COMMERCIAL FORMULATION FORM-COATING COMPOUNDS THAT WILL NOT BOND WITH, STAIN NOR ADVERSELY AFFECT CONCRETE SURFACES, AND WILL NOT IMPAIR SUBSEQUENT TREATMENTS.

2.2 REINFORCING MATERIALS
A. REINFORCING STEEL: ASTM 615, GRADE 60.

2.3 ANCHOR BOLTS
A. ANCHOR BOLTS FOR MOUNTING WIND TURBINE TOWER TO FOUNDATION, SHALL BE FURNISHED IN ACCORDANCE WITH SECTION 05120.

2.4 CONCRETE MATERIALS
A. PORTLAND CEMENT SHALL CONFORM TO ASTM C150, TYPE IA.
B. COARSE AGGREGATE: COARSE AGGREGATE SHALL CONFORM TO ASTM C33. MAXIMUM COARSE AGGREGATE SIZE SHALL BE 1.5 INCHES AND SHALL CONSIST OF GRAVEL, CRUSHED GRAVEL OR STONE, AIR-COOLED BLAST FURNACE SLAG OR COMBINATION THEREOF.
C. MIXING WATER: POTABLE WATER HAVING NO PRONOUNCED TASTE OR ODOR, AND CONTAINING NO DELETERIOUS MATERIALS SHALL BE USED FOR MIXING CONCRETE.
D. AIR-ENTRAINING AGENTS SHALL MEET THE REQUIREMENTS OF ASTM C260 AND SHALL NOT CONTAIN CHLORIDE.
E. HIGH RANGE WATER-REDUCING ADMIXTURE (SUPERPLASTICIZER) SHALL CONFORM TO ASTM C494, TYPE F.
F. WATER-REDUCING ADMIXTURES SHALL CONFORM TO ASTM C494, TYPE A AND CONTAIN NO MORE THAN 1% CHLORIDE IONS.
G. CALCIUM CHLORIDE SHALL NOT BE USED.
H. POZZOLANS (FLY ASH) SHALL CONFORM TO ASTM C618, CLASS F AND THE LOSS OF IGNITION (LOI) SHALL BE LESS THAN 6%.
I. FINE AGGREGATE: FINE AGGREGATE SHALL CONFORM TO ASTM C33. FINE AGGREGATE SHALL CONSIST OF NATURAL SAND, MANUFACTURED SAND OR A COMBINATION THEREOF.
J. CURING COMPOUND SHALL COMPLY WITH ASTM C309, TYPE I, CLASS A.

2.5 CONCRETE MIX DESIGN
A. CONCRETE MIX DESIGN SHALL BE PREPARED FOR EACH REQUIRED TYPE AND STRENGTH OF CONCRETE BY EITHER LABORATORY TRIAL BATCH, FIELD EXPERIENCE METHODS AS SPECIFIED IN ACI 318, OR BASED ON BATCH PLANT OWNER'S EXPERIENCE. THE MIX DESIGNS AND SUPPORTING DATA, SIGNED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF ALASKA, SUBMITTED TO AND APPROVED BY THE FIELD ENGINEER PRIOR TO PLACING CONCRETE.

2.6 LABORATORY AND FIELD TESTING OF CONCRETE

A.	COMPRESSIVE STRENGTH (28 DAY):	4000 PSI FOR SPREAD FOOTING 4000 PSI FOR PEDESTAL
B.	COMPRESSIVE STRENGTH : (PRIOR TO BACKFILLING AND/OR TENTIONING BOLTS AND INSTALLATION OF BOTTOM SECTION OF TOWER)	3500 PSI FOR SPREAD FOOTING 3500 PSI FOR PEDESTAL
C.	WATER/CEMENT RATIO (MAXIMUM BY WEIGHT):	0.45 MAX
D.	AGGREGATE SIZE (MAXIMUM):	1.5 INCHES
E.	ENTRAINED AIR:	6 PERCENT (± 1.0%)
F.	FLY ASH CONTENT:	MAX. 20 PERCENT OF CEMENTITOUS CONTENT
G.	SLUMP:	4 INCHES ± 1 INCH

H. ADMIXTURE TYPES AND QUANTITIES SHALL BE AS INDICATED IN CONCRETE MIX DESIGNS.
I. MAXIMUM SLUMP FOR CONCRETE USING A HIGH-RANGE WATER-REDUCER MAY BE INCREASED TO 6 INCHES ± 2 INCHES AT POINT OF PLACEMENT.

2.7 GROUT MATERIALS
A. NON-SHRINK GROUT SHALL CONFORM TO ASTM C1107, GRADE B, CAPABLE OF DEVELOPING MINIMUM COMPRESSIVE STRENGTH OF 4000 PSI IN 3 DAYS AND 8000 PSI IN 28 DAYS.

PART 3 EXECUTION

3.1 CONCRETE FORMWORK
A. ALL FORMS SHALL BE STRAIGHT AND PLUMB, RIGID, AND MORTAR TIGHT. ALL FORMS SHALL BE BRACED, TIED AND SUPPORTED SUFFICIENTLY TO MAINTAIN THEIR REQUIRED POSITION DURING AND AFTER THE PLACEMENT OF THE CONCRETE. EARTH FORMS MAY BE USED IN CONSTRUCTING FOUNDATIONS WHEN SOIL AT THE SITE IS STIFF.
B. FORM TIES: USE FACTORY-FABRICATED, ADJUSTABLE-LENGTH REMOVABLE OR SNAPOFF METAL FORM TIES, DESIGNED TO PREVENT FORM DEFLECTION, AND TO PREVENT SPALLING CONCRETE SURFACE UPON REMOVAL UNLESS OTHERWISE INDICATED. PROVIDE TIES SO THAT PORTIONS REMAINING WITHIN CONCRETE AFTER REMOVAL WILL NOT BE WITHIN 1 INCH OF ANY EXPOSED CONCRETE SURFACE.
C. PROVIDE OPENINGS IN CONCRETE FORMWORK TO ACCOMMODATE THE INSTALLATION OF EMBEDDED CONDUIT.
D. TOLERANCES: FORMWORK SHALL BE CONSTRUCTED WITHIN THE TOLERANCES SHOWN ON THE FORMWORK DRAWINGS.
E. PREPARATION OF FORM SURFACES: COAT CONTACT SURFACES OF FORMS WITH A FORM-COATING COMPOUND BEFORE REINFORCEMENT IS PLACED. DO NOT ALLOW FORM-COATING COMPOUND TO COME INTO CONTACT WITH REINFORCEMENT OR WITH CONCRETE SURFACES AGAINST WHICH FRESH CONCRETE WILL BE PLACED.
F. REMOVAL OF FORMS AND SUPPORTS: AFTER PLACING CONCRETE, FORMS SHALL REMAIN IN PLACE AFTER COMPLETION OF CONCRETE PLACEMENTS FOR ENOUGH TIME TO PREVENT CONCRETE DAMAGE DURING FORM REMOVAL.
G. INSPECT AND CHECK THE FORMWORK BEFORE THE REINFORCING STEEL IS PLACED TO CONFIRM THAT THE DIMENSIONS AND LOCATION OF THE CONCRETE FOUNDATIONS WILL CONFORM TO THE WTG FOUNDATION DESIGN DRAWINGS.

3.2 PLACING REINFORCEMENT AND EMBEDDED ITEMS
A. PROVIDE BARS, WIRE FABRIC, WIRE TIES, SUPPORTS, AND OTHER DEVICES NECESSARY TO INSTALL AND SECURE REINFORCEMENT. REINFORCEMENT SHALL NOT HAVE SCALE, OIL, GREASE, CLAY, OR FOREIGN SUBSTANCES THAT WOULD REDUCE THE BOND. RUSTING OF REINFORCEMENT IS A BASIS OF REJECTION IF THE EFFECTIVE CROSS-SECTIONAL AREA OR THE NOMINAL WEIGHT PER UNIT LENGTH HAS BEEN REDUCED. REMOVE LOOSE RUST PRIOR TO PLACING STEEL. TACK WELDING IS PROHIBITED FOR ALL REINFORCEMENT SHOWN ON STRUCTURAL DRAWINGS.
B. PLACE REINFORCEMENT AND SECURE WITH GALVANIZED OR NON-CORRODIBLE CHAIRS, SPACERS, OR METAL HANGERS. FOR SUPPORTING REINFORCEMENT ON THE GROUND, USE CONCRETE OR OTHER NON-CORRODIBLE MATERIAL HAVING A COMPRESSIVE STRENGTH EQUAL TO OR GREATER THAN THE CONCRETE BEING PLACED. ACCURATELY POSITION, SUPPORT AND SECURE REINFORCEMENT AGAINST MOVEMENT BY FORMWORK, CONSTRUCTION, OR CONCRETE PLACEMENT OPERATIONS.
C. PLACE REINFORCEMENT TO MEET MINIMUM REBAR COVER FOR REINFORCEMENT PROTECTION, SPACING AND PLACEMENT REQUIREMENTS SPECIFIED ON DESIGN DRAWINGS.
D. SPLICING: LOCATE REINFORCEMENT SPLICES AS INDICATED ON THE PLACEMENT DRAWINGS. REBAR SPLICE SHALL BE ALTERNATED TO PREVENT WEAK PLANES.
E. EMBEDDED ITEMS:
   1. MAKE PROVISIONS FOR EMBEDDED CONDUITS AND ANCHOR BOLT ASSEMBLY SPECIFIED ON DESIGN DRAWINGS.
   2. DO NOT EMBED WOOD OR UNCOATED ALUMINUM IN CONCRETE.
   3. SECURELY ANCHOR EMBEDDED ITEMS IN CORRECT LOCATION AND ALIGNMENT PRIOR TO PLACING CONCRETE.
F. EXAMINATION OF REINFORCEMENT: VERIFY REQUIREMENTS FOR CONCRETE COVER OVER REINFORCEMENT. VERIFY ANCHORS, SEATS, PLATES, REINFORCEMENT AND OTHER ITEMS TO BE CAST INTO CONCRETE ARE ACCURATELY PLACED, POSITIONED SECURELY, AND WILL NOT INTERFERE WITH PLACING CONCRETE. NOTIFY THE MASTEC REPRESENTATIVE AFTER PLACEMENT OF REINFORCING STEEL IN FORMS, BUT PRIOR TO PLACING CONCRETE. SCHEDULE CONCRETE PLACEMENT TO PERMIT FORMWORK INSPECTION BY THE MASTEC REPRESENTATIVE BEFORE PLACING CONCRETE.

3.3 SETTING ANCHOR BOLTS
A. INSTALLATION OF CAST-IN-PLACE ANCHOR BOLTS SHALL BE IN ACCORDANCE WITH SECTION 05120.

3.4 MIXING AND TRANSPORTING CONCRETE
A. HAND-MIXED CONCRETE SHALL NOT BE ALLOWED FOR ANY PORTION OF THE WORK.
B. CONCRETE SHALL BE DISCHARGED, WHEN THE AIR TEMPERATURE IS LESS THAN 85 DEGREES F, WITHIN ONE AND ONE-HALF HOURS FROM THE TIME DRY AGGREGATES ARE LOADED INTO THE TRUCK MIXER. FOR AIR TEMPERATURE ABOVE 85 DEGREES F, CONCRETE SHALL BE PLACED WITHIN 60 MINUTES FROM THE TIME AGGREGATES ARE LOADED.
C. IF CONCRETE MIX DESIGN CONTAINS SET RETARDING ADMIXTURE, THE LIMIT FOR PLACING CONCRETE MAY REMAIN AT 90 MINUTES PROVIDED SLUMP REQUIREMENTS CAN BE MET.

DATED: MARCH 9, 2012

FINAL DESIGN

MICHAEL J. SHANNON
STATE OF WASHINGTON
42223
REGISTERED
PROFESSIONAL ENGINEER
03-09-2012
MICHAEL J. SHANNON, P.E.
No. 42223
LIC. EXP. DATE 5-16-2012

STATE OF ALASKA
49 TH
MICHAEL J. SHANNON
Date: 03-09-2012
No. CE 11940
REGISTERED PROFESSIONAL ENGINEER
MICHAEL J. SHANNON, P.E.
No. CE 11940
LIC. EXP. DATE 12-31-2013

PROJ# 106-4493			
W/O# N/A			
DATE MARCH 9, 2012			
ENG MJS		DES SAE	
DR DL/DB	CH VP		
APPROVAL			
REDRAWN FROM			

PILLAR MOUNTAIN WIND PROJECT
KODIAK ISLAND, ALASKA
PHASE 2
WTG FOUNDATION
SPECIFICATIONS AND SUBMITTALS
KODIAK ELECTRIC ASSOCIATION, INC

SCALE:		SHEET	REV.
NONE	TETRA TECH EC, INC.	S104	0

ELECTRONIC FILE NAME: D3642-003_01_S-104_REV 0.dwg
PLOT SCALE: 1=1

No.	DATE	REVISION	W/O No.	BY	CHK	APP

No.	DATE	REFERENCE DESCRIPTION/TYPE	DRAWING No.	BY	CHK	APP

D. FURNISH BATCH TICKET TO THE FIELD ENGINEER WITH EACH BATCH OF CONCRETE BEFORE UNLOADING AT THE SITE. THE BATCH TICKET SHALL CONTAIN THE FOLLOWING INFORMATION CONCERNING THE CONCRETE:
   1. NAME OF READY-MIX CONCRETE COMPANY
   2. SERIAL NUMBER OF TICKET
   3. DATE
   4. TRUCK NUMBER
   5. NAME OF PURCHASER
   6. AMOUNT OF CONCRETE IN CUBIC YARDS
   7. MAXIMUM SIZE OF AGGREGATE
   8. INGREDIENTS CERTIFIED AS BEING PREVIOUSLY APPROVED
   9. SIGNATURE OF PRODUCER'S REPRESENTATIVE
   10. TIME THE BATCH WAS PLACED IN THE TRUCK
E. AVOID SEGREGATING THE CONCRETE MIX DURING DISCHARGE AT THE LOCATION OF PLACEMENT.
F. TRANSPORT CONCRETE FROM THE BATCH PLANT TO THE PROJECT SITE AS SOON AS POSSIBLE TO AVOID DELAYS AND DISPOSAL OF UNSUITABLE CONCRETE.
G. CLEAN TRANSPORTING EQUIPMENT BEFORE EACH BATCH. DO NOT USE ALUMINUM PIPE OR CHUTES
H. READY-MIX CONCRETE SHALL BE IN ACCORDANCE WITH ACI 301 AND ASTM C94.

3.5 PLACING CONCRETE

A. NOTIFY MASTEC REPRESENTATIVE A MINIMUM 24 HOURS PRIOR TO COMMENCEMENT OF CONCRETE OPERATIONS.
B. PRE-PLACEMENT INSPECTION: MASTEC REPRESENTATIVE SHALL INSPECT THE COMPLETED FORMWORK, REINFORCING STEEL, AND ITEMS TO BE EMBEDDED PRIOR TO CONCRETE PLACEMENT. HOWEVER, THIS DOES NOT RELEASE THE CONTRACTOR FROM RESPONSIBILITY FOR ACCEPTABLE AND SATISFACTORILY COMPLETED WORK.
C. PLACE CONCRETE AS SOON AS PRACTICAL AFTER THE FORMS AND THE REINFORCEMENT HAVE BEEN INSPECTED AND APPROVED. DO NOT PLACE CONCRETE WHEN WEATHER CONDITIONS PREVENT PROPER PLACEMENT, CONSOLIDATION AND CURING; IN UNCOVERED AREAS DURING PERIODS OF PRECIPITATION; OR IN STANDING WATER. PRIOR TO PLACING CONCRETE, REMOVE DIRT, CONSTRUCTION DEBRIS, WATER, SNOW, AND ICE FROM WITHIN THE FORMS. DEPOSIT CONCRETE AS CLOSE AS PRACTICABLE TO THE FINAL POSITION IN THE FORMS. DO NOT EXCEED A FREE VERTICAL DROP OF 5 FEET FROM THE POINT OF DISCHARGE.
D. CONSOLIDATION: CONSOLIDATE CONCRETE IN ACCORDANCE WITH ACI 301. CONSOLIDATE CONCRETE FOUNDATION WITH HIGH FREQUENCY, INTERNAL, MECHANICAL VIBRATING EQUIPMENT SUPPLEMENTED BY HAND SPADING AND TAMPING. OPERATE VIBRATORS WITH VIBRATORY ELEMENT SUBMERGED IN THE CONCRETE, WITH A MINIMUM FREQUENCY OF NOT LESS THAN 6000 IMPULSES PER MINUTE WHEN SUBMERGED. DO NOT USE VIBRATORS TO TRANSPORT THE CONCRETE IN THE FORMS. INSERT AND WITHDRAW VIBRATORS AT A SPACING RECOMMENDED BY THE MANUFACTURER. PENETRATE THE PREVIOUSLY PLACED LIFT WITH THE VIBRATOR WHEN MORE THAN ONE LIFT IS REQUIRED. PLACE CONCRETE IN 18 INCHES MAXIMUM VERTICAL LIFTS. EXTERNAL VIBRATORS MAY BE USED ON THE EXTERIOR SURFACE OF THE FORMS WHEN INTERNAL VIBRATORS DO NOT PROVIDE ADEQUATE CONSOLIDATION OF THE CONCRETE.
E. MAINTAIN RECORDS OF CONCRETE PLACEMENT. RECORD DATE, LOCATION, QUANTITY, AIR TEMPERATURE, AND TEST SAMPLES TAKEN. CONTRACTOR SHALL ALSO KEEP DUPLICATE RECORDS.
F. DO NOT INTERRUPT SUCCESSIVE PLACEMENT TO PREVENT COLD JOINTS FROM FORMING.

3.6 FINISH OF FORMED SURFACES

A. DEFECTS: REPAIR FORMED SURFACES BY REMOVING MINOR HONEYCOMBS, PITS GREATER THAN 1 IN2 SURFACE AREA OR ¼ INCH MAXIMUM DEPTH. PROVIDE EDGES PERPENDICULAR TO THE SURFACE AND PATCH WITH NONSHRINK GROUT. PATCH TIE HOLES AND DEFECTS WHEN THE FORMS ARE REMOVED. CONCRETE WITH EXTENSIVE HONEYCOMB INCLUDING EXPOSED STEEL REINFORCEMENT, COLD JOINTS, ENTRAPPED DEBRIS, SEPARATED AGGREGATE, OR OTHER DEFECTS, WHICH AFFECT THE SERVICEABILITY OR STRUCTURAL STRENGTH, WILL BE REJECTED, UNLESS CORRECTION OF DEFECTS IS APPROVED BY THE FIELD ENGINEER. OBTAIN APPROVAL OF CORRECTIVE ACTION PRIOR TO REPAIR. EXPOSED SURFACES SHALL BE UNIFORM IN APPEARANCE AND FINISHED TO A SMOOTH FORM FINISH UNLESS OTHERWISE SPECIFIED.
B. ROUGH FORM FINISH: PROVIDE AS-CAST ROUGH FORM FINISH TO FORMED CONCRETE SURFACES THAT ARE TO BE CONCEALED IN FINISH WORK OR BY OTHER CONSTRUCTION, UNLESS OTHERWISE INDICATED.
C. SMOOTH FORM FINISH: PROVIDE AS-CAST SMOOTH FORM FINISH FOR FORMED CONCRETE SURFACES THAT ARE EXPOSED TO VIEW, OR THAT ARE COVERED WITH A COATING MATERIAL APPLIED DIRECTLY TO CONCRETE, OR A COATING MATERIAL BONDED TO CONCRETE SUCH AS WATERPROOFING, DAMP-PROOFING, PAINTING, OR OTHER SIMILAR SYSTEM. PRODUCE SMOOTH FORM FINISH BY SELECTING FORM MATERIAL TO IMPART A SMOOTH, HARD, UNIFORM TEXTURE AND ARRANGING THEM ORDERLY AND SYMMETRICALLY WITH A MINIMUM OF SEAMS. REPAIR AND PATCH DEFECTIVE AREAS WITH FINS OR OTHER PROJECTIONS COMPLETELY REMOVED AND SMOOTHED.

3.7 FOUNDATION TOP FINISH

D. PLACE, CONSOLIDATE, AND IMMEDIATELY STRIKE OFF CONCRETE TO OBTAIN PROPER CONTOUR, GRADE, AND ELEVATION BEFORE BLEEDWATER APPEARS. PERMIT CONCRETE TO ATTAIN A SET SUFFICIENT FOR FLOATING AND SUPPORTING THE WEIGHT OF THE FINISHER AND EQUIPMENT. IF BLEEDWATER IS PRESENT PRIOR TO FLOATING THE SURFACE, DRAG THE EXCESS WATER OFF OR REMOVE BY ABSORPTION WITH POROUS MATERIALS. DO NOT USE DRY CEMENT TO ABSORB BLEEDWATER.
E. TROWEL FINISH: APPLY TROWEL FINISH TO TOP SURFACE OF THE FOUNDATION, UNLESS OTHERWISE INDICATED, IN THE DEIGN DRAWINGS. AFTER FLOATING, BEGIN FIRST TROWEL OPERATION USING POWER TROWEL OR USING MANUAL LABOR. BEGIN FINAL TROWELING WHEN SURFACE PRODUCES RINGING SOUND AS TROWEL IS MOVED OVER SURFACE. CONSOLIDATE CONCRETE SURFACE BY FINAL HAND TROWELING OPERATION, FREE OF TROWEL MARKS, UNIFORM IN TEXTURE AND APPEARANCE. AFTER TROWELING OPERATION, USE SOFT-BRISTLED PUSH BROOM OVER THE FRESHLY TROWELED SURFACE TO OBTAIN NON-SLIP SURFACE.

3.8 CURING AND PROTECTION

A. CURE AND PROTECT CONCRETE FROM DAMAGING ACTIONS BY SUN, RAIN, WIND, FLOWING WATER, MECHANICAL DAMAGE AND PREMATURE DRYING FOR NOT LESS THAN SEVEN CONSECUTIVE DAYS AFTER PLACEMENT IN ACCORDANCE WITH ACI 301. BEGIN CURING FORMED SURFACES IMMEDIATELY FOLLOWING FORM REMOVAL. AVOID DAMAGE TO CONCRETE FROM VIBRATION CREATED BY ANY ACTIVITY RESULTING IN GROUND VIBRATIONS. DO NOT ALLOW CONCRETE TO DRY OUT FROM TIME OF PLACEMENT UNTIL THE EXPIRATION OF THE SPECIFIED CURING PERIOD.
B. IF FORMS ARE REMOVED PRIOR TO THE EXPIRATION OF THE CURING PERIOD, PROVIDE ANOTHER CURING PROCEDURE SPECIFIED HEREIN FOR THE REMAINING PORTION OF THE CURING PERIOD FOR EXPOSED SURFACES AFTER REMOVAL OF FORM. PROVIDE MOIST CURING FOR THOSE AREAS RECEIVING LIQUID CHEMICAL SEALER-HARDENER OR EPOXY COATING.
C. MOIST CURING: COVER CONCRETE SURFACES WITH MOISTURE-RETAINING COVER FOR CURING PERIOD. EXPOSED HORIZONTAL CONCRETE SURFACES MAY BE COVERED WITH SAND OR OTHER APPROVED MATERIAL AND KEPT WET FOR THE REQUIRED PERIOD. WOOD FORMS SHALL BE KEPT SUFFICIENTLY WET AT ALL TIMES TO PREVENT THE FORMS FROM SEPARATING AT THE JOINTS AND THE CONCRETE FROM DRYING.
D. MEMBRANE CURING: CONCRETE SURFACES TO RECEIVE MEMBRANE CURING SHALL BE TREATED WITH A CURING COMPOUND AS SPECIFIED OR OTHERWISE APPROVED. THE CURING COMPOUND SHALL BE APPLIED IN STRICT ACCORDANCE WITH THE DIRECTIONS OF THE MANUFACTURER OF THE COMPOUND.
E. COLD WEATHER: PROTECT CONCRETE BY PROVIDING ADEQUATE COVER AND HEATING SOURCE TO MAINTAIN CONCRETE TEMPERATURE SPECIFIED IN ACI 306.1 OR AS APPROVED BY THE MASTEC REPRESENTATIVE.
F. HOT WEATHER: THE CONCRETE SURFACES SHALL BE KEPT BELOW 85 DEGREES F FOR THE CURING PERIOD. PROVIDE WINDBREAKS, SHADING, FOG SPRAYING, SPRINKLING, PONDING, OR WET COVERING, AS REQUIRED, IN ACI 305 OR AS APPROVED BY THE MASTEC REPRESENTATIVE TO PREVENT MOISTURE LOSS DURING CURING PERIOD.

3.9 PATCHING

A. NOTIFY THE MASTEC REPRESENTATIVE TO INSPECT CONCRETE SURFACES IMMEDIATELY UPON REMOVAL OF FORMS.
B. EXCESSIVE HONEYCOMB OR EMBEDDED DEBRIS IN CONCRETE IS NOT ACCEPTABLE. NOTIFY THE MASTEC REPRESENTATIVE UPON DISCOVERY.
C. PATCH IMPERFECTIONS AS DIRECTED BY THE MASTEC REPRESENTATIVE.

3.10 TESTING

A. PROVIDE THE NECESSARY TESTING AND MONITORING SERVICES NEEDED TO CONTROL OR MONITOR THE PRODUCTION, TRANSPORTATION, PLACEMENT, PROTECTION, CURING OF THE CONCRETE. SAMPLING AND TESTING FOR QUALITY CONTROL DURING PLACEMENT SHALL INCLUDE THE FOLLOWING:
   1. SAMPLING OF FRESH CONCRETE: OBTAIN CONCRETE SAMPLES FOR TESTING IN ACCORDANCE WITH ASTM C172.
   2. SLUMP: TEST THE SLUMP OF THE SAMPLED CONCRETE IN ACCORDANCE WITH ASTM C143. THE MAXIMUM SLUMP MAY BE INCREASED AS SPECIFIED WITH THE ADDITION OF AN APPROVED ADMIXTURE PROVIDED THAT THE WATER-CEMENT RATIO IS NOT EXCEEDED. PERFORM TESTS AT COMMENCEMENT OF CONCRETE PLACEMENT, WHEN TEST CYLINDERS ARE MADE, AND FOR EACH BATCH (MINIMUM) OR EVERY 150 CUBIC YARDS (MAXIMUM) OF CONCRETE.
   3. AIR CONTENT: TEST AIR CONTENT OF THE SAMPLED CONCRETE IN ACCORDANCE WITH ASTM C231. TEST CONCRETE FOR AIR CONTENT AT THE SAME FREQUENCY AS SPECIFIED FOR SLUMP TESTS.
   4. CONCRETE TEMPERATURE: TEST WHEN AIR TEMPERATURE IS BELOW 40 DEGREES F OR WHEN ABOVE 80 DEGREES F. TEST CONCRETE DELIVERED AND WHILE IN THE FORMS DURING CURING PERIOD.
   5. COMPRESSION TEST SPECIMENS: MAKE FIVE TEST CYLINDERS FOR EACH SET OF TESTS IN ACCORDANCE WITH ASTM C31. PRECAUTIONS SHALL BE TAKEN TO PREVENT EVAPORATION AND LOSS OF WATER FROM THE SPECIMEN. LABORATORY SHALL PERFORM COMPRESSION TESTING OF CONCRETE CYLINDERS IN ACCORDANCE WITH ASTM C39. TEST TWO CYLINDERS AT 7 DAYS, TWO CYLINDERS AT 28 DAYS, AND HOLD ONE CYLINDER IN RESERVE. SAMPLES FOR STRENGTH TESTS SHALL BE TAKEN FOR EACH 100 CUBIC YARDS OR FRACTION THEREOF, OF EACH CONCRETE CLASS PLACED. STRENGTH LEVEL OF CONCRETE SHALL BE CONSIDERED SATISFACTORY IF BOTH THE FOLLOWING REQUIREMENTS ARE MET:
      a. NO INDIVIDUAL TEST RESULT IS 500 PSI LESS THAN THE 7-DAY OR 28-DAY STRENGTH AS APPLICABLE.
      b. THE AVERAGE OF THE COMPRESSIVE TESTS EQUALS OR EXCEEDS THE 7-DAY OR 28-DAY STRENGTH AS APPLICABLE.
B. IN THE EVENT OF UNSATISFACTORY COMPRESSIVE TEST RESULTS, NOTIFY A THIRD PARTY REPRESENTATIVE FOR RESOLUTION.

3.11 DEFECTIVE CONCRETE

A. DEFECTIVE CONCRETE: CONCRETE NOT CONFORMING TO REQUIRED DETAILS, DIMENSIONS, TOLERANCES OR SPECIFIED REQUIREMENTS.
B. REPAIR OR REPLACEMENT OF DEFECTIVE CONCRETE WILL BE DETERMINED BY A THIRD PARTY REPRESENTATIVE.

3.12 TOLERANCE

A. PLACE CONRETE IN ACCORDANCE WITH THE FOLLOWING DIMENSIONAL TOLERANCES.
   1. REINFORCING PLAN SPACING: PLUS OR MINUS 2 INCHES.
   2. REINFORCING VERTICAL SPACING: PLUS OR MINUS 1 INCH.
   3. FOOTING CLEAR CONCRETE COVER: MINUS 0 INCHES, PLUS 1 INCH.
   4. PEDESTAL CLEAR CONCRETE COVER: MINUS 0 INCHES, PLUS 1 INCH.
   5. FOOTING PLAN DIMENSIONS: MINUS 0 INCHES, PLUS 2 INCHES.
   6. FOOTING THICKNESS: MINUS 0 INCHES, PLUS 2 INCHES.
   7. PEDESTAL PLAN DIMENSIONS: MINUS 0 INCHES, PLUS 2 INCHES.
   8. PEDESTAL HEIGHT: MINUS 0 INCH, PLUS 1 INCH.
   9. LOCATION OF FOUNDATION CENTER: PLUS OR MINUS 1/4 INCH.
   10. ELEVATION AT TOP OF ANCHOR BOLTS AND TOP OF PEDESTAL: MINUS 0 INCHES, PLUS 1/4 INCH.
   11. FOUNDATION DEVIATION FROM LEVEL: 1/16 INCH IN 4 FEET.

3.13 PLACING GROUT

A. MIX, PLACE, AND CURE GROUT IN ACCORDANCE WITH APPROVED MANUFACTURER'S INSTRUCTIONS.
B. PROVIDE GROUT IN ACORDANCE WITH DESIGN DRAWINGS. DO NOT ALLOW GROUT TO BE PLACED AGAINST THE SIDE OF THE WIND TURBINE TOWER BOTTOM T-FLANGE.
C. CAST MINIMUM OF 4 GROUT CUBES, AND PERFORM LABORATORY STRENGTH TESTING AT 3 DAYS (AVERAGE OF TWO BREAKS) AND 28 DAYS (AVERAGE OF TWO BREAKS).

SECTION 05120 STRUCTURAL STEEL

PART 1 GENERAL

1.1 THIS SECTION SPECIFIES TECHNICAL AND CONSTRUCTION REQUIREMENTS FOR BOTTOM ANCHOR RING PLATE AND ANCHOR BOLT ASSEMBLY FOR CONNECTING THE WIND TURBINE BOTTOM T-FLANGE TO WTG FOUNDATION.

1.2 SUBMITTALS

A. CERTIFICATE OF CONFORMANCE INDICATING COMPLIANCE WITH THE MATERIALS SPECIFIED ON THE DESIGN DRAWINGS. THE CERTIFICATION SHALL INCLUDE MILL CERTIFICATES FOR EACH TYPE OF STEEL USED FOR EMBEDMENT RING PLATE AND ANCHOR BOLT ASSEMBLY, INDICATING MINIMUM YIELD STRESS.
B. WELDERS CERTIFICATES: SUBMIT WELDER INFORMATION DOCUMENTING WELDER QUALIFICATIONS FOR APPROVAL PRIOR TO WORK.
C. WELD PROCEDURE: SUBMIT PROPOSED WELD PROCEDURE FOR APPROVAL PRIOR TO WORK.
D. WELD INSPECTION REPORT: SUBMIT WELD INSPECTION REPORT IN ACCORDANCE WITH AWS D1.1.
E. FABRICATION AND ERECTION DRAWINGS: SUBMIT SHOP DRAWINGS FOR THE STEEL STRUCTURES SHOWN ON THE DESIGN DRAWINGS.
F. PRODUCT DATA FOR ANCHOR BOLT ASSEMBLY, WHICH INCLUDES ANCHOR BOLT, SLEEVE, NUTS AND WASHERS. THIS SHALL INCLUDE THE INDEPENDENT LABORATORY TENSION TEST RESULTS FOR 5 ANCHOR BOLTS WITH THREADS IN ACCORDANCE WITH ASTM A370.
G. A 12-INCH LONG PRODUCT SAMPLE FOR ANCHOR BOLT ASSEMBLY.
H. TENSIONING PROCEDURE FOR ANCHOR BOLT, INCLUDING EQUIPMENT CALIBRATION, TENSIONING METHODS AND POST TENSION TESTING PROCEDURES.
I. TENSION TEST DATA FOR ANCHOR BOLTS INDICATING THE BOLT LOCATION AND ITS TENSION VALUE. IMMEDIATELY AFTER ALL ANCHOR BOLTS HAVE BEEN TENSIONED FOR EACH WTG FOUNDATION, A MINIMUM OF 15 RANDOMLY SELECTED ANCHOR BOLTS SHALL BE INSPECTED AND RE-TESTED FOR TENSION VALUES. AN INSPECTION REPORT SHALL BE PROVIDED BY A THIRD PARTY REPRESENTATIVE.

1.3 QUALITY ASSURANCE

A. PERFORM STRUCTURAL WELDING WORK IN ACCORDANCE WITH AWS D1.1, STRUCTURAL WELDING CODE.
B. FABRICATION TOLERANCES FOR STEEL STRUCTURAL SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF AISC MANUAL OF STEEL CONSTRUCTION.
C. PERFORM TENSIONING FOR ANCHOR BOLT IN ACCORDANCE WITH APPROVED TENSIONING PROCEDURE.

PART 2 PRODUCTS

A. BOTTOM ANCHOR RING PLATE SHALL CONFORM TO ASTM A36, PLAIN FINISH. WELDING ELECTRODE SHALL BE E70XX.
B. ANCHOR BOLT: WILLIAMS FORM ENGINEERING NO. 11, GRADE 75 OR EQUAL AS APPROVED BY THE TETRA TECH PROFESSIONAL ENGINEER. ANCHOR BOLT TENSION FORCE = 76 KIPS. MINIMUM YIELD STRESS = 75 KSI. MINIMUM TENSILE STRESS = 100 KSI. ANCHOR BOLT DIAMETER (THREAD MAJOR DIAMETER) = 1-1/2 INCHES.
C. ANCHOR BOLT SLEEVES: PVC CONFORMING TO ASTM D1784, CLASS 10000 MANUFACTURED TO ASTM D2241 SDR21 WALL THICKNESS.
D. HEAVY HEX NUTS SHALL BE FULL STRENGTH HEX NUTS BY WILLIAMS FORM ENGINEERING.
E. STEEL WASHERS SHALL BE HARDENED WASHERS BY WILLIAMS FORM ENGINEERING.

PART 3 EXECUTION

3.1 PLACEMENT OF ANCHOR BOLTS

A. USE A TEMPLATE RING PLATE TO SET ANCHOR BOLTS. VERIFY THE BOTTOM ANCHOR RING PLATE AND ANCHOR BOLTS ARE SET WITHIN THE TOLERANCES SPECIFIED IN PARAGRAPH 3.2 OF THIS SPECIFICATION.
B. ENSURE THE BOTTOM ANCHOR RING PLATE IS PROPERLY SECURED TO PREVENT MOVEMENT DURING PLACEMENT OF CONCRETE.
C. AFTER PLACEMENT OF THE PEDESTAL, PREVENT WATER FROM ENTERING THE SLEEVE ANNULUS PRIOR TO ERECTION OF WIND TURBINE TOWER BOTTOM T-FLANGE BY SEALING WITH SILICON.
D. AFTER SETTING OF THE WIND TURBINE BOTTOM T-FLANGE, INSTALL GROUT IN ACCORDANCE WITH SECTION 03300 UNDER BOTTOM T-FLANGE AS INDICATED IN DESIGN DRAWINGS. PROVIDE BOND BREAKER BETWEEN GROUT AND ANCHOR BOLT.
E. TENSIONING ANCHOR BOLT WHEN GROUT STRENGTH EXCEEDED 6500 PSI AND THE CONCRETE STRENGTH OF THE FOUNDATION (SPREAD FOOTING AND PEDESTAL) HAS REACHED 3500 PSI.
F. PERFORM POST-TENSIONING FOR ANCHOR BOLT IN ACCORDANCE WITH APPROVED TENSIONING PROCEDURE TO ACHIEVE A MINIMUM POST-TENSION FORCE OF 76 KIPS.
G. ANCHOR BOLTS IN AREAS DIRECTLY IN CONTACT WITH CONCRETE OR GROUT SHALL BE PROTECTED FROM CORROSION BY WRAPPING WITH PETROLATUM FABRIC (44 MILS) OR EQUAL.
H. ANCHOR BOLT PROJECTIONS ABOVE THE WTG BOTTOM T-FLANGE SHALL BE GREASED TO PREVENT CORROSION.
I. EXTERIOR ANCHOR BOLT PROJECTIONS SHALL BE CAPPED WITH PLASTIC CAPS. CAPS SHALL BE SIZED TO BE WATER TIGHT.

3.2 TOLERANCES

A.	ANCHOR BOLT LOCATION:	1/16 INCH
B.	ANCHOR BOLT PLUMBNESS (VERTICAL):	LESS THAN 1/16 INCH IN 1 FOOT
C.	HORIZONTAL ANGULAR ALIGNMENT (ROTATION) OF ANCHOR BOLT GROUP	1 DEGREE
D.	EMBEDMENT RING PLATE ELEVATION:	1/2 INCH
E.	EMBEDMENT RING PLATE DIMENSIONS:	1/16 INCH
F.	ANCHOR BOLT LENGTH:	1 INCH
G.	ANCHOR BOLT POST TENSION:	MINUS 0 KIPS, PLUS 2 KIPS

SECTION 01300 SUBMITTAL REQUIREMENTS

A. THIS SECTION SPECIFIES THE REQUIREMENTS FOR SUBMITTALS LISTED IN SECTIONS 02300, 03300 AND 05120
B. SUBMIT ONE ELECTRONIC COPY OF THE SUBMITTALS SPECIFIED TO THE PROFESSIONAL ENGINEER OF RECORD.
C. THE ENGINEER OF RECORD WILL REVIEW THE SUBMITTALS FOR CONFORMANCE AND COMPLIANCE WITH THE DESIGN DRAWINGS AND TECHNICAL SPECIFICATIONS.

DEFINITIONS

A. THIRD PARTY REPRESENTATIVE - REPRESENTATIVE OF THE CLIENT OR OWNER
B. ENGINEER OF RECORD - PROFESSIONAL ENGINEER WHO HAS SIGNED AND SEALED THE DESIGN DRAWINGS
C. MASTEC REPRESENTATIVE - EMPLOYEE OF MASTEC

MICHAEL J. SHANNON STATE OF WASHINGTON 42223 REGISTERED PROFESSIONAL ENGINEER
03-09-2012
MICHAEL J. SHANNON, P.E.
No. 42223
LIC. EXP. DATE 5-16-2012

STATE OF ALASKA 49TH MICHAEL J. SHANNON Date: 03-09-2012 No. CE 11940 REGISTERED PROFESSIONAL ENGINEER
MICHAEL J. SHANNON, P.E.
No. CE 11940
LIC. EXP. DATE 12-31-2013

DATED: MARCH 9, 2012

FINAL DESIGN

PROJ# 106-4493			
W/O# N/A			
DATE MARCH 9, 2012			
ENG MJS	DES SAE		
DR DL	CH VP		
APPROVAL			
REDRAWN FROM			

PILLAR MOUNTAIN WIND PROJECT
KODIAK ISLAND, ALASKA
PHASE 2
WTG FOUNDATION
SPECIFICATIONS AND SUBMITTALS
KODIAK ELECTRIC ASSOCIATION, INC

SCALE: NONE | TETRA TECH EC, INC. | SHEET S105 | REV. 0

No.	DATE	REVISION	W/O No.	BY	CHK	APP

ELECTRONIC FILE NAME: 03642-003_01_S-105_REV 0.dwg
PLOT SCALE: 1=1

No.	DATE	REFERENCE DESCRIPTION/TYPE	DRAWING No.